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PROCEEDINGS

OF THE

LINNEAN SOCIETY OF LONDON.



122ND SESSION.

FROM NOVEMBER 1909 TO JUNE 1910.

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Publications of the Society issued during the period, 31st July, 1909, to 31st July, 1910 :—

Journal (Botany), No. 270, 4th Aug., 1909.
 „ 271, 28th Oct., 1909.
 „ (Zoology), No. 200, 15th Dec., 1909.
 „ 201, 22nd June, 1910.
 „ 206, 30th Nov., 1909.

Transactions (2nd Ser.) Botany, Vol. VII. Part XIII., Sept. 1909.
 „ XIV., Nov. 1909.
 „ (2nd Ser.) Zoology, Vol. X. Part IX., Nov. 1909.
 „ XIII. „ I., Oct. 1909.
 „ II., Feb. 1910.
 „ III., June 1910.

Proceedings, 121st Session, from November 1908 to June 1909 :
 October 1909.

List of [Fellows, Associates, and Foreign Members], 1909-1910.

PROCEEDINGS
OF THE
LINNEAN SOCIETY OF LONDON.

(ONE HUNDRED AND TWENTY-SECOND SESSION,
1909-1910.)

November 4th, 1909.

Dr. D. H. SCOTT, F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 17th June, 1909, were read and confirmed.

Miss Julia Lindley, Mr. Martin Hubert Foquet Sutton, and Mr. Cecil Hallworth Treadgold, M.A. (Cantab.), were admitted Fellows.

Captain John Humphrey Barbour, M.B., Mr. Frederick James Bridgman, Mr. Linnæus Greening, Mr. Henry John Jeffery, A.R.C.S., Mr. Frank Armitage Potts, M.A. (Cantab.), Mr. Walter Theodore Saxton, M.A. (Cantab.), Mr. Hugh Scott, B.A. (Cantab.), Mr. Charles Sillem, and Mr. Charles Worster-Drought, B.A. (Cantab.), were proposed as Fellows, and Mr. Oswald Arthur Sayce as an Associate.

Mr. Richard Siddoway Bagnall was elected a Fellow.

Mr. Cecil Carus-Wilson, F.R.S.E., F.G.S., exhibited specimens and lantern-slides of the Natural Inclusion of Stones in Woody Tissue. He said:—About twenty-three years ago a gravel-pit was started in the valley-gravels occurring between Syndale and Newnham, some three miles from Faversham in Kent. Part of a wood, chiefly oak trees, covered the deposit; as the work progressed these were felled, and the stumps and roots dislodged.

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The gravel consists of subangular, water-worn flints, large nodules less worn, and occasional blocks of Sarsen-stone; the whole being mixed with flint grit and quartzose sand, and forming a compact and somewhat coherent mass. Several Palæolithic implements and part of a skull of *Bos longifrons* have been found in the deposit.

The roots and stumps referred to were distributed promiscuously over the surface of the ground as the gravel in which they were embedded was removed. The work of excavating ceased in this particular part of the valley about ten years ago, so the roots still remaining have been exposed for that length of time, the others having been cut up for fuel by the cottagers in the neighbourhood.

Most of those now found there were left intact because of the large number of stones enclosed in the wood. Not only did these resist the work of saw and axe, but when burnt they burst asunder with considerable force, becoming a source of danger to those within range of the flying fragments.

The stones are actually embedded in the solid oak, and not merely included within forked portions which may have grown together subsequently. The tissue of the wood appears to have grown around the stones and enveloped them, indicating that the process was carried on under conditions of considerable pressure. There are dozens of stones embedded in some of these roots, or snags, so that the substance might be described as "a conglomerate formed of flints enclosed in a woody matrix."

In the specimen of which I now show a photograph (Plate 1) I counted no less than sixty-seven flints, the largest being several pounds in weight, and there are innumerable empty cavities showing where others existed before the shrinkage of the wood after exposure. Piles of these dislodged flints are to be seen on the ground under and around each root.

The picture now thrown upon the screen shows the same root with one of the limbs cut off to facilitate its removal to the Museum at Kew last July. Only three of the sixty-seven stones were shaken out before the specimen reached Kew—this being due to the sawing, and the shaking of the cart in which they were conveyed to Faversham.

In regard to the forked part now seen:—Each limb measures about 3 feet in length, with girths averaging about 25 inches. This part contains 50 stones. The single piece was sawn off the forked one; its length is 33 inches, and the girth measurement averages 25 inches; it contains 14 stones.

I have occasionally seen odd stones thus embedded in the trunks of trees. In Norton Churchyard, a few miles from Faversham, are three very old yew trees, and in two of them I saw flints and fragments of tiles embedded in the wood of the trunk seven feet above the ground.

In Molash Churchyard, six or seven miles south of Faversham, there are six very old and large yews. Some of these have flints



FLINTS IN WOOD.

embedded in their trunks seven or eight feet above the ground, and in one, on the north side of the churchyard, I saw flints at least twelve feet above ground.

The circumstances led me to suppose that the stones and fragments of tile had been originally pressed into the roots when these were in a soft and spongy state below ground, and that they subsequently emerged with the growth of the tree.

The examples at Syndale are, however, as far as I know, unique, and if trees can enclose stones in such quantities, and retain them within their substance so tenaciously, we have transporting agents capable, under certain conditions, of distributing terrigenous material over sea-beds to an extent not hitherto appreciated.

My thanks are due to Mr. C. Gordon Neame, of Copton Manor, for his valuable assistance in enabling me to secure the specimens referred to.

The President contributed some remarks upon the interest of this exhibition.

Dr. A. B. RENDLE, F.R.S., showed a specimen of heather (*Erica cinerea*) found near Axminster in which the flowers were replaced by dark red leaf-buds of about the same size as the flowers. One side, or about half of a clump of heather was affected; the other side bore normal flowers and the two sorts were not mixed. The red leaf-buds, which occupy the position of flowers, consist each of a number of short, strongly ascending leaves closely arranged in superposed whorls of four; the four lines have often a strong spiral twist in the upper part of the bud. The leaf-arrangement therefore resembles that of the flower, not of the foliage leaves which are in whorls of three. The leaves of these special buds also differ in form from the foliage leaves in that they are upwardly concave with a bluntly keeled back recalling the sepals of a typical flower. They are 32 or more in number, and thus considerably out-number the parts of a typical flower (24 including bracteoles). The tip of the bud was always damaged, but in many of those examined a shrivelled or more or less misshapen pistil or its parts were present, and sometimes below this semifoliaceous stamens were found. The appearance suggested insect injury, but Mr. C. O. Waterhouse was unable to find any animal organism; he pointed out, however, that the appearance suggested the work of a *Phytoptus*, which in the normal course of events would have already deserted the buds. Dr. Rendle has, however, been able to find no record of *Phytoptus* in connection with our heather. The specimen is of interest as resembling a teratological form of *Erica cinerea* described by Maxime Cornu in 1879, where the flowers were replaced by vegetative buds apparently very similar in appearance to those on our specimens, but in which the arrangement of the foliage leaves was maintained (the leaves being in rows of six), while the bud

contained no trace of floral organs or of damage by any animal organisms.

A discussion followed in which the following engaged :—Mr. E. M. Holmes, Dr. O. Stapf, and the President; Dr. Rendle replying.

Prof. H. H. W. PEARSON, Sc.D., F.L.S., then gave a lecture illustrated by a long series of lantern-slides, entitled—"Types of the Vegetation of Bushmanland, Namaqualand, Damaraland, and South Angola (A Preliminary Report of the Percy Sladen Memorial Expedition in South-West Africa, 1908-1909)," of which the following is an abstract :—

The floras of the regions named in the title are very distinctly related, if the remarkable vegetation found on the Huilla plateau in South Angola be excluded. Otherwise the differences that are observed are probably to be accounted for mainly as a result of variation of (1) elevation; (2) atmospheric humidity; (3) depth at which permanent supplies of underground water are available; (4) geographical position, especially with regard to the composition of the floras of contiguous regions. In all, the rainfall is normally scanty and inconstant, and there is a prolonged drought in the winter season. Near the coast, in some places up to elevations as great as 2,700 feet, the total annual rainfall is never more than a few millimetres and frequently fails altogether.

The affinities of these floras (again excepting that of the Huilla plateau) are primarily with those of the South Central African highlands. In South Angola many species are undoubtedly derived from the Coast and Montane regions of West Tropical Africa. Throughout, the vegetation is more or less extremely xerophytic in character, and is marked either by a very short period of duration or by the possession of those structural peculiarities which are commonly found in dry climate perennials. Of these, hairiness is, in general, not a conspicuous feature; except in Lower Namaqualand, succulence is not especially common. A round bushy habit is very marked throughout. The root system is usually very deep; the leaves are commonly simple and of small size and with a strongly developed cuticle.

The formations and associations indicated are predominant by reason either of their great extent or of striking peculiarities of the plants composing them. They are arranged in the main geographically from South to North.

The President having opened the discussion, it was continued by Prof. Herdman, Dr. Henry Woodward (visitor), Dr. A. B. Rendle, Mr. Bailey Saunders (visitor), and Dr. Stapf; Prof. Pearson replying.

November 18th, 1909.

Dr. D. H. SCOTT, F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 4th November, 1909, were read and confirmed.

Prof. William Bateson, M.A. (Cantab.), F.R.S., and Mr. Donald Herbert Edmund Sunder, were proposed as Fellows.

Mr. Thomas Parkin, M.A., was elected a Fellow.

Mr. F. ENOCK, F.L.S., exhibited on the screen a series of photographs of the movements of animals, and contributed the following summary of his remarks:—

Among the recent discoveries and improvements in scientific appliances connected with photography, the kinematograph stands out before all others, but it is a fact much to be regretted that ninety per cent. of the films made are for the simple amusement of the multitude. No doubt, as time goes on, naturalists will realize the immense value of the kinematograph in permanently registering movements of every kind of living creature, which can be shown time after time upon the screen. Every stage in the life-history of an insect can (with a good deal of trouble and patience) be photographed with all the detail of living movements.

During the past two years I have, with the invaluable assistance of Mr. A. Newman, taken a number of films showing the movements peculiar to certain larvæ of Lepidoptera, together with other insects, as well as those swimming in their native element. Our first film shows a beetle crawling along a stem, using its antennæ to feel its way along; a woodlouse also uses these organs for the same purpose; and a garden spider runs across so rapidly that the order in which its legs are used is quite lost in this instance.

Caterpillars of various species each show some peculiarity in their progression along a stem. That of an Ermine Moth, one of the familiar Woolly-bear type, moves very hurriedly, so that the undulatory movement is most noticeable. Others, such as the larva of the Puss Moth, show greater caution in their movements; and that of the Elephant Hawk-Moth gives a good idea of dignified motion, the bringing up and setting down of the anal segment much resembling the action of the ponderous foot of the Elephant.

The strange appendages with which the larva of *Stauropus fagi*, the Lobster Moth, moves are all shown to advantage, especially the frying-pan appendage at the tail.

As might be imagined, the undulatory movement of the "Looper" caterpillars is noticeable by its absence, owing to the fact that these larvæ have no intermediate claspers, so necessitating

the rapid drawing up of the anal claspers to the prolegs, and so making the body into a loop.

Films taken of aquatic insects such as the Common Water-Beetle (*Dytiscus*), Water-Scorpion (*Nepa cinerea*), and the Water-Boatman (*Notonecta*), all show the characteristic movement of the limbs.

Perhaps the most interesting film is that showing a Butterfly emerging from its chrysalis, as it first bursts open, gradually withdraws its legs, antennæ, tongue, and body, followed by the wings, catches hold with its claws as the wings fall into position, and then, swayed to and fro by the wind, mysteriously develops until the wings attain their full size.

Passing from insects, an interesting film of two Lizards engaged in a fierce struggle for the possession of a meal-worm, shows how they can plant their claws and throw each other over in the most approved fashion of wrestling.

The film of swimming Sticklebacks was produced by Mr. Newman; and the last film showed a tongueless Frog from the Cape, catching and swallowing a worm, during which operation it makes a most comical use of its front legs and claws for pushing the worm into its mouth.

I feel that attention ought to be called to Mr. Newman's invention of a safety trough, which is inserted between the illuminant and film, which, being filled with water, prevents the film from becoming dangerously heated, so that it is possible to stop the apparatus at any point, when it is necessary to explain any special feature.

Further remarks were made by Mr. John Hopkinson, Mr. E. M. Holmes, and Mr. Enock.

The following papers were read :—

1. "A New Tipulid Subfamily." By W. WESCHÉ, F.R.M.S. (Communicated by J. HOPKINSON, F.L.S.)
2. "Freshwater Rhizopods from the Lake District." By J. M. BROWN, B.Sc. (Communicated by Prof. A. DENNY, F.L.S.)

December 2nd, 1909.

Dr. D. H. SCOTT, F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 18th November, 1909, were read and confirmed.

Captain John Humphrey Barbour, M.B., Mr. Frederick James Bridgman, Mr. Linnæus Greening, Mr. Henry John Jeffery, A.R.C.S., Mr. Frank Armitage Potts, M.A. (Cantab.), Mr. Walter Theodore Saxton, M.A. (Cantab.), Mr. Hugh Scott, B.A. (Cantab.),

Mr. Charles Sillem, and Mr. Charles Worster-Drought, B.A. (Cantab.), were elected Fellows, and Mr. Oswald Arthur Sayce an Associate.

On behalf of Dr. H. DRINKWATER, F.R.S.E., there were exhibited 25 drawings in body-colour on dark backgrounds, of wild flowers, chiefly from Wrexham.

Mr. CLEMENT REID, F.R.S., F.L.S., exhibited photographs on the screen of fruits and seeds of some of the plants introduced by the Romans into Britain. The remains have been collected principally from disused Roman wells, employed subsequently as rubbish pits, and often sealed up under Roman pavements of later date. The principal sources have been Roman Silchester, Caerwent, London, and Pevensey; and to a large extent the collections have been made by Mr. A. H. Lyell, who has been most careful to reject any deposit of doubtful or later date.

The fruits and seeds exhibited belong to pea, bean, fig, grape, mulberry, medlar (a very small variety), apple, cherries (probably both black and red), sloe, bullace (wild and cultivated), damson, a larger plum like the "black plum" of Cornwall, Portugal laurel, black and white mustard, turnip? fennel, dill, coriander, alexanders, *Cherophyllum aureum* (a casual, perhaps introduced with packing-case rubbish from France, and not grown in Britain), belladonna, henbane, field poppies (*Papaver Rhœas*, *P. Argemone*), the opium poppy (seeds of this were probably used, as in Rome, scattered on loaves of bread), greater celandine, corn-cockle, white campion, bladder campion, penny cress, sow-thistle, ox-eye daisy, *Chenopodium urbicum* and *C. murale*, and leaves of box. Box-leaves have been found in three different rubbish-pits in Roman Silchester; the branches may have been used for wreaths, as the nearest native substitute for the Italian myrtle.

The plants thus far found do not suggest any direct shipping trade with the Mediterranean. The peach, apricot, almond, and other fruits that will only ripen south of Britain are missing. The fruits and spices found are only such as can be grown commercially in Britain at the present day, and this makes it probable that the abundant fig and grape seeds belong to fruit grown in this country and not imported in a dried state. Mulberries do not travel well and are scarcely ever dried; they must have been grown at Silchester.

Mr. Lyell (visitor), Lt.-Col. Prain, Mr. G. C. Druce, Mr. L. A. Boodle, the Rev. J. Gerard, Mr. E. M. Holmes, Mr. E. G. Baker, and the President took part in the discussion which followed, and Mr. Reid briefly replied.

Mr. G. CLARIDGE DRUCE, F.L.S., exhibited specimens of (a) *Zannichellia gibberosa*, Reichb., new to Britain, from Eye Green, Northants; and (b) *Orchis maculata* var. *O'Kellyi*, Druce, from Ballyvaughan, Co. Clare, recently described in 'The Irish Naturalist.'

Mr. CLEMENT REID exhibited in connection with this, three photographs of *Zannichellia* fruits obtained by him from the Cromer Forest Bed (pre-glacial), and also contributed some remarks; Mr. Holmes brought specimens of another variety of *Orchis maculata* and commented on the same, and Mr. Druce replied.

The following papers were read:—

1. "Nudibranchs from the Indian Ocean." By Sir CHAS. ELIOT, K.C.M.G. (Communicated by Prof. J. STANLEY GARDINER, M.A., F.R.S., F.L.S.)
2. "Trichoptera von Mr. Hugh Scott auf den Seychellen gesammelt." By Dr. GEORG ULMER. (Communicated by the same.)
3. "Report on the Brachiopoda obtained from the Indian Ocean." By Dr. W. H. DALL. (Communicated by the same.)
4. "Narrative of the 'Sealark' Expedition. Part III." By Prof. J. STANLEY GARDINER, M.A., F.R.S., F.L.S., and others.

December 16th, 1909.

Prof. E. B. POULTON, F.R.S., Vice-President, in the Chair.

The Minutes of the General Meeting of the 2nd December, 1909, were read and confirmed.

Dr. William Henry Lang, and Mr. Charles Sillem, were admitted Fellows.

Mr. Cyril Crossland, and Dr. Harry Drinkwater, M.D. (Edin.), were proposed as Fellows.

Prof. William Bateson, M.A.(Cantab.), F.R.S., and Mr. Donald Herbert Edmund Sunder, were balloted for and elected Fellows.

The following papers were read:—

1. "Report on the Crustacea Isopoda and Tanaidacea collected by Mr. Cyril Crossland in the Sudanese Red Sea." By the Rev. T. R. R. STEBBING, M.A., F.R.S., F.L.S.
2. "Isopoda from the Indian Ocean and British East Africa." By the same.
3. "Pycnogonida from the Red Sea and Indian Ocean, collected by Mr. Cyril Crossland." By G. H. CARPENTER. (Communicated by Prof. W. A. HERDMAN, F.R.S., F.L.S.)
4. "On a Collection of Blattidæ preserved in Amber, from Prussia." By R. SHELFORD, F.L.S.

5. "The Bryozoa from collections made by Mr. Cyril Crossland, Part II.—Cyclostomata, Ctenostomata, and Endoprocta." By A. W. WATERS, F.L.S.

The Vice-President in the Chair announced the subject for the following meeting on the 20th January, 1910.

January 20th, 1910.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 16th December, 1909, were read and confirmed.

Mr. Frederick James Bridgman was admitted a Fellow.

In accordance with the announcement from the Chair at the previous Meeting, the Meeting was devoted to a discussion upon the

ORIGIN OF THE VERTEBRATES.

Dr. W. H. GASKELL, F.R.S. (Visitor), who opened the Discussion on the "Origin of Vertebrates," said:—I take it for granted that we all believe in Evolution and that an upward progress can be traced from the Protozoa to Man. Now the formation of the Metazoa from the Protozoa and the progress of the Metazoa upwards signifies that the separate units composing the individual have been coordinated for the well-being of that individual. Such coordination has taken place in two ways: (1) a chemical method, by the formation of hormones; (2) a nervous method, by the formation of a central nervous system, and it is self-evident that as soon as a central nervous system is formed, such nervous coordination, especially in connection with the formation of the special senses of sight and smell, must become the important factor in the life of the individual, and its further and further development must constitute the most important factor for the upward progress of the animal race. The first point I want to impress upon you is that for all questions of Evolution, the central nervous system rather than the alimentary canal is the most important factor.

Throughout the whole history of the attempts to find out the origin of Vertebrates one point stands out clearly: whatever other views have been put forward there have always been strong supporters of the view that the Vertebrates have arisen from that great group of segmented Invertebrates, the Appendiculata, and such supporters have not been outsiders of no account, but largely the main authorities in the zoological teaching of the time, *e. g.*, Geoffroy St. Hilaire, Leydig, Newport, Treviranus, Owen, Dohrn, and numerous others, all of whom based their views on the presence of the infundibulum in the Vertebrate in exactly the

same position in the brain as the œsophagus in the Invertebrate group. Supra-infundibular nerve-mass was then the same as the supra-œsophageal, infra-infundibular as infra-œsophageal, and it was seen that the function corresponded marvellously. So powerful was the fetish of the inviolability of the alimentary canal, that no one of these observers ever noticed that if the infundibulum is the old œsophagus, it leads directly into the great cavity of the ventricles of the brain, which again lead into the straight narrow canal of the spinal cord and so through the neurenteric canal to the anus; that in fact if the infundibulum is the œsophagus, the rest of the lining-walls of the cavity of the central nervous system corresponds word for word with the rest of the Invertebrate alimentary canal. On the contrary, they considered the homology could only hold good by turning the animal topsy-turvy and making the back of the Invertebrate correspond to the ventral surface of the Vertebrate. Such a method was doomed to failure and is now universally discredited.

As to the alternative hypothesis of an origin from some non-segmented Invertebrate, please think what it implies and consider seriously whether it is possible to accept it. I imagine we may take it for granted that we know the nature of all the main groups of animals alive on the earth at the present time, and as far as I know the geological record has not brought to light any forms which are not capable of being classified either among or in connection with our present main groups; yet the assumption of this hypothesis is that from some unsegmented animal low down in the scale a group of segmented animals has arisen, in which the alimentary canal was always ventral to the central nervous system and that this group gave origin to the Vertebrate. The absence of any evidence of such chain among living animals at all comparable to the well-marked evidence in the case of the Appendiculata, makes this hypothesis an improbable one; and when the hypothesis further necessitates that not only the central nervous system of such segmented animals has been built up on exactly the same lines as the central nervous system of the Appendiculata, but, contrary to all other nervous systems, has been formed hollow, and that that hollow tube has been formed in such a shape and in such a position with respect to the true nervous elements as exactly to mimic the alimentary canal of the Appendiculata with respect to its central nervous system,—I ask you plainly, does not the improbability amount to an absurdity? This I claim to be the great characteristic of the Vertebrate which differentiates it from all other animals—the presence and nature of this tube around which the central nervous system is grouped: and I beg that those speakers who follow after me and disagree with my conclusions, will give some explanation of the presence and peculiarities of this tube. To me and to all my friends who are accustomed to deal with the Vertebrate central nervous system, the explanation I have given is so self-evident and natural, that it is impossible to look at the matter in any other way.

The paramount importance of the development of the central nervous system for the upward progress of the members of the Animal Kingdom leads to the conclusion that each higher group of animals has arisen in succession from the highest race developed up to that time, by highest meaning the group possessing the best developed central nervous system. This law is proved to us most clearly by the evidence of the rocks in the case of the Vertebrate group.

Thus we see that Man came from the Mammals, the highest race in the Tertiary times. They arose from the Reptiles, the highest race in Mesozoic times, who in their turn arose from the Amphibians, the lords of the Carboniferous epoch. Further back we leave the land and find that the Amphibians arose from the Fishes, the earliest of the Vertebrate race which swarmed in Devonian times. This steady sequence in upward progress from Fishes to Man, revealed by Geology in the long series of ages from the Devonian to recent days, is in absolute conformity with the upward development of brain-power through the Vertebrate series from Fishes to Man, as shown by the investigations of Comparative Anatomists, especially Eddinger and Elliot Smith.

If thus it can be proved that such a law of Evolution has held good through the enormous spaces of time between the beginning of the Devonian and the present day, surely it is highly probable that the same law has held throughout, and that therefore the Fishes themselves arose from the race that was the most highly developed at the time when they first appeared: a race therefore which possessed a central nervous system most closely resembling that of the fish.

The evidence of the rocks points to the Silurian age as the time when the Vertebrate first arose, and to the great and striking group of Arthropods which swarmed in the seas at that time, to which the name Palæostraca has been given. These were the highest developed race at that time and from them, according to this law of Evolution, the Vertebrate ought to have sprung.

The great problem then for the study of the origin of Vertebrates resolves itself into this: What was the nature of the earliest fish and of the Palæostraca in Silurian times?

That was the problem I set myself, and it is that comparison which I have attempted to make by organ in my recent book. Such an attempt was rendered possible by the fortunate occurrence of one of the Palæostracan Group—*Limulus* or the King Crab—being still living in the present day, and what is still more important, the remarkable resemblance of *Ammocetes*—the larval form of the Lamprey—to the fishes belonging to the Osteostraci, especially the close resemblance in position and structure of that remarkable muco-cartilaginous head-shield of *Ammocetes* to the head-shield of such a fish as *Cephalaspis*.

My object throughout has been by the study of *Ammocetes* to find out a clue to the past history of these extraordinary early forms of fish. The results are published in my book, and give a

striking evidence of the way in which these early fishes may have arisen from their contemporary Palæostracan rivals. It must always be remembered that these latter animals were not Crustaceans or Arachnids, but the precursors of both of these groups, and much nearer to their origin from the Annelids than the present day Arthropoda. To this circumstance must be attributed the annelid characteristics so markedly found in the Vertebrate, especially in the excretory organs.

It seems to me highly probable that this same law of upward progress, viz., that each successive group has arisen from some member of the highest group existing at the time, holds good also for the vegetable kingdom, especially in view of the statement recently made that Phanerogams arose from Cycads. I hope that the President may see his way to offer a few remarks on that aspect of the question.

The great stumbling block to the acceptance of my theory in the minds of many, is the necessity of making a new digestive tube in a highly organised animal, and yet the same zoologists accept without the slightest difficulty, as a commonplace, the manufacture of a new respiratory organ for breathing air instead of water in the transition from the fish to the amphibian. The previous factor in that case was the swim-bladder which provided the new organ, in the other a respiratory chamber formed by the internal gills; for one of the great characteristics of many members of the Palæostracan group is the absence of external gills and the indication of internally situated gills, and it does seem to me that the evidence is stronger in favour of the Vertebrate alimentary canal being formed from a preexisting respiratory chamber, than that an alimentary canal should have taken on a respiratory function in its anterior end.

The way in which the alimentary canal is innervated by the downgrowth of the great respiratory nerve, the vagus, which is so clearly a segmental nerve for the respiratory part but not for the small intestine, points to this conclusion. The fact that in the well-marked segmental respiratory chamber of *Ammocoetes* a new unsegmented alimentary tube should be formed at transformation, again indicates that a segmented respiratory chamber was the precursor of an alimentary canal. Finally, the position of the anus in such a form as *Drepanaspis* and *Bothriolepis* immediately following upon the region of the head-shield, suggests strongly that in these most ancient and extraordinarily formed fishes the anus followed close upon the mesosomatic or respiratory region just as it does in such an animal as *Limulus*.

Finally in this sketch, not of details but of general principles, I come to the argument that this theory is untenable because it contravenes the fundamental principles of ontogeny.

Against this statement I most strongly protest, for the strength, I might almost say the main strength, of my position is based on the facts of Vertebrate development.

The one great principle of ontogeny is the Law of Recapitulation,

the law which lays down that the past phylogenetic stages which have led to the evolution of any individual are indicated to some extent in the ontogeny of that individual.

This law is confirmed and indicated in a most amazing way by my theory. The theory asserts that the clue to the origin of Vertebrates is to be found in the tubular nature of the central nervous system of the Vertebrate in that the central nervous system is in reality formed of two things: (1) a central nervous system of the Arthropod type, and (2) an epithelial tube in the position of the alimentary canal of the Arthropod.

Is it possible for embryology to recapitulate such a phylogenetic history more clearly than is here the case? In order to avoid all possibility of our mistaking the clues, the nerve-tube in the embryo always opens into the anus at its posterior end, while in the larval *Amphioxus* it is actually still open to the exterior at its anterior end. Consider the shape of the nerve-tube when first formed in the Vertebrate. At the cephalic end a simple bulged-out tube with two simple anterior diverticula, which passes into a narrow straight spinal tube: from this large cephalic bulging a narrow diverticulum, the infundibulum, passes to the ventral surface of the forming brain. This tube is the embryological expression of the simple dilated cephalic stomach, with its ventral œsophagus and two anterior diverticula, which opens into the straight intestine of the arthropod. Nay more, by its very shape and the invariable presence of two anterior diverticula, it points not only to an Arthropod ancestry but to a descent from a particular group of primitive Arthropods. Then comes the formation of the cerebral vesicles and the formation of the optic cup, telling us, as plainly as can be, how the invasion of nervous material over this simple cephalic stomach and its diverticula has altered the shape of the original tube and more and more enclosed it with nervous elements.

So, too, in the spinal cord region. When the tube is first formed, it is a large tube, the latero-ventral part of which presents two marked bulgings; connecting these two bulgings is the anterior commissure. These two lateral bulgings, with their transverse commissure, represent with marked fidelity the ventral ganglion masses of the Arthropod with their transverse commissure, and occupy the same position with respect to the spinal tube, as the ganglion-masses do with respect to the intestine in the Arthropod. Then the further development shows how, by the subsequent growth of the nervous material, the calibre of the tube is diminished in size and the spinal cord is formed.

Again, I say, is it possible to conceive that embryology should indicate the nature of the origin of the Vertebrate nervous system more clearly than it does?

It is the same with all the other organs. Take for example the skeletal tissues. The study of the Vertebrate embryo asserts that the cartilaginous skeleton arose as simple branchial bars and a simple cranio-facial skeleton, and also that the parenchymatous

variety of cartilage represents the embryonic form. Word for word, the early embryonic stage of the Vertebrate skeleton closely resembles the stage reached in the Arthropod, as shown by *Limulus*, and again records unmistakably the past history of the Vertebrate.

So, too, with the whole of the prosomatic region; the situation of the old mouth, the manner in which the nose of the Cephalaspidian fishes arose from the Palæostracan, are all shown with vivid clearness by Kupffer's investigations of the early stage of *Ammocoetes*, while at the same time the closure of the oral cavity by the septum shows how the oral chamber was originally bounded by the operculum. Nay, further, the very formation of this chamber embryologically was brought about by the forward growth of the lower lip, just as it must have been if the chilaria grew forward to form the metastoma. So, too, the study of the embryo teaches that the branchiæ arise as ingrowths, that the heart arises as two longitudinal veins, just as the theory supposes from the facts provided by *Limulus* and the Scorpions.

No indication of the origin of the thyroid gland is given by the study of its structure in any adult Vertebrate, but in the larval form of the Lamprey there is still preserved for us a most graphic record of its past history.

The close comparison which it is possible to make between the eye-muscles of the Vertebrate and the recti muscles of the Scorpion group on the one hand, and between the pituitary and coxal glands on the other, are based upon, or at all events are strikingly confirmed by, the study of the cœlomic cavities and the origin of these muscles in the two groups. In fact the embryological evidence of the double segmentation in the head and the whole nature of the cranial segments, is one of the main foundation stones on which the whole of my theory rests.

So it is throughout. Turn to the excretory organs: it is not the kidney of the adult animal which leads direct to the excretory organs of the primitive Arthropod, but the early embryonic origin of that kidney.

So far from having put forward a theory which runs counter to the principles of embryology, I claim to have vindicated the great Law of Recapitulation which is the foundation stone of embryological principles. My theory is largely based upon embryological facts, and its strength consists in the manner in which it links together into one harmonious whole the facts of Embryology, Palæontology, Anatomy, and Physiology.

It cannot then be said that my theory contravenes this great law of development, the Law of Recapitulation. What, then, is the objection? It is that it disregards the germ-layer theory, a theory which assumes that the origin of the Metazoa from the Protozoa took place by the formation of a gastrula-form—Haeckel's hypothetical Gastræa—which gave a fixed and definite morphological origin to hypoblast, and that from that time up to the latest animal development that hypoblastic layer has always

remained the same. Such a positive assertion, if true, immediately puts out of court any theory which forms an alimentary canal out of something which is not hypoblast. It makes the alimentary canal the keystone of the whole fabric of Evolution, not the central nervous system.

As I have pointed out in my book, the evidence of Brehm and others is to the effect that there is no such morphological criterion of hypoblast, but, on the contrary, the hypoblast is a physiological conception rather than a morphological one, being the term given to that layer which is found by its development to form the digestive tube of the animal, and that in the earliest members of the Metazoa, where we ought to expect the gastrula formation to be most conspicuous, there it is most conspicuously absent, while it is most clearly evident in those free-living pelagic blastula-forms in which, owing to the absence of yolk, the necessity exists of obtaining food from the outside even from the early blastula stage.

According to the Law of Recapitulation we may expect to find in the developmental history of the Metazoa some indication of the nature of the Protozoan ancestor which gave origin to the Metazoa. Such indication is given with absolute uniformity in all the Metazoa by the blastula stage, not by the so-called gastrula stage. The blastula represents one of the highest Protozoan forms, such, for example, as *Volvox*, as I have suggested in my book, and the blastula stage affords yet another indication of the great law, that the upward progress of the Animal Race has always been brought about by the genesis of the next highest form from a member of the highest existing group of animals.

Prof. E. W. MACBRIDE, F.R.S. (Visitor), remarked :—

Dr. Gaskell has given us a brilliant exposition of his famous theory of the "Origin of Vertebrates" to which it is impossible to reply at all adequately in a quarter of an hour. Fourteen years ago this theory was presented to the Cambridge Philosophical Society and I then gave expression to many objections which I felt to it; and I confess that those objections remain in unaltered force to-day. Not one of them has been removed by Dr. Gaskell's speech, nor has a perusal of the latest edition of his book weakened one of them in the slightest degree.

The first and most fundamental objection is to the whole nature of Dr. Gaskell's morphological reasoning. Unless this kind of reasoning is to be guided by definite rules it becomes a mere arena for the display of the imaginative faculties. The change which one man regards as inconceivable another thinks the most natural in the world. I, for instance, cannot contemplate in cold blood a free-living animal giving up its alimentary canal and beginning to digest with its skin, whilst to Dr. Gaskell this seems the most natural transition in the world. But what rules for morphological reasoning are suggested? Tacitly or avowedly, all zoologists agree on this—morphological reasoning must conform to precedent. But what constitutes precedent in this case?

Those changes about the nature of which all zoologists are agreed, such as the relationship of an aberrant genus to the typical form of the family or order to which it belongs. Thus no one doubts that the Hermit Crab is descended from a normal Lobster or *Chaptorus* from a normal Annelid. The changes involved in the descent of such forms from the more normal types give us the only rules we can have to guide us when we attempt the more difficult task of passing from one phylum to another.

Now Dr. Gaskell, in assuming that Vertebrates are descended from some Palæostracan type of Arthropod of which the only survivor is *Limulus*, is obliged to reconstruct the entire animal, leaving only the central nervous system standing. We are asked to believe that the original alimentary canal has become the neural canal, and that a new alimentary canal has developed from the skin of the ventral surface of the body. No precedent for such a change can be gathered from any of the data I have mentioned above.

Again, the skin of the lower Vertebrates is ciliated, and this is most undoubtedly a primitive condition seeing how widely it is spread amongst the lower groups in the Animal Kingdom. No Arthropod* is ciliated at any time of its existence: its whole organisation is dominated by the tendency to form thick chitinous cuticle. We have to suppose that this tendency, which is spread throughout Arthropoda from the highest to the lowest, has been overcome and that a reversion to a primitive soft ciliated ectoderm has been accomplished. No precedent for such a change can be gathered from the entire Animal Kingdom. It is no answer to this to show that in *Ammocoetes* and one or two other cases a thin exterior cuticle is developed on certain parts of the skin—for it is the normal sequence of things that a cuticle should succeed to a ciliated skin as a secondary change, but the change in the reverse direction is absolutely without precedent.

The eyes of Vertebrates, or, to speak more correctly, their retinæ, are lateral pockets of the walls of the neural canal—which we are told to regard as the old alimentary canal. The eyes of Arthropoda are, without exception, modifications of the external skin. Are the lateral eyes of the two groups homologous or are they not? If they are homologous, how is their different origin explained? Dr. Gaskell figures a section of *Artemia* in which one of the liver sacculi is in close contact with the lower layer of the eye. He hints that perhaps part of the eye is developed from the epithelium of the liver sacculi, but this is in flat contradiction to the work of every zoologist who has examined their development. If the eyes in the two cases are not homologous, why did the Arachnid ancestor of Vertebrates give up its external eyes and develop a new pair from its old alimentary canal? To say that there is no precedent for such a change is to put it mildly.

* I hardly think it necessary to refer to the ciliation of the genital ducts of *Peripatus*, the only exception to this rule, since *Peripatus* is hardly as yet an Arthropod.

Dr. Gaskell indulges in a polemic against the germ-layer theory, whilst maintaining strongly the theory that the development of the embryo recapitulates the history of the race. He seems to be unaware that the germ-layer theory is only a special instance of the recapitulation theory. It asserts that the egg in its progress to a hollow blastula recapitulates the change from a unicellular to a multicellular Protozoon. This part of it Dr. Gaskell accepts, and with justice, for in the development of simple and primitive types the blastula crops up throughout the entire Animal Kingdom. But in every case which is free from the complication of yolk, the blastula is transformed into a hollow gastrula by a process of invagination, so that we find that in the Arthropod *Lucifer* and the Vertebrate *Amphioxus* the process is very similar. And yet Dr. Gaskell asks us to believe that in the one case the cavity is homologous with the neural canal of Vertebrata and in the other with the gut! Such reasoning seems to me to be very difficult to accept. Dr. Gaskell assumes that *Lucifer* developed the hollow gastrula stage because its egg is a small one floating in water and has to absorb nourishment early through the blastopore, but the fact is that in this stage of its development the egg of *Lucifer* is in a tough shell and that before it begins to absorb nourishment the blastopore closes, and this is the case with *Amphioxus* also. The doubts as to the validity of the germ-layer theory have concerned themselves chiefly with the nature of the third layer, the mesoderm. If everything which is found between ectoderm and endoderm be called mesoderm no doubt confusion will arise, for heterogeneous structures are confounded under this name. But the more careful investigation of doubtful cases in recent years, for which we are specially indebted to the Americans, have shown that if by mesoderm we mean the *wall of the coelom*, then this is homologous in all cases and always arises from the gut-wall.

I pass over minor difficulties of Dr. Gaskell's theory, such as the degeneration of the ancient genital gland into packing tissue surrounding the brain, and the transformation of the womb into a gland which in *Ammocoetes*, as in *Amphioxus*, produces a string of mucus to entangle food; for the mind which accepts the main ideas of the theory will be capable of digesting such trifles also. We come then to the only points in Dr. Gaskell's theory which in the mind of any zoologist would constitute even *prima facie* evidence in its favour, viz. the external resemblance between some of the armoured fish of the Devonian and the contemporary Eurypterids, coupled with the assertion that when Vertebrates appeared Arthropods were dominant in the water, and that only creatures with strong armour and well-developed nervous systems could have overcome them. Dr. Gaskell infers that if the primitive Vertebrates had been like *Amphioxus* they never could have won the day. Now to this, two answers may be made. First, that the resemblance is purely superficial, in fact far less than exists between a Whale and a Fish: we should in fact have far more reason for classing Whales as Fish than for regarding *Cephalaspis* as allied

to *Limulus*. This point I shall leave for elaboration to the palæontologists who follow me. Secondly, Dr. Gaskell has no right to assume that *Cephalaspis*-like forms were the first Vertebrates. It is entirely to ignore all that Darwin taught on the imperfection of the geological record, and already the discovery of forms like *Thelodus* with a skeleton of isolated denticles and of fusiform fish like *Birkenia* and *Lasanius*, in which the skeleton, if any, was formed of small isolated plates, has given the lie to such assumptions. If early Vertebrates were like *Amphioxus* they may have existed from Pre-Cambrian times and we should have found no trace of them. Moreover, the form of *Cephalaspis* and its allies is totally unlike the typical fish form. This is fusiform and flattened in the vertical plane, while *Limulus*, like all Palæostraca and the overwhelming majority of Arthropoda, is flattened in the horizontal plane. *Cephalaspis* in outer form resembles such modern fish as *Lophius* (the Angler) and the Gurnards, which habitually squat on the bottom and some of which bury themselves in the mud; and some of these forms actually develop their scales into plates and have their eyes shifted dorsally. I have no doubt at all that whilst *Cephalaspis*, *Pterichthys*, and their congeners were practising this sluggish mode of life, the real ancestors of the dominant Vertebrates of the sea were ranging like flashes of living light through the waters above. It is customary to speak of *Amphioxus* as a degraded creature, but no one who has ever seen it swim will fail to realize the immeasurable superiority of the Vertebrate motor system over that of the Arachnid. The comparison of the one to the screw of a steamer and of the other to an eight-oared boat gives some idea of the difference. We may add that the whole course of evolution in fish and other Vertebrates has tended in the direction of getting rid of external armour, and there is no foundation for Dr. Gaskell's assumption that the possession of heavy external armour indicates a "dominant" form. It really indicates a sluggish form. But Dr. Gaskell continues, there is the unique feature that the Vertebrate nervous system is tubular and that the ganglion cells bear the same relationship to this tube as do the ganglia of an Arthropod to its alimentary canal, and the central nervous system is the most important organ in the body: whilst all else may change it endures. Here again every single item of this statement may be met with a denial. A tubular nervous system is not confined to the Vertebrata. It is found amongst the Echinodermata in Ophiuroidea, Echinoidea, and Holothuroidea, and in all cases it is formed precisely as in *Amphioxus*. An exposed plate of nervous ectoderm, such as is found throughout life in Asteroidea, is covered by the meeting of two thin non-nervous flaps. Then again the ganglionated character of the nervous system of an Arthropod is appealed to as a sign of high differentiation—but this is entirely to misread it. This character depends on the nature of the locomotor system, which consists of discrete groups of muscles confined to appendages, which leads to a local grouping

of motor nerve-cells. What intelligence *Limulus* has is confined to its minute archicerebrum, and this is probably small in amount. *Amphioxus* has no particular reason to fear *Limulus* on the ground of brains. In the Vertebrate the swellings of the nervous system are associated with the development of large sense organs, but its locomotor organs are the almost continuous bands of muscle known as myotomes, and hence the motor nerve-cells form a practically continuous plate. Moreover, the whole study of the Animal Kingdom is dead against the assumption that all else may change but the nervous system must endure. If we start with the most highly developed Arthropoda, or with the most highly developed Mollusca, we find as we pass back to more primitive forms that the nervous system evaporates into a mist of general ciliated nervous ectoderm. Out of this, as required by the exigencies of motor and sensory organs, accumulations of nerve-cells develop, and disappear with the disappearance of these organs. Of course, like every other organ, when they have persisted for a long time in a phylum they become stable, but why we should trace the highly developed brain of a Cuttlefish back to primitive ectoderm and pass from the developed nervous system of a typical Arthropod to the typical nervous system of a developed Vertebrate—ignoring all the really primitive forms belonging to the Vertebrates, is conceivable to no one who really knows zoology.

The alternative theory to his, as Dr. Gaskell admits, is that Vertebrates arose from some simple form with undifferentiated organs. *Amphioxus* gives us an idea of the Vertebrate structure in its most undifferentiated form, but showing the characteristic Vertebrate organs of notochord, gill-slits and tubular nerve-cord. The worm-like *Balanoglossus* and its allies show the same structures, but without the segmentation characteristic of the muscles of *Amphioxus* and other Vertebrates. But in its development, which shows far more primitive features than that of any known Arthropod, *Amphioxus* resembles *Balanoglossus*. The larva of *Balanoglossus* resembles that of Echinoderms, and here we have a hint of a wide ranging free-swimming group of pelagic animals, the direct descendants of whom are Vertebrata, but the degenerate off-shoots of which at various levels are Echinodermata, Enteropneusta, *Amphioxus*, and Ascidians.

Dr. Gaskell heaps scorn on the idea that Vertebrates, the dominant class, arose from a degenerate like *Balanoglossus*, and asks how such worms could have competed with the big Arthropods. No one supposes that Vertebrates are descended from *Balanoglossus*, but at the immensely remote period of time when the ancestors of *Balanoglossus*, leaving their closely allied compeers the ancestors of Vertebrata, deserted the surface to seek the mud, the ancestors of the Gaskellian Arthropods were probably in the condition of the Trochophore larva.

Dr. Gaskell alludes to Spengel's work on *Balanoglossus* as destroying the supposed Vertebrate character. Nothing could be more mistaken. Every argument of Spengel has been

pulverized, and every statement of Bateson confirmed in the sixteen years that have succeeded the publication of Spengel's work.

Dr. Gaskell calls the theory of "parallel development," by which he means the theory of the independent origin of the great phyla Arthropoda, Mollusca, Vertebrata, &c. from simple forms, an "unscientific and inconceivable suggestion." Surely he has forgotten the 'Origin of Species.'

Does he forget that Darwin felt the differences between these phyla so strongly that he doubted their common origin, and seems to have imagined that they might have originated independently from primordial protoplasm. Does not Dr. Gaskell know that those who give their lives to the study of Zoology have "parallel development" or fan-like development forced on them at every turn, in every section and sub-section of the Animal Kingdom. That the air-breathing type of gastropod Mollusc, for instance, must have originated at least half a dozen times and the snake-like Vertebrate at least a dozen times each time in entire independence of every other. And why unscientific? If protoplasm be fundamentally the same sort of thing at bottom, and if variations be due to definite changes in its chemical composition produced directly or indirectly by changes in the environment, should not like causes have like results?

Dr. Gaskell states that his theory strikes at the root of the conception of parallel development. In this case I venture to predict that the root will prove to be more resistant than the axe with which it is struck.

Prof. E. H. STARLING, F.R.S. (Visitor), followed and remarked:

I do not know how far an apology may be considered necessary for the intervention of a physiologist in the discussion of a topic which has hitherto been regarded as the special preserve of the zoologist and comparative anatomist. I understand, however, that the chief criticism of the theory, which has been so ably put before us this evening, has had reference to the method by which the problem is attacked, rather than to the facts in comparative anatomy which have been discovered or collated by Dr. Gaskell. On this point, namely, the principles which must guide any research into the phylogeny of our race, a physiologist has as good a right to be heard as has a comparative anatomist. In fact, it was the author of the 'Origin of Species' himself who introduced physiological considerations into the theory of descent. Darwin showed that the grouping of living beings made by zoologists had a far deeper significance than mere resemblance of form, and were really expressions of blood relationships among the members of any group or between allied groups. He thus replaced a purely conceptual anatomical grouping by an actual physiological kinship. Since the varying degrees of divergence among different forms are to be referred to the survival only of such individuals as are most

fitly adapted to their environment, the problems of relationship, of descent and, in short, of the origin of species become part of that great study of adaptation which is the proper occupation of the physiologist. These problems are bound up, not with the outward seeming of an organ or organs, but with their *use* to the animal in the struggle for existence, and are therefore in the first place problems of function.

In a search for the ancestry of Man and of Vertebrates generally we must therefore remember that we are dealing, not with museum specimens, but with living organisms, and must endeavour to learn what are the essential factors in the life of the animal that give it an advantage over its fellows and tend to the perpetuation of its stock.

We have really two questions to deal with, namely:—

- (1) What determines survival of type? and,
- (2) What determines dominance of type?

Survival is merely a question of perfection of adaptation and does not necessarily imply that the type which survives becomes dominant. There are many holes and corners on the surface of the globe where the environment is of a very special character, and in each of these we shall find some group of organisms adapted for this environment and for none other. In many cases such an environment is furnished by the surface or interior of some other type leading a more active existence. It is in this parasitic condition that we get the most extreme degree of specialized adaptation associated with degeneration of all parts rendered unnecessary by the restricted range of environmental events to which the organism is liable.

Dominance of a type, on the other hand, involves wide distribution and, in most cases, the existence of numerous species of the same general characteristics under widely different conditions of environment. To such a dominant type belongs the Vertebrate with its highest representative, Man. There can be no doubt that the evolution of such a type must have been continuous and progressive. It has often been imagined that the evolution of the dominant forms of life was simultaneous and not successive, and was to be compared rather to the spokes of a fan than to a tree with its branches diverging from a common stem. Such a fan-like evolution could only occur with a complete separation of environments. It is as difficult to conceive that the Vertebrate was evolved from a primitive worm-like organism which shot up past the more highly developed Arthropoda, as it is to believe that mankind is destined to be replaced by some beast that is now being evolved from lower groups in the depths of the sea. But what do we mean by speaking of lower and higher groups? The idea involved in this antithesis is the same as that included in the term "dominance." The position of any type in the animal scale, the question whether it is to win in life's struggle, is determined

by *range of adaptation* or of reaction. The organ or system on which the range of adaptation depends is the one on which we must concentrate our attention in tracing back the evolution of the Vertebrate. This organ is the central nervous system. There has been no continuous rise in type of the muscular, digestive, or respiratory systems. It is the central nervous system which determines dominance of any type, and the nervous system is the only part of the body which undergoes continuous evolution from the lowest to the highest forms. The reactions of the highest animals are determined by the nerve-cells and tracts laid down in the embryo and inherited from the parents, no new formation or repair being possible after the earliest stages of foetal life, if indeed at any time. In no case, so far as I am aware, do we find the central nervous system cleared away and laid down afresh in the metamorphosis of an animal. At various times an animal may breathe by its skin, by gills or by lungs. It may digest its food by means of glands derived from the epiblast or hypoblast, and indeed digestive ferments may be produced by almost any cell in the body. It may excrete waste products by kidneys, intestines, or skin; but the central nervous system remains the one unchangeable organ, whose function, namely, the determination of adapted reactions and therefore of survival, cannot be replaced by the vicarious activity of any other part of the body.

Looking back as physiologists we may indeed see that all the main epochs in the evolution of higher forms of life are characterized by changes in the nervous system. The first step was taken when the individuals of a cell colony remained in structural connection, so that the *consensus partium* could be maintained by the propagation of molecular changes along the protoplasmic strands between the different cells and no longer depended solely on the diffusion into the surrounding medium of chemical substances which might affect friend or foe alike. By a differentiation among these connecting strands a diffuse nervous system was formed with immensely enhanced rapidity of reaction of the whole organism to environmental changes at any part of its surface. The location of the mouth at the front end of the body, *i. e.* the one which in the actively moving animal was first exposed to changes in the environment, was attended by the concentration at this end of the specialized projicient organs of sense, *i. e.* those whose activity was aroused by changes occurring at some distance from the animal, in a region with which a continuation of the forward progression of the animal would bring it in more intimate relations. The presence of these *foreseeing* organs at the anterior end necessarily brought in its train a subjection of all other parts of the nervous system to that part, the supra-oesophageal ganglion, which was the first recipient of the afferent impressions from these organs. The rise in type, which has culminated in the production of Man himself, has been determined simply by a continuous

advance in the complexity of adaptations, and by an increase in the powers of control and foresight exercised by the foremost part of the central nervous system. On these two factors, foresight and control, depends a man's position among his fellows, and a continuous growth in the same factors marks the progression of living forms from the Worm to the highest Vertebrate.

Since the functions which determine survival are those bound up almost exclusively with the central nervous system, this system is taken by Gaskell as his guide in tracing the genealogy of the Vertebrate. I am not sufficiently equipped to bear testimony in favour or otherwise of the facts adduced by Gaskell in support of his theory. I am convinced, however, that the principles on which he has proceeded are the only ones which will lead to a solution of the problem, and that researches along these lines will throw light on the meaning and physiological significance of many organs whose part in the economy of the body is still a mystery. It is difficult to understand the attitude which has been taken up by the majority of zoologists towards this theory of the origin of Vertebrates. We find zoologists themselves putting forward theories of the descent of Vertebrates based on a more or less profound study of all sorts of organs and structures which really have little or no importance in the life of the animal, or can be replaced vicariously or structurally with the utmost ease. Thus they concentrate their attention on organs such as the alimentary canal, blood vessels, foetal membranes, excretory organs, the notochord, but pay little or no regard to the one system of the body which is all-important in determining the continuous series of adaptations which make up the life of the animal. And what is strange is that in most cases no palaeontological evidence seems to be brought forward in favour of these hypotheses. I do not know whether succeeding speakers will be able to adduce any facts from the geological record in favour of the existence of the strange slug-like animals, with or without holes punched in them, which have been evolved out of the inner consciences of our most distinguished zoologists and assigned to us as our remote ancestors. To an onlooker like myself the striking resemblance between the earliest fishes and the Arthropoda which were the dominant type just before the appearance of these Vertebrates, is striking evidence in favour of Gaskell's theory. I would ask the morphologists present here to-night to explain how they account for this striking similarity. If the gastrula theory had been mentioned in the first chapter of Genesis, it is possible that the presence of those earliest fishes in the earth's crust might be regarded as a divinely appointed trial of faith for the orthodox among zoologists. It seems to me that the morphologist, while professing a lip service to the doctrine of Evolution, has really forsaken the teachings of Darwin and gone back to the worship of his old idol, the study of form for itself. For him, as for the anatomists before Darwin, similarity of form is everything and function is of no account.

The special message of Darwin to biology was the vindication of function, and the demonstration that it was the use of parts and not their shape which determined their significance,—that relationship between different types was a question of descent and of survival, and therefore depended not on form but on fitness, that is to say, on physiological function. It is curious to note, with this relapse into scholasticism, the old tendency to intolerance of new ideas and of any light on the problems at issue other than that shed by some enshrined man-made theory at the end of a dark passage. In fact some members of the zoological hierarchy apparently regard the attempt to throw light from any other direction as impious, and associate it, like many worthy divines did the work of Darwin, with the Author of all evil. I would not however like to suggest that Professor MacBride entertained any such comminatory feelings or was conscious of any spirit of religious intolerance when he speaks of the “diabolical ingenuity” of Gaskell’s theory. But surely the *odium theologicum* is out of place in dealing with biological problems. A sacerdotal attitude of mind will never advance our knowledge of natural phenomena or of the origin of Vertebrates. It is a happy augury for the revival of freedom of thought in English biology that the Linnean Society should, in this jubilee year of Darwin, have devoted an evening to the discussion of a theory, which, I believe, will prove to be the most important contribution to the history of our race since the publication of the ‘Descent of Man.’

Mr. E. S. GOODRICH, F.R.S., F.L.S., stated that before embarking on a theory as to the origin of the Vertebrates, we may attempt to determine what must have been the structure of the primitive early Vertebrate from which the Cephalochorda, Cyclostomata, and Gnathostomata (Fish and higher Vertebrates) have been derived. That all these forms are bilaterally symmetrical coelomate animals, provided with gill-slits, notochord, and dorsal central nervous system, will be granted to start with; but we must further try to find out what has been the general course of differentiation and specialization, to distinguish the higher from the lower forms, and to point out what other characters must have been absent or present from the undifferentiated ancestral stage common to them all.

With considerable certainty Gnathostomes can be traced back to an aquatic fish-like ancestor, in general structure not unlike the modern Selachian. It possessed biting jaws with true teeth, a general covering of denticles, open branchial slits, paired and median fins, a cartilaginous endoskeleton, and well-developed sense-organs.

The Cyclostomes belong to an altogether lower grade of organisation, the primitive characters of which cannot be merely due to degeneration. The segmentation of the body is more complete, and the segments are more uniform. This is especially the case

in the head. The formation of a distinct head-region with a large differentiated brain, a skull, and cranial nerves, is one of the most important and characteristic features of the structure of the Craniata (Cyclostomes and Gnathostomes). It takes place by the gradual modification of more and more of the segments at the anterior region of the body where are situated the mouth, gill-slits, and paired organs of sense. But this process of cephalization has gone much further in the Gnathostomes, where the 9th and 10th cranial nerves become included in the skull, and the corresponding muscle segments are suppressed, than in the Cyclostomes, where these nerves emerge behind the rudimentary skull and the muscle segments still in the adult form an uninterrupted series from in front of the mouth to the tip of the tail. Moreover in the Cyclostomes there are no paired limbs, no true teeth, in fact no trace whatever of dermal skeleton, and the testis has not yet acquired any direct connection with the kidney tubules.

The next point to be studied is the structure of the common ancestor of the Cephalochorda and the Craniata. Now, although *Amphioxus* is doubtless in some respects a very specialized animal—as for instance in the possession of an atrial cavity—yet it preserves many primitive characters. Judging from its structure, we must conclude that the ancestral Vertebrate was still more uniformly segmented than the primitive Craniate. The head-region was scarcely differentiated at all, there was no skull (probably no cartilaginous axial skeleton at all), a quite rudimentary brain, no specialized cranial nerves, no cephalization due to the presence of large paired organs of sense. It is possible that *Amphioxus* is somewhat degenerate; but it cannot seriously be urged that it once possessed in well-developed condition those paired sense-organs which have so profoundly modified the structure of the head-region in the Craniata. For it would be ridiculous to suppose that the modified segments could be restored to their original condition of uniformity with the trunk segments; no trace of the disturbance appearing in either adult or embryo.

Further, in *Amphioxus*, there is no dermal or epidermal armour, and primitiveness is shown in the structure of the endostyle, which becomes modified into the thyroid gland in higher forms. Lastly the presence of true nephridia, a type of excretory organ which has been lost in other Vertebrates, links *Amphioxus* to the lower Invertebrate Cœlomata.

Thus can be traced an irreversible series of stages in the differentiation of Vertebrate structure, at the bottom of which we find a much simpler, but still essentially Vertebrate ancestor, probably already extinct in Silurian times.

Among the various Classes of modern Invertebrates we do not, and indeed cannot expect to find any close allies. But the somewhat distantly related Enteropneusta (*Balanoglossus*) seem to

point to a remote common ancestor in which the supporting notochord was not yet formed, the nervous system was superficial and more diffuse, and the segmentation less perfect.

We have seen that the study of the Vertebrates leads us back step by step to a simple undifferentiated ancestor, in which the complex sense-organs, the highly developed brain, the chambered heart, and other structures so characteristic of this phylum had not yet appeared. Now, the same conclusion is reached on studying such other groups as the Mollusca and Arthropoda. Here also we are led back along an irreversible series of forms to a simpler generalized ancestor. The Vertebrates, Molluscs, and Arthropods, have diverged along fundamentally different lines of differentiation.

Just as the organisation of the Vertebrata is governed by the appearance of a dorsal nervous system, a notochord, gill-slits, a mesoblastic skeleton, etc., so the whole organisation of the Arthropoda is dominated by the secretion of a complete superficial chitinous skeleton, and the accompanying development of jointed appendages serving for feeding and progression. Similarly, the Molluscan organisation has been throughout influenced by the secretion of a calcareous dorsal shell, and the development of a soft body capable of distention by the blood-vascular system. Of all the systems of organs the nervous system may be considered as the most important, and it is just in the study of this system that we can most easily trace the divergence in structure of the three groups.

Owing to adaptation to similar environment or function certain striking resemblances may occur between animals of widely separated origin; this is especially the case with sense-organs adapted to receive definite stimuli. Thus, a Cephalopod Mollusc has a large brain enclosed in a cartilaginous skull, with paired orbits containing large eyes remarkably like those of the Craniate Vertebrate. But the resemblance is due to convergence; these complex organs were not present in more primitive Mollusca, and have been acquired within the Molluscan phylum. Examined carefully they are found to differ as fundamentally in every detail from those of the Vertebrate as does the whole organisation of the Mollusc differ from that of the Vertebrate in general.

Resemblances between the Arthropod and the Vertebrate are not so striking; when they do occur they can be shown to be of the same nature. Here also the various organs which acquire some likeness to each other in the two groups are found to differ as fundamentally in detail as they do in origin. What the two groups really have in common is only that which they have both inherited from a very early undifferentiated ancestral stock.

Dr. H. GADOW, F.R.S. (Visitor), followed, and said:—When Dr. Gaskell explained his hypothesis at a meeting of the Cambridge Philosophical Society, fourteen years ago, I was the only one who had the courage of pleading for its being given a chance. It has survived pitiful contempt and ridicule.

If we want to join the ends of a broken chain, we must be clear about the links. I propose pointing out the last Vertebrate link, by reconstructing an early Vertebrate analytically.

Ever since Gegenbaur based his investigations into the composition of the cranium upon Elasmobranchs, and as since, after him, Balfour discovered so many important features in their embryonic development, the Elasmobranchs have come to be looked upon as the ideally lowest typical Vertebrates. Dohrn even went so far as to explain the Cyclostomes out of the way of direct ancestry as degenerated Elasmobranchs.

This Elasmobranch worship is wrong. They are a side-branch which leads to nothing. The main stem of the Vertebrate descent passes through what we may call Gano-Dipnoi, and their ancestors, Proto-Gano-Dipnoi, presumably were still devoid of paired limbs, and still lower down were not yet Gnathostomes. We can reconstruct further: With a mouth not terminal but ventral: their bulk consisting of a large anterior complex and a short, tapering tail, both segmented and metameric. Condensation and fusion produced a head which was so large because it contained all the principal organic systems, as nervous, digestive, respiratory, vascular, and possibly excretory and generative.

Metamerism in this anterior complex, the incipient head, was doomed, but in the posterior portion it underwent renewed activity. Not only were more segments formed by interstitial budding, but metamerism ran wild, culminating, besides other features, in vertebralization.

The latter proceeded from the tail end forwards, and it is idle to seek for vertebræ in the primitive head, excepting in the part from the vagus backwards, which in the early creature we are dealing with, was a very recent formation.

Meanwhile, the posterior or tail portion becoming larger, part of it, from before backwards, was converted into a trunk, as this was receiving most of those organs which were crowded out from the consolidating head, and also no doubt owing to the repetitional budding backwards of some of these organs. Thus we have arrived at a Tadpole-shaped Vertebrate of which some Ostracodermi with their vertebralized tails are not a bad sample.

Gegenbaur had taught us to consider the spinal cord as an outgrowth from the older brain. The greater part of the chorda is likewise due to a secondary growth backwards, this organ not being laid down in its totality, certainly not in the tail where it ought to have arisen if originally intended for an axial stiffening organ. It arises, however, in the trunk, and since this is a later

addition (due to interstitial postcephalic budding) the chorda must be of a comparatively late stage.

Both these features, chorda and spinal cord, fit into the sketch I have just outlined, but if we consider the spinal cord as an outgrowth from, and therefore a thing later than, the brain, this seems to go strongly against Dr. Gaskell's theory, and this would not be reconcilable with my early Vertebrate. But Gegenbaur's explanation, development from the supra-oesophageal ganglia of the Invertebrates, is one of those captivating notions which is really nothing but a working hypothesis to account for the dorsal position of the spinal cord. And yet this hypothesis, absolutely wrong in detail, led and became wrapped up in the much more important principle of the foundation of a trunk by backward interstitial budding. As this became dimly recognised as reasonable, the spinal cord explanation benefited by it, although wrongly.

A few words about the skeletal material, the cartilage. I remember Gegenbaur saying in his lectures, "Aller Knorpel kommt ursprünglich von Aussen." We are only now beginning fully to understand the meaning of that oracular sentence. The cartilage of the Vertebrata is originally an ectodermal, basal membrane product, which then migrates inwards. It does not arise, as the old master himself had taught, and as everybody teaches, in the immediate vicinity of the chorda, there to form arcualia or basal blocks, these to form neural and ventral processes, whence ultimately arise the median fin-supporting rays. The process is just the reverse. First rays, lastly basal blocks, culminating in the formation of an axial skeleton with centra. As an aside, I need scarcely mention that this reversed process considerably assists the derivation of the paired fins from a hypothetical lateral fin.

Another point: since Gegenbaur has stated it positively, there have been persistent attempts to prove that cartilage appears endogenous in the chorda. Personally I think that this belief rests upon faulty, or misinterpreted observations, but if there should, after all, exist such endogenous chordal cartilage, such an endodermal origin would appear quite irreconcilable with the new doctrine of its ectodermal origin. And yet, if Gaskell's explanation of the chorda as an early folded-off portion of his new gut is right, then it becomes quite comprehensible how this new gut-wall may still retain some lingering scleroblastic cells, since, according to Gaskell, this gut is partly made out of ventral ectoderm.

The early Vertebrate I have just reconstructed approaches the Silurian limbless Ostracoderms. *Pterichthys* may be a belated offshoot, still retaining a pair of Invertebrate limblike appendages. Ostracoderms I hold to be the lowest known Vertebrates, not yet Gnathostomes, whether we call them Hypostomes or Agnatha, or even Cyclostomes in a wider sense.

It is one of Dr. Gaskell's happiest feats to have shown that

Cyclostomes closely resemble such Ostracoderms, not, however, as their descendants, but rather as their ancestors, although modified and even somewhat degenerated. To appreciate this, however, we must cease gazing at the Lamprey. The *Ammocoetes* larva is the key. Of course, even this is not primitive enough for the earliest Vertebrate. To reconstruct this we have to take away its trunk, and such a creature may well be expected to have lived in early Silurian times. Although there is not yet known a single fossil Cyclostome from the Silurian slates to recent river-mud, such creatures may come to light and they would not be more puzzling than *Paleospondylus*.

Thus far it is plain sailing. The Vertebrate end of the broken chain is clear enough. The attempts to bring *Amphioxus* into line have not been successful, and the claims of the other "Chordata" restrict themselves to a few features of doubtful value. Nowhere could these comparisons be driven home, and what do these attempts amount to against Dr. Gaskell's detailed, almost too minute comparisons of a dozen of the most important organs? If his results were, every one, nothing but coincidences, analogies, such a state of things would be much more astonishing and unlikely than his whole hypothesis. His explanations of the huge cavities in the brain, the peculiar structure of its roof, the ventral and the neurenteric canal, are the only plausible ones ever offered. It is a somewhat forgotten fact that in some Birds there is no proper neurenteric canal, while in other species there are, not one, but two and even three successively formed communications of the central canal with the gut and passing right through the chorda. An organ which, like the chorda of a bird, has passed its prime, is liable in its degeneration to revert to primitive features, somewhat muddled. Here we have three neurenteric connections, their respective funnels behaving as if the chorda were a negligible quantity, or rather part of the gut.

Gaskell's explanation of the chorda is by far the best we have. If considered as a product of an endodermal gut, the chorda cannot well have started as a supporting organ. It must have started with gut-like function, but having lost this with its lumen, its walls shrinking to rod-shape, may then well have formed a useful axial support. Can it be upheld, that the chordoids of *Balanoglossus* and *Rhabdopleura* ever had a gut function? This would mean that a glandular, secretive organ has lost its function and yet waxed large. A proper chorda is not a glandular thing, and even when it is a rod ten feet long and more than one inch thick, it possesses neither nerves nor blood-vessels.

Zoologists have allowed histology to slip out of their hands into those of the physiologists, and it has done well there. Embryology would likewise have fared better if the function of the aggregating and growing masses of cells had been taken as the leading principle, instead of the structures which they ultimately give rise to. It is function which determines the organ, and the

possible function often depends upon mere position, sometimes almost accidental, with regard to the surrounding medium. Nature does not care where the material comes from, provided it be suitable. There are, for instance, endodermal and ectodermal gills; nor does it matter whether a creature digests and absorbs food by its inner or by its outer surface. Whilst an armour-clad animal cannot do it, a naked Amphibian drinks through its whole skin; and most species of *Spelerpes*, sometimes six and more inches long, never possess gills, have lost their lungs, and breathe almost entirely through their outer surface.

The Germ-layer theory has crystallized into a dogma and has led into a *cul-de-sac*. How else could it happen that people, who have spent a lifetime at embryology, throw it up in disappointment and denounce the theory of Recapitulation, which is about the only valuable, really priceless generalization of this direct means of studying evolution.

Because Dr. Gaskell is a good physiologist, he saw that the central canal and the brain ventricles could not possibly have anything to do, primarily, with the central nervous system, that, in fact, they are the remnants of a gut. This has of course been suggested long ago, from the general look of the thing, but there were no proofs, and there was the seemingly hopeless task of having to account for a new gut. Gaskell had the courage and insight to show how such a gut may have been evolved, and this is one of the best, simplest and most convincing chapters. It is a false dogma that the gut must be *the* organ which is homologous in all gut-possessing animals.

Dr. Gaskell may be mistaken in some of his interpretations, but his hypothesis is not only at least as good as others, but it is the only one which endeavours to carry through a great number of comparisons. His hypothesis is logically conceived; it is built up of items, none of which are impossible, therefore the total is possible.

The discussion was then adjourned to the next General Meeting, Thursday, 3rd February, 1910, at 8.0 P.M.

February 3rd, 1910.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 20th January, 1910, were read and confirmed.

Dr. Henry Drinkwater, M.D. (Edin.), and Mr. Cyril Crossland, M.A. (Cantab.), B.Sc. (Lond.), were elected Fellows.

The discussion upon the Origin of the Vertebrates, begun at the previous Meeting, was resumed.

The discussion was continued by Dr. A. SMITH WOODWARD, F.R.S., F.L.S., who remarked that Palæontology affords no clue to the ancestry of the Vertebrates, because they seem to have originated as animals with no hard parts capable of fossilization. When they first acquired a calcified skeleton in the Upper Silurian period, they were represented not only by very primitive types like the Ostracoderms, but by true fishes of at least as high a grade as the Elasmobranchs (Acanthodians).

It is perhaps a significant fact that the Arthropods were the dominant type of life at the time when the Vertebrates began to be conspicuous. It is known that during the subsequent course of evolution of the Vertebrates themselves, each successively higher great group became the dominant type for the time being; and that each advance was due to evolution from the immediately preceding dominant type. In every case, however, the higher group seems to have been directly derived from the earliest and most generalized members of the preceding group, not from the specialized members that flourished at the time of its dominance. If, therefore, the Vertebrates originated from Arthropods, their direct ancestors must have been early generalized forms which there is little hope of discovering among fossils.

Although so little is known of their organisation, it seems probable that the Ostracoderms are lower in rank than the true fishes, and most nearly related, among surviving animals, to the Marsipobranchs. Dr. Gaskell has added to this probability by his researches on the Ammocæte. His comparison of the structure of the dermal head-shield in the Upper Silurian *Auchenaspis* with that of the more deeply seated plate of muco-cartilage in the Ammocæte, is particularly striking and interesting.

Most of the Ostracoderms have a remarkable superficial resemblance to the contemporaneous Arthropods of the Eurypterid group, being adapted for a similar mode of life on the sea-bottom. A few, however, are laterally compressed and as gracefully fusiform as swiftly-swimming fishes (e. g., *Birkenia*); and that these had a wide geographical distribution in Upper Silurian times is shown by the recent discovery of a fragment (named *Ctenopleuron nerepisense* by G. F. Matthew) in New Brunswick.

The supposed discoveries in Ostracoderms of appendages comparable with those of Arthropods, are due entirely to faulty observation or misinterpretation. There is nothing more than a normal branchial chamber on each side of the cranial region in genera such as *Cephalaspis*, *Pteraspis*, *Cyathaspis*, and *Tremutaspis*, where the skeleton can be well observed. The so-called paired appendages ascribed to the trunk of *Cephalaspis* by Prof. W. Patten, are merely the scales which project along its sharp angulation on each side.

Prof. ARTHUR DENDY, F.R.S., Sec.L.S., contributed the following remarks:—

Any theory of the origin of Vertebrates must stand or fall by the results of detailed criticism of the evidence upon which it rests, and owing to the large amount of evidence which Dr. Gaskell has brought forward, this must necessarily be a very laborious undertaking. The portion of this evidence to which I wish to call special attention on this occasion is that which concerns the eyes, upon which very great stress has been laid. This applies especially to the median eyes, concerning which Dr. Gaskell himself states* that “undoubtedly, in recent times, the most important clue to the ancestry of Vertebrates has been given by the discovery that the so-called pineal gland in the Vertebrate brain is all that remains of a pair of median or pineal eyes, the existence of which is manifest in the earliest Vertebrates.” This being so, it seems especially desirable to examine critically the evidence brought forward in this case. Dr. Gaskell has studied these organs in the Ammocete larva of *Petromyzon*. I myself have studied them in the *Velasia* stage of the New Zealand Lamprey, *Geotria*, which is very closely related to *Petromyzon*, and also in *Sphenodon*, where they are exceptionally well developed. I may say at once that my interpretation of their structure does not agree with that of Dr. Gaskell.

Dr. Gaskell reminds us that Crustaceans and Arachnids, as well as Vertebrates, have lateral and median eyes and that in these Arthropods, “the median eyes are in all cases eyes with a simple upright retina and a simple cuticular lens, while the retina of the lateral eyes is compound or may be inverted, according as the animal in question possesses crustacean or arachnid affinities.” Again he says, “The lateral eye of the vertebrate, possessing, as it does, an inverted compound retina, indicates that the vertebrate arose from a stock which was neither arachnid nor crustacean, but gave rise to both groups—in fact, was a member of the great palæostracan group.” He then proceeds to examine the evidence with regard to the median eyes of *Ammocetes*, with a view to discovering whether they belong to the same type as those of Arachnids and Crustacea. He compares an extremely diagrammatic figure of the pineal eye of *Ammocetes*, which in my opinion is far from being correct, with an apparently equally diagrammatic figure of an *Acilius* larva, which, to judge from the drawing of this eye copied from Patten on a later page, is also far from accurate. By this procrustean method of treatment the two eyes are certainly made to look very like one another, although it has been impossible to eliminate the cuticular lens of *Acilius*, which is entirely wanting in *Ammocetes*.

The manner in which it has been necessary to treat the evidence in order to arrive at this comparison is clearly illustrated by

* ‘The Origin of Vertebrates’: Longmans, Green, & Co., 1908, p. 74.

Dr. Gaskell's discussion of the minute structure of the retina. If the comparison is to be valid the retina of the pineal eye must be a simple retina, that is to say, it must not contain an optic ganglion. Dr. Gaskell says "neither I myself nor Studnička have been able to see any definite groups of cells between the nerve end-cells and the optic nerve such as a compound retina necessitates." It is difficult to reconcile this statement with what Studnička himself says. According to this author,* the retina of a developed *Amunocæte* consists of the following cell-layers:—

- (1) At the bottom, a layer of nerve-fibres, which are in direct connection with those of the pineal nerve.
- (2) A layer of basal cells; large, very clear cells with lightly staining protoplasm and large nuclei, with a number of nerve-fibres running between them.
- (3) A layer of nuclei belonging to small cells.
- (4) A layer of cylindrical cells which correspond to the rods of older authors and which consist of sense-cells and supporting cells.

This does not sound very much like a simple retina. Dr. Gaskell quotes Studnička as saying that the nerve end-cells pass directly into the nerve, which, Dr. Gaskell observes, "points directly to the conclusion that this retina is a simple, not a compound retina, and that it therefore in this respect agrees with the retina of all median eyes." I do not know where Studnička makes the statement upon which Dr. Gaskell bases this conclusion. What I do find him saying (*op. cit.* p. 25) is that the lower extremity of the sense-cell is produced into a nerve-fibre which loses itself in the nerve-fibre layer of the retina (1). He further expressly states that in the adult *Petromyzon* there are amongst the round basal cells many which undoubtedly have the character of ganglion cells, and that the processes of these cells may be followed into the layer of nerve-fibres, while they also send processes into the layer of cylindrical cells.

In short the retina of the pineal eye of *Ammocetes* is undoubtedly a compound retina and not, as Dr. Gaskell would have it, a simple one. My own observations on the pineal eye of *Geotria* fully confirm this view. In this animal also a well-developed retinal ganglion is present. Dr. Gaskell endeavours to harmonize my observations with his theory by supposing that the cells of which this retinal ganglion is composed "do not represent the original optic ganglion of a compound retina, but rather the subsequent invasion, by way of the pineal nerve, of ganglion cells belonging to a portion of the brain." When undoubted facts have to be ignored or explained away in this manner in order to

* "Die Parietalorgane" (in Oppel's 'Lehrbuch der vergleichenden mikroskopischen Anatomie der Wirbelthiere'), p. 24.

support a theory it looks as if that theory must stand upon a somewhat shaky foundation.

Dr. Gaskell, then, concludes that in the pineal eye of *Ammocetes* "there is certainly no appearance in the least resembling a compound retina such as is seen in the vertebrate or crustacean lateral eye." It is true that in the Lampreys the retinal ganglion of the pineal eye is not spread out to form a layer of such uniform thickness as in the lateral eye, but the pineal eyes of *Sphenodon* and of the *Lacertilia* make a much closer approach to the lateral eyes in this respect.

By far the most important evidence afforded by both the pineal and lateral eyes of Vertebrates, however, is, in my opinion, that derived from their development. Both differ essentially from any Invertebrate eye in being formed as diverticula of a hollow brain. The eyes of Arthropods are formed by thickening and differentiation of the superficial epiblast. How is it possible to reconcile this discrepancy? Dr. Gaskell himself (*op. cit.* p. 101) states the problem quite clearly in the case of the lateral eyes. Having arrived at the conclusion that the retina is in this case a compound retina, composed of a retina and retinal ganglion of the type found in Arthropods, he goes on to say: "From this it follows that the development of the vertebrate retina ought to show the formation of (1) an optic plate formed from the peripheral epidermis and not from the brain; (2) a part of the brain closely attached to this optic plate forming the retinal ganglion, which remains at the surface when the rest of the optic ganglion withdraws: (3) an optic nerve formed in consequence of this withdrawal, as the connection between the retinal and cerebral parts of the optic ganglion." Of course, the same must apply to the pineal eyes*.

Relying upon Götte's observation "that the retina arises from an optic plate, being the optical portion of his 'Sinnesplatte,'" Gaskell concludes that the retina (of the lateral eye) is to be regarded as a portion of the superficial epiblast together with a retinal ganglion with which it has become fused, while the optic vesicles are explained as outgrowths of the primitive Arthropod stomach which supply only the epithelial and supporting framework of the retina, with which the nervous and sensory elements become interwoven. The development of the lateral Vertebrate eye is, however, a very complex process, and as I have not made a special study of it myself, I leave it on one side, though I may say that Dr. Gaskell's idea of the double origin of the retina and its supporting structures seems to me to be too far-fetched to be of much value as a support for his theory, and that any attempt to institute a close comparison between the lateral eye of a Vertebrate and the highly specialized compound eye of an Arthropod is foredoomed to failure.

* At any rate so far as no. (1) is concerned, whatever view we may take as to the presence or absence of a retinal ganglion in the pineal eye.

Dr. Gaskell unfortunately does not deal with the development of the pineal eye, which is far simpler. This has been carefully studied in various types, all of which agree in essential features. I myself have studied it chiefly in *Sphenodon*, upon which animal the following statements are based. The pineal eye originates as a simple evagination of the brain-roof. This completely separates from the brain and closes up. The optic vesicle thus formed does not invaginate to form an optic cup, as in the case of the paired eye, but the retina, with its sense-cells, ganglion-cells and nerve-fibres, is formed directly and *in situ* by differentiation of its posterior wall, while the lens is formed from its anterior wall. There is not the slightest indication of the origin of any part of the retina directly from the superficial epiblast. It is true, of course, that the whole of the central nervous system is derived, in the first instance, from superficial epiblast, and so also is the central nervous system of an Arthropod. No one denies that the retina is epiblastic in origin; the question is, what part of the epiblast is it derived from? In the Vertebrate it is derived from the part which becomes invaginated to form the central nervous system. In the Arthropod and in other Invertebrates, it is not.

I cannot, therefore, avoid expressing the opinion that the evidence which Dr. Gaskell derives from the study of the lateral and pineal eyes in favour of his theory does not stand the test of critical examination. It appears to me, if I may venture to say so, that he has failed to distinguish between analogy and homology. Animals which have to live under similar conditions must be expected to become adapted along similar lines, and it is no more necessary to invoke a common ancestry to explain the resemblance between the visual organs of Vertebrates and Arthropods than it is to give the same explanation of the superficial resemblance between their organs of locomotion. Again, the resemblance between the lateral eyes of Vertebrates and the highly characteristic compound eyes of any Arthropod is not nearly so striking as is that between the former and the higher Cephalopod eye, and yet no one, so far as I am aware, has yet ventured to include the Octopus in the ancestral portrait gallery of the Vertebrata.

Looking at the problem for a moment from a wider point of view, I should like to express my agreement with those who see in *Amphioxus* a close approximation to the starting-point of the great Vertebrate phylum. The evidence in favour of the essentially primitive character of *Amphioxus* is, to my mind, overwhelming, but the acceptance of this evidence is fatal to Dr. Gaskell's views, for in *Amphioxus*, of course, a very large proportion of the Vertebrate characters upon which he lays so much stress as indicating Arthropod affinities, have not yet put in an appearance. Thus, for example, there is no trace of either lateral or pineal eyes, and we therefore conclude with confidence that

these structures have not been inherited from any Invertebrate ancestor at all, but have arisen quite independently within the Vertebrate group.

In connection with Dr. Gaskell's theory, the question is sometimes asked:—If the cavity of the central nervous system of the Vertebrate, with its lining epithelium, has not been derived from the alimentary canal of an Arthropod ancestor, how do you account for its existence, and how do you account for the existence of the choroid plexuses? To the zoologist, of course, this question presents no difficulty. One of the commonest phenomena of development throughout the Animal Kingdom is the increase of surface by the formation of folds. We are familiar with it in glandular tissues and in respiratory tissues, and we are familiar with it also in the formation of the central nervous system of various Invertebrates, as Professor MacBride has already pointed out. No one doubts, moreover, that this is the explanation of the convolutions of the brain in higher Vertebrates. Why then object to apply the same principle in explanation of the origin of the Vertebrate nervous system by invagination of the superficial epiblast? The Vertebrates inherited from their Invertebrate, worm-like ancestors, this characteristic mode of forming the central nervous system, which naturally resulted in the development of a hollow tube with at first a narrow lumen. Further evolution of the nervous system was brought about primarily by the increase in number of the nerve-cells and the consequent thickening of the wall of the neural tube. It will, of course, be asked by the supporters of Dr. Gaskell's theory, why has the cavity of the original neural tube increased to such enormous dimensions in the case of the ventricles of the brain? Here again I do not see any difficulty. The great mass of nerve tissue formed in the brain requires some very well developed system for nutrition and respiration. This is primarily effected of course by the cerebral blood-vessels; but we have also the cerebro-spinal fluid, with which the ventricles of the brain and the *canalis centralis* of the spinal cord are filled, and which probably exercises an important respiratory and possibly also other functions. I suppose Dr. Gaskell will hardly ask us to look upon the cerebro-spinal fluid as representing the digestive juices which were poured into the stomach of the ancestral Arthropod.

What about the choroid plexuses, then? Here, again, we have a beautiful illustration of the principle of folding in order to increase surface, a folding which is quite inexplicable except on the assumption that the choroid plexuses fulfil some very important function in connection with the cerebro-spinal fluid into which they dip. They are, as everyone knows, extraordinarily vascular (which the wall of the Arthropod stomach is not), and they probably constitute a kind of intra-cerebral gills concerned in the respiration of the cerebro-spinal fluid; they may also have other functions in connection with this important fluid.

It appears from Dr. Gaskell's opening speech that he assumes that the anterior opening of the neural tube in the larval *Amphioxus* represents the old Arthropod mouth, but in the higher Vertebrates he locates this ancestral mouth in the region of the infundibulum. This necessitates the supposition that the anterior neuropore is identical in position with the infundibulum, a supposition which would, I imagine, strike modern embryologists with amazement.

Then again, what is the value of the evidence afforded by the so-called neurenteric canal? This structure, if structure it can be called, simply results from the fortuitous enclosure of the blastopore by the uprising neural folds, and to my mind it has no phylogenetic significance of the kind attributed to it by Dr. Gaskell.

It was urged, I think by Professor Starling, that the immense physiological importance of the central nervous system gives it a special claim to consideration as evidence in the discussion of the origin of Vertebrates. This is entirely contrary to the usually accepted views of systematic zoologists, who find in structures which are apparently of the least use to their possessors* the best guides to genetic affinity. Organs which are of great use must be subject to adaptive modification in accordance with the changing needs of the organism. Modern schemes of classification are indeed largely based upon this principle, and certain modifications in the nervous system of tape-worms have been explicitly ruled out as guides to classification in accordance therewith.

[The central nervous system of a Vertebrate of course agrees with that of an Arthropod in exhibiting traces of a fundamental metamerism, because both Vertebrates and Arthropods are metamerically segmented animals, and both have very probably been derived from some metamerically segmented common ancestor.

It is the later modifications, cœnogenetic rather than palingenetic features, readily explicable as adaptations to the special needs of the Vertebrate organisation (which are of course in many respects similar to those of the Arthropod organisation), that I consider to be inadmissible as evidence in considering the phylogenetic relationships of the Vertebrates. The fact that highly specialized characters of the brain may afford a useful clue to relationship *within the limits of the Vertebrate phylum* does not, in my opinion, affect the question at issue. In dealing with closely related groups comparatively recent modifications are of undoubted taxonomic value; but in comparing such widely divergent groups as Vertebrates and Arthropods, resemblances due to such characters, when they can be explained quite reasonably as the result of convergent evolution, must be eliminated from the discussion.]

* I may cite in illustration the microscleres or so-called flesh-spicules of siliceous sponges, with their extraordinarily diverse and apparently specifically constant modifications.

Sir RAY LANKESTER, F.R.S., F.L.S., said he was not prepared there and then to discuss points of detail, but the subject was so interesting that he should wish to offer some remarks. Moreover he gathered from Dr. Gaskell's book, and from more direct information, that he himself was to some extent connected with the genesis of Dr. Gaskell's views, since certain observations and arguments of his own on *Limulus* and the Scorpion had germinated in Dr. Gaskell's mind and led him to the very careful and elaborate studies which he had made and the extraordinary theory which he advanced. Whilst calling it an "extraordinary" theory, he did not wish it to be supposed that on that account he wished to reject it or not to give it full attention. This was a matter not to be treated as *à priori* impossible or improbable, but the question simply was, "Are the facts brought forward by Dr. Gaskell such as to make it appear probable that the Vertebrates have developed from Arthropods resembling *Limulus* by the conversion of the old alimentary canal into the neural tube and the simultaneous formation of a totally new digestive tract?"

The relations of animal forms to one another is the great problem of morphology. A hundred and twenty years ago morphologists still believed in the "scala naturæ" and a linear progressive series of animal groups. The great step was taken by Cuvier in opposition to the conception of Lamarck of arranging animal forms in four branches—"embranchemens" he termed them, the Radiata, Mollusca, Articulata, and Vertebrata. He thereby anticipated the modern conception of a branching pedigree, which became the generally accepted form of classification when once Darwin had established the theory of Descent.

The earlier attempts at a branching pedigree made by Haeckel differed from the later ones by the same naturalist, and there had been considerable development and improvement in the theoretical pedigree, which aimed at exhibiting the genetic affinities of all animal forms. The question of the position of the Tunicata had been one of the most interesting. Allman, forty or more years ago, considered the Tunicata as related together with the Polyzoa to the Lamellibranchs and other Mollusca. He regarded the perforated pharynx of the Ascidian as formed by the fusion of the gill-plates of a Lamellibranch along their free edges to form a closed sac, and this was perhaps the largest call upon the imagination which had been made by a modern morphologist until Dr. Gaskell suggested the conversion of the Arthropod's digestive tract into the spinal cord and the formation of a new gut in Vertebrata by the closing in of an open ventral groove. The facts brought forward by Kowalewsky had determined the position of Ascidians in the Vertebrate stem. There were four "coincidences" of structure which by the law of probability led to the conclusion that Ascidians were genetically closely related to Vertebrata. They were the existence in the Ascidian tadpole as well as in Vertebrata (1) of the notochord developed from endoderm,

(2) of the pharyngeal gill-slits, (3) of the tubular dorsally placed nerve-cord, and (4) of the cerebral eye. The evidence was cumulative, and its value depended on the exact and indisputable nature of the agreements and on the fact that they were found in the two cases compared and in no other animals, so that a common inheritance of these structures by Ascidians and certain Vertebrata, not shared by other forms, was the only rational explanation of the facts. Was this the case with the coincidences of structure between the Lamprey and the Arthropods brought forward by Dr. Gaskell? Sir Ray Lankester held that the coincidences cited by Dr. Gaskell were not of a sufficiently exact and special nature, nor peculiar to the Vertebrates and Arthropods, so as to render it necessary to suppose that Vertebrates had been derived from Arthropods, and certainly not of such a nature as to render it reasonable to suppose that the extraordinary conversion of the Arthropod's digestive tract into the nerve-tube had taken place as insisted upon by Dr. Gaskell.

The view which was almost universally accepted at present by zoologists was that when once we pass from the Coelenterate or Entero-coelous grade of animal structure to the Coelomata or Coelomo-coelous grade, a number of diverging great lines of descent or phyla must be recognised—such as the Echinoderina, the Appendiculata (including Arthropods, Rotifers, and Annelids), the Mollusca, the Vertebrata, the Nemertina, and other worm-phyla. As to the beginnings of any of these lines of descent, we had (as was natural enough) very scant indications, nor could we say anything as to the early connection of any one of these great phyla with another. What appeared highly probable, if not certain, was that they all converged to simpler ancestral forms, and that they all inherited the same fundamental tissues, digestive tract and glands, nephridia, coelom and coelomic ducts, reproductive gonads, blood-vascular system, and nervous cords (many or few), and essentially the same types of sense-organs—ophthalmic, auditory, gustatory, olfactive, and tactile. That the optic vesicles of Arthropoda should agree, not absolutely but in many important respects, with those of Vertebrata, could not be held to indicate special affinities since Annelids, Molluscs, and even Echinoderms had organs of the same kind. That some of the tissues should agree minutely in two of the phyla was not suggestive of special affinity, since many of the tissues agreed in most of the larger phyla. Sir Ray Lankester held and he desired to state it without any offence, that in searching by long and strenuous enquiry for evidence in favour of such a hypothesis as that adopted by Dr. Gaskell, the mind is liable to a kind of "suggestion," and that the psychological condition may become similar to that of those who too readily admit all sorts of coincidences as evidence that Bacon wrote the plays of Shakespeare. The heroic nature of the task which it is sought to accomplish undoubtedly in many enterprising and devoted investigators has re-acted unfavourably on the

judgment. All are liable to it and it may be that something of the kind is here at work. Though he could not follow Dr. Gaskell in the theory put forward by him as to the origin of Vertebrates, he recognised very gratefully the value of the observations on many details of structure to which it had led that distinguished physiologist, and also the new observations which it had called forth on the part of other naturalists, such as the interesting additions to our knowledge of the head-shield and the body-scales of *Cephalaspis* which had just been placed before the meeting by Dr. Smith Woodward. He thought the Society was to be congratulated on a very interesting debate. (In the further course of the discussion Sir Ray Lankester stated that whilst he considered *Amphioxus* and the Ascidian tadpole to present in many points of structure a very much more primitive phase of the Vertebrate group than do either Lampreys or Fishes, he held that they were also specially modified and degenerate each in its own way, and were not closely representative of the main line of descent. He considered that the remains of the earliest known fossil fishes, on account of their necessarily incomplete condition, were not capable of throwing much light on the question of Vertebrate ancestry. He was led to the conclusion that *Balanoglossus* threw some light on the subject, and he drew attention to the remarkably complex brain and cerebral respiratory pits of the Nemertine worms and the dorsal median as well as lateral nerve-cords of those creatures, which had led Hubrecht long ago to suggest their close connection with the remote ancestors of Vertebrates. A large survey of the facts of animal structure, even including that of unfamiliar marine worms, was necessary in order to form a reasonable judgment on the question of Vertebrate ancestry.)

Dr. P. CHALMERS MITCHELL, F.R.S., F.L.S., remarked that consideration of the general morphology of the nervous system enables us to place the Vertebrates in their true perspective amongst the various Invertebrate groups. In the Cœlentera, as shown by the Hertwigs, the nervous system frequently appears as a diffuse layer of cells and fibres underlying, and in close connection with, the epidermis, whilst there is much evidence that a similar primitive condition underlies the various presentations of the nervous system in higher groups. Even amongst the Cœlentera, two processes coincidently or independently result in modification of the primitive simplicity. The original diffuse layer may become thickened in definite regions, forming, for instance, rings round apertures or radial bands, whilst in the intervening areas it may be obliterated. The thickened bands or rings may migrate inwards and lose their intimate connection with the epidermis. Similar processes varying in position and extent of their incidence have led to many different arrangements of the nervous system in the higher groups.

In the Turbellaria, inward migration has taken place, and two ventro-lateral cords have been formed.

In the Trematodes, inward migration has taken place, and there are six cords, two dorsal, two ventral, and two lateral, with a network of connecting cords, some of which form a series of hoop-like rings.

In the Cestodes there is less inward migration, whilst there are two lateral cords with occasional transverse connections.

In the Nemertines, sometimes there is no inward migration, so that the nerve-strands remain strictly sub-epidermal; sometimes the strands have completely separated. The primitive continuous sheath is frequently retained with two lateral and sometimes one dorsal thickening.

In the Nematodes also the extent to which inward migration has taken place varies very much, in some cases the sub-epidermal position being retained. Six strands occur in many forms, one dorsal, one ventral, and two at each side; these are connected by traces of the primitive continuous sheath in the form of a very broad anterior hoop, and narrow posterior strands. A different arrangement of these antero-posterior strands occurs in front of the nerve-collar.

In *Gordius*, inward migration has occurred and there are three ventral strands.

In Arthropods, the inward migration and separation from the epidermis are complete, and there are two ventral bands with an anteriorly placed collar.

In *Balanoglossus*, there is a continuous sub-epidermal sheath which has not migrated inwards, and special dorsal and ventral thickenings, and also in the collar region the very interesting short neural tube with anterior and posterior neuropore formed by invagination.

In Chordates, there is a single dorsal band which migrates inwards, whilst the outgrowing segmental nerves may be taken as specialized representatives of the continuous sheath.

From the point of view of the general morphology of the nervous system, therefore, the Chordate or Vertebrate group exhibits simply one of a large series of different modes of specialization of the primitive diffuse, sub-epidermal sheath.

In quite a number of these different experiments, the processes of segmentation and of cephalization with the formation of a brain have occurred independently, and have produced analogical or homoplastic structures. The elaborate comparison of the results of the processes of cephalization and segmentation in *Ammocoetes* and higher Vertebrates with those of the Arthropods are meaningless unless we suppose that *Amphioxus* has passed through such a stage and has lost all traces of it; it is a simpler supposition that the higher Vertebrates have independently acquired the results of cephalization after having passed through a stage of which *Amphioxus* is the nearest living although specialized and degenerate representative.

As Prof. Gaskell has laid so much stress on comparison between

the brain and central nervous system of Arthropods and Vertebrates, it is interesting to notice that C. Judson Herrick, another distinguished physiologist and psychologist, has recently compared the two sets of organs (Address of the Chairman of the Section Zoology; American Association for the Advancement of Science, 1909, printed in 'Science,' 1910, p. 7). Professor Herrick, reviewing the subject without reference to any theory of origin, comes to the conclusions that the psychological processes of Arthropods and Vertebrates differ totally; that the difference of function is correlated with a fundamental difference of type underlying all superficial resemblances, and which was "foreshadowed far back among the ancestral crawling things in which no truly vertebrate character was manifest, foreshadowed merely by a structural type with different latent potencies."

Professor STANLEY GARDINER, F.R.S., F.L.S., said:—Of the many speakers only Dr. Gaskell has put forward a connected theory which the rest have merely attempted to destroy. Their alternative plan is by a line of evolution through *Amphioxus*, but they do not attempt to show us how this beast may have been produced. Unfortunately in the whole question of the Origin of Vertebrates we have very few real facts upon which to base our views. Such facts, so far as I can see, will be obtained from the study of extinct forms, and it is a most curious fact that nowhere has Palæontology yet shown a series of transitional types between distant groups. We have to content ourselves with *conclusions from analogies* and *proofs by probabilities*. We largely study existing forms. The danger of this is well exemplified when we consider the relations of Reptiles to Mammals. Both groups as existing now must largely be traced to *Theromorphs*, of which, following Cope, minute and relatively puny forms probably branched off into each of the two phyla. Applying the ordinary terminology of Cope, it may be said that existing Reptiles have regressed and that existing Mammals have progressed. We may now consider this line as fairly well established by *analogies* and *probabilities*, and it appears to me that it is a line almost of facts to which we can appeal with considerable certainty for zoological canons. If there is one point more than another which it shows it is surely the paramount importance of considering the condition of the central nervous system a test of progression, as Dr. Gaskell maintains. It demonstrates with certainty that his deductions from the brains of living Vertebrates, as such a test, are absolutely justified. In opposition to Professor Dendy I should claim that the central nervous system is the best organ on which to trace the changes of evolution. It governs every organ in the body, and it must reflect in its own structure every change which those organs undergo, every act of progression.

Turning to Amphibia, we have no indications of their real origin, and we have still less when we come to the Fishes. The

Leptocardia and the Marsipobranchia are with no certainty represented in the fossil state. They are derived from an ancestor far more ancient than the *Theromorphs*, and any comparison of existing forms, supposed to have been derived from this ancestor, might well show vastly greater differences than between say Primates and Lacertilia, or even Primates and Pisces.

The weakest part of the MacBride-Goodrich argument the other night lies in their consideration of *Amphioxus* as a simple primitive Vertebrate. Whatever *Amphioxus* may be, it is surely not in the main stem of the Vertebrate descent, and it is certainly a very specialized form. To argue, as Goodrich did, that the presence of primitive excretory cells (solenocytes) in *Amphioxus* proves it to be primitive, and related to the Annelids, comes to the same thing as claiming that *Phoronis* is also an Annelid, because its larva has similar cells.

Examining both the above groups, and applying "every canon of Biology," we must, I conceive, regard *Amphioxus* as equally typical of regression as is any beast that exists in the Animal Kingdom, while the Marsipobranchia as typically show progression. Looking at the groups from this point of view the Leptocardia may be cast aside from our discussion as unprofitable, and we can turn with certainty to considering the morphology of Marsipobranchs for some guide to the evolution of Vertebrates.

It is not my desire to draw your attention to the series of facts, both physiological and morphological, discovered by Dr. Gaskell in his extensive comparison of the higher Invertebrates with the lower Vertebrates. They present an extraordinary series of analogies and probabilities which cannot be lightly passed over, and, even if his views be ultimately rejected by palæontological discoveries, will for ever make Zoologists indebted to him for drawing their attention to a fresh and broader aspect in which to consider their science. Of his comparisons I would particularly draw attention to that between the internal cartilaginous skeleton of *Limulus* and that of *Ammocetes*, the skeleton being a part which, judging from fossil and living Vertebrates, seems to retain for the longest period traces of all its developments, "earmarks," as Osborne terms them. I might refer also to the infundibulum, the commissures of the brain, the thyroid, the auditory apparatus, and the existence of giant fibres and cells in the nervous system. By far the simplest way to explain this extraordinary series of coincidences between the organs of different forms is to suppose that they are due to a common inheritance.

I would turn now rather to the difficulties which beset the view, and by far the chief of these must be deemed to be that relating to the alimentary canal. To get that of *Petromyzon* from that of *Ammocetes* we have an entirely new formation of quite startling character. This is a fact, and accepting it as such we can proceed with our minds more open, I think, to consider how a gut in Vertebrates came into existence. Professor MacBride is quite

Haeckelian in his views of the gastrula—or at least of the germ-layer theory, which he claims to be stronger than ever. If there is a real fundamentally important separation such as he claims between the germ layers, it is quite inconceivable that there could be formed cells of one layer from those of another layer. In regeneration of tissues we have clear evidence that ectoderm can form mesoderm and endoderm, that endoderm can form ectoderm and mesoderm. Mesoderm is not very happy in its formation of the other layers, but Dendy has shown that in *Antedon* the endoderm can come from ectoderm and from mesoderm.

I would altogether dissent from Sir Ray Lankester's line of evolution from the gastrula. I am inclined myself at present to regard the Annelids as coming from some Actinian-like ancestor. In this, as in all Actinia, the secreting digestive epithelium, that of the stomodæum and mesenterial filaments, is derived from (grows down from) the ectoderm after the whole of the gastro-vascular cavity is lined by an epithelium which is capable of ingestion but not of extracellular digestion. My own work is not sufficiently advanced perhaps for me to make this statement, but such were the indications I obtained. The lining epithelium of the cavity would be equivalent to and homologous with the endoderm of *Hydra*, and it would form the mesoderm of three-layered animals, the endoderm being an entirely new formation. I am aware that there are great, even insurmountable, difficulties in respect to this view, but the ectoderm and endoderm of higher forms appear to me to be far more intimately related in their functions than are either of them to the mesoderm.

In the experimental work of Driesch, Wilson, and others, we get into a maze of difficulties in regard to the preformationist hypothesis. Blastomeres, it is clear, are to a large degree interchangeable. Incidentally, a fourth blastomere gives a gastrula in *Amphioxus*. Again, in budding there are difficulties with this theory, the gut of some budded-off Polyzoa being formed from mesoderm, while of Tunicates, supposed relations of the Vertebrates, *Clavellina* buds from the endoderm and *Botryllus* from the ectoderm, giving ectoderm and endoderm respectively; and do not some Sponges turn inside out to give the adult?

I need scarcely go further into the question of the germ-layer theory. The confusion when it is applied to Vertebrates is obvious, and we get everywhere involved in difficulties in Invertebrates. If the gastrula be a general stage on which great stress is to be laid, it necessarily might be supposed that the stages up to it should be the same, while actually in the segmenting eggs we get the most diverse fates for the individual cells.

On the whole it is abundantly clear, it appears to me, that it is the nurture as well as the nature of the individual organs which is to be discussed. The law of recapitulation in embryology has only a limited applicability. Surely the transitory characters are at best only a very partial reminiscence of the structural types

through which the adult may be supposed to have passed during the geological ages. In all these stages the embryo has itself been subject to specialisation. I think that where Dr. Gaskell errs is in laying too much stress on many details of the recapitulation hypothesis. Some of his resemblances I can conceive might be due to convergent or adaptive evolution, acting upon lines almost infinitely long before the common ancestor is reached. Yet there remains such a mass of hard analogy, borne out too by the most careful physiological and morphological investigation, a mass which cannot be put forward—or even a tithe of it put forward—by the exponents of any other view, that one is inclined to doubt the presence of adaptive evolution at all in this case. Although I should feel it to be “non-proven,” I cannot but regard it as by far the most striking view of the origin of Vertebrates that has yet been expounded.

Morphologists must carefully consider whether they may not be holding on to shibboleths, and wilfully blinding their eyes to the great mass of facts, many largely physiological, which has in recent years been accumulated. Is it not just as necessary for the zoologist, who wishes to consider these great questions, to be a physiologist as it is for the latter to be a morphologist? If it is desired to prove Dr. Gaskell’s hypothesis wrong, his points must be taken fact by fact to see where they lead—as indeed barristers do with evidence in our courts. If it is desired to prove some other theory right, it must likewise be taken fact by fact, and no one can, as some try to do at present, consider the nature of any beast without any examination into its nurture.

The Rev. T. R. R. STEBBING, F.R.S., F.L.S., said: Mr. President, may I be allowed for a few moments to intervene on behalf of those among us who may describe themselves as the know-nothing section of the audience, persons not a few who are committed to neither side in the controversy? When we return home and our friends gleefully enquire, “What then has been decided as to the Origin of Vertebrates?” so far we seem to have no reply ready, except that the disputants agreed on one single point, namely, that their opponents were all in the wrong. It occurs to me to illustrate the position by propounding another enigma. What is the origin of arguments? Take an example. Suppose a company in which some pedantic arithmetician asserts that two and three invariably make five. To those who like myself easily fall in with the views of the last speaker, the statement appears incontrovertible. But in some brains any positive declaration at once sets up what may be called an intellectual wriggle. This process soon enables the contradictory person to point out that two and three sometimes make six and sometimes minus one or plus one, as well as two-thirds of one or one and a half. Since one operation in arithmetic is as good as another, if not a great deal better, it follows that two and three do *not* invariably make five; far from it. Thus the wriggling of the brain originates argument.

Incidentally I may refer to two points raised by those who object to connecting the origin of Vertebrates with the Arthropoda. It was represented that the chitinous envelope of the latter was prohibitive of cilia. The delicate auditory cilia of Crustaceans are well known to carcinologists, but I am warned by intelligible signals that the term *cilia* is variously applied in different branches of Natural History. Another objection was founded on the difficulty of believing in the transfer of function from one organ to another, as required by Dr. Gaskell's hypothesis. But on this head the ingenuity of Nature seems to have been signally vindicated by the late Professor Gegenbaur, who showed how one part of an animal organism, in proportion as it went out of service for one function, could be appropriated for another.

Now, on the general question we have admired Dr. Smith Woodward's interesting account of the earliest fossil fishes. But these are accepted Vertebrates. For the origin of Vertebrates we must go back to something that is not a Vertebrate, such as may have existed perhaps far back in the Laurentian period. Imagine some soft, more or less elongated, animal organism wriggling about in the primeval sea. Then, as now, the hard conditions of the World demanded some sort of hardening on the part of living creatures. Some would find advantage in a stronger external coating, others in a strengthened central axis. But in either case the necessity of wriggling would often be paramount, giving rise on the one hand to a segmented exoskeleton, on the other to a jointed backbone. In these wrigglers, Mr. President, you have the origin of the Vertebrates,—a theory which it will be difficult to refute, as the supposed animals have hitherto revealed absolutely no relics.

The President having called upon Dr. Gaskell to reply, that gentleman said:—

It is impossible for me in the short time at my disposal to deal thoroughly with all the speakers in the two days' discussion. I will, however, do what I can.

Prof. MacBride in his latest paper prefers, as he said many years ago, to attribute my explanation to my diabolical ingenuity. As I have stated in my book, there is absolutely no ingenuity on my part; given the one fixed point that the infundibulum represents the old œsophagus and the animal remains upright, all the resemblances between the two groups of animals to which I have drawn attention, naturally follow. The devil is not in my ingenuity but in Nature's facts. I can sympathize with MacBride, for surely there could not be a more diabolical trick than to create from a lowly organised unsegmented animal whole groups of animals becoming more and more segmented, all characterised by the presence of an alimentary canal ventral to the nervous system, and then wipe them off the face of the earth, so that no trace of this sequence of forms is left among living animals. Not content

with this, this diabolic agency has left as the end result a segmented animal—the Vertebrate—in which with the greatest cunning he has not only made the supra-infundibular brain the exact counterpart of the supra-œsophageal and the infra-infundibular of the infra-œsophageal, but has grouped that nervous system round a large epithelial bag, which has nothing to do with a nervous system, but most ingeniously has been put in the exact position of the cephalic stomach and œsophagus of the Arthropod animal. To complete the story and give it an artistic finish, this ingenious devil plants above the brain of the Vertebrate impostor two median eyes exactly in the position of the two median eyes of the Palæostracan. He does not put them there for the purposes of sight, for they are functionless and degenerate in all Vertebrates, but just for sheer mischief, and how he must have chuckled over the happy thought of making them partly degenerate in the lowest Vertebrates, for he well knew that in the *Limulus* and his contemporaries they were already markedly degenerate and that they were no longer the chief eyes but their place had been taken by the large lateral eyes.

Prof. MacBride has asserted again, without giving instances, the statement so often made before, that I assume violent changes of function. Again and again I have denied it, and shown that I do not assume any such thing. Yet again I will go through the list of resemblances and ask where this statement of MacBride's is justified. The function and structure of the supra-infundibular brain is the same as that of the supra-œsophageal ganglia; the two lateral eyes and the two median eyes are the same in the two groups; the median nose has the same structure, the same nerves, and the same olfactory glomeruli in the two groups and even the slight difference, that the nasal tube in *Ammocetes* opens dorsally and the olfactory passage in the Scorpion ventrally, vanishes after von Kupffer's demonstration that this *Ammocetes* nasal tube originates as the tube of the hypophysis, which opens ventrally, and the dorsal position is due simply to the growth of the upper lip. Passing to the infra-œsophageal region, in both animals the anterior part is devoted to the organs of mastication and the posterior part to the organs of respiration; there is no change of function here, and I have given the evidence to show how the actual masticating and respiratory organs of the one group have insensibly shifted into those of the other group. Where are the violent changes of function so far? Then, if we pass into the spinal cord region, are we to look for them in the muscles or in the excretory organs or in the cœlomic cavities? Why, the whole evidence is that they are the same in the two groups; no sign of change violent or otherwise. I wonder what Prof. MacBride means. Surely this scathing indictment is not based on the thyroid gland which, I must repeat yet again, is not a mucin secreting gland but is a gland of great importance to the well being of the Vertebrate, apparently having something to do with

the manipulation of iodine. Is anything known of the function of the corresponding gland in the Scorpion? It may have the same function for aught I know. No! The only part of my theory which causes this assertion is that I have had the audacity to make a new gut and so go contrary to the laws of the germ-layer theory; I am content to leave it at that: time will show, I firmly believe, that the germ-layer theory is absolutely dead.

I come now to the observations of Goodrich; he as well as MacBride seemed, to my astonishment, to hold the view that *Amphioxus* was on the direct line of ascent to the Cyclostomes, that between *Amphioxus* and the Cyclostomes a brain had been developed with organs of sense, the eyes and nose. Surely this is a unique position! All other morphologists look upon *Amphioxus* as a degenerate animal, and degenerate in this precise direction. What conception has Goodrich of the evolutionary process, of the struggle for existence, of the survival of the fittest? Just consider it: here is a wretched animal without brains, without eyes, without a nose, victorious in the struggle for existence over the whole of the Invertebrate world. What is the driving force; how could it have taken place? Only, it seems to me, by some beneficent power taking special charge of him and assisting him in the growth of brain and of eyes and nose.

If there is one thing certain, surely it is Gegenbaur's dictum that the brain part is older than the spinal part, and further, the study of neurology shows clearly that in all animals, whether vertebrate or invertebrate, the brain is built up in connection with the optic and olfactory senses. No, the *Amphioxus* is not the ancestor of the Cyclostomes but, in my opinion, is closely related to the Cyclostomes as seen by its myomeres and the whole of the spinal region. After the Vertebrates had been well established the *Amphioxus*, in my opinion, arose by a process of degeneration from some ancestor of the Cyclostomes. Goodrich asserts that such a view is impossible, as no trace is seen in the development of the missing organs. Surely that argument is not good enough, for in the Tunicates, where a relationship with the Vertebrates is inferred from their development, such development is only found in certain members of the group and not in all.

Smith Woodward gave us an interesting discourse on certain early fishes, but I did not gather whether he thought the evidence I had brought forward pointed to the Osteostraci being Cyclostomes, though I think he favours that view. He called *Birkenia*, *Lasthenia*, and *Thelodus* Ostracoderms, and seemed to imply they were of the nature of Elasmobranchs. I cannot see why he called these scanty remains Ostracoderms, and would like to know whether, in his opinion, they were gnathostomatous, for the evidence is strongly in favour of the true Ostracoderms being cyclostomatous. In any case I see no difficulty in the presence of these forms, for surely it was likely enough that in the Upper Silurian seas some fish-like forms should have already progressed

onwards in the Elasmobranch direction with shagreen scales and possibly jaws from the primitive agnathous condition. The question of the interpretation of the lateral markings on some of the head shields of these mailed fishes is a comparatively small matter. Smith Woodward agrees with me that they show the presence of segmentation in this region, but thinks they were branchial segments; in my opinion, judging from *Ammocoetes*, they extend too far forward for branchiæ, and I think they are more likely to have been due to the presence of muscles supplied by the trigeminal nerve.

Coming to Lankester's speech I have a difficulty in finding anything to answer in it; he spoke of cryptograms and of Bacon and Shakespeare; another suggestion akin to the diabolic ingenuity of MacBride which hardly requires any further answer than I have given. He said there was no resemblance between the lateral eyes of Vertebrates and Arthropods, but that is not the point; it is not the dioptric apparatus upon which I was laying stress, but the retinal arrangements. It was the resemblance between this latter apparatus in the two groups upon which every observer from Berger to Parker has laid stress.

Finally, I come to the remarks of Dendy. He referred to the drawing of the right pineal eye of *Ammocoetes* as drawn in my book as a diagram. That is not so: the left half of the drawing is from the actual specimen, the right half is my interpretation of the meaning of the appearance seen. In my paper in the Q. J. Micr. Science all the drawings are carefully drawn by Wilson from the actual specimens and are not in any way diagrams. He referred to the finding by Studnička in the pineal eye of *Ammocoetes* of certain cells which he called ganglion cells. They are not arranged like an optic ganglion and are much more like the cells described in the median eye of *Limulus* by Lankester and Bourne, and called by them intrusive connective tissue cells. What these cells are I do not venture to assert; in any case they are present both in the median eye of *Limulus* and of *Ammocoetes*. As to *Geotria*, I have explained in my book that the cells grouped round the atrium may be nerve-cells as asserted by Dendy, but they are found along the nerve from the *ganglion habenule* to the eye. In the left eye of *Ammocoetes* the nerve has vanished and cells of the *ganglion habenule* run right into the eye. It is perfectly possible that *Geotria* represents an intermediate stage of degeneration between that of the right and left eyes of *Ammocoetes*, especially seeing that a portion of the original cavity is cut off to form the atrium by the massing of the cells in question. As to the tube of the nervous system, Dendy, as well as all the other speakers on that side, find it very convenient to leave out the infundibular prolongation in their picture of the formation of an epithelial tube, an unfortunate omission as it happens to be the main point of my argument. Dendy's view that the choroid

plexuses form a respiratory organ for the brain is novel: I wonder what Dendy's conception of a respiratory organ is.

In conclusion, I am grateful to the Linnean Society for allowing me to put my views before them, and only hope that all those who dissent from them will study for themselves organ by organ the resemblances between the two groups of animals and make up their minds whether they are accidental or, as I believe, significant of a real relationship.

The PRESIDENT said that at that hour of the evening, and after so brilliant a discussion, no one would expect a speech from a botanical Chairman, though much had been said of great general interest to all biologists. On the first evening Dr. Gaskell had directly appealed to the Chair with reference to his belief that "each higher group of animals has arisen in succession from the highest race developed up to that time." At present he would only say that the evidence on the botanical side appeared not unfavourable to such a view; perhaps he might have an opportunity of returning to this question on the 24th of May.

The President felt that any criticisms of his on the course of the discussion might well be dispensed with, for he had been anticipated by Prof. Stanley Gardiner, whose remarks appeared to him to agree, point for point, with those which would occur to the mind of any present-day botanist in listening to the discussion.

It only remained for him to ask the Fellows to return their hearty thanks to Dr. Gaskell and all who had taken part in the discussion, for the intellectual entertainment they had provided.

February 17th, 1910.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair, succeeded by Mr. H. W. MONCKTON, Treasurer & Vice-President.

The Minutes of the General Meeting of the 3rd February, 1910, were read and confirmed.

Mr. Henry John Jeffery, A.R.C.S., was admitted a Fellow.

Dr. Leonard Cockayne, Mr. Walter Ambrose Heath Harding, M.A. (Cantab.), and Miss Ida Margaret Hayward, were proposed as Fellows.

Mr. W. T. SAXTON, F.L.S., then gave an account of his recent investigations upon the anatomy of the genera *Widdringtonia*, Endl., and *Callitris*, Vent., of which the following is an abstract.

Evidence is brought forward in this communication to show (i) that *Widdringtonia* and *Callitris* do not conform to the "Cupressineæ" type; (ii) that *Widdringtonia* cannot be merged in the genus *Callitris*, but must rank as a distinct genus.

(i) The chief points in which these two genera differ from the Cupressineæ are as follows:—

- (a) The position of the Archegonia. In Cupressineæ these are found at the apex of the prothallus, in *Widdringtonia* and *Callitris* never at the apex.
- (b) The multinucleate prothallus cells.
- (c) The development of the proembryo. Eight free nuclei are *not* formed in these genera and the proembryo fills the archegonium.
- (d) At least three embryos may be formed from a single proembryo.

CALLITRINEÆ is suggested as a tribal name to include these two genera (possibly also *Actinostrobus* and *Tetrclinis*).

(ii) Both morphological and anatomical differences are pointed out between *Callitris* and *Widdringtonia*, which seem more than sufficient to warrant the retention of *Widdringtonia* as a separate genus.

Of the morphological differences the more important of those brought forward for the first time are:—

- (a) In *Widdringtonia* about 64 potential megaspore mother-cells are formed at the base of the nucellus. In *Callitris* about two such cells are found, half way up the nucellus.
- (b) The number and arrangement of the Archegonia differ materially in the two genera.
- (c) The microsporophyll normally bears 4 sporangia in *Widdringtonia*, 3 in *Callitris*.

Of the anatomical differences the most important is the occurrence of thickenings of the cell-wall in connection with the bordered pits in both the wood and the transfusion tracheids of *Callitris*; these are not found in *Widdringtonia*.

A discussion followed in which Prof. Farmer, Dr. Stapf, and the President engaged.

Mr. GEORGE MASEEE, F.L.S., followed with a lantern demonstration of his researches entitled:—

EVOLUTION OF PARASITISM IN FUNGI.

To understand clearly the evolution of parasitism it is important to grasp a fundamental point in the evolution of fungi generally. The most primitive forms were aquatic, and reproduced by zoospores which necessitated the presence of water to secure their dispersion. As the fungi gradually took possession of dry land, a second asexual or conidia form of reproduction, suitable for dispersion by wind, &c., was gradually evolved. This supplementary conidial condition is always the form that has assumed a parasitic

condition, the older sexual phase remaining as a saprophyte and developing when the host is exhausted. Parasitism is mainly the outcome of opportunity : and the fact that fungi present all stages of parasitism, and that a saprophytic fungus can be educated to become a parasite, proves that parasitism is an acquired habit. Incipient or imperfectly evolved parasites promptly kill the host, and consequently curtail the period of their own existence, as *Pythium De Baryanum*. A higher stage of parasitism is reached by many of the rusts and smuts, *Ustilago avenæ*, &c., where the host is attacked as a seedling, and is stimulated to an unusual condition of growth throughout its normal period of growth. More advanced parasites show a tendency to arrest the production of spores and conidia, and to perpetuate themselves by perennial mycelium located in some perennial vegetative portion of the host (root, tubers, &c.) or in the seed. In the most highly evolved parasites reproductive bodies are entirely arrested, and the parasite is perpetuated by hibernating mycelium only.

In the discussion which followed the speakers were Mr. H. W. Monckton, V.-P., Miss A. J. Smith, Dr. Helen Fraser, and Prof. Dendy, Mr. Massee replying.

The following papers (communicated by Prof. J. STANLEY GARDINER, M.A., F.R.S., F.L.S.) were read :—

1. "The Orneodidæ and Pterophoridæ of the Seychelles Expedition." By T. B. FLETCHER, R.N., F.E.S.
2. "Die von Herrn Hugh Scott auf den Seychellen gesammelten Embiidinen, Coniopterygiden, und Hemerobiiden." By Dr. GÜNTHER ENDERLEIN.
3. "Die Termiten der Seychellen-Region." By Dr. NILS F. HOLMGREN.
4. "On the Land and Amphibious Decapoda of Aldabra." By L. A. BORRADAILE, M.A.

March 3rd, 1910.

Mr. H. W. MONCKTON, Treasurer and Vice-President,
in the Chair.

The Minutes of the General Meeting of the 17th February, 1910, were read and confirmed.

Mr. Hugh Scott was admitted a Fellow.

Miss Winifred Elsie Brenchley B.Sc. (Lond.), Mr. James Meikle Brown, B.Sc. (Lond. & Sheff.), and Mr. Hayward Radcliffe Darlington, M.A., LL.M. (Cantab.), were proposed as Fellows.

Mr. W. BICKERTON, F.Z.S., M.B.O.U., gave a lantern lecture

on "Our British Nesting Terns," illustrated by about 110 photographs taken by him direct from nature, of all the British species.

At the conclusion of the lecture, the Chairman, after remarking upon the interest of the subject, and the excellence of the slides, moved a vote of thanks to the Lecturer, which was carried by acclamation.

March 17th, 1910.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 3rd March, 1910, were read and confirmed.

Dr. Harry Drinkwater, Mr. Frederick Hamilton Davey, and Lady Isabel Browne were admitted Fellows.

Miss Nellie Bancroft, Mr. Sidney Guest, and Mr. John Charles Wilson were proposed as Fellows.

Dr. Leonard Cockayne, Mr. Walter Ambrose Heath Harding, M.A., and Miss Ida Margaret Hayward were elected Fellows.

Dr. HARRY DRINKWATER, F.L.S., showed specimens of drawings in distemper on coloured paper, of wild-flowers growing at Wrexham; his object was to draw every plant in the local flora natural size, and he had completed 300, leaving about 500 still to be drawn.

Dr. OTTO STAFF, F.R.S., Sec.L.S., on behalf of the Director, Royal Botanic Gardens, Kew, exhibited specimens of *Eysenhardtia amorphoides*, H. B. & K., and demonstrated the exquisite fluorescence of the infusion of the wood of the plant (as described by him in the Kew 'Bulletin,' 1907, no. 7, pp. 293-305) by the aid of the electric arc-light of the optical lantern.

The Rev. T. R. R. Stebbing, F.L.S., Prof. Dendy, and Mr. Shennstone contributed additional observations.

Mr. J. H. HOLLAND, F.L.S., also on behalf of the Director of Kew, showed samples of Soy Bean, *Glycine Soja*, Sieb. & Zucc. (*G. hispida*, Maxim.), with herbarium specimens of the plant producing this seed.

He stated that the seeds of "Soy," of which there are many varieties, may be black, brown, green or greenish-yellow, yellow, or mottled; sometimes seeds are described as white, but there appears to be no Soy bean true white in colour.

The plant is variously known as "Soy," "Soja," "Soya," "White Gram," "American Coffee Berry," and "China Bean."

In China and Japan, where the plant has been cultivated for many years—perhaps centuries—the beans are an important food,

and they are also said to be used as a substitute for coffee. Bean Cake and the sauce known commercially as "Soy" is also made from them. It is stated that in the manufacture of the Soy of Commerce, in addition to the beans, the requirements are simply a large amount of salt and flour, and an unlimited supply of fresh water. Wenchow is an important centre of the manufacture, and here the bean used for the purpose is said to be chiefly the white form from Chinkiang.

The cultivation has been extended to India, Africa, and other warm countries, and in America the plant has been grown for a number of years (25 at least) as a forage crop. Like many other leguminous plants, it has a special value as a green manure.

The principal use of the beans in this country is for the extraction of the oil, of which they contain about 18 per cent. suitable for soap-making, and in general as a substitute for cotton-seed oil. The residue, after the extraction of oil, is suitable for feeding cattle, and for this purpose appears likely to become a serious competitor of cotton-seed cakes, sunflower-seed cakes, linseed cakes, &c. The beans can be bought in London at about £5 to £6 per ton; the oil realises about £21 to £22 per ton, and the cake about £6 to £7 per ton.

Beans and bean-cake exported from China have gone chiefly to Japan, and certain parts of Asia, but recently, beginning about November 1908, an important trade has been developed in them, more especially with the beans, between Manchuria and Europe, Dairen (Dalny) being the chief place of export.

The cause of this sudden development may, perhaps, be attributed to the facts that a great increase in the cultivation took place in Manchuria during the Russo-Japanese war, to meet the demands for food of the Russian Army; then, when the troops were withdrawn, the production being found profitable, and the home demand reduced, other markets were sought. The trade extended to Japan, and afterwards, assisted perhaps by a period of depression in that country, it extended to Europe, where the industry has created interest in many quarters.

The amount of the 1908 crop sent to Europe through Vladivostok up to July 1909, was 180,000 tons, the greater part destined for the English market (Hull and Liverpool), and the remainder going to German (Hamburg) and Scandinavian ports.

Up to 1907 the export of Soy beans from Manchuria did not exceed 120,000 tons annually. During 1908 the export rose to 330,000 tons (one half shipped from Dairen; 100,000 tons from Newchang, and 65,000 tons by rail *via* Suifenhō to Vladivostok), the increase it is said being due entirely to the demand from Europe. The total of the 1909 crop exported has been estimated at about 700,000 to 800,000 tons. It is anticipated that at present prices Europe may eventually take at least 1,000,000 tons annually.

Mr. Craib (Visitor), Mr. Bunzō Hayata (from Tokyo), and Dr. Stapf gave further details, and Mr. Holland replied. He

also brought for exhibition a series of 17 photographs showing the methods now used to bring Teak, *Tectona grandis*, Linn. f., from the Burma forests to the shipping ports.

Mr. E. P. Stebbing, Mr. J. S. Gamble, Mr. John Hopkinson, the Rev. T. R. R. Stebbing, and Dr. A. P. Young, joined in the discussion, and Mr. Holland briefly replied.

The following papers were read :—

1. "On the Life-history of *Chermes himalayensis* on the Spruce (*Picea Morinda*) and Silver Fir (*Abies Webbiana*) of the N.W. Himalaya." By E. P. STEBBING, F.L.S.
2. "A Contribution towards our Knowledge of the Neotropical Thysanoptera." By R. S. BAGNALL, F.L.S.

April 7th, 1910.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair, succeeded by Mr. H. W. MONCKTON, Treasurer & Vice-President.

The Minutes of the General Meeting of the 17th March, 1910, were read and confirmed.

Miss Winifred Elsie Brenchley, B.Sc. (Lond.), Mr. James Meikle Brown, B.Sc. (Lond. & Sheff.), and Mr. Hayward Radcliffe Darlington, M.A., LL.M. (Cantab.), were elected Fellows.

The President announced that the Linnean Medal would be presented at the forthcoming Anniversary Meeting to Prof. GEORG OSSIAN SARS, of Christiania, and the first presentation of the newly founded Trail Award for research on protoplasm, would be made on the same occasion to Prof. EDWARD ALFRED MINCHIN, Professor of Protozoology in the University of London.

The following were recommended by the Council to serve as Auditors for the Treasurer's Accounts, and by show of hands duly elected :—

For the Council: Prof. J. P. HILL and Mr. JOHN HOPKINSON.

For the Fellows: Mr. HERBERT DRUCE and Mr. JAMES GROVES.

The General Secretary exhibited a fruit recently bought by Mr. William P. D. Stebbing at a fruiterers in Jermyn Street, of unassigned origin, with the native name of "Cupu-assu." This name appears in the 'Flora brasiliensis' as applied to *Theobroma grandiflora*, Schum., a congener of the plant yielding chocolate, *T. Cacao*, Linn. Prof. J. W. H. Trail remarked that "Cupua" was the native Brazilian name for plants of that genus, and that "assu" meant large. Mr. T. A. Sprague exhibited two specimens from the Museum of the Royal Botanic Gardens, Kew, which

were strikingly diverse in form, but he yet believed them to be the same species.

The following papers were read :—

1. "Elm Seedlings showing Mendelian Results." By AUGUSTINE HENRY, M.A., F.L.S.
2. "Foraminifera and Ostracoda from Funafuti." By FREDERICK CHAPMAN, A.L.S.

April 21st, 1910.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 7th April, 1910, were read and confirmed.

Miss Winifred Elsie Brenchley, B.Sc. (Lond.), was admitted a Fellow.

Mr. Henry Smith Holden, B.Sc., Mr. Charles William Mally, M.Sc. (Iowa), Mr. Sydney Gross Paine, and Mr. Percy Alfred Talbot, B.A. (Oxon.), F.R.A.S., were proposed as Fellows.

Miss Nellie Bancroft, Mr. Sidney Guest, and Mr. John Charles Wilson. were severally balloted for and elected Fellows.

The President having explained that Mr. JOHN HOPKINSON, who had been elected an Auditor at the last Meeting, could not take part in the Audit, Mr. LEONARD ALFRED BOODLE was proposed in his stead, and, by show of hands, unanimously elected.

Mr. JOHN HOPKINSON, F.L.S., exhibited eight coloured plates, in quarto, of British Nudibranchs, which will be shortly issued by the Ray Society, and explained that they were from drawings by Messrs. Alder and Hancock.

Prof. Dendy and the Rev. T. R. R. Stebbing commented on these illustrations.

The Rev. T. R. R. STEBBING drew attention to a "Witch-knot" or "Witch-broom" on a Spruce Fir, *Picea excelsa*, Link, from Walton-on-the-Hill, Surrey, where it had been detected by his nephew, Mr. William P. D. Stebbing.

A discussion followed in which Mr. A. D. Cotton, Mr. H. W. Monckton, Treasurer and Vice-President, Prof. F. W. Oliver, Mr. John Hopkinson, and the President took part.

The following papers were read :—

1. "The Anatomy of *Welwitschia mirabilis*, in the Seedling and Adult states." By Miss M. G. SYKES. (Communicated by Prof. H. H. W. PEARSON, M.A., Sc.D., F.L.S.)

2. "Die von Herrn Hugh Scott im Juli 1908-März 1909 auf den Seychellen gesammelten Anthomyidæ, mit den Gattungen *Rhinia* und *Idiella*." By Prof. P. STEIN. (Communicated by Prof. J. STANLEY GARDINER, M.A., F.R.S., F.L.S.)
3. "The Dermaptera of the Seychelles." By Dr. M. BURR, F.L.S., F.E.S.
4. "The Pteropoda and Heteropoda collected by the Percy Sladen Trust Expedition in the Indian Ocean." By Dr. J. J. TESCH. (Communicated by Prof. J. STANLEY GARDINER, M.A., F.R.S., F.L.S.)
5. "Die Pilzmücken Fauna der Seychellen." By Dr. G. ENDERLEIN. (Communicated by the same.)

May 5th, 1910.

Prof. E. B. POULTON, D.Sc., F.R.S., Vice-President, in the Chair.

The Minutes of the General Meeting of the 21st April, 1910, were read and confirmed.

Mr. John Charles Wilson, Mr. Thomas Parkin, Mr. Walter Ambrose Heath Harding, Mr. Robert Lawrence Heinig, and Mr. Iltyd Buller Pole Evans were admitted Fellows.

Mr. Cecil Hanbury was proposed as a Fellow.

Mr. E. M. HOLMES exhibited specimens of a rare British lichen, *Parmelia rugosa*, var. *concentrica*, Cromb., from the chalk hills between Eastbourne and Seaford, which had previously only been recorded from Melbury Hill near Shaftesbury in Dorset, where it was noticed in 1856 by Sir W. C. Trevelyan. This lichen grows in a concentric manner forming rounded nodules 1-2 inches in diameter, and is apparently formed at first on pebbles, but becoming detached and blown about by strong winds, ultimately forms more or less spherical growths.

He also exhibited specimens of the preserved fruits of a large variety of the Jujube, *Zizyphus Jujuba*, which is cultivated in China as a dessert sweetmeat, and is known by the name of "Mei-tsao," or honey-date. The fruits are preserved by boiling in honey, and are then pressed flat and dried and by mechanical means are given a striated appearance, having longitudinal lines from base to apex. The fruit has not as yet been imported into this country. It was received from Mr. McDougall of Swatow.

Mr. Holmes also directed attention to a volume of water-colour and pencil drawings, from which the plates of the very scarce work Postel and Ruprecht's 'Illustrationes Algarum' had evidently been prepared, the majority representing the plates being reversed, but also included some algæ which had not been utilised. The work consisted of only 200 copies, and the plates had been

destroyed by fire. Very few of these copies were held by private individuals, and the work, which was issued in 1840 at the price of £40, was hardly ever purchasable. The drawings shown were formerly in the possession of Mr. E. Meinshausen, of the Imperial Botanical Garden at St. Petersburg, and are now the property of the University of Birmingham.

Dr. OTTO STAPF, F.R.S., Sec.L.S., exhibited specimens of *Utricularia rigida*, Benj., from West Africa, and *U. neottiioides*, St. Hil., from Brazil, the only known representatives of Kamienski's section *Avesicaria*, which is characterised by the absence of bladders. This condition seems to be correlated with the habitat of the plants, that is, rocks and stones submerged in running water. The plants are attached to the rocks or pebbles by modified clawlike rhizoids, very like the 'haptera' of Podostemonaceæ. The fertile stems are erect, bearing the flowers and fruits above the water. The assimilation-apparatus is submerged and consists of much-divided, in their ultimate divisions, capillary branches which resemble the 'leaves' of our native Utricularias. In *U. rigida* they seem always to spring from the base of the fertile stems and often attain a considerable length. Here and there they give rise to young fertile shoots which attach themselves by throwing out 'haptera' from their bases. In *U. neottiioides*, however, they also spring from the axils of the lower 3-5 scale-leaves of the flowering stems, and remain rather short. Nowhere is any trace of bladders to be found. The flowers are those of typical Utricularias. The capsules are small and open, in *U. rigida* at least, by lateral slits, the valves remaining united at the top for some time. The seeds of both species are rather peculiar in the genus in as far as they exude mucilage when wetted. The coat of mucilage thus formed helps them in becoming fixed in positions suitable for the growing plant. *U. rigida* is known from the Sierra Leone coast to the head-waters of the Niger; *U. neottiioides* from the mountains of Brazil (Bahia, Goyaz, Minaes Geraes). Thus they form another link connecting the floras of West Africa and Brazil. In habit these Utricularias resemble two other aquatic plants of tropical Africa also found in running water, namely *Quartinia*, a Lythracea, and *Angolara*, a Podostemonacea, of which specimens were shown.

An animated discussion followed in which the following took part:—Mr. E. M. Holmes, the Rev. T. R. R. Stebbing, Prof. Dendy, Prof. Poulton, and Mr. Henry Groves, Dr. Stapf replying.

Mr. F. N. WILLIAMS brought up for exhibition fresh specimens of a straw-coloured variety of *Lathraea Squamaria*, Linn., from Harefield, Middlesex, growing upon elm-roots; the normal form grew also with it, but was earlier in its development than the variety now shown, and besides had the property of quickly turning black after being gathered, whilst the new variety retained its hue for more than 24 hours without much change; it was distinct from the pure white variety *nivea*, known on the Continent.

The General Secretary exhibited the Linnean MS. 'Spolia botanica' dated 1729, to show that the name *Linnaea* had been scratched out, and *Rudbeckia* substituted, in compliment to Prof. Oluf Rudbeck the Younger, in whose house he was then living as tutor. This shows that Linnæus had early selected the plant which now bears his name, for he mentions two localities in Stenbrohult parish where it occurs, and that the choice of this plant to bear his name was not made when gathering specimens at Tugganforsen in Lyksele Lappmark.

After this conclusion had been arrived at, and the erasure and substituted name shown to several Fellows on the 10th March, 1910, the discovery was made that Dr. E. Åhrling had recorded the same, which had been overlooked as being in a note in his 'Carl von Linnés Ungdomsskrifter,' i. pp. 92-93, of which the following is a translation:—"As regards the name or word *Rudbeckia* just employed, there is this peculiarity, that in the original manuscript the word was evidently written there after erasure, and of the first writing there remains a perfectly plain L such as Linnæus usually wrote, altered to R. Perhaps this suggestion may be ventured, that Linnæus first wrote *Linnaea*, when he meant to keep these records to himself, but afterwards, when he dedicated them to Prof. L. Roberg (into whose hands however the manuscript perhaps never came), he considered himself bound to protect himself against people's ridicule."

Mr. H. W. Monckton and the Rev. T. R. R. Stebbing raised questions, which were replied to by the exhibitor.

The following papers were read:—

1. Eight months' Entomological collecting in the Seychelles." By H. SCOTT, F.L.S.
2. "Some points in the Anatomy of the Larva of *Tipula maxima*; a contribution to our knowledge of the respiration and circulation in Insects." By J. M. BROWN, F.L.S.

May 24th, 1910.

Anniversary Meeting.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 5th May, 1910, were read and confirmed.

Before opening the business of the Meeting, the President spoke of the incalculable loss which the Society, in common with the whole Empire, had suffered by the death of His late Majesty King Edward, Patron of the Society. The grief universally felt had found expression in every quarter; there was one remark however, which he, as President of the Society, would like to add.

His late Majesty's great work, in maintaining the peace of the world, claimed in a special manner the gratitude of scientific men, for Peace was the greatest scientific interest. Science, like genius, was of no country, and the maintenance of harmonious and friendly relations between all those nations among whom science was cultivated, was an essential condition for the advancement of knowledge.

The President then read from the Chair the following Loyal Addresses, which had been prepared by the Officers, and approved by the Council; these were unanimously adopted, all present rising from their seats :—

To the King's Most Excellent Majesty.

THE HUMBLE ADDRESS OF THE PRESIDENT, COUNCIL,
AND FELLOWS OF THE LINNEAN SOCIETY OF LONDON.

Most Gracious Sovereign,

WE, Your Majesty's most dutiful and loyal subjects, the President, Council, and Fellows of the Linnean Society of London in Anniversary Meeting assembled, humbly beg leave to offer our deepest and most heartfelt sympathy with Your Majesty in the great sorrow which has befallen You in the death of Your beloved Father, our late Sovereign Lord, King EDWARD VII. Your Majesty's loss is our loss also, and is felt not only throughout the Empire over which His late Majesty ruled, but by the world at large.

While thus expressing our sorrow, we ask leave, Sire, at the same time to tender to Your Majesty our unfeigned and heartfelt congratulations upon Your Majesty's accession to the Throne of Your Ancestors.

The sympathetic interest, which Your Majesty has constantly manifested in all that concerns the progress of Science, encourages us to hope that Your Majesty will be graciously pleased to continue to our Corporate Body, that beneficent Patronage which it has uninterruptedly enjoyed at the Hands of Your Majesty's Royal Predecessors since the granting of our Charter in 1802.

That Your Majesty's Reign over a loyal, grateful, and loving people may be long and glorious, is our earnest wish and ardent prayer.

Given under the Common Seal of the Society, this twenty-fourth day of May, in the year one thousand nine hundred and ten.

	DUKINFIELD H. SCOTT, <i>President.</i>	
L. S.	ARTHUR DENDY,	}
	B. DAYDON JACKSON,	} <i>Secretaries</i> *.

* (Dr. STAFF being abroad could not sign the addresses.)

To Her Most Excellent Majesty Queen Alexandra.

THE HUMBLE ADDRESS OF THE PRESIDENT, COUNCIL,
AND FELLOWS OF THE LINNEAN SOCIETY OF LONDON.

Madam,

WE, the President, Council, and Fellows of the Linnean Society of London, in Anniversary Meeting assembled, remembering with heartfelt pride the high distinction which Your Majesty has conferred upon our Society in graciously consenting to become one of our Honorary Members, beg leave humbly to express our profound sorrow at the great and irreparable loss which has befallen Your Majesty, the Royal House, and the Nation, in the death of our Beloved and Venerated Sovereign Lord, King EDWARD the Seventh, our Patron, Whose Memory will ever be faithfully cherished by a grateful people.

Given under the Common Seal of the Society, this twenty-fourth day of May, in the year one thousand nine hundred and ten.

L. S.

DUKINFIELD H. SCOTT, *President*.
ARTHUR DENDY,
B. DAYDON JACKSON, } *Secretaries*.

Mr. Frank Armitage Potts was admitted a Fellow.

Dr. Wilfred Eade Agar, M.A. (Cantab.), was proposed as a Fellow.

The Treasurer then brought forward the Annual Cash Statement to the 30th April last, duly audited, and explained the various items. The statement was thereupon received and adopted (see pp. 62, 63).

The General Secretary laid his Annual Report before the Meeting :—

Since the last Anniversary Meeting 18 Fellows had died, or their deaths been ascertained :—

William Hadden Beeby.
Thomas William Bridge.
Woodyer Merricks Buckton.
Edward Clapton.
Emmeline Crocker.
William Henry Dallinger.
William Hillhouse.
Walter Bessemer Longsdon.
Peter MacOwan.

Robert Morton Middleton.
The Marquess of Ripon.
Edward Saunders.
George Sharpe Saunders.
James Ebenezer Saunders.
Richard Bowdler Sharpe.
Arthur Ernest Bousfield Steains.
Sir Charles Strickland, Bt.
Edward Perceval Wright.

Investments on April 30th, 1910.

	£	s.	d.	£	s.	d.
Metropolitan 3½ per cent. ..	1079	11	3 @ 101½	.....	1095	15 1
Great Indian Peninsula Railway, Annuity Class B ..	42	1	5 @ 20½	.....	846	13 6
Forth Bridge Railway 4 per cent. Stock ..	450	0	0 @ 109	.....	490	10 0
Metropolitan 3 per cent.	1000	0	0 @ 92	.....	920	0 0
India 3 per cent.	975	0	0 @ 82½	.....	804	7 6
Eastern Bengal Railway 4 per cent. Debenture Stock ..	1000	0	0 @ 107	.....	1070	0 0
Great Western Railway 4 per cent. , , ..	1000	0	0 @ 113	.....	1130	0 0
Midland Railway 2½ per cent. Pref. Stock ..	200	0	0 @ 66½	.....	133	0 0
Metropolitan Water Board 3 per cent. Stock "B" (Westwood Fund) ..	232	5	0 @ 88	.....	204	7 7
New South Wales 3½ per cent. Stock (Trail Award Fund) ..	100	0	0 @ 98	.....	98	0 0
					<hr/>	
					£6792	13 8

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, 1910, and found them correct.

LEONARD A. BOODLE,
ARTHUR DENDY,
HERBERT DRUCE,
JAMES P. HILL,

W. B. KEEN, *Chartered Accountant.*

HORACE W. MONCKTON, *Treasurer.*

The deaths of four Foreign Members have also been recorded :—

Alexander Agassiz.
Anton Dohrn.

Emil Christian Hansen.
Kakichi Mitsukuri.

The following 13 Fellows have withdrawn :—

Arthur James Dicks.
John Basil Feilding.
Samuel Jennings.
Samuel Lithgow.
George Edward Lodge.
Philip Walker Mackinnon.
Frederick Gymer Parsons.

Albert Henry Pawson.
Henry Power.
Selmar Schönland.
George Swainson.
Henry Sullivan Thomas.
Lt.-Col. John William Yerbury.

Mr. Alfred Woodward has been removed from the List by order of the Council.

31 Fellows (of whom 29 have qualified) and 1 Associate have been elected.

The Librarian's report was then read, showing that during the past year there have been received as Donations from Private Individuals 75 volumes and 189 pamphlets.

From the various Universities, Academies, and Scientific Societies, there have been received in exchange and otherwise 336 volumes and 86 detached parts, besides 68 volumes and 15 parts obtained by exchange and as donations from the Editors and Proprietors of independent periodicals.

The Council at the recommendation of the Library Committee have sanctioned the purchase of 184 volumes and 91 parts of important works.

The total additions to the Library are therefore 663 volumes and 381 separate parts.

The number of books bound during the year is as follows :—
In full morocco 8 volumes, in half morocco 217 volumes, in half calf 3 volumes, in full cloth 338 volumes, in vellum 40 volumes, in buckram 15 volumes, in boards or half cloth 9 volumes. Relabelled (half morocco and cloth backs), 42 volumes. Total 672 volumes.

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 for the ensuing year.

The Ballot having been closed, the President appointed the Rev. T. R. R. Stebbing, F.R.S., Prof. M. C. Potter, and Mr. W. Fawcett, Scrutineers, who, having cast up the votes and reported to the President, he declared the Council to be elected as follows :—

E. A. NEWELL ARBER, M.A. ; HENRY BURY, M.A. ; Sir FRANK CRISP ; Prof. ARTHUR DENDY, D.Sc., F.R.S. ; Prof. J. B. FARMER, F.R.S. ; Dr. G. HERBERT FOWLER ; Prof. J. STANLEY GARDINER, F.R.S. ; ARTHUR W. HILL, M.A. ; Prof. J. P. HILL, M.A., D.Sc. ; JOHN HOPKINSON, F.G.S. ; Dr. B. DAYDON JACKSON ; HORACE W. MONCKTON, F.G.S. ; Prof. FRANCIS W. OLIVER, F.R.S. ; Prof. E. B. POULTON, F.R.S. ; Dr. A. B. RENDLE, F.R.S. ; Dr. WALTER GEORGE RIDWOOD ; Miss EDITH R. SAUNDERS ; Dr. DUKINFIELD H. SCOTT, F.R.S. ; Dr. OTTO STAFF, F.R.S. ; Miss ETHEL N. THOMAS, B.Sc.

The Ballot for the Officers having also been closed, the President appointed the same Scrutineers, who, having cast up the votes, reported to the President, who declared the result as follows :—

President : Dr. DUKINFIELD H. SCOTT, M.A., F.R.S.

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

Secretaries : Dr. B. DAYDON JACKSON,
Prof. A. DENDY, D.Sc., F.R.S.,
Dr. OTTO STAFF, F.R.S.

The President then referred in a few words to the losses the Society had sustained by death during the past year. He also announced to the Fellows the generous gift to the Society of £200 by Sir Frank Crisp, for the encouragement of Microscopical Research. The regulations adopted enjoin the award to be made by the Council at intervals of five years, for the best paper in our publications during the previous five years, contributed by our own Fellows, the first award to be made in May 1912, and its title to be the “Crisp Award for Microscopical Research.”

The Constitution of the Crisp Award for Microscopical Research is as follows :—

1. The Award to be made at intervals of not less than five years.
2. The Award to be given by the Council for the best paper dealing with Microscopical Research.
3. The Award to be confined to Fellows and to work published by the Linnean Society since the previous award, and in the first case during the five years previous.
4. The first Award to be given in May 1912.
5. The Award to be paid out of the accrued interest on the £200, and to be accompanied by a bronze medal similar to the Trail Medal, but bearing the words “Crisp Award for Microscopical Research.”
6. The fund to be invested in Metropolitan Water Board B Stock.
7. With regard to the procedure in the event of the Award being withheld, the provisions of the Trail Award to be followed.

The President then delivered his Annual Address as follows :—
LINN. SOC. PROCEEDINGS.—SESSION 1909–1910. f

PRESIDENTIAL ADDRESS, 1910.

I PROPOSE to take as the subject of my Address this year "Some Modern Ideas on the Course of Evolution of Plants"—an extensive field, no doubt, which it will only be possible to sketch in the merest outline on an occasion like this. The bearing of recent investigations in Fossil Botany on the problem will come in for a good deal of attention, but obviously it is impossible to limit oneself to this point of view.

I do not intend, however, to enter with any freedom upon the regions of pure theory, in which we must include the great question of the origin of the Alternation of Generations, characteristic of the higher plants.

Dr. Lang, it is true, in the remarkable paper which we discussed in February 1909, held out hopes of putting this question on an experimental basis; it will be extremely interesting to see what comes of this suggestion when practically tested, but I think that much will always remain hypothetical. As Dr. Lang himself recognized, we can hardly hope to reconstruct the conditions under which the sexual and asexual phases first became differentiated, a process which must have taken place ages before the date of our earliest fossil records.

I may venture, however, to state my conviction that the position of this question, so clearly put before us on the occasion referred to, is now far more hopeful and stimulating to research than it was a few years back. Dr. Lang said:—"If this ontogenetic view is correct, we should be justified in seeking for correspondence in the vegetative organs, and possibly also in the reproductive organs, between two individuals of the same life-cycle. These correspondences—though between haploid and diploid individuals—I should term homologies, since they may amount to practical identity when the conditions of development are exactly the same" *.

It is not very long since the idea of any homology between the sexual and asexual generations would have been scouted by our more orthodox morphologists; even the heterodox would have hesitated to back their opinions so far as to seek for detailed correspondence. The old antithetic theory not only set up an impassable barrier between the two generations, it also shut off the vascular plants absolutely from everything below them. The sporophyte, *i. e.* the plant itself, was assumed to be a new intercalation in the life-history, and could therefore never be compared with the plant in Thallophytes, which was supposed to belong to the other generation. Now all this is changed—the Alga *Dictyota* has given the clue, for it shows us how the two alternating generations, the sexual and asexual, may be exactly

* Discussion on "Alternation of Generations," 'New Phytologist,' vol. viii, 1909, p. 106.

alike, and homologous one with the other in all their parts, in cases where they are exposed to like conditions.

Thus the idea has once more gained ground that the vascular plant—the sporophyte—like the gametophyte or prothallus, may itself be a modified thallus: in this way the whole field of comparison between the higher plants and the Thallophyta is once more opened up. This conception adds enormously to the interest of the older types of vascular plants, for there is now always the possibility that among them we may succeed in tracing their organs—leaf, stem, and root—a step or two nearer to their origin. There was never the remotest chance of this so long as the plant was supposed to be derived from a sporogonium, for it was obvious that the farther back we went in geological history, the less like a sporogonium did plants prove to be.

As we shall presently see, the new views of alternation, involving the thalloid origin of the vascular plant, have already proved fertile in evolutionary ideas; the palæontologist, however, will do well to maintain a cautious position with regard to the application of these conceptions to fossil plants. Though we may now have a tenable theory of the origin of vascular plants, and it is theoretically possible that we may be able to trace some of the stages in their evolution from thalloid ancestors, it is yet extremely doubtful whether the fossil record goes far enough back to help us appreciably in such an attempt. It cannot be too strongly emphasized that the earliest known land-plants were already highly advanced and varied types, very far removed from any thalloid ancestry. It is possible that here and there a primitive character may have lingered, but the presumption is always against it.

I shall therefore only touch on theories of the derivation of vascular plants in so far as they affect our views of the inter-relations of their main groups, for it is on questions of the latter kind that new light has been thrown by the investigations, largely palæobotanical, of the last few years.

I may here refer to a remark of Dr. Gaskell's, in his opening speech in the discussion on the Origin of Vertebrates, to which we listened with such deep interest a month or two back. Dr. Gaskell used these words:—"It seems to me highly probable that this same law of upward progress, viz., that each successive group has arisen from some member of the highest group existing at the time, holds good also for the Vegetable Kingdom, especially in view of the statement recently made that Phanerogams arose from Cycads. I hope that the President may see his way to offer a few remarks on this aspect of the question" *.

There was no time then to deal with Dr. Gaskell's point, and I promised to refer to it at the Anniversary Meeting. The question

* Discussion on the Origin of Vertebrates, Proc. Linn. Soc., Session 122, 1909-10, p. 12.

raised is an interesting one, and it is worth while to consider how far Dr. Gaskell's suggestion is supported by palæobotanical and other data.

For one thing, to return to a subject already touched on, the present trend of opinion on the origin of the alternating generations is favourable to the hypothesis put before us by Dr. Gaskell. On the old antithetic view the plant (sporophyte) of the Vasculares was held to be derived from a sporogonium of the simplest type, the Liverwort *Riccia*, in which the asexual generation is merely a group of spores enclosed in an epidermis, affording the nearest analogy. Not only the higher Bryophyta, but all the more advanced Thallophyta were put on one side, their highly organized soma belonging, as it appeared, to the wrong generation; the leading races of plants, so far as their principal phase, the sporophyte, is concerned, were supposed to have started *de novo* from the elaboration of a zygote—a fertilized ovum. The sexual generation of the ancestral form was also assumed to have been at a low grade of organization, as shown in the prothallus. Now, as we have seen, the somewhat academic belief that "the plant is nothing but a sporogonium" is being abandoned, and the reasonable doctrine that the cormophyte is a more highly differentiated thallophyte is beginning to prevail. On this view the probability is that the Pteridophyta had their origin from the higher Thallophyta.

This, however, is of necessity all an hypothesis, far more probable than the former one, but still too much "in der Luft" to afford any very sure support to further hypotheses. Let us go on to the actual evidence.

What do we know about the origin of "successive groups" of plants? We are only concerned with the land-flora, for the evolution of marine plants is entirely a question for the future. We can go back no further than the Devonian. At that period we have good evidence that the following main groups of vascular plants were already in existence:—

Lycopods (Club-mosses).
Equisetales (Horse-tails).
Sphenophyllales.
Ferns.
Pteridosperms (Seed-ferns).
Cordaitales.

Of these six great groups the Pteridosperms and the Cordaitales must be accounted the highest, for they were seed-bearing plants. The successive groups of later origin were, essentially, three in number, namely,

Cycadophyta,
Conifers,
Angiosperms.

The first two groups appeared, so far as we know, about the

same time, towards the end of the Palæozoic period—the Angiosperms much later, high up in the Mesozoic.

The origin of the Cycadophyta (an enormously numerous, varied and advanced class in Mesozoic times) is generally admitted—they came from the Pteridosperms, or Cycadofilices, to use the older name, to which Potonié and some others still adhere. Even Prof. Chodat *, who is inclined to break up the Pteridosperms, would admit that some of the plants grouped under that name were on the line of descent of the Cycadophytes. Hence that great and dominant class of Mesozoic plants appears to have been derived from a highly organized preceding group, and in fact from one of the two highest classes of Palæozoic plants—a conclusion wholly favourable to Dr. Gaskell's view.

The question as to the Conifers is far less simple. There are three theories in the field :—

1. All Conifers may have come from Lycopods.
2. All may have come from Cordaitales.
3. Part may have come from Lycopods and part from Cordaitales.

I am not going to enter into the controversy now, but we will see how the different views affect the question before us.

If the Conifers as a whole were derived from the Palæozoic Lycopods, they came from a very highly developed earlier group, though not from the highest. The Lycopod advocates now base their case to a great extent on *Lepidocarpon*—a Lycopod which had attained to the seed-bearing habit, or something very like it. Further, the Lycopods, if not morphologically among the highest Palæozoic plants, were probably the dominant class of that age, at least in the coal-forests. So that on this view the Conifers had, at any rate, a very distinguished ancestry.

If, on the other hand, they sprang from the same stock with the Cordaitales, then they may perhaps claim as their ancestors the very highest of Palæozoic plants. It is not likely, however, that the typical Cordaitæ were themselves the direct progenitors of Conifers: they are too specialized—the fructifications of Cordaitæ, for example, were decidedly more advanced than those of Araucarian Conifers. The plants from which, on this hypothesis, the Conifers were derived were perhaps less highly modified than the true Cordaitæ, such as Grand'Eury and Renault investigated, though still very advanced types.

If, again, the Conifers had a mixed ancestry (not that I regard such a view as really tenable), they could claim kindred partly with the morphologically highest, partly with the most dominant race of the earlier period.

Thus, on any view, Dr. Gaskell's hypothesis finds support.

The Ginkgoales, a group of some importance in Mesozoic ages,

* "Ptéropsides des Temps Paléozoïques," Archives des Sci. Phys. et Nat. t. xxvi. 1908, Geneva.

might be separately considered. They are almost certainly connected with the Cordaitales, and indeed more closely than the true Coniferae. The Maidenhair trees are not, however, of much consequence for our immediate purpose, for they cannot really be called a higher group than the Cordaitales, but are merely slight modifications of an old and persistent type.

We now come to the Angiosperms. Until quite recently no serious hypothesis as to their origin has been in the field, for comparisons with *Isoëtes* as regards some anatomical points, or with *Selaginella* as regards the endosperm, were obviously the merest analogies at the best. There was a vague idea in the air that their origin may have been obscure, from small, unimportant plants, easily overlooked or not preserved: so that they might have existed for a long time as inconspicuous members of the flora, side by side with the dominant Cycadophyta and Conifers. I think this was the current idea until Wieland, and his apostles Arber and Parkin, showed how we might well have had the ancestors of Angiosperms (or something like them) in our hands all the time without knowing it—that is, they showed that the Mesozoic Cycadophytes themselves, more than any other group, betray affinity with the great race which succeeded them. This important conception was suggested by the discovery that the fructifications of Bennettitæ, the characteristic Mesozoic Cycadophytes, were organized essentially like the bisexual flowers of an Angiosperm, though, of course, with important differences in detail. The latest work has further strengthened the comparison, and there are strong grounds for the hypothesis that the Angiosperms arose from a stock nearly allied to such Mesozoic Cycadophyta as the Bennettitæ. The view is by no means universally accepted: some botanists, as, for example, Miss Stopes and Prof. Fujii in their recent work on the Cretaceous Flora of Japan, still incline to the opinion that the Angiosperms may have sprung from unknown herbaceous plants with a simple floral structure. We cannot enter on the discussion here, but the Cycadophyte theory of the origin of Angiosperms is at any rate tenable, and, if confirmed, will afford a strong support to Dr. Gaskell's theory.

On the whole, though so much is still uncertain, one may safely say that the present tendency of botanical opinion, determined chiefly by palæobotanical discovery, is favourable to the belief that new advances in organization start from the highest, or rather from very high, preceding types. Probably the latter, more guarded way of putting the case is the better; the *highest*, in the sense of the most differentiated types, may have been usually too far committed to special lines of adaptation to have afforded suitable material for new developments.

As a type of modern opinion on the evolution of the higher plants, influenced by the conception of the thalloid origin of the Cormophyte, we may suitably take the views of Prof. Lignier.

They were originally stated in his paper on the Sphenophyllales and Equisetales, published in 1903*, and have been more fully developed in his recent essay on the Morphological Evolution of the Vegetable Kingdom (1908)†. Prof. Lignier is a strong advocate of the homologous theory of alternating generations. He derives all the higher plants (Bryophyta and Vasculares) from a hypothetical group, his Prohepaties, in which the life-cycle embraced two phases—sporophyte and gametophyte,—which, he suggests, probably also existed in their marine ancestors, as is the case in the recent *Dictyota*. He supposes that in the Prohepaties the sexual and asexual individuals had a flat dichotomous thallus, and that they were aquatic or semi-aquatic in habit. Typical antheridia and archegonia may have already appeared at this early stage; the author refers to their long persistence through so many of the higher groups—an example, as Prof. Buller has pointed out, of morphological stability dependent on adaptation. From the Prohepatic ancestors evolution proceeded in two main directions. In the Bryophyta the gametophytic phase assumed the greater importance, vegetatively, while the sporophyte became reduced in relation to its parasitic life. In the line of the Vasculares the reverse process went on: the gametophyte underwent progressive and ultimately extreme reduction, while the sporophytic phase showed an immense advance in vegetative organization, some of the branches of the thallus (cauloids) becoming specialized as organs of absorption, *i. e.* roots, which are acutely described as simply the most ancient of rhizomes. He cites the Lycopods as still showing traces of the common origin of aerial cauloids and roots.

Concurrently with this important differentiation of absorptive organs proceeded the no less momentous differentiation of an internal conducting system, by which these plants became vascular, and thus fully adapted to a terrestrial life.

As the sporophyte thus attained a more and more exuberant growth, a new differentiation of its aerial parts set in. The original dichotomous branching of the thallus became, as Prof. Lignier puts it, “sympodised,” certain branches becoming predominant, and thus forming an *axis*, while others were subordinated and constituted the beginnings of *leaves*. Here, however, a great distinction manifested itself, on which the main divisions of Prof. Lignier’s system are based. In the Lycopodiaceæ the sympodisation of the thallus never went very far, and true leaves (limited thallus-branches) were never developed. The small leaves characteristic of the Lycopods—“phylloids,” as our author calls them—are not thallus-branches at all, but have always been of the nature of appendages and are derived from lamellar hairs already present at the Prohepatic stage. They are

* “Les Equisétales et Sphénophyllales,” Bull. Soc. Linn. de Normandie, sér. 5, t. vii. p. 93. Caen, 1903.

† Comptes Rendus de l’Assoc. Franç. pour l’Avancement des Sci. 1908, p. 530.

comparable to the amphigastria of the Marchantias, and, indeed, to the leaves of the Bryophyta generally.

On the other hand, in the early members of the Fern series the sympodising process went on to a great extent, converting whole groups of thallus-branches (cauloids) into appendages, borne on the main supporting branches, and thus leading to the final differentiation of the thallus into stem and leaf. Small groups of terminal cauloids, forming part of the appendages, became flattened out into pinnules; a process which we can see exactly repeated in the modern Flora in plants which convert their branches into cladodes. Thus, according to our author, the Ferns and all the higher groups have true *leaves* differentiated out of thallus-branches, while the Lycopods alone retain the simple primitive appendages, which they possess in common with the Bryophytes. Hence all plants above the Thallophytes are divided into PHYLLOIDEÆ (Bryophytes and Lycopodineæ) and PHYLLINEÆ (Ferns and all remaining classes of vascular plants). In the former, the assimilating organs are still the lamellar phylloids of the supposed Prohepatic ancestors; in the latter they are true leaves, *i. e.* differentiated parts of the branch-system of the original thallus.

The Bryophytes are *gametophytic* Phylloideæ, the Lycopodineæ *sporophytic* Phylloideæ, the phylloid appendages being borne in the former on the sexual, in the latter on the asexual individual. Thus Mosses and Club-mosses find themselves at last united in one main group!

Prof. Lignier's idea is interesting. We see how a certain degree of affinity (though a remote one) may conceivably still be traced between members of the Bryophyte and Pteridophyte groups, which have been regarded as separated by the widest gap in the Vegetable Kingdom. But the point which more nearly concerns us is the separation of the Lycopods from the rest of the vascular plants. The possibility that the leaves of the Lycopods may be essentially different from those of the Ferns, is one which must have occurred to the minds of many botanists. I remember how, nearly thirty years ago, a walk through the Fern-houses at Kew suggested to me and to a botanical friend the idea that the fronds of Ferns might be really branches, and the leaves of Lycopods scales, comparable to the ramenta of Ferns. At that time, however, the relation of the Ferns to the higher classes of vascular plants was not recognized, so we never extended our idea to the leaves of Phanerogams.

Fossil Botany tends to emphasize the isolation of the Lycopods, for it shows us no transition between the microphyllly of this phylum and the megaphyllly of other groups. On the contrary, it provides evidence, as Prof. Lignier has shown, that the *apparent* microphyllly of certain classes (Equisetales and Conifers for example) is derived from a primitively megaphyllous condition. There is no indication that this applies to the Lycopods; neither is there any appreciable evidence that their simple leaves ever became modified

into anything more complex *. On the whole, Prof. Lignier's idea that the Lycopods stand apart from the rest of the Vasculares appears quite tenable, though by no means proved. It is confirmed by the simple relation between sporangium and sporophyll which prevails throughout the group, and by the fact that the Lycopods are the only vascular plants in which there is a want of sharp differentiation between root and shoot. The former character may not be a primitive one (Prof. Lignier himself regards the terminal position of the sporangium on a branch as the original arrangement; other botanists suggest the presence of a reduced sporangiophore); but the existence of so many transitional forms between root or rootlet and stem or leaf is a strong indication of a relatively primitive and isolated position.

I may here recall that Mr. Tansley has touched on the position of the Lycopods in a very illuminating way in the first and the last of his lectures on the Evolution of the Filicinean Vascular System †. He recognizes the peculiar character of their leaves, contrasting so sharply with the megaphylly of other Pteridophytes, but the explanation he suggests is different from Prof. Lignier's. He says that the Lycopods "may be independently derived from the primitive Propteridophytes by *foliar specialisation of short undivided branchlets of the thallus, instead of whole branch systems as in the Filicinean type*" (p. 9). This, as he points out, would bring the Lycopods into line with the other Pteridophytes without assuming any extensive reduction, or abandoning, in this case, the thallus-branch theory of the leaf, which he regards as by far the most rational and convincing which has yet been suggested.

I should like to dwell on the wonderfully instructive comparison which Mr. Tansley draws between the morphological construction of *Selaginella* and that of a Fern with its fronds, but must content myself with a couple of short quotations. "In *Selaginella* we have a very old if not a primitively microphyllous stock which modifies whole branch-systems for assimilating purposes. The leaf itself is so small as to exercise no influence on the general conformation of the vascular system, and corresponds physiologically with the ultimate pinnule or segment of the lamina in a fern-frond. But the branch-system as a whole retains its plasticity and becomes moulded on lines parallel with those of the fern-frond as a whole" (p. 135). "In the frond-like dorsiventral type of branch-system seen in some species of *Selaginella* we have in fact a kind of working model of the hypothetical thallus of the 'pro-Lycopod,' the leaves representing the ultimate assimilating branchlets, and the whole showing a convergence with a fern-frond hypothetically derived by integration of a whole thalloid branch-system" (p. 136).

To return to Prof. Lignier. The Phylloideæ are after all a limited group now, though so prominent in the Palæozoic Floras.

* The doubling of the vascular bundle in *Sigillariopsis* is the only case in point, but does not seem to have led to anything further.

† 'New Phytologist,' Reprint, No. 2. Cambridge, 1908.

The great mass of vascular plants, which he derives from the Primofilices (Mr. Arber's name for the early Ferns), belong to the Phyllineæ, with true leaves, differentiated from thalloid branches or system of branches, as already explained. He divides the Phyllineæ into four groups :—

1. The Macrophyllineæ.—Leaves large and dominant in comparison with the stem. Primofilices and Ferns generally; Pteridosperms or Cycadofilices; Cycadophyta.
2. The Microphyllineæ.—Leaves reduced in comparison with the dominant stem. Cordaitæ; Ginkgoales; Coniferæ.
3. The Mesophyllineæ.—Leaves intermediate, as regards these relations, between groups 1 and 2. = Angiosperms. The latest developed of all the groups and the most highly adapted to special conditions, sometimes simulating Macrophyllineæ (*e. g.* Palms), sometimes Microphyllineæ (*e. g.* Heaths).
4. The Articulatæ.—Allied to the Macrophyllineæ, from which they became detached at the epoch of their ancestors, the Primofilices. Characterized by verticillate symmetry, progressive reduction of leaves, radiate arrangement of leaflets, and tendency to multiply the planes of cauline symmetry. This includes the Equisetales, mainly, and the Sphenophylls, wholly, a Palæozoic group.

It is at this point that Prof. Lignier's views have perhaps exercised the greatest influence on botanical opinion. A very few years ago it became customary to associate the Articulatæ with the Lycopods, for which fossil evidence seemed to speak, the characters in common being mainly anatomical. Prof. Jeffrey was the strongest advocate of this view, and, as is well known, divided all vascular plants into Lycopsidea and Pteropsida; the former including Lycopods, Equisetales and Sphenophylls, the latter all other Vasculares.

This classification was based partly on the microphyllly of the Lycopsidea, the megaphyllly of the Pteropsida, and partly on certain anatomical characters closely connected with the relative dimensions of leaf and stem. Other characters also came in, and the position appeared a strong one; at any rate I was among those who adopted it for a time. I now think, however, that the Equisetales and Sphenophyllales have been shown by Prof. Lignier not to be really microphyllous at all, but to be derived by reduction from plants with compound leaves of considerable size. The leaves of the Sphenophylls are generally of some complexity and often deeply divided—it is only their *segments* which have a simple character. *Archirocalamites*—the oldest known member of the Equisetales—had compound, forked leaves, while in *Pseudobornia*, a Devonian representative of the Articulatæ, the leaves were doubly compound, and were originally taken for fern-fronds. It seems clear from all this, and from the detailed arguments of Prof. Lignier, which I cannot now recapitulate, that the Articulatæ,

when microphyllous, are only so by reduction, and consequently that the anatomical characters correlated with microphyly are not essential to the group. On the other hand, as we have seen, the Lycopods stand apart as a genuine microphyllous class, unconnected by any known transitions with the large-leaved phyla. At the same time one cannot admit any very close relationship between the Articulatæ and the Ferns; their ancestors, though in all probability megaphyllous, may have been much less like Ferns than any of the known Primofilices. For these reasons, which I cannot now develop at greater length, it seems to me clear that the attempt to divide Vasculares into two main series only must be given up, at least for the present.

I have proposed a threefold division, into Pteropsida (Ferns and all Spermatophyta), Sphenopsida (Equisetales, Sphenophyllales, and Psilotales), and Lycopsidea (Lycopods alone). The isolation of the Lycopods while the Psilotales are put in Sphenopsida has been criticised, and justly so—the position of the little family Psilotales is a great difficulty, and I do not think we are yet in a position to solve it, in the absence of all geological evidence of their history. The group has certain definite characters in common with the Sphenophylls, namely the nature of the sporangial apparatus and the anatomy: for these reasons some modern authors have united them in one class. On the other hand, the Psilotales have other, less definite characters in common with the Lycopods—the dichotomous branching, the alternate leaves, and to some extent the habit (in the case of *Tmesipteris*). The older writers always put them in this class, but at that time the Sphenophylls were practically unknown. We are not at present able to reconcile the two apparent directions of affinity. It is best to emphasize the Sphenophyll relation as the more definite, and otherwise to reserve judgment.

It should be mentioned here that Prof. Lignier gives the Psilotales quite a different position, regarding them as the most primitive of the Lycopod series, and consequently of all living vascular plants. He believes that in the earliest Pteridophyta the sporangia were terminal on certain cauloids (derived from thallus-branches), and that the Psilotales only differ from this type in having the sporangia grouped on special short branches. In arriving at this opinion the author allows himself to be too much influenced by the very problematic Devonian fossil *Psilophyton*, of which we really know nothing definite. I cannot accept a view which ignores the points of agreement between the Psilotales and the Sphenophyllales, and the probability that the former have suffered some reduction in organization in consequence of their epiphytic habit.

Prof. Lignier is of opinion that all his Phyllineæ (*i. e.* all Vasculares except Lycopods and Psilotales) are descended from the Primofilices.

As regards the Articulatæ, I have already suggested that if we accept this view we must take Primofilices in an extremely wide

sense. The comparison between the sporangiophores of *Sphenophyllum* and the fertile pinnules of the Devonian "Fern" *Archæopteris** does not seem to me very helpful, for *Archæopteris* can scarcely be regarded as one of the Primofilices, but appears to have been a very advanced type, possibly, as Mr. Kidston has suggested, a Pteridosperm rather than a true Fern.

With reference to the seed-bearing plants, however, I find myself in agreement with Prof. Lignier as to their ultimate origin from an early Filicinean stock. This is an opinion which has been very generally adopted, during the last few years, either for the whole or at least for a large part of the Seed-plants; formerly the Lycopods were in favour as the probable ancestral group, though the origin of the Cycads from Marattiaceous Ferns was taught by Sachs about the year 1880. It may be worth while to point out, in a few words, the grounds on which the modern view is held.

For nearly 30 years the existence of a considerable group of Palæozoic Fern-like plants allied to the Cycads has been recognized by some palæobotanists, though at first only on negative grounds, the plants in question showing no evidence of Filicinean fructification. Then came the discoveries of Williamson, Solms-Laubach and others, proving that many of these Fern-like plants had an anatomical structure intermediate between that of Ferns and Cycads. These observations strongly confirmed the opinion that the latter plants were derived from, or had a common origin with, the former; this stage in the development of our knowledge may be called the "Cycadofilices" phase. The discovery of the multiciliate spermatozoids of living Cycads, in 1896, further strengthened their affinities with Ferns.

Then in 1903 began the series of discoveries, led by Oliver and Kidston, proving that certain of the Cycadofilices bore seeds of a Cycadean type, and establishing a strong probability that this applied to the whole group, a group outnumbering the true Ferns of the period. The name Pteridospermeæ marks this important step in advance. That the Cycads sprang from a Fern-like ancestry was now established beyond reasonable doubt. The Cycads, however, were not merely the little isolated family that now bears the name—in Mesozoic times they were a vast and varied class of plants, for which Nathorst's wider name Cycadophyta is appropriate; for long ages they were a dominant race throughout the whole world. Thus the proof of the Fern-ancestry of this great class was already a serious matter. But the theory could not stop here. It had always been recognized, since the first recognition of the Cordaitæ as a separate class, that these plants had a strong Cycadean affinity. It now further appeared that the seeds of the Pteridosperms were organized just on the same lines as those of the Cordaitæ, while anatomically an almost unbroken series of transitions between the two groups has been traced. Hence it became evident that the Cordaitæ—the most specialized of the

* Lignier, "Sur l'Origine des Sphénophyllées," Bull. Soc. Bot. de France, sér. 4, t. viii. p. 278 (1908).

Palæozoic Spermatophyta—had a common origin with the Pteridosperms, and consequently that they also were ultimately derived from the Fern phylum. This meant that practically all the Palæozoic seed-plants (if we except the quasi-seminiferous Lycopods) were of Filicinean origin.

Up to this point I do not think there has been any very serious difference of opinion among modern botanists who have considered the question. I have already mentioned that the affinity of the Maidenhair trees with the Cordaitales is generally recognized. I am unwilling, at the close of this address, to embark on the controversy as to the origin of the Coniferæ, a question with which I have lately dealt in print. Strange to say, the morphology of the cone in this familiar order of plants is still very imperfectly understood; I am convinced that a thorough comparative re-investigation of the whole family will be needed before the question of their affinities can be cleared up. A vast amount of good work has been and is being done, but a broad synthesis is urgently needed.

There are so many points in common between the Conifers and the Cordaitales, both in the anatomy and in the morphology of the fructifications, especially the male, that I cannot doubt that these classes are allied, an opinion in which I believe nearly all botanists agree, though my friend Prof. Seward is a serious exception. If we accept this relationship, we cannot escape the conclusion that the Conifers were ultimately, though remotely, derived from the same ancient Fern-stock with the Pteridosperms and the Cycadophyta.

I have already touched on the great question of the origin of the Angiosperms. It is clear that if the views now so widely held of their relation to the Mesozoic Cycadophytes should be confirmed, they also must fall into line with the rest of the Spermatophyta. At any rate, without prejudging a problem which will long continue to engage the chief interest of botanical evolutionists, one may safely say that the only tenable or intelligible theory of the origin of Angiosperms at present before the scientific world, involves their derivation from the Cycad-Pteridosperm-Primofilices series, and demands for them a place among the Pteropsida.

My object in the very slight and rough sketch of a vast field, which I have ventured to lay before you, has been to bring home to the minds of the Fellows, especially such as are not themselves morphological botanists, the profound interest and importance of the fundamental problems of Descent which are now under investigation and even appear ripe for solution. It is the great merit of modern Palæobotany that it has put new life into the study of our phylogenetic questions. It has done so by forcing us into contact with realities, with the ancient plants themselves, which were the actual predecessors (though by no means always the ancestors) of our living Flora. I believe it to be true, in

spite of all those difficulties which spur us on to further research, that in Botany, as in Zoology, the doctrine of evolution rests at present most securely on a paleontological foundation.

Mr. HENRY GROVES 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 being seconded by Prof. M. C. POTTER, was adopted by acclamation, and acknowledged by the President.

The President, then addressing Herr EMIL HVITFELDT, Secretary of the Norwegian Legation, said:—

Professor GEORG OSSIAN SARS is the distinguished son of a distinguished father, the late Professor Michael Sars having been one of the pioneers of deep-sea dredging; it was he who laid the foundations of our knowledge of the deep-sea Fauna.

Professor Georg Sars, following and extending the same lines of investigation, has long been recognized by his fellow-workers in all parts of the globe as a distinguished leader and guide. For nearly half a century his successive writings have been shedding light on the class of Crustacea in its different branches. Almost at the outset of his career he succeeded in rescuing a difficult group from the obscurity and confusion in which it had been previously involved. Experts have over and over again paid his systems of classification the supreme compliment of adopting them. His instructive essays on the larval Decapoda, founded on an ingenious but toilsome plan of investigation, would have sufficed alone to make a considerable reputation.

After showing his command of languages by treatises in Latin, French, and German, besides his native Norwegian, he has obliged us by adopting the English tongue for several important volumes. Above all, his ready pencil, in an almost miraculous number of scientific illustrations, has used an idiom which every nation can read with facility.

The carcinologists of Great Britain, I am informed, have special reason to rejoice that in Prof. Sars's crowning work on 'The Crustacea of Norway,' already containing 756 plates, by a fortunate coincidence, the fauna of their own country finds illuminating treatment.

All who have been privileged to be in communication with him, praise the courteous readiness with which he renders the assistance they desire, nor can anyone explore his writings without admiring the entire absence of unkindly criticism, and the generous acknowledgment of merit in the work of other students.

It is eleven years since we had the honour of enrolling Prof. Sars among our Foreign Members. It is now my agreeable duty, in recognition of the world-wide reputation which he has acquired, to present him, through your kind mediation, with the Linnean Medal, as a token of our highest esteem.

Herr HVITFELDT, in accepting the medal, stated that the Norwegian Minister himself would have been pleased to be present, but having only recently arrived in London, he had not yet been received in audience by His Majesty the King, and was consequently debarred from attending.

Turning to Prof. E. A. MINCHIN, the President said:—

Prof. EDWARD ALFRED MINCHIN,

It is a great pleasure to me to present to you, on behalf of the Society, the first Trail Award, generously founded by my friend Prof. Trail, "with the object of encouraging study that throws light on the substance known to us as Protoplasm, or on what may, in the progress of knowledge, be regarded in a corresponding way as the physical basis of life."

Your work, in various directions, has done and is doing much to throw new light on the morphology and developmental activities of the living substance of animal cells. You have made contributions of fundamental importance to our knowledge of the minute structure and development of the Calcareous Sponges. You have discovered the remarkable mode of development of those singular structures the calcareous sponge-spicules, and in addition to your valuable original memoirs on the group, you have written the very able account of these organisms in Sir Ray Lankester's great Text-book of Zoology.

You have also published much work of the utmost importance on the parasitic Protozoa, especially the Trypanosomes, a field of investigation of momentous practical significance as well as of the highest scientific interest. In furtherance of these studies you made an expedition to Uganda, to study the problem of Sleeping Sickness under the auspices of the Royal Society.

You have written a masterly treatise on the Sporozoa, for the Text-book already referred to, and in addition to all your own investigations, have rendered a further service to biological science by your translation of Bütschli's classical work on Protoplasm.

No one could more fittingly be the first recipient of the Trail Award, which I now present to you, for the recognition and encouragement of the study of the living substance of organisms.

Professor MINCHIN replied as follows:—

MR. PRESIDENT, LADIES and GENTLEMEN,

I desire to express my deep sense of gratitude both to the Founder of the Trail Award for his generous benefaction, and to the Council of the Linnean Society for the honour they have done me in conferring the Award upon me. It adds very greatly to the pleasure and pride which I feel in receiving it, that the selection has been made by a body so distinguished and honourable as the Council of the Linnean Society.

The Trail Award is intended to encourage and promote the

study of protoplasm, this line of investigation being understood in its widest sense as the study of the living substance and its vital powers and manifestations. Strictly speaking, such investigations are co-extensive with the whole range of the biological sciences, but for convenience the study of protoplasm may be regarded as the special theme of that branch of scientific investigation which is occupied with cells and with organisms of simple structure, and which deals with their constitution, development, and elementary vital activities. In such objects we are confronted with the stupendous mystery of life under its thinnest veil, and we observe in bodies almost infinitely minute the exercise of the most extraordinary powers, such as would lead us to infer the existence of a very great complexity of organization. Thus a flagellum performs movements which necessitate the assumption of a complex structure, but after studying it with the best optical instruments and the most refined technique, we can only represent it by a bare pencil-line. The chromatin-substance of the nucleus exhibits marvellous activities and powers, but again our pencils can only draw meaningless dots. Nothing, again, is more wonderful than the fact that peculiarities in the complex mental and physical constitution of a human being should be transmitted from one generation to another through the nucleus of the spermatozoa, the tiniest cell in the body; but with all the technique at our disposal we can only represent that nucleus as a minute dense refringent body, apparently homogeneous. A consideration of such facts forces upon us the conviction that the living substance possesses a complexity of organization far transcending anything that our microscopes can reveal, and only to be inferred from the activities manifested by it.

Cells or unicellular organisms relatively higher in the scale possess various cell-organs for the exercise of different functions: but as we descend the scale in our survey of nature we see these organs stripped off, as it were, until we come to cells in which the living substance consists only of two parts, termed respectively the cytoplasm and the nucleus. This type of structure is far, however, from being the simplest possible condition of a living organism. The cell-nucleus itself is essentially a collection of grains of a peculiar substance known as chromatin, which is combined with various accessory structures, such as a framework, membrane, &c., and organized into a complex structural unit. In the simplest organisms there is no definite nucleus, in the strict sense of the word, but only scattered grains of the chromatin-substance. Hence the living substance, protoplasm, in its simplest form consists of two chief constituent parts:—

(1) Cytoplasm, a semi-fluid matrix, itself organized and exhibiting a minute structure which, according to the alveolar theory of Bütschli, is due to the arrangement of at least two distinct substances not miscible one with the other, forming the alveolar framework (reticulum) and the enchylema (cell-sap) respectively.

(2) Chromatin, occurring as minute granules imbedded in the cytoplasm, and either scattered in it, or aggregated wholly or in part to form a definite nucleus.

The question at once arises, which of these two constituents of protoplasm represents the true living matter? Is the cytoplasm, or the chromatin, to be regarded as the primary living substance?

No answer that may be attempted to this question can be regarded as in any way final in the present state of our knowledge, and the subject can hardly be discussed adequately in a brief space: but the following are a few of the most important facts upon which to found a judgment:—

I. No living organism is known with certainty which does not contain substance of the nature of chromatin; and some of the minutest organisms, *e. g.* some Bacteria and Spirochætes, seem to consist of chromatin alone. These facts indicate that chromatin is, and cytoplasm is not, a constant constituent of living bodies.

II. By experiment it is found that cells, if deprived of the nucleus and reduced to cytoplasm alone, cannot continue living for long, and cannot initiate vital changes or processes.

III. The present state of our knowledge tends to establish as a general truth that the chromatin-elements are the governing and directing bodies of cells, and as such are the bearers of hereditary tendencies.

From these data the conclusion seems to me irresistible, that chromatin is the primary living substance, not cytoplasm.

If then chromatin is a substance of such immense importance in living things, it becomes necessary to attempt to define or characterize it further—a very difficult task. In the first place, it is found that the chromatin-elements of the nucleus consist of, or contain, substances of greater complexity from the chemical point of view, than the other portions of the protoplasm. In the second place, this complexity is combined with a high degree of variability, as might indeed have been expected on general grounds. For since the vital activities and properties manifestly differ in every species of organism, and even, it might be said, in every individual cell, then, if the chromatin-substance be the regulating and determining cause of the vital activities and manifestations, it follows that the chromatin must differ to a corresponding degree in each case; and therefore no given sample of chromatin can be expected to be identically similar to any other sample. It is a matter of common knowledge that such differences do occur between the chromatin-elements of different organisms, and even in the same organism at different periods of the life-cycle; to take only the micro-chemical test most commonly employed for the identification of chromatin, namely its affinity for certain colouring-matters, it can be said at once that there is no stain which can be relied upon either to tinge the chromatin-elements of any organisms at all times, or to stain only chromatin.

In short, chromatin cannot be defined solely by chemico-physical tests: it is essentially a biological conception. By chromatin we understand certain grains of substance imbedded in the cytoplasm or aggregated in the nucleus, and playing a definite role in the life-cycle of the organism. In the first place, in reproduction of the simplest type by fission, the chromatin of the daughter-individuals is derived by growth and fission of the chromatin-elements of the parent individual. Secondly, in syngamy (sexual conjugation), the constant and essential feature of the process in all its innumerable variations is the union of chromatin from two distinct individuals. Thus chromatin exhibits in itself the primary vital properties of growth, reproduction and individuality—the individuality which is characteristic of living organisms, and which depends primarily on the variability of the living substance. A given granule in a cell cannot be determined with certainty to be chromatin by inspection or by chemico-physical tests, but only by its relation to the life-cycle of the organism. This is what is meant by saying that the conception of chromatin is a purely biological one.

Our notion of the living substance influences necessarily our ideas as to the primitive form of living organism. It has generally been held that the first living things were relatively large masses of protoplasm consisting of pure cytoplasm, without nuclear elements, which appeared later in evolution. Such hypothetical forms of life were termed *Monera* by Haeckel, and with a technique less advanced than that of modern times, this distinguished naturalist described organisms which he believed to be true *Monera*. But it seems practically certain that no organisms exist, however primitive, which do not contain in some form or another the chromatin-substance which is the essential constituent of a nucleus. On the view that chromatin represents the primary living substance, I believe that the first living things were excessively minute specks of matter, perhaps even ultra-microscopic. I consider that, of the forms of life existing at the present day, the earliest type is most nearly represented by the minutest Bacteria and allied organisms in which the body is practically nothing more than a grain of chromatin. The first stages of evolution consisted in a gradual increase in the size of the body, which came to be composed of several or numerous grains of chromatin imbedded in a matrix, the cytoplasm. With further growth in size, the chromatin, at first scattered through the cytoplasm (chromidial condition of the nuclear substance), became aggregated wholly or in part at one spot, and there became organized and combined into a compact body, the nucleus. With the separation of the nucleus and cytoplasm a most important stage of evolution was reached, namely the stage of the cell in the strict sense of the word, the starting-point of the evolution of the entire animal and vegetable kingdoms. It would, in my opinion, be of advantage, as conducing to clear thinking, if the term "cell" could be restricted in its application to that type of

organization in which there is a sharp differentiation of nucleus and cytoplasm, and if organisms such as Bacteria, in which there is scattered chromatin but no definite nucleus, were not termed cells. If, however, the term "cell" is too compromised to be restricted in this manner, then two terms should be coined to denote these two primitive grades or types of organization, the one without a nucleus, as in Bacteria and allied forms, the other possessing a nucleus, as in Protozoa and the cells of animals and plants.

I have ventured here to express definite views upon some very controversial and speculative subjects. It is not to be expected that everybody should be of one mind in such matters; but whatever may be the views taken, I think everyone will agree as to the fundamental importance of the study of the living substance in its simplest forms, and I desire, therefore, to express my strong appreciation of the sagacity and foresight, no less than the generosity, of the Founder of the Trail Award, and my thanks to him for the stimulus and encouragement which he has given to such investigations.

The General Secretary then laid Obituary Notices of deceased Fellows on the table, and the proceedings closed.

OBITUARY NOTICES.

ALEXANDER AGASSIZ.—The death of Alexander Agassiz leaves a real gap in the world of scientific oceanography which no man of our own generation can adequately fill. He died on March the 27th, 1910, on the steamer 'Adriatic,' *en route* from England to America, at the age of seventy-five. Alexander Agassiz was the son of Louis Agassiz, Professor of Zoology at Harvard. He accompanied his father to America in 1849, at the age of fourteen years, and graduated in Engineering and Zoology. His first serious work was on the Pacific Coast Survey of America, but in 1849 and in 1851 he had already served an apprenticeship under his father on the Atlantic sea-board and off Florida. He spent some years in assisting his father in developing the Museum of Zoology at Harvard; and he became well known for his ability not only in Zoology but in the management of affairs. In 1866 he undertook the development and management of the Calumet and Hecla Copper Mine on Lake Superior. This was at that time almost a worthless property: it has since become the greatest single copper mine in the world, and has paid in dividends, since that date, upwards of £25,000,000. His association with this mine led to the foundation of a fortune which enabled him to follow his natural bent towards Marine Biology. He retired from active work in connexion with the mine after about five years, but he retained his interest in it as President or Director until his death.

Professor Agassiz will be best remembered by his numerous

expeditions in the tropical regions of the world. His three cruises of the 'Blake' in the West Indies and through the Caribbean Sea produced two admirable volumes. They give an excellent idea of the topography of the Caribbean, with many notes and observations on the reefs of that region. In addition they give an account of the deep-sea fauna as well as chapters on deposits, the pelagic fauna, and the Gulf Stream. Even at the present day there is no better or more interesting book on the subject. Professor Agassiz paid further visits to the West Indies, particularly to the Bahamas, and the elevated coral-reefs of Cuba: he also explored the elevated reefs of Florida, and visited Hawaii and the west coast of North America, going down to the Galapagos Islands. In the latter cruise he was mainly interested in the surface population of the ocean, which he had previously investigated in the Gulf Stream. In 1896 Professor Agassiz visited, in the steamer 'Croydon,' which he had himself chartered, the Great Barrier Reef of Australia. He gave the world an admirable account of the structure of the reef. He confirmed Jukes's general analysis of its main features, but came to the conclusion that it could not have been formed by subsidence as was then generally supposed. In 1897 he visited the Fiji Islands, exploring most of the "live" and fossil reefs of that archipelago; in particular he examined the barrier reefs of the Lau Archipelago, putting down a boring on Wailangalala. He also examined many of the elevated coral limestone islands, thus getting many sections of reefs up to 1000 feet in vertical thickness. He calculated that the islands of the whole group had been elevated, had then remained nearly stationary, and that their present conditions might be explained by prolonged denudation and erosion. The "actual living reefs" were considered to be flats left by the erosion of a central island, while the lagoons had largely been formed by the scouring action of the sea. In 1899 Professor Agassiz was in the North Pacific, but in 1901 he visited the Maldive Archipelago in the SS. 'Amra,' visiting every atoll of that group. He gave us an important series of soundings between the different atolls of that archipelago, enabling us to get the first clear idea of its topography. In particular he inspected the northern atolls, which had not previously been examined. Professor Agassiz's next work was a long cruise which practically included every group of coral islands in the Pacific Ocean. This was followed by a dredging cruise down the eastern Pacific to Easter Island, during which all kinds of oceanographical research were carried out. The greatest interest is to be attached to these explorations, since the eastern Pacific is the largest area of the world absolutely uninterrupted by islands. An extensive, peculiarly barren area was discovered to the east of the Marquesas and Paumotu, and between these archipelagoes and the South American coast.

The Reports on these Expeditions were mostly published in the *Bulletin* and *Memoirs* of the Museum of Comparative Zoology

at Harvard. They are noted for their lucid statements of facts and for their excellent illustrations, which are made, to a large degree, to take the place of further description. They present a veritable mine of information to be drawn on by investigators interested in oceanic and other islands. The later expeditions were undertaken mainly to elucidate the problem of the formation of coral reefs. Professor Agassiz had at the time of his death practically completed his work on this important problem. He had hoped to present his book during the present summer: it had arrived at such a point that it is not likely to be long delayed. It should put the crown on forty years of continuous research, undertaken in every region of the world.

In addition to his oceanographical work, Professor Agassiz published many Monographs on Hydrozoa and Echinoderma. His first paper was on the "Embryology of the Starfish," in 1864, and he followed this up by reports on the Acalephæ and on the "Embryology of the Ctenophoræ." His "Revision of the Echini," 4to, 774 pp., with an atlas of 94 plates, 1872-4, is a classical publication for reference; while his last contribution to "Hawaiian and other Pacific Echini" was issued only last year. The variety and extent of his published works are very great, mostly in large and important Monographs giving the results of his collecting in the 'Blake' and in the 'Albatross,' U.S. Government steamers which he was allowed to run on paying their working expenses.

Alexander Agassiz was all his life connected in some way or other with the Museum of Comparative Zoology at Harvard. He succeeded his father as Director and Curator in 1874, and he built up the Museum from a small Institution to a magnificent home for his wonderfully rich collections from all parts of the world. He himself, to a large degree, built and endowed the Museum, which will ever remain as an enduring monument of his wonderful energy. Its publications he paid for on a most lavish scale and he equipped it with the most modern scientific apparatus. In his will he further bequeathed to it £40,000 with a possible residual share in his estate. His gifts to the Museum altogether probably reached at least £500,000. His full model of Funafuti atoll is a magnificent piece of work, while his vast collections will form, as it were, an immense library for future researchers in Oceanography.

In conclusion one must refer to the great charm of Professor Agassiz as a man. He belonged to no country but rather to the whole world of science; he was cosmopolitan in every sense, a Fellow or an Honorary Member of Scientific Societies in every country, a welcome guest everywhere; he was noted for his unflinching courtesy to all, to the most junior student as much as to the Professor or Director. To anyone researching on coral reefs he gave special encouragement. He was not prodigal of advice, but what he did give it would be wise to follow. He was not above taking advice from those junior to himself. He was a man of indomitable energy; subject to sea-sickness, many of his cruises

must have been great pain to him, but he never flinched if he might increase our knowledge of the science in which he was interested. He never sought recognition, and in many respects he was averse from it. He never liked teaching, and he seldom lectured anywhere. Like a true scientific man, he cared not for himself but simply for the advancement of the subject which he loved. He was elected a Foreign Member on the 6th May, 1875.

[J. STANLEY GARDINER.]

WILLIAM HADDEN BEEBY, F.L.S., F.R.M.S., was born on June 9, 1849, and died on January 4 of the present year. He was in the banking business, from which he retired only a few months before his death. From an early time he devoted his leisure hours to the study of British Botany, in which he acquired soon a reputation for acuteness and great critical knowledge. He added a considerable number of new forms to the 'London Catalogue,' and deposited some of his critical gatherings in the herbaria at the British Museum and at Kew. His publications in the shape of short articles and notes were mostly published in the volumes of the 'Journal of Botany' for 1879-1897 and for 1908. He was also engaged in the preparation of a Flora of Surrey. Lack of leisure, however, compelled him finally to entrust the work to other hands; but he wrote the Botany article for the Victoria History of the County of Surrey (1902). His Surrey collections as well as those made in Shetland, which he visited repeatedly, are to be placed in the Horniman Museum, in the botanical department founded by Mr. A. O. Hume. He was elected an Associate of the Society in 1887 and became a Fellow in 1890. A portrait of him was published in the 'Journal of Botany' for May 1910. [O. STAFF.]

EDWARD CLAPTON was born at Stamford, 28th September, 1830, died at his house "Tower Croft" on the 28th September, 1909, and was buried at Stamford on the 2nd October. He was the second son of his parents, and educated at the Stamford Grammar School, afterwards entering at St. Thomas's Hospital in 1850, after an apprenticeship to a local practitioner from the age of 16 to 20. In 1857 he became M.D. Lond. and F.R.C.S.; in the same year he was appointed Assistant Physician and Lecturer on Botany at St. Thomas's Hospital, and later on he lectured on Materia Medica. In 1858 he became Member, and 17 years later Fellow of the Royal College of Physicians.

Shortly before his death he presented to the Museum of the Royal College of Surgeons two branches and a bundle of twigs from the plane tree in the island of Cos, under the shade of which Hippocrates lectured on Medicine from a marble seat, still in existence: the tree is believed to be considerably more than 2000 years old.

He was elected a Fellow, 21st November, 1861. [B. D. J.]

EMMELINE CROCKER was born in 1858 at Dulwich, where her father Augustus Coleman Crocker then lived; when quite a child the family moved to Cheshunt, and here she grew up, with the exception of her school time at Brighton. On leaving school she continued her studies in music and in art, the latter she pursued with much ardour under Miss Gann at the Queen's Square School of Art.

Upon her mother's death, when the ties of home life became slighter, Miss Crocker undertook a trip round the world by herself, visiting on her way the botanical gardens of Singapore and Hong Kong, finally reaching home by way of Canada.

After her return she spent some time at Glasnevin, where she became conversant with practical garden work under Mr. F. W. Moore, A.L.S.; on leaving she became directress of Mr. Spottiswood's garden at Porthquidden in Cornwall, from time to time contributing articles to 'The World' newspaper, which were reprinted in 1908 as "Thirty-nine articles on Gardening." This estate was sold by the owner in 1907, and then Miss Crocker resolved to busy herself with a monograph on *Rhododendron* forms in cultivation, and for this she painted a large series of pictures.

Unfortunately she had suffered of late years from repeated attacks of influenza, and with the idea of escaping the English winter, she decided to spend that part of the year in Madeira. Here she devoted herself to the flora of the islands, and began a collection of marine Algæ for Kew, but owing to the bad sanitation of the hotel at Funchal where she was staying, a violent epidemic of typhoid fever broke out, and our late Fellow fell a victim to it, dying on the 26th February, 1910.

She was elected Fellow so recently as 6th February, 1907, but entered into the life of the Society with characteristic energy, attending our meetings and using the Library freely.

For the materials for the foregoing sketch the writer has to thank Mr. Alfred Crocker and Miss Alice Shaw. [B. D. J.]

The Rev. WILLIAM HENRY DALLINGER, LL.D., D.C.L., D.Sc., F.R.S., F.L.S., F.Z.S., F.R.M.S., &c., died on the 7th November, 1909; he was born at Devonport on July 5, 1840; he was the son of J. S. Dallinger, and married Emma J. Goldsmith, daughter of David Goldsmith of Bury St. Edmunds. At one time he thought of adopting Medicine as his profession, but his strong religious tendency led him, in 1861, to enter the Wesleyan Ministry; the first circuit to which he was appointed was that of Faversham, but he afterwards travelled those of Cardiff, Bristol, and Liverpool; his life, at this time, was that of a circuit Minister, but he occupied most of his leisure in studying Hebrew, Greek, and German.

In 1880 Dr. Dallinger was appointed Governor and Principal of Wesley College, Sheffield, in which capacity he was highly appreciated, but he resigned the post in 1888, and became a

minister without pastoral charge, in order to have more time at his disposal for his scientific studies and researches; these, and his lectures on microscopical and biological subjects, occupied the greater part of the last twenty-one years of his life, but of late years he was greatly hampered by failing health. One of these lectures which was delivered in 1884, before the British Association at Montreal, was famous at the time: it was on "The lowest and smallest forms of animal life."

Dr. Dallinger was elected F.R.S. in 1880, and received the LL.D. from the Victoria University in 1884, the D.Sc. from Dublin in 1892, and the D.C.L. from Durham in 1896; he was President of the Royal Microscopical Society of London from 1884 to 1887 inclusive, and of the Quekett Microscopical Club from 1890 to 1892 inclusive; he was also senior lecturer on the staff of the Gilchrist Educational Trust. He was a Fellow of the Linnean Society from 2nd March, 1882, until the time of his death, and served on the Council from 1888 to 1890.

From early youth Dallinger took a strong interest in natural science, but the researches which established his position in the scientific world, and eventually made his name famous, commenced in 1870, and lasted for about ten years; they were microscopical researches on the life-histories of certain minute septic organisms known as "Monads." The results of these researches were published, from time to time, chiefly in the 'Monthly Microscopical Journal,' which was at the time the journal of the Royal Microscopical Society. The earlier of these researches were conducted in conjunction with J. Drysdale, M.D., and were marvels of patient and skilful investigation: the life-histories were traced and established by continuous watching through the microscope day and night without a break; one observer sitting down to the instrument as the other rose, until the whole life-history had been thoroughly traced and verified. The question of spontaneous generation was then a burning one, and the results of Messrs. Dallinger and Drysdale's enquiries and experiments had considerable influence in determining the conclusions at which the greater part of the scientific world arrived. Some of the later researches into the thermal death-point of known Monads and Monad-germs were conducted by Dr. Dallinger alone, without Dr. Drysdale's assistance; his careful and prolonged experiments proved that these Flagellates, which normally lived at a temperature of about 60° F., could, by a gradual raising of the temperature of the fluid in which they were immersed, be accustomed to live and thrive at 158° F. The joint experiments had already proved that the germs were capable of resisting a fluid heat of 220° F., and a dry heat of 300° F.

The enquiries above referred to were probably Dr. Dallinger's only original investigations and discoveries of importance in biological science; but in the course of them he had to employ the highest powers of the microscope, and to use them to the best advantage, as the flagella of living monads are difficult objects to

see and define properly ; and, in his anxiety to give his investigations every advantage that patience and skill could afford, he studied the optical construction of the instrument, and the most advantageous methods of its illumination and management, until he became extremely skilful in its use and a great authority upon these subjects, in which he took a deep interest. It was probably this which led him to edit the 7th and 8th editions, published respectively in 1891 and 1901, of Dr. W. B. Carpenter's "The Microscope and its revelations." For the 1891 edition Dallinger entirely re-wrote the whole of the first seven chapters, being the part treating of the instrument itself and the preparation of objects for examination by its means, and the same portion was almost entirely rewritten for the 1901 edition. It is characteristic of the patient and untiring nature of the man that, during the transit of part of these manuscripts to the printer, an accident happened to the box and a considerable portion of the manuscript was lost : Dallinger at once quietly set to work to restore it.

Dallinger wrote his well-known "Fernley Lecture" on "The Creator and what we may know about Creation" in 1896 ; he frequently contributed scientific articles to the 'Wesleyan Methodist Magazine,' and he wrote some other papers of less importance from time to time.

When Dallinger was President of the Royal Microscopical Society he was also Principal of the Wesley College, yet he rarely missed a meeting of the Society, but used to travel back to Sheffield by the night-mail after the meeting in order to be ready for his duties at the College the next morning ; and after his term as President expired he undertook the office of honorary optical Secretary in order to assist the Society, and this office he held for many years.

Finally, Dr. Dallinger was a man who gained the affection of most of those who knew him, and all those who were in any way associated with him in his scientific pursuits will remember his constant readiness to help others and his anxiety to acknowledge all assistance which he himself received. [ALBERT D. MICHAEL.]

FELIX ANTON DOHRN, Foreign Member of the Linnean Society since 1888, the founder of the famous Biological Station at Naples, died in Munich on September 26th last, in his seventieth year. He lived to see not only his own Foundation grow famous, the acknowledged rendezvous of biologists of all nations, but also similar institutions for the prosecution of marine research spring up on the shores of almost every civilized country with a sea-board. It is not too much to say that all these institutions, which are now to be counted by the score, owe their existence largely to the insight and courageous initiative of Anton Dohrn, who was the first to conceive the plan of a Marine Biological Station, and to prove it feasible in the face of much opposition and even ridicule. It is therefore difficult to overestimate the part which he has played in the great progress of marine biology during the past

forty years, a progress which has contributed as much as anything else to the general advance of biological science.

Although his principal life-work was the founding and management of the Station, he made many important contributions to Morphological Science, especially upon the vexed and complicated problem of the evolution of the Vertebrate head.

His quick perception of the trend of scientific thought had recently convinced him that biology in the future would turn more in the direction of experimental and physiological enquiry, and accordingly he determined to increase the buildings and staff of the Aquarium for the especial purpose of offering facilities for such work, and his friends may rejoice that he lived to see this undertaking, which involved the erection of a wing equal in size to the original building, most happily consummated.

It was Dohrn's wish to preserve the international character of the Biological Station. Great Britain has for many years been represented by students appointed by Oxford, Cambridge, and the British Association. In many conversations with Professor Dohrn I learnt that he regarded this connection with especial pleasure, owing to his intimate friendship with Huxley and Francis Balfour in the early days of the Station, and to the cordial support which they had given him in difficult times.

Built physically on a grand scale with immense reverberating voice, everyone who knew him felt that his mind corresponded: his bursts of humour, his explosions of anger, his ardent enthusiasms, were all irresistible in their spontaneous force. A man of great culture in literature and the arts, especially music, he never forsook right up to the end the slow and laborious method of science. In the power and destiny of science he possessed an ardent faith which amounted to idealism, almost to romanticism. His sense of the mysteries of nature and what they meant for man transcended the narrow bounds of knowledge, and any advance into the unknown, however small or apparently insignificant, was to him worth any amount of effort and sacrifice. This burning enthusiasm for knowledge was certainly the source of his greatness. Doubtless his wide sympathies, his knowledge of men and of the world, both great and small, his extraordinary faculty of linking powerful and distinguished men to his own enthusiasm, contributed largely to his success; but it would be the grossest error to ascribe the outcome of his life's work to a successful obsequiousness to those in power. The strength of his influence resided ultimately in the strength of his belief in nature and in science, without which his tact and knowledge of affairs would have accomplished little. By his death natural science has lost one of its most forcible and genuine leaders. [GEOFFREY SMITH.]

EMIL CHRISTIAN HANSEN was born at Ribe in Jutland, Denmark, on May 8, 1842, and died at Copenhagen on August 27 of last year. He was originally a house-decorator and pupil of the Art school at Copenhagen, but he soon turned to the study of science.

As he had, however, to earn his living as a private tutor, it was not until 1866—when the Danish government granted him a scholarship—that he could apply himself wholly to his studies. Having been appointed a science master in a Copenhagen gymnasium, he began to occupy himself more exclusively with botany and chemistry.

Apart from a preliminary communication on a peat moor in Denmark, a subject which he did not follow up, his first publication was on “*De Danske Gjødningsvampene (Fungi fimicoli Danici)*” in *Vidensk. Medd. Copenhagen*, 1876, pp. 207–354.

In 1878 he entered the physiological laboratory at Carlsberg, near Copenhagen, where he at once began that brilliant series of researches on fermentations which constitute his life-work. He initiated it with a dissertation, “Contributions to our knowledge of the organisms which are found in beer and beer wort and are able to live therein”; and having taken his doctor degree in 1879 he was appointed Director of the Carlsberg Laboratory, which post he held until his death.

Hansen's biological researches on the organisms of fermentation, and among them mainly of the *Saccharomycetæ*, were carefully planned and carried out on ingenious methods which assured a degree of precision not attained before. They were fruitful in theoretical results bearing on the biology of those micro-organisms, and in many respects of the physiology of the cell generally; but thanks to his practical genius, they also led in the industries depending on fermentation to technical improvements of the greatest importance and in some respect to changes which almost revolutionized them. His numerous publications are scattered through the *Comptes Rendus* of the Carlsberg Laboratory, the *Centralblatt für Bacteriologie und Parasitenkunde*, the *Annals of Botany*, the *Zeitschrift für das gesammte Brauwesen*, etc. An independent publication, “*Untersuchungen aus der Praxis der Gärungsindustrie*” (Practical Studies in Fermentation, Engl. transl. by Miller), did not get beyond part ii.

In 1898, E. C. Hansen was elected a Foreign Member of the Society. [O. STAPE.]

WILLIAM HILLHOUSE, whose death occurred at Malvern Wells on January 27th, 1910, was appointed to the professorship of Botany at the Mason Science College, Birmingham, in April 1882. He had for some time suffered from chronic pulmonary trouble, and in September 1909 he resigned his professorship at the University of Birmingham. Unfortunately he lived but a short time to enjoy his retirement.

He was born at Bedford on December 17th, 1850, and in course of time became an assistant at the Bedford Modern School. It was during this period that he began his study of Botany, working more especially the Bedfordshire flora, and he was instrumental in founding the Bedfordshire Natural History Society. He became a Fellow of the Linnean Society in 1876. In 1877 he

went to Trinity College, Cambridge, of which he soon became a distinguished scholar. From 1878 to 1882 he was assistant curator of the University Herbarium, and was in this period appointed a University Lecturer in Botany. He also became Lecturer in Botany to both Girton and Newnham Colleges, and his literary tastes combined with his general activity were largely responsible for the appearance of the 'Cambridge Review,' of which he was one of the original editors.

On his appointment at Birmingham, Hillhouse went over to Bonn to work with Prof. Strasburger, a visit which culminated in the translation of Strasburger's 'Practical Botany.'

In Birmingham and the Midlands Hillhouse took an active part in educational work. He was for a time president of the Birmingham Natural History Society, and of several of the local Institutes, and for years he was a prominent member of the Leicestershire Education Committee. He was honorary secretary, and subsequently chairman, of the Birmingham Botanical and Horticultural Society, and under his direction the Botanical Gardens, Edgbaston, became one of the delights of the Birmingham district. Until his death, which will be sincerely regretted by many students, friends, and colleagues, he was chairman of the Council of the Midland Reafforestation Association.

[G. S. WEST.]

Professor PETER MACOWAN, who died at Uitenhage, Cape Colony, on the 1st December, 1909, was born at Hull, Yorks., 14th November, 1830, and at the age of 16 became a tutor at Bath, and after one or two intermediate positions, became a master at Huddersfield College, acting also as teacher of Chemistry, in 1857, in which year he graduated in Arts in the University of London.

He had already taken up the study of Phanerogams and Mosses, when his health gave way, and threatened with lung trouble, he left Huddersfield in 1861 to take charge of a projected college at Grahamstown. His health was wholly re-established on the voyage out, and he never felt any serious failure until late in life. At this school, Shaw College, he began his botanical work in South Africa, and got into correspondence with prominent botanists at the Cape and elsewhere.

In 1869 he left Grahamstown to become science tutor at Gill College, Somerset East. He gave his herbarium to the College, and began a museum, and from this time must be dated his association with Dr. Harry Bolus, who was then living at Graaff Reinet.

He was appointed Director of the Capetown Botanical Gardens in 1881, and soon afterwards became Professor of Botany at the South African College. Here he seemed to have attained his true position, but the real position of the Botanic Garden was really most unsatisfactory, and the appliances at the College were quite inadequate, and after a few years his classes were perforce abandoned, though his methods were admirable and his descriptions

vivid. The Garden was carried on with much trouble, upon a precarious retail business in plants and seeds, and it is much to his credit that when in 1892 he handed it over to the municipality it was with a small credit balance, after defraying costly improvements.

The Herbarium in connection with the Garden was badly housed and had been greatly neglected. It was not till 1892 that a couple of rooms were assigned to it; in that year he reported that he had now 31 cabinets, against 7, which was the number in 1881, with 3000 sheets, and containing the types of the Cape Flora as far as Campanulaceæ, mounted by Dr. Harvey in 1864. The basis of the collection was once the property of Zeyher, and afterwards of Dr. Pappe, and dated from 1825 to 1849; the specimens, besides being old, had suffered much from want of care, and even Harvey's set had been allowed to lie for years unpoisoned, and it is due to Sir Henry Barkly that this measure of preservation was adopted. By 1901 there were 61 full cabinets, the increase entirely due to MacOwan's own hard work. In 1904, to his great delight, his old herbarium was presented to the Albany Museum by the Trustees of Gill College, where it had lain entirely unused since his time. Although it had somewhat dwindled, it still contained 14,000 sheets of phanerogams, many of them types, and 1800 fungi.

In 1884 he began with Dr. Bolus the issue of his 'Herbarium normale Austro-Africanum,' which was continued till 15 centuries had been issued; five more were issued by MacOwan single-handed.

He resigned the Directorship of the Botanic Garden at the end of 1891, but retained the post of Curator of the Herbarium till his retirement in 1905; when he left the sheets had increased to 44,000, of which 25,500 were Cape plants. For about two years subsequent he worked about 6 to 7 hours daily in the Herbarium of the Albany Museum, chiefly getting the Gill College herbarium into creditable order once more. In 1907 he had a slight paralytic stroke, and finding the climate of Grahamstown too cold in winter, he moved to Uitenhage. He gradually weakened till the end came last year, as previously noted, and passed away in the house of a son-in-law, Mr. Chase of Uitenhage.

He took his degree of B.A. before leaving England, and he never revisited his native land. Frequently acting as examiner to the Cape of Good Hope University in Chemistry, Botany, Geology, and Zoology, the Council bestowed upon him in 1902 the honorary degree of Doctor of Science. He was elected Fellow of our Society on the 2nd April, 1885.

For the particulars of the foregoing sketch the writer would acknowledge his indebtedness to Dr. Schönland's obituary of his father-in-law which came out in the 'Kew Bulletin,' 1910, pp. 84-90, and to the sketch with portrait which appeared in the 'South African Journal of Science' for January last, pp. 71-79, above the initials of Dr. Juritz, the Editor; the latter article contains a partial bibliography of Prof. MacOwan's writings. [B. D. J.]

ROBERT MORTON MIDDLETON was born at Sowerby, near Thirsk, Yorkshire, on January 25, 1846, and died on August 8, 1909, at Wallington, Surrey. His career, beginning in the banking business, was somewhat varied. He spent part of his life in the United States, whence he returned to England in 1896. Afterwards he went out on missionary work among the Araucarian Indians of South Chili, coming back to this country for good in 1907. Since then he was employed temporarily at the Botanical Department of the Natural History Museum, where he also placed his collection of Chilian plants. He was a lively, genial man of many interests; but he published very little. He joined the Society, whose meetings he attended very regularly, on the 4th March, 1880. [O. S.]

The Most Honourable GEORGE FREDERICK SAMUEL ROBINSON, 1st Marquis of Ripon, K.G., P.C., was born in London 24th October, 1827, son of the 1st Earl of Ripon and Sarah, only daughter of the 4th Earl of Buckinghamshire. He was elected a Fellow on the 20th November, 1849, as Viscount Goderich, and, continuing to pay his annual contribution during his life, was the oldest paying Fellow on the Roll, and had therefore contributed most largely to the pecuniary support of the Society.

Of his varied and honourable official career this is not the place to discuss; the places he filled in the State, including the Governor-Generalship of India from 1880 to 1884, claimed the whole of his time and attention. In addition to the Garter Knighthood and membership of the Privy Council, he was G.C.S.I., Hon. D.C.L. (Oxford), Hon. Litt. D. (Victoria), and F.R.S. He succeeded to the title in 1859; and died at his beautiful seat, Studley Royal, on the 9th July, 1909, the cause of death being heart-failure.

[B. D. J.]

EDWARD SAUNDERS, F.R.S., F.L.S., F.E.S., and GEORGE SHARP SAUNDERS, F.L.S., F.E.S., Hon.F.R.H.S., were both born at East Hill, Wandsworth, sons of the well known William Wilson Saunders, F.R.S., who was for eleven years Treasurer of the Linnean Society. They were further fortunate in having for their elder half-brother William Frederick Saunders (F.L.S. 1857-1901), not only an accomplished botanist, but a noble-minded man, who in all relations of life "loved himself last." In 1857 the family residence was removed to Hillfield, Reigate, and there the brothers, educated at home, were constantly in familiar touch with their father's immense entomological, horticultural, and other collections. Their father's ready sympathy with every form of scientific pursuit will be remembered by all who knew him; and the frequent presence at Hillfield of men illustrious in various departments of natural history was well calculated to impress the minds of intelligent boys with the importance of such knowledge. Between the claims of heredity and environment, it must remain an open question which was the more potent influence to produce in the

two brothers the tastes and aptitudes for which their father was distinguished. However that question may be answered, it is certainly a little, or not a little, remarkable that George, born March 9, 1842, and Edward, born March 22, 1848, published in joint authorship, through the Holmesdale Natural History Club, a "List of the Land and Freshwater Mollusca of the Reigate District," in February 1861. There is reason to believe that in this publication Edward Saunders, not yet thirteen years of age, was the predominant partner. A second edition, brought up to date, was issued in January 1864. The correspondence for exchange of specimens in which the younger of the two naturalists had at once become involved, though no doubt a trial for youthful vanity, was only a foretaste of the incessant appeals for friendly scientific aid which throughout his life he never failed to answer with unselfish readiness. At sixteen, by his "Coleoptera at Lowestoft" he opened on a new subject, which was thenceforward for several years to engage his special attention. This early contribution appeared in the first volume of 'The Entomologist's Monthly Magazine,' a useful serial destined to have him for the last thirty years of his life as one of its editors. In its March number for the present year there appears an admirably sympathetic appreciation of his work and character by his long-time friend and well-wisher, the Rev. F. D. Morice, M.A., formerly a master at Rugby. It is unnecessary, therefore, to repeat the details there given of his assiduous labours and numerous publications, successively on the Buprestidæ, the Hemiptera Heteroptera, and lastly on the Aculeate Hymenoptera. It may, however, be noticed as a token of the ardour with which he carried out his investigations, that when publishing in 1871 his important 'Catalogus Buprestidarum,' he had won the right to say in his Preface:—"To render the synonymy as full and accurate as possible, I have myself examined the types in the following collections:—British Museum, Museums of Berlin, Copenhagen, Kiel, Leyden, Oxford, d'Hist. Naturelle de Paris, Stockholm, and Upsala; Colls. Chevrolat, Kirsch, Le Conte, Linnæus, Mniszech, Reiche, Sallé, Thomson, Weyers."

Concerning his later efforts Mr. Morice writes:—"It is quite impossible within the limits of this Notice to give even the titles of Saunders's minor writings on Aculeates. It must suffice to say that his grand work 'The Hymenoptera Aculeata of the British Isles' (1896) is one of the few without which no serious Hymenopterist thinks his working-library complete, and that its merits have been acknowledged in the warmest terms by every one at home or abroad who is competent to form an opinion upon it." Among his minor writings on the subject, however, one of the latest is worthy of record, because it shows that he could at will descend from that impassioned sublimity of style, with which, as is well known, specialists are wont to soar over the heads of the vulgar. In 1908 he published with Routledge & Sons a pleasant little Tractate for the unlearned, illustrated by his daughter

Constance. Regarding this he says in his preface:—"The object of this little book is to give in as simple a form as possible a short account of some of the British Wild Bees, Wasps, Ants, etc., scientifically known as the *Hymenoptera Aculeata*. Of these the non-scientific public rarely recognizes more than the Hive Bee, the Humble Bee, the Wasp, and the Hornet, whereas there are about 400 different kinds to be found in this country, and they can be recognized by any one who is disposed to make a special study of the group."

To the Linnean Society Edward Saunders contributed a paper read Nov. 7, 1867, published April 23, 1868, communicated by his father, then a V.P.L.S. The subject was "Descriptions of fifty new Species of the genus *Stigmodera*," with two plates drawn by the author. Another paper containing "Descriptions of ten new Species of the genus *Paracupta*, H. Deyrolle, and of ten new Species of the genus *Conognatha*, Escholtze," with one plate, was read Dec. 3, 1868, and published Aug. 10, 1869, the author having in the meantime, on June 3rd, been elected a Fellow. His third paper, "Descriptions of Buprestidæ collected in Japan by George Lewis, Esq." (F.L.S. since Jan. 18, 1883), was read Feb. 20, 1873, and published July 18 of the same year. Thirty-four new species, with a new genus, were included in this memoir. After a long interval he again contributed to the Linnean Journal, his paper "On the Tongues of the British Hymenoptera Anthophila" being read April 17, 1890, and published Oct. 18 of that year. These honeyed Tongues, successfully mounted by the ingenious Mr. Frederick Enock, F.L.S., were delineated on eight attractive plates by George Saunders, who in 1882 had similarly assisted his younger brother by drawing plates for his "Synopsis of British Hymenoptera" in the 'Transactions' of the Entomological Society.

While treating the biography of the two brothers chiefly from its scientific aspect, it may not be improper for the recorder here to note that in 1873 the prospects of easy affluence with which their careers had opened were clouded over. This change from the smiles of fortune to her frowns they met with brave equanimity. It left the younger immersed for the rest of his life in the business anxieties of marine insurance, while the elder suffered for some time from the unsettlement due to abruptly altered plans and avocations. These were henceforward considerably diversified, but their general character will be sufficiently understood by the following extracts from obituary notices published last April.

Thus 'The Garden' says: "Mr. George Saunders was a warm lover of flowers, and also took an interest in insects, so much so that we are sorry no book came from his pen on this important subject. His initials 'G.S.S.' were familiar, until his recent illness, to readers of 'The Garden,' and no one was more qualified to give advice on the friends and foes of the garden. One of his most important contributions on this subject was to the 'Century Book of Gardening,' and he contributed an excellent series of

articles in 'Gardening Illustrated' some years ago."... "Our friend was librarian for many years at St. Thomas's Hospital, and many medical men will feel a real pang of sorrow when they know that Mr. Saunders is dead. He was beloved by the students and the staff generally." The 'Gardeners' Chronicle' says: "He was soon initiated in horticulture, but his bent lay more towards the study of insects than of other living things, though he took a keen interest in many branches of natural science. He became well known as an expert in economic entomology, and his opinion was on this subject widely sought and greatly valued, by none more than by the Scientific Committee of the Royal Horticultural Society, whose meetings he regularly attended for many years. His knowledge of entomology was always at the disposal of enquirers, and his ready courtesy and clear expositions of life-histories and so on made his communications of real value. He was the author of several clearly written articles (not all of them signed) in the horticultural Press. He was a skilled draughtsman, and made a considerable number of coloured drawings of teratological subjects of great interest and value to the botanist. When in 1906, the Rev. W. Wilks was obliged, through pressure of work, to give up the editorship of the R.H.S. Journal, Mr. Saunders was appointed to succeed him, and he edited the Journal until 1908, when ill-health obliged him to resign."

George Saunders had been a Fellow of the Entomological Society from 1861 and had served on its Council. It was not till 1899 that he joined the Linnean Society, on the Council of which he also served from 1902 to 1905, his appointment coinciding with his brother's election as a Fellow of the Royal Society.

Alike in their devotion to natural history, the two brothers were further alike in a certain seriousness of temper which evidently invited appeals for their aid in church-work wherever they happened to reside. This earnestness was happily combined with a ready sense of things humorous and with what may best be described as a singular capacity for friendship.

For many years of happy married life they were alike in enjoyment and gratitude. But George Saunders, who was united to Miss Mary Horsley on July 9, 1868, had the sorrow of losing her, after long and painful illness, in 1909, whereas Miss Mary Agnes Brown, to whom Edward Saunders was married Sept. 3, 1872, survives him, together with nine of their twelve children, most of them already engaged in a variety of promising pursuits. The brothers died as they had lived, each fading from the scene with a kind of modest tranquillity, Edward on the 6th of February last, and George on the following 6th of April. Both had been for some time conspicuously out of health, yet in each case there seemed room for hope, though from the opposite considerations that the one had been so seldom ill and the other so often. The elder, after a delicate childhood, had proved immune to sickness, till sympathy with his wife's affliction apparently broke down his powers of resistance. The younger, on the other hand, had so

frequently recovered from dangerous attacks that there seemed no special reason why the last should be fatal. Yet they fell, not indeed on one day, nor on the field of battle, but after so close a union from first to last, that, borrowing from a song of triumphant sorrow, a friend may say of them, "They were lovely and pleasant in their lives, and in their deaths they were not divided."

[T. R. R. STEBBING.]

The death of Dr. RICHARD BOWDLER SHARPE, which took place at his residence at Chiswick on Christmas Day 1909, deprived Ornithologists, the world over, of a guide, philosopher, and friend indeed; for his knowledge of Systematic Ornithology, and of the Geographical Distribution of Birds and all that pertained thereto, was profound. So long as he lived this knowledge was at the disposal of his fellow-workers without reserve; for he was one of the most generous of men, and no man turned away from him empty handed. But when he died a rich hoard of facts died with him, for in spite of his extraordinary output of memoirs and monographs, the best of what he knew he could never be induced to systematize and publish.

Dr. Sharpe was born in London, November 22, 1847, and was the eldest son of Thomas Bowdler Sharpe, well known as the publisher of 'Sharpe's London Magazine.' His grandfather was the Rev. Lancelot Sharpe, Rector of All Hallows Staining, in the City, and for many years Headmaster of St. Saviour's Grammar School in Southwark. Happily he was not brought up in London, but at the age of six was placed under the care of his aunt, Mrs. Magdalen Wallace, widow of the Rev. J. Wallace, Headmaster of the Grammar School at Sevenoaks. She kept a preparatory school at Brighton, and here the boy passed three uneventful years; he was then transferred to the Grammar School at Peterborough, where his cousin, the Rev. James Wallace was Master. Here he gained a King's Scholarship, which not only guaranteed his education but carried with it a small sum of money which was increased by his services as a choir-boy in the Cathedral. A little later his cousin accepted the Headmastership of the Grammar School at Loughborough, and the boy accompanied him. In these sojournings young Sharpe found scope for his innate love of Natural History, which was to bear such fruit in after years. But a time of trial was before him. An unsympathetic father, irritated at this marked fondness for what he regarded as an unprofitable subject boding no good for the future, suddenly bundled him off to London—a boy of sixteen—with a sovereign in his pocket, and a letter of introduction to the publishing firm of W. H. Smith & Sons! But opposition of this kind rarely attains its end. It certainly did not in the present case: on the contrary, it seems to have added fuel to the flames; and the boy succeeded, in spite of this disaster, in following his bent, for here, though every imaginable obstacle confronted him, he began to write a Monograph of the Kingfishers which marked an epoch

in Ornithological Literature. Two years later he entered the employment of Mr. B. Quaritch, the well-known bookseller, and this gave him access to some of the finest Ornithological works of the time. Every penny he could scrape together he spent in buying specimens of Kingfishers for his great book, and every moment he could spare was spent in its preparation, so that his working hours were long indeed.

In 1867, when nineteen years old, he was appointed Librarian to the Zoological Society of London—the first to hold this position, and this appointment gave him better opportunities, and greater scope for his talents. Five years later the reward for his years of unnecessary hard labour came to him, for in 1872 he was appointed Senior Assistant in the Department of Zoology of the British Museum, and was placed in charge of the Collection of Birds.

One of the first tasks entrusted to him was the preparation of the first volume of that monumental work the British Museum 'Catalogue of Birds,' the most exhaustive work of its kind in existence. In the seven-and-twenty volumes of that work every known species of bird, up to the date of publicity of each volume, is described. This entailed an account of all phases of plumage and a list of all the literature, relating to each species—a truly appalling task; yet of these twenty-seven volumes Sharpe contrived to write eleven, and portions of two others. At least this much stands to his credit: the remaining volumes were written in part by Mr. W. R. Ogilvie-Grant, and in part by outside aid, and these later authors drew largely on Sharpe for guidance and help.

But besides this, he also compiled during his later years a 'Hand-list of Birds,' the last volume of which was only completed just before his death. Most men would have quailed before such an undertaking requiring so much labour and yielding so little in return, for it can appeal only to the specialist.

Another official publication was his 'History of the Bird Collection in the British Museum.' This is full of interesting matter concerning the collections, and the men who made them.

Besides his Monograph of the Kingfishers he also wrote no less comprehensive treatises on the Swallows and the Birds of Paradise, and a Handbook to the Birds of Great Britain. Innumerable appendices to the Volumes of Travel written by eminent explorers, describing the birds collected on their journeys, and a no less voluminous list of separate reports and papers on new species of birds, in themselves form no mean monument. Besides, he also edited, or revised and largely re-wrote, a considerable number of works of eminent Ornithologists removed by death before their labours were complete. The huge tomes of John Gould, and two volumes of Henry Seebohm are among the most notable of this category. To these we must add a very long list of papers contributed to the Journal and Transactions of this Society, the Zoological Society, the 'Annals and Magazine of Natural History,' 'The Ibis,' and the Bulletin of the British Ornithologists' Club.

In his later years he edited a two volume edition of White's *Selborne*, and during his researches in the Gilbert White country he became interested in the history of Basing Castle and the story of the siege by Cromwell. This theme he pursued with great zeal, and finally decided to write a book on the subject. Unhappily he died while preparing the first volume, but had he lived to complete his task, it is certain that he would have produced a record of sterling merit, for I had the good fortune to know him intimately, and know how exhaustively he had treated his subject. But this was by way of recreation, though his official work left him but little real leisure.

Sharpe always regarded the Collections under his charge with a peculiarly tender affection, and the main purpose of his life was to enrich them. He spared no effort to persuade the jealous Guardians of the Museum purse to buy collections, and often when his pleadings proved unavailing he would purchase collections with his own money—which he could ill afford to do, but it was anguish unspeakable to him to let a specimen escape that he courted for his beloved collection. He had great powers of persuasion, and these he exerted to the full when he desired to move some generously inclined traveller to hand over his specimens to the national store-house. The great Hume Collection of Indian birds, and the wonderful Tweeddale and Salvin-Godman collections are among the more remarkable illustrations of his triumphs, for these were given to the Museum largely on Sharpe's account. Mr. Hume, in presenting his magnificent collection of Indian birds and eggs numbering nearly 80,000 specimens, remarked in presenting the Collection to the Nation: "I trust it may not be forgotten that its acquisition by the Museum has been solely due to the fact that Mr. Sharpe was at the head of the Ornithological branch of that Institution." But this is only one, of many munificent gifts to the Ornithological Department made on Sharpe's recommendation.

He was President of Section A at the Ornithological Congress held at Budapest in 1891, and again in Paris in 1900, when he was elected President of the Congress which met in London five years later. He was an Honorary LL.D. of Aberdeen, a Fellow of the Linnean and Zoological Societies, a Member of the British Ornithologists' Union, and was an Honorary or Foreign Member of all the principal Ornithological Societies in the world. In 1891, H.I.M. the Emperor of Austria bestowed on him the Gold Medal for Science.

His rule as Assistant Keeper of the Zoological Department was mildness itself, for he was of a peculiarly genial temperament. In spite of domestic worries he was always in exuberant spirits, and was a wonderful story-teller. His friends loved to inveigle him into telling yarns of the many eccentric people he had met, or into reciting Bab-ballads, in which feat he was peculiarly accomplished; few, surely, ever succeeded in bringing out the exquisite humour of these lines so well as Sharpe! But his kindly

nature was sorely abused by people of the begging-letter type : he could never resist an appeal to his purse, though that was far from a well-filled one, and he was no less generous in bestowing the fruits of scientific labours on those who asked him.

Take him for all in all, we shall not see his like again.

[W. P. PYCRAFT.]

SIR CHARLES WILLIAM STRICKLAND, eighth baronet, who died on the last day of 1909, Dec. 31st, was a Fellow of the Linnean Society from the 15th February, 1877. He resided at Hildenley Hall near Malton, on one of his country estates, for many years. The Hall, although not a very large building, is a comfortable residence, built in a well sheltered site at the base of a steep wooded bank of limestone formation known as Hildenley Wood, which is a relic of the ancient forest-land of Yorkshire and has never been under cultivation, and is the home of some of the rarest of our British native orchids and other rare kinds of the wild flora of Britain. He was the original of "Martin the Madman" in 'Tom Brown's Schooldays,' and was proud of the fact.

Sir Charles was a lover of Nature, and lived for many years a quiet life. He built attached to the Hall a fine conservatory for flowering plants, and also erected other glass structures for the cultivation of exotic orchids, in which he was very successful, and gave much attention to them, and no doubt enjoyed his quiet life in the study of their growth and admiration of the great beauty and variety of their flowers.

He was a good botanist and had an extensive knowledge of the flora of the British Islands ; he was also much interested in the cultivation of hardy fruits, more especially of the apple, as he considered it to be the most valuable fruit for general cultivation in England. Some twenty years ago he represented a committee of the Royal Horticultural Society, in the examination of the apples growing in this district of Yorkshire, more particularly to get a knowledge of the best kinds suitable to the locality. For two or three seasons collections of these fruits were exhibited at Malton and Whitby, local kinds were traced to their origin, and all exhibits were named as far as possible and lists given of those most suitable to the district.

He was a large landowner in Yorkshire and generally considered to be a generous landlord ; he let his farms at reasonable rents, and very rarely changed his tenants.

He was a tall, robust man of good appearance, was a careful liver, and enjoyed the life of a country gentleman. He was fond of hunting, and was a regular attendant at Lord Middleton's hunt during the season up to within a few years of his death. In his early life, whilst he was at Trinity College, Cambridge, he rowed at Henley Regatta in 1839, the first year the grand challenge cup for Eights was ever rowed for, and was number 7 in the winning crew, his college eight.

Sir Charles was twice married; his first wife was Georgina Milner, daughter of Sir William Milner, by whom he had one son, Walter William Strickland, born in 1851, who now succeeds to the title and estates, and who has been travelling for some years in the Colonies of Australia, New Zealand, India, Ceylon, &c., and is now residing in Italy. The second marriage was in 1866, to Ann Elizabeth, daughter of the Rev. Christopher Neville of Thorney, Notts, who predeceased him. There are two surviving sons and one daughter of the second family, Mr. Frederick Strickland, of the Brows, Malton, and Lieut. Henry Strickland, of the Royal Navy. His daughter is married to the Hon. Tatton Lane Fox Willoughby.

Sir Charles had a good constitution and enjoyed the happiness of good health through his long life, and passed away quietly, after a very short illness, in his home at Hildenley, in the 91st year of his age. [M. B. SLATER.]

The death of EDWARD PERCEVAL WRIGHT, which took place on March 4th, caused sincere regret among the large group of friends and acquaintances whose affection and regard Wright's genial and striking personality had won. Wright was born in Dublin in 1834. He was educated at home and began life as a clerk at the age of 16. His taste for Natural History brought him early into contact with Geo. J. Allman, the University Professor of Botany in Trinity College, Dublin, and resigning his clerkship, he entered Trinity College in 1853 and threw himself with zeal into the study of Natural History. His enthusiasm to forward the science led him in the following year to found the 'Natural History Review.' He continued editor of that Journal till 1866. His earliest essays in Science were made in this Journal and exhibit his keen interest from the first in field-work and observation. He visited the caves of Michelstown in 1857, with Haliday, and was the first to point out the interest of the living fauna of the Irish caves. In the same year, he took his B.A. degree and was appointed Director of the Museum of Trinity College. In 1858, he was appointed Lecturer in Zoology in Trinity College and Lecturer in Botany in Dr. Steevens' Hospital Medical School, and he was chosen Secretary for the Royal Geological Society of Ireland and Secretary for Section D of the British Association. He continued Secretary of this Section for several years, and was always very much interested in the work of the Association. It is a proof of Wright's energy and capacity for work, that while he was discharging all these duties he was at the same time able to keep pace with his undergraduate medical studies, and did not give up his work in Natural Science. He was elected Fellow of the Linnean Society in 1859. In 1862 he took his M.D. degree, and after studying abroad in Berlin, Vienna, and Paris, he began to practise as an oculist. But his chief interests being in Natural Science he did not remain in practice long, and in 1866, in order to devote himself entirely to his duties as *locum tenens* for Harvey, then the University Professor

of Botany. Wright definitely gave up ophthalmological work. In 1865 his attention was called to the fossils of the Jarrow Colliery, and with T. H. Huxley he published in the following year an important memoir on the Fossil Amphibia of the Kilkenny Coal Measures.

In 1867, Wright went to the Seychelles Islands to study the flora and fauna of that group. Unfortunately, all his collecting apparatus and preserving materials were lost on the way out by shipwreck. But notwithstanding this misfortune he succeeded in bringing back an important collection of animals and plants, and in the following years was able to publish a series of papers describing the new and interesting forms collected. These papers, together with others on collections made off the coast of Portugal and in Sicily in 1868, appeared in the 'Annals and Magazine of Natural History,' in the Transactions of the Royal Irish Academy, and in the Reports of the British Association.

In 1869, Wright was appointed University Professor of Botany and Keeper of the Herbarium in Trinity College. During the first years of his professorship he was still engaged in work on his Seychelles and South European collections. In 1877, Wright commenced to publish a series of memoirs on the structure and development of Algæ, which won the appreciative recognition of Bornet in 1879. The work on Algæ was put aside to draw up the Report, with Th. Studer, on the Alcyonaria of the 'Challenger' Expedition. This was not completed till 1888. During this period also Wright spent a great deal of energy on arranging the Herbarium of Trinity College; and if it had not been for his devotion and painstaking toil at a critical time, the usefulness of the collection would have been seriously impaired. The history of these events he records in the first number of the 'Notes from the Botanical School of Trinity College'—a journal which owes its existence to Wright's energy and generosity. He further showed his affection to the department of which he was head by presenting to it his valuable collection of botanical books and journals. In 1894 Wright visited the Pyrenees and brought back several additions to the Herbarium, and the spring of 1895 he spent collecting in Algiers. In 1904 he resigned his professorship after a tenure of 35 years. He remained Keeper of the Herbarium till his death.

In addition to his researches on Distribution and on Systematic Biology, Wright took an active part in many Scientific Societies, and was officially connected with several scientific publications. Among these activities may be mentioned his connection with the 'Natural History Review' as founder and editor, as Secretary, with the Dublin University Zoological and Botanical Association, with the Royal Geological Society of Ireland, and with Section D of the British Association. He was President of the Natural History Society of Dublin in 1872, and in 1874 he became Secretary of the Royal Irish Academy and editor of its publications. He was also editor for some time of the publications of the Royal

Dublin Society. In these various capacities he showed remarkable energy in forwarding the welfare of the institutions with which he was connected, and his generosity, when need arose, could always safely be counted upon. He displayed the same activity and generosity towards antiquarian research, and the Royal Society of Antiquaries marked its appreciation of his services in forwarding its aims by electing him President in 1900.

Wright's sympathetic nature won the affection of those who came in contact with him, and he was keenly desirous of forwarding younger men's work in science, and generously helped them by all the means in his power. It was a pleasure to him to put his varied and often recondite knowledge of the literature of Natural Science at their disposal. He showed the liveliest appreciation of the results obtained by the more modern generation of biologists. As a teacher he was more than ordinarily successful in stimulating the enthusiasm of his students and in implanting in them the desire to carry out investigation. At the same time he had a keen interest in his contemporaries in scientific work, and his desire to help the work of others and his human sympathies brought him into personal contact with a large number of his colleagues, not only in the British Isles, but also on the Continent and in America. It was always a pleasure to him to speak of these friends, and anecdotes of them formed a feature of his conversation.

[H. H. DIXON.]

June 2nd, 1910.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the Anniversary Meeting of the 24th May, 1910, were read and confirmed.

Miss Nellie Bancroft, Mr. Sidney Guest, and Mr. Hayward Radcliffe Darlington, M.A., LL.M.(Cantab.), were admitted Fellows.

Mr. Anthony Belt, and Prof. Edward Alfred Minchin, M.A.(Oxon.), were proposed as Fellows.

Mr. Cecil Hanbury, Mr. Henry Smith Holden, B.Sc., Mr. Charles William Mally, M.Sc.(Iowa), Mr. Sydney Gross Paine, and Mr. Percy Alfred Talbot, B.A.(Oxon.), were elected Fellows.

The President stated that he had appointed Sir Frank Crisp, Mr. H. W. Monckton, Prof. F. W. Oliver, and Prof. E. B. Poulton, to be Vice-Presidents for the ensuing Session.

Mr. H. W. MONCKTON, Treasurer and V.-P., then referred to previous exhibitions of Witches' brooms or Witch-knots in Conifers; instancing those by Dr. Masters on 18th March, 1886,

Mr. James Saunders, A.L.S., on 21st April, 1907, and the Rev. T. R. R. Stebbing on 21st April of the present year. He showed by lantern-slides similar growths on *Pinus sylvestris* growing near Wellington College, in Berkshire.

The President pointed out that the term was probably a recent translation of the German "Hexenbesen"; and the discussion was continued by Miss A. L. Smith, Mr. J. C. Shenstone, the General Secretary, Dr. A. P. Young, and Dr. A. B. Rendle.

Dr. STAFF, on behalf of Mr. J. F. WABY, F.L.S., of the Botanic Garden, Georgetown, British Guiana, exhibited lantern-slides from photographs of male and female specimens of *Lodoicea Sechellarum*, Labill., which were flowering and fruiting in that Garden.

He stated that of 36 nuts specially imported in 1893, only three plants survived, the two in question, and a third which had not yet flowered. It is of interest as being the first occasion of this palm flowering in the New World, and for its precocious development.

The President, Dr. Rendle, and Mr. W. Fawcett contributed further remarks.

Sir FRANK CRISP showed fresh specimens in flower of *Linnaea borealis* from his garden at Friar Park, Henley.

The General Secretary placed on the table for inspection, a living specimen of the rare and local orchid, *Ophrys aranifera*, received that morning from Mrs. Mann, of Temple Ewell Vicarage, near Dover; it had been procured from the neighbourhood of Folkestone.

The following paper was read:—

"A Contribution to our Knowledge of the Flora of Gazaland, an Account of Collections made by Mr. Swynnerton."
By Dr. A. B. RENDLE and others.

June 16th, 1910.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 2nd June, 1910, were read and confirmed.

Mr. Percy Alfred Talbot, B.A.(Oxon.), and Mr. Sydney Gross Paine were admitted Fellows.

Dr. Edward Hindle and Mr. Cuthbert St. John Nevill were proposed as Fellows.

Dr. Wilfred Eade Agar, M.A.(Cantab.), was elected a Fellow.

The President read a letter to Sir JOSEPH HOOKER, O.M., G.C.S.I., F.R.S., congratulating him on the approach of his 93rd birthday, which was signed by the Fellows present.

Prof. A. DENDY, Sec.L.S., on behalf of Mr. N. C. MACNAMARA, F.R.C.S., of Chorley Wood, Herts, showed a spike cut from a Foxglove grown from seed of a sport which appeared in 1907, in which the corolla was suppressed but the five divisions were represented as stamens, making nine in all, and this peculiarity comes true from seed.

Lantern-slides showing the original mutation and other descendants thereof were also shown; and a discussion followed, in which Dr. Stapf (who pointed out the frequency of monstrosities in *Digitalis purpurea*), Mr. J. C. Shenstone, Mr. Arthur W. Sutton, and the President engaged.

Mr. J. HOPKINSON showed under the microscope a slide by Dr. Penard, of Geneva, illustrating a peculiar method of reproduction in freshwater Rhizopoda, two specimens uniting to form a third of larger size than either, ultimately giving rise to spores.

The President remarked on the similarity between these Protozoa and such Conjugata as *Spirogyra* and *Mesocarpus*, showing that these lowly organisms should be studied by both botanists and zoologists.

Mr. P. A. TALBOT exhibited a large series of coloured drawings by Mrs. TALBOT of plants from Southern Nigeria, and displayed a map and photographs of the scenery. He described the country as very hilly and densely wooded.

"These photographs are of the Kwa River and give some idea of the beauty and density of the vegetation, but none of the glory of colouring or variety of the multitudes of flowers. Right down to the water's edge grow giant arums, green on the outer sheath, but cream splashed with purple within. Behind these spring trees of every shape and tint, from mimosas, with their delicate mauve or cream balls and feathery foliage, to the huge trumpet-shaped flowers of *Gardenia physophylla*, and the heavily scented purple-splashed blooms of *G. Kalbreyeri*, or the great *Berlinia*, the white flowers of which shine with a pearl-like lustre from amid its dim dark leaves.

About this river lies the boundary between the sedimentary deposits below and the crystalline rocks above. The line of demarcation runs along this parallel to the Akwa Yafe on the German Border, and the Calabar River on the other side. By far the greater part of the District therefore is composed of metamorphic rocks in which gneiss predominates.

The photographs show the density of the bush through which the roads lead. Perhaps the most striking feature of all in these ancient forests is the hurry shown by all trees to reach the light, above the thick undergrowth.

Perhaps the tallest of all the bush giants are the silk-cotton trees. It is difficult to get a good photograph of these owing to the density of the surrounding bush, which would have to be cleared for a great way before a picture could be taken. The photograph is of a comparatively poor specimen, which stood on the edge of a clearing. It is only about 150 feet high. The man standing at the base was the tallest carrier available, a man well over 6 feet. These trees are often 200 to 250 feet high, and have a girth of over 80 feet.

Another photograph shows the source of the Calabar River. It was on the slope of a hill near by that a *Napoleona* was discovered, which is not only a new species, but which shows an inflorescence hitherto unknown in this interesting genus. Altogether, four new *Napoleonas* have been brought home—thus adding half as many again to those already known. The second, with the consent of the courteous authorities at the Natural History Museum, has been named after my friend and former leader, Boyd Alexander, who was murdered on April 2nd in Central Africa.

Altogether over fifty specimens of cauliflorous trees were discovered in the District. Detailed drawings of all these were made, but unfortunately many of the actual specimens were ruined by climatic conditions or lost in transit. This number only represents a small proportion of those to be found. I hope to bring back at least double the number on my next tour.

Of the Balanophoraceæ, five species have been brought home. The *Gardenias* of the district are specially striking in the size and beauty of their flowers. The fruits of most of them afford excellent black dyes, some of which are at present being tested at the Imperial Institute, and also a new fibre, made from an epiphytic *Arum*, which I forwarded with them.

Two kinds of *Geasters* were found in the District. These are the first of this genus discovered in Africa. The specimens are in England, but have been temporarily mislaid. Altogether over a thousand drawings were made in the course of the year."

Dr. Rendle, Dr. Stapf, Mr. E. G. Baker, and Mr. J. Hopkinson discussed the exhibition, and Mr. P. A. Talbot replied.

Dr. STAPF showed a selection of Arctic specimens collected by Capt. Bartlett during the last Peary Expedition, on Ellesmere Island, between 82° and 83° N. latitude, describing them as some of the most northerly botanical specimens extant.

Mr. A. W. HILL showed a specimen in spirit of a barren stem of *Equisetum Telmateia*, Ehrh., in which about half of the nodes

disappeared in a spiral arrangement; it had been sent by Dr. H. Drinkwater, F.L.S., of Wrexham.

Dr. Rendle made a few remarks on this phenomenon.

The following paper was read:—

“Male Sterility in Potatoes, a dominant Mendelian character; with Remarks on the Shape of the Pollen in Wild and Domestic Varieties.” By Dr. R. N. SALAMAN. (Communicated by Mr. A. W. SUTTON, F.L.S.)

ADDITIONS AND DONATIONS

TO THE

LIBRARY.

1909-1910.

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- Alcock** (*Alfred William*). Catalogue of the Indian Decapod Crustacea in the Collection of the Indian Museum. Part I. Brachyura. Fasc. ii. The Indian Freshwater Crabs (*Potamonidae*). Pp. 135; plates 14. 4to. *Calcutta*, 1910.
- Allis** (*Edward Phelps, jr.*). The Cranial Anatomie of the Mail-Cheeked Fishes. Pp. iii, 219; mit 8 Doppel-Tafeln. (Zoologica, Bd. 22, Heft 57.) 4to. *Stuttgart*, 1909.
- Ameghino** (*Florentino*). Examen critique du Mémoire de M. OÜTES sur les Scories et les Terres cuites. Pp. 56. (An. Mus. Nac. Buenos Aires, xx. pp. 459-512.) Roy. 8vo. *Buenos Aires*, 1909.
- L'avant-première dentition dans le Tapir. Pp. 30, tab. 4. Roy. 8vo. *Buenos Aires*, 1900.
- Una nueva especie de Tapir (*Tapirus Spegazzinii*, n. sp.). Pp. 8; tab. 4. (An. Mus. Nac. Buenos Aires, xx. pp. 31-38.) Roy. 8vo. *Buenos Aires*, 1909.
- Énumération chronologique et critique des notices sur les terres cuites et les scories anthropiques des Terrains sédimentaires néogènes de l'Argentine parcos jusqu'à la fin de l'année 1907. Pp. 42. (An. Mus. Nac. Buenos Aires, xx. pp. 39-80.) Roy. 8vo. *Buenos Aires*, 1909.
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- Amphlett** (*John*) and **Rea** (*Carleton*). The Botany of Worcester-shire. The Mosses and Hepatics contributed by JAMES EUSTACE BAGNALL. Pp. xxxiii, 651, and map. 8vo. *Birmingham*, 1909.

- Appelöf (Adolf).** Untersuchungen über den Hummer, mit besonderer Berücksichtigung seines Auftretens an den Norwegischen Küsten. (Bergens Mus. Skr., Ny Række I.) Pp. 79; plates 3. 4to. *Bergen*, 1909.
- Arrow (G. J.).** See **Blanford (W. T.).** The Fauna of British India, including Ceylon and Burma. Coleoptera—Lamellicornia (Cetoniinae and Dynastinae). 8vo. 1910.
- Audigé (J.).** Contribution à l'étude des reins de Poissons Téléostéens. (Arch. Zool. exp. &c., 5^e sér. t. iv. pp. 275–624; pls. 17, figs. 1–104.) 8vo. *Paris*, 1910.
- Bagnall (James Eustace).** See **Amphlett (John).** The Botany of Worcestershire—Mosses and Hepatics. Pp. xxxiii, 651, and map. 8vo. 1909.
- Bailey (Frederick Manson).** Contributions to the Flora of Queensland and British New Guinea. (Queensl. Agric. Journ. xxiii. parts 1, 3, 4, 5.) 8vo. *Brisbane*, 1909. Author.
- Baker.** See **Clinton-Baker (H.).**
- Balfour (Isaac Bayley).** See **Warming (Johannes Eugenius Bülow).** Oecology of Plants. 8vo. 1909.
- Bateman (James).** The Orchidaceæ of Mexico and Guatemala. Pp. [viii] 12 [4]; 40 col. plates with descriptive letterpress. Fol. London [1837–43]. **F. Du Cane Godman.**
- Beissner (L.).** Handbuch der Nadelholzkunde. Systematik, Beschreibung, Verwendung und Kultur der Ginkgoaceen, Freiland-Coniferen und Gnetaceen. Zweite, völlig umgearbeitete, vermehrte und verbesserte Auflage. Pp. xxi, 742. Mit 165 nach der Natur gezeichneten Originalabbildungen. 8vo. *Berlin*, 1909.
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Band XVI. Heft 72. FOCKE (WILHELM OLBERS). Species Ruborum. Monographiae generis Rubi Prodrumus. Pars I. Pp. 120; figs. 53. 1910.

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1861.

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1862.

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1863.

Subscription portrait of John Joseph Bennett, by E. U. Eddis.

1864.

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1865.

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1867.

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1869.

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1875.

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1878.

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Philip Henry Gosse, Esq.: towards cost of illustrating his paper, £25.

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1888.

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1889.

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1890.

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

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 Royal Society: Third and final grant towards 'Biscayan Plankton,' £50.
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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.

[With the gifts received in 1888, the Society now possesses the gold watch and chain formerly belonging to Robert Brown, with the watch-key, amethyst signet engraved R. B., cornelian signet engraved J. D. = Jonas Dryander, and cornelian seal, with Linnean bust engraved after C. F. Inlander by William (?) Tassie.]

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The following Councillors retired at the Anniversary Meeting,
24th May, 1910 :—

L. A. BOODLE, Esq., R. I. POCKOCK, Esq., Lieut.-Col. PRIN,
Miss ETHEL SARGANT, and Prof. A. C. SEWARD.

PROCEEDINGS
OF THE
LINNEAN SOCIETY OF LONDON.



123RD SESSION.

FROM NOVEMBER 1910 TO JUNE 1911.

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Journal (Botany), No. 272, 18th Oct., 1910.
 „ (Zoology), No. 202, 20th Oct., 1910.
 „ 211, 20th July, 1910.

Transactions (2nd Ser.) Botany, Vol. VII. Part	xv., Oct. 1910.
„ (2nd Ser.) Zoology, Vol. X. Part	x., June 1911.
Vol. XI. „	vi., Dec. 1910.
„	vii., Dec. 1910.
Vol. XIII. „	iv., Nov. 1910.
Vol. XIV. „	i., Nov. 1910.

Proceedings, 122nd Session, from November 1909 to June 1910 :
 October 1910.

List of [Fellows, Associates, and Foreign Members], 1910-1911.

PROCEEDINGS
OF THE
LINNEAN SOCIETY OF LONDON.

(ONE HUNDRED AND TWENTY-THIRD SESSION,
1910-1911.)

November 3rd, 1910.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 16th June, 1910, were read and confirmed.

Mr. Hugh Broughton was admitted a Fellow.

Mr. Anthony Belt and Prof. Edward Alfred Minchin, M.A. (Oxon.), were elected Fellows.

Miss Madelaine Carson, M.Sc., Mr. Jules Augustin de Gaye, Mr. Thomas Bennett Goodall, F.R.C.V.S., Mr. Francis Cecil Hudson, Mr. Norman Miller Johnson, Miss Eleanor Mary Evered Parsons, Lient.-Col. Simpson Powell, M.D. (Durh.), and Mr. Harold Stuart Thompson, were proposed as Fellows.

The following letter addressed to the General Secretary was read from the Chair :—

Marlborough House,
Pall Mall, S.W.,
18th July, 1910.

DEAR SIR,

I am commanded by The King to inform you that His Majesty is graciously pleased to become Patron of the Linnean Society of London.

Yours faithfully,
(Signed) W. H. P. CARINGTON,

The deaths of Dr. Melchior Treub, Foreign Member, of Samuel Alexander Stewart and Edward Geirard, Associates, were announced.

The following papers were read and discussed :—

1. Prof. W. A. HERDMAN, F.R.S., F.L.S.—A Comparison of the Summer Plankton on the West Coast of Scotland with that in the Irish Sea.
2. Mr. J. C. F. FRYER.—The Structure and Formation of Aldabra and neighbouring Islands, with notes on their Flora and Fauna. (Communicated by Prof. J. STANLEY GARDINER, F.R.S., F.L.S.)
3. Mr. H. B. BIGELOW.—On the Siphonophora of the 'Research' Biscayan Plankton. (Communicated by Dr. G. HERBERT FOWLER, F.L.S.)

November 17th, 1910.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 3rd November, 1910, were read and confirmed.

Dr. Edward Hindle and Mr. Cuthbert St. John Nevill were elected Fellows.

The Rev. Manoah Holland and Mr. Hugh Godfrey Mundy were proposed as Fellows, and Mr. Arthur Bennett and Mr. William Cole were proposed as Associates.

Mr. W. C. WORSDELL, F.L.S., exhibited specimens of Maize showing androgynous inflorescences, from Pretoria, South Africa; Dr. Stapf spoke on the probable derivation of *Zea Mays* from a species of *Euchlæna*. Mr. Worsdell also showed the model of a native tortoise carved from some unknown wood, which had been riddled by a wood-boring beetle in Cape Town, identified as *Botrychoplites cornutus*, Oliv.

Prof. J. W. H. TRAIL, F.R.S., F.L.S., exhibited specimens and a lantern-slide of a remarkable form of *Rubus Idæus*, distributed over a considerable district in Aberdeenshire, in which the normal number of leaflets was increased by an extra basal pair, approaching the leaf of the Suberecti group of fruticose *Rubi*.

A discussion followed in which Prof. Henslow, Mr. Henry Groves, and the President took part.

The General Secretary showed a monstrous pear, similar to those figured by Dr. Masters in his 'Vegetable Teratology,' which had been picked up under a pear-tree in a Holloway garden by Mr. A. H. Williams. Prof. Henslow and Mr. Worsdell remarked upon the frequency of this monstrosity and its probable origin.

The following papers were read and discussed :—

1. Prof. G. HENSLow, F.L.S.—A Theoretical Origin of *Plantago maritima*, L. and *P. alpina*, L. from *P. Coronopus*, L. Vars.
2. ——— A Theoretical Origin of Monocotyledons from Aquatic Dicotyledons, through Self-Adaptation to an Aquatic Habit—Being Supplementary Observations to a previous paper (Journ. Linn. Soc., Bot. xxix. (1892) p. 485).

December 1st, 1910.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 17th November, 1910, were read and confirmed.

Miss Ida Margaret Hayward and Mr. Cuthbert St. John Nevill, were admitted Fellows.

Miss Madelaine Carson, M.Sc., Mr. Jules Augustin de Gaye, Mr. Thomas Bennett Goodall, F.R.C.V.S., Mr. Francis Cecil Hudson, Mr. Norman Miller Johnson, Miss Eleanor Mary Evered Parsons, Lieut.-Col. Simpson Powell, M.D. (Durh.), and Mr. Harold Stuart Thompson, were elected Fellows.

Mr. G. CLARIDGE DRUCE exhibited *Utricularia ochroleuca*, Hartm., and *U. Bremii*, Heer, new records from Ireland, with *Arabis alpina*, Linn., and *Chærophyllum aureum*, Linn., from Scotland, the latter two in confirmation of George Don's statements, which had been doubted during the last century.

A discussion followed, the participants being Mr. Clement Reid, Mr. E. M. Holmes, and Mr. Henry Groves, Mr. Druce briefly replying.

Miss IDA M. HAYWARD exhibited 18 alien plants selected from about 200, which had been noted by the side of the river Tweed, and its tributary the Gala. (See p. 48.)

The following paper was read and discussed :—

Capt. C. F. U. MEEK, F.L.S.—The Spermatogenesis of *Stenobothrus viridulus*, with special reference to the Heterotropic Chromosome as a sex determinant in Grasshoppers.

December 15th, 1910.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 1st December, 1910, were read and confirmed.

Prof. William Bateson, M.A., F.R.S., Miss Madelaine Carson, Miss Eleanor Mary Evered Parsons, and Mr. Henry Smith Holden, B.Sc., were admitted Fellows.

The Rev. Manoah Holland and Mr. Hugh Godfrey Mundy were elected Fellows; and Mr. Arthur Bennett and Mr. William Cole were elected Associates.

Miss BEATRICE O. CORFE exhibited a portfolio of drawings in water-colour, natural size, of about 250 wild flowers, chiefly from the neighbourhood of Winchester. For some years she had studied flowers as an artist and lover of Nature, to whom plant-growth and blossom had a great attraction from the variety of form and colour displayed.

Additional observations were contributed by the President, Mr. H. J. Elwes, Mr. E. M. Holmes, Prof. Dendy, Mr. J. C. Shenstone, and the Rev. T. R. R. Stebbing, expressive of admiration for these successful representations of the natural forms and colours of the native flora, and a preference for an artistic rather than a photographic record of plant-life.

Dr. STAFF then brought forward the reports on the International Congress of Botanists at Brussels (see p. 51).

Dr. Staff having concluded, an animated discussion followed, in which the following engaged:—The President, Prof. Dendy, Mr. H. J. Elwes, Mr. Augustin Henry, the General Secretary, Mr. H. N. Dixon, and the Rev. T. R. R. Stebbing; Dr. Staff briefly replying.

The following papers were read and discussed:—

1. Mr. R. W. H. ROW, B.Sc., F.L.S.—Non-calcareous Sponges from the Red Sea, collected by Mr. Cyril Crossland, F.L.S.
2. Mr. R. S. ADAMSON.—Notes on the Comparative Anatomy of the Leaves of certain Species of *Veronica*. (Communicated by Mr. A. G. TANSLEY, F.L.S.)

January 19th, 1911.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 15th December, 1910, were read and confirmed.

The Rev. Manoah Holland and Prof. Edward Alfred Minchin, M.A., were admitted Fellows.

The President alluded to the great loss biological science has sustained in the death of Sir FRANCIS GALTON, F.R.S., on the previous day, and stated that although not a Fellow of the Society, he had often been at our Meetings, and was closely associated with us as one of the recipients of the Darwin-Wallace Medal on the 1st July, 1908.

Miss BEATRICE O. CORFE exhibited some trays of Lepidoptera and other insects received from her brother, Mr. Charles Corfe, living at Toronto. Amongst these local insects were some equally common in Great Britain and Canada, as the Red Admiral (*Vanessa Atalanta*) and a local variety of the Large Tortoiseshell (*V. polychloros*). Others, as the Camberwell Beauty, *Vanessa Antiopa*, common in Canada, are extremely rare in the United Kingdom, and still others, as many of the various Swallowtails, are absent from our fauna. Many of these insects were caught at the street lamps.

Prof. DENDY and Mr. G. E. NICHOLLS exhibited a series of lantern-slides illustrating the structure and relations of the Sub-Commissural Organ and Reissner's Fibre in various vertebrate types; the slides were described by Prof. Dendy, and Mr. Nicholls gave a brief account of some experiments which he had made which so far seemed to support the view that these organs constitute an apparatus for automatically regulating the flexure of the long axis of the body.

Mr. F. N. Williams, Dr. Rendle, Prof. Minchin, and Dr. Lilian Veley discussed the points raised by the exhibition, and Prof. Dendy replied.

The Rev. R. A. BULLEN exhibited specimens of *Bythinella padiraci*, Locard, and *Niphargus plateaui*, Chevreux, from an underground river in Southern Central France. The Rev. T. R. R. Stebbing added some observations to the foregoing.

The following papers were read and discussed :—

1. Mr. C. H. WRIGHT, A.L.S.—The Flora of the Falkland Islands.

2. Mr. CYRIL CROSSLAND, F.L.S.—A Physical Description of Khor Dongonab, Red Sea.
3. Mr. ROWLAND E. TURNER.—On the Fossorial Hymenoptera of the Indian Ocean. (Communicated by Prof. J. STANLEY GARDINER, F.R.S., F.L.S., with the four following.)
4. Prof. J. J. KIEFFER.—The Cecidomyiidae of the Seychelles.
5. ——— The Chironomidae of the Seychelles.
6. Dr. K. KERTÉSZ.—The Stratiomyidae of the Seychelles.
7. Mr. E. MEYRICK, F.R.S.—The Tortricina and Tineina of the Seychelles and Aldabra.

February 2nd, 1911.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 19th January, 1911, were read and confirmed.

The GENERAL SECRETARY showed a series of lantern-slides, (1) explaining the genesis of the portrait of Carl von Linné, painted by Alexander Roslin, and the various copies, including the original three-quarter-length portrait now at Versailles, though in a somewhat poor condition; and (2) showing that the Lapland drum in the Hoffman portrait and on the lap of the foreground figure in the engraved title-page of the 'Flora lapponica' is a magic drum, and not a botanic press. (See abstract on pp. 56-61.)

Dr. Young asked a question about the reversal of the Bervie print, to which Dr. Daydon Jackson replied.

Dr. OTTO STAFF, F.R.S., Sec.L.S., showed specimens and a lantern-slide of *Digitaria didactyla*, Willd., from Sydney, where it has recently been used with fair success in making lawns.

Mr. A. W. Sutton, F.L.S., stated:—"It is almost a universal custom throughout the Continent—that is, in France, Germany, Switzerland, and Italy—to make their garden lawns fresh every year by sowing Perennial Rye Grass (*Lolium perenne*) exclusively, or almost exclusively, as, owing to the heat and drought often experienced, it is impossible to use those finer grasses in mixture which are the essential feature of English lawns. Consequently the *Digitaria didactyla* exhibited may prove of greater value on the Continent than in England."

Rev. T. R. R. Stebbing asked what gave the green colour in the spring in the Nile Valley, when Mr. Sutton replied that it was wholly due to young corn, along the river-side and canals.

The following papers were read and discussed:—

1. Fleet-Surgeon MATTHEW, M.B., F.L.S.—Enumeration of Chinese Ferns.
2. Mr. S. T. DUNN, F.L.S., showed a series of lantern-slides from photographic snap-shots during his journey in Central Fokien, described on the 6th February, 1908, before this Society. He also showed some specimens of bamboo-rope, the species of which had not yet been identified, used on the rivers of that province, which he had procured for the Museum at Kew.
3. ——— Supplementary List of Chinese Flowering-Plants, in continuation of the List in the Society's Journal (Botany), vol. xxxvi., and extending from 1904 to 1910.
4. Mr. W. RICKATSON DYKES (a visitor) showed a series of autochrome photographs on the screen of various Indian and Chinese species of *Iris* in his garden.
5. Mr. S. T. DUNN, F.L.S.—A Revision of the Genus *Actinidia*, Lindl.

February 16th, 1911.

II. W. MONCKTON, Esq., Treasurer & V.-P., in the Chair.

The Minutes of the General Meeting of the 2nd February, 1911, were read and confirmed.

Miss Freda Bage, M.Sc., Mr. Ralph Evelyn Drake-Brockman, M.R.C.S., L.R.C.P., Mr. Moore Betty Fullerton, and Mr. Charles David Soar, F.R.M.S., were proposed as Fellows.

The Vice-President announced from the Chair that there were now seven vacancies in the List of Foreign Members.

Prof. DENDY, F.R.S., Sec.L.S., showed three lantern-slides of some remarkable growth-forms in sponges, and exhibited a singular horny sponge collected by him in New Zealand, which has not yet been described.

The Rev. T. R. R. Stebbing referred to some curious sponges in a collection possessed by him, and Prof. Dendy replied.

The following papers were read and discussed:—

1. Mrs. L. J. WILSMORE.—On some Hexactiniae from New South Wales. (Communicated by Prof. J. P. HILL, F.L.S.)
2. Rev. Canon NORMAN, F.R.S., F.L.S.—Three Species of Harpacticid Copepoda.

3. Mr. A. S. HIRST.—Report on the Araneæ, Opiliones, and Pseudoscorpiones from the Seychelles. (Communicated, with two following, by Prof. J. STANLEY GARDINER, F.R.S., F.L.S.)
4. Mr. G. A. BOULENGER, F.R.S.—List of the Batrachians and Reptiles obtained by Prof. Stanley Gardiner on his Second Expedition to the Seychelles and Aldabra.
5. Miss MARY JANE RATHBUN.—On the Marine Brachyura from the Indian Ocean collected in 1905.

March 2nd, 1911.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 16th February, 1911, were read and confirmed.

Mr. George Herbert Wailes was proposed as a Fellow, and Dr. Hans Driesch, Prof. Richard von Hertwig, Geh.-Hofrat Prof. Georg Klebs, Prof. Sergej Gawrilowitsch Nawaschin, Dr. Eugène Penard, Prof. Johann Wilhelm Spengel, and Prof. Edmund Beecher Wilson as Foreign Members.

Mr. C. E. SALMON showed British specimens of *Lepidium neglectum*, Thell., and *L. densiflorum*, Schrad. Mr. F. N. Williams, Mr. E. G. Baker, and Dr. O. Stapf discussed the probable origin of these forms, and Mr. Salmon replied.

Mr. E. M. HOLMES showed a specimen of *Griffithsia globifera*, J. Ag., from Milford Haven; Mr. Cotton remarked upon the spread of some of these alien algæ in our waters.

Mr. H. W. MONCKTON, Treas. & V.-P., showed a series of lantern-slides from photographs taken during his visit last autumn to Sweden as a delegate on behalf of the Society to the International Congress of Geologists, especially those taken at Uppsala, some of which showed places connected with Carl von Linné, including a front view of his house in the old Botanic Garden.

Mr. H. R. Darlington commented on the modern use in Sweden of the German prefix "von."

The General Secretary then showed a supplementary series of lantern-slides, chiefly from old prints, concerning the history of the old botanic garden. He stated that when Linné and Rosén had exchanged Chairs in January 1742, and the former had thereby become prefect of the garden, he took immediate steps to rearrange the garden, provide glass-houses, and rebuild the house attached, which belonged to the prefect. The last slide showed the old poplar close to the entrance, the only specimen which can be regarded as coeval with Linné, inasmuch as the laurels and a few other veterans had been transported to the new botanic garden early in the nineteenth century.

Dr. A. Strahan, F.R.S. (visitor), Mr. H. N. Dixon, Dr. A. P. Young, and Dr. James Murie joined in the discussion which ensued upon the whole exhibition.

Mr. JOHN HOPKINSON then showed thirty slides taken about the same time as those of his co-delegate, but from a different line of country; he also showed specimens of rock from Omberg and Kinnekulle.

The General Secretary alluded to the profile of Kinnekulle, published by Linné in his 'Wästgöta resa' in 1747, and specially alluded to by Prof. A. G. Nathorst in his 'Linné såsom geolog' which came out in 1907.

The following papers were read and discussed:—

1. Dr. MALCOLM BURR, F.L.S.—Dermaptera (Earwigs) preserved in Amber.
2. Miss LAURA ROSCOE THORNELY.—Report on the Marine Polyzoa of the Collection made by Mr. J. Stanley Gardiner, in the Indian Ocean, in H.M.S. 'Sealark' during 1905. (Communicated by Prof. J. S. GARDINER, F.R.S., F.L.S.)
3. Rev. T. R. R. STEBBING, F.R.S., F.L.S.—The terms Polyzoa and Bryozoa. (See Abstract, p. 61.)
4. Mr. W. M. TATTERSALL.—On the Nysidacea and Euphausiacea collected in the Indian Ocean during 1905. (Communicated by Prof. J. STANLEY GARDINER, F.R.S., F.L.S.)

March 16th, 1911.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 2nd March, 1911, were read and confirmed.

Mr. Anthony Belt and Dr. Edward Hindle were admitted Fellows.

Miss Freda Bage, M.Sc., Mr. Ralph Evelyn Drake-Brockman, M.R.C.S., L.R.C.P., Mr. Moore Betty Fullerton, and Mr. Charles David Soar, F.R.M.S., were elected Fellows.

Prof. A. DENDY, F.R.S., Sec.L.S., read a communication from Prof. W. A. HERDMAN, F.R.S., combating the statement regarding the use of the term "Polyzoa" made by the Rev. T. R. R. Stebbing at the last meeting; on the suggestion of Mr. Stebbing the discussion was postponed to another Meeting. (See Abstract, p. 62.)

Mrs. D. H. SCOTT gave a lantern exhibition of new species of the fossil genus *Traquairia*. She also exhibited the original diagram made by Dr. W. Carruthers, F.R.S., who first described the genus at a meeting of the British Association in 1872, in a paper entitled "*Traquairia*, a Radiolarian Rhizopod from the Coal-Measures."

Count Solms-Laubach, Professors Schenk, Strassburger, and Zeiller, considered it comparable to the massulæ or sporocarps of *Azolla*. Prof. Williamson (Phil. Trans. 1880) thought it the spore of a Cryptogam. He found a group of three *Traquairiæ* in a sporangium of *Lepidostrobus*, and thought them three megaspores of a tetrad. The true megaspores are, however, now well known.

Mrs. Scott defined *Traquairia* thus:—" *Traquairia* is a spherical organism, consisting of two parts each surrounded by a sharply defined membrane—an inner capsule, often containing spores, and an outer part, which is surrounded by a thick gelatinous envelope. In this are embedded numerous hollow spines. The apparent bases of these spines are produced into hollow anastomosing tubes, which spread over the surface of the sphere, forming a complicated network. The spines are hollow and are perforated in every direction by projecting tubular pores. Emanating from these pores are delicate threads which appear to lose themselves in the gelatinous envelope. Sometimes the threads form a regular network in it. The inner capsule, a definite brown membrane, can only be observed in the more perfectly preserved specimens. Spores are generally present, which appear to produce small spores. *Traquairiæ* occur in groups in the decayed wood of *Lepidodendron* and other plants."

She then exhibited *T. Carruthersii*, *T. Spenceri*, sp. nov., *T. burntislandica*, sp. nov., and *T. stellata*, sp. nov., and a species of an allied genus, *Sporocarpon elegans*. The most characteristic feature in the organisms described is the very complicated structure of the outer envelope with its elaborate system of anastomosing tubes connected with prominent spines, which are themselves very complex organs. Nothing parallel to this is known in the vegetable world.

The presence of an "inner capsule" containing spores, in the interior of which small spores are produced, is reminiscent of Radiolarians. These features are also common to *Sporocarpon elegans*, which with its long spines is very much like a Radiolarian.

A discussion followed in which Dr. G. J. Hinde, F.R.S. (visitor), Prof. Dendy, Rev. T. R. R. Stebbing, Prof. F. W. Oliver, and the President took part.

The following paper was read and discussed:—

Mr. R. S. ADAMSON, M.A.—An Ecological Study of a Cambridgeshire Woodland. (Communicated by Mr. A. G. TANSLEY, F.L.S.)

April 6th, 1911.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 16th March, 1911, were read and confirmed.

Mr. Norman Miller Johnson and Mr. Moore Betty Fullerton were admitted Fellows.

Mr. George Herbert Wailes was elected a Fellow.

The Rev. Hilderic Friend, Miss Ann Cronin Haket, Mr. Ernest Lee, A.R.C.S., Mr. John Coney Moulton, Mr. Frederick John Freshwater Shaw, B.Sc., and Mr. Malcolm Wilson, B.Sc., were proposed as Fellows.

The following Auditors were recommended by the Council, and were, by show of hands, elected :—For the Council, Prof. Dendy and Dr. A. B. Rendle; for the Fellows, Mr. Henry Groves and Mr. Hamilton Druce.

The President announced that the Council had selected Count HERMANN ZU SOLMS-LAUBACH to receive the Linnean Medal.

The following papers were read and discussed :—

1. Miss SARAH M. BAKER, B.Sc.—On the Brown Seaweeds of the Salt-Marsh. (Communicated by Prof. F. W. OLIVER, F.R.S., F.L.S.)
2. Dr. C. E. MOSS, Mr. E. G. SALISBURY, F.L.S., and Dr. ETHEL DE FRAINE, F.L.S.—On the Genus *Salicornia*; its History, Character, and Anatomy.

May 4th, 1911.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair,
afterwards Prof. POULTON, F.R.S., V.-P.

The Minutes of the General Meeting of the 6th April, 1911, were read and confirmed.

Mr. Jules Augustin de Gaye and Mr. Charles David Soar were admitted Fellows.

Mr. Frederick Eyles, Mr. John Graham Murray, and Mr. Charles Waterfall were proposed as Fellows.

Dr. Hans Driesch, Prof. Richard von Hertwig, Gen.-Hofrat Prof. Georg Klebs, Prof. Sergej Gawrilowitsch Nawaschin, Dr. Eugène Penard, Prof. Johann Wilhelm Spengel, and Prof. Edmund Beecher Wilson, were elected Foreign Members.

The following papers were read and discussed:—

1. The Rev. T. R. R. STEBBING, F.R.S., F.L.S.—On John Vaughan Thompson and his Polyzoa, and on *Vaunthompsonia*, a genus of Sympoda. (See Abstract, p. 64.)
2. Prof. SYDNEY J. HICKSON, F.R.S.—On *Polytrema* and some allied genera. (Communicated by Prof. J. STANLEY GARDINER, F.R.S., F.L.S.)
3. Mr. J. M. BROWN, B.Sc., F.L.S.—Observations on some new and little-known British Rhizopods.
4. Mr. R. SHELFORD, F.L.S.—The British Museum collection of Blattidæ enclosed in Amber.
5. Dr. F. E. FRITSCH, F.L.S.—Freshwater Algæ collected in the South Orkneys by Mr. R. N. R. Brown.

May 24th, 1911.

Anniversary Meeting.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 4th May were read and confirmed.

Mr. William Neilson Jones, M.A. (Cantab.), was proposed as a Fellow.

The Treasurer then laid his Annual Statement of Accounts before the Meeting, which, after observations by Mr. Alfred W. Oke, Sir Frank Crisp, Lt.-Col. Prain, and Mr. John Hopkinson, was received and adopted (see pp. 14 & 15).

The General Secretary laid his Annual Report before the Meeting, thus:—

Since the last Anniversary 15 Fellows had died, or their deaths been ascertained, viz.:—

Fellows (15).

Thomas Hodgson Archer-Hind.	John Hinchley Hart.
Richard Henry Beddome.	Frederick Hovenden.
James Bisset.	Simpson Powell.
John Bennett Carruthers.	Harry Sanford-Burton.
William Ambrose Clarke.	Francis Lesiter Soper.
Thomas Walker Coffin.	Robert Boog Watson.
Theodore Cooke.	William Dickenson Wickes.
Alfred Russell Fox.	

Associates (2).

Edward Gerrard.

| Samuel Alexander Stewart.

Foreign Members (2).

Melchior Treub.

| Charles Otis Whitman.

Fellows withdrawn (9).

Charles Crossland.

Louis Charles Deverell.

Ernest John Lewis.

Arthur Thomas Masterman.

Edward Archibald Smith.

| Henry Aldwin Soames.

| Ernest Ruthven Sykes.

| Charles Edward Walker.

| Amandus H. C. Zietz.

Whilst 25 Fellows, all of whom had qualified, 2 Associates, and 7 Foreign Members have been elected. One Fellow has, by election, been transferred to the list of Associates.

The Librarian's report was submitted as follows:—

During the past year there have been received as Donations from private individuals 87 volumes and 192 pamphlets.

From the various Universities, Academies, and Scientific Societies, there have been received in exchange and otherwise 319 volumes and 128 detached parts, besides 57 volumes and 29 parts obtained in exchange and as donations from the editors and proprietors of independent periodicals.

The Council at the recommendation of the Library Committee have sanctioned the purchase of 198 volumes and 81 parts of important books.

The total additions to the Library are therefore 661 volumes and 430 separate parts.

The number of books bound during the year is as follows:—
In full-morocco 3, in half-morocco 234, in half-calf 4, in full-cloth 433, in vellum 88, in buckram 30, in boards and half-cloth 12. Relabelled (half-morocco and cloth back) 30. Total 834 volumes.

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 and Officers.

The Ballot for the Council having been closed, the President nominated Mr. Clement Reid, the Rev. T. R. R. Stebbing, and

TREASURER'S ACCOUNT FOR THE YEAR ENDING APRIL 30TH, 1911.
(Presented at the Anniversary Meeting, May 24th, 1911.)

Receipts and Payments of the Linnean Society from May 1st, 1910, to April 30th, 1911.

<i>Receipts.</i>		<i>Payments.</i>	
	£ s. d.		£ s. d.
Balance at Bankers on 1st May, 1910	£218 16 4	Taxes and Insurance	10 18 9
Less separate account	32 14 11	Repairs and Furniture	77 17 10
Interest on Investments	—	Coal, Electric Current and Gas	37 7 0
Admission Fees	236 0 3	Salaries	784 10 6
Annual Contributions	162 0 0	Library:—	
Compositions	1575 0 0	Books	£174 13 6
Sales of Publications:—	75 0 0	Binding	123 7 9
Transactions	£139 15 7		—
Journals	88 0 4	Expenses of Publications:—	
Proceedings and Catalogues	2 17 9	Printing	£550 18 0
	—	Illustrations	239 19 11
Miscellaneous Receipts	230 13 8	Distribution	32 15 4
Donations in aid of Publications	9 4 6		—
	305 1 6	Miscellaneous Printing and Stationery	823 13 3
		Petty Expenses (including Tea and Postage)	96 13 11
		Linnean Medal	91 0 3
		Investment of Compositions (£100 Midland 2½ Pref. Stock)	15 0 0
		Balance at Bankers, 30th April, 1911	£348 14 8
		Receipts not paid in	128 6 9
			—
			477 1 5
			—
			£2779 1 4

Separate Funds Account.

	£	s.	d.		£	s.	d.
To Balance at Bankers, May 1st, 1910 :—				By Trail Award			
Westwood Fund	£16	8	11	„ Purchase of £252 18s. 0d. Consols 2½ % on account			15 15 0
Trail Fund ..	16	6	0	of Sir F. Crisp's donation.....			200 0 0
				„ Balance at Bankers :—			
Donation from Sir F. Crisp for Special Award				Westwood Fund	£23	8	3
„ Interest on Investments :—				Trail Award	4	1	0
Westwood Fund	£6	19	4	Crisp Award	2	19	6
Trail Award	3	10	0				
Crisp Award	2	19	6				
							30 8 9
	</						

Investments on April 30th, 1911.

	£	s.	d.		£	s.	d.
Metropolitan 3½ per cent.	1079	11	3	@ 101	1090	7	2
Great Indian Peninsula Railway, Annuity Class B	42	1	5	@ 20¾	872	19	4
North Bridge Railway 4 per cent. Stock	450	0	0	@ 107	481	10	0
Metropolitan 3 per cent.	1000	0	0	@ 91	910	0	0
India 3 per cent.	975	0	0	@ 83	809	5	0
Eastern Bengal Railway 4 per cent. Debenture Stock	1000	0	0	@ 106	1060	0	0
Great Western Railway 4 per cent.	1000	0	0	@ 111	1110	0	0
Midland Railway 2½ per cent. Pref. Stock	300	0	0	@ 66¾	200	5	0
Metropolitan Water Board 3 per cent. Stock "B" (Westwood Fund)	232	5	0	@ 85½	198	11	6
New South Wales 3½ per cent. Stock (Trail Award Fund)	100	0	0	@ 98¾	98	10	0
Consols 2½ per cent. (Crisp Award Fund).....	252	18	0	@ 81¼	205	9	4
					<u>£7036</u>	<u>17</u>	<u>4</u>

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, 1911, and found the above statement correct. We call attention to the fact that receipts to the amount of £128 6s. 9d. have not been paid into the Bank, and the matter is the subject of investigation.

D. H. SCOTT, H. GROVES,
A. B. RENDLE, OTTO STAPF,
ARTHUR DENDY, HAMILTON H. DRUCE, } *Auditors.*

W. B. KEEN, *Chartered Accountant.*

Mr. A. O. Walker, Scrutineers, who, having cast up the votes, reported to the President, who declared the result as follows:—

Prof. V. H. BLACKMAN, Sc.D.; HENRY BURY, M.A.; Sir FRANK CRISP; Prof. ARTHUR DENDY, D.Sc., F.R.S.; Prof. J. STANLEY GARDINER, F.R.S.; E. S. GOODRICH, F.R.S.; HENRY GROVES, Esq.; Prof. W. A. HERDMAN, F.R.S.; ARTHUR W. HILL, M.A.; Dr. B. DAYDON JACKSON; HORACE W. MONCKTON, F.G.S.; Prof. FRANCIS W. OLIVER, F.R.S.; Prof. E. B. POULTON, F.R.S.; Dr. A. B. RENDLE, F.R.S.; Dr. WALTER GEORGE RIDWOOD; Miss EDITH R. SAUNDERS; Dr. DUKINFIELD H. SCOTT, F.R.S.; Dr. OTTO STAFF, F.R.S.; Miss ETHEL N. THOMAS, B.Sc.; Dr. A. SMITH WOODWARD, F.R.S.

The Ballot for the Officers having been closed, the President appointed Mr. Clement Reid, the Rev. T. R. R. Stebbing, and Prof. G. S. Boulger, Scrutineers, who, having cast up the votes, reported to the President, who declared the result as follows:—

President: Dr. DUKINFIELD HENRY SCOTT, M.A., F.R.S.

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

Secretaries: Dr. B. DAYDON JACKSON,

Prof. A. DENDY, D.Sc., F.R.S.,

Dr. OTTO STAFF, F.R.S.

The President then delivered his Address:—

PRESIDENTIAL ADDRESS, 1911.

I HAVE lately had occasion to look into some of the older work on the structure of fossil plants, and it has occurred to me that a few notes on the subject might be of some general interest. The period referred to is that round about the year 1830—the period of Witham and Cotta and of the earlier work of Brongniart. It was an interesting time, when the study of fossil plants was first caught up in the flame of enthusiasm which then burnt so brightly for the young science of geology. It was practically a pre-evolution period, for though Lamarck had written, the influence of Cuvier was dominant; the evidence, however, was accumulating which ultimately formed the firmest basis of the theory of descent. In fossil botany in particular, the controversies which were soon to divide the French school from its neighbours had not yet sprung up, though Brongniart had already established his great and well merited authority in the science. If some of the opinions of that time strike us as crude and fantastic, we are just as often surprised at the greatness of the advance which had already been made and at the essential modernness of the point of view. Take the following, for example :—

“Everyone will readily admit that anatomical characters, those which relate to the intimate organisation of the plant, have more value than the external forms; it is to these characters, then, that one ought to attach the most importance when one is able to observe them; and when one cannot do so, one should seek to discover in the external form of organs, such modifications as may, so to speak, be the expression of the internal character, and may enable us to form an estimate of its modifications.

“The nutritive vessels, forming the framework which determines the relations of position and often even the form of organs, are evidently more important than the parenchyma which surrounds them, and which may mask the most essential character of an organ. The mode of distribution of the vessels alone may put us on the track of the true affinities of plants. Their arrangement is consequently the principal thing to observe in each organ.”

This has a very modern sound. The passage might almost have been written yesterday; yet it is a literal translation from the Introduction to Brongniart's ‘*Histoire des Végétaux Fossiles*’ and was published in 1828. Evidently we flatter ourselves over-much when we fancy that our vascular morphology is a new creation. The French have long understood the value of systematic anatomy. Brongniart made it a rule to preface the description of each fossil group with an account of the recent allied plants, and especially of their anatomy. He constantly found it necessary to make his own investigations, for just the points most needed for comparison with the fossils had usually been passed over in works on recent botany. “These researches,” he says, “may not be without result for the comparative anatomy of plants, or for their physiology and natural classification” (p. 6). Artis, in 1825, had

felt the same need for a better basis of comparison. He says, "The whole Anatomy of the Plant must be studied," and cites Cuvier's famous researches on fossil animals as a model. This healthy reaction of fossil work on the investigation of living plants still goes on in our own day.

Brongniart gives an excellent account of the characters available for the discrimination of fragmentary specimens, and points out that while almost any organ will suffice to distinguish the main groups, for more exact determination the vegetative organs have a relatively greater importance in the lower and the reproductive in the higher classes. At the same time, the significance of vascular anatomy had long been recognised in the distinctive characters of Dicotyledons and Monocotyledons. "After the internal structure of the stem," he says, "the most important character of this organ is the mode of insertion of the leaves on its surface," then the arrangement of the vessels passing from the stem into the petiole, and in the leaves themselves the venation. We see that Brongniart, poorly provided at that time with structural material, was feeling about after external characters which might serve as the "outward and visible sign" of the structure within.

Comparative anatomy, he argues, forms the basis of zoological classification, and it will be the same for plants, only here the difficulty is greater, because a more or less high magnification is always required to show the structure. He especially regrets the absence, at that time, of any comparative anatomy of the wood, a need which even now has scarcely been adequately supplied. Let us see, a little more in detail, how Brongniart succeeded in applying his principles to the problems of fossil botany.

He recognised four periods of geological time, in which the vegetation had a special aspect due to the predominance of certain families and to the great development of the plants of these families. This recognition of successive periods of vegetation was in itself a great step in advance. Only a few years before, botanists had still expected to be able to refer the fossils of the Coal to recent species and appeared disappointed when they failed to do so. The same spirit still sometimes shows itself in our own day, among those who view anything like an intermediate fossil group with suspicion. Brongniart's four periods (characterised in his own words) were:—

1. Vegetation almost solely composed of Ferns and arborescent Horsetails and of the singular *Lepidodendrons*—gigantic plants sharing in the characters of *Lycopods* and *Conifers*. After the first period these plants seem to have disappeared, at least from the regions so far explored.
2. Characterized by very different forms, of which only a small number has come down to present times,—they are especially Ferns, less elevated than those of the Coal, and *Conifers* of a very peculiar aspect.

[This refers essentially to the Triassic Flora.]

3. In the third Period the Ferns, and still more the singular family of Cycads, were dominant to such a degree that the species of the latter family were already more numerous than those now existing, and this little group, which only forms the 2000th part of living plants, constituted half the flora of that epoch. [Mesozoic.]
4. Plants much less different from those which still exist,—the same families and most often the same genera which still inhabit our climates. In spite of their analogy with recent vegetation, these fossils are no less worthy of our attention, for they may solve questions of great interest for the history of the latest changes in the surface of the globe: they can decide whether plants, like animals, have experienced great specific changes during the latest revolutions to which our globe has been exposed. [Tertiary.]

We must not suppose from these words that Brongniart was an evolutionist, for, as Saporta says, he always opposed evolution, the doctrine to which his own discoveries lent the strongest support. At the same time the whole tone of Brongniart's prospectus and introduction to his great book is thoroughly modern and enlightened.

His classification of plants was a singularly natural one, and indeed scarcely differs in its main divisions from our modern system. He has six great classes:—

- I. Agames: Algæ, Fungi, Lichens [=Thallophyta].
- II. Cryptogames celluleuses: Hepatics and Mosses [=Bryophyta].
- III. Cryptogames vasculaires [=Pteridophyta, but with the addition of Characeæ].
- IV. Phanérogames gymnospermes.
- V. Phanérogames angiospermes monocotylédones.
- VI. Phanérogames angiospermes dicotylédones.

There is little room for criticism here. The name Agames, which is used for Thallophytes, shows that little was known at that time of sexual reproduction in these plants, though the discoveries of Vaucher had already given the clue. Brongniart is quite sound on the Mosses, which he rightly says have nothing in common with the "Agames" beyond the absence of vessels. It must be remembered that at that time, owing to the splendid early work of Hedwig, the Mosses were much better understood as regards their reproduction than the Vascular Cryptogams.

Brongniart thought that the stems of the Vascular Cryptogams had some analogy in structure with those of Monocotyledons. He says that their organs of reproduction appear always to consist of two sexes; in those days, long before the advent of Suminski and Hofmeister, there must have been a certain amount of luck in arriving at this true conclusion. He explains further

on (p. 97) that the organs of fructification vary very much; sometimes one recognises easily enough organs which characterise two different sexes, sometimes only a single one has been, with any probability, discovered. He places the Characeæ, Marsileaceæ, Equisetaceæ, and some Lycopodiaceæ in the former category: the Ferns and most Lycopodiaceæ in the latter.

The inclusion of Characeæ in Vascular Cryptogams seems odd to a modern botanist; but we are scarcely in a position to scoff, for the true systematic relations of this family have never yet been made clear.

A striking merit of Brongniart's classification is the separation of the Gymnosperms in a class of their own, a point in which he was far in advance of most botanists of his own day and even of a much later time. He shows that the Gymnosperms are distinct from other Phanerogams both in their reproductive organs (the seeds, destitute of a capsule, receiving directly the action of the fecundating substance), and in the organisation of their stems, very different in many respects from that of true Dicotyledons (p. 22).

In the detailed part of the 'Histoire,' passing over the Fucoids and the scanty and doubtful Mosses, the Equisetaceæ are dealt with first of the vascular plants. The anatomy of recent forms is fully treated. It is curious to see what was then thought about their sexual reproduction. Hedwig had suggested that the spore was an ovary with a short style, while the elaters represented four anthers attached to the style by their filaments. Brongniart improves on this by supposing the spore to be an ovule, and the elaters four grains of pollen adhering to it.

As regards the Calamites, he says that up to that time everything had confirmed his idea of a relation between them and *Equisetum*. So far, however, he knew nothing either of the fructification or the anatomy of the fossil forms. The discovery of the latter, at a later date, long misled him and his school, and formed one of the great subjects of controversy with English and German investigators.

The rest of the first volume is devoted to the Ferns or the plants which he then classed as such, constituting by themselves, as he says, the greater part of the Flora of the ancient rocks.

As regards the reproduction of recent Ferns, Brongniart inclines to Hedwig's view that the stalked vesicles (glandular hairs) on the young fronds represent the male organs. At any rate, he finds "their analogy with the pollen-sacs of Mosses complete" (p. 141). His classification of Ferns is quite a natural one, only differing from modern systems in including the Tree-ferns (Cyatheaceæ) under Polypodiaceæ, and making the Parkeriaceæ (*Ceratopteris*) a distinct group, as was still done much later.

For the purposes of fossil botany he employs his well-known artificial classification based on the venation and form of the frond, a classification which is still indispensable for fossil taxonomic work.

The most curious point is that Brongniart at that time included

Sigillaria under Ferns, while he included Lindley's genus *Caulopteris* (true Tree-ferns) under *Sigillaria*, recognising that the fern-affinities of *Caulopteris* were more evident than those of the *Sigillariæ* proper. Brongniart shows that the *Sigillarias* could not have been Cacti, as Martius, or Euphorbiæ, as Artis had supposed, for they were not succulent, but woody plants. He argues that they could not have been Dicotyledons at all, for their form gives no indication of growth in thickness at the base of the stem. In view of subsequent developments, his rejection of growth in thickness is remarkable. Neither, he continues, could the *Sigillarias* have been Monocotyledons, for their leaf-scars are too narrow. Thus he arrives, by a process of exclusion, at the Vascular Cryptogams, "that is to say the Ferns, for that is evidently the only one of the families of this group to which one could refer the *Sigillarias*." He argues elaborately in support of this view; the Lycopod affinities seem never to have occurred to him at that time. It was no doubt the superficial resemblances between the Fern-stems and *Sigillaria* which misled him, though the comparison with *Lepidodendron* seems to us fairly obvious.

The incomplete second volume, the parts of which began to appear in 1837, is devoted, as far as it goes, to the Lycopods. He gives a most admirable account of the external characters of recent Lycopods and has a good deal to say about the anatomy, which he illustrates by some capital figures. He does not, however, distinguish clearly between the structure of *Lycopodium* and that of *Selaginella*, or *Stachygynandrum* as he called it. He notices the interesting fact that in some Lycopodiums the roots have practically the same structure as the stem (p. 24).

He is at pains to show that the anatomy of Lycopods and Conifers is essentially different. On the other hand, he lays great stress on the resemblance in the cones of the two groups, saying that in Conifers and Cycads the ovules are fixed on the scales exactly like the "capsules" of Lycopodiaceæ. In describing the two kinds of spores in "*Stachygynandrum*" and *Isoetes* he calls the large spores "veritable seeds"; he compares the small spores to pollen-grains but declines to discuss their function (p. 33).

He is very emphatic on the Lycopod affinities of *Lepidodendron*, saying that the fossils of which that genus is the type merely form a special section of the family Lycopodiaceæ. "A fortunate and rare circumstance" had given him an opportunity of studying the internal structure. This, of course, refers to the famous *Lepidodendron Houghtonii*, first described by Witham in 1832, and afterwards by Lindley and Hutton in vol. ii. of their 'British Fossil Flora,' 1833. Brongniart's account of the structure shows a great advance on the previous descriptions. He was the first to recognise the ring of wood, with its smaller elements towards the outside. Oddly enough, this principal feature of the anatomy had been overlooked, or at least not clearly distinguished, by the English writers. The relation of the leaf-

trace bundles to the central axis was correctly followed; the restoration of the structure in the solid which he gives (Pl. 21, fig. 4) is remarkably accurate. In opposition to Lindley and Hutton, who had concluded that *Lepidodendron* was intermediate between Coniferæ and Lycopodiaceæ, Brongniart showed that the structure is essentially different from that of any Dicotyledon, gymnospermous or angiospermous (p. 44). He points out the differences from *Lycopodium* and *Selaginella*, and shows that the best anatomical comparison is with *Psilotum* and *Tmesipteris*.

He further points out the identity of the rayed or scalariform vessels of *Lepidodendron* with those of Lycopods, and the small size of the peripheral vessels in both, and concludes: "Thus, by the internal structure of their stems, as by their external form, their mode of branching and the arrangement of their leaves, the *Lepidodendrons* agree almost completely with the Lycopodiaceæ, and could be nothing else but arborescent Lycopods" (p. 46). His whole treatment of the subject is on sound modern lines.

He then asks the question, "Is the same analogy to be met with in their mode of reproduction?"

He begins by citing cases where the cones (*Lepidostrobi*) had already been found in connection with species of *Lepidodendron*—he found that they were borne on the ends of branches, like *Lycopodium* cones on a large scale, or like the cones of *Araucaria*. He was much puzzled about the position of the sporangium or capsule, which from the analogy of Lycopods and Conifers ("families between which all botanists are agreed in placing the *Lepidodendrons*") should be on the upper surface of the scale [he ignores the *male* cones of Coniferæ here]. Having no petrified specimens to work with, Brongniart at that time completely misunderstood the position of the sporangium, which in fact he had never seen, or had perhaps confused with the lateral wings of the scale. Lindley and Hutton, it is true, had already observed the sporangium in *Lepidostrobus ornatus*, but they had described it as a "seed"*, so that Brongniart not unnaturally suspected a confusion with the cones of Araucarian Coniferæ.

He was very cautious about the supposed relation of *Lepidodendron* to Conifers, regarding it as extremely remote. The former group, he says, is not intermediate between Lycopods and Conifers, but is at most a Lycopodiaceous genus tending to establish the first link in a series forming the passage between the two families (p. 55). Some of his arguments against a nearer relation, especially those drawn from the mode of branching and the structure of the wood, are well worthy of consideration.

Brongniart was distinctly less fortunate in his view of the petrified tree-fern stems known as *Psaronius*, which he regarded, on what seem to us very weak grounds, as representing the base of Lycopodiaceous stems. With all his good intentions, his knowledge of Fern-anatomy was not yet wide enough to guide

* 'Fossil Flora,' vol. i. pl. 26. fig. 2 a, p. 83.

him to the right conclusion, though it must be admitted that others had already been more fortunate. Brongniart, however, quite rightly interpreted the structure of *Psaronius*, as regards the distinction between the stem and the surrounding zone of roots.

The volume comes to a sudden end in the middle of a sentence on p. 72, while the author is discussing the nature of *Ulodendron*. The reasons given by Saporta, in his obituary notice of Brongniart, for the abrupt cessation of the work—the immensity of the scheme, the difficulties of the Tertiary floras, and the changes in the author's views—do not seem altogether sufficient. Brongniart lived and continued active work for more than thirty years afterwards. It is, however, no part of my plan to follow the later and more important development of his career.

Saporta rightly points out that in his early work Brongniart was the first to clearly enunciate the principle that there has been a definite and gradual development of vegetation in successive epochs.

Brongniart was a great botanist, as everything he wrote proves; by far the greatest who up to that time had undertaken the study of fossil plants.

In passing from him to Bernhard Cotta, we make a marked descent—Cotta was by no means great, but he did some meritorious work. His book, 'Die Dendrolithen in Beziehung auf ihren inneren Bau,' was published at Dresden in 1832, while Brongniart's first volume of the 'Histoire' was appearing. Cotta's work was based on his father's collection, which included more than 500 ground specimens of fossil plants. At that time such specimens were sometimes ground thin, to admit of microscopic investigation, but it does not appear that Cotta used the modern method of mounting really thin sections on glass—that was introduced contemporaneously in our own country by Witham and Nicol.

Young Cotta began his work as a sort of "holiday task"; he appears to have been a student at the time, and modestly desires that his figures may be regarded as the "Hauptsache," the text only as a necessary explanation.

Cotta was much impressed by the evidence of a tropical climate found in the rich vegetation of the Coal-measures. He adds: "But not only in reference to climatic changes, but also with respect to the gradual development of organic Nature, it is interesting that we find more lowly organised plants in the older than in the later rocks. It is possible, however, that this latter circumstance proceeds merely from differences of climate, for in the Red Sandstone, for example, besides many lower plants, remains of Dicotyledonous plants also frequently occur, of which the numerous petrified woods with evident annual rings and medullary rays afford the best proof" (p. 3).

Cotta no doubt made too much of his favourite climatic changes, but there is some force in what he says: *e. g.*, the difference

between the plants of the root-nodules and those of the seam-nodules in Lancashire coal beds is clearly due to different conditions rather than to different age. Like Brongniart, he expresses his regret that "we unfortunately still possess no botanical work in which the internal structure of the races of plants is characterised. In this respect it would be especially desirable to know accurately the internal structure of the stems of Palms and Tree-ferns, which in the forests of America grow into such gigantic trees" (p. 7). He realised the difficulty of naming the fragmentary fossil remains without the risk of bringing the separate parts of one and the same plant under different species. He bases his own arrangement on internal characters, not that he considered these the best (though they might be so if the anatomy of recent plants were better known), but because no other characters were available in his petrified specimens. He realised that there are whole fossil families which no longer exist, so far as is known, in the living Creation (p. 11).

Cotta's classification was rudimentary. He divided his specimens into three groups: Rhizomata, Stipites, and Radiati—a classification of fossils rather than of plants.

His first group he calls the rhizomes of extinct Ferns, in which he was roughly right. His genus *Tubicaulis*, of Permian age, may be said to correspond to the family Zygopterideæ, as understood by the latest writer, Paul Bertrand. This is a group of the early Ferns—Primofilices of Mr. Arber—of which so much has been heard of late. Before Cotta, these fossils had been placed in the Palms, though D. Anton Sprengel had already called them "exotic Ferns." The genus *Tubicaulis*, as now limited, includes one only of Cotta's species, based on a single, very fine specimen which had been discovered in 1815. A second specimen of a distinct species was brought to light in Lancashire nearly a century later, and described by Dr. Marie Stopes. Cotta nowhere distinguishes clearly between the petioles and the true stem of these plants.

He follows his predecessor D. A. Sprengel in classing *Psaronius* (also Permian) with Ferns, and in this respect did better than Brongniart. The name "Starling-stones" for these ornamental fossils is familiar; it may not be so generally known that this name properly applies only to the specimens showing the roots; those in which the long, curved sections of the vascular bundles of the stem are visible used to be called "Maggot-stones," "Madensteine," "*Psaronius helmintholithus*." In earlier days these fossils had been regarded as Corals or Encrinites.

In certain cases Cotta recognised the roots as such, though he more often interpreted the same bodies as leaf-stalks.

His second group—Stipites or Trunks—includes fossil stems from much later rocks, which he rightly classed as Palms.

The third family, Radiati, or radiately striated stems, is of considerable interest—it embraces, as one might judge from the family-name, stems with secondary thickening. He says that

these specimens, which he placed in two genera, *Medullosa* and *Calamitea*, have no analogue among living plants.

His description of the genus *Medullosa*, which he founded, is on the whole remarkably accurate, and some of his figures are excellent and might still be used as adequate illustrations. Two of his species, *M. stellata* and *M. porosa*, are the real stems; the third, *M. elegans*, consists of the leaf-stalks (afterwards *Myeloxylon*). It is odd that he should have placed these in the right genus, for of course the structure is totally different from that of the stem. He no doubt mistook the hypodermal strengthening zone of the petiole for the outer ring of wood in the stem.

In the description of the stem of *M. stellata*, he interpreted the complex structure with surprising success, considering that it is quite unlike anything in recent plants, consisting as it does of a double system of peripheral and central steles, each growing in thickness by its own cambium. In fact he practically recognised the "polystely" (to anticipate more than half a century), for he describes the pith as containing many-rayed stellate columns, constructed on the same plan as the radiating outer zone, which he saw was itself a compound structure. He points out that each radiating portion forms a whole by itself and possesses a special pith (einen besonderen Markkern) (p. 65). He rather spoils his excellent observations, however, by suggesting that the internal stellate columns might be young plants which grew up inside an old hollow stem!

His second genus of "Radiati," *Calamitea*, may, he says, with much probability be supposed to have a common origin with the Calamites, so well known as impressions (p. 57). On this point his knowledge was decidedly in advance of Brongniart's at the same time. He arrived at this right conclusion by comparing the striations of his petrified specimens with those on the casts (p. 67). His *Calamitea striata* = *Calamodendron striatum*, Goepfert, and his *Calamitea bistriata* = *Arthropitys bistriata*, Goepfert. Thus he had already recognised the two chief groups of Calamarian stems.

Cotta's "Supplementary Remarks" are partly on the subject of the mode of preservation, but their chief object is to correlate the impressions with the petrifications, a laudable attempt in which, with the one exception of the Calamites, he was singularly unsuccessful.

He was inclined to identify *Tubicaulis* with *Lepidodendron*, some species of which (including the well-known *L. obovatum*) he regarded as Ferns. He compares the ribbed *Sigillarias* with Cacti, a view which, oddly enough, has re-appeared in the present day in a work by the geologist Steinmann. At the same time Cotta identified these Sigillarian stems with his genus *Medullosa* (p. 84).

As regards the Calamites, which he rightly identified, he was misled, like Brongniart in later days, by the internal structure, though not to the same extent. He argues against their being

Equisetaceæ, but suggests that they may represent an extinct family intermediate between Equisetaceæ and Casuarineæ!

On the whole Cotta's book is not to be taken too seriously from a scientific point of view. He was only a beginner at the time, and evidently no great botanist. His observations, however, were good, and sometimes his natural instinct led him right when more learned authorities went wrong.

To us, in this country, the most interesting figure among the group we are considering, is that of Henry Witham. His real name was Henry Silvertop; he was born in 1779, and took the name of Witham on his marriage. He was a man of considerable property and importance in the North of England, and was the first Roman Catholic High Sheriff of the County of Durham. His work on fossil plants belongs to a short period of his life, when he was about 50. He was the founder of modern structural fossil Botany in so far as he was the first man who used thin sections mounted on glass—the discovery of this method was due to Nicol, to whom he fully acknowledges his indebtedness, as he does also to Macgillivray, who made the drawings and also no doubt helped with his botanical knowledge.

In an early paper "On the Vegetation of the First Period of an Ancient World," read before the Wernerian Society of Edinburgh on Dec. 5, 1829, Witham shows himself still much under the influence of Brongniart. He regards the "Craigleith Tree," first discovered in 1826, and now known as *Pitys Withami* (L. & H.), and other Gymnospermous Phanerogams of Carboniferous age as trifling exceptions to the general distribution of early vegetation. He says: "We find the opinion of Mr. A. Brongniart most completely verified, namely that the Vascular Cryptogamic plants had a vast numerical proportion, and in fact of 260 species discovered in this Terrain or period, 220 belong to this Class." Witham very soon modified this opinion, as we shall see. It appears that a section of the Craigleith fossil—a manifest Gymnosperm, one would think—had been sent to Brongniart, who replied: "I cannot now give a final but only a conditional opinion. It is that I believe it to be a section of a Monocotyledonous plant." This strange conclusion, which seems to have been shared by some local botanists, though not, of course, by Witham himself, can only be explained by the state of preservation combined perhaps with a certain prejudice, at that time, in favour of the greater antiquity of Monocotyledons.

In a letter to Winch, a Newcastle naturalist, dated Dec. 23, 1829, accompanying this pamphlet and preserved in Winch's correspondence in our own Library, Witham goes into the interesting question of the presence of annual rings in the early Gymnosperms. He says: "I have as yet been unable to discover any concentric rings in the Wideopen fossil [*Pinites*, now *Cordaites*, *Brandlingi*] I sent Mr. Hutton a beautiful slice of the Wideopen tree, which to look at with the naked eye would have inclined one to believe they were there, but upon microscopic

examination such idea appears to me to vanish." This exactly expresses the usual state of the case in stems of that period.

In the paper "On the Vegetable Fossils found at Lennel Braes, near Coldstream," read May 10, 1830, Witham shows that these trees (*Pitys antiqua* and *P. primæva*, Witham) "must be classed amongst the dicotyledonous plants" (p. 11). He attributes (not quite accurately) the opinion to Brongniart that "out of six classes only two existed at that time, namely the Vascular Cryptogams and the Monocotyledons, the latter containing a small number of plants which appear to resemble the Palms and arborescent Liliacæ The existence therefore of so extensive a deposit of dicotyledonous plants at this early period of the earth's vegetation appears to demand the attention of the naturalist."

In his "Description of a Fossil Tree discovered in the Quarry at Craighleith, near Edinburgh, in the month of November, 1830,"* Witham speaks of this fine tree having flourished "for aught we can say a million years ago" (p. 4). He had evidently frankly accepted the teachings of the young science of Geology, which was not the case with all English writers at that time. He says: "Several scientific gentlemen having stated as their opinion that this fossil is a *Lycopodium*, I may here mention the reasons why I have come to a different conclusion" (p. 5). And further on he adds: "In conclusion I beg to add, that we have in this striking and stupendous relic of ages long gone by, an additional proof amongst many others lately advanced, that plants belonging to the Gymnospermous Phanerogamic class are much more abundant in these early sedimentary deposits than continental writers would lead us to believe" (p. 10). It was in fact Witham's chief work to demonstrate the early prevalence of Gymnosperms, as is more fully shown in his book 'The Internal Structure of Fossil Vegetables,' 1833, which brings together and correlates his various investigations.

"Many fossil vegetables having lately been found, particularly in the mountain-limestone series and coal-fields, belonging either to the Coniferæ or to a family closely allied to them, I am induced to believe that those geologists who maintain that the vascular cryptogamic plants almost entirely composed the flora of that first period labour under a misapprehension" (p. 6).

"That the preponderance of vascular cryptogamic plants was considerable, I do not wish to question . . . From the frequent occurrence of trees possessing an exogenous structure I cannot help suspecting the correctness of the assertion that 'the class which almost of itself composed the flora of this period is that of the vascular cryptogamic plants, and in fact that of 260 species discovered in this formation, 220 belong to that class'." A few years before Witham had accepted this statement, but now his

* Nat. Hist. Soc. Northumberland, Durham, and Newcastle-upon-Tyne; read Dec. 28, 1830.

views had matured. He was, in fact, the first to challenge the description of the Palæozoic period as the "Age of Cryptogams." The latest progress of the science has been on the same lines as his. Witham rightly emphasized the high organisation of the early floras, though somewhat overstating the case owing to his not having fully grasped the width of the distinction between the Gymnosperms and the true Dicotyledons.

He regarded the predominance of Vascular Cryptogams as indicating the presence of a damp forest, where the remains of the plants had been preserved *in situ*, while the Phanerogamic fossils represented a hill flora, from which the trunks had drifted down streams into lakes or pools.

The absence of concentric circles, and especially the nature of the pits—the longitudinal series of hexagonal markings on the walls of the wood-cells facing the medullary rays,—led Witham to infer that the Craigleith trees "are not Coniferæ, or at least not in all respects similar to the Coniferæ of the present day." He extends this inference to the allied species, and concludes: "It is, however, certain that hitherto no structure precisely resembling that of the Coniferæ in every respect has been found in the Mountain limestone series or in the Coal formation; but the alleged absence of phanerogamic trunks in these deposits has been fully and, I trust, satisfactorily refuted" (p. 49). His conclusion is strictly correct, though the grounds on which he based it may not be perfectly convincing. He recognised that the Liassic and Oölitic woods which he placed in the genus *Pence*, are evident Conifers, which the older fossils are not, though "of the same natural family" (p. 69).

Witham's work on the fossil Gymnosperms was perhaps the most important of his life; he also has the credit of having been the first to describe the structure of a fossil Lycopod, for we owe to him the original description and figures of *Lepidodendron Harcourtii*, "beyond all doubt," as Lindley and Hutton said, "the most remarkable discovery in the science of Fossil Botany."* Witham himself showed equal enthusiasm. He says: "I had so repeatedly examined the stems of vascular cryptogamic plants without detecting any trace of organisation, that I cannot refrain from mentioning the delight which I experienced when I observed a structure so perfect. I am the more gratified as it affords me an opportunity of corroborating the opinion of so distinguished a botanist as Mr. A. Brougniart, though founded solely upon the external markings of the peculiar plants."†

He compared the structure with that of the stem of *Lycopodium clavatum*, but it is not surprising that he was not altogether successful in interpreting so unfamiliar a type as that of the *Lepidodendron*.

* 'Fossil Flora,' vol. ii. p. 46.

† "On the *Lepidodendron Harcourtii*." Read at the Natural History Society of Newcastle-upon-Tyne, March 1832.

Anabathra pulcherrima, a Lycopod with secondary growth in thickness, was another fossil investigated by Witham, who, however, did not attempt to determine its affinities. "Whatever, therefore, may be the family to which the plant in question is ultimately referred, it is necessary to institute a provisory genus for its reception" (p. 42). He fully satisfied himself of the existence of medullary rays, a point about which very unnecessary difficulties were raised at a much later date.

Witham was a modest author. He writes: "My pretensions to botanical knowledge are indeed very limited, nor do I presume to rank myself among the cultivators of a science to which so many eminent individuals have devoted themselves in this country. The only object I have always kept steadily in view, is to direct their attention to a department of botany which has hitherto been too much neglected; for, although the study of the external forms of the stems, leaves and fructification, of recent vegetables, has elicited much knowledge respecting the nature of the former, little has been effected by an application to their internal composition, in which decided and characteristic differences are nevertheless to be found. It is by the recently discovered method of cutting and polishing the stems of fossil plants that we are enabled to obtain an insight into their structure."* Witham was deeply impressed with the importance of the work which he was undertaking, and showed a serious and almost religious enthusiasm which we cannot but respect.

The few fragments from the earlier history of a modern branch of science which I have ventured to recall to your memories are of interest as showing that the problems before the investigators of those days were essentially the same as our own, and that the spirit in which they approached them is one which we may well emulate. The birth of Geology is one of the most interesting events in the history of science, and forms an integral part, as Prof. Judd has recently so well shown, of the History of Evolution. The spirit of Evolution was already in the air, and we, in post-Darwin days, find ourselves in complete sympathy with the work that was going on in palæontology at a time when the 'Beagle' had scarcely started on her momentous voyage.

The President, having delivered his Address, Lient.-Col. PRAIN 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 being seconded by Prof. F. W. OLIVER, was carried by acclamation.

* 'Internal Structure of Fossil Vegetables,' pp. 1-2.

The President, then addressing Count SOLMS - LAUBACH, said :—

COUNT SOLMS-LAUBACH,

It is a great pleasure to me that it falls to my lot to present to you, on behalf of the Society, our Linnean Medal, awarded for the highest distinction in Biology.

The wide range of your work, almost unequalled in these days of specialisation, covers morphology, development, ecology, physiology, the systematic both of Phanerogams and Cryptogams, the history of cultivated plants, the geography of plants, and, last not least, fossil botany.

Your earliest work was in a difficult field, in which you soon made yourself the leading authority, the morphology and affinities of parasitic Flowering Plants, beginning in 1863 with a paper on an *Orobanche*, followed, a couple of years later, by your dissertation, 'De *Lathyræ* generis positione systematica.' An important general paper on the structure and development of parasitic Phanerogams (1868) was succeeded by a series of monographs on the families *Lennoaceæ*, *Rafflesiaceæ*, and *Hydnoraceæ*.

Turning to another subject, you monographed the *Pandanaceæ*, *Pontederiaceæ*, *Caricaceæ*, and *Aristolochiaceæ*, and in more recent years have interested yourself in the *Cruciferae* and *Chenopodiaceæ*.

The first of your *Cruciferen-Studien*, 1900, describes the remarkable case of *Capsella Hegeri*, to all appearance a new species, which has sprung into existence in our own time.

Your systematic work extended to Cryptogams, and we had the honour of publishing in our own Transactions your fine monograph of the *Acetabulariaceæ*, calcareous Algæ of special interest from their relation to early fossil types.

In other works you have thrown new light on the structure, taxonomy, and distribution of Vascular Cryptogams, Mosses, Hepatics and Fungi.

A feature of special morphological interest is discussed in your paper on Monocotyledonous embryos with terminal growing points. You have touched on physiology in your work on the occurrence of calcium oxalate in the walls of living cells.

In another direction again, of more human interest, and of wide evolutionary bearing, you have treated with much learning and ingenuity the history of cultivated plants, such as the Fig, the Papaw, the Wheats, Tulips, and Strawberries. I am glad to hear that your important historical researches are still in active progress during your present visit to England.

Your work on the Principles of Plant Geography (1905), a critical review of the leading ideas on the distribution of plants, is characterised, like all your writings, by breadth and originality of thought, and is exercising a wholesome influence on the progress of this great subject.

I should like especially to recognise how you have always zealously pursued systematic botany, side by side with every

branch of laboratory work, an example which we in this country will do well to lay to heart.

Lastly, I come to your contributions to fossil botany, the side of your work with which I happen to have been in closest touch. Beginning in 1883-84 with papers on the fossil fern *Scolecopteris elegans* and on Permian Coniferae, you published in 1887 your 'Einleitung in die Paläophytologie' (translated five years later, for the Oxford Press), a book which marks an epoch in the history of this science. To many, like myself, who had never till then realized the wealth and significance of the fossil material, this truly scientific exposition must have come as a revelation. In my own case it prepared me to appreciate the treasures of the Williamson Collection, and the work of our dear old friend himself, which you alone, at that time, were able to estimate at its true value.

Since then you have continued to enrich our science by a series of memoirs of the utmost importance. To recount them all would be to write the history of fossil botany during the last quarter of a century. I may mention the work on the English Greensand fossil, *Bennettites Gibsonianus*, the type of an extinct family, dominant in Mesozoic times; on the Cycadofilices or Pteridosperms, to use a later name (a group which you and Williamson were the first to recognise), *Protopitys*, *Medullosa*, *Völkelia* and *Steloxylon*; on the Lower Carboniferous plants (now likely to prove of Devonian age) of Falkenberg and Thuringia; on *Stigmariopsis*, *Pleuromeia* and many more,—all researches which have done much to transform fossil botany and to place it in its present strong position as a worthy ally of animal palæontology. In this subject also your work is as active as ever, and I am delighted to hear that you are about to elucidate further the structure of that wonderful genus of Palæozoic tree-ferns *Psaronius*, the first group of fossil plants showing structure to attract attention, and still among the most interesting and difficult.

I ask you to accept this medal as a symbol of the deep admiration and affection of your English colleagues, and as the highest recognition which this Society can bestow.

The recipient having received the Medal, expressed his thanks as follows:—

Mr. President, Ladies and Gentlemen,

It has not been an easy matter for me to come to London this spring, but as I am fond of this country, where I have so many friends, and have always been received with the greatest kindness by public institutions as well as by private persons, it seemed to me to be my duty personally to present my most hearty thanks to this Society, the first of all the great societies to receive me as a member, and now has awarded me the highest honour in its power, an honour I can only accept with the proviso "Magnis in rebus voluisse sat est."

It is, further, a great pleasure for me to receive this medal, awarded by the Council, from the hands of our President, Dr. Scott, my friend and fellow-worker in palæophytological matters.

I am now approaching the age of seventy, and my work is essentially done; but should God permit me some further time of strength and health, this medal will be a further stimulus for me to employ it entirely to the benefit of our beloved biological science.

The General Secretary having laid before the Meeting the Obituary Notices of deceased Fellows, the proceedings terminated.

OBITUARY NOTICES.

THOMAS HODGSON ARCHER-HIND was born in the year 1814, and when at Eton from 1826 to 1832 was contemporary with Mr. W. E. Gladstone, the future Bishop Selwyn, and other notable men. He went up to Trinity College, Cambridge, graduated B.A. in 1837, and proceeded M.A. in 1840. He was elected Fellow of our Society on the 4th March, 1834, and had therefore, for many years, been Father of the Society.

In 1856, on succeeding to an estate, he added the name Archer-Hind to his original Thomas Hodgson, and from 1872 he lived at Coombe Fishacre House, Newton Abbot, Devonshire.

Possessing a keen delight in plants all his life, and delighting in his charming garden, he seems never to have appeared in print during his long career. Up to the last year our Librarian was accustomed to receive an annual letter, written in a legible and steady hand, requisitioning the Transactions to which he was entitled. He died on the 3rd February, 1911. [B. D. J.]

RICHARD HENRY BEDDOME was born in 1831, educated at Charterhouse, and joined the Military service of the H.E.I.C. on its Madras establishment in 1848. In 1856 the Madras Government took steps to organize a Department of Forestry, and in the year following, Beddome, who was then Quartermaster and Interpreter of his regiment, the 42nd Madras Native Infantry, was selected, on account of his devotion to Natural History in different branches, and proficiency in Botany, as chief Assistant to the first Conservator, Dr. H. Cleghorn. One of his first duties in this post was an exploration of the Pulney Hills, even now too little known scientifically, and the botanical results appeared in the *Madras Journal* (n.s.) iii. (1858), pp. 163-202. The time allotted to this survey was necessarily brief, but it added more than one species to the local Flora and the published account remains of much interest to the present day. In 1859 Beddome contributed to the same *Journal* (iv. pp. 66-73) a valuable paper on the South Indian and Ceylon species of the difficult genus *Impatiens*.

In 1860 Cleghorn retired and Beddome succeeded him; in 1863 he brought out, mainly for the use of foresters and planters, his 'Trees of the Madras Presidency,' and this was followed by the 'Flora Sylvatica for Southern India,' giving descriptions with figures of all the principal timber trees and large shrubs of South India and Ceylon. The three hundred and thirty quarto plates, executed under the author's supervision by native artists, are remarkable for clearness and accuracy. Combined with this work is a 'Foresters' Manual' of the local Flora, illustrated by twenty-nine lithographed sheets of analytical drawings of genera not represented in the main series. This work appeared in parts during 1869 to 1874, when it was completed. Side by side with these substantially official labours, Beddome steadily adhered to Natural History as a personal pursuit in such leisure as his public duties permitted. Even after his appointment as Censervator he had communicated papers on zoological subjects to different publications, including the Zoological Society's 'Proceedings' for 1863 (pp. 225-229); but he gradually limited the field of study to Botany, and from 1863 his work was mainly concentrated on Ferns and their allies.

In 1863 he published the 'Ferns of Southern India'; from that year to 1870 parts appeared of the 'Ferns of British India,' dealing with those species which, not having been recorded from the area covered by the 'Ferns of Southern India,' were not treated in that work.

A Supplement to these two publications jointly was issued in 1876, bringing the total number of ferns figured up to 661; with the majority of which the author was directly acquainted.

Although now devoting his energies mainly to *Filicales*, between 1869 and 1874 Beddome brought out three hundred figures with descriptions of remarkable flowering plants from South India and Ceylon under the title of 'Icones Plantarum Indiæ Orientalis' (Madras: Gantz Brothers, 1874, 4to).

Retiring from the service of the Crown with the rank of Colonel in 1882, he published in the year following his 'Handbook to the Ferns of British India, Ceylon, and the Malay Peninsula' (Thacker & Spink, Calcutta, 1883). This was based on the larger works already mentioned—that is to say, the 'Ferns of Southern India' and 'Ferns of British India,'—the descriptions, however, being more succinctly framed and the figures (woodcuts) being reduced from the original illustrations. The 'Handbook' was designed to meet the wants of a wider public than the previous undertakings, and met with an excellent reception both with the public and in scientific circles.

Beddome made his home at Putney, where he devoted himself enthusiastically to horticulture, while in no way relaxing his interest in the taxonomic side of Pteridology. A frequent visitor to Kew, and a contributor from time to time of rare or interesting plants to the Royal Gardens, he also gave valuable aid to the staff of the Herbarium by naming sets of Ferns and their allies

from the Indo-Malayan region: and within a few weeks of his decease he had worked out the whole of the Malayan material at Kew of *Selaginella*. His name appears in the Kew Herbarium Visitors' Book for the last time on the 27th January, 1911; on the 23rd February he succumbed at his residence, after a very brief illness, to an attack of heart-trouble, leaving a widow, daughters and grandchildren. His last published contribution to botanical literature was a paper entitled "Notes on Indian Ferns" in the Journal of the Bombay Natural History Society, April 13, 1908. To the Journal of the Royal Horticultural Society, of which he was a Fellow, he contributed useful annotated lists of *Campanula* (1907), Gesneraceæ and Acanthaceæ (1908). In 1898 Beddome presented his collection of Mosses to Kew; his Phanerogamic herbarium is well represented in the Royal Herbarium, also in the Herbarium of the Botanical Department, Madras; while many fine specimens of trees and flowering plants collected by himself in Southern India are preserved in the Natural History Museum at South Kensington, to which a selected set of his Ferns was also distributed. The bulk of his own set of the Ferns has been presented by Mrs. Beddome to Kew.

As a horticulturist in his Surrey home, Beddome was for nearly thirty years indefatigable and successful, repeatedly flowering rare or little-known species, which were exhibited at the Royal Horticultural Society's shows, or figured in the 'Botanical Magazine'; he was keenly interested in practical questions of hybridization and selection, and the annual view of his Chrysanthemums, to which friends were hospitably invited, was widely appreciated.

For those who enjoyed his personal friendship, the blank caused by his death cannot be filled; while his personality, keen and active in spite of his age, will be missed by all who knew him.

He was elected Fellow of this Society on the 2nd March, 1882, although a short note of his, extending only to half a page, communicated by Dr. Thomas Thomson, was read on 17th November, 1864, and published in the Journal; it was descriptive of his *Pucciloneuron indicum*. He preferred to delay his connection with this Society until he could make full use of it.

[J. R. DRUMMOND.]

JAMES BISSET was born on the 4th June, 1843, and from his boyhood was keenly interested in natural science, particularly botany. His business took him to Japan in the early sixties, at the time when the great changes were taking place which have resulted in the modern Japan. He made extensive collections of Japanese plants, and corresponded with Maximovitch, who named several plants after him, e. g. *Viola Bisseti*. After living twenty years in Japan he came home in 1886, and for some years he lived at Banchory in Aberdeenshire, then, in 1892, he moved to Oxford, to gratify his ambition to graduate there, and, at the age of 47, he matriculated with a view to graduating in honours in the School of Natural Science. He had intended to take botany as

his chief subject, but found the needed amount of microscopical work too trying for his eyesight, and he then turned to geology, in which subject he passed with honours in 1896, at the age of 51; he proceeded M.A. in 1899. It was not till he was in the middle of his University career that he retired from business.

Upon taking his degree, he moved to Edinburgh and threw himself into local scientific work; he was a Fellow of the Royal Society of Edinburgh, the Royal Physical Society, and a member of the London and the Edinburgh Geological Societies. He joined the Linnean Society, 21st April, 1881.

His published papers were, "List of Desmidiaceæ found . . . in the neighbourhood of Lake Windermere during 1883," which appeared in *Journ. R. Micr. Soc.* ser. 2, iv. (1884) 192-197, and in conjunction with Dr. John Roy, in the 'Scottish Naturalist' in 1893-94, comprising 64 pages on Scottish Desmids.

He died on 3rd April, 1911, at Edinburgh. [B. D. J.]

JOHN BENNETT CARRUTHERS, F.L.S., F.R.S.E., died in Trinidad at the early age of 41, on July 17, 1910. He was born at Islington on January 19, 1869, son of the then Keeper of the Department of Botany of the British Museum, William Carruthers. He was educated at Dulwich College, the Royal School of Mines, and University College. Having decided for a botanical career, he devoted himself more particularly to the study of Algæ, first under George Murray of the British Museum, and afterwards under Prof. Schmidt in the University of Greifswald. After his return to England he assisted his father, then Consulting Botanist to the Royal Agricultural Society, and, at the same time, acted as lecturer on botany at Downton College and at the Royal Veterinary College, until in 1897 he went, for the Planters' Association, to Ceylon to investigate a disease which threatened the Cocoa plantations. He delivered himself so successfully of his task that in 1900 he was appointed Mycologist to the Government of Ceylon and Assistant-Director of the Botanic Gardens at Peradenyia. Five years later he went to the Federated Malay States as Director of the new Department of Agriculture. This post he held until 1909, when he accepted an appointment as Government Botanist and Assistant-Director of Agriculture in Trinidad. During an official visit to Tobago he contracted fever which, after a prolonged illness, led to his premature death. J. B. Carruthers was eminently a practical botanist, his principal achievements being in the sphere of Tropical Agriculture and plant pathology, and he was considered an authority on rubber cultivation. His publications were not numerous and, apart from one on the cystocarps of some Algæ, dealt with economical matters.

He was elected a Fellow of the Linnean Society in 1890 and of the Royal Society of Edinburgh in 1906. His rapid promotion speaks sufficiently for the high appreciation which his knowledge

and work found in official circles, whilst he was not less esteemed by his numerous friends for his genial and loyal character.

[O. S.]

WILLIAM AMBROSE CLARKE was born at Hineckley, Leicestershire, on the 6th February, 1841, the son of the Rev. T. A. Clarke, of Stapleton. He was articled to a Chippenham solicitor, and afterwards practised in that calling in the town. He became interested in botany, and formed acquaintance with the Rev. T. A. Preston of Marlborough College, helping in the 'Flora of Marlborough,' issued in 1888. In 1892 he married and moved to Oxford, where he spent the rest of his life.

In 1892 onwards he published in the 'Journal of Botany' the first records of British Plants, which was issued as a volume in 1896, followed by a second revised edition in 1900.

He was elected a Fellow on the 4th December, 1890, but withdrew on the 7th February, 1901; later he was again elected 4th March, 1909.

The writer is indebted to the account of Mr. Clarke given in the 'Journal of Botany' for May 1911 for most of the facts above given.

[B. D. J.]

THEODORE COOKE, C.I.E., M.A., LL.D., M.I., F.L.S., was born at Tramore, Co. Waterford, Ireland, in 1836, as the eldest son of the Rev. J. Cooke. He was educated at Trinity College, Dublin. After having graduated in 1859, he went to India as an engineer in the service of the Bombay, Baroda, and Central India Railway. Five years later, in 1865, he was appointed Principal of the Civil Engineering College at Poona, or, as it was afterwards, the Poona College of Science, and he continued in this position until 1893, when he retired. During his tenure of this post he also acted temporarily as Director of Public Instruction, Director of Land Records and Agriculture of Bombay Presidency, and as Dean of Faculty and member of the Syndicate of the University of Bombay. From an early date he paid careful attention to the flora of the presidency he lived in, and brought together very considerable collections. When in 1891 the Botanical Survey of India was established, he was entrusted with the survey of Western India. He soon conceived the plan of writing a 'Flora of the Presidency of Bombay'; but it was not until 1898 that his proposal was approved by the Secretary of State for India. He was by that time 62, an age when a much younger man might have shrunk from undertaking such a task, particularly if it was, as in Cooke's case, his first attempt at writing a flora, or in fact anything botanical. But Cooke had, in a quiet way, built up for himself a knowledge of the plants of his area which was surprising even to his friends when it disclosed itself. This, combined with an admirable method and regularity of work, was the foundation of the remarkable success of his Flora, the first part of which appeared in 1901. After that, part

followed part without a single hitch, until, in 1908, with the eighth part, the work came to a conclusion. For clearness, precision and method, Cooke's 'Flora of the Presidency of Bombay' will always be a model. The plant-material on which it was based consisted, apart from the older specimens in the Kew collections, almost entirely of his own extensive herbarium, which he brought with him to Europe, leaving a duplicate set at Poona, and when subsequently the Poona Herbarium was burned, he, very unselfishly, handed over his own set to the Poona College to form the nucleus for a new Herbarium. After the completion of his 'Flora' he undertook to work out certain families for the 'Flora Capensis.' He finished the genera *Plectranthus*, *Coleus*, *Pycnostachys*, *Æolanthus*, *Hyptis*, and *Mentha* of Labiatae, and the families of the Plantaginaceae, Nyctaginaceae, and Illecebraceae. But whilst working at the Amarantaceae he was seized with his last and fatal illness.

In Theodore Cooke botany lost a serious worker who came forward late in life, but with unabated energy and ripe experience, whilst his friends mourned in him the man, kind, genial and broad-minded. He was made an LL.D. by his University and created a C.I.E. in 1891. He was further a member of the Institute of Civil Engineers, Ireland, of the Anthropological Institute of Great Britain, and a Fellow of the Geological and—since 1892—of this Society. [O. STAFF.]

ALFRED RUSSELL FOX, who died at Sheffield, 5th December, 1910, after a long illness, was born in that city in 1853, and on leaving school was apprenticed to his father, a pharmaceutical chemist, with whom he became a partner in 1876, and the following year his name was enrolled in the Pharmaceutical Society.

He identified himself with municipal work, and particularly with the work of local natural history societies. An ardent field-botanist, he was much appreciated as a lecturer on his favourite pursuit. He was one of the oldest members of the Sheffield Field Naturalists' Society and of the Sheffield Microscopical Society.

His connection with this Society dated from 15th June, 1899.

[B. D. J.]

EDWARD GERRARD, an Associate of the Society, elected in 1862, was born in Oxford, October 20, 1810. While he was still in his childhood, his parents came to London, and settled at St. Pancras, where he continued to reside during the many years of a longer life than is granted to the majority of mankind. In 1836 he entered the service of the Zoological Society on the same day as the late Mr. G. R. Waterhouse, whom he assisted in the curatorial work of the Society's Museum. It is recorded that this Museum at that time contained 6720 exhibited specimens of Vertebrata; and it was here that he laid the foundation of his knowledge of

Vertebrate Zoology. Dr. J. E. Gray, a frequent visitor to the Society's Museum, recognized the worth of the young man, and induced him to exchange his post for one in the British Museum; and on April 5, 1841, he was appointed an Attendant of the First Class in the Department of Zoology. In this modest position he worked for 55 years; and never had the Museum a more industrious, more conscientious, more devoted servant than Edward Gerrard; he was Dr. Gray's right-hand man, always the best of my friends, and equally helpful to me in later years.

When Gerrard entered upon his new duties he was just in time to bear a hand in the removal of the Zoological collections from Montague House into the new Museum at Bloomsbury, and to form there the new exhibition of Mammals; it consisted almost exclusively of mounted skins; but Dr. Gray, who fully understood the importance of osteology for his systematic studies, set immediately to work with his usual energy to supply this desideratum. In this Gerrard's assistance was invaluable to him; only a few of the skeletons were mounted, the majority being kept disarticulated in wooden boxes in a large basement-room in which a fire had to be kept all the year round to prevent the boxes and labels from getting damp and mouldy. Here Gerrard could be found engaged in arranging the collections and preparing a systematic Manuscript Catalogue. Dr. Gray's 'List of Osteological Specimens in the British Museum' (1847) was based upon that Manuscript; and a greatly enlarged later edition, 'Catalogue of the Bones of Mammalia in the British Museum' (1862), was almost wholly Gerrard's work. This collection remained the centre of his solicitude and its care his favourite occupation. It was a proud day for him when he saw the magnificent series of skeletons, with the individual history of which no one was more intimately acquainted than himself, set up for the first time for exhibition, filling an entire gallery in the new Museum at South Kensington in systematic arrangement. Great was his mortification that he had to witness the breaking-up and dispersal of this unique exhibition at the time of his retirement from the Museum.

Besides this special work, Gerrard had other important duties to perform in the Department. A general supervision of the acquisitions of former years, and the registration and conservation of all new accessions to the classes of Mammals, Reptiles, Batrachians, and Fishes, were entrusted to him, until by additions to the staff some of these duties could be assigned to others.

After 55 years of service Gerrard retired in 1896. According to a "Minute" of the Trustees' meeting on July 25, "the Trustees in accepting Gerrard's resignation, desired the Director to express to him their high appreciation of his very long-continued and faithful service." This "appreciation" is probably unique in the annals of the Museum, as regards a member of the class of Attendants.

Gerrard was endowed with an unusually strong constitution,

which he retained unimpaired almost to within the last year of his life, owing to his frugal and regular habits. The days on which during those 55 years he was compelled by indisposition to absent himself from duty were very few; in fact, I cannot remember one. Daily, in all weathers, he walked from his home in Camden Town to the Museum, and even after his retirement he continued his daily exercise, enjoying excellent health. His friends hoped that he would reach his 100th year; he died on June 19, 1910, within four months of his 101st birthday.

His son, Edward Gerrard, and one daughter survive him. The former followed in his father's footsteps, being the well-known Agent of Natural History, who has done great services to the Museum by faithfully fulfilling numerous commissions with which he has been entrusted, and from whose laboratory the majority of the best-mounted mammals in the Museum have been issued.
[ALBERT GÜNTHER.]

JOHN HINCHLEY HARR, F.L.S., was born in 1847 and educated in England, but as early as 1872 he went to America, where in the British Colonies he found a rich field for his energy and his practical abilities. He spent the years 1872-75 as landscape-gardener in Nova Scotia, and the next twelve years in Jamaica, first in charge of the gardens and grounds of King's House, then as Superintendent of the Cinchona plantations (1881-86), and finally as Director of Public Gardens and Plantations. In 1887 he was appointed Superintendent of the Royal Botanic Gardens in Trinidad, which post he held until 1908, when he retired from Government service. He was regarded as one of the best and most trustworthy authorities in agriculture and horticulture in the West Indies, and had an extensive knowledge of the floras of Jamaica and Trinidad. His publications are few, but the Herbarium list of the botanical department of Trinidad (1908) is very useful. He also edited Jenman's volume of 'The Ferns and Fern Allies of the British West Indies and Guiana' (1909). He was elected a Fellow of this Society in 1887.
[O. STAFF.]

FREDERICK HOVENDEN was a member of a firm of perfumers, and succeeded in securing the means of early retirement from business cares. Born in London in 1838, he soon took part in local work, and in 1874 became the principal mover in founding the South London Natural History Society (of which he became the first secretary) in conjunction with Henry Deane, Prof. Charles Stewart, Dr. Braithwaite, and others. On quitting business he moved from Brixton to Dulwich, and, later still, he acquired a country house near Swanage, attracted thither by the charm of the geology of the district.

He was elected Fellow, 5th June, 1873, and of the Geological Society in 1876; he died at Dulwich on the 17th March, 1911, being buried at Norwood.
[B. D. J.]

Lieut.-Colonel SIMPSON POWELL, M.D., R.A.M.C., died at Rangoon on the 23rd March, 1911, soon after he had returned to duty as senior medical officer from furlough, during which he had been elected a Fellow of the Linnean Society, on 1st December, 1910; his connection with us therefore lasting less than four months.

He was the eldest son of Mr. Christopher Bollared Powell, of Southborough, Kent; born in 1858, he was educated at Bury St. Edmunds School, and received his medical training at King's College, London, becoming house physician there. After taking the medical diplomas of L.S.A. and M.R.C.S. in 1880 and 1882 respectively, he graduated at Durham University M.B. in 1883 and M.D. in 1896. He entered the Army Medical Service in 1885, and thenceforward served in India, China, and the Home District. Gazetted Lieut.-Colonel in 1905, he sailed again for India in 1908, and was transferred to Burma, where his career was cut short by the climate. [B. D. J.]

FRANCIS LESITER SOPER was, at the time of his death, 30th December, 1910, at Highgate, at the advanced age of 92, the head of the firm of scientific publishers Lovell Reeve & Co. He was a frequent attendant at the General Meetings of the Society till a few months before his death.

Like his predeceased partner, Mr. Lovell Reeve, he took a keen interest in the subjects of the volumes published by their house, but, unlike the senior partner, he did not join the ranks of authors.

He was elected Fellow of the Society, 1st December, 1870.

[B. D. J.]

SAMUEL ALEXANDER STEWART, A.L.S., was born in Philadelphia on February 5, 1826. When eleven years old he came with his father to live at Belfast, where he spent the remainder of his long life, dying on June 15, 1910, in consequence of an accident in the street. He was an entirely self-educated man. Poor health when a child, and then straitened circumstances, shut him out from the ordinary school career; but, fortunately, his love of nature took him early to the field where the work of his life was done. Up to 1880, when he was appointed Assistant-Curator of the Belfast Museum, he worked at trunk-making, a trade in which he was particularly skilful, giving all the spare hours to natural history, especially botany and geology. He was on the committee of the Belfast Naturalists' Field Club from its foundation in 1863, and his first paper, "On the occurrence of some rare or little known Plants in the Belfast district," was published the same year. A considerable number of other papers and notes on the botany, zoology, and geology, mainly of the North-East of Ireland, followed, his last contribution bearing the date 1909. But his principal work was the 'Flora of the North-East of Ireland'

(1888), of which Lloyd Praeger, a most competent judge, says, that "its fulness, accuracy, and scholarly style place it high among works of the kind." In 1891 he was appointed Curator of the Belfast Museum, which post he held until 1907. He was elected Associate of the Society in 1904. A list of his publications and further particulars of his life and achievements, as well as a portrait, were published in 'The Irish Naturalist,' vol. xix. (1910) pp. 201-209. [O. STAFF.]

By the death of Dr. MELCHIOR TREUB, at St. Raphael on the 3rd October, 1910, the Linnean Society has lost one of its most distinguished Foreign Members, and Botany one of its most able exponents.

He was born at Voorschoten, three miles S.W. of Leyden, on the 26th December, 1851; and soon showing his love for Natural Science, he devoted himself to its study at Leyden under Prof. W. F. R. Suringar, but early struck out into other directions than those usually then followed at that University. His dissertation 'Onderzoekingen over de natuur der lichenen,' Leiden, 1873, was upon the then burning question of the independent entity of Lichens, and Treub succeeded by cultures in showing that gonidia did not arise from hyphæ, a theory previously only tentatively advanced. For this he received a gold medal, and became assistant to Prof. Suringar. A small paper on the pappus of *Hieracium umbellatum* followed, where he observed, in a plant affected by galls, the altered flower-heads displayed 5-leaved calyces and other transitions, from which he concluded that the pappus arose from division of the calyx-segments.

'lets over het Chlorophyll,' which came out in the following year, 1874, showed his powers in a new field, and one to which he recurred in later years when in Java; in this he specially dealt with the occurrence of red and green colouring-matter.

After this his writings were most often expressed in French, his mother's native tongue, beginning with 'Le meristème primitif de la racine dans les Monocotylédones,' 1876, and 'Recherches sur les organes de la végétation du *Selaginella Martensii*,' Leiden, 1877; and his first essay in cytology, 'Quelques recherches sur la rôle du noyau dans la division des cellules végétales,' Amsterdam, 1878, and in 1879 his observations on sclerenchyma and multinucleate cells, and 'Notes sur l'embryogénie de quelques Orchidées,' Amsterdam.

By this time his gifts and scientific industry had drawn attention to him; whilst still assistant to Suringar he was chosen a Member of the Dutch Academy of Sciences, and when R. H. C. C. Scheffer's death left the post of Director of the Botanic Gardens at Buitenzorg vacant, Treub was thought the best man for the place, though he was not at first disposed to accept it.

The Garden at Buitenzorg, founded in 1817 by Reinwardt,

and soon after rendered famous by C. L. Blume, had since fallen into neglect, but had been somewhat rehabilitated during the long service of Teysman, and the eleven years of directorship under Scheffer. The latter had started a department of Colonial Agriculture, and a scientific journal emanating from the garden, and restricted to systematic papers, under the title of '*Annales du jardin botanique de Buitenzorg*.' Of this only the first volume was completed by Scheffer in 1876, when it stopped, until resumed by his successor.

In November 1880 Treub was settled at Buitenzorg, with Dr. W. Burck as his assistant, and soon determined that the '*Annales*' should be continued on a wider basis, and not be confined to the concerns of Java. In the preface to the second volume of that series the new editor explained how that administrative duties had hindered his predecessor from prosecuting the work, but he considered it his pious duty to put forward the only paper found written by Scheffer, and that though his own work had hitherto lain in the departments of plant anatomy and physiology, he had no intention of confining the journal to one department. Besides the contribution already mentioned, Dr. Treub printed in this volume the first part of his '*Recherches sur les Cycadées*' and '*Observations sur les Loranthacées*.'

Traub may be considered as the first botanist, trained in modern methods, who has had the control of a botanic garden in the tropical wonderland: of this he made full use. Few botanists had used the microscope in the tropics: in India, Griffith had employed the instruments of his day to good purpose, it is true, but the new Director set himself to establish proper and adequate means of research, amidst the gorgeous and abundant vegetation surrounding his sphere of activity. He succeeded in making Buitenzorg a goal for visiting botanists, attracted thither by the prospect of employing material in abundance, quite unattainable in temperate climates, and he also succeeded in establishing the Agricultural Department on a scientific basis. With the administration of the garden and the department just mentioned, his energies, even in a climate which usually exhausts Europeans in a few years, were still further employed in a series of researches and observations which would have done credit to a man of leisure.

Prof. Goebel has pointed out that Traub's contributions to the '*Annales*' may be grouped under four heads.

First, his observations on the prothallia of the Lycopodiaceæ, extending over four volumes. Second, the work on Cycads, *Casuarina*, the division of Angiosperms into chalazogamic and porogamic plants, and Apogamy. Third, on Epiphytes and *Myrmecodia*, on climbing plants, and the renewal of vegetation on Krakatau, tracing it from the third year after the eruption, with the occurrence of Cyanophyceæ as rendering possible the advent of Mosses and Ferns. Fourth, the continuation of his

researches on chlorophyll, and the presence of hydrocyanic acid in plants as the first product of nitrogenous assimilation.

At Buitenzorg he had established the 'Laboratoire des Savants étrangers'—what a wealth of meaning and of scientific hospitality is in that phrase,—and at Tjibodas, already famous as the early station for *Cinchona* culture in Java, he had a small mountain-garden established, with a laboratory in close connection with the virgin forest. At his instigation, the Government set apart a portion of the original forest, so that it might remain undisturbed.

Treub left Java in October 1909, hoping to spend the remainder of his life in Europe. He broke his journey at Cairo, and afterwards travelled to the Riviera. But after 29 years' service in Java, cooler regions did not restore his strength, and on the 3rd October, 1910, he breathed his last at St. Raphael. He was elected a Foreign Member, 5th May, 1887.

This brief sketch of a full and strenuous life gives no idea of Treub's charming personality. Even to those who met him only during his occasional visits to Europe he was a delightful companion, but to those who had the good fortune to visit him at Buitenzorg he was still more; he had a unique position, and used it wisely and well. We have lost a great man, of a character too rarely found, and the present generation may never again see his equal, but his memory will live with those who were fortunate enough to know him and to value his labours at their true worth.

A good portrait will be found in the 'Gardeners' Chronicle' for 5th November, 1910, p. 336, and a full bibliography by Prof. F. A. F. Went, in *Ann. Jard. Bot. Buitenz.* xxiv. (1911) pp. xxix-xxxii, preceding Treub's latest and posthumous essay.

[B. D. J.]

The Reverend ROBERT BOOG WATSON, LL.D., F.L.S., F.G.S., F.R.S.E. Born on September 26th, 1823, he was educated at the Edinburgh Academy and at Lille, and took his B.A. at Edinburgh University. After a course of study at the New College, Edinburgh, he was licensed by the Free Presbytery in 1847, and in 1854, on the outbreak of the Crimean War, he went out as Chaplain to the 93rd Highlanders. Invalided home after a nearly fatal attack of dysentery, he recovered sufficiently to undertake garrison work at Dover in 1856. In this year he married Janet Cowan, daughter of the founder of the firm of Alexander Cowan & Sons, papermakers, and immediately afterwards went out to India, and acted as Chaplain to the Highland Brigade in the Mutiny. Owing to a return of his illness, he was again invalided home.

In 1864 he accepted an appointment to the Scots' Church in Madeira, and in the course of his ten years' tenure of that office was enabled to investigate the remarkably rich land molluscan fauna of the Madeiran group, as well as the marine shells,

in co-operation with Lowe and Wollaston. On returning to Edinburgh, he devoted himself chiefly to his favourite sciences of geology and conchology; and in 1876, at the request of his friend, Sir Charles Wyville Thomson, he undertook to work out all the mollusca which had just been brought back by H.M.S. 'Challenger'—with the exception of the Cephalopoda and Pteropoda.

In 1878, however, the failure of the City of Glasgow Bank compelled him to give up his well-earned leisure and to return to work; and he accepted the call of the Free Church congregation at Cardross, Dumbartonshire, where he remained till his retirement from active work in 1898.

Residence in a country district of course deprived him of easy access to books and collections, and he therefore returned all the material he was working at to the 'Challenger' office; but Sir C. Wyville Thomson's urgent representations induced him to resume his studies in part, though he limited his investigations to the Gastropoda and Scaphopoda—about 1300 recognizable species in all.

The results of his labours appeared in the fifteenth volume of the 'Challenger' series in 1886, and, as an illustration of the thoroughness of his methods, it may be mentioned that he worked at the Museums of Paris, Berne, and Geneva, as well as at the British Museum, before the Natural History portion was removed to South Kensington.

In 1891 he was President of the Conchological Society, and in 1892 the University of Edinburgh conferred upon him the degree of LL.D.

Of the nature of Dr. Watson's work there is only one opinion. His descriptions, at times almost too detailed, are excellent, and he spared himself no trouble in their preparation.

For nearly twenty years he spent part of the summer in Switzerland, especially in the Rhone Valley, and his favourite haunt was Bel Alp, where he did much climbing and botanising, and fraternised with such men as Bishop Ellicot, Edward Whymper, and Prof. Tyndall.

[E. A. SMITH, I.S.O., and J. R. LE B. TOMLIN.]

[A list of nineteen works, nearly all on Mollusca, is given in *Journ. of Conch.* vol. xiii. pp. 139-40. Excluding the 'Challenger' monograph, the most important of these is the series on the 'Challenger' Mollusca in the *Journ. Linn. Soc. (Zool.)* xiv.-xvii. 1878-83.]

June 1st, 1911.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the Anniversary Meeting of the 24th May, 1911, were read and confirmed.

Mr. Frederick Eyles, the Rev. Hilderic Friend, Mr. Ernest Lee, Miss Ann Cronin Halket, Mr. John Coney Moulton, Mr. John Graham Murray, Mr. Frederick John Freshwater Shaw, B.Sc., Mr. Charles Waterfall, and Mr. Malcolm Wilson, B.Sc., were elected Fellows.

The President announced that he had appointed the following as Vice-Presidents for the ensuing session:—Sir Frank Crisp, Mr. Horace W. Monckton, Prof. E. B. Poulton, and Dr. A. B. Rendle.

Prof. W. A. HERDMAN gave an account of the recent occurrence (April 1911) of the minute Dinoflagellate *Amphidinium operculatum*, Clap. & Lachm., at Port Erin in the Isle of Man, in such profusion as to discolour the sand between tide-marks in patches extending on some days for many yards. *Amphidinium operculatum* has been recorded from several places on the coasts of Europe and America, but has apparently not been previously found in Britain.

The Rev. T. R. R. Stebbing and Prof. Dendy contributed some remarks, and the author replied.

Dr. A. SMITH WOODWARD gave a general account of the Fauna of the Carboniferous Period, so far as it has been discovered in the same deposits as the Carboniferous Flora. The Fauna agrees with the Flora in consisting for the most part of highly specialised representatives of the lower groups, but is singularly modern in some respects. Some of the freshwater and land Mollusca are scarcely distinguishable from genera still existing. All the Crustaceans are of primitive groups, and some of the most interesting are related to *Anaspides*, which still survives in Tasmania. The Myriapods, Scorpions, and Spiders are similar to those of later date, but a few of the Scorpions retain obvious remnants of the characters of their aquatic ancestors. Limuloids also occur. Insects are numerous, but all belong to the lower groups in which there is no complete metamorphosis, and there are many generalised types which can scarcely be referred to existing Orders. Cockroaches are numerous, but have transparent fore-wings. Primitive Dragon-flies occur, and some of these are the largest known insects, with a span of wings measuring 2 feet. Among Fishes, the spiny Acanthodian Sharks, which are typically Lower Palæozoic, are still found in the Carboniferous Fauna, and are known to have been preyed upon by the higher Fishes. The Pleuracanth

Sharks are characteristic of the period, and interesting as showing a more generalised vertebrate skeleton than any later Fishes. The Coeliodont Sharks with grinding teeth appear to be closely related to the existing *Cestracion*, but have many of the teeth fused into extensive plates. Some of the sharp-toothed Sharks also seem to have had their teeth fused into rigid masses. The highest Fishes are the Palæoniscids and Platysonids, which exhibit all the fundamental characters of the present-day Sturgeons, obscured beneath a normal covering of ganoid head-plates and scales. Large Dipnoan Fishes are numerous, and differ little from *Ceratodus*, except in showing traces of the separate points of which their dental plates are composed. Most important are the Crossopterygian Fishes, of which *Rhizodus* and *Megalichthys* are typical genera. These Fishes make a closer approach to the earliest lung-breathers than any Fishes which have existed before or since. Lung-breathers were certainly in existence just before the beginning of the Carboniferous Period, and all seem to belong to a very primitive group of Amphibia, variously termed Stegocephalia or Labyrinthodontia, in allusion to the complete roofing of their cheeks by bone and to the complicated structure of their teeth. In their possession of supra-temporal plates and often of post-temporal bones, as also in the marking of their superficial bones by the course of the slime-canals, these Amphibians more closely resemble fishes than any later members of the Order. Towards the end of the Carboniferous Period some of the smaller Stegocephalia, the so-called Microsauria, seem to have passed into true Reptiles very similar to the surviving *Sphenodon* or *Hatteria*.

A discussion followed, the undermentioned taking part:—The President, Mr. William Cash (visitor), the Rev. T. R. R. Stebbing, and Mr. A. O. Walker; the author replying.

June 15th, 1911.

Dr. A. B. RENDLE, F.R.S., Vice-President, in the Chair

The Minutes of the General Meeting of the 1st June, 1911, were read and confirmed.

Mr. George Herbert Wailes, Miss Freda Bage, M.Sc., Mr. Malcolm Wilson, B.Sc., Miss Ann Cronin Halket, and Mr. Ernest Lee, B.Sc., were admitted Fellows.

Mr. William Neilson Jones, M.A. (Cantab.), was elected a Fellow.

A letter congratulating Sir JOSEPH HOOKER on his approaching 94th birthday, was read and signed by the Chairman and the Fellows present.

Professor W. A. HERDMAN referred to his paper at the last meeting on the abundance of a *Peridinium* at Port Erin, and stated that he visited that locality a few days after the said meeting, and found similar markings on the sand, but on the latter occasion it was due to vast numbers of a Diatom, *Navicula Amphishæna*.

Mr. G. H. Wailes, Prof. Dendy, and Mr. J. C. Shenstone contributed some remarks.

The following papers were read and discussed:—

1. Miss H. M. CUNNINGTON.—The anatomy of *Enhalus acoroides*, Rich. (Communicated by Prof. PERCY GROOM, F.L.S.)
2. Prof. A. D. IMMS.—On the life-history of *Croce filipennis*, Westw. (Communicated by Canon FOWLER, F.L.S.)
3. Prof. J. J. KIEFFER.—Cynipidæ.
4. The same.—Proctotrupoidea.
5. Prof. T. D. A. COCKERELL.—Apoidea.
6. Mr. J. C. F. FRYER.—Lepidoptera.
7. Mr. G. MEADE-WALDO.—Wasps.
8. Mr. J. E. COLLIN.—Borboridæ.
9. The same.—Phoridæ.
10. Mr. F. V. THEOBALD.—Culicidæ.

(The last eight papers, relating to the fauna of the Seychelles, were communicated by Prof. J. STANLEY GARDINER, F.R.S., F.L.S.)

The first exhibition was by Mr. F. ENOCK, who showed a series of slides illustrating several species of the minute hymenopteron *Mymar*, especially the recently-discovered *M. regalis* from Burnham Beeches.

Dr. GEORGE HENDERSON, F.L.S., exhibited a lantern-slide, made from a snapshot of the head of a Waterbuck, *Cobus ellipsiprymnus*, taken by his son, Mr. Fred. L. Henderson, of the British East African Medical Service, at Nairobi.

Mr. W. FAWCETT, F.L.S., showed:—

(a) A Parasitic Flowering Plant from Jamaica (*Scybalium jamaicense*, Schott & Endl.).

(b) Flowers of Banana (*Musa paradisiaca* var. *sapientum*).

The cultivated Banana-plant attains its full height before the flowers are formed. The trunk is a hollow cylinder formed by the bases of the leaf-stalks. The flowering-stalk first appears as a projection from the tuber into the base of the cylinder. The first flowers are formed while the stalk is quite short, and apparently it takes about six weeks for it to grow from the base until it emerges at the apex. The flowers exhibited were taken before emergence. They occur in clusters spirally arranged round the

peduncle. The lowest clusters are female flowers; the highest clusters are male flowers. Between these two sets of clusters there are very often a few clusters in which the ovary is about half the length of the whole flower; these are probably not truly hermaphrodite, but neuter.

The ovaries of the female flowers become the banana-fruit; those of the neuter flowers grow into small worthless fruit. The male flowers and bracts are deciduous, and the peduncle continues to lengthen and produce male flowers until the fruit is cut.

Dr. STAFF commented on these exhibitions.

Mrs. LONGSTAFF showed a specimen of *Brassia caudata*, Lindl., in flower, from Jamaica, which was followed by remarks from Mr. W. Fawcett and the Chairman.

Sir FRANK CRISP exhibited on behalf of Mr. WILLIAM MORRIS a monstrous proliferation of a Foxglove, in which the terminal flower had attained an extraordinary development.

Mrs. STEBBING, F.L.S., also showed a very small monstrosity in the same species.

These exhibits were discussed by the Rev. T. R. R. Stebbing, Dr. Longstaff (visitor), Miss May Rathbone, and the Chairman.

ABSTRACTS.

I.

Alien Plants introduced into the Tweed District with Foreign Wool. By IDA M. HAYWARD, F.L.S.

[Read 1st December, 1910.]

THE subject to which I propose briefly to direct the attention of this meeting is the Alien Plants of the Tweed district.

Those shown are a selection out of about 200 alien plants which I collected on the banks of the river Tweed and its tributary the Gala in the course of the last three or four years. Three of them were gathered when accompanied by Mr. James Fraser of Edinburgh, and two of them when accompanied by Mr. Claridge Druce of Oxford.

It is, however, proper to add that reference has been made to the major portion of them in the course of the present and past year in the 'Annals of Scottish Natural History' and the Botanical Exchange Club Report of the British Isles.

The reason of the plants being found on the banks of the Tweed and Gala is interesting. The staple industry in that locality is the manufacture of wool into cloth. The wool is brought from

the Colonies and various foreign countries, and in it is entangled a variety of seeds. In the process of washing the wool the seeds are swept into the river, and some of them, deposited on the shingle or on the banks of the river, germinate and grow into more or less hardy plants. In this way plants that are natives of Australia, New Zealand, Cape Colony, South America, and other foreign countries are seen to be growing side by side with plants of the British Flora.

Erodium Botrys, Bert. No. 1 specimen. A South European species.

There are a great many European species of *Erodium* by the river-banks and on mill waste-heaps.

Medicago præcox, DC. No. 2 specimen.

This genus, like the *Erodium*, is a very common one in the Tweed district. Eight different species have been collected; the species now exhibited, however, has not hitherto been recorded.

The history of this *Medicago* is interesting. Originally a South European species, it has become widely spread in Argentina. The Spaniards, in the sixteenth century, introduced into that country some of their domesticated sheep which probably carried some fruits of the *Medicago* with them. The seeds, finding there a congenial soil, have flourished and now come back to Europe and to the Tweedside in bales of wool. The fruits are also found in the wool of Australia and other colonies, and probably also have a similar origin.

The fruits, or burrs as they are locally called, are very detrimental to the wool. This, however, is overcome to some extent by the following process, which is now much practised in the manufacturing districts of this country and on the Continent. The rind of the burrs is carbonised by a weak solution of sulphuric acid, and then subjected to a dry heat of about 180 degrees. The burrs are then pulverised by heavy rollers and blown out by strong fans. The seeds themselves are uninjured by this process or even by being boiled in the process of dyeing.

Tillæa Vaillantii, Willd. Specimen No. 3. Native of France and Spain.

Plentiful for two successive years. It has stalked flowers and their parts are in fours, while in *Tillæa muscosa* the parts are in threes, and the flower sessile.

The genus *Helipterum*, of which I have specimens of three different species, Nos. 6, 7, 8, *Helipterum corymbiflorum*, Schlecht., *Helipterum floribundum*, DC., *Helipterum hyalospermum*, F. von Mueller. is perhaps the most interesting of these alien plants. This genus has hitherto been unrecorded for Great Britain, and yet has been found growing as far north as the banks of the

Tweed. It is nearly allied to *Helichrysum*, an everlasting flower. *Helipterum* differs by having the hairs of the pappus *plumose* instead of *pilose*. Natives of South Africa and Australia.

Cotula australis, Hook. f. No. 9.

These I have found in plenty six miles down the river at Melrose for two successive years. It is a perennial, a native of Australia and New Zealand, invariably following sheep.

Cenia turbinata, Pers., var. *concolor*. No. 10.

In variety *concolor* the rays are yellow on both sides, in the type they are white above and red on the lower surface. An hitherto unrecorded genus for Britain, but a common weed throughout Cape Colony.

Senecio laetus, Forster. No. 11.

I have noticed *Senecio laetus* for three years. It is a handsome perennial plant and grows in abundance on the banks of the Gala and Tweed to a height of 2 feet. A native of Australia, Tasmania, and New Zealand.

Eritrichium australasicum, A. DC. No. 13.

One small patch of the above endemic Australian species was found in moist alluvium near the junction of the Gala and Tweed, and was an unrecorded genus for Britain.

Atriplex spongiosa, F. von Mueller. No. 14.

The berry-like spongy fruit of plants found at Tweedside turned from pale green to dull red. I have noticed the testa comes off, leaving the inner membrane with ripe seeds. It may be at this stage the seeds adhere to the wool. Sheep are very fond of *Atriplex spongiosa*: Maiden, in his 'Useful Plants of Australia,' tells us "it is a useful salt bush for culture." It may be found through a great part of Central Australia, extending to the West Coast and also South Australia.

Deyeuxia retrofracta (Willd.), Druce. No. 18.

This very common, but variable Australian species is referred to by Maiden as Toothed Bent Grass. It produces a large quantity of sweet fodder in damp localities and is valuable for pastures. It is essentially a winter grass, dying out on the approach of summer, and is eaten when young. Its pointed seeds are very injurious to wool. It seeds in September and October.

The remaining specimens exhibited are:—

Daucus brachiatus, Sieber. No. 4. A native of Australia.

Erigeron linifolius, Willd. No. 5. A native of Australia, South America, common in China and Ceylon.

Senecio brachyglossus, F. von Mueller. A native of Australia.

Rumex Brownii, Camp. No. 15. A native of Australia and said to thrive in every place where sheep have been*. I have found it growing for three years in abundance by the banks of the Gala and Tweed.

Agrostis lachnantha, Nees. No. 16. A native of South Africa and Abyssinia.

Polypogon linearis, Trin. No. 17. A Chilian species.

I have to accord my warmest thanks to the authorities of the Herbaria of Kew and the British Museum, to Mr. G. Claridge Druce, to Prof. Bayley Balfour, and Mr. James Fraser of Edinburgh, for kindly helping to name and verify these plants.

II.

Reports on the International Congress of Botanists, held at Brussels in May 1910.

[Presented 15th December, 1910.]

Dr. O. STAPP introduced his report on the International Botanical Congress, held at Brussels between May 14–22 of the present year, with a short account of the working programme of the Congress as it arose out of the decisions of the last International Botanical Congress which met at Vienna in 1905 and the dispositions of the Belgian Bureau. There were altogether 5 sections. Sections I. and II. were charged with the discussion and codification of the special arrangements necessary with respect to the nomenclature of fossil and non-vascular plants on account of their special nature. Tacked on to them were two propositions dealing with an extension of the list of '*nomena conservanda*' for phanerogams and vascular cryptogams, adopted at Vienna. Section III. was reserved to 'phytogeographical nomenclature.' Section IV. was to deal with bibliography and botanical documentation, and Section V. with botanical instruction. Sections I. and II. continued the work of the Vienna Congress in so far as it concerned nomenclature. Section III. was the result of the deliberations of a new Commission appointed by the Vienna Congress. The other two sections were added by the Belgian Bureau.

The Linnean Society appointed five delegates for the Congress with a view to have the different departments concerned in the discussion on taxonomic nomenclature as far as possible represented. The delegates were Messrs. Arber (fossil plants), Cotton (Algæ, Lichens, and Fungi), Gepp (Musci and Hepaticæ), Henry Groves and Dr. Stapf (Phanerogams and Vascular Cryptogams,

* Bentham, 'Flora of Australia,' vol. v. p. 263.

and Mr. H. Groves, the latter also for Characeæ). Phytogeography was not taken especially into account, as Mr. Tansley, the delegate of the Cambridge Philosophical Society, joined Section III. As to Sections IV. and V. no special steps were taken, and as their meetings mostly coincided in time with those of Sections I., II., and III., the delegates of the Society did not take part in their deliberations.

Dr. Stapf reported then especially on the decisions concerning the nomenclature of phanerogams and vascular cryptogams. A number of propositions of a general character, and insofar touching the nomenclature of phanerogams and vascular cryptogams, had been submitted to the Permanent Bureau on Nomenclature, but they were automatically cut out by the decision of the Bureau not to reopen the discussion on points decided at Vienna. Thus the only serious subject to decide upon was the question whether and to what extent the list of '*nomina conservanda*' was to be added to. There were two lists of addenda proposed—one of phanerogamic genera, the other of fern genera and fern allies. The object of their promoters was to restrict as far as possible the replacement of well-known and generally used names by obscure ones on the ground of the strict application of the rule of priority. As in certain cases the changes had already been made since 1905 and they had found their way into floras and textbooks, a compromise was accepted by which those changes were recognised, but further changes barred by putting a considerable number of threatened genera on the list of '*nomina conservanda*.' Among the names thus saved were, for instance, *Persea* and *Terminalia*, genera including a great many species, and *Welwitschia* and *Selaginella*.

Mr. HENRY GROVES followed with some remarks on the question of taxonomy as affecting local floras, and the fact that little had to be altered in Characeæ. He also paid a warm tribute to the masterly manner in which Dr. Briquet discharged his duties as 'Rapporteur général.'

Mr. A. GEPP reported thus:—

In contributing to the report on the International Congress of Botanists at Brussels, I beg to express my thanks to the Society for the honour they conferred upon me by including me among their delegates. The Congress was attended by many distinguished botanists, whom it was a pleasure to see, and whom otherwise one might never come across.

The work of the Congress covered a very wide field, but owing to the thorough carefulness with which the matters for discussion had been sifted and prepared beforehand by the permanent Committee, and to the diligence and determination of the honorary presidents, vice-presidents, and secretaries, the agenda were carried through and settled point by point with business-like celerity at the meetings.

Though interested in the welfare of the Cryptogams as a whole, I was specially interested in the nomenclature of the Algæ, Mosses, Hepatics, and Ferns. The points to be settled by the Congress were these:—Whether the nomenclature of the Cellular Cryptogams would start from Linnæus's '*Species Plantarum*,' Edition 1. (1753), thus bringing them into line with the Vascular Plants, which occupied the attention of the Vienna Congress in 1905; or whether the various groups of Cryptogams should have separate starting-points of later date. In the event it was decided that some of the groups should date from Linnæus's '*Species Plantarum*' (1753), viz.:—Myxomycetes, Lichenes, Hepaticæ, Sphagnaceæ, and the main group of the Algæ. On the other hand, the Fungi are to start partly from Fries's '*Systema Mycologicum*' (1821–32), and partly from Persoon's '*Synopsis Fungorum*' (1801). The remainder of the Algæ, broken up into small groups, are to start from various dates, and some are left over for consideration at the next Congress (London, 1915). The Mosses (*Musci veri*) are to date from Hedwig's '*Species Muscorum*' (1801).

The reason for selecting works of post-Linnean date as starting-points for some of the groups of Cryptogams is that there is considerable doubt as to what plants Linnæus meant by the names and descriptions in his '*Species Plantarum*.' It sometimes happens, for instance, that his description represents one species, while the plate cited figures another species, and the specimen found in his herbarium is a third and different species.

It was to avoid basing the Mosses upon such uncertain types that the proposal was made to select Hedwig's '*Species Muscorum*' (1801) as starting-point for the *Musci veri*. For Hedwig was the first to discern generic values and relationships among the Mosses, and to investigate and figure their morphology with a microscope (a primitive one though it was). His '*Species Muscorum*' is an epitome of his previous works; and his type-specimens are still in existence.

Similarly, it would have been well to make the Hepaticæ and Lichenes start, not from Linnæus's '*Species Plantarum*' (1753), where, indeed, they are included under the Algæ, but from the works of some post-Linnean specialists. For instance, Sir William J. Hooker's '*British Jungermannia*' (1812–16) is the real starting-point of hepaticology, and only fails to qualify through not treating of the Marchantiaceæ, Ricciaceæ, Anthocerotaceæ. And for the Lichenes the book that suggests itself is Acharius's '*Lichenographia Universalis*' (1810). The types of these two authors are either in existence or for the most part are comprehensible. But in the absence of any definite proposal, the Congress could hardly do otherwise than leave the Hepaticæ and Lichenes on the Linnean starting-line. In the case of the Algæ, the proposals for giving the main group a less antiquated starting-point were defeated.

However, the actual starting-point may perhaps not be of vital

importance; for the Congress made the wise provision of appointing for each group of Cryptogams a special Committee, whose duty it is to prepare and consider lists of '*nomina conservanda*' to be submitted to the next Congress (London, 1915). This should put the nomenclature of the various groups upon a satisfactory and stable basis, and will give an opportunity for eliminating undesirable factors, as, for example, the name *Jungermannia*, which in Linnæus's '*Species Plantarum*' represents, not a genus, but a whole family of heterogeneous genera. *Jungermannia* can be discarded, just as *Lichen*, as a genus-name, has been long discarded by universal consent.

A word now as to the Ferns and Fern-allies. These, as decided at the Vienna Congress (1905), start from Linnæus's '*Species Plantarum*.' An attempt was made at the recent Brussels Congress to establish a list of '*nomina conservanda*' for some twelve genera of ferns which otherwise will pass out of use: the most interesting of these are *Nephrodium* and *Selaginella*. The proposal was, however, rejected by a strong opposition on the plea of practical convenience; for a complete and appropriate scheme of fern-nomenclature has been carefully elaborated by Christensen in his '*Index Filicum*' (1905-6), a book that is everywhere accepted and is in full accord with the laws of priority. Let it be the standard, and there will be no more wrangling over fern-names. It should be added, however, that the Congress decided to maintain the name *Selaginella* in place of *Stachygynandrum* and other earlier synonyms. Further, it is interesting to note about *Nephrodium*, that upon its acceptance or rejection depended the fate of some 800 species. These have now been transferred by Christensen and others to *Dryopteris*, a genus which however does not deserve its position. For recently it has been pointed out by Niewland in the '*American Midland Naturalist*' that Schmidel in his '*Icones Plantarum*' employed the name *Thelypteris* for the same group of ferns a year before Adanson proposed *Dryopteris*, and that Schmidel has given in illustration an unmistakable figure of the Marsh-fern (*Nephrodium Thelypteris*). It would appear, then, that the 800 species will now have to be transferred to *Thelypteris*, unless *Dryopteris* should be put among the '*genera conservanda*.'

Mr. A. D. COTTON then explained that the following dates were adopted as the starting-points for the nomenclature of the Cellular Cryptogams:—

ALGÆ.

Linnæus, *Species Plantarum*, 1753; with the following exceptions:—

Desmidiaceæ. Ralfs, *British Desmidiaceæ*, 1848.

Oedogoniaceæ. Hirn, *Monographie der Oedogoniaceen*, 1900.

Cyanophyceæ. Bornet & Flahault, Revision des Nostocacées hétérocystées, 1886-8; and Gomont, Monographie des Oscillariées (Nostocacées homocystées), 1892-3.

Diatomaceæ, Chroococcaceæ, and Flagellateæ were postponed till the next Congress.

FUNGI.

Fries, Systema Mycologicum, 1821-1832; with the following exceptions:—

Uredineæ, Ustilagineæ, and Gasteromycetes, which start from Persoon, Synopsis Fungorum, 1801.

LICHENS.

Linnaeus, Species Plantarum, 1753.

MYXOMYCETES.

Linnaeus, Species Plantarum, 1753.

Committees were appointed to prepare lists of '*genera conservanda*' for the Algæ, Fungi, and Lichens.

For Fungi with a pleomorphic life-cycle, it was decided to adopt the oldest name applied to the perfect stage of the fungus, provided that in other respects it conform to the rules.

Mr. E. A. N. ARBER not being present, and no delegate having been present at the Section on Phytogeographical Nomenclature (admirably summarised in the '*New Phytologist*,' ix. nos. 6 & 7, pp. 260-262), Dr. Stapf resumed his address, stating that:—

The propositions concerning fossil plants led in one particular point to a somewhat lively discussion. This was with respect to the admission of diagnoses or descriptions not in Latin, but in one of the four modern tongues, English, French, German, or Italian. It was in the end decided that descriptions of fossil plants might be in a modern language, but they should always be accompanied by a Latin diagnosis. As starting-point Linnaeus's '*Species Plantarum*,' 1753, was adopted for fossil plants; but in order to reduce the changes arising from that rule to a minimum, a list of '*nomina conservanda*' will have to be drawn up, including generic names of living plants which otherwise—as, for instance, *Bucklandia*—would have to give way to old generic names of fossil plants, and generic names of fossil plants which are homonyms of synonyms of recent plants.

III.

2nd February, 1911.

(a)

THE General Secretary, Dr. B. DAYDON JACKSON, gave the following history of the portrait of Carl von Linné painted by Alexander Roslin, with some further remarks on the Lapland drum in the Hoffman portrait.

He pointed out that there are three portraits of the great Swede known to be painted by Roslin, two of them busts and one a three-quarter length. They have been termed by Prof. Tycho Tullberg, the iconographer of Linné, (1) the Stockholm, (2) the Gripsholm, and (3) the Versailles portraits; nos. 1 and 2 respectively form plates 13 and 12 of Tullberg's 'Linnéporträtt' and are excellently reproduced; no. 3 in the same work is a half-tone reproduction which leaves much to be desired. He had, therefore, after much trouble and delay succeeded in getting a fresh photograph taken (Plate), and accompanied it with the following account of its origin, so far as now ascertainable.

Linné in his 'Egenh. Anteck.' p. 68, says:—"Herr Roslin who takes 1000 plåtar (about £165) of others, is doing Linné's portrait gratis and so excellently that nothing can be more like; all the others are somewhat unlike." In a letter to his intimate friend Bäck at Stockholm, Linné says:—"Will my brother [*i. e.* Bäck] should he meet Roslin, who has not his equal in the world, be so good as to ask when I should come? Think how extremely generous he was to promise to paint my head gratis, though he charges from 7000 to 8000 dalers (about £160 to £182) for each portrait, and that he promised me the first time I had the fortune to meet him. God grant that he may not repent. It would be a reason for me once more during life to see Stockholm." This letter is undated, but Prof. Fries states it was certainly written in November 1774 (see *Bref och Skrifv. v.* p. 222). In a later letter, of the 18th November, he continues, "My colleagues want to have me with them in Stockholm, when they will present the first book of their Bible version, but lectures, presidency, cold winds, and old age prevent me, though I should like to come, if Roslin the great portrait painter has time to do me the favour he has so kindly promised" (*Ib.* p. 223); and four days later, "If I keep well, I will come to Stockholm to enjoy the signal and valuable favour our great Roslin offered me so innocently" (*Ib.* p. 224).

It is certain that Linné journeyed to Stockholm, probably a few months later, in 1775, when the portrait was painted. Which of the three portraits specified above was the original is not easy to decide, for Roslin took it with him to Paris. At the beginning he evidently did not contemplate this, but on so deciding he applied to the secretary of the Royal Academy of Science, P. Wargentin, who seems to have taken Linné's opinion upon the



CARL VON LINNÉ.

project, for Linné replies to Wargentin, 17th Sept., 1775: "Through my being at Hammarby I only received the post to-day. Herr Roslin has done the portrait gratis, so that he was at liberty to dispose of it, even without my wish, but he has thereby done me double favour, for it was only painted for posterity, and can never be better copied than in Paris; give him my respectful thanks, if he is still [in Stockholm] and say that I am doubly indebted to him." This letter shows that the reason why Roslin wanted to carry off the portrait, was to copy it in Paris, where he was permanently settled.

It is perfectly certain that the portrait which now belongs to the Versailles gallery was painted complete in Sweden, for it was very accurately copied by Lorenz Pasch the younger; and as he seems never to have left Sweden after his return from abroad in 1766, the copy must have been made in that country, so that Roslin's original must have been then complete.

Nothing more was heard about the portrait till after Linné's death early in 1778, and the news seems to have stirred Roslin up to carry out his promise to give a copy to the family of Linné and to the Royal Academy of Science. In September of that year, the Academy debated upon some talk which the painter had with some of the members, that he was to get one of the most skilful of the Paris engravers to engrave the portrait of his fellow-countryman which he had painted. It was to cost 1000 livres (£39 15s. 0d.), and Roslin asked whether the Academy would pay this on condition of receiving the plate and the whole of the impression, which it was thought would readily sell, and be eagerly sought after by the whole of the learned world, so that not only would the outlay be recouped, but that the Academy would benefit. The Academy took this view gladly and gave instructions to the Secretary accordingly. A letter of the 12th May, 1779, from Roslin was read in the meeting of the 2nd June, in which he stated, that the copper was now ready with 500 copies printed, and 150 of these were sent by Herr Sergel [the Swedish sculptor]. The remainder might be sold in Paris and elsewhere for 2 livres (=1s. 7d.) apiece. Besides the cost of the plate, 86 livres [=£3] had been spent for paper and printing. "The actual portrait which Herr Roslin made for himself, he offers to present to the Academy. All this delighted the Academy, but the determination as to the disposal of the 150 copies was postponed, till they should arrive." In a letter to the younger Linné dated 19th July, 1779, Wargentin says:—"Of the late Hr. Archiater's portrait engraved on copper, 150 copies have come. It is extraordinarily beautiful, and like, although the Archiater is represented younger and plumper than he was during the last years. It has cost the Academy 3600 dalers in copper (about £83)." This refers to Bervic's engraving, a copy of which was shown at the meeting held on the 21st July: "All present found it extremely well done, but were of various opinions as to the more or less likeness to our lamented Linné. The Academy decided to present copies to the widow and

son, Hr. Bäck and Hr. Sergel, but that the rest should be sold to the members and others at half a Riksdaler apiece (about 2s. 3d.).” On the same occasion a letter from Roslin was read, in which he offered the portrait itself. “The Secretary received instructions to thank him in the choicest language for this offer, which had been received by the Academy with the greatest pleasure.”

As soon as the younger Linné received the print, he wrote to Wargentin:—“I thank you most obediently for the specimen of my late father’s portrait, of which I have given my mother hers. It is extremely beautiful and well engraved; it is a pity that it appears so filled out, otherwise it would probably have been more like. Each time I look at it, at the first moment it seems wholly like, but that disappears directly I look longer at it. What about the Roslin portrait? Can it be got back? It would be most suitable if it were in the same building [the University] where both the Rudbecks were formerly.”

When this was written the writer was probably unaware that a canvas had already been given to the Academy, and the picture he asked about was that which Roslin took with him to Paris. In a later letter, also to Wargentin, he says:—“That my late father’s portrait has been given by Roslin to the Royal Academy, I can never say anything against, but am thereat extremely pleased.” From this it would seem that the younger Linné, when he heard that Roslin had presented a portrait to the Academy, and when he did not get back that which Roslin carried off, thought the latter should hang in the University, for he could not object to another portrait being given to the Academy, of which, it must be remembered, Linné was one of the founders, its first president, and for 20 years its secretary.

As regards the three Roslin canvases, Prof. Tullberg comes to the following conclusion:—Roslin offered Linné when he met him to paint his portrait gratuitously for his own sake, possibly also with an idea of painting a replica to exhibit in Paris. He then painted the three-quarter length, which Linné saw and admired. Afterwards the idea just alluded to took a more definite shape, and as during his visit to Sweden he was unable to make the copy, he took it with him to Paris after getting Linné’s permission. There it remained and nothing was done, and only after Linné’s death in January 1778, did he begin to think about it. Roslin therefore did not trouble to paint a complete replica, but kept the original and pleased himself by painting a head-and-shoulders, which he suggested to the R. Academy should be engraved, a suggestion gladly received. It was this which he gave to the Academy; the latter, knowing that Roslin had promised the portrait to Linné, asked his son if he had any objection to the Academy accepting it, upon which he replied, that he “was very pleased therewith.” Roslin, however, considered he was bound to carry out the promise made to Linné, and therefore painted the “Gripsholm” portrait for the family. It belonged to them until it was bought by Gustaf III. and placed in the palace of Gripsholm, but when, it is uncertain,

though it must have been before 1792, when he was assassinated by Ankarström. It cannot be maintained that this is a mere copy of the upper part of the Versailles' portrait, for the position of the shoulders varies, the coat is of velvet, not silk, the necktie has another form, and a spray of *Linnaea* is placed in the button-hole, instead of the hand, which does not appear in the smaller canvas. In general the latter agrees with the Stockholm portrait: it seems probable that the Gripsholm portrait was painted first, possibly as a sketch; it might have been done in Sweden, or after the painter's return to Paris.

It may therefore be assumed that the Versailles portrait was painted in Sweden, and is the original picture; it was copied by Pasch very soon afterwards, and disappeared from sight after being exhibited at the Salon, till its reappearance fifty years ago. It is possible that the Gripsholm portrait was painted also in Sweden, but the Stockholm picture must certainly have been produced in Paris at a later period.

As the Versailles portrait is practically unknown in this country, the following details are taken from Prof. Tullberg's volume. It was shown at the Salon in Paris in 1779, and came by purchase to Versailles before 1861, and is numbered 4514. It has suffered bad treatment, and was restored some years since. When it was being cleaned, it was discovered that the painting bore traces of the cross of the Polar Star, which had previously escaped notice, and since then it has been very unhappily painted in, the crown being omitted, and the cross placed flat on the ribbon, instead of the true method of suspension. This explains why, in a series of photographs issued in 1897, the decoration is wanting; but it was present in 1906, as shown in a later photograph possessed by Prof. Tullberg.

The account given by Dr. W. Carruthers in our 'Proceedings,' 1905-6, pp. 67-68, set out the facts then available regarding the Pasch copy, but more recent information has rendered that account somewhat incorrect, as may be inferred from the foregoing narrative. It may be restated thus:—

Uno von Troil (1746-1803) was the son of an archbishop of Upsala, who, after taking his degree as *Philosophie Magister*, went on a foreign tour, during which he accompanied Sir Joseph Banks and Dr. Solander to Iceland, in 1770, and on his return to Sweden published his 'Bref rörande en resa till Island,' which aroused great attention. He met Roslin in Paris in 1771, and was therefore an acquaintance of the painter when he revisited his native country in 1774-5. Von Troil became a court-chaplain in 1775, and it seems practically certain that he then induced Roslin to allow Pasch to make a copy of what we have termed the Versailles portrait as a present to Sir Joseph Banks. It remained in Banks's possession till his death in 1820, when it passed to Robert Brown, under the proviso of Banks's will, that the household furniture in the Soho Square establishment should pass to Brown, upon Lady Banks ceasing to reside there after her husband's death. Brown

was President of the Linnean Society from 1849 to 1853, and upon his retiring from the Chair, he presented the Pasch copy of the Linnean portrait to the Society.

(b)

In the second and more detailed account given by Mr. (now Dr.) William Carruthers* of the various portraits known of Linné, he has recorded his belief that the frontispiece to the '*Flora lapponica*' represents the author himself, with a Lapland drum on his knees, which, it is suggested, is a press for drying plants (Proc. 1905-6, p. 60). I am myself forced to regard the whole frontispiece as representing the country and its inhabitants, some of the objects as drawn by Linné, others, such as the mountains, as imagined by the Dutch artist. The figure in the foreground is a Lapp in front of his tent, with the magic drum on his knees, some small stones on the stretched skin, and a forked instrument to set the membrane in vibration and cause the stones to move on to certain representations of deities and objects of every-day life, by which the future might be forecast. These drums were formerly common amongst the Lapps, but the Swedish missionaries discouraged their preservation as savouring of superstition, and large numbers were destroyed. The ultimate fate of Linné's specimen seems unknown; he had it with him in Amsterdam, when the full-length canvas was painted by M. Hoffman.

Prof. Tullberg, on the authority of Prof. K. B. Wiklund, has given in his '*Linnéporträtt*,' p. 92, the following explanation of the designs drawn upon the drum in the Hoffman portrait, as also the text-figure here reproduced, slightly reduced in size. The

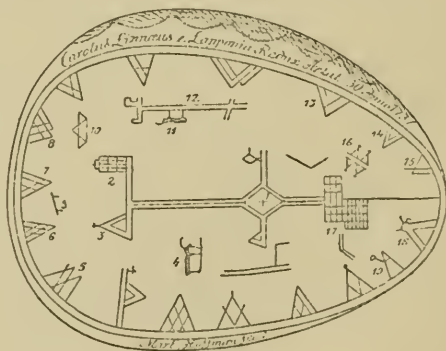


Fig. 39.

drum consisted of an oval frame of wood over which was stretched a skin, upon which many figures were drawn; it was used by the Lapps to search out hidden matters, which was done by placing stones or other small objects on the drum-skin, which was then thrown into vibration by means of a fork-like instrument, which

* Proc. Linn. Soc. 1905-6, p. 60.

was called the hammer. Naturally the objects on the membrane changed places on the skin, and by their incidence upon the respective figures, the future was foretold. The figures on the drum are thus identified:—

1. The sun with its beams in four directions, 2. Reindeer paddock (?), 3. Lapp tent, 4. Reindeer, 5–8. Deities, 9. The sacrifice, 10. Boat, 11. Reindeer, 12. Road to peasant's cottage, 13–15. Lapp divinities or norns, 16. Road with 4 human figures, 17. Reindeer enclosure (?), 18. The kingdom of the dead, 19. Magician with drum.

The remainder of the picture shows other Lapps hunting, boating, driving in reindeer sleighs, with the sun in its course visible throughout the entire twenty-four hours, and apparently about 3 A.M. judging from its position, a Lapp storehouse on poles, and sundry other indications of their wandering life.

IV.

March 2, 16, and May 4, 1911.

THE TERMS POLYZOA AND BRYOZOA.

(a)

THE REV. T. R. R. STEBBING made the following remarks:—Like the suit of *Jarndyce v. Jarndyce*, the controversy between the terms Polyzoa and Bryozoa seems almost interminable. An attempt to settle it ought to be welcome. For this purpose it is desirable to confront the arguments on each side.

The late Mr. Busk, in his monograph of the Crag Polyzoa, 1859, after mentioning that Milne-Edwards had proposed to distinguish this group from the hydroid polyps by the name of 'Polypes tuniciers,' goes on to say:—"Another independent observer, however, Dr. John V. Thompson, of Cork, was also at work on the same subject, the results of whose researches, apparently commenced in 1820, were not published till December 1830, in the first part of his 'Zoological Researches and Illustrations.' He, like M. Milne-Edwards, recognising the close affinities presented in the structure of the animals to that of the compound Ascidians, was the first to propose for them an appellation wholly independent of their former incongruous allies, the hydroid 'Polypes.' The term he employed was 'Polyzoa,' it 'being applied,' as he says, 'to a distinct class of Polypes hitherto in great measure confounded with the Hydroida.' But it is to be remarked that he used the word in the singular number, so that the plural term, 'Polyzoa,' as now employed, though etymologically more correct, is not in reality synonymous with that of Dr. J. V. Thompson. This fact, which appears to have been strangely overlooked till 1852, may fairly enough be used as an argument in their favour by those who are inclined to prefer the Ehrenbergian term 'Bryozoa.' But as this preference, which is still extensively prevalent, more especially on the Continent, is based simply on the supposed priority of Professor Ehrenberg's appellation,

n claim which has been shown to be wholly untenable, it is scarcely likely that British naturalists will refuse the honour justly due to Dr. J. V. Thompson, for what can scarcely perhaps be regarded as a sufficient reason."

In a footnote Busk refers to his own article "On the Priority of the Term 'Polyzoa' for the Ascidian Polypes" (Ann. Nat. Hist. 2nd series, vol. x. p. 352, 1852). He there convincingly shows that December 1830 (date of Polyzoa) is earlier than March 1831 (first mention of Bryozoa). But he is apparently unaware how the importance of this undeniable fact is undermined by other considerations.

J. Vaughan Thompson was a man of renown who dimmed the lustre of his researches by his confused manner of expounding them. The fifth memoir of his 'Zoological Researches,' which is here in question, is entitled "On Polyzoa, a new animal discovered as an inhabitant of some Zoophytes, with a description of the newly instituted Genera of *Pedicellaria* and *Vesicularia*."

At p. 94, Thompson says:—"This new animal, the Polyzoa, was subsequently found in *Sertularia Cuscuta*, *Spinosa*, and *Pustulosa*."

At p. 96, he says:—"The discovery of the Polyzoa was made in the summer of 1820; during the subsequent and following seasons, an exactly similar structure was noticed in the other species above enumerated, and in a new type which perhaps merits to be distinguished as a separate genus, under the title of *Pedicellaria*."

It thus appears that Polyzoa and Bryozoa are not really comparable, the latter being of ordinal and the former of generic value. Now, according to Scudder's 'Nomenclator Zoologicus,' Polyzoa was instituted by Lesson as a mollusean genus in 1830, while, according to Cuvier's 'Règne Animal,' vol. iii. p. 385 (1830), Lesson's 'Manuel de l'Hist. des Mollusques' was in fact published in 1829, so that Thompson's Polyzoa, published in December 1830, was void by preoccupation.

(b)

Note on J. V. Thompson's use of the term "Polyzoa."

By Prof. W. A. HERDMAN, F.R.S., F.L.S.

I HAVE read with much interest the report of the remarks made by the Rev. T. R. R. Stebbing, at the last meeting of the Society, in regard to the use of the term "Polyzoa" in the title of one of the papers then communicated to the meeting. There are several distinct points that can be raised in the controversy as to the use of the terms "Bryozoa" and "Polyzoa." The only one that I desire to remark upon now is Mr. Stebbing's contention that Dr. J. Vaughan Thompson, in his publication of December, 1830, intended to use the term "Polyzoa" as a generic title, and that as such the name was pre-occupied by Lesson's institution of a Molluscan genus in 1829. I am sorry that an examination of J. V. Thompson's 5th Memoir, in the 4th part of his 'Zoological Researches and Illustrations,' leaves me unable to agree with Mr. Stebbing that Thompson used "Polyzoa" as a generic name. Several passages in the memoir seem to me to show clearly that

the author was arguing that sets of species included under several different genera, and even distinct families, had the structure which he was describing under the term "Polyzoa" and, therefore, ought to be removed from the groups with which they had previously been associated. For example, after saying that some of the Sertularian Zoophytes would require to be so removed, "as well as such *other genera* [italics mine] as may hereafter be found similarly circumstanced," he goes on (Mem. 5, p. 92) to say:—"I shall merely indicate here in a general way the whole of the Flustraceæ, in many of which I have clearly ascertained the animals to be Polyzoæ." Surely this indicates that he recognised that whole families and genera would find their proper places in his new group?

Then again, on page 97, he refers some of the species of "Sertularia" (which, by the way, from another passage he evidently regards as a "Family"), in which he has found the animals to be Polyzoa, "to *one genus*"; but that does not mean one genus "Polyzoa," for, a few lines below, he proposes the name "Vesicularia" for this genus, showing clearly that he did *not* regard his term "Polyzoa" as a generic title, and that *Vesicularia* was only one set of species in the larger assemblage Polyzoa which he was creating. Thompson was in the habit of printing a generic name at the foot of each of his plates—such as *Nebalia*, *Noetiluca*, etc., in previous Parts of his 'Zoological Researches,'—and below the plates of this "Polyzoa" memoir we find the name "Vesicularia," as one would expect from the text. It is clear then, on all these grounds, that he did not regard "Polyzoa" as a genus.

Finally, in the last paragraph of this paper (p. 100) he says:—"Time and more accurate observations will no doubt add many more species to the above genera, etc." That is, genera of which he had demonstrated the Polyzoan structure or nature. It is therefore obvious that he could not and did not regard the whole assemblage of such genera as one genus to which he was applying the term "Polyzoa," as Mr. Stebbing would apparently have us believe.

In short, I consider that John Vaughan Thompson knew what he was about, and that although in places his language is a little quaint his meaning is clear: that he was the first to recognise the essential points in Polyzoan structure, as seen, for example, in the genus *Vesicularia*, or in the larger group "Flustracea," and that he described and figured these adequately in December, 1830, in a memoir entitled "On Polyzoa," etc. The very title of his memoir shows that he did not put Polyzoa forward as the name of a genus, since it cites *Pedicellaria* and *Vesicularia* as the two new genera he is placing in the larger group Polyzoa. Is that clear recognition and demonstration of a group of allied genera collectively named "Polyzoa" invalidated by the fact that Lesson a few months before applied the term Polyzoa to a genus of Tunicata?

March 11th, 1911.

W. A. HERDMAN.

(c)

ON JOHN VAUGHAN THOMPSON and his Polyzoa, and on *Vaunthompsonia*, a genus of Sympoda. By the Rev. T. R. R. STEBBING, M.A., F.R.S., F.L.S.

JOHN VAUGHAN THOMPSON was born in 1779 and died in 1847. The Linnean Society with prophetic instinct elected him a Fellow on February 6th, 1810. It would be an honourable thing to commemorate that centenary by a re-issue of his writings, which are small in compass, difficult to obtain, but of great historic interest and value. In 1830 he made a pathetic appeal to the scientific world to furnish him with a hundred and fifty subscribers, as his private income would no longer bear the sacrifice till then entailed by the publication of his researches. He had good reason to be proud of his "discoveries," though he may not have been the first to make them. That is the lot of all discoverers, as Columbus, for example, in finding the New World found it already peopled by men who had known it before he was born. None the less, Vaughan Thompson was a foremost leader in proving that cirripedes (Thyrostraca) are crustaceans and that crustaceans as a rule pass through metamorphic stages. He was also undeniably in the vanguard of those who proved that the term Zoophytes had been used to cover a mixture of animals superficially alike but essentially different in structure.

In regard to this latter part of his investigations, a curious terminological dispute or difference of usage has arisen. While practically all Continental and American writers speak of a class Bryozoa, a very distinguished section of British experts apply the name Polyzoa to a class identically the same. Possibly the arguments in favour of either term may be so evenly balanced that after discussion we shall leave off where we began, each side thinking that it has had the better in the controversy and applying to those of the opposite opinion the French proverb "*Chacun à son goût*," or, as sometimes amplified, "*Chacun à son vilain goût*."

On the one hand, then, it may be urged that no confusion can arise from the retention of both the terms. They have become perfectly familiar as equivalents. Some writers even head their treatises "*Bryozoa or Polyzoa*," as though it were a matter of complete indifference, and perhaps wishing to insinuate to the disputants "*a plague on both your houses*." Further, it is clear that the names of classes and orders have never been subject to so strict a discipline as the names of genera and species, probably because, while the limits of the higher divisions remained essentially unstable, fixity in their designation has been felt to be inconvenient or unreasonable. In fact, as Lord Walsingham has urged in the introduction to his Merton Code, the moral law, the law of giving every man his due, is the strongest foundation on which any precise methods can be based.

Again, it may be argued that any defect in the form of

Thompson's term Polyzoa is venial, considering the date of its publication. Thus in 1814 Leach named an order Podosoma, which in 1816 he silently corrected into a proper plural Podosomata. In 1843 the French author René Primevère Lesson recalls the family Plethosoma which he had established in 1828, in order at the later date to make of it a tribe, with the name unaltered, and including in it a genus also named *Plethosoma*.

It will be no breach of confidence, I think, to quote the unpublished words of a leading authority on this subject, who writes to me as follows: "I base my action on two considerations: (1) That Thompson was the first to recognize the Polyzoa as a distinct type of structure in the Animal Kingdom; and, moreover, introduced a name that can quite fairly be used as that of the Class or Phylum. (2) That a large proportion of the work that has been done on the group has been done by men who have consistently spoken of these animals as the Polyzoa. I need only mention Busk, Allman, Hincks, Norman, and perhaps Hyatt in America."

As a matter of fact, it was apparently Dr. Gray in 1840 who first gave currency to Polyzoa (in the plural) as the name of an extensive animal group, while Busk by his arguments in 1852 and 1859 procured for it vogue among his English followers. It may just possibly be contended that Thompson himself used Polyzoa in the plural number, since on page 92 of his Memoirs he says: "The Polyzoa will probably be found in many dissimilar Genera of the Zoophytes, and even mixed up with Hydra in some, as they appear to be in the Sertularia of authors." It should suffice to say that the very paragraph in which this ambiguous "they" occurs ends with the genuine plural Polyzoæ. But yet again on page 96 we read "the Polyzoa however are essentially different." That this is merely a slip of the pen or a printer's error seems absolutely certain, since we have Polyzoæ on page 97 and on page 99, and the Introductory Address, incorporated in Vol. I. of the Researches, promises a future article on "Animals of some Cellariæ, Tabuliporæ and Flustraciæ, proved to be Polyzoæ."

That Thompson's use of the word Polyzoa antedates Ehrenberg's introduction of the name Bryozoa cannot be denied.

Whether these various considerations, or any others which I have failed to discover, justify our eminent English authorities in their usage of the term Polyzoa, is a question now to be presented from an opposite point of view.

Strangely enough the first witness to be called is Busk, the very *fons et origo mali*, as evidence himself against himself. Speaking of Vaughan Thompson, he says, "It is to be remarked that he used the word in the singular number, so that the plural term 'Polyzoa,' as now employed, though etymologically more correct is not in reality synonymous with that of Dr. J. V. Thompson." And he adds that this fact "may fairly enough be used as an argument in their favour by those who are inclined to prefer the

Ehrenbergian term Bryozoa." What amazing candour on the part of an advocate for the use of one term, when he declares that fair argument is in favour of our using the other. Here, too, it should be remembered that Busk's action had to be judged by itself at the time when it was taken. It could not rely on a long list of famous experts in 1852. Allman and Hincks, Norman and Harmer, Herdman and Gardiner, Nicholls and Thornely, Kirkpatrick and Annandale, had not yet either written on the subject or expressed any opinion on its proper title.

Observe, further, that Busk's article in the 'Annals' of 1852 is "On the Priority of the Term 'Polyzoa' for the Ascidian Polypes." As a very imperfectly informed amateur on this branch of zoology, I venture to ask the learned disciples of Busk whether the animals which they call Polyzoa *are* Ascidians. They will in their answer no doubt give away their tutelary genius. But Busk himself would probably have paused in upholding what he supposed to be Thompson's claim, had he been conscious of the fact that, prior to the publication of Thompson's memoir, R. P. Lesson, in the 'Voyage de la Coquille' (vol. ii. p. 437), had already used *Polyzoa* in the singular number for a genus of compound ascidians. He would probably have thought it quite inexpedient to have a word, undistinguishable in sound and spelling from that generic name, as appellation of a much higher group.

Here it is right to confess that Lesson's 'Manuel de l'histoire des Mollusques,' to which I referred in the Linnean circular for 2nd March, 1911, has not proved to be procurable either in France or England. But the same Lesson in his 'Histoire naturelle des Zoophytes,' p. 56, 1843, declares that his contribution to the zoology of 'La Coquille' was "tiré à part et mis en commerce" in 1829. The priority, therefore, of Lesson's Polyzoa over Thompson's can scarcely be disputed. Whether in Zoology it is desirable, allowable, or in accordance with any good precedent, that a name previously adopted for a genus should be independently repeated as the name of a class or phylum, it would be presumptuous in me to decide. Branchiopoda, I admit, has been sometimes retained for an Entomostracan order, very likely from ignorance of its earlier employment as a generic name by Lamarek in 1801.

But surely no rare exception, if any valid one can be found, ought to be followed in the present instance, for why should a claim be asserted for Thompson which he never made for himself? Some stress has been laid on the words which he uses in regard to his Polyzoa (p. 92), that "this discovery must be the cause of extensive alterations and dismemberments in the Class with which they have hitherto been associated." But in the very same paragraph he immediately proceeds, not to establish a new Class, but simply to transfer all such species and genera as contain his "new animal" from the class Zoophytes to the class Mollusca acephala, adding, "I shall merely indicate here in a general way

the whole of the Flustraceæ, in many of which I have clearly ascertained the animals to be Polyzoæ."

Now, in regard to that last remark, without casting the slightest imputation on Thompson's originality, one must again appeal to Busk, who, publishing in 1859, says: "Thirty-one years ago, Dr. Grant, in some 'Observations on the Structure and Nature of Flustræ,' drew, for the first time, a distinction between the animals inhabiting those growths, and the Sertularian, or Hydroid Polypes, with which they had previously been associated." These Observations by Dr. R. S. Grant appear in the Third volume of the Edinburgh New Philosophical Journal (pp. 107, 337), which is dated 1827, so that he has two years precedence of Thompson and three of Ehrenberg. A nice flustration there will be if we start a new school of writers calling the class Flustræ! And yet in the language of Busk, "It is scarcely likely that British naturalists will refuse the honour justly due to Dr. R. S. Grant, for what can scarcely perhaps be regarded as a sufficient reason."

Seriously speaking, in the face of Busk's admission that it was Grant who, for the first time, drew the distinction, it can scarcely be maintained that Thompson was the first to recognize the Polyzoa as a distinct type of structure in the Animal Kingdom. This is no denial of his statement that "the discovery of Polyzoa was made in the summer of 1820." My own belief is that, had he published in 1820, he would have made a new genus Polyzoa for the *Sertularia imbricata* of Adams. But, as we all know, recognition of our discoveries has to date, not from the time when they were made, but from the time when they were published. For aught we know, Grant also may have carried out his observations ten years before he made them public.

As an observer of nature Thompson was in the highest degree keen and admirable; in nomenclature he was almost equally erratic and unmethodical. Witness his vacillating use of Shizopoda and Shizopodæ for the Schizopoda of Latreille, his unmeaning name *Nocticula* for a luminous shrimp, his unjustified change of that shrimp's specific name from *fulgens* to *banksii*, his adoption of *Cynthia* and *Pedicellaria* for new genera, though he was avowedly aware that each had been previously used in a different sense.

That Polyzoa either in the singular or plural is not a term worth contending for in respect of its appropriateness, should be felt at least by members of that famous University which claims the fine scholarship of Milton and Gray, of Porson and Munro, for the Greek word *πολύζωος* happens to mean long-lived, not many-animated, and even if it had the latter meaning it would be undistinctive, being equally applicable to many species in quite different groups. But some witchcraft must have put a spell upon Thompson in respect of names. When he has to mention the *Cancer scorpioides* of Montagu, he calls it *scorpionurus*. After his death he leaves behind him a manuscript genus *Scorpionura*, once more a preoccupied name. In place of this Spence Bate founded on the words Vaughan Thompson a new concoction. But the

spell still works. Again there is vacillation. Again there is controversy. To my mind it is clear that in 1858 Bate called his genus *Vaunthompsonia*, that in 1859 he changed it to *Vaunthomsonia*, and finally in 1860 decided for *Vauntompsonia*. But another oracle maintains that the *tomp* was earlier than the *thomp*. We must wait and see.

Now all this slight skirmishing may easily and perhaps justifiably be dismissed with the remark, that the argument against Polyzoa is advanced by one who has little or no intimate acquaintance with the subject matter in which he is interfering. But there is at least one writer, a Fellow of this Society, against whom such a reproach cannot possibly be urged. It may well be that some of us are ill acquainted with the arguments on this topic powerfully stated by the veteran Bryo-zoologist, A. W. Waters, so far back as 1880. But all those in the least interested in the matter are bound to have taken into account his paper of December 16th, 1909, published in our Journal so recently as the 22nd of June, 1910. Nevertheless, to refresh our memories, I shall do myself the pleasure of quoting his two concluding paragraphs. He writes:—"As a young man when I presented papers, those in authority said, you should not use Bryozoa when Busk and others use Polyzoa. I pointed out my reasons and induced them to examine Thompson's paper, and they all, without exception, said they considered I was quite right and that there could not be any question of Thompson using Polyzoa as a class name. Such able literary and scientific critics as Mr. Dallas and Dr. Francis became quite convinced, and Mr. Dallas in a review of Hincks's book put the question more clearly than it has been put by anyone else. A number of members of the staff of the British Museum working upon invertebrates met together to examine Thompson's paper, and unanimously came to the conclusion that Polyzoa was not given as a class designation.

"Bryozoa was for a long time used in England, and then Busk introduced Polyzoa as being Thompson's name. I was not surprised that Busk, Allman, and Hincks, who had worked together, did not change, but I felt confident that the change would soon be made by a younger generation. In this I seem to have been mistaken; and so long as any of our leaders use Polyzoa we must recognise that there are two sides to the question, though I find it very difficult to understand how this can be if we try to divest ourselves of the knowledge gained since Thompson's time and put ourselves in his position." (Journ. Linn. Soc., Zool. vol. xxxi. p. 247.)

You will not fail to notice the modesty of that conclusion. It warns me not to alienate goodwill by being too self-assertive, and to bring my treatment of the matter to an end, before you become too sorry that it ever had a beginning.

On *Vaunthompsonia*, Bate.

For the difficulties which beset our use of this generic name, Vaughan Thompson, in whose honour it was invented, is only indirectly responsible. The genus belongs to the Sympoda, for long but very unsuitably known as Cumacea, in dealing with which among many eminent names there are, I think, pre-eminent, Kröyer in Denmark, Sars in Norway, and our own Dr. Calman in England. Now in this remarkable group Thompson, as already intimated, promised but never gave "Detail of the curious structure of several species of the newly instituted Genus *Condylura* (*Cancer Scorpionurus* of Montagu)." No doubt he intended to refer to "*Cancer Scorpioides*" of Montagu, but among his collections there were subsequently found specimens labelled as three species of a new genus *Scorpionura*. Here he had once again the misfortune to choose a name preoccupied before his own use of it was published. Thus it came about that Spence Bate instituted the genus *Vaunthompsonia* for one of Thompson's three species. For the record of this genus we are indebted first of all to Professor Kinahan, through the 'Natural History Review,' vol. v. pp. 202-205, 1858. The professor there says, "I have extracted Mr. Bate's communication and figures *in extenso* from the 'Journal of the Royal Dublin Society,' before whose evening meeting of the 28th May it was read." The definition of *Vaunthompsonia* (Spence Bate) is included in the communication. Next year, in the 'Annals of Natural History,' ser. 3, vol. iii. pp. 273-274, no. 16 for April 1859, Spence Bate speaks of the genus *Vaunthomsonia*, recently described by me in the 'Natural History Review.' Then finally, in the 'Journal of the Royal Dublin Society,' vol. ii. 1858-1859 (Dublin: Hodges, Smith, & Co., 1860), pp. 101-104, he defines *Vaunthompsonia*, n. g. In 1905, however, Dr. Calman argues that this last form has priority. Of *Vaunthompsonia* he says that "it is used in Spence Bate's paper in the Nat. Hist. Review, which appears to be a reprint of, and was probably later than, that in the J. Royal Dublin Soc., in which the aspirate is omitted. In any case the omission was clearly intended by the author, who states that in building up the word the Christian name and the surname of Mr. Vaughan Thompson have been "both spelled according to sound." But the 'Natural History Review' of 1858, in which Bate's paper appeared through the intervention of Kinahan, recorded the Proceedings of various Irish Societies, much as 'Nature' and 'The Athenæum' nowadays record the Proceedings of many Societies, as a rule far in advance of the Journals of the Societies themselves. There is no reason for thinking that the 'Journal' of the Royal Dublin Society, published under the date of 1860, was earlier than the 'Natural History Review' of 1858. But there is a reason for thinking that it was later, since, as already mentioned, Spence Bate in April 1859 speaks of the genus *Vaunthomsonia*, recently described

by me in the 'Natural History Review.' Why should he refer to that Review, if the genus had been published still earlier in the Royal Dublin Society's Journal, and why should he retain the aspirate, if he had already entertained the happy idea of rejecting it? It is evident that, contrary to modern notions, he thought that he had a right to do what he liked with his own. So he first wrote *Vaunthompsonia*, as recited by Kinahan in 1858. Then in 1859 he improved this into *Vaunthomsonia*, and finally in 1860 he dropped the aspirate but resumed the *p* in the form *Vauntompsonia*. Modern rules require that we should revert to the first published *Vaunthompsonia*.

Against retaining Cumacea, proposed by Kröyer in 1846, I venture to indulge the vanity of quoting from my friends Dr. Norman and Dr. Brady, who in their 'Crustacea of Northumberland and Durham,' p. 25, say, "The name *Cuma* of Humphreys, 1795, being in use for a genus of Mollusca, the Rev. T. R. R. Stebbing has discarded it among Crustacea, substituting for it *Bodotria* Goodsir, and for the order Cumacea the more appropriate name Sympoda."

Not only was *Cuma*, as used by Milne-Edwards, a preoccupied name, but apparently it had the further disadvantage of embalming an error to which that great naturalist obstinately adhered in regard to the Sympoda. He thought that his specimens were embryonic, and in naming a genus for them he chose a Greek word meaning among other things "an embryo." But, apart from the misfortunes of its origin, this genus had no right of priority in determining the name of the order, since *Diastylis* had been well defined by the American Say ten years earlier. In Sympoda we have a form corresponding with Decapoda, Schizopoda, Stomatopoda, Isopoda, and Amphipoda, all of them important divisions of the Malacostraca.

(d)

MR. S. F. HARMER did not agree with Mr. Stebbing's conclusions. He pointed out that the Laws of Priority which govern generic and specific names do not apply with equal force to group-names. He regarded the criticism that Thompson usually (though not always) employs "Polyzoa" as a singular word as comparatively unimportant when taken in conjunction with the broad conclusion which Thompson saw so clearly, that the observations he had made would "render extensive alterations and dismemberments" in classification necessary. The title of Thompson's memoir shows indeed that "Polyzoa" is not a generic term, but is of higher value: in other words, that it is a group-name. The priority of "Polyzoa" over "Bryozoa" is admitted, and there is evidence that it was used by Thompson even earlier than December, 1830, the date on the wrapper of No. IV. of the 'Zoological Researches,' which consists of "Memoir v, On Polyzoa." The wrapper of No. III., which is headed January,

1830, bears the announcement (dated by Thompson December, 1829) that the Fourth Number will contain "a Memoir on *Polyzoa*, a new animal discovered as an inhabitant of some Zoophytes." The speaker considered that Thompson's clear realisation of the effect his discovery must have in altering current views with regard to the classification of Zoophytes constitutes ample justification for preferring "*Polyzoa*" to "*Bryozoa*."

(e)

MR. A. W. WATERS said that his reasons for using the term *Bryozoa* were given many years ago, and he had recently restated his firm adherence to the view arrived at. But it will be well to first clear up a mistake which has misled many, for most naturalists have looked to Busk's '*Crag Polyzoa*' to see why he changed from *Bryozoa* to *Polyzoa*; and speaking of Thompson, Busk writes: "The term he employed was *Polyzoa*, 'it being applied,' as he says, 'to a distinct class of Polypes hitherto in great measure confounded with the *Hydroida*': although this is given as a quotation, in inverted commas, Thompson never said anything of the kind, and a critical examination shows how impossible it would have been for him to have written it.

The speaker said his point had always been that Thompson gave no indication that he was establishing a class. The paper is on "*Polyzoa, a new animal discovered as an inhabitant of some Zoophytes*," and then he speaks of the animal as *Polyzoa*, and this idea of the animal being a *Polyzoa*, but the animals *Polyzoæ*, is repeated several times in the paper. Thompson considered that a certain section of the zoophytes must ultimately be separated, as the polypides were not hydra, and we must remember that at that time the polypes of *Hydrozoa* were still spoken of as flores, and there were perhaps naturalists still living who had believed that the polypides of *Flustra* could leave the zoecium whenever they wished, just as a bee can leave its cell.

A year before Thompson's paper, Cuvier had separated the *Bryozoa* as "*Polypes à cellules*" as a distinct family from "*Polypes vaginiformes*," namely the *Hydrozoa*, but said the animals in both cases resemble *Hydræ*.

It has been urged that Thompson having seen the great difference between the *Bryozoa* and other zoophytes, we ought to honour him by retaining the name *Polyzoa*. However, if he did not create the class we must remember that he was not the first to publish the difference, for Dr. Grant (1827) had seen that a separation must be made, and he based it upon the *Bryozoa* having no common cœnosare, but, though he described the polypide correctly, he did not recognise that the digestive tract had two openings. Then Audouin and Milne-Edwards (1828), studying the marine invertebrates of Chausey, divided the Polypes, or Zoophytes, into four families, and these were, as we should say,

approximately (1) Sponges, (2) Hydrozoa, (3) Anthozoa, and (4) Bryozoa; and of this last they said, *our fourth family contains Flustra and the other Polypes of which the digestive canal communicates with the exterior by two distinct openings, and of which the organisation approaches that of the compound Ascidians.* At the meeting of the French Academy, when the paper was read, Blainville stated that he was aware of this structure, and that it had been also pointed out to him some years ago by Lesueur and Desmarest; so that several observers had independently come to the same conclusions, within a few years of one another.

It is strange to find these divisions called families, where we should say orders and classes, but nothing could be clearer than that Audouin and Milne-Edwards forestalled Thompson and distinctly indicated a division, for we must not forget that *Flustra* then always included *Membranipora* and was sometimes used where we should say Cheilostomata. It is surprising how seldom zoologists of that period, working on the zoophytes, ever refer to Classes or Orders, and often use class as a general term instead of group. Lamarck, in 'Hist. Nat. des Animaux sans Vertèbres,' instead of classes and orders, says divisions and sections.

In conclusion, if Thompson meant to establish a class division, then his paper is an extraordinary muddle of a communication; whereas, if he wished to indicate the nature of the polypide, it is consistent from beginning to end, and though forestalled in his main points we must respect him for it.

ADDITIONS AND DONATIONS

TO THE

LIBRARY.

1910-1911.

- Adamović (Lujo).** Die Vegetationsverhältnisse der Balkanländer (Mösische Länder) umfassend Serbien, Altserbien, Bulgarien, Ostrumelien, Nordthrakien und Nordmazedonien. Pp. xvi, 567; mit 49 Vollbildern, 11 Textfiguren und 6 Karten. (Engler-Drude, Vegetation der Erde, xi.) Svo. *Leipzig*, 1909.
- Ameghino (Florentino).** Sur l'orientation de la Calotte du Diprothomo. Pp. 11. (An. Mus. Nac. Buenos Aires, xx.) 4to. *Buenos Aires*, 1910.
- Montaneia Anthropomorpha un género de Monos hoy extinguido de la Isla de Cuba. Nota Preliminar. Pp. 2. (An. Mus. Nac. Buenos Aires, xx.) 4to. *Buenos Aires*, 1910.
- L'Âge des formations sédimentaires tertiaires de l'Argentine en relation avec l'Antiquité de l'Homme. Note Supplémentaire. Pp. 11. (An. Mus. Nac. Buenos Aires, xxii. pp. 169-179.) 4to. *Buenos Aires*, 1911.
- Observations au sujet des Notes du Dr. Mochi sur la Paléoanthropologie Argentine. Pp. 50, with 18 illustrations. (An. Mus. Nac. Buenos Aires, xxii. pp. 181-200.) 4to. *Buenos Aires*, 1911.
- La Calotte du Diprothomo d'après l'orientation fronto-glabellaire. Pp. 9; plates 4. (An. Mus. Nac. Buenos Aires, xxii.) 4to. *Buenos Aires*, 1911.
- Las escorias y tierras cocidas de las formaciones sedimentarias neogenas. Pp. 36; plates 6. (An. Mus. Nac. Buenos Aires, xxii.) 4to. *Buenos Aires*, 1911.
- L'Âge des formations sédimentaires tertiaires de l'Argentine en relation avec l'Antiquité de l'Homme. Pp. 31. (An. Mus. Nac. Buenos Aires, xxii.) 4to. *Buenos Aires*, 1911. Author.
- Andrews (Charles William).** A Descriptive Catalogue of the Marine Reptiles of the Oxford Clay. Part. I. See *British Museum (Natural History)*—Fossils. 4to. 1910.
- Annandale (Nelson).** See *Blanford (W. T.)*. The Fauna of British India, including Ceylon and Burma. Freshwater Sponges, Hydroids, and Polyzoa. Svo. 1911.
- Appel (Louise C.).** See *Kleinschrod (Franz)*. The Inherent Law of Life. Svo. *London*, 1910.

- Arber (Edward Alexander Newell).** *Plant Life in Alpine Switzerland.* Pp. xxiv, 355; with 48 plates and 80 figs. in the text. Svo. *London*, 1910. **Author.**
- Bailey (Charles).** *A third List of the Adventitious Vegetation of the Sandhills of St. Anne's-on-the-Sea, North Lancashire (vice-county 60).* Pp. 11. (Mem. & Proc. Manch. Lit. Phil. Soc. vol. 54, part 3.) Svo. *Manchester*, 1910. **Author.**
- Baker (Richard Thomas) and Smith (Henry G.).** *A Research on the Pines of Australia.* (Technol. Mus. N. S. Wales, Educ. Ser. n. 16.) Pp. xiv, 458; with 73 plates, 3 charts, & 298 illustrations in the text. 4to. *Sydney*, 1910. **Authors.**
- Balfour (Henry).** *See Tongue (Miss Helen).* *Bushman Paintings.* 4to. *Oxford*, 1909.
- Barrett-Hamilton (Gerald E. H.).** *A History of British Mammals.* Parts 1-8. Svo. *London*, 1910-1911.
- Beiträge zur Kryptogamenflora der Schweiz.** Auf Initiative der Schweiz. Botanischen Gesellschaft und auf Kosten der Eidgenossenschaft. Herausgegeben von einer Kommission der Schweiz. Naturforschenden Gesellschaft. Bände I-III. Svo. *Bern*, 1898-1911.
- Band II. Heft 2. **FISCHER (EDUARD).** *Die Uredineen der Schweiz.* Pp. xciv, 590; mit 342 Figuren im Text 1904.
- „ III. Heft 1. **LENDNER (ALFRED).** *Les Mucorinées de la Suisse.* Pp. 180; avec 59 figures et 3 planches. 1908.
- „ „ Heft 2. **SCELLENBERG (HANS CONRAD).** *Die Brandpilze der Schweiz.* Pp. xlv, 180; mit 79 Textfiguren. 1911.
- Berlin.**
- Das Tierreich.** Herausgegeben von der Deutschen Zoologischen Gesellschaft. Generalredakteur: **FRANZ EILHARD SCHULZE.** Liefg. 26, 27, 29. Svo. *Berlin*, 1911.
- Liefg. 26. **IXODIDÆ.** Von **L. G. NEUMANN.** Pp. vi, 169; mit 76 Abbildungen. 1911.
- „ 27. **REPTILIA.—CHAMAELONTIDÆ.** Von Prof. Dr. **FRANZ WERNER.** Pp. xi, 52; mit 20 Abbildungen. 1911.
- „ 29. **VERMES.—CHAETOGNATHI.** Von **RUDOLF VON RITTER-ZÁHONY.** Pp. viii, 35; mit 16 Abbildungen. 1911.
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Report on the Sand Dunes of New Zealand. By L. COCKAYNE. Pp. 30; figs. 35. fol. *Wellington*, 1909.

Report on a Botanical Survey of Stewart Island. By L. COCKAYNE. Pp. 68; figs. 43 and map. fol. *Wellington*, 1909.

Werner (Franz). *See* Berlin. Das Tierreich. Liefg. 27. Reptilia—Chamæleontidæ. 8vo. 1911.

West (George Stephen). On Variation in the Desmidiæ, and its Bearings on their Classification. Pp. 52; with 4 plates, and 4 cuts in the text. (*Journ. Linn. Soc., Bot.* xxxiv.)

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— The Alga-Flora of Cambridgeshire, being an Account of the Freshwater Algæ of the County, with Notes on their Classification and Distribution, with Critical Remarks on many of the Species and Descriptions of new ones. Pp. 47, with 3 plates. (*Journ. Bot.* xxxvii.)

8vo. *London*, 1899.

— Report on the Freshwater Algæ, including Phytoplankton, of the Third Tanganyika Expedition conducted by Dr. A. W. CUNNINGTON, 1904–1905. Pp. 117, with 9 plates. (*Journ. Linn. Soc., Bot.* xxxviii.)

4to. *London*, 1907.

— Some Critical Green Algæ. Pp. 11, with 2 plates. (*Journ. Linn. Soc., Bot.* xxxviii.)

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— Botanical Synonyms in the Desmidiaceæ and Protococcoideæ. Pp. 5. (*Journ. Bot.* xlvii.)

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— The "Red Snow" Plant (*Sphærella nivalis*). Pp. 3. (*Journ. Roy. Microsc. Soc.* 1909, pp. 28–30.)

8vo. *London*, 1909.

— The Algæ of the Yan Yean Reservoir, Victoria: a Biological and Œcological Study. Pp. 88; with 6 plates, and 10 cuts in the text. (*Journ. Linn. Soc., Bot.* xxxix.)

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— A Biological Investigation of the Peridiniæ of Sutton Park, Warwickshire. Pp. 16, with 7 cuts in the text. (*New Phytol.* viii. nos. 5 & 6.)

8vo. *Cambridge*, 1909.

— The Algæ of the Birket Qarun, Egypt. Pp. 10, with 1 plate. (*Journ. Bot.* xlvii.)

8vo. *London*, 1909.

— Some new African Species of *Folvox*. Pp. 6, with plate. (*Journ. Quekett Microsc. Club*, 2 ser. xi.)

8vo. *London*, 1910.

— Algological Notes. Pp. 8, with 3 cuts. (*Journ. Bot.* xlix.)

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West (G. S.) and Griffiths (B. M.). *Hillhousia mirabilis*, a Giant Sulphur Bacterium. Pp. 8, with 1 plate. (*Proc. Roy. Soc. B.* vol. 81.)

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West (William) and West (George Stephen). Notes on Freshwater Algæ. I., II., III. Pp. 36. (*Journ. Bot.* vols. 36, 38, 41.)

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- — Freshwater Algæ from Burma, including a few from Bengal and Madras. Pp. 88, with 7 plates. (Ann. Roy. Bot. Garden, Calcutta, vi. part 2.) fol. *Calcutta*, 1907.
- — The Phytoplankton of the English Lake District. Pp. 47, with 3 plates, and 8 cuts in text. (Naturalist, Aug., Sept., 1909.) 8vo. *London*, 1909.
- — The British Freshwater Phytoplankton, with Special Reference to Desmid-plankton and the Distribution of British Desmids. Pp. 42, with 6 figs. (Proc. Roy. Soc. B. vol. 81.) 4to. *London*, 1909.
- — The Ecology of the Upper Driva Valley in the Dovrefjeld. Pp. 22, with 2 plates and 7 cuts. (New Phytol. ix. no. 10.) 8vo. *Cambridge*, 1910. **Authors.**
- Wildeman (Émile de).** Mission Émile Laurent (1903–1904). Énumération des plantes récoltées par ÉMILE LAURENT avec la collaboration de MARCEL LAURENT pendant sa dernière Mission au Congo; par É. de W. 2 vols. Roy. 8vo. *Bruxelles*, 1905–1907.
I. pp. ccxxv, 617; figs. 138.
II. plates 184.
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- Wolff (Hermann).** See Engler (H. G. A.). Das Pflanzenreich. Heft 43. Umbelliferæ—Apioidæ—*Bupleurum*, *Trinia* et reliquæ Aminineæ heteroclitæ. 1910.
- Wood (Bertha).** See Ewart (Alfred James). Contributions to the Flora of Australia. Nos. 14, 15. 8vo. 1910.
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- Woodward (Bernard Barham).** Note on the Occurrence of *Pisidium personatum*, Malm, in the British Islands. P. 1. (Proc. Malacol. Soc. viii. part 3.) 8vo. *London*, 1908.
- On the Occurrence of *Pisidium supinum* in the Living State in England. P. 1. (Proc. Malacol. Soc. viii. part 6.) 8vo. *London*, 1909.
- On the Occurrence in the British Isles of Living Specimens of *Pisidium n. Steenbuchii*, Mörch, and *P. Lilljeborgii*, Clessin, with Notes of New Records of *Pisidia* for the Lake District, and Fresh Localities for *P. supinum*, A. Schm. Pp. 2. (Proc. Malacol. Soc. ix. part 1.) 8vo. *London*, 1910.
- Note on further British Localities for *Pisidium Steenbuchii*, Möller, and *P. Lilljeborgii*, Clessin. P. 1. (Proc. Malacol. Soc. ix. part 3.) 8vo. *London*, 1910.

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——— *See* Kennard (A. S.). Notes on Non-Marine Mollusca from some Irish Lakes, obtained by Major H. Trevelyan. 8vo. 1911.

Ziegler (Heinrich Ernst). Der Begriff des Instinktes einst und jetzt ... Mit einem Anhang: Die Gehirne der Bienen und Ameisen. Pp. vi, 112; mit 2 Tafeln und 16 Abbildungen im Text. 8vo. Jena, 1910.

Zoological Record. Vol. 46. (1909.) 8vo. London, 1910. Zürich.

Botanische Museum der Universität Zürich. Mitteilungen. No. 36. 8vo. Zürich, 1907→

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BENEFACTIONS.

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1859.

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1862.

The Linnean Club: presentation bust of Prof. T. Bell, by P. Slater.

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1864.

Beriah Botfield, Esq.: Legacy, £40 less Duty.

1865.

Executors of Sir J. W. Hooker, £100.

George Bentham, Esq.: cost of 10 plates for his "Tropical Leguminosæ," Trans. vol. xxv.

1866.

Dr. Friedrich Welwitsch: Illustrations of his 'Sertum Angolense,' £130.

1867.

George Bentham, Esq.: General Index to Transactions, vols. i.-xxv.
Royal Society: Grant in aid of G. S. Brady on British Ostracoda, £80.

1869.

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1874.

Subscription portrait of George Bentham, by Lowes Dickinson.
George Bentham, Esq., for expenditure on Library, £50.

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George Bentham, Esq.: General Index to Transactions, vols. xxvi.-xxx.

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1879.

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1880.

The Secretary of State for India in Council: cost of setting up Dr. Aitchison's paper, £36.

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The Secretary of State for India in Council: Grant for publication of Dr. Aitchison's second paper on the Flora of the Kurrum Valley, £60.

1883.

Sir John Lubbock, Bt. (afterwards Lord Avebury).

Portrait of Carl von Linné, ascribed to M. Hallman.

Philip Henry Gosse, Esq.: towards cost of illustrating his paper, £25.

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Dr. John Anderson, for the same, £60.

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Sir Joseph Hooker: (1) Series of medals formerly in possession of George Bentham; (2) Gold watch, key, and two seals belonging to Robert Brown.

1889.

Bronze copy of model for Statue of C. von Linné, by J. F. Kjellberg ;
presented by Frank Crisp, Esq.

1890.

The Secretary of State for India in Council : Grant for Delimitation
Expedition report, £200.

Oak table for Meeting Room, presented by Frank Crisp, Esq.

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Executors of the late John Ball, Esq. : a large selection of books.

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1891.

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1892.

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1893.

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1894.

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1896.

Clock and supports in Meeting Room, presented by Frank Crisp,
Esq.

1897.

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Stipules, £43 14s. 9d.

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"	"	"	"	Murray & Blackman's paper, £50.
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1899.

- A. C. Harmsworth, Esq. [Lord Northcliffe]: Contribution towards cost of plates, £43.
 Royal Society: Contribution towards Mr. R. T. Günther's paper on Lake Urmi, £50.

1901.

- Hon. Charles Ellis, Hon. Walter Rothschild, 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.
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1903.

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 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.
 Supplementary Royal Charter: cost borne by Frank Crisp, Esq. (afterwards Sir Frank Crisp).

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 Kræfft 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 is for the façade of the new building for the Royal Academy of Science, Stockholm.

Miss Sarah Marianne Silver, 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 : Donation towards the publication of the third volume on the Indian Ocean *Researches*, £70.

The following Councillors retired at the Anniversary Meeting,
24th May, 1911 :—

E. A. NEWELL ARBER, M.A., Prof. J. BRETLAND FARMER,
Dr. G. HERBERT FOWLER, Prof. J. P. HILL, and JOHN HOPKINSON,
F.G.S.

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 Druce, G. C., exhibited *Utricularia ochroleuca*, *U. Bremii*, *Arabis alpina*, and *Chorophyllum aureum*, 3.
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 Dunn, S. T., Chinese Flowering-Plants, 7; exhibited bamboo-rope from Central Fokien, 7; — lantern-slides of photographs of Central Fokien, 7; Revision of the Genus *Actinidia*, 7.
 Dykes, W. R., showed autochrome photographs of certain species of *Iris*, 7.
 Earwigs, *see* Dermaptera.
 Ecology of a Cambs. woodland (Adamson), 10.
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Enhalus acoroides, Rich., Anatomy of, (Cunningtoun), 47.
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 Eyles, F., proposed, 11; elected 45.
 Falkland Islands, Flora of the (Wright), 5.
 Farmer, Prof. J. B., Councillor retired, 105.

- Fauna of the Carboniferous Period (Woodward), 45.
- Fawcett, W., showed *Scybalium jamaicense*, Schott & Endl., and *Musa paradisiaca* var. *sapientum*, 47.
- Fellows deceased, 12; elected, 13; withdrawn, 13.
- Ferns, Chinese (Matthew), 7.
- Financial Statement, *see* Cash Statement.
- Flora of the Falkland Islands (Wright), 5.
- Flowering-plants, Chinese (Dunn), 7.
- Foreign Members deceased, and elected, 13.
- Fossorial Hymenoptera of the Indian Ocean (Turner), 6.
- Fowler, Dr. G. H., communication by (Bigelow), 2; Councillor retired, 105.
- Fowler, Canon W. W., communication by (Imms), 47.
- Fox, A. R., deceased, 12; obituary, 37.
- Foxglove, Monstrosities in the, exhibited (Crisp, Stebbing), 48.
- Friend, Rev. H., elected, 45; proposed, 11.
- Fritsch, Dr. F. E., Freshwater Algæ from the South Orkneys, 12.
- Fryer, J. C. F., Aldabra and neighbouring Islands, 2; Lepidoptera of the Seychelles, 47.
- Fullerton, M. B., admitted, 11; elected, 9; proposed, 7.
- Galton, the late Sir Francis, mentioned, 5.
- Gardiner, Prof. J. S., communications by: (Fryer), 2; (Hickson), 12; (Hirst and others), 8; (Kieffer and others), 47; (Tattersall, Thornely), 9; (Turner and others), 6; elected Councillor, 16.
- General Secretary, Annual Report of, 12; election of (Dr. B. D. Jackson), 16.
- Gepp, A., Report on the Inter. Congr. of Bot., 1911, 52.
- Gerrard, E., deceased, 2, 13; obituary, 37.
- Goodall, T. B., elected, 3; proposed, 1.
- Goodrich, E. S., elected Councillor, 16.
- Griffithsia globifera*, J. Ag., exhibited (Holmes), 8.
- Groom, Prof. P., communication by (Cunnington), 47.
- Groves, H., elected Auditor, 11; — Councillor, 16; Report of, on the Inter. Congr. of Bot., 1911, 52.
- Halket, Miss A. C., admitted, 46; elected, 45; proposed, 11.
- Harmer, S. F., on the terms Polyzoa and Bryozoa, 70.
- Harpacticid Copepoda, Three species of (Norman), 7.
- Hart, J. H., deceased, 12; obituary, 39.
- Hayward, Miss I. M., admitted, 3; on alien plants from banks of River Tweed, 3, 48-51.
- Henderson, Dr. G., showed lantern-slide of the head of a Waterbuck, 47.
- Henslow, Prof. G., Origin of Monocotyledons, 3; Origin of *Plantago maritima* and *P. alpina*, 3.
- Herdman, Prof. W. A., *Amphidinium operculatum*, Clap. & Lachm., at Port Erin, 45, 47; elected Councillor, 16; On the use of the term Polyzoa, 9; On J. V. Thompson's use of the term "Polyzoa," 62; Summer Plankton in the Irish Sea, 2.
- Hertwig, Prof. R. von, proposed as, and elected, Foreign Member, 8, 12.
- Hexactiniae from New South Wales (Wilsmore), 7.
- Hickson, Prof. S. J., *Polytrema* and some allied genera, 12.
- Hill, A. W., elected Councillor, 16.
- Hill, Prof. J. P., communication by (Wilsmore), 7; Councillor retired, 105.
- Hind, *see* Archer-Hind.
- Hindle, Dr. E., admitted, 9; elected, 2.
- Hirst, A. S., Araneæ, Opiliones, and Pseudoscorpiones from the Seychelles, 8.
- Holden, H. S., admitted, 4.
- Holland, Rev. M., admitted, 5; elected, 4; proposed, 2.
- Holmes, E. M., exhibited *Griffithsia globifera*, J. Ag., 8.
- Hooker, Sir Joseph, letter of congratulation to, 46.
- Hopkinson, J., Councillor retired, 105; showed lantern-slides of photographs of, and exhibited specimens of rock from, Sweden, 9.
- Hovenden, F., deceased, 12; obituary, 39.
- Hudson, F. C., elected, 3; proposed, 1.
- Hymenoptera, Fossorial, of the Indian Ocean (Turner), 6.
- Imms, Prof. A. D., Life-history of *Croce filipennis*, Westw., 47.
- Indian Ocean, Fossorial Hymenoptera of the (Turner), 6; Marine Brachyura from the (Rathbun), 8; Marine

- Polyzoa from the (Thornely), 9;
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- International Congress of Botany Re-
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 Gepp), 52; (Cotton), 54.
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- Irish Sea, *see* Plankton.
- Jackson, Dr. B. D., elected Councillor
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 strous pear, 21; on some portraits of
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- Jones, W. N., elected, 46; proposed, 12.
- Johnson, N. M., admitted, 11; elected,
 3; proposed, 1.
- Kertész, Dr. K., Stratiomyiidae of the
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- Khor Dongonab, Physical description
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- Kieffer, J. J., Cecidomyiidae and Chiro-
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 pidae and Proctotrupoidea of the
 Seychelles, 47.
- Klebs, Prof. G., elected Foreign Mem-
 ber, 12; proposed, 8.
- Leaves of certain species of *Veronica*
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- Lepidium neglectum*, Thell., and *L. den-
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- Longstaff, Mrs., showed *Brassia caudata*,
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- Maize with androgynous inflorescences
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- Masterman, A. T., withdrawn, 13.
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- Meade-Waldo, G., Wasps of the Sey-
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- Medal, Linnean, presented to Count
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- Meek, Capt. C. F. U., Spermatogenesis
 of *Stenobothrus viridulus*, 3.
- Meyrick, E., Tortricina and Tineina of
 the Seychelles and Aldabra, 6.
- Minchin, Prof. E. A., admitted, 5;
 elected, 1.
- Monckton, H. W., appointed V.-P., 45;
 elected Councillor and Treasurer, 16;
 showed lantern-slides of photographs
 of Sweden, 8.
- Monocotyledons, Origin of (Henslow),
 3.
- Moss, Dr. C. E., E. G. Salisbury, and
 Dr. E. de Fraine, The Genus *Salic-
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- Moulton, J. C., elected, 45; proposed,
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- Mundy, H. G., elected, 4; proposed, 2.
- Murray, J. G., elected, 45; proposed,
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- Musa paradisiaca* var. *sapientum*, shown
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- Nevill, C. St. J., admitted, 3; elected,
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- New South Wales, *see* Wilsmore, Mrs.
 L. J.
- New Zealand, *see* Dendy, Prof. A.
- Nicholls, G. E., *see* Dendy, Prof. A.
- Niphargus plateaui*, Chevreux, exhibited
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- Norman, Rev. Canon, Three species of
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- Nysidacea and Euphausiacea from the
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- Oliver, Prof. F. W., communication by
 (Baker), 11; elected Councillor, 16;
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- Opiliones, *see* Aranæ.
- Origin of Monocotyledons (Henslow),
 3; — of *Plantago maritima* and
P. alpina (Henslow), 3.
- Orkneys, South, *see* Fritsch, Dr. F. E.
- Parsons, Miss E. M. E., admitted, 4;
 elected, 3; proposed, 1.

- Patron, Consent of King George V. to become, 1.
- Pear, monstrosous, exhibited (Gen. Sec.), 2.
- Penard, Dr. E., elected Foreign Member, 12; proposed, 8.
- Phoridae of the Seychelles (Collin), 47.
- Physical description of Khor Dongonab (Crossland), 6.
- Plankton, Summer, in the Irish Sea (Herdman), 2; *see* Siphonophora.
- Plantago maritima* and *P. alpina*, Origin of (Henslow), 3.
- Polytrema* and some allied genera (Hickson), 12.
- Polyzoa, Marine, from the Indian Ocean (Thornely), 9.
- Polyzoa and Bryozoa, The terms (Stebbing), 9, 12, 61, 64-68; (Harmer), 70; (Herdman), 9, 62; (Waters), 71.
- Port Erin, *see* Herdman, Prof. W. A.
- Poulton, Prof. E. B., appointed V.-P., 45; elected Councillor, 16.
- Powell, Lt.-Col. S., deceased, 12; elected, 3; obituary, 40; proposed, 1.
- Prain, Lt.-Col. D., Vote of thanks moved by, 29.
- President elected (Dr. D. H. Scott), 16.
- Presidential Address, 17-29.
- Proctotrupoidea of the Seychelles (Kieffer), 47.
- Pseudoscorpiones, *see* Araneæ.
- Rathbun, Miss M. J., Marine Brachyura from the Indian Ocean, 8.
- Red Sea, *see* Sponges.
- Reid, Clement, appointed Scrutineer, 13, 16.
- Reissner's Fibre, *see* Dendy, Prof. A.
- Rendle, Dr. A. B., appointed V.-P., 45; Councillor, 16; elected Auditor, 11.
- Reptiles, *see* Batrachians.
- Rhizopods, British, New and little-known (Brown), 12.
- Ridewood, Dr. W. G., elected Councillor, 16.
- Row, R. W. H., Non-calcareous Sponges from the Red Sea, 4.
- Rubus Idæus*, Abnormal form of, exhibited (Trail), 2.
- Salicornia*, The Genus (Moss, Salisbury, and de Fraine), 11.
- Salisbury, E. G., *see* Moss, Dr. C. E.
- Salmon, C. E., exhibited *Lepidium neglectum*, Thell., and *L. densiflorum*, Schrad., 8.
- Salt-Marsh, *see* Seaweeds.
- Sanford-Burton, H., deceased, 12.
- Saunders, Miss E. R., elected Councillor, 16.
- Scott, Dr. D. H., appointed Vice-Presidents, 45; elected Councillor and President, 16; nominated Scrutineers, 13, 16; Presidential Address of, 17-29.
- Scott, Mrs. D. H., gave lantern exhibition of new species of *Traquairia*, 10.
- Scrutineers appointed, 13, 16.
- Scybalium jamaicense*, Schott & Endl., shown (Fawcett), 47.
- Seaweeds, Brown, of the Salt-Marsh (Baker), 11.
- Secretaries elected, 16.
- Seychelles, Apoidea (Cockerell), 47; Araneæ, Opiliones, and Pseudoscorpiones from the (Hirst), 8; Batrachians and Reptiles from the, and Aldabra (Boulenger), 8; Borboridæ, 47; Cecidomyiidæ of the (Kieffer), 6; Chironomidæ of the (Kieffer), 6; Culicidæ (Theobald) of the, 47; Cynipidæ and Proctotrupoidea (Kieffer), 47; Lepidoptera (Fryer), 47; Phoridæ (Collin), 47; Stratiomyiidæ of the (Kertész), 6; Tortricina and Tineina of the, and Adabra (Meyrick), 6; Wasps (Meade-Waldo), 47.
- Shaw, F. J. F., proposed, 11; elected, 45.
- Shelford, R., Blattidæ enclosed in Amber, 12.
- Siphonophora of 'Research' Biscayan Plankton (Bigelow), 2.
- Smith, E. A., withdrawn, 13.
- Soames, H. A., withdrawn, 13.
- Soar, C. D., admitted, 11; elected, 9; proposed, 7.
- Solms-Laubach, Count Hermann, to receive the Linnean Medal, 11; Linnean Medal presented to, 30; his thanks, 31.
- Soper, F. L., deceased, 12; obituary, 40.
- Spengel, Prof. J. W., elected Foreign Member, 12; proposed, 8.
- Spermatogenesis of *Stenobothrus viridulus* (Meck), 3.
- Sponges, Lantern-slides, and a specimen, of New Zealand, shown (Dendy), 7; Non-calcareous, from the Red Sea (Row), 4.
- Sporocarpion elegans*, exhibited (Scott), 10.
- Stapf, Dr. O., elected Councillor and Secretary, 16; exhibited *Digitaria didactyla*, Willd., from Sydney, 6; Report on the Inter. Congr. of Bot., 1911, 4, 51, 55.

- Stebbing, Mrs. M. A., exhibited monstrosity in the Foxglove, 48.
- Stebbing, Rev. T. R. R., appointed Scrutineer, 13, 16; On J. V. Thompson and his Polyzoa, 12, 64-68; On *Taunthompsonia*, Bate, 69; The terms Polyzoa and Bryozoa, 9, 61.
- Stenobothrus viridulus*, Spermatogenesis of (Meek), 3.
- Stewart, S. A., deceased, 2, 13; obituary, 40.
- Stratiomyiidae of the Seychelles (Kertész), 6.
- Sub-Commissural Organ and Reissner's Fibre (Dendy and Nicholls), 5.
- Sweden, Lantern-slides of photographs of, shown (Hopkinson), 9; (Monckton), 8; specimens of rock from, exhibited, 9.
- Sydney, *see* Stapf, Dr. O.
- Sykes, E. R., withdrawn, 13.
- Tansley, A. G., communications by (Adamson), 4, 10.
- Tattersall, W. M., Nysidacea and Euphausiacea from the Indian Ocean, 9.
- Theobald, F. V., Culicidae of the Seychelles, 47.
- Thomas, Miss E. N., elected Councillor, 16.
- Thompson, H. S., elected, 3; proposed, 1.
- Thompson, J. V., and his Polyzoa (Stebbing), 12; his use of the term "Polyzoa" (Herdman), 62.
- Thornely, Miss L. R., Marine Polyzoa from the Indian Ocean, 9.
- Tineina, *see* Tortricina.
- Toronto, *see* Corfe, Miss B. O.
- Tortricina and Tineina of the Seychelles and Aldabra (Meyrick), 6.
- Trail, Prof. J. W. H., exhibited an abnormal form of *Rubus Idæus*, 2.
- Traquairia*, Lantern exhibition of new species of (Scott), 10.
- Treasurer elected (H. W. Monckton), 16.
- Treub, Dr. M., deceased, 2, 13; obituary, 41.
- Turner, R. E., Fossorial Hymenoptera of the Indian Ocean, 6.
- Tweed, River, *see* Hayward, Miss I. M.
- Uppsala, Old Botanic Garden at (Gen. Sec.), 8.
- Utricularia ochroleuca*, Hartm., and *U. Bremii*, Heer, exhibited (Druce), 3.
- Taunthompsonia*, Bate (Stebbing), 69.
- Veronica*, Leaves of certain species of (Adamson), 4.
- Vice-Presidents appointed, 45.
- Wailes, G. H., admitted, 46; elected, 11; proposed, 8.
- Waldo, *see* Meade-Waldo.
- Walker, A. O., appointed Scrutineer, 16.
- Walker, C. E., withdrawn, 13.
- Wasps of the Seychelles (Meade-Waldo), 47.
- Waterbuck, Lantern-slide of the head of a, shown (Henderson), 47.
- Water-colour drawings of wild flowers, exhibited (Corfe), 4.
- Waterfall, C., elected, 45; proposed, 11.
- Waters, A. W., On the terms Polyzoa and Bryozoa, 71.
- Watson, Rev. R. B., deceased, 12; obituary, 43.
- Whitman, C. O., deceased, 13.
- Wickes, W. D., deceased, 12.
- Wilmshire, Mrs. L. J., Hexactiniae from New South Wales, 7.
- Wilson, Prof. E. B., proposed as, and elected, Foreign Member, 8, 12.
- Wilson, M., admitted, 46; elected, 45; proposed, 11.
- Withdrawals, 13.
- Woodward, Dr. A. S., elected Councillor, 16; On the Fauna of the Carboniferous Period, 45.
- Worsdell, W. C., exhibited maize showing androgynous inflorescences, and wood-carving riddled by *Botrychoplites cornutus*, Oliv., 2.
- Wright, C. H., Flora of the Falkland Islands, 5.
- Zeitz, A. H. C., withdrawn, 13.
- Zoological Secretary elected (Prof. A. Dendy), 16.



JOSEPH DALTON HOOKER
at the age of 51.

PROCEEDINGS
OF THE
LINNEAN SOCIETY OF LONDON.



124TH SESSION.

FROM NOVEMBER 1911 TO JUNE 1912.

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SUPPLEMENT.

Index to the Linnean Herbarium.

PUBLICATIONS: SESSION JULY 1911-JULY 1912.

Journal, Botany.

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Proceedings, 123rd Session, October 1911.

List of [Fellows, Associates, and Foreign Members], Nov. 1911.

PROCEEDINGS
OF THE
LINNEAN SOCIETY OF LONDON.

(ONE HUNDRED AND TWENTY-FOURTH SESSION,
1911-1912.)

November 2nd, 1911.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 15th June, 1911, were read and confirmed.

Mr. William Neilson Jones, M.A., Mr. Charles Waterfall, and Mr. Richard Siddoway Bagnall were admitted Fellows.

Mr. James Wales Audas, Mr. Claude Keith Bancroft, B.A., William John Dakin, D.Sc., Miss Ruth Mary Cardew, Mr. John Hughes, Thomas Harvey Johnston, M.A., D.Sc., Robert Laurie, M.B., Ch.B. (Glasg.), B.Sc. (Edin.), William McRae, B.Sc., Sir Frederick William Moore, M.A., M.R.I.A., Dr. Annie Porter, B.Sc. (Lond.), Albert Malins Smith, M.A. (Cantab.), Miss Edith Layard Stephens, B.A. (Cape), Miss Elsie Maud Wakefield, and Alfred James Wilmott, B.A. (Cantab.), were proposed as Fellows.

The PRESIDENT read the following reply by Sir JOSEPH HOOKER, in response to the letter of congratulation sent to him from the General Meeting of the 15th June:—

The Camp, Sunningdale,
[25th June, 1911.]

MY DEAR PRESIDENT,

The warm congratulations with which I have been greeted by my fellow-members of the Linnean Society on the approach of my 94th birthday have moved me more deeply than I can express. From no other association of scientific labourers could

greetings be so welcome to me, because of the esteem and affection I feel for the Society as one of its oldest members and because of my descent, as grandson and son of two of its earliest.

Requesting you to make known to my fellow-members my hearty appreciation of their affectionate congratulation and my own best wishes for the continuation of its increasing prosperity,

Believe me, sincerely yours,

(Signed) JOS. D. HOOKER.

*The President,
Linnean Society.*

Dr. A. B. RENDLE, V.-P., having taken the Chair:—

Dr. D. H. SCOTT gave an account of the Palæozoic Fern, *Zygopteris Grayi* (Williamson). (Subsequently published in the 'Annals of Botany,' vol. xxvi. no. ci, 1912, pp. 39-67, 5 pls., 1 fig.)

Dr. Rendle having spoken on the subject of the paper, left the Chair, and the President resumed.

A paper, by Miss EDITH E. BAMFORD, entitled "Pelagic Actinian Larvæ," and communicated by Prof. J. Stanley Gardiner, F.R.S., F.L.S., was read in abstract.

Mr. ALFRED O. WALKER contributed a paper on "The Distribution of *Elodea canadensis*, Michx., in the British Isles in 1909." (Abstract, p. 71.)

A discussion followed, in which the following took part:—Mr. James Groves, Mr. E. M. Holmes, the Rev. T. R. R. Stebbing, Prof. J. W. H. Trail, Dr. Margaret Benson, Mr. H. N. Dixon, Mr. J. C. Shenstone, Prof. A. Dendy, Dr. O. Stapf, Mr. Henry Groves, Dr. A. B. Rendle, and the President.

Dr. JAMES MURIE exhibited sets of specimens of the "Slipper Limpet" (*Crepidula fornicata*), the shells themselves in graduated series and living examples attached to oysters, mussels, &c. These were obtained in the Essex waters, by dredging, and from shallow muddy shore tracts.

The "Limpets" have now become a nuisance on the oyster-beds of Kent and Essex. Originally they were introduced from America, among the barrelled oysters brought over for relaying. They have since become thoroughly naturalised, and on the Blackwater and River Crouch are dredged up in tons, attached to the oysters, mussels, &c.

Unlike the Starfish, devourers and arch-enemies of the oyster, the Mussels, which literally smother them, or the Whelk Tingles, which bore through their shells, the "Slipper Limpet" is more of a commensal parasite and messmate, partaking of the oyster's food.

The labour and expense involved in constant dredging for them

renders them a serious menace to oyster-culture, as likewise the necessity for individually chopping them off by "cultack" before the oysters are presentable for sale.

Prof. A. Dendy and the President made remarks, and Dr. Murie briefly replied.

Mr. ALFRED O. WALKER exhibited *Clerodendron trichotomum*, Thunb., in fruit, a result of the past abnormal summer, explaining that, although the plant frequently flowered in England, this year is the first time it had fruited, the same occurrence being also observed at Kew.

Mr. R. S. BAGNALL briefly referred to three interesting captures he had lately made in the county of Durham, namely, species of *Diplopora* and *Paupropoda*, and of *Protura* first recorded as British.

November 16th, 1911.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 2nd November, 1911, were read and confirmed.

Mr. James M'Crone Douie, C.S.I., Mr. John William Haigh Johnson, B.Sc., and Miss Beatrice Lindsay, were proposed as Fellows.

Dr. REGINALD R. GATES, M.A., Ph.D., then gave the main outlines of his paper, communicated by Dr. Marie Stopes, F.L.S., on "Certain aspects of the Mutation Problem in *Oenothera*." He stated that:—

Work with the *Oenotheras* has developed in several directions, all bearing on the general question of the place to be assigned to mutation as an evolutionary factor. An investigation of the behaviour of the *Oenotheras* in heredity and variation from several points of view, gives a broader basis for the interpretation of the evolutionary significance of these phenomena than has hitherto been possible in most other genera.

The cytological evidence shows that in most of the mutants from *Oenothera Lamarckiana* the chromosome number is unchanged, but in the mutant *O. gigas* it is doubled. Hence mutants originate in various ways. Evidence tends to show that the chromosome doubling in *O. gigas* probably occurred either in the fertilized egg, or in a megaspore mother-cell which afterwards developed apogamously.

On the other hand, in certain cases the mutational change probably occurs during the reduction divisions. Thus *O. rubricalyx* is a mutant from *O. rubrinervis* which produces an extreme

amount of pigment; and when crossed with the parent type the new character behaves as a Mendelian dominant, and so as to show that the original mutant individual was heterozygous and probably originated from a cross between a germ-cell in which the new dominant character appeared and one in which it was lacking.

From this and much other evidence, mutation in *Oenothera* appears to be due to a general condition of germinal instability, which in turn is probably connected with crossing in the ancestry. This, however, by no means deprives it of evolutionary significance, for all open-pollinated species of plants are hybrids in the sense that various races have participated in their immediate ancestry.

The paper, which was illustrated by lantern-slides, was discussed by Dr. Helen Fraser and the President, the author replying.

MR. G. CLARIDGE DRUCE, in his exhibition entitled "Some Floristic results of the International Phytogeographic Excursion through the British Isles" during the past summer, gave an account of the places visited during the five weeks spent on the tour, and touched on the species and varieties discovered. (Abstract, p. 77.)

Dr. C. E. Moss (visitor), the Rev. T. R. R. Stebbing, Mr. William Fawcett, and Mr. J. C. Shenstone discussed certain points raised, and Mr. Druce replied.

MR. ARTHUR W. HILL showed drawings of a viviparous specimen of *Juncus bufonius*, in which the seedlings were seen emerging from the parent capsule.

MR. N. C. MACNAMARA contributed some remarks on "Mutations in Foxglove plants," which was communicated by Prof. A. DENDY, and read by the General Secretary, as follows:—

The following record is intended to supplement the communication made to the Linnean Society, on my behalf, by Prof. A. Dendy, F.R.S., on the 16th of June, 1910, concerning mutations in certain Foxglove plants grown at Chorley Wood, Herts.

From a packet of Foxglove seeds (*Digitalis purpurea*) sown in the year 1906, fifty-four plants were, in June 1907, planted in a shrubbery of fir-trees with an undergrowth of laurels. Of these plants fifty-one grew into normal Foxgloves, but the three remaining plants were sports which we may distinguish by the letters A, B, and C.

A. In this plant the flowers of the lower half of the stem possessed only a bifid upper petal and seven stamens united at their bases. The flowers of the upper part of the spike were normal.

B. A fine, well-grown plant $4\frac{1}{2}$ feet high; throughout the

whole length of the spike the flower consisted of a bifid upper petal, seven stamens, and style. The upper part of this spike was isolated; it produced abundant self-fertilized seed.

C. The spike of this plant grew to be 5 feet high; from base to apex its flowers consisted of nine stamens and a style, with no vestige of petals.

It is unnecessary to follow the history of plant A, as it was only the lower part of the spike in which the flowers were abnormal, and the stem was not isolated.

Seed taken from the upper covered part of the plant B (described above) germinated abundantly; twenty-one of these plants flowered in 1909. Of these twenty-one plants thirteen produced spikes of the parent type, and eight produced normal Foxglove flowers. One of the thirteen plants grew to be 5 feet 1 inch high, its spike producing one bifid petal and a style; but its terminal flower consisted of twenty-two stamens and a large flask-shaped carpel (divided into seven compartments) and style, but having no corolla, that is, it had no petals. (As shown in photograph exhibited.)

The season of 1909 was sunless with constant rain; consequently, all covered plants suffered much from mildew, but I managed to collect some self-fertilized seed from the terminal flower of the plant referred to, and this seed germinated and flowered in 1911. Every one of the twelve plants I reared from the seed of the terminal flower produced flowers precisely like the parent. Two of these plants were isolated and their self-fertilized seed germinated freely (September, 1911).

The seed originally collected from the covered part of plant C of 1907, had produced plants which in 1909 gave flowers precisely similar to the parent plant; self-fertilized seed from these plants (1909) in 1911 produced plants exactly like those of 1907, *i.e.*, flowers having nine stamens and a style but no petals; self-fertilized seed from these plants are now (September, 1911) germinating freely. Some of the plants of 1909, however, in place of a tall single spike grew some seven or eight shorter spikes, each flower of which had nine stamens but no petals.

It seems that a certain number of the Foxglove seeds sown in the year 1906 contained elements in a condition such as that described by de Vries as being "impressed by an impulsive mutability," for some of the flowers produced by these seeds were sports. Seeds from these sports produced their like in 1909; and, further, these latter plants produced some terminal flowers totally differing in character from the parent sport from which they were derived. Seeds from these terminal flowers produced their like in the year 1911; so that I have now two different strains of Foxglove plants produced from the seeds sown in 1906, and these strains have been produced from self-fertilized flowers, that is, from flowers carefully protected from insects or other means of cross-fertilization. If other observers would record their

experience as to the behaviour of sports of this kind, in the course of time we might hope to possess data sufficient to enable us to form some reasonable idea as to the frequency, and above all, the permanency of such mutations in wild types of plants.

December 7th, 1911.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 16th November, 1911, were read and confirmed.

Mr. Frank Evans, Mr. George William Howes, and Dr. Ralph Vincent were proposed as Fellows.

Mr. James Wales Audas, Mr. Claude Keith Bancroft, B.A., Miss Ruth Mary Cardew, William John Dakin, D.Sc., Mr. John Hughes, John Harvey Johnston, M.A., D.Sc., Robert Laurie, M.B., Ch.B. (Glasg.), B.Sc. (Edin.), William McRae, B.Sc., Sir Frederick William Moore, M.A., M.R.I.A., Dr. Annie Porter, B.Sc. (Lond.), Albert Malins Smith, M.A. (Cantab.), Miss Edith Layard Stephens, B.A. (Cape), Miss Elsie Maud Wakefield, and Alfred James Wilmott, B.A. (Cantab.), were elected Fellows.

Mr. H. N. DIXON read his paper entitled "On some Mosses of New Zealand."

Dr. GEORGE HENDERSON then showed a series of more than 70 slides, taken during an official mission through Kashmir, Little Tibet, and Turkestan in 1870. The original photographs had been lost sight of, but having recently been discovered in the keeping of a friend, lantern-slides had been made from them, and were now shown, with explanations by the author. He traced the progress of the expedition from Lahore to Yarkand, where the series ended.

Dr. Stapf and the President commented on the interest of the exhibition, and the botanical results obtained 40 years ago.

Dr. HENDERSON also showed three variations in the foliage of *Alnus glutinosa* from the banks of the River Darent, in full view of his house, and explained that these differences corresponded with varying dates of leafing, leaf-fall, and fruiting.

The President spoke on the changes induced by trees and shrubs being cut back, the luxuriance of the new growth making it almost unrecognizable, as in a case observed at Oakley, when it was found that *Rhamnus cathartica* had assumed a new form owing to severe coppicing. Mr. J. C. Shenstone also spoke.

Dr. A. B. RENDLE showed a fine specimen of a viviparous *Poa trivialis*, Linn., found by Mr. Miller Christy at Stisted, near Braintree, in Essex. The normal inflorescence was almost entirely replaced by a mass of vegetative outgrowths replacing the flowers.

A discussion followed, in which Dr. Stapf, Mr. H. N. Dixon, and Mr. W. C. Worsdell took part.

December 21st, 1911.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair

The Minutes of the General Meeting of the 7th December, 1911, were read and confirmed.

The President then spoke of the loss sustained by the Society since its last meeting in the death of Sir JOSEPH HOOKER, beyond doubt their most distinguished Fellow. He was elected June 7, 1842, over 69 years ago, and served on the Council, with only short intermissions, from 1846 to 1884; he was Vice-President during a great part of that time, and exercised considerable influence on the affairs of the Society, though, unfortunately, never President. Much of his best work, so far as it was not in book-form, was published by the Society; his memoirs on the Flora of the Galapagos Islands, the distribution of Arctic plants, and the classic memoir on the unique plant, *Welwitschia mirabilis*, were mentioned. His last paper published in our Transactions was on the Rubber plant, *Castilloa*, 25 years back. The Society hoped to have the honour of publishing his latest work, on the genus *Impatiens*, upon which he was actively engaged during the last years of his life, till very near the end.

Sir Joseph was the acknowledged leader in systematic, and above all, in geographical botany. His contributions to fossil botany were of great value: by the world at large, he would be best known for his close association with Darwin and with the development of the Darwinian theory.

The following Resolution was then moved from the Chair:—

The Fellows of the Linnean Society of London in General Meeting assembled, desire to place upon record their profound sense of the loss to the Society and to the World of Science, occasioned by the death of Sir JOSEPH DALTON HOOKER on the 10th December, and their pride in his having been a Fellow of the Linnean Society for nearly 70 years, during which by his scientific contributions to the Society's publications and his advice throughout his many years of service on the Council, he so greatly added to the prestige and efficiency of the Society.

They desire also to express their deepest sympathy with Lady Hooker and the family in their bereavement.

That a copy of the foregoing Resolution be communicated to the family by the General Secretary.

The Resolution was carried unanimously, the Fellows rising in their places.

The President then announced that a vacancy existed in the List of Foreign Members by the recent death of Dr. Jean Baptiste Edouard Bornet, F.M.R.S., and that two vacancies had arisen in the List of Associates, by the death of Mr. Oswald Arthur Sayce, and the election as Fellow of Sir Frederick William Moore, M.A.

Miss Ruth Mary Cardew, the Rev. Hilderic Friend, and Miss Elsie Maud Wakefield, were admitted Fellows.

Sir James M'Crone Donie, K.C.S.I., Mr. John William Haigh Johnson, B.Sc., and Miss Beatrice Lindsay, were elected Fellows.

The Rev. HILDERIC FRIEND, F.L.S., then read his paper, entitled "Some Annelids of the Thames Valley," which was discussed by Prof. A. Dendy, Sec.L.S., and the Rev. T. R. R. Stebbing; the author briefly replying.

Mr. W. C. WORSDELL, F.L.S., then gave a lantern exhibition of a series of slides, showing abnormalities in fungi, and explained his views on the causes which produce them. Prof. F. O. Bower, Prof. D. T. MacDougal (visitor), the Rev. T. R. R. Stebbing, Prof. A. Dendy, Sec.L.S., Dr. Stapf, Sec.L.S., Miss E. M. Wakefield, Miss E. N. Thomas, and the President joined in a discussion, and the exhibitor replied.

Dr. A. B. RENDLE, F.R.S., F.L.S., showed specimens obtained in 1911, of the dissected leaf-form of Horseradish, *Cochlearia Armoracia*; in his absence, the following statement was read for him by the General Secretary:—

"It is not suggested that the dissected form of leaf of Horseradish is new; it will be familiar to many Fellows. The leaf-tissue between the veins is undeveloped to a greater or less degree, and a more or less cut form of leaf results. I should like to ask whether this form has been more generally noticed during the past remarkably sunny summer. It might be suggested that it is a response to an increased amount of sunlight or diminution of water-supply. The specimen which I am showing came from a dry field, about a mile from the sea, at Bognor, in which a number of the plants were growing here and there, and nearly all of them showed the phenomenon in a greater or less degree. I noticed the same dissected leaf-form in other places this summer.

"Miss Ida M. Roper, F.L.S., has sent a specimen from Somerset, and her letter may be worth reading to the Fellows."

The letter, dated the 20th December, was accordingly read.

Dr. Stapf then referred to one or two points suggested by the specimens.

January 18th, 1912.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 21st December, 1911, were read and confirmed.

Miss Alice Pegler was proposed as an Associate.

Mr. Frank Evans, Mr. George William Howes, and Ralph Vincent, M.D., M.R.C.P., were elected Fellows.

Dr. A. ANSTRUTHER LAWSON, F.L.S., gave a lantern lecture entitled "Some features of the Marine Flora at St. Andrews," showing the wealth of algal vegetation at that part of the coast, and its special characteristics, including the habit of the plants when growing in their natural position under water. Illustrations of the gigantic Brown Algæ of the Pacific Coast were also shown for comparison.

The lecture was discussed by Miss A. L. Smith, Mr. J. C. Shenstone, Prof. F. E. Fritsch, Mr. A. D. Cotton, and the President, the lecturer replying to various questions.

Miss E. L. TURNER, F.L.S., then showed a series of lantern-slides illustrating her discovery last year of a nestling Bittern in Norfolk on the 8th July, 1911. The slides were from photographs taken by the author, and showed the young bird in its protective attitude simulating a bundle of reeds, and the nest itself.

The narrative showed that probably more than one young bird had been hatched, and that the fledgling found was the last of the brood, and the older birds had been induced by the parents to quit the neighbourhood of the nest and scatter amongst the reeds of the marsh. It is gratifying to record the recurrence of this interesting species in a county in which it was formerly common, and it is hoped that it may re-establish itself in its old haunts.

The Rev. T. R. R. Stebbing, F.R.S., added some remarks, congratulating Miss Turner on her success as an observer.

The General Secretary read a letter from Dr. George Henderson, accompanying a quantity of seeds of *Nannorrhops Ritchiana*, H. Wendl., which the sender wished should be tried in cultivation in the South of England by as many persons as possible. He stated that these seeds were of last summer's growth, and came from the Khyber Pass, where snow sometimes covered these palms in winter, whilst the summer is very hot. He further suggested

that heat might be requisite to cause the seeds to germinate freely.

The seeds were accordingly distributed amongst those present at the meeting.

February 1st, 1912.

Prof. E. B. POULTON, F.R.S., Vice-President, in the Chair.

The Minutes of the General Meeting of the 18th January, 1912 were read and confirmed.

Dr. Ralph Vincent was admitted a Fellow.

Mr. Charles Cumming Calder, B.Sc., Mr. Thomas Alfred Dymes, Mr. Thomas Maldon Fitch, Miss Clara Ethelinda Larter, Miss Maud Samuel, B.Sc., and Mr. David George Stead, were proposed as Fellows, and Mr. Arthur Patterson and Mr. Charles Davies Sherborn for the vacant Zoological Associateship.

Mr. F. N. WILLIAMS regretted the present method of postponing exhibitions, which produced the greatest amount of discussion, to the reading of papers of mere formal importance, with the consequent inconvenience to those Fellows who, living at a distance, had to leave early on account of their trains.

The Vice-President in the Chair pointed out that the matter was actually before the Council, and Mr. Williams's remarks would receive attention; and Prof. Dendy, Sec.L.S., explained the reason why the alteration had been tried.

The following five papers, relating to the fauna of the Seychelles and other islands of the Indian Ocean, were communicated by Prof. J. STANLEY GARDINER, F.R.S., F.L.S.:—

1. M. A. FOREL.—Fourmis des Seychelles et des Aldabras, reçues de M. Hugh Scott.
2. Mr. F. W. EDWARDS.—Tipulidæ.
3. Dr. GÜNTHER ENDERLEIN.—Sciaridæ.
4. Mr. CLAUDE MORLEY.—The Ichneumonidæ.
5. C. TATE REGAN, M.A.—New Fishes.

The Vice-President in the Chair, Prof. Dendy, Sec.L.S., the Rev. T. R. R. Stebbing, and Prof. W. A. Herdman contributed some remarks on the value and importance of the results thus briefly summarized.

The Rev. R. ASHINGTON BULLEN, F.L.S., exhibited a snail found by him at Porto Pi, near Palma, Mallorca, in March 1909. Its shell puzzled him, because it had composite characters allying it on the

one hand to *Helix aspersa*, O. F. Müll., and on the other to *Otala vermiculata* (O. F. Müll.), both common Lusitanian forms. The Rev. E. H. Bowell having examined the anatomy of the animal itself, found that its radula partook of an intermediate character, showing affinities to the species named above, and the absence of certain organs argued its hybridity.

A discussion followed, in which the following took part:—Prof. Poulton, Mr. Alfred Santer Kennard (visitor), and the Treasurer.

Rev. R. ASHINGTON BULLEN also exhibited new engravings, enlarged 12 diameters, of *Hygromia montivaga*, Westerlund. This land-mollusc was found at Harlyn Bay, Cornwall, in 1902, in a prehistoric cemetery of late Keltic date. He had found about 40 specimens in all. It is a member of the Lusitanian fauna, and, so far, only found in England in the above locality. The exhibitor adduced evidence to show that it was certainly of pre-Roman date (dying out in the early Iron Age), he having obtained it from a probably Pleistocene horizon in previously undisturbed brown sandy clay, the upper disintegrated layer of the Ladock Beds (Devonian Slates). The place where he so found it had not been dug into for the purpose of burial. It also occurred in the brown sand in which the late Keltic burials were placed, but not in the 12 or 13 feet of bright shell-sand beneath the top soil and above the interments. Roman remains (a coin of the younger Faustina) had occurred in the neighbourhood no deeper than plough-depth.

The following joined in the discussion upon this exhibition:—Prof. Dendy, Sec.L.S., Mr. A. S. Kennard (visitor), the Treasurer, Mr. J. C. Shenstone, Mr. Hugh Findon, Dr. Otto Stapf, Sec.L.S., Mr. F. N. Williams, Dr. Marie Stopes, and Prof. Poulton, the exhibitor replying.

The General Secretary brought forward a communication from Herr PAUL SCHERDLIN, as follows:—

“For hundreds of years pigeons have nested on the spire of Strassburg cathedral. They increased so much that many attempts have been made to extirpate them, but in vain. During the last few years there has been a sudden and startling diminution in the number of these cathedral pigeons.

“I am of opinion that this manifest reduction is due to the asphalting of the streets round the cathedral. Between the stone sets of the pavement the pigeons were able to pick up food in quantity. In consequence of the asphalting, and daily watering and cleansing of the places in the immediate neighbourhood, the birds have gone.

“Has a similar case been observed elsewhere?”

The Rev. R. Ashington Bullen, Prof. Dendy, Mr. Henry Bury, and Mr. Charles Oldham (visitor) spoke on the subject,—the last

speaker referring to the lessened number of pigeons in certain parts of London, due to the increase of motor traffic and corresponding decrease of horses, the birds thus losing their chief source of food from scattered horse-feed.

The General Secretary then brought forward a communication entitled "Additional Information concerning Linné's Lapland Drum." He stated that on the 2nd February, 1911, he showed some lantern-slides concerning Roslin's portrait of Carl von Linné (Proc. 1910-11, p. 2, plate), followed by some remarks on the Lapp drum which figures in the Hoffman portrait and on the titlepage of the '*Flora Lapponica*.'

Immediately upon the printed account of this exhibition reaching Sweden, two correspondents wrote to him about it, and one of them, Dr. J. M. Hulth, of Uppsala, was so kind as to enclose a reprint of an article by Dr. Edgar Reuterskiöld, on the Linnean Lapland magic drum, from which the following information is taken.

The information printed in the Proceedings for last year (pp. 60-61) represented the ascertained facts up to the Bicentenary of Linné in May 1907. But enquiry was afterwards made as to what had become of the Linnean drum, and it resulted in the discovery of its history as follows:—The drum formed part of a large collection of curiosities which was bought by the University of Upsala in 1832 on the death of Thunberg's pupil and botanical demonstrator, C. P. Forsberg. In 1874 the University, not knowing its interesting history, presented it to the Royal Academy of Science, Stockholm, whence, in 1883, it passed to the Trocadéro Museum, in Paris, in exchange for some Peruvian curiosities.

It now seems certain that Linné received the magic drum from Pite Lappmark, as it agrees with the design of others from that part, and differs from the form of those from Kimi and Torne Lappmark; it has certain figures used in the district of Åsele. We may expect a detailed account of the drum in question from Dr. Reuterskiöld, who is occupied in an exhaustive review of all known specimens.

The Treasurer referred to the interest of this exhibition, specially with regard to the local variations in the pattern of the drums.

The General Secretary also read a letter from Sir E. RAY LANKESTER, K.C.B., F.R.S., referring to certain developments on the part of 'The Field' newspaper, as enlisting the help of sportsmen and country gentlemen for natural history.

Mr. John Hopkinson also contributed some remarks on the illustrations shown in support of the letter.

February 15th, 1912.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 1st February, 1912, were read and confirmed.

Mr. Albert Malins Smith, M.A., was admitted a Fellow.

Mr. Richard Higgins Burne and Prof. Augustus Daniel Imms, B.A., B.Sc., were proposed as Fellows.

Miss Alice Pegler was elected an Associate.

With reference to remarks made at the last General Meeting, the President read the following Resolution which had been adopted by the Council:—

“That it be the duty of the Secretaries to arrange the Agenda of the Exhibitions and Papers for each meeting in such a way as may in their discretion best contribute to the interest and convenience of the Fellows attending the Meeting.”

Mr. ROBERT HAROLD COMPTON, M.A., read a paper, communicated by Prof. A. C. SEWARD, F.R.S., F.L.S., entitled “An Investigation of the Seedling Structure in the Leguminosæ.”

A discussion followed, by Miss E. N. Thomas, Mr. T. G. Hill, Dr. Ethel de Fraine, Mr. A. G. Tansley, the President, Dr. Otto Stapf, Sec.L.S., and Mr. Ernest Lee, the author replying.

Mr. C. E. SALMON exhibited an abnormal *Orchis* with enlarged drawings of the flowers, with the following note:—

On April 23rd, 1911, Mr. P. H. Mitchiner gathered this remarkable specimen on the chalk downs above Reigate and brought it to me for determination. At a first glance, *Habenaria viridis* or *Herminium Monorchis* might be suggested as a name, for the stem was about 4 inches high, with a spike of small greenish-yellow flowers.

A close examination soon dispelled such an idea, and I saw at once that the specimen was unlike any British wild Orchid. Knowing that Mr. W. B. Hemsley had studied various species of this Order very closely, I at once packed up the specimen and despatched it to him. I cannot do better than read the careful report he made upon it, only regretting that he is unable to be present to-night to explain personally the various points. He writes:—

“Although none of the flowers attained full development, some of them grew out sufficiently for analysis and recognition of the parts. Briefly, the flowers present several peculiarities. In the

first place, they have three spurs, the additional pair being sepaline; agreeing in this respect with the three-spurred *Platanthera* that I exhibited before the Linnean Society, Jan. 17, 1907, and differing from the three-spurred *Platanthera* exhibited March 19, 1908, in which the additional spurs were petaline; these two conditions affording examples of false and true peloria respectively. Both specimens of *Platanthera* contained fully developed normal pollinia; your plant, none. The structure of the flowers of your plant is as follows:—Scape with one appressed leaf. Flowers yellowish, crowded, not fully developed and only about one-third of an inch long. Bracts longer than the ovary, shorter than the flower. Flowers 3-spurred, the additional spurs produced by the two lateral sepals, and somewhat thicker than the labellum spur. Spurs equal or unequal in length. Labellum considerably larger than the sepals and petals, narrow in the basal half and nearly orbicular in the distal half, entire or irregularly 5-toothed. Sepals and petals otherwise similar. Genitalia quite rudimentary with no trace of pollinia.

“The floral structure of this anomalous orchid, especially the shape of the different organs, and its sterile nature, would lead one to suppose it to be of hybrid origin. But its early appearance and its small size make it difficult to suggest a probable parentage. The shape of the labellum points to *Orchis* and I suggest some connection with *O. Morio*; yet the resemblances go no further. I sent the drawings to my friend Dr. Focke, and he replied that he could say very little about it but referred me to a Swiss record, which he had not seen, of an anomalous *O. Morio*, as a possible clue.”

The suggestion of Dr. Focke (whose letter is upon the table) is not very helpful, as the plant to which he refers proved to be a 3-lipped and 3-spurred *Orchis Morio*. The plants associated with this abnormal *Orchis* on the Reigate Downs include *Orchis mascula*, *O. Morio* (sparingly), *O. ustulata* (sparingly), *Aceras*, and, not far away, *Habenaria bifolia*; but of all these, *O. mascula* would be the only species in flower on such an early date as April 23rd.

I may mention that Mr. Hemsley showed the drawing at a meeting of the Scientific Committee of the Royal Horticultural Society on Aug. 29, 1911, but no conclusion was arrived at. I should be very glad to hear any suggestions as to the origin of the plant.

Mr. HUGH FINDON showed a series of Glass-sponges from Japan. He stated that these sponges had been lately given to him by a gentleman who received a number of them some years ago from a naturalist in Japan.

He stated that they were of two species, *Hyalonema Sieboldii* and *H. apertum*, and were dredged in ten to fifteen fathoms of water off the East Coast of Japan. One specimen had been cut in order to see the connection between the stalk, or “rope,”

and the sponge proper. The lower ends of the strands of the "rope" are barbed in a peculiar manner, as may be seen under the microscope.

Slides of the spicules were also shown under the microscope, of which there seem to be a great variety, the most noteworthy being the double-ended, six-bladed, battleaxe-form and the four-rayed star with the barbed spur. There also appears to be a smaller double mushroom anchor form and many straight spines. The spicules polarize light but slightly, and appear to have an organic nucleus or centre core.

Prof. A. Dendy, Sec.L.S., spoke on the history of these sponges, and the original erroneous ideas entertained concerning their nature and mode of growth. He further displayed illustrations from various sources in support of his statements.

March 7th, 1912.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 15th February, 1912, were read and confirmed.

Mr. Alleyne Leechman and Dr. Charles Edward Moss were proposed as Fellows, and Dr. Hermann Christ-Socin as a Foreign Member.

Mr. Charles Cumming Calder, B.Sc., Mr. Thomas Alfred Dymes, Mr. Thomas Maldon Fitch, Miss Clara Ethelinda Larter, Miss Maud Samuel, B.Sc., and Mr. David George Stead were elected Fellows.

The names of Mr. Arthur Patterson and Mr. Charles Davies Sherborn were submitted to a ballot for the vacant Zoological Associateship. The ballot having been closed, the President nominated Mr. A. D. Michael, Dr. W. T. Calman, and Dr. A. P. Young, Scrutineers; these having examined the Ballot-papers and reported to the President, he declared that Mr. Charles Davies Sherborn had been elected an Associate.

The President announced the death of Mr. Alfred Fryer, A.L.S.

Prof. PERCY GROOM read a paper entitled "Note on the Internodes of *Calamites*."

A discussion followed, in which the following took part:—Prof. F. W. Oliver, Dr. Marie Stopes, Mr. Clement Reid, and the President, the author replying.

Miss ETHEL M. PHILLIPS exhibited a portfolio of water-colour drawings, and explained that they were made during a recent

visit to Barbados, West Indies, between November 1908 and May 1911. "I had been greatly struck by the profusion and brilliance of the flora of the Island, and having tried to make a collection of dried specimens, which proved most disappointing, I was led to begin the paintings by a desire to have some permanent record of what I saw. The list of 104 plants is far from being exhaustive, but contains perhaps the majority of the more prominent ones. I am not a botanist, but have endeavoured to delineate as faithfully as possible the form and structure of the various species, and have also tried to reproduce something of the intensity of colouring which seemed to me so remarkable. I may perhaps be allowed to make a special mention of the number of Flamboyant trees, *Poinciana regia*, which with their abundance of bright scarlet blossoms form so striking a feature of the landscape in the months of May, June, and July." A list of most of the botanical names, supplied by Mr. John Bovell, F.L.S., of the Agricultural Department, Barbados, was also shown. The exhibitor reminded those present that some of the colours, especially the mauves and blues, are not seen to advantage in artificial light.

The Rev. T. R. R. STEBBING read his paper, "Historic doubts about *Vaunthompsonia*." (Abstract, p. 78).

Dr. W. T. Calman, the General Secretary, and Prof. A. Dendy, Sec.L.S., joined in the subsequent discussion.

Dr. OTTO STAFF, Sec.L.S., by permission of the Director of the Royal Botanic Gardens, Kew, showed some living specimens of Cactoid Euphorbias from South Africa, and commented on the salient features of the group.

The President, Miss M. Carson, Mr. H. R. Darlington, the Treasurer, Mr. Clement Reid, Mr. J. C. Shenstone, Prof. A. Dendy, and Dr. C. E. Moss (visitor) contributed further remarks, and Dr. Stapf replied.

March 21st, 1912.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 7th March, 1912, were read and confirmed.

Dr. Ronald Hamlyn-Harris, F.Z.S., and Mr. Robert Heath Lock, M.A. (Cantab.), were proposed as Fellows, and Mr. William Hales as an Associate.

Mr. Richard Higgins Burne, and Prof. Augustus Daniel Imms, B.A., D.Sc., were elected Fellows.

A paper by Dr. IGNACIO BOLIVAR and Mr. CHARLES FERRIÈRE, B.Sc., on the "Orthoptera-Phasmidæ of the Seychelles," and communicated by Prof. J. STANLEY GARDINER, F.R.S., F.L.S., was read by the Zoological Secretary, who, in illustration of this paper, showed living examples of Phasmidæ and their eggs.

Mr. W. F. Kirby, Miss E. Pearse (who also showed specimens), Miss E. M. Wakefield, Dr. A. P. Young, and Dr. Otto Stapf, Sec.L.S., joined in the discussion which followed.

Miss MAY RATHBONE exhibited a specimen of *Trifolium repens* which showed phyllody of the carpels in a very distinct manner, the axes of many of the flowers being prolonged into a single leaflet, subtended by stipules, the rest of the flower calling for no remark. (Abstract, p. 79.)

Miss E. M. Berridge, the President, Dr. O. Stapf, Dr. C. E. Moss (visitor), Mr. H. R. Darlington, the Rev. E. S. Marshall, and Dr. R. R. Gates (visitor), contributed further observations.

Mr. J. A. LIDDELL's paper, "On *Nitocrameira bdelluræ*, a new genus of parasitic Canthocamptidæ," communicated by Prof. G. C. BOURNE, F.R.S., F.L.S., was read in abstract by the Zoological Secretary, and commented on by the Rev. T. R. R. Stebbing, Dr. W. T. Calman, Prof. Dendy, Sec.L.S., and the President.

The Botanical Secretary gave an account of a paper by Mr. W. WEST and Prof. G. S. WEST entitled "On the Periodicity of the Phytoplankton of some British Lakes."

Mr. H. N. DIXON showed a series of plants from South Portugal, stating that the plants shown were collected on a botanical visit to Algarve in company with Mr. W. E. Nicholson in May, 1911. The trip was mainly taken with a view to bryophytic study, and the phanerogams were only incidentally collected. They were not shown with special reference to their botanical interest, though some of them were decidedly rare, but chiefly in order to draw attention to the method of mounting in some instances, certain of the specimens being mounted on sheets of black paper, instead of the ordinary white. In some cases, as for instance with white and yellow flowers, or with many grasses, the colour of the flower is shown up much better by the contrast; and in others, where this is not conspicuously the case, the black background produces a restfulness to the eye which probably, quite apart from colour contrast, is an advantage. It is not suggested that in all cases, or for herbarium purposes, there is any advantage gained, but for exhibition purposes, and for a certain class of plants it seems an improvement over the ordinary white sheet. The surface should of course have as little glaze as possible, and a paper should be chosen which has been found to bear considerable exposure to light without discoloration.

Several of the plants shown are endemic to Portugal, and others to the Spanish Peninsula.

Dr. C. E. Moss, Mr. Wilfred Mark Webb, Mr. J. C. Shenstone, and the Treasurer also spoke on the subject of the exhibition.

Dr. JOHN MASTIN sent for exhibition under the microscope, two slides of Polycistina obtained under the following circumstances:—

“On the 4th September, 1911, a few days after a stormy sea and heavy wind, on the coast off Whitby, Yorkshire, I saw a little patch of beautiful iridescent colour floating on the surface of the then calm water. I skimmed this cloud of colour, and on clearing later, found it to be varieties of Polycistina, of the family Rhizopoda, but having siliceous instead of calcareous shells.

“These shells, which are of magnificent forms, are identical with those usually (and, I am informed, hitherto *only*) found in the West Indies and along the coasts of Florida and the Gulf of Mexico. I believe they are the first discovered on the English Coast, to which they will most probably have been brought by the Gulf Stream.

“I shall be glad if any of the Fellows of the Society can inform me if such as these have ever been discovered on the Yorkshire Coast, or indeed on any portion of the home coasts.

“Up to the present I have failed to find similar ones in any private or public collection which have been found locally. They are all purely West Indian varieties and appear to be absolutely new on these shores.”

Prof. Dendy remarked upon the interest of this exhibition, and that the forms shown were similar to those procurable from Barbados.

April 18th, 1912.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 21st March, 1912, were read and confirmed.

Mr. Richard Higgins Burne was admitted a Fellow.

Mrs. Eleanor Mary Reid, B.Sc., was proposed as a Fellow.

Mr. Alleyne Leechman and Dr. Charles Edward Moss were elected Fellows.

The following Auditors for the Treasurer's Accounts were nominated by the Council, and elected by show of hands, namely: for the Council, Dr. A. B. Rendle and Mr. A. W. Hill: for the Fellows, Mr. Hamilton H. C. J. Druce and the Hon. N. C. Rothschild.

The President announced that the Linnean Medal would be awarded to Dr. R. C. L. PERKINS, famous for his researches on the Fauna of the Sandwich Islands.

Dr. D. H. SCOTT read a paper on "*Botrychioxylon paradoxum*, a Palæozoic Fern with Secondary Wood."

Remarks were contributed by Dr. E. A. N. Arber, Prof. A. C. Seward, and Dr. W. H. Lang, the author replying briefly.

Dr. E. A. NEWELL ARBER then summarized his paper, "On *Psygmonophyllum majus*, sp. nov., from the Lower Carboniferous Rocks of Newfoundland, together with a Revision of the Genus, and Remarks on its Affinities."

Prof. Seward and the President followed with additional observations.

Mrs. HENSHAW then gave a lantern demonstration on "The Alpine Flora of the Canadian Rocky Mountains," the slides giving admirable representations of the more striking constituents of the flora, with views of the magnificent mountain scenery in which the plants are found.

Dr. O. Stapf, Sir Frank Crisp, and the President joined in the discussion which followed.

May 2nd, 1912.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 18th April, 1912, were read and confirmed.

Mr. Charles Hedley and Mr. Thomas Alfred Dymes were admitted Fellows.

Mr. William Henry Daun, M.A. (Cantab.), the Rev. John Stewart Müller, M.A. (Cantab.), and Mr. Edwin Percy Phillips, M.A. (Cape Univ.), were proposed as Fellows.

The following persons were severally balloted for and elected:—Dr. Ronald Hamlyn-Harris, F.Z.S., and Mr. Robert Heath Lock, M.A. (Cantab.), Fellows; Dr. Hermann Christ-Socin, of Basel, Foreign Member; and Mr. William Hales, Associate.

The President read the proposed alterations in the Bye-Laws in Chap. II. Sections 2 and 3, with regard to Composition; the new provisions were explained by the President, and the method of voting to be adopted on the 6th June, by the General Secretary.

Miss T. L. PRANKERD, B.Sc., read her paper "On the Structure of the Palæozoic Seed *Lagenostoma ovoides*, Will.," and communicated by Prof. F. W. OLIVER, F.R.S., F.L.S.

The President, Prof. F. W. Oliver, and Dr. Marie Stopes contributed further remarks on the subject of the memoir.

A paper, by Dr. KAREL DOMIN, was communicated and read by Dr. OTTO STAPF, Sec.L.S., and entitled: "Additions to the Flora of Western and North-Western Australia."

Dr. Rendle and Dr. Stapf commented on certain points of the paper.

The next paper was by Mr. G. H. WAILES, entitled "Fresh-water Rhizopoda from the States of New York, New Jersey, and Georgia, with a supplementary account of some species from the Seychelles."

Mr. WILFRED MARK WEBB exhibited several specimens of the extremely rare British Woodlouse, *Lygidium hypnorum*, and explained the circumstances under which he obtained these specimens from Great Warley, Essex.

The Rev. T. R. R. Stebbing adverted to his first finding the species in Britain, and the relations experienced with the then leading authorities on the group; Prof. Dendy also joined in the discussion.

The Rev. R. ASHINGTON BULLEN had sent a box containing cochineal insects for exhibition; he expressed a fear that they would be dead before they could be shown, which was the case.

The General Secretary referred to the unfortunate experience of Carl von Linné, who had laboured so hard to procure living insects; when at last they reached Uppsala they were cleaned off by the gardener, without the Professor's knowledge, to his deep chagrin.

The General Secretary placed before the Meeting a summary of his recent investigation of the Linnean Herbarium. He stated that a full catalogue of its contents had long been desired, but difficulties have stood in the way of a complete catalogue. The present list was on a modest scale, and only aimed at indicating which of the Linnean types are represented in the Herbarium verified by himself, and these will be shown in the list by special type. This will probably obviate much correspondence, and many useless references in search of species not contained in the Herbarium. It is hoped that the "Index" may be printed by the autumn of the present year.

It was found in the course of investigation that Sir J. E. Smith had transferred no fewer than 110 species to genera other than those assigned to them by Linné; these have now been restored to their original positions. Three sigus which had been a puzzle

to botanists since the days of the younger Linné, have been interpreted; and another discovery shows that Linné had catalogued his plants as late as 1767, making three enumerations. Another interesting find was that the insects and shells were marked off in copies of the 10th ed. of the 'Systema,' 1759, and the 12th ed. 1767. A short series of slides in illustration, closed the exhibition.

Dr. Rendle, Dr. Stapf, and the President referred to certain points, and the author replied.

May 24th, 1912.

Anniversary Meeting.

Dr. D. H. SCOTT, M.A., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 2nd May, 1912, were read and confirmed.

Miss Clara Ethelinda Larter and Sir Frederick William Moore were admitted Fellows.

Miss Ethel Mary Doidge, M.A. (Cape Univ.), Mr. Thomas Bainbrigge Fletcher, and Mr. John Gervaise Turnbull, were proposed as Fellows.

The Treasurer then laid his Annual Statement of Accounts before the Meeting, and explained the various items of receipts and expenditure, and the same was received and adopted upon the motion of the President (see pp. 22 & 23).

The General Secretary then laid his Annual Report before the Meeting, thus:—

Since the last Anniversary 10 Fellows had died, or their deaths been ascertained:—

Algernon Sidney Bicknell.	Albert Harrison.
Dr. Harry Bolus.	Thomas Morland Hocken, M.D.
Rev. John Bufton, Ph.D.	Sir Joseph Dalton Hooker, O.M.
Mrs. Marian Sarah Farquharson,	George Maw.
F.R.M.S. [Mrs. Ogilvie-	John Campbell Oman.
Farquharson of Haughton.]	Francis Tagart.

Also 2 Associates:—

Alfred Fryer.	Oswald Arthur Sayce.
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And 2 Foreign Members:—

Dr. Jean Baptiste Edouard Bornet.	Prof. Eduard Strasburger, F.M.R.S.
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TREASURER'S ACCOUNT FOR THE YEAR ENDED APRIL 30TH, 1912.
(Presented at the Anniversary Meeting, May 24th, 1912.)

Receipts and Payments of the Linnean Society from May 1st, 1911, to April 30th, 1912.

<i>Receipts.</i>		£	s.	d.	<i>Payments.</i>		£	s.	d.
Balance at Bankers on 1st May, 1911	£348	14	8		Taxes and Insurance		12	8	9
Deficiency as per last year's account, on sums paid into Bank	128	6	9		Repairs and Furniture		45	15	0
Deficiency on Fellows' foreign postal account.....	7	15	6		Coal, Electric Current, and Gas		50	17	0
					Salaries		765	1	8
					Library:—				
Interest on Investments				484	16	11			
Admission Fees				236	3	10			
Annual Contributions				180	0	0			
Compositions.....				1629	0	0			
Sales of Publications:—				85	0	0			
Transactions	£151	14	6		Books	£280	2	4	
Journals	143	11	11		Binding.....	154	7	3	
Proceedings and Catalogues	9	2	6						434 9 7
				304	8	11			
Miscellaneous Receipts	£16	8	4		Expenses of Publications:—				
Fellows' foreign postal account, deposits... ..	34	12	9		Printing.....	£968	4	10	
					Illustrations	237	5	5	
					Distribution	74	5	7	
Donations in aid of Publications				51	1	1			
				185	10	8			
					Miscellaneous Printing and Stationery		1279	15	10
					Petty Expenses (including Tea and Postage)	£97	13	1	
					Fellows' foreign postal account	2	10	1	
									178 15 9
					Linnean Medal		100	3	2
					Balance at Bankers, 30th April, 1912 (including		15	0	0
					£39 18 2, deposits, Fellows' foreign postal account).				
					Deficiencies as per contra now written off.....		137	12	5
							136	2	3
							£3156	1	5

Separate Funds Account.

	£	s.	d.		£	s.	d.
To Balance at Bankers, May 1st, 1911 :—				By Donations from Westwood Fund on account of three plates in the Society's publications	16	12	6
Westwood Fund	£23	8	3	„ Purchase of £530 East Indian Rly. 3½ % Debenture Stock on account of Tagart Fund	498	4	0
Trail Award Fund	4	1	0	„ Balance at Bankers :—			
Crisp Award Fund	2	19	6	Westwood Fund	£13	15	1
„ Legacy from the late Francis Tagart, F.L.S.	30	8	9	Trail Award Fund	7	11	0
„ Interest on Investments :—	500	0	0	Crisp Award Fund	9	0	4
Westwood Fund	£6	19	4	Tagart Fund	1	16	0
Trail Award Fund	3	10	0				
Crisp Award Fund	6	0	10				
	16	10	2				
	£546	18	11				

Investments on April 30th, 1912.

	£	s.	d.		£	s.	d.
Metropolitan 2½ per cent.	1079	11	3	@ 101	1090	7	2
Great Indian Peninsula Railway, Annuity Class B	42	1	5	@ 21½	888	14	11
Fourth Bridge Railway 4 per cent. Stock	450	0	0	@ 103	463	10	0
Metropolitan 3 per cent.	1000	0	0	@ 88½	885	0	0
India 3 per cent.	975	0	0	@ 80¼	782	8	9
Eastern Bengal Railway 4 per cent. Irred. Debenture Stock	1000	0	0	@ 105	1050	0	0
Great Western Railway 4 per cent. Debenture Stock	1000	0	0	@ 107	1070	0	0
Midland Railway 2½ per cent. Pref. Stock	300	0	0	@ 64¾	194	5	0
Metropolitan Water Board 3 per cent. Stock "B" (Westwood Fund)	232	5	0	@ 83¼	193	7	0
New South Wales 3½ per cent. Stock (Trail Award Fund)	100	0	0	@ 97½	97	10	0
Consols 2½ per cent. (Crisp Award Fund)	252	18	0	@ 78¼	197	17	11
East Indian Railway 3½ per cent. Debenture Stock (Tagart Fund)	530	0	0	@ 93	492	18	0
					£7405	18	9

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, 1912, and found them correct.

A. B. RENDLE,
OTTO STAFF,
ARTHUR W. HILL, } *Auditors.*

W. B. KEEN, *Chartered Accountant.*

Fellows withdrawn (14):—

Rev. William Jenkins Webb	Prof. A. F. Stanley Kent.
Anderson.	Robert Walter Campbell
Dr. Frederic Hungerford	Shelford.
Bowman.	Thomas R. Sim.
Hugh Broughton.	Matthew B. Slater.
Fergusson Escombe.	Herbert Stone.
Dr. George Wallace Eustace.	David Thomas.
Rev. Hilderic Friend.	William Whitwell.
Robert Lawrence Heinig.	

Fellows whose names were ordered by the Council to be removed from the List (2):—

Walter Harris Coffin. | James Moore Williams.

Fellows elected 42, of whom 36 have qualified up to the present time; also 2 Associates and 1 Foreign Member.

The Librarian's report was as follows:—

During the past year there have been received as Donations from private individuals 82 volumes and 228 pamphlets.

From the various Universities, Academies, and Scientific Societies there have been received in exchange, and otherwise, 321 volumes and 94 detached parts, besides 76 volumes and 21 parts obtained in exchange, and as donations from the editors and proprietors of independent periodicals.

The Council at the recommendation of the Library Committee have sanctioned the purchase of 193 volumes and 60 parts of important works.

The total additions to the Library are therefore 672 volumes and 403 separate parts.

The number of books bound during the year is as follows:—In full-morocco 3, in half-morocco 225, in half-calf 3, in full-cloth 438, in vellum 58, in buckram 55, in boards and half-cloth 24. Relabelled (half-morocco and cloth back) 44. Total 850 volumes.

The President referred to the losses by death which the Society had sustained during the past year, and especially to the quite recent death of their Foreign Member, Prof. Strasburger, the news of which had only been received the day before. Prof. Strasburger received the Linnean Medal in 1905, and the Darwin-Wallace Medal in 1908; he was the founder and acknowledged leader of modern cytology on its botanical side; students from all parts of the world frequented his famous laboratory, and to many of his colleagues, like the speaker, he was a valued personal friend.

The President referred to the end, now so near, of his own term of office, and while regretting for his own sake that the

time had come for him to be gathered to his predecessors, congratulated the Society on their gain in securing Prof. Poulton as their new President.

He expressed his great regret that Prof. Dendy was unable to offer himself for re-election as Zoological Secretary, his many and increasing duties preventing him from continuing his valuable services to the Society. In Prof. Dendy they were losing a vigorous and able officer, whom they could ill spare. If, however, they could not keep Prof. Dendy, they were fortunate in being able to put forward Prof. Bourne, of Oxford, as his successor.

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 and Officers.

The Ballot for the Council having been closed, the President nominated the Rev. T. R. R. Stebbing, Dr. A. P. Young, and Mr. A. W. Oke, Scrutineers, who, having cast up the votes, reported to the President, who declared the result as follows:—

TEMPEST ANDERSON, D.Sc.; Prof. G. C. BOURNE, F.R.S.; Prof. ARTHUR DENDY, D.Sc., F.R.S.; Prof. J. STANLEY GARDINER, F.R.S.; Prof. PERCY GROOM, D.Sc.; HENRY GROVES, Esq.; Prof. W. A. HERDMAN, F.R.S.; ARTHUR W. HILL, M.A.; Dr. B. DAYDON JACKSON; Prof. F. KEEBLE, Sc.D.; HORACE W. MONCKTON, F.G.S.; Prof. FRANCIS W. OLIVER, F.R.S.; Prof. E. B. POULTON, F.R.S.; Dr. WALTER GEORGE RIDEWOOD; HENRY N. RIDLEY, C.M.G., F.R.S.; Miss EDITH R. SAUNDERS; Dr. DUKINFIELD H. SCOTT, F.R.S.; Dr. OTTO STAPF, F.R.S.; Miss ETHEL N. THOMAS, B.Sc.; Dr. A. SMITH WOODWARD, F.R.S.

(The retiring Councillors were:—Prof. V. H. BLACKMAN, Mr. HENRY BURY, Sir FRANK CRISP, Mr. E. S. GOODRICH, F.R.S., and Dr. A. B. RENDLE.)

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

President: Prof. E. B. POULTON, F.R.S.

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

Secretaries: Dr. B. DAYDON JACKSON,
Dr. OTTO STAPF, F.R.S.,
Prof. G. C. BOURNE, F.R.S.

Dr. D. H. SCOTT, the retiring President, then delivered his Address:—

PRESIDENTIAL ADDRESS.

IN my Address last year I ventured to give you a short sketch of the work of some of the founders of scientific palæobotany. The subject which I propose to touch on today, though not dissimilar, has claims on our attention of a more personal nature. The death, during the past year, of the acknowledged leader of Botany, Sir Joseph Hooker, our most distinguished Fellow, is an event which must be present to the minds of all of us. The notice of his career for our Proceedings is in hands more competent than mine; I shall limit myself to one special field of his activity, that on which alone I feel in a position to speak, and propose to offer you a few remarks on Hooker's relation to the study of fossil plants.

Hooker's work on fossil botany began very early in his career, and was, with one exception, limited to his younger days, though he kept up his interest in the subject all through.

His first palæobotanical paper, dated 1842, is on fossil wood from the Macquarie Plains in Tasmania, a locality which he visited in the course of his famous Antarctic voyage. The fossil tree (now in the Natural History Museum) was found imbedded in Tertiary basalt; it is curious to find that in his investigation Hooker made no attempt to have sections cut. In the outer layers no siliceous matter had infiltrated into the intervening spaces between the elements, so that they could be separated for microscopic examination, and the "glandular tissue, the distinctive character of a pine-wood," be recognised. More than 60 years later the stem was more fully investigated by Dr. Arber, and named *Cupressinoxylon Hookeri*. On reading this paper Hooker wrote to me (March 28, 1903):—"I was much amused the other day on finding my infant attempt upon a fossil plant christened in the Geological Journal as a new species of plants!"

A Note on a fossil plant from the Fish River, South Africa, was another early contribution (1846). No name was assigned to the specimen, probably Rhaetic, and no definite opinion on its affinities was expressed. It has since been referred to the Equisetaceous genus *Schizoneura*.

These were unimportant works; but in 1846 Hooker was appointed Botanist to the Geological Survey of Great Britain, and though he only held the post for little more than a year, three valuable memoirs, published in 1848, were the immediate result. In fact, this was the time of his most active work on fossil plants. The first of these memoirs is of a general character; it is "On the Vegetation of the Carboniferous Period as compared with that of the present day," and is of remarkable interest as giving the impression made on the mind of a brilliant young botanist by the then state of our knowledge of Palæozoic plants. He says that his observations "are little more than the first impressions

received by a naturalist, who, having been almost exclusively occupied with an existing Flora, is called upon to contrast with it the fragmentary remains of another Flora, whose species are, without an exception, different from those now living, which represent in part the vegetation of a period indefinitely antecedent to the present, and have been succeeded by still other plants, equally diverse from both, and which have likewise perished" (p. 387). He realised the true interest of the enquiry, saying:—"As a field for botanical research there is none so novel as the coal formation, the few yards of shaft being more than equivalent to the longest voyage, in respect of the amount and kind of difference between the vegetation the naturalist is acquainted with and that he seeks to understand" (p. 394). At the same time Hooker, in this as in all his palaeobotanical work, was deeply impressed with the excessive difficulties of the subject, and it must be admitted that his criticisms, judicious as they always were, are apt to sound somewhat depreciatory and discouraging. In the later years of his life, as we shall see, he felt able, under the influence of recent advances, to take a more hopeful view of the position.

In the Essay of 1848 Hooker expressed the opinion that the classification of plants is less easily intelligible than that of animals, being less concerned with external characters. "It is partly," he says, "owing to these circumstances that the study has been comparatively neglected; partly also because a far more comprehensive knowledge of the existing forms of plants is required to make any progress in fossil botany, than of recent zoology to advance equally in palæontology" (p. 388). This is a very just comment, and accounts in a great degree for the rather late development of plant-palæontology.

While he recognised that the Carboniferous period presents exceptional facilities for investigation, Hooker scarcely did justice to the quality of its fossils. "Plants, whose tissues are so lax as to be convertible after death into a mass of such uniform structure as coal, evidently would not retain their characters well during fossilization, under whatever favourable circumstances that operation may be conducted. We consequently find that few specimens are available for scientific purposes" (p. 389). This somewhat theoretical difficulty would not trouble one at the present day.

It is interesting to find that Hooker already admitted the necessity for anatomical work. He says that the investigator's knowledge should embrace "a familiarity with vegetable anatomy, for when the stem or trunk alone is preserved, which is often the case, a minute examination of its tissues is the only method of determining its position in the natural series" (p. 392). All the same, Hooker was distrustful of anatomical characters, for in discussing the affinities of *Sigillaria elegans* he says:—"It is not by solitary characters, and least of all by such as the arrangement of the tissues in the axis affords, that genera of plants are referred to their natural orders" (p. 422). In this he was more cautious

than Brongniart and escaped his errors, but the riper knowledge of later times has fully rehabilitated the anatomical method.

He gives an excellent account of the Coal-measures and the distribution of their fossil plants; he says it may be concluded that the Coniferæ [now Cordaitæ] "never were associated with the *Sigillariæ* and other plants which abound in the coal seams; but that they flourished in the neighbourhood, and were at times transported to these localities" (p. 396), a conclusion confirmed by later work. He also calls attention to "the extraordinary size of both the vascular and cellular tissue of many" coal-plants, a point which has often struck subsequent observers, though it does not extend to the Cordaitæ, plants which had a different habitat.

He admits that this singularly succulent texture of the typical Coal flora possibly indicates a great degree of humidity, but in a later paper* he shows that no reliance can be placed on this argument, succulence being specially characteristic of the plants of deserts; at the same time he considered the geological evidence for the swamp-flora theory of the Coal-measures conclusive.

He was inclined to regard the Carboniferous Flora as poor in species, saying "A luxuriant vegetation is no index to a varied one; and as many of our modern woods and even great areas of tropical forests consist of but a few species multiplied *ad infinitum*, so may the forests of the Carboniferous period have been composed of but a few *Sigillariæ* and *Lepidodendrons*, sheltering an undergrowth of a limited number of kinds of ferns, for a very limited number of them (comparatively speaking) if as protean as some of their allies are in our day, would embrace all the known species of the Fossil Flora" (p. 398). He proceeds to show that a recent Flora, marked by a preponderance of ferns, is almost universally deficient in species of other orders. These speculations are interesting, and show how different the point of view was then from that of the present day. The flora of a past age was then treated rather as a peculiar flora of our own time might be—the evolutionary idea had not taken root. Whether the Flora of the Coal was a poor or a rich one is hard to decide, for we are still very ignorant of the true limits of species, a point on which Hooker's warnings are as much needed as ever.

Hooker refused to admit that the vegetation of the Carboniferous period was less highly developed than what succeeded it. His remarks here are very just. "We know," he says, "too little of the structure of the ferns of that day to pronounce them either more or less complete than their allies of the present time; while of the Lycopodiaceæ it may be safely asserted, that they were of a form and stature far more noble, and in structure more complicated than any plants of that order now existing" (p. 400). His caution about the ferns is seen to be more than justified, now that we have reason to believe that so many of them at that period were in reality seed-bearing plants. At that time, of course,

* Volkmannia, 1854.

and for many decades afterwards, there was no suspicion of the kind. Hooker, in fact, speaks of the ferns as the only group with obvious or recognisable affinities with an existing order. He even regarded *Pecopteris* as "the fossil representative, if not congener, of the modern *Pteris*" (p. 401); adding that it is not improbable that there are other genera of living ferns fossilized in the shales of the coal-formation. He illustrates the heteromorphous frond of his *Pecopteris heterophylla* (now *Alethopteris decurrens*) by that of the New Zealand *Pteris esculenta* (figs. 1 & 2), an analogy none the less striking because the plants have proved to be really so wide apart. It is interesting, however, to note that he already recognised the affinity of Corda's *Senftenbergia*, of which the fructification was known, with a recent group of ferns (*Aneimidietyon*, our *Aneimia*), a view now generally admitted.

Discussing the bearing of the supposed predominance of ferns on the question of climate he writes: "A climate warmer than ours now is would probably be indicated by the presence of an increased number of flowering plants, which would doubtless have been fossilized with the ferns; whilst a lower temperature, equal to the mean of the seasons now prevailing, would assimilate our climate to that of such cooler countries as are characterized by a disproportionate amount of ferns" (p. 404). Thus he appears to explain the absence of flowering plants from the Coal-flora by the climatic conditions.

Hooker, at that time, was quite alive to the remarkable rarity of fructifications on the fossil ferns of the Coal, and cites a striking analogy in explanation. "The infrequency of fructification upon the fronds of the fossil ferns belonging to this formation appears as possibly another argument in favour of many of those appertaining to tree-ferns; for, while the herbaceous and caulescent ferns of New Zealand are scarcely ever barren, the arborescent species are almost invariably so. I think I am safe in saying that of two or three kinds of New Zealand tree-fern, not one specimen in a thousand bears a single fertile frond, though all abound in barren ones" (p. 405). This observation must still have considerable weight when we are tempted to rely on *negative* evidence in judging of the nature of Carboniferous fern-like plants.

Hooker gives some striking examples of the worthlessness of external vegetative characters in ferns, showing how one and the same frond might, in the sterile condition, be equally well referred to four different genera (p. 408). Attention is also called to the dimorphism, in many cases, of the fertile and sterile fronds, a point of much importance, as it has proved, in dealing with the so-called ferns of the Carboniferous.

Venation, a character much relied on by pteridologists from Brongniart onwards, is shown to be usually characteristic of minor divisions, though not always valid even for them, while useless for the discrimination of main groups. Hence genera founded on venation must be wholly artificial. Although no palaeobotanist

would dispute this, the warning was not superfluous, for names exercise an undue influence and we are still apt to think that something is attained when we have referred a fossil to *Pecopteris* or *Neuropteris*. Outline is, of course, more deceptive even than venation. "On the whole," he remarks, "it is probable that the irregularity of outline and division, prevalent in recent ferns, is the most fertile source of error in our investigations amongst the fossil" (p. 413).

Considering the part played by glands in some recent investigations, it is worth noticing that Hooker specially calls attention to the value of the characters afforded by hairs, scales, and glands in living ferns (p. 414). Hooker's critical observations on the study of fossil ferns have by no means diminished, but rather gained in weight, now we know that under the name "ferns" so many Carboniferous plants of widely different affinity have been included.

Passing on to *Sigillaria*, Hooker gives an interesting account of the occurrence of the stems in coal-mines, showing a considerable practical knowledge of the subject. He discusses the possibility that some of the *Lepidodendrons* may have been the branches of *Sigillaria*, and adds that there is no real distinction between the two genera (p. 416). At that time all kinds of ideas as to the affinities of *Sigillaria* were held by good authorities. Hooker thought it worth while to discuss, though of course only to reject, the reference of this group to Euphorbiaceæ, Cacti, and Palmæ (p. 420). The opinion that they were ferns had the most advocates, though already abandoned, on good grounds, by Lindley and Hutton. Hooker is rather favourable to the idea of some affinity, or at least analogy, between *Sigillaria* and ferns, and even argues for the probability that the *Sigillarias* may have borne fern-fronds (p. 417). He would not admit that anything positive was known at that time of the foliage of *Sigillaria*, for he was inclined to refer the only species in which the true leaves had then been observed (*S. lepidodendri-folia*) to *Lepidodendron*. Apart from his too liberal concessions to the fern-theory, Hooker shows sound judgment as regards *Sigillarian* affinities, for he says: "That the *Sigillariæ* were allied to *Lycopodiaceæ* is evident, their tissues and scarring being very like those of *Lepidodendron*" (p. 421).

He recognised the high value of Brongniart's admirable account of the anatomy of his *Sigillaria elegans* (really *S. Menardi*), but had doubts whether the plant was a true *Sigillaria*. It will be remembered that Brongniart was led by his discovery of radially seriated (secondary) wood in *Sigillaria* to refer that family to the "great division of Gymnospermous Dicotyledons." He still recognised some affinity to the *Lycopodiaceæ*, regarding the *Sigillarias* as coming between *Lycopodiaceæ* and *Cycadeæ*, but nearer to the latter. Hooker's remarks on this point are most judicious. "Assuming," he says, "the *S. elegans* to be a true

Sigillaria, it appears to afford slender grounds for the adoption of the above view, as regards its uniting such diverse and distinct orders as Cycadeæ and Lycopodiaceæ. It is true that it departs signally from the ordinary structure of the latter order; but it requires stronger evidence than the more perfect structure and regular arrangement of the bundles of vascular tissue to ally it to Cycadeæ, with which, in general appearance, habit, fluting, markings, stigmaroid roots, absence of accompanying foliage, and many other points, it has nothing in common" (p. 421). Thus in the controversy which for so long divided fossil botanists, Hooker at once placed himself on the side which the event has shown to have been the right one.

Hooker's account of *Lepidodendron* contains a much needed caution on the question of species. "If the species of that genus," he remarks, "were as prone to vary in the foliage as are those of *Lycopodium*, our available means for distinguishing them are wholly insufficient" (p. 423). He illustrates his point by the New Zealand species, *Lycopodium densum*. The suggestion that some of the *Trigonocarpi* were the seed-vessels (sporangia) of *Lepidodendron* is curious, considering that other fossil "seeds" have turned out to be really of that nature.

At that time Hooker had seen no Calamiteæ with structure, and he refrains from expressing any opinion as to their relationships. It is interesting to find that he looked, though in vain "for evidence of their being Equisetaceæ, in the presence of those siliceous stomata with which that order abounds, and which would surely have been preserved in the fossil state" (p. 427). It is only within the last year or two that this evidence has been actually found, in the stomata of Calamitean leaves investigated by Mr. Hamshaw Thomas.

In his concluding remarks, Hooker speaks of the abundance of specimens, suggestive of most interesting points, still to be worked out. He hoped that they would form the materials for a succession of essays in the Memoirs of the Geological Survey, but only two more were ever published, his Himalayan expedition intervening.

The first of these is his memoir "On some Peculiarities in the Structure of *Stigmara*." The merit of this paper consists in the excellent and well-illustrated account given of the internal structure of *Stigmara*, which was already known to be the root, or at least the underground portion of *Sigillaria*. Only in one point was Hooker seriously mistaken regarding the anatomy. He allowed himself to be misled by an observation of Goeppert's, and believed that the vascular strands passing out through the medullary rays originated from isolated bundles occurring in the pith. As Williamson showed, nearly 40 years later, no such medullary bundles exist; Goeppert was deceived by Stigmarian rootlets burrowing in the decayed pith, and took them for integral parts of the structure.

The comparison drawn between the structure of *Stigmara*

and that of *Sigillaria* itself, and of *Lepidodendron* (p. 436) is interesting; but the state of anatomical knowledge was not then sufficiently advanced for the true homologies of the parts to be recognised. Regarding the affinities, Hooker says: "The points by which *Sigillaria* (and *Stigmaria*) is allied to Lycopodiaceæ, especially through the *Lepidodendra*, are probably quite sufficient" (p. 437). He again rejects the idea of any affinity with Cycadeæ, admitting only a certain analogy, a view in which he was undoubtedly justified.

The most important of Hooker's palæobotanical works is certainly the third paper in the Memoirs of the Geological Survey—"Remarks on the Structure and Affinities of some *Lepidostrobi*," in which, for the first time, he explained the true structure, hitherto quite misunderstood, of the fructification of the Carboniferous Clubmosses.

All his specimens of *Lepidostrobus* were found in nodules of clay-ironstone, from the coal-fields of Staffordshire, Glamorgan, &c. Curiously enough the best specimens occurred, as broken frustules of cones, inside the stems of *Lepidodendron elegans* and other species, having been washed into the hollow stumps before fossilization—the way in which this is likely to have occurred is discussed in detail. He examined no less than 30 such trunks from Staffordshire, all containing cones, which were sometimes very numerous.

Hooker begins his description by pointing out that three conditions must be fulfilled in order to determine the relationships of fossil cones. It is necessary to know: (1) the arrangement of the individual organs and nature of the scales; (2) the anatomical structure of the axis and other parts; (3) the nature of the contents—"there may be stamens or male organs,—ovaria or female ones;—or lastly, capsules containing reproductive spores (which are peculiar to plants having no sexual system)" (p. 441). At that time, immediately before the appearance of Hofmeister's great works, knowledge of the sexual reproduction of the Higher Cryptogams was still very imperfect. In *Lycopodium*, indeed, the genus which Hooker probably had especially in mind, nothing whatever was known of the sexual process till nearly 40 years later.

The memoir is illustrated by eight plates, which give an admirable idea of the external characters and internal structure of the cones. The slightly restored figure of the scales and sporangia in radial section (plate 8. fig. 11) has become classical, and is remarkably true to nature. The only defect is that the attachment of the sporangium to its scale is shown too short, no doubt owing to the section examined not having been so strictly radial as is necessary to show the narrow attachment in its full length.

He described the spores as "consisting of three or rarely four sporules, which are afterwards separated from one another" (p. 451), but it is probable that what he really observed, in most cases, was the split membrane of a single spore, and not the true tetrads (except perhaps in the case shown in plate 6. fig. 11). The mistake is extremely easy to make, as I know from experience.

Apart from these somewhat minute criticisms, it may be said without any reserve that Hooker's work at once placed our knowledge of these cones on a perfectly satisfactory basis, leaving indeed little, except the discovery of the megaspores, to be added by later observers.

He had no hesitation in referring the cones to *Lepidodendron*, on the ground of association, and of the entire agreement between the axis of the cone and the stem in the arrangement of the tissues. He considered that the only material difference from the recent *Lycopodium* was in the form of the sporangium. He emphasizes the clear Lycopodiaceous affinity and finally rejects the vague suggestions of Cycadean or Coniferous relationship which were still in the air.

At the conclusion of the memoir, he gives some examples from recent plants of false cones, often pathological, as a warning to the student of fossils. Although his own *Lepidostrobus* were so perfectly cleared up by his researches, he appears to have had some doubts about other species, and was thus led to a characteristic manifestation of scepticism.

The *Lepidostrobus* memoir shows how much fossil Botany might have expected from Hooker, if he had continued to give his attention to the subject. This, however, was not in any high degree, the case; his subsequent activity was turned in other directions, and his later palæobotanical papers are, with one exception, of less positive importance, though often interesting as critical contributions.

Passing over a brief note on some doubtful Calamites, of Old Red Sandstone Age, from the Shetland Islands (1852), Hooker's next serious contribution to our knowledge of Palæozoic Vasculares was a memoir "On a new Species of *Volkmannia*" (1854). Sternberg's genus *Volkmannia* was long employed for various fructifications which have turned out to be of Calamitean or Sphenophyllaceous affinity. Hooker's species, *V. Morrisii*, from the Lower Carboniferous of Carlisle near Glasgow, is a fine cone, nearly 3 inches long and more than an inch broad, the stalk having a length of 9 inches. Hooker says "the general resemblance to a gigantic *Equisetum* without sheaths is obvious," but adds "It is perhaps not improbable that the genus may prove to be allied to *Lepidodendron*." Casuarineæ and Gnetales are also referred to. The first suggestion is no doubt nearest the truth. As my friend Dr. Arber suggested to me, the size and character of the cone invite a comparison with *Cheirostrobus*, a fructification allied to the Sphenophyllaceæ and so far only known from structural specimens. Hooker felt the need for structural evidence in the case of his cone, saying "No progress in systematic Botany can be made without an extensive study of the structure and morphology of plants—of their comparative anatomy in fact, and the materials for these researches are seldom preserved in fossil specimens."

The memoir with Binney, "On the Structure of certain Limestone Nodules enclosed in seams of Bituminous Coal, with a Description

of some *Trigonocarpons* contained in them" (1855), is a valuable contribution, from two points of view. An excellent account of the nature and occurrence of the calcareous nodules (coal-balls) is given, the earliest, I believe, extant, but this was presumably the work of Binney. The writers notice the absence of fern-fronds from their petrified material, saying: "It is difficult to conceive the delicate fronds of Ferns so preserved that their structure should be recognized on a transverse section of them in the fossil state." Of course the structure of the leaves of some of the *Pteridosperms* (then included under Ferns) is now well known, but the rarity of true fern-fronds in the petrified condition is remarkable, considering the frequency of their petioles and stems.

As regards the *Trigonocarpons*, the writers proved that the common nut-like specimens are merely casts of the seed-cavity. They give, from their structural specimens, an excellent description of the "outer and second integument" (our sarcotesta or outer fleshy layer, and sclerotesta); the nucellus with its vascular bundles is also described, but not the outer system of bundles in the sarcotesta.

They made a detailed comparison with the seed of *Salisburia* (*Ginkgo*), and believed the affinities of *Trigonocarpon* to be Coniferous rather than Cycadaceous. As a matter of fact, Brongniart's suggestion of Cycadaceous relationship now seems nearer the truth. The authors say that association gives no clue—they were not then acquainted with the *Alethopteris*-leaves which so generally accompany these seeds.

They had some suspicion that *Trigonocarpon* might belong to *Sigillaria*, a suggestion which perhaps shows that Brongniart's belief in the Gymnospermous nature of *Sigillaria* was beginning to have an undue influence. The paper is an important one, as it placed our knowledge of one Palæozoic seed, at least, on a scientific basis.

Two papers by Hooker relate to the problematic organism *Pachytheca*, of Silurian age. The earlier work is "On the Spheroidal Bodies, resembling Seeds, from the Ludlow Bone Bed" (1852). The outer zone of the spheroidal thallus consists of radiating cells, and in this first paper Hooker said: "This simple structure of spore-sac is very characteristic of the natural order Lycopodiaceæ." He was thinking, no doubt, of the well-known columnar layer which forms the outer wall of the sporangium in *Lepidostrobus*. On a re-examination of specimens in 1875, he gave up this tentative hypothesis and recognised the Algal nature of the organism. His latest contribution to fossil Botany is a short paper on *Pachytheca*, published 37 years later in the 'Annals of Botany' for 1889, illustrated by beautiful drawings from his own hand, showing the detailed structure. He points out the remarkable density and power of resistance to deformation that the thallus must have possessed, and discusses the question whether the internal filaments might be parasitic. He cites the opinions of other botanists, but

does not express any decisive view of his own, beyond his conviction of Algal affinities.

This paper was preliminary to a somewhat fuller investigation by Mr. C. A. Barber, but the nature of the organism has never been any further determined.

Turning to Tertiary plants, a "Note on the Fossil Plants from Reading" derived from the Thanet Sands, is most interesting from the emphasis with which the author insists on the worthlessness of conclusions as to affinity drawn from mere impressions of leaves. Though his specimens were good ones, he refused to give even generic names to the plants. He found that all except two were decidedly Dicotyledonous and Exogenous. The other two "from having parallel veins, may be assumed to be Monocotyledonous," but beyond this he would not go.

Of other specimens he says: "It would be very easy to produce from an herbarium leaves so similar . . . as to deceive the inexperienced into instituting crude affinities." Speaking of the specimens generally Hooker remarks: "Though the leaves preserved in the Reading beds are all of the very commonest forms in the vegetable kingdom (of Dicotyledonous plants) I do not find that they exactly resemble those of any living English species and indeed, even were the resemblance so close that I could not distinguish them from existing forms, I should not consider myself warranted in drawing any conclusions therefrom." The only inference he permits himself is that there is no objection from the evidence of the plants to the climate having been a temperate one.

It would be well for our science if the caution shown in this paper by so great a systematist were more often emulated by those who approach the determination of plant-impressions with a more limited equipment of taxonomic knowledge.

In 1855 Hooker described two "seed-vessels," one ("*Carpolithes ovulum*, Brongn.") from the Eocene Beds of Lewisham, the other ("*Folliculites minutulus*, Bronn") from the Bovey Tracey Coal. Though very cautious in avoiding any definite determination of these objects, he was inclined to suggest, in each case, an affinity with Ferns, spore-like bodies having been found in the *Carpolithes*. I am informed by Mr. Clement Reid that the *Carpolithes ovulum* is the seed of a Water-lily, while the *Folliculites* is also a seed and certainly belongs to *Stratiotes*. The study of Tertiary seeds, now carried to such perfection by the work of Mr. & Mrs. Reid, was of course in its earliest infancy at the time when Hooker wrote these papers.

We have now run rapidly through those memoirs of Hooker's which are specially devoted to the consideration of fossil plants. It remains to notice a few references to the subject scattered through his more general Addresses.

I well remember the keen interest with which, as a boy, I read

Hooker's Presidential Address to the British Association at the Norwich Meeting of 1868. What appealed to one was, of course, his zealous championship of Darwinism, then by no means universally accepted, at least by the laity of Science. I will only, however, allow myself one quotation from this part of the Address. Speaking of the then position of the Darwinian theory the President said:—"it is *par excellence* an avowed favourite with the rising schools of naturalists; perhaps, indeed, too much so, for the young are apt to accept such theories as articles of faith, and the creed of the student is but too likely to become the shibboleth of the future professor" (p. 22). Darwinism has passed through and left behind the dangers of the age of faith predicted by Hooker; it has long emerged into the more wholesome air of free criticism, and has to face, on certain sides, the vigorous rivalry of alternative theories.

At that time it appears that fossil plants were attracting much attention, for Hooker says: "In my own special Science, the greatest advances that have been made during the last ten years have been in the departments of Fossil Botany, and Vegetable Physiology."

"In the past history of the globe, two epochs stand prominently forward—the Carboniferous and the Miocene—for the abundant materials they afford, and the light they consequently throw on the early conditions of the Vegetable Kingdom." (p. 13.) As regards the Carboniferous flora, he refers especially to the results attained by Binney and Carruthers. "These show," he says, "that *Calamites* is an actual member of the existing family of *Equisetaceæ*, which contained previously but one genus, that of the common Mare's-tail of our river-banks and woods." In this frank acceptance of the conclusion of the English palæobotanists Hooker was in advance of his time, for many years had to elapse before prejudices were overcome and difficulties surmounted so as to enable the true position of the *Calamariæ* to be universally recognised.

As regards the Miocene plants Hooker was much impressed by Heer's results; the evidence for a highly developed Arctic Tertiary Flora was what chiefly interested him.

In this Address Hooker, after some vigorous criticism of over-reliance on evidence from leaves in palæobotany, added: "In this most unreliable of Sciences—Fossil Botany—we do but grope in the dark; of the thousands of objects we stumble against, we here and there recognise a likeness to what we have elsewhere known and rely on external similitude for a helping hand to its affinities; of the great majority of specimens we know nothing for certain, and of no small proportion we are utterly ignorant. If, however, much is uncertain, all is not so, and the Science has of late made sure and steady progress, and developed really grand results" (p. 15). These words express concisely his attitude towards the whole subject—severest criticism combined with a keen interest in such advances as seemed to him to rest on a sound basis. The same

feeling is expressed in his Address to the Royal Society in 1877. After referring to Lesquereux's work on Cretaceous and other fossil plants of the United States, he says: "In the whole range of the natural sciences no study is so difficult and at the same time so fruitless, if we regard the amount of results accepted by botanists, as compared with the prodigious labour their acquisition by palæontologists has demanded." This discouraging remark refers, however, essentially to work based on external characters, especially on those of fossil leaves—his *bête noir*. In the same Address he follows with interest the progress of American fossil botany as bearing on distribution, and points out that in North America there is no break between the Upper Cretaceous and Lower Tertiary floras. He returns to the subject in his Royal Society Address of the next year, 1878, in which he discusses with sympathy Saporta's theory of the Polar origin of vegetation.

In an Address to the Geographical Section of the British Association in 1881, Hooker again refers to the discovery in Arctic latitudes of fossil plants whose existing representatives are to be found only in warm temperate regions, and discusses the bearing of them on the history of the Flora of North America. This subject was one which specially appealed to him from its immediate bearing on the great questions of Geographical Distribution to which his best work was devoted.

During his later years Hooker followed the rapid progress of fossil botany with a most sympathetic interest, which was very kindly shown in some of his letters to me. In a letter of Oct. 3, 1896, acknowledging a copy of my Address to the Botanical Section at Liverpool, he said: "Your Fossil Botany pages, of course, interest me most and very much indeed." This, and other passages show that, with all his severity of judgment, he had a specially friendly feeling for the study of fossil plants. Perhaps his most interesting letter in this connection was one written on receiving the preliminary communication by Prof. F. W. Oliver and myself on the seed of *Lyginodendron*, which, it may be remembered, was identified in the first instance by the glands on the cupule. He wrote (June 13, 1903): "I must write to thank you for sending me the Proceedings R. S. with your and Oliver's paper on *Lyginodendron*, which has interested me more than I can express. What can be the meaning of the capitate glands? they would seem to indicate the cotemporaneous insect-life which I think has been demonstrated to exist in the Coal Measures. Has any one accounted for the quantity of pollen-grains in the sac of the ovule of Cycadeæ? so many more than the wind is likely to have brought."

As regards the last suggestion some light is thrown on the difficulty by Prof. Pearson's observations on the insect-visitors of some South African Cycads. As regards the fossils the abundance of pollen in the ovule is equally remarkable, and Hooker's remark may here also give us a clue to the right explanation.

In a later letter (Oct. 6, 1906) he spoke of our "knowledge of

Botany, as it advances by strides under a study of its fossil representatives."

It is pleasant to a student of fossil plants to remember with what warm and generous sympathy the great leader of botanical science followed the recent progress of the subject.

Hooker's definite contributions to our knowledge of palæobotany were valuable, though limited in extent, owing to the small part of his time that he was free to devote to such investigations. His influence as a severe but just and friendly critic was of the greatest importance, and his warnings against the many pitfalls of the subject, though they may have discouraged some, are in reality entirely wholesome, and are no less needed today than at the time they were given.

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1848. On the Vegetation of the Carboniferous Period, as compared with that of the present day. *Mem. Geol. Survey*, vol. ii. 1848, p. 387.
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1848. Remarks on the Structure and Affinities of some *Lepidostrobi*. *Ibid.* p. 440.
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1854. On a new species of *Volkmannia* (*V. Morrisii*). *Ibid.* vol. x. p. 199.
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1877. Presidential Address to the Royal Society, 1877. *Proc. R. Soc.* vol. xxvi. p. 427.

1878. Presidential Address to the Royal Society, 1878. Proc. R. Soc. vol. xxviii. p. 43.
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Upon the conclusion of the Presidential Address the Rev. T. R. R. STEBBING 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, being seconded by Mr. CLEMENT REID, was carried by acclamation.

In acknowledging the vote of thanks proposed by Mr. Stebbing and seconded by Mr. C. Reid, the President said that, flourishing and active as the Linnean Society now was, he looked forward to even greater developments during the time of his successor and in the more distant future. The Fellows of the Linnean Society had perhaps even yet hardly realized their position as the first Biological Society of the World. That was a proud and responsible place for a Society to hold, and one which it required an effort to rise to. He should like to see the Society's rooms the recognized meeting place of British Biologists, and their Meetings the occasions when all the new biological discoveries were brought forward, whether destined for publication there or elsewhere.

The President then addressed Capt. CHARLES FRANCIS ULLATHORNE MEEK, F.L.S., and handed to him the bronze medal of the Crisp Award for Microscopical Science, and a cheque for the balance of the fund, this being the first presentation from the fund founded in 1910 by a donation from Sir Frank Crisp, speaking as follows:—

CAPTAIN MEEK,

It is now my welcome duty to present to you the Crisp Award for Microscopical Research, of which you are the first recipient.

The Award was founded two years ago by the generosity of our distinguished and valued Fellow, Sir Frank Crisp, to whose long-continued services in many directions our Society owes so much. I may briefly recall the conditions of the Crisp Award.

It is to be made at intervals of not less than five years, and is to be given by the Council for the best paper dealing with Microscopical Research. The Award is to be confined to Fellows and to work published by the Linnean Society since the previous Award, and, in the first case, during the five years previous. The first Award was to be given in May 1912, the date which we have now reached.

The paper on which the Award is made is your work on "The Spermatogenesis of *Stenobothrus viridulus*; with Special Reference to the Heterotropic Chromosome as a Sex Determinant in Grasshoppers," published in our Journal (Zoology) in 1911.

I am particularly glad that the choice of the Council has fallen upon this investigation of yours, because your work is, on the one hand, in the field of cytological microscopy, demanding the utmost skill in the use of advanced methods and the highest powers of the microscope; while on the other it is concerned with a fundamental problem of Biology of equal interest to the zoological and botanical sides of our Society. On both these grounds we feel that we are setting a fittingly high standard for future awards, worthy of the intentions of the founder.

The special interest of your work lies in its bearing on the question of the determination of sex, the insect you have investigated being one of those in which the male has an odd number of chromosomes in its somatic nuclei, while in the female the number is even, the figures in this particular case being 17 and 18 respectively. You have fully investigated the history of the spermatogenic divisions, with special reference to the behaviour of the accessory or heterotropic chromosome present in half the spermatozoa, while lacking in the remainder. The result of fertilization by the former is to produce females, by the latter to produce males, the odd chromosome consequently being regarded by some as the determinant of sex in these cases. You point out, with scientific caution, that this conclusion is not yet absolutely established, but the exact history of the process which you are able to give affords the best basis for the ultimate comprehension of its significance. Your singularly accurate and beautiful work deserves the more credit as it was begun at a time when you were still under the pressure of very different duties.

I have great pleasure in handing you the Crisp Award, in recognition of work which is of the best type of modern microscopical research.

Capt. Meek having received the medal and cheque, briefly returned thanks, and expressed his gratification at being chosen the first recipient of the award.

The President then addressing Prof. E. B. POULTON, handed to him the Linnean Medal for transmission to Dr. ROBERT CYRIL LAYTON PERKINS, who was abroad, said:—

PROFESSOR POULTON,

In the unavoidable absence of Dr. R. C. L. PERKINS, who is abroad, I ask you to receive our Medal on his behalf.

Dr. Perkins combines, in a rare degree, the qualities of an indefatigable field-naturalist and those of a skilled and precise

systematic investigator. He has himself worked out the systematics of the chief groups of the Hymenoptera, the whole of the Orthoptera and Neuroptera and part of the Coleoptera, and, among Vertebrates, the Birds of the Sandwich Islands. All these contributions are included in that great work the 'Fauna Hawaiiensis,' written by numerous eminent specialists: his General Introduction to the Fauna is now in the Press.

Throughout Dr. Perkins's long residence in the Sandwich Islands, extending over a period of at least twenty-five years, he has studied the conditions of life of all the groups of animals in the Islands, and not only those on which he has himself written.

The value of his long and arduous researches is enhanced by the unfortunate circumstance that large numbers of species which he has studied are now extinct, owing to the importation and spread of competing Continental species and to the destruction of the native forests to make way for the sugar-plantations. Dr. Perkins's careful work will thus be the sole record in the future of the many deeply interesting forms of life which have already gone, and of many more which are on the point of disappearing.

To Dr. Perkins's more strictly scientific achievements must be added his remarkable success in founding the Experimental Station at Honolulu. I am told that he, more than anyone else, has proved that such investigations in applied Biology really pay; the sugar-planters of the Islands have found it worth their while to liberally endow his Station, having learnt that he has saved them immense sums by his method of importing into the Islands the enemies of the insect-pests of the crop. This practical work has not been accomplished without laborious and most minute investigations into the life-history and bionomic conditions of the pests and their enemies, carried out by him or by skilled assistants under his direction. These enquiries have led to a most exact knowledge of the ways of parasites and hyper-parasites, and, while the object was originally a commercial one, a flood of light has been thrown on the scientific aspects of insect bionomics.

I regret to hear that Dr. Perkins's health has suffered in the course of his long-continued labours, owing to exposure during his travels at high elevations and in the damp regions of the Islands.

On the ground of his distinguished work in field natural history, in systematic investigation, and in applied biology, the Council have awarded the Linnean Medal to Dr. Perkins, and I have great pleasure in handing it to you for his acceptance.

Prof. Poulton made a suitable acknowledgment, and undertook to convey the medal to the recipient.

The General Secretary having laid before the Meeting certain obituary notices of deceased Fellows and others, the proceedings terminated.

OBITUARY NOTICES.

ALGERNON SIDNEY BICKNELL was the son of Elanan Bicknell, of Herne Hill, Surrey, a well-known collector of pictures, and born on the 9th October, 1832. Possessed of ample means, he gave his attention to botany, astronomy, and alpine exploration, travelling much and never happier than when in such scenes as the vast forests of the Amazon River.

At a later period he specially interested himself in fungi, and collected a good library bearing on that group. He showed an extensive series of fungi about the year 1887 at the Royal Horticultural Society, at that time at South Kensington. He was a member of several scientific Societies, amongst them the Woolhope Club and the Royal Geographical Society, but he seems never to have published any account of his travels or researches. He was elected a Fellow of the Linnean Society, 20th December, 1877, and died at Brighton after an operation, on the 26th October, 1911, shortly after completing his 79th year.

[B. D. J.]

HARRY BOLUS was born in Nottingham on April 28th, 1834, the son of Joseph Bolus, a business man of that town. Through the master of his school he became connected with William Kensitt, a merchant of Grahamstown, with whom he served as apprentice from 1850-1852, having landed at Port Elizabeth on March 28th, 1850. From Grahamstown he went to Port Elizabeth as book-keeper in a mercantile house, and, at the end of 1855, after a short visit to England, returned to South Africa to Graaff-Reinet, where he spent the succeeding nineteen years, acting for a short time as Secretary to the Midland Fire Insurance and Trust Company. In 1874 he left Graaff-Reinet and joined his brother, a stock-broker in Cape Town, retiring from business in 1895. He died at Oxted, Surrey, on May 25th, 1911, soon after his arrival on what was to be the last of his many visits to England, and was buried in the churchyard of the village.

Although no doubt interested from early youth in the observation of natural objects and phenomena, his connection with botany may be said to date from 1862, when he attended a short course of public lectures on botany, given by Prof. F. Guthrie, who the year before had been appointed to the newly founded Graaff-Reinet College. His friendship with Guthrie furthered his botanical inclinations, and the loss in 1865 of his eldest son and the desire for relief from the sad blow, drove him into the arms of the science in which his interests centred henceforth. For years his activity in this domain was confined to collecting and observations in the field, and studies in his own herbarium. Thorough and methodical habits and a keen eye not only helped him to build up a valuable collection of his own, but also made him a most useful contributor to his numerous correspondents, whose inquiries and wishes he always met with great liberality.

Foremost in his correspondence stood Kew, the connection with which extended from 1867 to his death, and was much strengthened by repeated visits, on which he used to bring with him large sets of specimens for study and comparison.

With Bolus started a second and most successful period in the botanical exploration of South Africa, the first having closed with Ecklon and Zeyher in the forties. The success was partly due to his own numerous travels, of which Prof. H. H. W. Pearson published a valuable list in the South African Journal of Science for 1911, and partly to the stimulus which he so well understood to awake and keep alive in others. His botanical journeys took him all over Cape Colony, from Cape Town to Namaqualand and Pondoland, and from Algoa Bay to Kimberley. He also visited the Orange Free State, and three times the Transvaal. Thus he acquired an unparalleled field knowledge of the flora of South Africa, and especially of Cape Colony. It found a masterly expression in his 'Sketch of the Flora of South Africa' (1886), and again in a more matured and condensed form in his 'Sketch of the Floral Regions of South Africa' (1905); but on the whole he was not a prolific writer. He was too modest to gauge exactly the value of his experience and first-hand knowledge, and perhaps also too cautious in a field where the inadequate literary and herbarium resources at his disposal certainly provided ample opportunity for blocking and pitfalls. However, he published a number of "Contributions to South African Botany" in various places, and with respect to two families he rose far above the level of the casual contributor. The immensely rich and varied Orchid flora of the Cape fascinated him early. In 1882 he gave us a "List of Published Species of Cape Orchids" in the Journal of the Linnean Society, followed in the same place by five "Contributions" (1884-1890) dealing with the family, whilst a paper on the Orchids of the Cape Peninsula, illustrated by himself, appeared in the Transactions of the South African Philosophical Society in 1882. The plan of illustrating as many South African members of the family as possible was carried further in his 'Icones Orchidearum Austro-Africanarum Extratropicarum,' of which the first part (50 plates) came out in 1892, the second (50 plates) in 1896, both constituting Volume I., and a third, Volume II., in 1911, the revision of the last proof-sheets of this having been concluded by him on the very eve of his death. The other family which deservedly claimed his special attention was the Ericaceæ, which in the genus *Erica* attains to such a marvellous number of species. Bolus, together with his friend Prof. Guthrie, undertook to elaborate the genus for the 'Flora Capensis,' and, after Guthrie's death in 1899, he finished the difficult and troublesome task, the work occupying over 300 pages with descriptions of 469 species in the fourth volume of the 'Flora Capensis' (1905). Yet another publication has to be mentioned, namely, 'A List of Flowering Plants and Ferns of the Cape Peninsula,' which he elaborated in conjunction with Capt. (now Major) A. H. Wolley Dod. It is

the fruit of his labours in the district where he resided for so long a part of his life, and was published in the Transactions of the South African Philosophical Society in 1903.

Allusion has been made to the stimulating influence he exercised over South Africa, thereby reviving the interest in the botany of the country. It was done mainly through his example and an extensive and sustained correspondence. This naturally ceased with his death. But in founding the Harry Bolus Chair of Botany in the South African College in 1902, he has secured for botany a permanent footing in the centre of one of the most remarkable floras of the world. It was a fine expression of public spirit, worthy of the man who was ever mindful of the common good and a staunch believer in education in the widest sense. He also provided in his will for the maintenance and extension of his herbarium and botanical library, which are now in the charge of the South African College. Although he was averse to coming to the front in public life, the integrity of his character and his ripe experience made him a desirable member of public bodies, and so he served on the board of the Colonial Orphan Chamber (since 1882), on that of the South African Public Library (since 1897), as a Trustee of the South African Museum (since 1906), and on the Council of the South African College (1908-1910). He was President of the South African Philosophical Society for the Session 1886-87, and an Original Fellow and Member of the Council of the Royal Society of South Africa. In 1903 the Cape University recognized his scientific merits by giving him the honorary degree of D.Sc., whilst in 1909 the South African Association for the Advancement of Science awarded him the South Africa Medal and Grant for Scientific Research. The Linnean Society numbered him among its Fellows since 1873.

Harry Bolus was a self-made man. From modest beginnings he rose by force of character to the position of a man of public standing and scientific recognition. Taken away from his Nottingham school when still in his boyhood, he educated himself up to the level not only of a superior student of science, but also a man of refined and liberal tastes. The independence and freshness of his mind made his company always enjoyable and stimulating, whilst the stern mettle of his manly character attached him and his memory permanently to those who had the good fortune of his friendship. Death has gently dealt with him and given him back to his old home when his work was done.

[O. STAFF.]

JEAN BAPTISTE EDOUARD BORNET, M.D., Membre de l'Institut, the well-known algologist, was born at Guérigny (Nièvre) on 2nd September, 1828. He studied under Tulasne and Léveillé, and early in his career turned his attention to lichens and algæ, groups which he continued to investigate throughout his life. His death took place at Paris, on December 18th, 1911.

The researches carried out by Bornet with regard to the life-history of lichens were especially important. He isolated and specifically determined the algæ which entered into the composition of a large number of species, and described the method by which the hyphæ envelop the algæ, coming to the conclusion that the gonidia of lichens can always be referred to a species of alga. The strong support which he gave Schwendener, materially helped in securing the early recognition of the theory of the dual nature of lichens.

His work on marine algæ was no less noteworthy. The magnificent drawings in 'Notes Algologiques' and 'Études Phycologiques' testify to his skill and to the careful manner in which he investigated the structure and development of these plants. Amongst systematic works his joint monograph with Flahault on the Nostocaceæ is perhaps the best known, being a masterly revision of a group that was previously in the greatest confusion.

Dr. Bornet was elected a Foreign Member of this Society on 1st May, 1870, and awarded the Linnean Medal in 1891; he was also a Foreign Member of the Royal Society, "Membre Fondateur" and Past President of the Société botanique de France, and "officier" of the Legion of Honour. His interest in marine algæ continued to the end. On the most friendly terms with British algologists, he never spared time or trouble in giving them the benefit of his opinion and advice. [A. D. COTTON.]

The removal by the hand of death, on the 20th April, 1912, at Nice, of Mrs. OGILVIE-FARQUHARSON, of Haughton, takes from us a woman who exercised a notable influence on the affairs of this Society in the matter of the full admission of women to all the activities of the Society.

MARIAN SARAH RIDLEY was born at Privet, Northamptonshire, on the 2nd July, 1846, the eldest daughter of the Rev. J. Nicholas Ridley, of Hollington, Hants. In 1881 she published a little volume, 'A Pocket Guide to British Ferns,' and a paper at the British Association at Aberdeen in 1885, on the distinctive characters of British Mosses; these seem to be her only contributions to scientific literature. In 1883 she was married to Mr. R. F. Ogilvie-Farquharson, of Haughton, and at Tillydrine, Kincardine O'Neil, the remainder of her days were spent, save when the calls of health or the cause she had most at heart, drew her from her home.

In June 1900 an application from Mrs. Farquharson respecting the admission of women as Fellows was laid before the Council, and received attention at several subsequent Councils. In view of the doubt expressed as to whether the Charter permitted the admission of women to the Fellowship, counsels' opinion was taken, to the effect that the Charter did not empower the Society to admit women. Upon this a memorial, set on foot and supported by a considerable number of Fellows favourable to the

admission of women, was presented to the Council early in 1902, and a circular inviting the opinions of the Fellows was issued in March of that year; the return of the papers in response to this enquiry showed a large majority in favour of applying for powers to admit women (301 in favour, 126 against, with 313 abstentions). The meeting of the 15th January, 1903, was made special, and the motion to proceed for enlarged powers was carried by a large majority. Upon this the Treasurer, the present Sir Frank Crisp, undertook to procure an additional Charter, granting wider powers in certain other directions as well, which was done at the sole cost of the Treasurer. The new Charter was granted in April 1904, and the Bye-laws were amended in accordance with it; the first election of women as Fellows took place on the 15th December, 1904, and their formal admission on the 19th January, 1905. In this first election Mrs. Farquharson did not succeed at the ballot, but subsequently, on the 5th March, 1908, she was elected Fellow, and the effort of many years crowned with success.

By this time Mrs. Farquharson was suffering from heart trouble, and the probable bad effect of excitement on a weakened organ, prevented her coming forward for formal admission. She died, as stated above, at Nice, and was buried by the side of her husband, at Alford, in the county of Aberdeen. [B. D. J.]

ALFRED FRYER (1826-1912).—To those to whom he was known the death of Alfred Fryer came as a shock, for notwithstanding his age, he was very active up to the last.

Born of an old Cambridgeshire family of the fenland, he was a typical type of the fenman. He often said "Ah! I knew him by the scowl of his brow," meaning he could identify a fenman anywhere.

He was a good letter-writer; from the time I first knew him till his death, his letters make 1480 pages, mostly referring to the genus *Potamogeton*; for which he was undoubtedly our best authority on the British species. He had a wonderful memory for the various forms all around Chatteris; at every dyke or ditch he took one to, he could point out each plant; these he had studied for years, both at home and in nature.

His 'Monograph of the British *Potamogetons*,' unfortunately unfinished at his death, with the plates by Robert Morgan, will ever remain as a monument to his memory. The nine quarto published parts appeared from 1898 to 1900.

He had an enormous collection of dried specimens of the genus, and was very liberal with them; he was also very well read in ornithology, entomology, and conchology.

It was very pleasant to see the estimation he was held in all around Chatteris; he never confined himself to roads or footpaths, but went where inclination led him, and everywhere he was received as though he was on his own ground.

He was elected an Associate of the Society on the 16th December, 1897, and died at Chatteris, 26th February, 1912, where he had carried on the business of nurseryman. His printed contributions to Science, besides the unfinished monograph referred to above, consisted in papers to the 'Journal of Botany' for a series of years, from 1883 onwards, on his special genus *Potamogeton*, and bear witness to the careful and valuable results he evolved from these studies.

[ARTHUR BENNETT.]

ALBERT HARRISON was born in 1860 at the New Pale Farm, Frodsham, Cheshire, and received his education at the Liverpool Institute, leaving at the age of 15 to enter the sugar refinery of Henry Tate & Sons in Liverpool, and three years later was transferred to the London branch, where he obtained rapid promotion, and finally was made manager.

The home of his boyhood being close to Delamere Forest, he early imbibed a liking for Natural History, and he usually spent part of his annual holiday in that forest. It was not till 1888 that he took up the study of the Lepidoptera in a serious way. Then he joined forces with his brother-in-law, Mr. Hugh Main, and the two experimented on forms of *Aplecta nebulosa* and *Pieris napi*, and latterly on *Boarmia repandata*. Mendelian results greatly interested him. He was a member of many biological associations, and in 1899 was President of the Entomological Society. He was elected Fellow of the Linnean Society 3rd November, 1898; he was also Fellow of the Zoological, Royal Microscopical, and Chemical Societies. He died suddenly of apoplexy at his house at South Woodford, on 28th August, 1911, and was buried at Alvanley, in Cheshire.

[B. D. J.]

JOSEPH DALTON HOOKER.—By the death of Sir Joseph Hooker on Sunday, December 10th, 1911, in his 95th year, the Linnean Society has lost at once the most renowned of all its Fellows and one of the most remarkable men who ever devoted his life to the advancement of Science. Hooker's ancestry and parentage do not require to be set forth here in detail. The son of Sir William Hooker, the Founder of Kew, he hailed from East Anglia—a part of England which can hold its own with any other region in the number and eminence of the Naturalists which it has cradled. Had Hooker lived another six months it would have been exactly 70 years since he was elected into the Linnean Society (June 7th, 1842). Nor does this lapse of time represent the full working life of this great man, for already on his election he had won his spurs as a botanical traveller in the Antarctic. His lifelong friend, Asa Gray, in a letter written about this time to Sir William Hooker, says * :—

"I heard within a few days that Ross's expedition had been

* 'Letters of Asa Gray,' p. 307.

heard of from Rio. Doubtless Joseph will have reached home before this letter arrives, and I may congratulate him—and yourself—upon his most gratifying success, which has laid a broad and sure foundation for his scientific eminence. His ‘*Flora Antaretica*’ must be of the very highest interest and importance.”

To young Hooker after his return Gray also wrote*: “You now stand in a perfectly unrivalled position as a botanist, as to advantages, &c. . . . and if you do not accomplish something worth the while, you ought not to bear the name of Hooker.” The sequel shewed how well placed was Gray’s high encouragement. No father can ever have had more just reason for pride than Sir William in the achievements of his son.

Hooker, though born in Suffolk, was taken to Glasgow at the age of four when his father was appointed to the Professorship of Botany in the University. Here he received his education so far as school and college are concerned. He graduated in Medicine in 1839, being then 22 years of age. With the world to conquer he seized the first big thing that chance afforded.

As Hooker has told us, his father’s house “was the resort of voyagers and travellers from all parts of the world On the occasion of a visit from Ross, he told my father of his hopes of obtaining the equipment of an expedition to discover the South Magnetic Pole; whereupon my father brought me to him as a youth who would be delighted to accompany him as Naturalist. Ross received me very kindly, and told me that if I could prepare myself for such a duty, he would take me. The Antarctic Expedition saw my debüt in a scientific career”†. To travel had always been Hooker’s dream as a child, and he relates how he used to look at the pictures in Cook’s voyages sitting on his grandfather’s knee (Dawson Turner). The one that took his fancy most was the plate of Christmas Harbour, Kerguelen’s Land, with the arched rock standing out to sea, and the sailors killing penguins. He was consumed with the desire to see that rock and knock penguins on the head. By an odd coincidence this was one of the first places he visited with the Antarctic Expedition.

The fascination and interest of this desolate island, the flora of which he fully described, appears to have remained throughout his life. In a letter to my father, written during a visit to the Scottish Highlands‡, Hooker says:—

“Skye Geology, too, impressed me much. The island resembled some of the Antarctic ones in many particulars; and though volcanic on the whole, it contains beds representative of most or all the British Formations from the Laurentian upwards! and I could not help wondering if future discoveries, say in

* ‘Letters of Asa Gray,’ p. 317.

† Anniversary Dinner of the Royal Society, Nov. 30, 1887. Sir Joseph Hooker’s reply to the toast of “The Medallists,” p. 13.

‡ Dated Aviemore, Sept. 25, 1876.

Kerguelen's Land, may not throw as much light on the Geology of the Antarctic regions as Skye alone would have done in respect of Northern Europe. Perhaps the fossil wood of Kerguelen's Land may be the nucleus of a great light."

On his return from the Antarctic, Hooker at once took in hand the description of his rich collections and the elucidation of the Southern Floras. This task culminated in the publication of the first instalment of the 'Flora Antarctica' in 1847. It is interesting to note at this period the influence of the atmosphere of Bryology in which the son of so famous a Bryologist as Sir William Hooker had been brought up. His earliest published papers all dealt with Mosses, and on his return from the Antarctic it was the Mosses, Liverworts, Lichens and Algæ of the voyage which he first worked out in detail.

In a letter to my father, written in his 91st year, Hooker states that the first plant he ever dissected was a Moss*, and though throughout the middle period of his life he concerned himself mainly with the flowering plants, the intention was always cherished and sometimes referred to, so my father tells me, of returning to the group once more when the burden of official duties should fall from his shoulders. This intention, as is well known, was never realised; the remarkable and difficult genus *Impatiens* absorbing him during the last ten years of his life.

In the course of his travels Hooker had come into frequent contact with fossil plants, and in 1846 he was appointed Botanist to the Geological Survey of Great Britain. This field evidently was a congenial one, and he pursued it for a while with marked success. It is not necessary, however, here to record in detail Hooker's work as a Palæobotanist, for it has formed the main subject matter of the Presidential Address to the Fellows of this Society delivered last May by our retiring President, Dr. D. H. Scott. This, at any rate, is certain. Had Hooker devoted his life to this branch, the history of fossil botany in this country must have been profoundly changed. The post of Botanist to the Geological Survey would appear to have been long obsolete, and, so far as the State is concerned, palæobotany has not received the encouragement which it deserves, having regard to the magnitude of the coal industry of Great Britain and to the intrinsic importance of the subject.

Though his energies were directed into other fields, Hooker always maintained an ardent interest in the progress of fossil botany right up to the end of his life. It is stated of his contemporary, Lindley, that he abandoned the pursuit of fossil botany lest it should beguile him from the straight path of systematics; in the case of Hooker no doubt the superior attractions of travel and phytogeography proved too strong.

* "Happily my eyes are as good and my fingers as nimble at dissecting under the microscope as when I commenced at 10 years of age—I think with a *Polytrichum*," from letter dated Jan. 22nd, 1903.

Be this as it may, towards the close of 1847 Hooker was on his way to India, and thus on the threshold of perhaps the largest of the interests that entered into his very full life. This journey came as a natural sequel to the Antarctic; he was anxious to become acquainted with the Tropics, and chose India in preference to South America because so much of its geography as well as the botany was "involved in a mystery equally attractive to the traveller and the naturalist."

The immediate outcome of this journey, which extended over three years, was the 'Himalayan Journals,' a book which fittingly takes its place beside 'The Voyage of the Beagle'—from the unpublished proof-sheets of which Hooker had drawn inspiration before his departure with Ross to the Antarctic. The perusal of these 'Journals' shows how incomparably well fitted was Hooker for the rôle of traveller in a strange country full of difficulties. Though circumstances ultimately determined that the botanical results should prove the richest, because pursued and analysed farthest, Hooker was no mere botanist. These notes appeal equally to the ethnologist, the zoologist, the geologist, the meteorologist, and the geographer. In several of these fields, especially Indian topography, Hooker left an enduring mark; had he chosen he could have attained to the highest eminence in any.

Here are a few extracts, taken at random from the 'Journals,' which illustrate some of his many sides:—

"During my ten days' stay at Zemu Samdong, I formed a large collection of insects, which was in great part destroyed by damp; many were new, beautiful, and particularly interesting, from belonging to types whose geographical distribution is analogous to that of the vegetation. The caterpillar of the swallow-tail butterfly was common, feeding on umbelliferous plants, as in England; that of a Sphinx was devouring the euphorbias; the English 'painted-lady' was common, as were 'sulphurs,' 'marbles,' 'whites,' 'blues,' and Thecla, of British aspect but foreign species."

"As the rains advanced, insects seemed to be called into existence in countless swarms; moths, cockchafers, glow-worms, and cockroaches made my tent a Noah's Ark by night, when the candle was burning; together with winged ants, may-flies, flying earwigs, and many beetles, while a very large species of daddy-long-legs swept across my face as I wrote my journal, or plotted off my map."

"Bhomtso [in Tibet] is 18,590 feet above the sea; it presented an infinitely more extensive prospect than I had ventured to anticipate No village or house is seen throughout the extensive area over which the eye roams from Bhomtso, and the general character of the desolate landscape was similar to that which I have described as seen from Donkia pass. The wild ass grazing with its foal on the sloping downs, the hare bounding

over the stony soil, the antelope scouring the sandy flats, and the fox stealing along to his burrow, are all desert and Tartarian types of the animal creation. The shrill whistle of the marmot alone breaks the silence of the scene, recalling the snows of Lapland to the mind; whilst the kite and raven wheel through the air, with as steady a pinion as if that atmosphere possessed the same power of resistance that it does at the level of the sea. Still higher in the heavens, long black V-shaped trains of wild geese cleave the air One plant alone, a yellow lichen (*Borreria*) is found at this height, and that only as a visitor; for Tartar-like, it migrates over these lofty slopes and ridges, blown about by the violent winds."

"The Khasias are superstitious, but have no religion; like the Lepchas, they believe in a supreme being, and in deities of the grove, cave, and stream. Altercations are often decided by holding the disputants' heads under water, when the longest winded carries his point. Fining is a common punishment, and death for grave offences. The changes of the moon are accounted for by the theory that this orb, who is a man, monthly falls in love with his wife's mother, who throws ashes in his face they have names for the twelve months; they do not divide their time by weeks, but hold a market every fourth day. These people are industrious, and good cultivators of rice, millet, and legumes of many kinds . . . They keep bees in rude hives of logs of wood."

The 'Himalayan Journals' were followed in 1855 by the first volume of the 'Flora Indica' in conjunction with his old college friend, Thomas Thomson. Though the work was never continued in the form then planned, this volume is famous for its Introductory Essay extending over 260 pages. This essay, besides presenting a masterly analysis of the vegetation and physical features of India, gives us the foundations of the study of systematic botany set forth as only Hooker could set them forth. It also shows Hooker as the fearless critic of current methods in systematic botany by which that branch had become encumbered to its serious disadvantage.

The Indian flora was taken up again later in what is Hooker's greatest floristic work, 'The Flora of British India,' which appeared in seven volumes between the years 1872 and 1897. In addition to this Hooker completed the 'Ceylon Flora' of Henry Trimen, and concluded his labours in this field with 'A Sketch of the Vegetation of the Indian Empire' (1904). Nor can it be said that Hooker ever laid aside his studies on the Indian Flora, for the closing years of his life were devoted to a monograph of the genus *Impatiens*. In this connection the following extract from a letter to my father, describing his method of work (dated Jan. 22, 1908) is of interest:—

"I have been at work ever since I retired on *Impatiens*, and have monographed all the Indian and Malayan Species—well

on to 200—and am now at China proper, from whence I have 140 species, of which not a dozen are natives of India! I do not know which is the more difficult task—to remove and dissect a flower, or to classify the species, or to describe their variable and grotesque organs for many points in which there is no technical terminology. Many single flowers of these curious species especially took 2 and even 3 hours to lay out the parts for drawing and description—and after all is done I doubt whether what I see, draw, and describe will fit in with the living flower! As it is, I defy the acutest botanist to tell me from the best dried specimens whether there are 2 or 4 lateral sepals, whether the anthers are acute or didymous, or—even approximately—the true form of a single floral envelope. To get at these you must remove and moisten the flowers and spread out every organ flat *under* water. This done, I secure them all on slips of gummed paper as evidences of the fidelity? of my sketches that go with the analyses into the Herbarium; no reagent has helped me.

“I have the loan of the Paris Chinese Balsams, 70 species, two-thirds different from the 80–90 species of the Herb. Kew. I find the bracts (as to situation) a prime character. Indeed, you may divide the genus into two groups, one with the lower pedicel of the raceme bracteate at the base, as in most, or ebracteate, as in *Noli-me-tangere*—the latter are few in India but abound in China. Of course the 1-flowered species puzzle you, but that is a detail!

“After the bracts I think the anthers come next, but these are so small and so crushed in dried flowers that the getting at their form is often a long affair. Lastly, the sectional character of one region won’t do for another; which is no wonder when you consider that of some 64 species of India W. of the Bay of Bengal not 5 are found in Burma and countries E. of the Bay, and only 2 or 3 in China.

“I will bore you no further—my head is as twisted as a balsam flower and as upside down.”

Almost everything Hooker undertook was conceived on the grand scale and carried through with a tenacity and continuity of driving power that was simply marvellous. What was true of the Indian Flora applied also to the Antarctic. Though interrupted, this was brought to a triumphant conclusion in the ‘Introductory Essay to the Flora of Australia,’ published in 1859. This, no doubt, was Hooker’s most brilliant effort, and it appeared just at the right moment. In it are discussed the general phenomena of variation in plants and the distribution of plants in space and time. Then follows the detailed handling of a special case—that of the Australian Flora. The headings of the sections in a single chapter will serve to illustrate the topics considered:—*Circumscription of area of species, and causes of it; Relative distribution of natural groups of plants; Insular floras, and analogies between them and mountain floras, and between the geological ages of*

insular and other floras; Existing conditions will not account for existing distribution; Effects of humidity in modifying distribution; Effects of the Glacial Epoch, and Darwin's views thereon. Coming just when it did, this essay was of enormous service to the cause of Darwinism. Hooker had always been Darwin's right hand man, and it was due to his well-judged intervention in conjunction with Lyell, that the famous Darwin-Wallace joint note on Natural Selection was presented to the Linnean Society on July 1st, 1858. The matter, however, need not be pursued here, as it has been recently embodied in *extenso* in a special volume issued by the Society on the occasion of the Jubilee celebration on July 1st, 1908. Hooker's friendship and scientific connection with Darwin was undoubtedly the most important experience of his lifetime, and was frequently alluded to by him with gratitude.

Hooker, now 40 years of age, had reached the plenitude of his powers, and must have been a great figure in those days. He had undertaken two great journeys in regions hitherto veiled in obscurity, and by his masterly handling of the enormous masses of data he had accumulated, he became the virtual founder of phytogeography as a science. In 1855 he was appointed Assistant Director of Kew under his father; and all this time he was behind the scenes with Darwin, doing yeoman service in the cause of evolution with his great stores of knowledge, good judgment, and fine critical powers.

At the present day we often incline to be envious of the apparent ease with which average men belonging to a former generation took their place as recognised authorities whilst still quite young; we conceive the world to have been less crowded then and the public less satiated with the results of modern science. Whatever substratum of justice there may be in such jaundiced reflections, they do not apply to the case of Hooker. This philosophically-minded and robust man of action, quick in observation and sound of judgment, always ready to help with acute criticism, such a man was bound in any age and in any field to tower above his contemporaries. The best material brought up in the best of schools, the early Victorian days threw into fitting relief this vivid and indomitable personality which really belongs to the heroic age. A hero indeed he was to the younger men of his time, as I gather from what my father tells me of his own feeling towards Hooker before he came to Kew.

For ten years (1855-1865) Hooker served under Sir William Hooker, and on the death of the latter naturally succeeded to the Directorship of Kew, a position which he held till 1885.

His official connection with Kew was marked by the continued active development of the Gardens along the lines laid down by his father. It was under the Hookers that Kew rose into fame, and I agree with Prof. F. O. Bower* that it would serve no useful

* An Oration on Sir Joseph Dalton Hooker. Glasgow, 1912, p. 15.

purpose to attempt to disentangle the respective shares of father and son in its advancing fortunes. So far as Kew is concerned the appearance of the Hookers may best be regarded as a single phenomenon. Sir William's policy had been large and enlightened, and it was not likely that the son would modify its main outlines. Apart from material expansion—and many new features were introduced—the official duties of the Director increased continually. Administration, together with correspondence with Government departments and Colonial gardens, would have overwhelmed a weaker man, but Hooker never permitted them to interrupt or seriously abate his scientific work. In Hooker, the man and botanist never relapsed into the official. At the same time he kept in the closest touch with the detailed administrative work of Kew. In my childhood Hooker was a familiar figure in the Gardens, going his daily round between eleven and one o'clock, commonly in company with Smith the Curator, or with the appropriate head of a department. These encounters were much appreciated by us children, for "Dr. Hooker" always had a cheery greeting and took an interest in our pursuits. I remember one day his challenging me to swarm up one of the wire stays of the great flagstaff, and, when my feet dangled over his head, his peremptory request that I should descend. I don't know whether Hooker was what would be called a "children's man," but we were all immensely devoted to him; perhaps because he kept our individualities distinct and identified himself with our interests. In his own house on the occasion of children's parties, and my recollection of the Christmas parties with "tree" and magic lantern-slides is vivid, Hooker, although he didn't hang about, always came in to welcome us on arrival, and to say good bye. I have also seen him emerge as a roaring lion from under the drawing-room table, and a very good lion, too!

As Director, Hooker never let a chance slip of picking up a good man. The following reference to Mr. Baker, afterwards Keeper of the Herbarium, occurs in a letter to my father in 1865. "I wonder whether Baker would ever care to come and work at Kew for a few weeks at a time if we paid his expenses and offered £1 a week; it might be the means of getting him on the staff eventually?"

He also looked after his subordinates, as is well illustrated by the following extract from the same letter:—

"I had a talk with ——. He corresponds with the 'Cottage Gardener,' but offered to discontinue it. I told him that I had no objection, but that no part of his time between 8.30 and 5 should be devoted to it. I also spoke of smoking, and of the necessity of resting after meals—which you should be told of, too! He suffers from dyspepsia (no wonder) and promises reform." To what extent — may have changed his ways I cannot say, but I well remember that my father always used to rest on the sofa for a quarter of an hour after luncheon, a habit

probably attributable to advice from Hooker, for I don't think such an idea would ever have occurred to him spontaneously! And also by this (1871):—

“I am pounding the Board to get an Assistant for Smith, who can hardly stagger along under his loads of duties of all sorts.”

In those days Kew was under the Board of Works, and later Hooker had a good deal of trouble with one of the Parliamentary heads. It is no use raking over this old controversy; suffice to say that Hooker more than held his own and was victorious in the end. I imagine no man was less tolerant of dictation and unintelligent interference than Hooker. During the seventies of last century there was a local agitation—doubtless promoted by the owners of houses along the Richmond Road—to have the brick wall which enclosed the Gardens on this side replaced by iron railings. Hooker's reply was to add another five or six feet to the height of this wall for a considerable part of its length, and so it remains to the present day.

I have heard the term “hasty” applied to Hooker, but cannot say how far it is justified. It may have been the “defect” of his quality for sound and rapid generalisation. Darwin in one of his letters reproaches Hooker for being “down” on second-rate men, and there is no doubt that Hooker used to express himself emphatically as to bad craftsmanship or waste of time.

C—— is not doing any good. He is putting out for Mueller bad specimens of the commonest garden things and putting them up in clumsy parcels that I am ashamed to send out”*.

It will be realised how annoyed Hooker must have been with the wretched C——, for he himself not infrequently sent out plants with his own hands—a habit acquired on his travels. My father tells me that the very first time he ever met Hooker, on the occasion of his arrival at Kew in 1858, he found him making up such parcels to send away in the little room on the right of the Herbarium door.

The period of Hooker's Directorship included numerous publications of value to systematic botany, of which the ‘*Genera Plantarum*’ was in many ways the most important and indispensable. In this great work, undertaken in conjunction with George Bentham, the whole of the genera of flowering plants were diagnosed and delimited; its publication extending from 1863 to 1882. To Hooker, of course, systematic botany was not an end in itself but an essential instrument in the solution of the higher problems, the laws that control evolution and dispersal of species, and the relation of physical changes and geology to these laws.

Hooker never lost his taste for travel nor failed to make opportunity for it. Among his minor and later journeys may be mentioned his trip to the Atlas Mountains of Morocco in 1871. His travelling companions were John Ball, the famous alpinist, and George Maw, well-known for his elaborate monograph on the genus

* Letter dated 1871.

Crocus. The following extract from a letter written from Tetuan gives us a glimpse of this trio in the field:—

“I say that Ball finds this or that because he beats me *hollow* in botanising and is making a splendid herbarium. I find my eyesight quite fails me as a collector; indeed, I have been remarking for two years now that I cannot read the garden labels with my spectacles even, except I stoop down *. Mr. Maw has a marvellous eye also, especially for bulbs. The aggregate knowledge of Ball and Maw as to European plants is simply astounding. Ball knows the smallest flowerless scrap of hundreds of obscure things (e.g. *Medicago*, *Carex*, and such like), and Maw recognises the bulbs by leaf, however like the long grass they grow amongst.”

In the summer of 1877 Hooker in company with Asa Gray, the great American botanist, undertook a journey of three months' duration in California and elsewhere in the United States of America. Of this journey Asa Gray wrote †:—

“Never were such busy people as Hooker and I the whole time. In fact, I was bound to make Hooker see just as much as possible within our limited time, and it seemed on the whole best for us to see very much in glimpses and snatches rather than far less more leisurely and thoroughly. He will have told you of our over nine thousand miles of travel together, and of how he liked it. . . . We should like to do it all over, and more. But especially we should like to see California in green attire. Not that we are not interested and taken with the sere aspect of these western regions in summer, which we fancy more than Hooker does. In fact, the greenness of England is so congenial to him that he took more delight in our eastern States, which he had mere glimpses of, than in all the wide western region, though, of course, there was more to learn in these.”

The rambling spirit in Hooker enabled him fully to enjoy more modest excursions. The following is a typical extract from a holiday letter written from the High Force, Teesdale, in 1865. As indicated in the previous extract from Asa Gray, bleak monotonous landscape was little to his liking.

“I call the country here *hideous* away from the river banks, which are charming. We are vastly pleased with the place, for even the hideous moors make capital hale walking ground and the moraines are most interesting. . . . We enjoy this place very much; it is just the sort of climate for my wife, and I am rapidly getting into that condition when after breakfast dinner is the only subject worth a thought. I have botanised Cronkley pretty well and got most of the good plants—nothing new as yet, but a little *Juncus* of which I send specimen enclosed, it is most abundant

* There was nothing seriously amiss with his eyesight, as the footnote at p. 49 shows.

† ‘Letters of Asa Gray,’ 1893, p. 671.

hereabouts, growing with *supinus*, but always quite different. The roots feel knotted; it swarms from the Force up to the top of Cronkley and never varies. If you can't make it into a new species I must send it to Babington! Bentham is puzzled with it."

The following account of a visit to Backhouse's nursery at York was written at the same time, and is of interest for its defence of the system of cultivation under glass that is usually followed in botanic gardens.

"We were delighted with Backhouse's nursery. The collection of Alpines is wonderful and entirely successful, and we ought to have something of the kind at Kew*.

"The underground fernery rather disappointed me, though very wonderful in its way. Many of the things do better than in pots, many worse. But I am beginning to think that my dislike to Ward's case cultivation and these devices of Backhouse and Bewley, &c., arises from the fact that though nearer imitations of nature than our house-and-pot system, they are failures by direct comparison with nature. No one compares the house-and-pot system with nature and no comparison is suggested: with these systems it is the contrary—I am taken to a muggy, close, damp, slimy hole, the contrast of which to the fresh air of heaven in the plants' native habitat is too violent, and the fact of the plant growing as well in the one case as the other, rather shocks than gratifies."

The occasional addresses and lectures delivered by Hooker at meetings of the British Association, of which he was President at Norwich in 1869, reach a very high standard indeed. Those dealing with Geographical Botany were especially remarkable.

Hooker's eminence marked him out for the Presidential chair of the Royal Society (1873-77), and it is a tribute to his marvellous vigour that he was able successfully to grapple with the onerous duties of this post during his period of full work at Kew. As a rule the presidentship is held by a veteran already in the enjoyment of some leisure from the active pursuits of his life.

Unlike his father, Hooker had little direct experience as a teacher of botany in academic institutions, though he held an assistantship in the botanical department of the University of Edinburgh for a brief period on his return from the Antarctic. None the less the educational side of botany always interested him deeply, and was often the subject of comment in his letters to my father. The following, written in 1862, merits repetition at the present day:—

"I do not approve of working a professoriate like a school or a college *coach*; it is a mistake depend upon it. Good free

* Realised in 1882.

lecturing, attention to fundamentals, and working with schedules * is more than enough for $\frac{4}{5}$ of the men, and quite enough for 3 months work with men who have other things to attend to. With such coaching the men become absolutely helpless when turned out—all self-reliance is gone."

His views on the scope and importance of botanical training are given at some length in the Introduction to the 'Flora Indica.' I am indebted to Mr. Alfred Milnes, of the University of London, for the information that Hooker acted as Examiner in Botany to the University during two periods of five years each. Those of his writings best known to students are Hooker's 'Students' Flora of the British Islands' (1870), the most scholarly of all our floras, the English edition of Le Maout and Decaisne's 'General System of Botany,' translated by Mrs. Hooker (1873), a Primer on Botany (1876), and Bentham & Hooker's 'Handbook of the British Flora' (1887).

To the publications of our Society Hooker was a copious contributor. The best known of his papers are perhaps his "Outlines of the Distribution of Arctic Plants" (1861), and the very important monograph "On *Welwitschia*" (1863). The discovery of this plant had aroused a very lively interest at the time, and Hooker's Memoir was a detailed, intensive study of its morphology, development, and histology. In recent years, at the initiative of Prof. Pearson, of the South African College, *Welwitschia* has been the subject of a fine series of additional papers extending our knowledge in many ways. It is, however, safe to say that, subject to the methods of investigation and amount of material available half a century ago, the original account still holds its place. This and a few other papers in the same field show Hooker's capacity to work successfully along lines which were not generally pursued, at any rate in this country, for another fifteen or twenty years.

In addition to a fine incisive literary style, Hooker had artistic gifts of a high order which were freely employed in connection with his pursuits. None but an artist could have knocked off the panoramic views reproduced in the first edition of the 'Himalayan Journals,' whilst his drawings of plants, tissues and the like were excellent. The sheets of dried plants which passed through his hands for description gained much in value from the sketches of analyses with which it was his practice to embellish them.

In the conduct of the affairs of our Society Hooker always showed the greatest activity; and he served on the Council for periods aggregating twenty years. It was largely at his instigation that the 'Journal' of the Society was founded; the circumstances are given in the following passage †:—

* The reference is doubtless to the schedules introduced by J. S. Henslow, by means of which students could exhibit the salient external features of a plant.

† Extracted from Jackson's Life of George Bentham, 1906, pp. 169-170.

"A small dinner-party in their rooms (at 91 Victoria Street) on 2nd March (1855) was arranged with Professor T. Bell, President of the Linnean Society, and Dr. Hooker, to discuss starting an octavo journal on behalf of the Society. This was ultimately achieved, but with great opposition from J. J. Bennett, the Secretary, and Robert Brown, opposition which made Bentham almost hopeless of success. The custom then was to issue one part of the Transactions annually, and the idea of a quarterly journal to those trained in the leisureliness of Robert Brown, was novel and distasteful."

In this connection the following letter to Dr. Daydon Jackson, the last which Hooker wrote to the Society, though it refers to a trivial matter, will be read with interest. It is dated July 13, 1911.

"I have just received from Linn. Soc. a most interesting number for me. I had no idea that 70 years ago I had gutted the Falkland Islands botanically so thoroughly.

"But my chief object in writing is to ask whether it might not be expedient to have the edges of the leaves of the Journal cut before issue? The time and *temper* it costs me to cut the leaves of the many books I have to read is I fear registered against me aloft, and, in these days of innumerable books that one must read, it would be a mercy to have the leaves cut, of which the Geographical, Royal, and Statistical Societies' Journals set good examples."

The suggestion as to the cutting of the leaves of the Journal was at once adopted by the Council.

As we have seen, Hooker in retirement maintained his activity to the last, and the output of this period alone would have been a creditable record for an ordinary man. His interest in the progress of botany was unabated and the men of younger generations derived much encouragement from his kindly sympathy and frank criticism. Although in retirement, no one ever dreamt of thinking of Hooker as on the shelf; he was always consulted when anything important was afoot, and he remained to the last by universal acclaim the greatest of living botanists.

Of public honours a goodly share was showered upon Hooker, the most notable perhaps being the Copley Medal of the Royal Society (1887), and the Order of Merit (1907). From this Society he received one of the first two Linnean Medals in 1888—the other going to Owen—and in 1897 a Medal struck to commemorate his 80th birthday. He was also the recipient of one of our Darwin-Wallace Medals on the occasion of the celebration held by this Society in 1908—at which celebration he was present and played a leading part.

For the list of papers contributed by Sir Joseph Hooker to the publications of this Society, herewith appended, I am indebted to the courtesy of Dr. Daydon Jackson. I have to thank my father,

who was Hooker's colleague at Kew for nearly 30 years, for much information and for access to the correspondence from which numerous extracts have been drawn.

The portrait which accompanies this notice is reproduced from the photograph taken by Mrs. Cameron in 1868. It has always been counted an admirable likeness of Sir Joseph Hooker in middle life.

[F. W. OLIVER.]

*List of Papers by Sir J. D. HOOKER in the issues of
the Linnean Society.*

1. In the Transactions.

- 1847. An enumeration of the Plants of the Galapagos Archipelago, with descriptions of those that are new. Trans. xx. pp. 163-233.
- 1847. On the Vegetation of the Galapagos Archipelago, as compared with that of some other tropical islands and of the Continent of America. Trans. xx. pp. 235-262.
- 1856. On the structure and affinities of Balanophoreæ. Trans. xxii. pp. 1-68; pls. 1-16.
- 1857. On the growth and composition of the Ovarium of *Siphonodon celsistrineus*, Griffith, especially with reference to the subject of its placentation. Trans. xxii. pp. 133-139, pl. 26.
- 1859. On the origin and development of the Pitchers of *Nepenthes*, with an account of some new Bornean plants of that genus. Trans. xxii. pp. 415-424, pls. 69-74.
- 1859. On a new genus of Balanophoreæ from New Zealand, and two new species of *Balanophora*. Trans. xxii. pp. 425-427, pl. 75.
- 1860. Illustrations of the Floras of the Malayan Archipelago and of Tropical Africa. Trans. xxiii. pp. 155-172, pls. 20-28.
- 1861. Outlines of the Distribution of Arctic Plants. Trans. xxiii. pp. 251-348, pl. 32 (map).
- 1861. On three Oaks of Palestine. Trans. xxiii. pp. 381-387, pls. 36-38.
- 1863. On *Welwitschia*, a new genus of Gnetaceæ. Trans. xxiv. pp. 1-48, pls. 1-14.
- 1865. Description of some new and remarkable species of *Aristolochia* from Western Tropical Africa. Trans. xxv. pp. 185-187, pl. 14.
- 1886. On the *Castilleja elastica* of Cervantes, and some allied rubber-yielding plants. Trans. 2nd Ser. Bot. ii. pp. 209-215, pls. 27, 28.

2. In the Journal (Botany).

- 1856. On some collections of Arctic plants, chiefly made by Dr. Lyall, Dr. Anderson, Herr Miertsching, and Mr. Rae, during the Expeditions in search of Sir John Franklin, under Sir John Richardson, Sir Edward Belcher, and Sir Robert McClure. Journ., Bot. i. pp. 114-124.
- 1856. On the Botany of Raoul Island, one of the Kermadec group in the South Pacific Ocean. Journ. i. pp. 125-129.
- 1860. On *Fropiera*, a new Mauritian genus of Calycifloral Exogens, of doubtful affinity. Journ. v. pp. 1-2.
- 1860. On *Barteria*, a new genus of Passifloreæ from the Niger River. Journ. v. pp. 14-15.

1861. On the Vegetation of Clarence Peak, Fernando Po; with descriptions of the Plants collected by Mr. Gustav Mann on the higher parts of that Mountain. Journ. vi. pp. 1-23.
1864. On a new *Heliconia* with the habit of a *Musa*, sent from New Granada by Dr. A. Anthoine to the Royal Gardens, Kew. Journ. vii. pp. 68-69.
1864. On the Plants of the Temperate Regions of the Cameroons Mountains and Islands in the Bight of Benin, collected by Mr. Gustav Mann, Government Botanist. Journ. vii. pp. 171-240, pl. 1.
1865. On the Identity of *Pinus Peuce*, Griseb. of Macedonia, with the *P. excelsa* of the Himalaya Mountains. Journ. viii. pp. 145-147.
1869. On the true *Fuchsia coccinea* of Aiton. Journ. x. pp. 450-461.
1874. On the Subalpine Vegetation of Kilima Njaro, E. Africa. Journ. xiv. pp. 141-146.
1874. On *Hydnora americana*, R. Br. Journ. xiv. pp. 182-188.
1875. On the discovery of *Phyllica arborea*, Thouars, a tree of Tristan d'Acunha, in Amsterdam Island, in the S. Indian Ocean, with an enumeration of the Phanerogams and Vascular Cryptogams of that Island and of St. Paul. Journ. xiv. pp. 474-480.
1875. Observations on some Indian species of *Garcinia*. Journ. xiv. pp. 484-486.
1882. On *Dyera*, a new genus of rubber-producing plants belonging to the Natural Order Apocynaceæ, from the Malayan Archipelago. Journ. xix. pp. 291-293.
1882. Preliminary Note to Prof. Watt's Indian species of *Primula*. Journ. xx. p. 1.
1884. Introductory Note to Mr. C. B. Clarke's Notes on the Flora of Parasnath, a mountain of North-western Bengal. Journ. xxi. p. 252.
1885. List of the Plants collected by Mr. Thomson, F.R.G.S., on the Mountains of Eastern Equatorial Africa, by Prof. Daniel Oliver, F.R.S.; with observations on their distribution by Sir J. D. Hooker, F.R.S. Journ. xxi. pp. 392-406. [Sir Joseph Hooker's Obs. are on pp. 392-396.]
1904. On the species of *Impatiens* in the Wallichian Herbarium of the Linnean Society. Journ. xxxvii. pp. 22-32.

With T. Thomson.

1857. Praecursores ad Floram Indicam: being Sketches of the Natural Families of Indian Plants, with Remarks on their Distribution, Structure, and Affinities. Journ. Bot. ii. pp. 1-29 [Campanulaceæ].
1857. — [Saxifragæ, etc.]. Journ. ii. pp. 54-96, pls. 1, 2.
1858. — " " " 97-103.
1858. — [Caprifoliaceæ]. " " " 163-180.
1859. — Balsamineæ. " iv. " 106-157.
1861. — Cruciferae. " v. " 128-181.
1864. On the genus *Euptelea*, Sieb. & Zucc. Journ. vii. pp. 240-244, pl. 2.
1864. Description of a new genus of Scrophularineæ from Martaban [*Brandisia*]. Journ. viii. pp. 11-12, pl. 4.

The following dates may be used to supplement the foregoing vivid sketch of a remarkable personality.

The late Sir Joseph Hooker was born on the 30th June, 1817, at Halesworth, Suffolk, where his parents were settled for a short time, on property belonging to Dawson Turner, his maternal grandfather. He received his early education at the High School, and in the Faculty of Arts and the Medical Faculty in the University of Glasgow. Having taken his degree in 1839, he was appointed Assistant Surgeon to the Royal Navy, and as such he accompanied Sir James Ross on his Antarctic Expedition of 1839-1843. After his return he was Assistant to Professor Graham in the University of Edinburgh, and from 1845-1847 Botanist to the Geological Survey. His famous travels in India cover the four years from 1847 to 1851. In 1855, he became Assistant Director to his father at Kew, on whose death, in 1865, he succeeded to the Directorship, which he held until his retirement in 1885. It was during this period that he travelled in Palestine (1860), in Morocco (1871), and in the United States (1877).

He was twice married, first to a daughter of Prof. J. S. Henslow in 1851, who died in 1874, and second, the widow of the late Sir W. Jardine in 1876, who survives him. He died at "The Camp," Sunningdale, 10th December, 1911, and was buried five days later at Kew, beside his father, amidst a large gathering of his friends and colleagues.

By will he left £100 free of duty to the Linnean Society, and the reversion of his large collection of medals, which are now shown on loan by Lady Hooker in the rooms of the Society.

[O. S. & B. D. J.]

GEORGE MAW was born in London on December 10th, 1832. His father was John Hornby Maw, then partner of a firm of surgical instrument makers in London. George received his early education at home, mainly at Hastings, where his father had removed in 1839. At the age of 16 or 17 he went to the Agricultural College at Cirencester with the idea of becoming a farmer. Although he was very successful there, gaining five certificates of honour and a certificate of merit, he gave up the agricultural career and joined his younger brother, Arthur, in establishing in 1850 a factory of encaustic tiles at Worcester, which two years later was removed to Benthall, Broseley, Shropshire. His father had been a man of much knowledge and culture and especially artistic gifts, and so was his son George.

His reputation as a chemist was considerable. As geologist he was a fertile and many-sided writer and successful worker. Among many papers his account of the structure of the Great Atlas, with his demonstration of the former extension of glaciers in that chain of mountains down to 5800 feet, and his treatise on the disposition of iron in variegated strata may be mentioned especially. Nevertheless, geologists seem to be inclined to count

him rather as a botanist than one of their own brotherhood. This may be on account of his early inclinations towards botany and his love for collecting plants wherever he went, be it for his herbarium or for his beautiful garden at Benthall Hall, whence not a few novelties found their way into other English gardens. His merits in this respect were summed up by Sir J. D. Hooker in these words: "No one of late years, or perhaps ever, has collected with his own hands so many of these (*i.e.*, hardy herbaceous plants) for transmission to England, cultivated them with more success, or distributed them with more liberality." But his claim to recognition as a scientific botanist rests almost entirely on a very narrow field, which, however, he exploited to the utmost with the keen eye of the trained observer and the love of the enthusiast. It is circumscribed by the limits of the genus *Crocus*, which he studied with rare thoroughness in the field and in his garden, where he succeeded in forming an almost complete living collection of the 67 species recognised by him. The result of his labours, which extended over more than 10 years, was a monograph which was published in 1886. It is the more valuable as it is beautifully illustrated from his own drawings, which also show him as an artist of no common powers. A long series of articles in 'The Gardeners' Chronicle' and a paper on "Notes on the life-history of a *Crocus*, and the classification and geographical distribution of the genus," in the Journal of this Society (vol. xix. 1882), preceded the publication of the monograph. Extensive journeys in Europe and travels in North Africa (1871) and Asia Minor (1877) contributed as much to his botanical education, as they went to enrich his collection of living plants and especially of *Crocuses*. Best known of them is his visit to the Great Atlas of Morocco, which he undertook in company of Sir Joseph D. Hooker and Mr. John Ball in 1871.

He joined the Linnean Society in 1860. The dedication of a volume (1874) of the 'Botanical Magazine' by Sir Joseph Hooker and of a volume of 'The Garden' (1878) by Mr. William Robinson, were fitting tokens of recognition of his enthusiastic love of plants. Unfortunately the latter part of his life was clouded by ill-health which obliged him to seek seclusion. He left Broseley in 1886, and died in retirement at Kenley, Surrey, on February 7th of the present year. A portrait of him was published in 'The Garden,' vol. xiv. No. 371, and a review of Benthall Hall, his home, in 'The Gardeners' Chronicle' of February 12th, 1881. The number of 'The Garden' quoted also contains an enumeration of the journeys undertaken by Mr. Maw up to 1878. [O. STAFF.]

OCTAVIUS ALBERT SAYCE was born in 1862, educated at the Scotch College, Melbourne, and entered business, becoming a commercial traveller. During this period he made constant use of the microscope, and succeeded in securing a position on the staff of Melbourne University.

A good field naturalist, especially in the Coleoptera, he passed through a course of practical biology, where his previous acquaintance with chemical manipulation stood him in good stead. His first important paper on *Gryllotalpa* when printed was sent to our late colleague, Prof. G. B. Howes, who sent a postcard simply inscribed "Good. Go on.—G. B. H.," which encouraged Sayce to persevere.

About the year 1902 he turned his attention to the Crustacea, and in 1906 was appointed Demonstrator and Assistant Lecturer on Bacteriology in the University; it was shortly after this that his paper on *Koonunga cursor* was published in our Transactions (Zool. xi. pt. 1, 1908); on the 2nd December, 1909, he was elected A.L.S., a distinction greatly valued by him.

In April 1911, he was appointed the first Director of the Bacteriological Institute of South Australia, but did not live to take up his new position. He died of pneumonia after a few days' illness, on the 29th April, 1911, and was buried on the 1st May following. The day of his death had been fixed for his entrance on his new duties. His widow passed away eight weeks later, on the 24th June, largely due to the shock of her husband's death.

A full bibliography will be found in 'The Victorian Naturalist' for June 1911, p. 27, appended to a sympathetic notice of Mr. Sayce, from which the foregoing notice has been derived, supplemented by a letter from Mr. F. Chapman, A.L.S. [B. D. J.]

EDUARD STRASBURGER.—The intelligence of the unexpected and sudden death of EDUARD STRASBURGER on the 19th May, 1912, was received on the eve of our last Anniversary Meeting, and saddened the many amongst our Fellows who knew and honoured our distinguished Foreign Member.

He was born in Warsaw, on 1st February, 1844, and received his first botanical training at the University of Bonn, under Hermann Schacht, and where Julius Sachs was then a teacher in the Poppelsdorf Agricultural Academy. Schacht died suddenly in 1864, and Strasburger, thus deprived of his professor, decided to migrate to Jena, to benefit by the lectures of Nathan Pringsheim, whom he had already met at Bonn. In after years he owned the impetus derived from Pringsheim, and his association with Ernst Haeckel. It was due to the latter that, upon the retirement of Pringsheim in 1869, Strasburger was called to the chair, at the age of 25 years. It was in this very year that the first production of Strasburger's pen saw the light: "Die Befruchtung bei den Coniferen," which happened to offend Hofmeister, because the author sought to prove that the "corpuscula" do not corresponds to the embryo-sacs of Angiosperms, but are archegonia.

Three years later he issued his "Die Coniferen und die

Gnetaceen' in octavo, with a quarto atlas of plates, and in 1873, his briefly entitled "Ueber *Azolla*."

In 1875 came out his "Ueber Zellbildung und Zelltheilung," which reached the second edition the next year, and the third in 1880, besides versions in other languages. From this time onward, Strasburger was the foremost worker in botanic cytology, and his labours, extending over 35 years, have proved extraordinarily fruitful. 'Ueber Befruchtung und Zelltheilung' came before the world in 1876, as did his 'Studien über Protoplasma.' His next important work was 'Die Angiospermen und die Gymnospermen,' in 1879.

Prof. Johannes von Hanstein, who had succeeded to Schlacht's chair at Bonn, after Strasburger had settled at Jena, died on the 27th August, 1880, and the latter was called upon to succeed him early in the following year, after 12 years' labour at Jena. In April of 1882 he produced 'Ueber den Bau und das Wachsthum der Zellhäute,' which work he described as in part three years old, thus in some measure the result of his work in Jena.

Soon afterwards he addressed himself to a wider circle and to younger students, by issuing 'Das botanische Practicum' early in 1884, a work which attained its 4th edition in 1902 (of which a summary has gone through many editions), and was translated by Prof. Hillhouse as 'Handbook to Practical Botany' in 1886. Later in the same year, he brought out his 'Neue Untersuchungen über den Befruchtungsvorgang bei den Phanerogamen als Grundlage für eine Theorie der Zeugung.'

In 1889 began his important series of researches, published under the name of 'Histologische Beiträge,' of which seven parts came out under these titles:—

1. Ueber Kern- und Zelltheilung im Pflanzenreiche, nebst einem Anhang über Befruchtung. 1888.
2. Ueber das Wachsthum vegetabilischer Zellhäute. 1889.
3. Ueber den Bau und die Verrichtungen der Leitungsbahnen in den Pflanzen. 1891. (He was accustomed to speak of this volume of 1000 pages as "mein grosses Buch.")
4. Ueber das Verhalten des Pollens und die Befruchtungsvorgänge bei den Gymnospermen—Schwärmosporen, Gameten, pflanzlichen Spermatozoiden und das Wesen der Befruchtung. 1892.
5. Ueber das Saftsteigen.—Ueber die Wirkungssphäre der Kerne und die Zellgrösse. 1893.
6. Ueber Reduktionstheilung, Spindelbildung, Centrosomen und Cilienbildner im Pflanzenreich. 1900.
7. Zeitpunkt der Bestimmung des Geschlechts, Apogamie, Parthenogenesis und Reduktionstheilung. 1909.

On the occasion of his assuming office as Rector of Bonn University, in October, 1891, he delivered an address, which was issued as 'Das Protoplasma und die Reizbarkeit.'

The work which has attained the widest circulation and popularity is that entitled:—‘Lehrbuch der Botanik für Hochschulen,’ written with the assistance of Drs. F. Noll, H. Schenck, and A. F. W. Schimper, appearing in 1894; it has since reached its tenth edition (1910). It has been translated in many other languages, and is now in its fourth edition in English.

In a more popular manner we have his ‘Streifzüge an der Riviera,’ the second edition of which came out in 1904, and in English as ‘Rambles on the Riviera,’ London, 1906, with 87 coloured plates. We cannot here catalogue his many shorter papers on various topics of botanic interest, but one in particular deserves mention, if only for the adverse criticism it called forth, which gave him much pain, though he maintained his position stoutly. It was “Meine Stellungnahme zur Frage der Pfropbastarde,” in *Ber. deutsch. bot. Ges.* xxvii. (1909) 511–528.

Strasburger was no mere conventional professor. In his pleasant quarters at Poppelsdorfer Schloss, formerly the palace of the Electors of Cologne, he was easily accessible, and delighted to be the sympathetic friend of his students; the many pupils attracted by his reputation to study under him, will gladly bear witness to the regard in which he was universally held. Supreme in his chosen department, he interested himself in many other directions, of which ecology may be adduced as an instance. This notice is not the place for a critical estimate of Strasburger’s work, but the frequency with which he changed his opinions regarding the interpretation of certain cytological phenomena, proved disquieting to some; in this he was only searching further, and was ever ready to submit his former opinions to the test of later work or new discoveries.

Few botanists were more appreciated in our own country; he was a Foreign Member of the Linnean Society from 6th May, 1880, of the Royal Society from 1891; further, he was the recipient of the Linnean Medal in 1905, when it was received for him by Sir Dietrich Brandis, and acknowledged by a letter then read, which explained that official duties hindered him from attending personally. He was present at the Darwin-Wallace Celebration on the 1st July, 1908, and received a silver copy of the special medal then struck. In his native country he enjoyed the title of “Geheimer Regierungsrath.”

He died from heart-failure on the date above-mentioned, his wife having predeceased him by several years. A Festschrift was in preparation for his 70th birthday, which it is hoped may yet see the light, though as a memorial volume in place of the congratulatory work intended. [B. D. J.]

FRANCIS TAGART, whose legacy of £500 free of legacy duty has recently been received by the Society, was the son of Mr. William Tagart, was born in 1839 and died on the 25th November, 1911, at his house, Old Sneed Park, Stoke Bishop. His business

life was passed in the City of London as a merchant, and amongst other subsidiary duties, he was a Director of the Surrey Commercial Dock Company, and at the time of his death, was one of H.M. Lieutenants for the City of London. He was proposed as a Fellow of this Society on the 6th March, 1855, by his brother, the Rev. Edward Tagart, who died a few years later, Edward Newman, and R. Wakefield, the election taking place on 1st May of that year. On retiring from business he resided on his estate near Bristol, and his last visit to the rooms of the Society was about two years before his death, when he expressed his intention of making a bequest in favour of the Society.

The sum thus bequeathed has been invested as a separate fund bearing the donor's name, the income to be applied to the purposes of the Society as the Council may determine from time to time.

[B. D. J.]

June 6th, 1912.

Prof. E. B. POULTON, F.R.S., President, in the Chair.

The Minutes of the Anniversary Meeting of the 24th May, 1912, were read and confirmed.

Dr. William John Dakin, Dr. Annie Porter, Prof. Alexander Meek, and Mr. William Edward Balston were admitted Fellows.

Mr. William Henry Daun, M.A. (Cantab.), the Rev. John Stewart Müller, M.A. (Cantab.), Mr. Edwin Percy Phillips, M.A. (Cape), and Mrs. Eleanor Mary Reid, B.Sc. (Lond.), were severally balloted for and elected Fellows.

The President read the proposed alterations of Chap. II. Sect. 2 and 3 of the Bye-Laws for the second time.

The President announced that he had appointed the following to be Vice-Presidents for the ensuing year:—Prof. J. STANLEY GARDINER, Mr. HORACE W. MONCKTON, Miss EDITH R. SAUNDERS, and Dr. DUKINFIELD H. SCOTT.

Prof. A. MEEK read his paper, “On the Development of the Cod, *Gadus morrhua*.”

Mr. CHARLES HEDLEY read his paper entitled “Palæogeographical relations of Antarctica.” (See p. 80.)

A discussion ensued in which the following took part:—Dr. Otto Stapf, Sec.L.S., Dr. G. B. Longstaff (visitor), Mr. Clement Reid, Mr. T. A. Sprague, Prof. C. Chilton, Dr. Marie Stopes, and Dr. A. Smith Woodward, the author briefly replying.

Mr. RUPERT VALLENTIN showed a series of slides from photographs taken by himself during a recent visit to the Falkland Islands, extending over many months. He divided them into views of the scenery, the native plants and the fauna, alluding to the changes in progress, and the loss of endemic types.

Miss MAY RATHBONE showed a portion of an unusually thick stem of *Hedera Helix*, stating that this specimen was taken from a plant of ivy growing on a tree in Cheshire. The stem, which was somewhat triangular, measured $18\frac{1}{8}$ inches in circumference and $5\frac{1}{2}$ inches in diameter at its widest part. The phloem, which was very well marked, measured about $\frac{3}{8}$ of an inch in its thickest part. The rings in the wood were not very distinct but about 46 could be counted. The wood was very heavy. The specimen, which was $18\frac{1}{4}$ inches long, weighed 14 lbs., and the specific gravity was 0.91, but, as it was weighed without removing the bark, this is only an approximation.

Dr. MARIE STOPES exhibited a plant of *Cardamine pratensis*, on behalf of Mr. A. D. LANG, showing bulbils in abundance from the blade of the leaf as well as the axil of the flowers.

Dr. Stapf remarked on the interest of the exhibit, and hoped by cultivation, that the causes of this phenomenon would be ascertained.

Mr. CHARLES SILLEM placed on the table specimens of the flowering branches of a rambler rose, all the flowers showing median proliferation of an unusual character.

Mrs. LONGSTAFF showed a specimen of *Lycaste Barringtoniae*, Lindl., brought from Jamaica four years ago, but flowering now for the first time. Mr. W. Fawcett remarked that the type of this plant is in Smith's Herbarium, possessed by the Society, under the name of *Epidendrum Barringtoniae*.

June 20th, 1912.

Prof. E. B. POULTON, F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 6th June, 1912, were read and confirmed.

Mrs. Eleanor Mary Reid, B.Sc., Miss Maud Samuel, B.Sc., Mr. William Henry Daun, M.A., and Mr. John Coney Moulton, M.A., were admitted Fellows.

Mr. Ernest John Bickford, Mr. Thomas Ford Chipp, B.Sc. (Lond.), Mr. Alfred Eugène Craven, Mr. Nevin Henry Foster, M.R.I.A., M.B.O.U., Mr. William Norman Sands, and Mr. Francis James Stayner, were proposed as Fellows.

Miss Ethel Mary Doidge, M.A., Mr. Thomas Bainbrigge Fletcher, and Mr. John Gervaise Turnbull, were elected Fellows.

The proposed alterations in the Bye-Laws, Chap. II. Sect. 2 and 3, which had been read from the Chair on the 2nd May and 6th June, were submitted to a ballot and approved by the Fellows.

The President announced that it was proposed to have a dinner of the Society on Thursday, 31st October, to be followed by a reception in the rooms of the Society. Further notice to be given in due course.

Mr. HUGH SCOTT briefly introduced the following papers, relating to the fauna of the Seychelles and other islands, the first three and the fifth being communicated by Prof. J. STANLEY GARDINER, F.R.S., F.L.S.

1. Mr. C. G. LAMB on the Lonchæidæ, Sapromyzidæ, Ephydridæ, Chloropidæ, and Agromyzidæ.
2. Dr. IGNACIO BOLIVAR on the Saltatorial Orthoptera.
3. Dr. A. SICARD on the Coccinellidæ.
4. Mr. HUGH SCOTT on the Coleoptera Lamellicornia and Adephaga.
5. The late Dr. BUDDE-LUND on the Terrestrial Isopoda of the Percy Sladen Expedition, which was introduced by the Rev. T. R. R. Stebbing, F.R.S.

Mr. H. STUART THOMPSON exhibited 33 coloured drawings of Alpine flowers by Mr. George Flemwell, with some proofs of plates taken from them.

Prof. ARTHUR DENDY, F.R.S., introduced an exhibition of four white canaries, of a race bred by Mrs. John Martin, of Martinborough, New Zealand, and brought home by Dr. A. E. A. Palmer, of the same Dominion, who was present, and explained that they were shown in this country for the first time. Miss Florence Durham (visitor) also spoke.

Prof. DENDY then showed the disc-like cocoons constructed by the larvæ of a Saw-fly, *Phyllotoma aceris*, which had been found in large numbers at Malden Station, in Surrey, and were characterised by jumping movements like those of the well-known Mexican "jumping bean." With them he showed specimens of sycamore leaves from which portions of the mesophyll had been eaten by the larvæ, while circles cut out of the upper cuticle had been utilised to form one side of the cocoon, the other side being spun by the larva.

Mr. R. W. H. Row related his experiments with these insects, and stated that the jumping began when the cocoons were exposed to sunshine, and appeared to be caused by an instinct to escape the light.

Mr. J. C. MOULTON had brought with him from Borneo, living examples—now seen for the first time in this country—of the remarkable Trilobite-like coleopterous larvæ, well known in the Oriental tropics. Mr. C. J. Gahan (visitor) referred to the previous knowledge of these larvæ, which belonged, he considered, to the Lycidæ, and spoke of the probability of their never passing into an imago stage. The discussion was continued by Mr. H. N. Ridley, Mr. S. G. Paine, Mr. J. C. Moulton, and the President.

Mr. S. T. DUNN introduced his paper on the revision of the genus *Millettia*.

Dr. OTTO STAFF, Sec.L.S., read a paper by Mr. CARL CHRISTENSEN, communicated by Prof. J. STANLEY GARDINER, on the Ferns of the Seychelles and Aldabra. The lantern-slides to illustrate this paper had not arrived, and their exhibition was postponed.

Prof. GARDINER also communicated Mr. C. WARBURTON's paper on the Acarina of the Percy Sladen Expedition, which was read in title, as was also Canon NORMAN's investigation of *Synagoga mira*.

Capt. C. F. U. MEEK's paper entitled "Correlation of Somatic Characters," was placed before the meeting, with the Author's own statement of his conclusions.

ABSTRACTS.

I.

The Distribution of *Elodea canadensis*, Michaux, in the British Isles in 1909. By A. O. WALKER, F.L.S.

[Read 2nd November, 1911.]

THE history of this plant, so far as our islands are concerned, is fairly well known. The first locality in which it appears to have been recorded, by Mr. John Dew in 1836, was at Waringstown, County Down, Ireland. In 1843 it was reported by Dr. G. Johnston, of Berwick-on-Tweed, in Dunse Loch, Berwickshire. By 1850 it had spread to many rivers and reservoirs in Great Britain and become a serious nuisance to navigation and drainage—so much so in Lincolnshire, that in 1852 Mr. Rawlinson was sent by the Government to advise as to clearing the dykes in the fens. Attempts to eradicate it by dredging failed, and it was found that the only way of dealing with it successfully was to leave it alone, when it appears to gradually diminish or die out altogether.

In 1884 Mr. J. D. Siddall, of Chester, published a valuable paper on the structure and history of this plant (Proc. Chester Soc. Nat. Sci., Part iii. 1884, p. 125), from which most of the above information is derived. He states that experience shows, "that if left alone, its habit is, upon first introduction into a new locality, to spread with alarming rapidity; so much so as literally to choke other water plants out of existence. But this active phase reaches a maximum in from five to seven years and then gradually declines, until at last the *Anacharis* ceases to be a pest and becomes an ordinary denizen of the pond, river, or canal as the case may be." This maximum period in the neighbourhood of Chester seems to have been between the years 1867 and 1873; in 1884 Mr. Siddall says it is "far less abundant than formerly," and in April 1909, he wrote that he had some difficulty in finding a piece in a locality where in 1873 all other vegetation was choked out by it. He also says that the circulation of the protoplasm in the leaf-cells was very feeble compared to what it was in 1873—an important fact, possibly indicating diminishing vitality in the species. The recollection of the writer, who resided in Chester from 1856 to 1889 and remembers the canal there so choked with the weed as to greatly impede the boat traffic, quite bears out Mr. Siddall's statements as to its abundance in 1867 to 1873 (*l. c.* p. 131).

In 1909 it appeared to the writer that sufficient time had elapsed to enable an opinion to be formed as to the probability of the plant becoming a permanent denizen in the British Isles, and with this view a circular was sent to most of the corresponding

Societies of Natural Science of the British Association asking for information on the subject.

To this, as may be seen, numerous replies were received and much valuable information obtained, for which the writer now heartily thanks all his correspondents. One unavoidable defect in the scheme consists in the fact that the period of maximum abundance having begun about 1852 (in the Lincolnshire Fens, the river Cam, &c.), there would be few botanists whose memories would extend far enough back to be able to compare the present with the past. But, with due allowance for this, the indications are that on the whole the plant is not now so abundant as to be a nuisance but has generally established itself as a denizen. It is, however, probable that there are waters to which it has not yet penetrated and in which it may still flourish as in previous years. Such may be the case with the artificial water of Moulton Grange, Northants, where Mr. H. N. Dixon, Hon. Sec. Northants Nat. Hist. Soc., describes it as "a great pest." It would be interesting to know whether it has ever re-appeared in water where it has flourished and died out, as might conceivably happen after a lapse of time sufficient for the bottom to recuperate. If it has not done so anywhere, it would not be unreasonable to attribute it to a diminution of the vitality of the species as suggested above.

The following reports from different Counties from the south of England to Banffshire are probably sufficiently representative of the whole of Great Britain.

DEVONSHIRE.

Mr. J. L. Sager, M.A., on behalf of the Exeter University College Field Club, writes: "It occurs in more or less abundance in the Rivers Exe, Culm, and the Exeter Canal. It has been known to flower occasionally, but fruits have not been seen."

Mr. H. J. Morgan, a member of the above Society, says that for some time before 1878, "the right bank of the Exe from the Bridge to the Gas Works (over 200 yds.) was one thick mass of *Elodea*. Since that date this plant has become by no means plentiful in this place. Many ditches on Exminster Marshes were almost filled with *Elodea* about seven years ago. There is certainly not so much there now."

DORSETSHIRE.

Mr. N. M. Richardson, President Dorset Field Club, reports: "Mr. Filleul says he sees it in every stream he fishes, but our own native weeds far more than hold their own against it."

Mansell-Pleydell, 'Flora of Dorset,' 1874: "Streams and ponds, common; thoroughly established, becoming a most troublesome plant."

HAMPSHIRE and ISLE OF WIGHT.

From the Flora of the above by F. Townsend, 1904 : "Abundant in Hants and Isle of Wight. Too common in many localities. Introduced to lake in Leigh Park in 1847 with American aquatics and discovered in Leicestershire the same year."

Not recorded in Bromfield's 'Flora of Isle of Wight,' edited by Sir W. J. Hooker & T. B. Salter, 1856.

SUSSEX.

Rev. E. Elman, per Mr. T. Hilton : "About Lewes and the Cuckmere Valley and in many other places in Sussex—cannot say if less abundant than formerly" (Brighton and Hove Nat. Hist. Soc.).

Mrs. T. R. R. Stebbing, F.L.S., writes : "It used to be found in Cold Bath Ponds at Rusthall, Tunbridge Wells, and the Lake at Warberry House."

'Flora of Sussex,' F. H. Arnold, 1887 : "Ditches, pools, rivers, common." By F. C. S. Roper, Eastbourne, 1875 : "Ditches, locally abundant."

SURREY.

Mr. J. G. Baker, F.R.S., writes in 1909 : "In a pond in the garden at Kew it was once very plentiful and has now quite died down, its place being taken by *Nitella*."

Holmesdale Nat. Hist. Club, Reigate : "River Mole and various ponds and ditches in the district. Not quite so plentiful as it used to be."

KENT.

"Now (1899) quite common in ponds, ditches, and slow streams throughout the county." First record 1855 ('Flora of Kent,' Hanbury & Marshall).

River Beult, near Headcorn (A. O. W., 1910). Not seen at Ulcombe. Lenworth Mill Pond, Maidstone, "grows alarmingly" (not signed). ["Still abundant there." A. O. W., 24th Sept., 1912.]

The Stour, "less abundant than formerly," Rev. C. H. Fielding.

MIDDLESEX.

"Very common here in ponds and streams : rivers Brent, Colne, and Paddington Canal" (Ealing Scientific and Microsc. Soc. per Mr. Offord).

"About the same in last 10 years, not increasing" (ditto).

HEREFORDSHIRE.

"Very abundant in River Wye, canals, streams, and pools, 1865 to 1889. Since that date becoming more scarce. First observed in Herefordshire about the year 1855" (Rev. Augustin Ley).

R. Lugg, by Mill Street ; marsh, Leominster ; pool at Sellark, Ross ; mill sluice (Rev. A. L.).

WORCESTERSHIRE NATURALISTS' CLUB.

"In nearly every piece of water in the County of Worcester."
 "Showing signs of decrease" (Amphlett & Rea).

'Botany of Worcestershire,' E. Lees, 1867: Avon division, several places; Severn division, many places.

STAFFORDSHIRE.

Rivers Trent, Sow, Penk, Weaver, Dove, and most of the canals and watercourses in the County.

"Not nearly so plentiful as 20 years ago, has disappeared from one or two spots where it used to occur plentifully, but is still to be found in most of the rivers and canals" (not signed).

Mr. J. E. Nowers, Burton-on-Trent, says it is very abundant there. "I think it is about the same quantity as it was 30 years ago." Mr. G. R. Jebb, C.E. (Dec. 1910), says: "*Elodea* has practically but not entirely disappeared from most of the ditches or canals in Shropshire and Staffordshire which used to be choked with it."

SHROPSHIRE.

E. W. Bowers, Wem: Shropshire Union Canal and R. Roden; a friend "seems to think this weed on the decrease."

Rev. J. B. Meredith, Kinnerley Vicarage: "As to American Weed, a mill pond near here was dredged clean, well mudded out, some four years ago, and is fuller than ever now."

Dr. W. P. Hamilton, Botanical Referee Caradoc and Severn Field Club: "The Severn, S. U. Canal, meres and pools everywhere." Mr. H. E. Forrest, Shrewsbury, confirms the above.

SUFFOLK.

Mr. P. G. Boswell, Hon. Sec. Ipswich Field-Club: "*Elodea* is now very common in all our ponds and streams round here and in the R. Gipping. It appears to be getting more plentiful."

NORFOLK.

Mr. E. T. Daubeney ('Nature Notes,' vol. xviii. 1907, p. 212), says that *Elodea* has disappeared from Narford Lake, near Swaffham, where it was formerly abundant, "leaving nothing in the shape of vegetable growth in its place."

CHESHIRE.

Mr. J. D. Siddall: "In most of the ponds, canals and streams of the district" (Chester Soc. of Nat. Science, &c.) "Much less abundant than 25 years ago and decidedly less robust."

Mr. C. Madeley, Warrington Museum: "Occurs in the Old Quay Canal near Warrington, and in many of the numerous ponds and ditches; perhaps a little less abundant than formerly."

NOTTINGHAMSHIRE.

"Common in rivers, brooks, canals, and ponds throughout the County."

"My own experience of 20 years is that it is *not* increasing, but that *if* there is any change at all it is in the direction of a slow decrease in abundance." Prof. J. W. Carr.

NORTHAMPTONSHIRE.

"It occurs in rivers and ponds in all the districts of Northants" (Druce in Journ. Northants Nat. Hist. Soc., vol. iv. p. 121, 1886).

Mr. Druce writes to Mr. H. N. Dixon: "My own impression is that although *Elodea* was common in the Grand Junction Canal, and I can remember it in 1860 both in Northants and Bucks, it was never a pest. In the sixties it was, however, a great pest in artificial pieces of water such as the Wakefield [Laun] Ponds, where it had to be frequently cut. It is certainly less common now."

First record 1841, Watford Locks, G. J. Canal.

Mr. H. N. Dixon, Hon. Sec. Northants Nat. Hist. Soc., says: "It is just now a great pest in the artificial water of Moulton Grange, the residence of Mr. H. Manfield, M.P."

LANCASHIRE.

Mr. W. H. Heathcote, Hon. Sec. Preston Scientific Soc.: "Very abundant in the Preston and Lancaster Canal; Leeds and Liverpool Canal; Rivers Ribble and Wyre; numerous ponds, &c. I should say more abundant" (than formerly).

"Ponds and ditches, common" (Flora of Preston and neighbourhood by members of the Preston Scientific Soc., 1903).

'Flora of Liverpool District,' C. T. Green, 1902: "Frequent in canals, ditches, and old ponds," Liverpool and Wirral.

YORKSHIRE.

Mr. F. Jowett, Hon. Sec. Bradford Nat. Hist. Soc.: "Aire about Skipton; Leeds and Liverpool Canal; mill dams all over the district; common in wet ditches. The plant is holding its own in all places except in the canal, where it is probably cut up by the screws of the boats."

Mr. F. Barker, Hon. Sec. Halifax Scientific Society: "Very common Calder and Hebble Canal between Halifax and Salterhebble. Several mill dams in the neighbourhood; very firmly established. Opinions differ" (as to its being more or less abundant than formerly).

'Flora of N. Yorkshire,' J. G. Baker, 1863: "The Wiske and ponds at Kirby Wiske. Clifton Ings ditch; Foss Islands near York." In 1909 J. G. B., writes: "It has never been abundant in the North Riding."

'Flora of E. Riding,' J. F. Robinson, 1902. "Common in dykes and drains, but scarcely so conspicuous as it was 12 years ago."

Dr. W. B. Russell writes : " It used to be so abundant in the Derwent at Malton, 30 or 40 years ago, as almost to block the river. It is now almost extinct, being replaced by *Potamogeton pectinatus*."

Mr. Fox Lea : " In canals, Dewsbury and other still waters, ponds, &c. River Wharfe at Ilkley, 1909. Not so abundant as formerly."

LINCOLNSHIRE.

Mr. Douglas Witty (Rydal Mount, Colwyn Bay), writes that " it is generally spread over all North Lincolnshire. In the Ancholme valley it is met with practically everywhere. In the Upper Ings Drain (near Barton-on-Humber) it has increased very considerably in the last decade, and has with other water-growths seriously obstructed the flow of the stream at times.

NORTHUMBERLAND and DURHAM.

C. E. Robson, Hon. Sec., Nat. Hist. Soc., Northumberland, Durham, &c., writes : " There are no canals in the district, and the rivers being swift-flowing and not wide the plant is practically unknown."

N. WALES.

MERIONETH.—Mr. D. A. Jones, Rock House, Harlech, writes : " I found it three years ago in Llyn Gwernen, 2 miles from Dolgelly. It is the only record I have for the County." (Mr. H. E. Forrest says D. A. J. is *the* authority on the Flora of Merioneth.)

MONTGOMERY.—Mr. D. A. J. says it grows at Llanymynech.

DENBIGHSHIRE.—Same authority says it grows at Gresford. Mr. T. R., per Mr. H. E. Forrest, says it is found in the canal 2 to 3 miles from Llangollen as " an ordinary humble weed," not choking any part of the canal. A. O. Walker remembers it about 30 years ago completely filling up the canal there.

SCOTLAND.

GLASGOW DISTRICT.—Mr. J. R. Lees (Glasgow Nat. Hist. Soc.) writes : " Occurs in the Forth and Clyde Canal and in a number of the small streams, ponds, and lakes near Glasgow. Not nearly so abundant as about 20 years ago Seems to be rapidly disappearing in most parts of the district."

BERWICKSHIRE.—First record for Gt. Britain in Dunse Loch by Dr. G. Johnston in 1842.

ISLE OF BUTE.—" Stream at Rothesay," W. H. Heathcote, Sec. Preston Scientific Society; also

INVERNESS, mill stream near, W. H. H.

PERTHSHIRE.—Mr. R. Barclay reports (1): " In Tay, Earn, Isla, Towns Lade, Moncreiffe Pond, and very many other ponds throughout the County. (2) Occurs in more localities" (than

formerly) "and on the whole more abundant, though less so in some stations."

ELGIN.—Rev. G. Binnie says it occurs in the Spey near Garmouth, in backwaters, &c. ; also in Fochabers Curling Pond. It has greatly increased in a stagnant pool in the old course of the Spey. Still water with a muddy bottom suits it.

IRELAND.

Mr. S. A. Stewart, A.L.S., gives a number of localities in Cos. Down, Antrim, and Derry, and says: "My own experience has been to meet with this plant in practically all suitable waters, save only the lakelets in Rathlin Island, off the Antrim Coast, but only the female plant. No exact data have been secured on the subject of the decrease or otherwise of this plant, but the general opinion seems to be that it is not increasing and is on the wane."

In the same district Mr. W. J. C. Tomlinson gives several localities and adds: "In almost every lake and lakelet in the district." He also says: "It is believed to be more abundant now than ever before within living memory. However, it may be that increased observation of its existence may contribute to the idea that the plant is still increasing here."

Mr. A. W. Stellfox, Hon. Sec. Belfast Naturalists' Field Club, considers that "In the Logan Canal the plant is certainly much less plentiful than, say, 12 years ago. About that time it was necessary to dredge the canal several times during the summer, while at present no obstruction is caused by the growth of the plant."

'Cybele Hibernica,' Moore & More, 1866: "Canals, ponds and streams, as yet rather local in 7 districts out of 12."

II.

Note on the Exhibits on 16th November, 1911.

By Mr. G. CLARIDGE DRUCE.

NEW BRITISH FORMS.

Castalia candida, Schinz & Thellung. Loch near Dunkeld, pointed out by C. H. Ostenfeld, and from Roundstone, Galway (Ostenfeld & Druce).

Viola epipsila, Ledeb. New to Ireland: Killarney.

Stellaria Dilleniana, Moench. Sutton Broad, growing with and flowering at the same time as *palustris*.

Sagina nodosa, var. *moniliformis*, Lange; pointed out by Prof. Massart.

S. glabra, Fenzl. Ben Lawers. Referred to as probably this species.

Rhamnus catharticus, var. *Schroeteri*, Druce.

Alchemilla vulgaris, Linn., var. *acutidens* (Buser). Ben Lawers (C. H. Ostenfeld).

Cirsium palustre, Scop., var. *ferox*, Druce.

Calluna vulgaris, Hull, var. *Erikoë*, Ascherson. Shown to the party on Wessenden Moors, Yorkshire, by Dr. Graebner. And also found on Ben Lawers, at the Lizard, and near Clifden, Galway.

Erica Tetralix \times *vagans* = *E. cinerea* \times *vagans*. Davey, in Journ. Bot. xlviii. (1910), p. 333, but identified by Druce, Schroeter, and Graebner as the above hybrid when the plant was shown to them by the discoverer, Mr. P. D. Williams, at Lanarth, on the St. Keverne Moors. The glandular hairs and other characters prove the presence of *Tetralix*.

Juncus ranarius, Perr. & Song. Southport, pointed out by Dr. Graebner.

III.

Historic doubts about *Vaunthompsonia*.

By the Rev. T. R. R. STEBBING, M.A., F.R.S., F.Z.S.

[Read 7th March, 1912.]

Dr. CALMAN has pointed out to me that my argument for the priority of this form over its rival *Vaunthompsonia* is open to a serious objection. The latter spelling of Bate's generic name appears in the second volume of the Royal Dublin Society's Journal, published under date of 1860. But the volume includes several numbers, and Number 10, with which we are here concerned, is dated on p. 63 (its first page) "July, 1858." That the number was actually published in that year, Dr. Calman says, "is shown by the fact, which I owe to Mr. Sherborn, that the part in question was received by the Library of the Geological Society between July 1st and October 31st, 1858, as recorded in the Quart. Journ. Geol. Soc. xv. p. 149, 1st Feb., 1859." This, however, still leaves open the question whether the July number of the Journal was published earlier or later than the July quarterly number of the Natural History Review of the same year. On this point neither the publishers of the Review nor the present editor of the Journal have been able to supply information. But the Library of the British Museum at Bloomsbury gives, as it seems to me, a fairly satisfactory clue. The number of the 'Natural History Review' for July 1858 is there on the last page of the number, p. 263, stamped "16 JY 58." Now, Bate's paper in the Journal is followed on p. 105 by "Return of Donations to the Royal Dublin Society, to July, 1858," so that the material for the number was not even complete till the beginning of July, and its issue within a fortnight of that completion would surely in those days have seemed needless to the editors and impossible to the printers. Incidentally it may be observed that Kinahan refers to Bate's paper as appearing in the second volume of the Journal without giving any page number, as he would naturally have done, had such a number been already available. We also find that Kinahan uses the spelling *Vaunthompsonia* in a Report to the

British Association at Leeds in September, 1858, on p. 266 of the General Report, which was no doubt not effectively published till the following year, when he might have corrected an unintended error.

My thanks are due to Dr. Calman for his having entrusted me with the evidence that Bate's *Vauntomponia* was published at some time in the third quarter of 1858. Nevertheless we have Bate's own clear statement that the genus was described by him in the 'Natural History Review.' He could just as well have referred to the Journal, if that had priority, and it would have given him the best possible opportunity of vindicating his mode of spelling the generic name against Kinahan's. Kinahan was on terms of intimacy with Spence Bate, as letters in my possession show. He was also interested in the reputation of Vaughan Thompson. It may well be that he thought his friend Bate was taking too much of a liberty with the deceased author in misspelling both his christian and his surname. To remedy this, we may suppose, he himself took the liberty of making a change in the still unpublished name of Bate's genus, against which I cannot find that Spence Bate ever uttered or printed a word of expostulation.

Whatever may be the result of the particular controversy, time will not have been wasted over it, if it helps to bring about a more general adoption of the practice in scientific literature of printing on each separate publication the exact date of issue.

IV.

Phyllody in *Trifolium*. By MAY RATHBONE, F.L.S.

[Read 21st March, 1912.]

A specimen of *Trifolium repens* showing phyllody of the carpels, was gathered in a hayfield, Cheshire, in the summer of 1912.

The flowers are of two forms, both occurring on the same plant, but in different heads. In one form in place of the carpel the axis of the flower is prolonged into a petiole with well-developed stipules and bearing only one leaflet. The other parts of the flower are normal, except that the calyx teeth are, I think, a little longer and broader than usual.

The other form bears a trifoliate leaf instead of the carpel and, in the flower of this type which was dissected, no stipules were found. The stamens, corolla, and calyx were normal.

The season of 1912 was a particularly dry one, and the plant showed no signs of disease or injury.

References.

Dr. Masters, "Vegetable Teratology," pp. 276 & 279, 1869.

M. Germain de Saint-Pierre, Bull. Soc. Bot. France, 1856, vol. iii. p. 477.

Dr. Penzig, "Pflanzen-Teratologie," vol. i. 1890.

V.

The Paleogeographical Relations of Antarctica. By CHARLES HEDLEY, F.L.S., Assistant Curator of the Australian Museum, Sydney, New South Wales.

[Read 6th June, 1912.]

1. INTRODUCTION.

TESTIMONY in support of alteration in temperature and contour of Tertiary Antarctica is almost wholly based on a comparison of the living fauna and flora of surrounding countries. While biologists in general, led by Wallace, Selater, and Hutton, opposed the idea of an extended and habitable Antarctica, geographers hesitated to adopt a hypothesis the arguments for which lay in a foreign field. But of late years most of those engaged in its discussion have been supporters of extension, so that the theory has advanced from the position of a disparaged heresy to that of an established view.

Accustomed to rely on biological evidence, in the form of palæontology, for important and far-reaching generalisations, geology may now accept from biology this theory of former Antarctic extension. Thereby is acquired a correlation of climate, of time, and of continental change, while incidentally a new light is thrown on the question of the permanence of ocean basins.

It seemed nothing unusual to find a similar fauna and flora, even to the extent of a large proportion of identical species, on the subantarctic islands all round the world. But collectors working in south temperate and even in south tropical zones were surprised to find related species and genera in opposite hemispheres. This correspondence is more pronounced in primitive groups and grows clearer southwards.

First, it was realised when the famous botanist Sir J. D. Hooker pointed to the distribution of the southern pines as indicating a common origin (Hooker, 'London Journal of Botany,' iv. 1845, p. 137).

The relations of a southern fauna linking Australasia to South America were sketched firm and clear by a master hand in Professor Huxley's essay on the classification and distribution of the gallinaceous birds (Huxley, Proc. Zool. Soc. 1868, p. 294).

According to Ortmann, first Rüttimeyer definitely proposed radiation from Antarctica as the solution of the problem (Rüttimeyer, 'Ueber die Herkunft unserer Thierwelt,' 1867, p. 15).

Our knowledge of this subject was much advanced by Dr. H. O. Forbes (Forbes, Roy. Geogr. Soc. Suppl. Papers, iii. 1893). Starting from the fossil avifauna of the Chatham Islands, he reviewed the community of southern faunas and interpreted it by

antarctic distribution. As the means of dispersal he mapped a vast continent stretching continuously from Madagascar to South America and Fiji during the "northern glacial epoch."

It was suggested by the present writer that a far smaller area of continental land, of an earlier date and of unstable form, was indicated by its surviving refugees (Hedley, *Proc. Roy. Soc. N. S. Wales*, xxix. 1896, p. 278); and that the last Antarctic phase as reflected by these might be expressed in arms reaching on one side to Tasmania, on the other to Cape Horn, while previous phases may have been represented by other rays extending to New Zealand, Madagascar, Ceylon, and perhaps South Africa.

A study of terrestrial and fluviatile mollusca induced Ancey to subscribe to these suggestions (C. F. Ancey, *Journ. de Conch.* xlix. 1901, p. 12).

Dr. Ortmann, while investigating the South American Tertiary Invertebrates, accepted my amendments to Forbes's proposition. To a clear exposition of the subject he added a map and bibliography ('Report Princeton University-Expedition to Patagonia,' iv. pt. 2, 1902, pp. 310-324).

The distribution of southern earthworms was discussed by Prof. W. B. Benham (*Proc. Austr. Assoc. Adv. Sci.* 1902, pp. 319-343). In his opinion the Acanthodrilids, a primitive group, originated in New Zealand and spread by way of Antarctica to South America. He emphasised the fact that the union they indicated between Antarctica and New Zealand was not synchronous with the Australian connection.

Examining the mammalian fauna A. Gaudry considered that unless Tertiary Patagonia was united to Antarctica its palæontological history would be incomprehensible (*Compt. Rend.* vol. cxli. 1905, p. 806).

From a study of the freshwater crustacea of Tasmania, Mr. Geoffrey Smith concludes that certain elements of this fauna "reached their present range by means of an Antarctic connection between the southernmost projections of Australia, South America, and New Zealand" (*Trans. Linn. Soc. Lond. Ser. 2. Zool.* ix. 1909, p. 67). His analysis revealed the presence in Tasmania of another element which he derived from the northern hemisphere and which he supposed to have travelled down the Andean chain and crossed to Australasia by the Antarctic route.

Summing up a biological examination of the southern islands of New Zealand, Prof. C. Chilton concludes: "The evidence pointing to former extensions of land from the Antarctic continent northward, and to the warm climate that was enjoyed by this continent in early Tertiary times, seems to offer a fairly satisfactory explanation of the facts before us" ('Subantarctic Islands of New Zealand,' ii. 1909, p. 467). A full bibliography is included in this article.

Finally, Osborn describes the hypothetical reconstruction of Antarctica as "one of the greatest triumphs of recent biological investigation" ('The Age of Mammals,' 1910, p. 75). *

2. ARGUMENT.

The distribution records of recent and fossil species upon which the generalisations of the foregoing authors depend have never been denied. Indeed, they continue to increase with the progress of science.

To other, and usually earlier, authors these views presented two insuperable difficulties. One is the extreme change in climate which formerly permitted temperate and subtropical animals and plants to exist where cold is now so intense. The other is the demand for the existence of Tertiary land where an ocean now extends so broad and deep as that between Antarctica and Tasmania or New Zealand.

To evade these difficulties and yet explain existing distribution the following three alternatives have been advanced.

I.

That decadent groups were expelled from their original seats by more vigorous competitors; retreating from a northern centre to the ends of the earth, such groups divided into fugitive parties which converged as southern lands approached the pole. Or discontinuous distribution in southern continents were simply considered remnants of a former universal distribution (Wallace, 'The Geographical Distribution of Animals,' i. 1876, p. 398; Pfeffer, Zool. Jahrb. Suppl. viii. 1905, pp. 407-442).

But whereas, under the circumstances postulated, the northern wanderers would be expected to diminish and to vary as they receded, the southern forms in question became more alike and more numerous proceeding south. Thus radiation rather than convergence is indicated.

II.

That birds, winds, or circumpolar currents, by a process of picking up and setting down passengers from the continents or

* While this article was in the press, there reached me an important memoir by Dr. Pilsbry on "The Non-Marine Mollusca of Patagonia" (Rep. Princeton Univ. Exped. Patagonia, iii. 1912, pt. v. pp. 513-633). My friend considers Antarctica rather as a road for migration, especially an American exit, than as a centre of evolution. He takes exception to my derivation of Australian Acavidae from Antarctica, and suggests that the group arose in Gondwana Land. On reconsideration I would still maintain that the south-eastwardly increasing distribution of Australian Acavidae indicates their immediate Antarctic origin. But previous to an Antarctic sojourn the group may have been Gondwana bred. This memoir heightens the resemblance between east and west. *Gundlachia*, *Diplodon*, and *Radiodiscus* are common, *Petterdiana* scarcely differs from *Littoridina*, and *Potamolithis* appears to have Tasmanian relatives.

islands by the way, established a uniformity of fauna and flora. Thus Dr. Michaelson writes (Journ. West. Aust. Nat. Hist. Soc. v., July 1908, p. 13): "There is no need for the supposition of an ancient great Antarctic continent which connected Australia and South America as some scientific men still suppose. Certain littoral Oligochæta consisting of euryhaline forms, for which the salt sea is no barrier, can be transported by the west wind drift over the stations on the different islands lying between one continent and another."

The flora of the circumantaretic islands, as instanced by Kerguelen, was thought by W. Schimper to have been conveyed by sea birds and ocean drift (Schimper, Wissenschaft. Ergebn. Valdivia, ii. 1905, p. 75). Although this might apply to species which recur through several archipelagoes, such would not explain the presence of endemic plants and on Kerguelen the occurrence of an endemic snail, *Amphidora hookeri*.

Such transport accounts only for a wide range of individual species capable of air or water carriage. It has doubtless been a small but real factor in distribution. But it does not account for the existence of related and representative species, for the subtropical element, or for the species incapable of such conveyance. Prof. W. B. Benham raises the objection that a species might drift yet never land:—"When I stood at the top of the sheer cliffs, some 500 ft. to 1000 ft. in height, which form the whole of the west coast of Auckland Island, and saw the tremendous breakers which even in moderately calm weather dash with incredible force against the rocks, I was more than ever convinced that the 'west-wind drift,' cannot account for the transference of Oligochæta from the various land surfaces of this subantarctic region" (Benham, 'Subantarctic Islands of New Zealand,' i. 1909, p. 254).

III.

That a trans-Pacific continent conveyed to New Zealand, Australia, and South America a common stock otherwise recognised as the Antarctic element (Hutton, Proc. Linn. Soc. N. S. Wales, xxi. 1896, p. 36; Baur, 'American Naturalist,' xxxi. 1897, p. 661).

This alternative seems the weakest. Had a trans-Pacific bridge really disseminated the species under discussion, then they should be best developed in the central remaining portion (for instance, in Tahiti or Samoa) and least at the extremity (as in Chili or Tasmania). Actually the reverse is the case: South America is the most closely associated with Tasmania, then New Zealand is less so, and the Mid-Pacific islands not at all.

Those who consider the demand for land between Tasmania and Antarctica as exorbitant are not consistent in asking so much larger a grant in the Pacific.

Another difficulty is why that South American contingent which flooded Tertiary Antarctica, and then Australia, failed to include such characteristic South American fauna as the humming-

birds, platyrrhine monkeys, hystricomorph rodents, edentates, or notoungulates. Dr. von Ihering explains (Trans. N.Z. Inst. xxiv. 1891, p. 431; and N. Jahrb. f. Mineralogie, &c. Beil.-Bd. xxxii. 1911, p. 176, pl. v.) that two former subcontinents, of late mesozoic or early tertiary age, are now fused in the present South America. Before the rise of the Andes these were separated from each other by a broad sea and maintained distinct fauna and flora. The southern tract, which he calls "Archiplatea," comprised what is now Chili, Argentina, and Southern Brazil. The northern area, called "Archiguyana," embraced Northern Brazil, Venezuela, and Guiana.

It was from Archiplatea that the last phase of Antarctica had its American derivatives, and that at a time when many forms now regarded as typically South American had not yet reached Archiplatea. Not until after Antarctica was released from Archiplatea did the latter join Archiguyana, and then the southern fauna suffered the usual fate from the incursion of the more highly organised northern types.

3. THE AUSTRAL FAUNA AND FLORA.

More space than is here available would be required to enumerate the Antarctic refugees in austral lands. A few of the more striking instances are now selected.

Recent marsupials are restricted to Australasia and to the Americas, the monotremes to the former. It seems to have been assumed generally that marsupials necessarily had a European origin and travelled across Siberia to North America. A shorter connection between Western Europe and South America by way of Archhelenis is at any rate worth debate. Had the entry to Australia been by the Malay Archipelago, as opponents of the Antarctic hypothesis advance, then stragglers by the way should have lingered in the East Indies. In Australasia marsupials and monotremes are least developed in the north; proceeding southwards more groups successively appear till ultimately Tasmania has, as Professor Spencer expressed it, "a condensation of most that is noteworthy in the Australian region" (Spencer, Proc. Austr. Assoc. Adv. Sci. 1892, p. 106). Indeed, the most convincing proof of the Antarctic theory is the fact that in Australasia the South American affinities regularly increase as Tasmania is approached and there attain their maximum. Those who deny marsupial migration across Antarctica are obliged to assume that the Thylacinidae were independently evolved in each hemisphere. That Tasmania was the point of entry is supported by the discovery in Tasmania of the earliest fossil Australian marsupial. This, *Wynyardia bassiana*, is apparently one of the Phalangeridae, but the unique example is too imperfect for positive identification (Spencer, Proc. Zool. Soc. 1900, p. 776).

Local geologists class the stratum in which it occurred as Eocene, but English and American geologists are less disposed to grant these beds such antiquity.

If marsupials had not been available, the case could have been made as clear from herpetological evidence. And, indeed, were the vertebrata disregarded, the hypothesis could still be as well established from the invertebrata or the plants.

Among the reptiles, fifty genera of the Iguanidæ are known, all of which are confined to the New World, chiefly South America, except one genus in Fiji and two in Madagascar. Australian snakes are divisible into the venomous and the non-venomous groups. All the venomous are of the family Elapidæ, related to South American types; they focus in Tasmania, where non-venomous snakes are absent. The non-venomous snakes are of Asiatic or Papuan affinity, and focus in North Queensland. The majority of Australian frogs are also akin to South American forms.

A family of large snails, conspicuous for the size and beauty of the shell and distinct in structural features, called by Dr. Pilsbry the *Macroogona*, has the following distribution:—In South America, chiefly tropical, *Macrocyclus* 1 species, *Strophochilus* 51 species, and *Gonyostomus* 5 species; in Madagascar, *Ampelita* 54 species and *Helicophanta* 16 species; in the Seychelles, *Stylodonta* 2 species; in Ceylon, *Acavus* 7 species; in the Moluccas, *Pyrochilus* 4 species; in Tasmania, *Anoglypta* 1 species and *Caryodes* 1 species; in Eastern Australia, *Pedinogyra* 1 species and *Panda* 4 species. The Chilean *Macrocyclus* and the Queensland *Pedinogyra* by shell characters pair together, while *Helicophanta* is a match for *Panda*. The absence of this family from New Zealand, its preponderance of species in Madagascar, of genera in Tasmania with Australia, and its development in the tropics are remarkable characters of this old austral group.

The snail family Bulimulidæ is characteristic of South America, beyond which two genera stray into the West Indies and North America, and two others, *Bothriembryon* and *Placostylus*, occur in Australasia. The first ranges from Tasmania to West Australia, and forms an exception to Antarctic rule by having its distribution centre in the latter. Indeed, *Bothriembryon* and the fluviatile crustacean *Cheraps* raise a suspicion that West Australia had direct relations with Antaretica, prior to and independent of the Tasmanian Isthmus. *Placostylus* extends from New Zealand to Fiji and New Guinea, "giving testimony," as Pilsbry remarks, "to the former existence of an Antarctic land connecting the austral continents of the two hemispheres" (Man. Conch., Index, vols. x.–xiv. 1902, p. ix).

The Buprestidæ, a family of large and handsome beetles, exhibit a striking affinity between Australia and South America. So

much so that, opposed as Wallace was to the Antarctic connection, he here conceded that some exchange between the two areas was required. He thought that it took the form of larvæ in floating timber drifting round the antarctic seas in a warm period.

Among early Tertiary vegetation brought from Seymour Island in the Antarctic by Dr. Nordenskjöld's expedition, Dusen has recognised a species of *Fagus* and an *Araucaria* like *A. brasiliensis* (Schwedische Sudpolar. Exp., Bd. iii. Lief 3, 1908). In the light of this discovery the range of the living species of these genera acquires an importance for the student of the Antarctic hypothesis. The distribution of the beech trees is a particularly interesting one, for on the principle of Antarctic extension it is simple and intelligible, but without it is complicated and inexplicable.

This genus *Fagus*, sensu latu, has two representatives in Europe, one in North America, and several in China and Japan. But in South America there are eleven, in New Zealand seven, and in Tasmania with Australia three. The northern forms are deciduous, but with one or two exceptions the southern are evergreen. The genus being a natural one is certainly not of polyphyletic origin, and the question before us is, from what centre of migration has it spread? Did the southern species radiate from the south or converge from the north? It is a strong argument for a southern origin that the bulk of the species are southern. Again, the evergreen state is primitive, the deciduous derived, and this indicates that the northerners are offshoots from an evergreen stock. Thirdly, the southern species more closely resemble each other than any northern does any southern form. Even, as Mr. Rodway (Proc. Austr. Assoc. Adv. Sci. 1912) points out, the same parasite afflicts Tasmanian and South American trees. This agrees better with radiation from the south than with convergence from the north.

Another aspect of Antarctic distribution is presented by the genus *Araucaria*. None of the fifteen existing species reach the northern hemisphere, so the complication of a boreal factor is absent. It is chiefly subtropical and characterises a zone external to that of *Fagus*. In South America there are three species, in New Caledonia eight, in Norfolk Island one, in New Guinea one, and in Australia two. The latter pair are unlike each other, but one, *A. bidwilli*, from Queensland, stands very close to the Chilean *A. imbricata*. This indicates that the genus had already differentiated almost to its present extreme before the migration route between Australia and South America had closed. The large and heavy seeds of these trees possess no floating power and are unfitted for dispersal by birds. As Dr. Guppy remarks of the Fijian Kauri pine, "they may well be cited in support of any continental hypothesis" (Guppy, 'Naturalist in the Pacific,' ii. 1906, p. 301).

The preponderance of *Araucaria* in the Pacific is enforced by a

related genus *Agathis*. If statistics carry a meaning, *Pagus* would seem to have come to Australasia from America, while *Araucaria* made the reverse journey.

The remarkable and well known genus *Fuchsia* includes sixty-nine species. Four of these are natives of New Zealand, the rest inhabit South America, Mexico, and the West Indies. These figures are almost exactly reversed for the shrubby evergreen *Veronicas*, plants conspicuous in any New Zealand landscape, totally absent from Australia or Tasmania, and represented by a few stragglers in South America and Fuegia.

4. DEDUCTIONS.

If it be resolved that the community of austral life is explicable only by former radiation along land-routes from the south polar regions, we reach a position to probe deeper into the intricacies of the problem.

In the scheme propounded by Dr. H. O. Forbes, the austral forms inhabited one vast continent, nearly a third of the southern hemisphere, at the same (? Pleistocene) time. But an analysis of the fauna in question shows that some groups avoid Tasmania and others avoid New Zealand. Clearly the Antarctica that supplied Australia with an abundant fauna of marsupials, monotremes, snakes, frogs, and so on, was not in touch with New Zealand, where these animals are conspicuously absent. Benham has emphasised the fact that the Acanthrodrids, Antarctic earth-worms, failed to reach Tasmania. When they, the fuschias and other associates, spread backwards and forwards from New Zealand to South America, it is equally clear that the road to Tasmania was barred to them. Iredale remarks (Proc. Malac. Soc. ix. 1910, p. 160) that the Antarctic element in the New Zealand Polyplacophora, a marine molluscan group, is distinct from that which reached Tasmania from the south. The differences are both positive and negative, and are not due merely to the more southern latitude of New Zealand preserving a larger proportion of cold types. When circumstances allowed Iguanidæ to wander from South America in two genera to Madagascar and in another to Fiji, the Australian road was apparently closed to them.

It becomes increasingly apparent that the Antarctic source of austral life was not simple but compound. This complexity has probably been the chief hindrance to its recognition. The problem before us is:—Was the complexity that of time or space, or both?

Shall we suppose, for instance, that at the close of a glacial period an Antarctic continent bare of life received a fauna and flora from one neighbour, then developed and transmitted it to another? That a subsequent glaciation swept all life away from the polar area? That a warm interglacial period succeeded when another transfer, but between different neighbours, took place?

So that the fauna of New Zealand might represent the life of one interglacial antarctic phase and that of Australia another.

Or shall we consider that Tertiary Antarctica was an archipelago, the islands of which carried such different fauna and flora that emigrants from one quarter differed from those of another. It is not yet known whether the area between King Edward VII. Land and Graham Land is a lobe of the continent or an archipelago, or an independent island (Darwin, Proc. Roy. Soc. A. vol. lxxxiv, 1910, p. 420; and Mawson, Geogr. Journ. xxxvii. 1911, map, p. 613). In the latter case it is possible that King Edward VII. Land may have joined New Zealand, while Tasmania was separately linked to South Victoria Land. Under these circumstances New Zealand and Tasmania may have simultaneously imported an Antarctic and yet a different fauna and flora.

Or both conditions of interglacial succession and insularity may have combined in the past to produce present effects.

Prof. H. Pilsbry has shown (Proc. Acad. Nat. Sci. Philad. 1900, p. 568) that the land molluscan faunas of the Marquesas, Hawaii, and Society Islands are closely related, and that though of primitive type they are harmonic such as befits continental land, not a drift selection such as oceanic islands have. He proposes them as witness to the existence of a Palæozoic or early Mesozoic land mass. The tree-lobelias also testify to the antiquity and association of these distant Pacific archipelagoes (Guppy, 'A Naturalist in the Pacific,' ii. 1906, p. 250). Their relations are with the alpine floras of South America and Equatorial Africa. A third of the mountain flora of Hawaii is derived from high southern latitudes. It is now suggested that these primitive continental plants and animals reflect a meridional Pacific land-ray, the first visible vestige of Antarctic extension, as Tasmania was the last. To carry a cold flora across the Equator the land must have been lofty and continuous. In such a range some might see the rib of a former tetrahedral world.

As the Eocene was both a warm period and a time when land was largely developed in the Patagonian area, it is likely that the Archiplatan fauna then or earlier entered Antarctica. If the Tasmanian fossil *Wynyardia* is rightly dated Eocene, then during that age some at least of the American migrants reached Australia.

Whereas New Zealand in its relation with South America, *via* Antarctica, appears both as a giver and a receiver, Australia, on the contrary, seems to have made no return to South America, but to have received all and given nothing.* No Eucalypts, for instance, crossed from Tasmania to Patagonia. One explanation

* Ortmann (Proc. Am. Philos. Soc. xli. 1902, p. 340) considers that the freshwater crustacea Parastacidae spread from Australia into Antarctica and thence into Chili. But the distribution of this group in Australia as detailed by G. Smith (Proc. Zool. Soc. 1912, p. 149) appears to me to be that of immigrants from an east and west base respectively.

may be that Australia was then too poor to afford emigrants. Another and more probable explanation is that Antarctica having received a fauna and flora from Archiplata was severed from it before joining Australia. Thus a stream of migration would be forced forward and checked backwards.

The austral fauna and flora appears extending in successive zones from the far south to the tropics. In New Zealand the warmth-loving plants and animals, such as the Kauri pine (a relation of *Araucaria*) and *Placostylus* snail, have been thrust to a northern refuge, while diminished temperature has probably exterminated others. The *Araucaria* and iguanas, the freshwater fish *Osteoglossum*, are examples of tropical austral forms of which a long list could be compiled.

It is unlikely that the Antarctica that bore this tropical and subtropical assembly reached much more broadly to the tropics than does the present continent. Had it done so, more traces would have been left of such extension in the South Sea Islands on the one side or in South Africa on the other.

But if the subtropical flora and fauna had in the Tertiary extended unbroken across the pole from Fuegia to Tasmania, what then became of the ancestors of the present subantarctic and south alpine life? Why were not these frigid forms driven from off the face of the earth when the heart of the Antarctic itself enjoyed a genial climate?

The discovery by Sir E. Shackleton of a plateau 10,000 feet high near the south pole, suggests a solution of the difficulty. If such a plateau existed when the climate was at its warmest, then the tropical migrants could have found a congenial climate on the coast, while the ancestors of the Kosciusko and Kerguelen plants and animals took refuge on the plateau heights. The inference is that such a plateau did then exist.

If the land-connection between the Antarctic and Tasmania had broken down during the warmest period of the interglacial phase, it would have isolated the flora and fauna at a time when the cold elements were gathered together on the central plateau heights, while the temperate and subtropical elements possessed the Antarctic periphery. In that case the cold forms would have had no opportunity to escape to the alpine stations of New Zealand or Australia, or to occupy the subantarctic islands.

The conclusion is therefore drawn that the land link was maintained during the period of refrigeration, and that from the Antarctic focus first the subtropical, then the temperate, lastly the alpine forms were expelled, each to gain a fresh footing in lower latitudes.

Possibly associated with the formation of great ice masses, a paroxysm of diastrophic energy ensued. This, which perhaps has not yet subsided, effected the destruction of the antarctic bridge, and to it may be due the recent disarticulation of the Dominion

of New Zealand and the severance of Tasmania from its parent continent.

In the long perspective of past time Antarctica appears to fade and form like a summer cloud, now extending a limb, now shedding it, now resolving into a continent, now dissolving into an archipelago. At present it lies dead and cold under its white winding-sheet of snow. By the light of the magician's lamp we watch the summer of the cycles dawn. The glow of life returns, the ice mask melts, green spreads a mantle. At last a vision comes of rippling brooks, of singing birds, of blossoming flowers, and of forest glades in the heart of Antarctica.

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22. PHILIPPS (E. G.). Report on the Polyzoa, &c. Pp. 439-450; Plates 42-43. 1900.
23. THORNELY (LAURA ROSCOE). The Hydroid Zoophytes. Pp. 451-458; Plate 44. 1900.
24. LISTER (J. J.). *Astroclera willeyana*, the type of a new Family of Sponges. Pp. 459-482; Plates 45-48. 1900.
25. PYCRAFT (W. P.). Pterylography of the Megapodii. Pp. 483-492; Plate 49. 1900.
26. HICKSON (SYDNEY J.) and HILES (ISA L.). Stolonifera and Alcyonacea. Pp. 493-508; Plates 50, 51. 1900.
27. ASHWORTH (J. H.). Report on the Xenidiæ. Pp. 509-528; Plates 52, 53. 1900.

Part V.

28. SHIPLEY (ARTHUR E.). Entozoa. Pp. 531-568; Plates 54-56. 1900.
29. PUNNETT (R. C.). South Pacific Nemertines. Pp. 569-584; Plates 57-61. 1900.
30. BORRADAILE (L. A.). Young of the Robber Crab. Pp. 585-590; with figures in the text. 1900.
31. PRATT (EDITH M.). Anatomy of *Neohelia porcellana*, Moseley. Pp. 591-602; Plates 62, 63. 1900.
32. BOULENGER (G. A.). New Blind Snake from Lifu, Loyalty Islands. Pp. 603-604; with figures in the text. 1900.
33. STEBBING (REV. T. R. R.). Crustacea from the South Seas. Pp. 605-690; Plates 64-74. 1900.

Part VI.

34. WILLEY (ARTHUR). Natural History of the Pearly Nautilus. Pp. 691-830.
 - I. Personal Narrative. With 11 text-figures.
 - II. Special Contribution. Plates 75-83, a map, and fifteen text-figures. 1902.
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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-five pounds and upwards.*

1790.

The Rt. Hon. Sir Joseph Banks, Bt.

Cost of Copper and engraving of the plates of the first volume of Transactions, 20 in number.

The same: Medallion of C. von Linné, by C. F. Inlander.

1796.

The same: a large collection of books.

1800.

Subscription towards the Charter, £295 4s. 6d.

Claudius Stephen Hunter, Esq., F.L.S. (Gratuitous professional services in securing the Charter).

1802.

Dr. Richard Pulteney.

His collections, and £200 Stock.

Aylmer Bourke Lambert, Esq.

Portrait of Henry Seymer.

1804.

The Rt. Hon. Sir Joseph Banks, Bt.

His collection of Insects.

1807.

Richard Anthony Salisbury, Esq.

Portrait of Daniel Solander, by J. Zoffany.

1811.

The Rt. Hon. Sir Joseph Banks, Bt.

His collection of Shells.

Mrs. Pulteney.

Portrait of Dr. R. Pulteney, by S. Beach.

1814.

Joseph Sabine, Esq.

Portrait of C. von Linné, after A. Roslin, reversed.

Dr. John Sims.

Portrait of Dr. Trew.

1818.

Subscription of £215 6s. for Caley's Zoological Collection.

1819.

The Medical Society of Stockholm.

A medallion of Linnæus in alabaster.

1822.

Bust of Sir Joseph Banks, Bt., by Sir F. Chantrey, R.A.
Subscription of the Fellows.

1825.

The late Natural History Society.
£190, 3½ Stock.

Bust of Sir James Edward Smith, P.L.S., by Sir F. Chantrey,
R.A., by Subscribers.

1829.

Subscription for the purchase of the Linnean and Smithian
Collections, £1593 8s.

1830.

Sir Thomas Grey Cullum, Bt.
£100 Bond given up.

1832.

The Honourable East India Company.
East Indian Herbarium (Wallichian Collection).

1833.

Subscription for Cabinets and mounting the East Indian Herbarium,
£315 14s.

1835.

Subscription portrait of Robert Brown, by H. W. Pickersgill, R.A.

1836.

Subscription portrait of Edward Forster, by Eden Upton Eddis.
Subscription portrait of Archibald Menzies, by E. U. Eddis.

1837.

Subscription portrait of Alexander MacLeay, by Sir Thomas
Lawrence, P.R.A.

1838.

Collections and Correspondence of Nathaniel John Winch.
Portrait of Dr. Nathaniel Wallich, by John Lucas, presented by
Mrs. Smith, of Hull.

1839.

Subscription portrait of William Yarrell, by Mrs. Carpenter.

1842.

David Don: herbarium of woods and fruits.
Archibald Menzies: bequest of £100, subject to legacy duty.
Portrait of John Ebenezer Bicheno, by E. U. Eddis, presented by
Mr. Bicheno.

1843.

Subscription in aid of the funds of the Society, £994 3s.
Subscription portrait of Sir William Jackson Hooker, by S. Gambardella.

1845.

Microscope presented by Subscribers.

1846.

Joseph Janson: £100 legacy, free of duty, and two cabinets.

1847.

[Bequest of £200 in trust, by Edward Rudge; declined for reasons set forth in Proceedings, i. pp. 315-317.]

1849.

Portrait of Sir J. Banks, Bt., by T. Phillips, R.A., presented by Capt. Sir E. Home, Bt., R.N.

1850.

Subscription portrait of the Rt. Rev. Edward Stanley, D.D., Bishop of Norwich, by J. H. Maguire.

1853.

Portrait of Carl von Linné, after A. Roslin, by L. Pasch, presented by Robert Brown.

Pastel portrait of A. B. Lambert, by John Russell, presented by Robert Brown.

1854.

Professor Thomas Bell, £105.

1857.

Subscription portrait of Prof. T. Bell, P.L.S., by H. W. Pickersgill, R.A.

Thomas Corbyn Janson: two cabinets to hold the collection of fruits and seeds.

Pleasance, Lady Smith: Correspondence of Sir J. E. Smith, in 19 volumes.

1858.

Subscription portrait of Nathaniel Bagshaw Ward, by J. P. Knight.

Richard Horsman Solly, £90 after payment of Legacy Duty.

Subscription for removal to Burlington House, £1108 15s.

Biography of Carl von Linné, and letters to Bishop Menander, presented by Miss Wray.

Dr. Horsfield's Javan plants, presented by the Court of Directors of the Hon. East India Company.

Dr. Ferdinand von Mueller's Australian and Tasmanian plants, including many types.

1859.

Books from the library of Robert Brown, presented by J. J. Bennett, Sec.L.S.

Robert Brown: bequest of two bonds given up, £200.

1861.

Subscription bust of Robert Brown, by Peter Slater.

Collection of birds' eggs, bequeathed by John Drew Salmon, F.L.S.

1862.

The Linnean Club: presentation bust of Prof. T. Bell, by P. Slater.

1863.

Subscription portrait of John Joseph Bennett, by E. U. Eddis.

1864.

Beriah Botfield, Esq.: Legacy, £40 less Duty.

1865.

Executors of Sir J. W. Hooker, £100.

George Bentham, Esq.: cost of 10 plates for his "Tropical Leguminosæ," Trans. vol. xxv.

1866.

Dr. Friedrich Welwitsch: Illustrations of his 'Sertum Angolense,' £130.

1867.

George Bentham, Esq.: General Index to Transactions, vols. i.-xxv.

Royal Society: Grant in aid of G. S. Brady on British Ostracoda, £80.

1869.

Carved rhinoceros horn from Lady Smith, formerly in the possession of Carl von Linné.

1874.

Subscription portrait of George Bentham, by Lowes Dickinson.

George Bentham, Esq., for expenditure on Library, £50.

1875.

Legacy from James Yates, £50 free of Duty.

„ „ Daniel Hanbury, £100 less Duty.

1876.

Legacy of the late Thomas Corbyn Janson, £200.

„ „ „ Charles Lambert. £500.

George Bentham, Esq.: General Index to Transactions, vols. xxvi.-xxx.

1878.

Subscription portrait of John Claudius Loudon, by J. Linnell.

Subscription portrait of Rev. Miles Joseph Berkeley, by James Peel.

1879.

Rev. George Henslow and Sir J. D. Hooker: Contribution to illustrations, £35.

1880.

The Secretary of State for India in Council: cost of setting up Dr. Aitchison's paper, £36.

1881.

George Bentham, Esq., special donation, £25.

The same: towards Richard Kippist's pension, £50.

Portrait of Dr. St. George Jackson Mivart, by Miss Solomon;
presented by Mrs. Mivart.

1882.

Executors of the late Frederick Currey: a large selection of books.
Subscription portrait of Charles Robert Darwin, by Hon. John Collier.

The Secretary of State for India in Council: Grant for publication
of Dr. Aitchison's second paper on the Flora of the Kurrum
Valley, £60.

1883.

Sir John Lubbock, Bt. (afterwards Lord Avebury).

Portrait of Carl von Linné, ascribed to M. Hallman.

Philip Henry Gosse, Esq.: towards cost of illustrating his paper,
£25.

Royal Society: Grant in aid of Mr. P. H. Gosse's paper, £50.

Sophia Grover, Harriet Grover, Emily Grover, and Charles Ehret
Grover: 11 letters from Carl von Linné to G. D. Ehret.

1885.

Executors of the late George Bentham, £567 11s. 2d.

Subscription portrait of George Busk, by his daughter Marian
Busk.

1886.

A large selection of books from the library of the late Dr. Spencer
Thomas Cobbold (a bequest for a medal was declined).

Sir George MacLeay, Bt.: MSS. of Alexander MacLeay and
portrait of Rev. William Kirby.

1887.

William Davidson, Esq.: 1st and 2nd instalments of grant in aid
of publication, £50.

Francis Blackwell Forbes, Esq., in aid of Chinese Flora, £25.

1888.

The Secretary of State for India in Council: Grant in aid of
publication of results of the Afghan Boundary Delimitation
Expedition, £150.

Dr. J. E. T. Aitchison, towards the same, £25.

Trustees of the Indian Museum: Mergui Archipelago report, for
publication in Journal, £135.

Dr. John Anderson, for the same, £60.

Wm. Davidson, Esq.: 3rd and last instalment, £25.

Sir Joseph Hooker: (1) Series of medals formerly in possession
of George Bentham; (2) Gold watch, key, and two seals
belonging to Robert Brown.

1889.

Bronze copy of model for Statue of C. von Linné, by J. F. Kjellberg ;
presented by Frank Crisp, Esq.

1890.

The Secretary of State for India in Council : Grant for Delimitation
Expedition report, £200.

Oak table for Meeting Room, presented by Frank Crisp, Esq.

Subscription portrait of Sir Joseph Dalton Hooker, K.C.S.I., by
Hubert Herkomer, R.A.

Executors of the late John Ball, Esq. : a large selection of books.

An anonymous donor, £30.

Colonel Sir Henry Collett, K.C.B., towards the publication of his
Shan States collections, £50.

1891.

Subscription portrait of Sir John Lubbock, Bt. [Lord Avebury]
by Leslie Ward.

George Frederick Scott Elliot, Esq., towards cost of his Madagascar
paper, £60.

1892.

Dr. Richard Charles Alexander Prior : for projection lantern, £50.

1893.

The Executors of Lord Arthur Russell : his collection of portraits
of naturalists.

Electric light installation : cost borne by Frank Crisp, Esq.

1894.

Algernon Peckover, Esq. : Legacy, £100 free of Duty.

Miss Emma Swan : " Westwood Fund," £250.

1896.

Clock and supports in Meeting Room, presented by Frank Crisp,
Esq.

1897.

William Carruthers, Esq. : Collection of engravings and photo-
graphs of portraits of Carl von Linné.

Royal Society : Grant towards publication of paper by the late
John Ball, £60.

Subscription portrait of Professor George James Allman, by
Marian Busk.

1898.

Sir John Lubbock, Bt. : Contribution towards his paper on
Stipules, £43 14s. 9d.

Royal Society : Contribution towards F. J. Cole's paper, £50.

" " " " Murray & Blackman's paper,
£80.

" " " " Elliot Smith's paper, £50.

" " " " Forsyth Major's paper, £50.

1899.

A. C. Harmsworth, Esq. [Lord Northcliffe]: Contribution towards cost of plates, £43.

Royal Society: Contribution towards Mr. R. T. Günther's paper on Lake Urmi, £50.

1901.

Hon. Charles Ellis, Hon. Walter Rothschild, 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.

Supplementary Royal Charter: cost borne by Frank Crisp, Esq. (afterwards Sir Frank Crisp).

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 is for the façade of the new building for the Royal Academy of Science, Stockholm.

Miss Sarah Marianne Silver, 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.

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- Lamb, C. G., Lonchaidæ, Sapromyzidæ, Ephyrdræ, Chloropidæ, and Agromyzidæ, of the Seychelles, 69.
- Lankester, Sir E. Ray, letter from, concerning "The Field," read, 12.
- Lapland Drum, *see* Jackson, Dr. B. D.
- Larter, Miss C. E., admitted, 21; elected, 15; proposed, 10.
- Larvæ from Borneo exhibited (Moulton), 70.
- Laurie, R., elected, 6; proposed, 1.
- Lawson, Dr. A. A., Marine flora of St. Andrews, 9.
- Leechman, A., elected, 18; proposed, 15.
- Leguminosæ, seedling structure in the (Compton), 13.
- Librarian's report, 24.
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- Lindsay, Miss B., elected 8; proposed, 3.
- Linné, Carl von, his Lapland Drum, additional information concerning (Jackson), 12; on his cochineal insects (Jackson), 20.
- Linnean Herbarium, Recent investigation of the (Jackson), 20; Index to the (Jackson). Supplement, 1-152.
- Linnean Medal, recipient nominated, 19; presented to Dr. R. C. L. Perkins, 40.
- Lock, R. H., elected, 19; proposed, 16.
- Lonchaidæ, Sapromyzidæ, Ephyrdræ, Chloropidæ, and Agromyzidæ of the Seychelles (Lamb), 69.
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- Macnamara, N. C., Mutations in Fox-glove plants, 4-6.
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- Marine flora of St. Andrews (Lawson), 9.
- Martin, Dr. J., exhibited microscope-slides of Polycistina, 18.
- Maw, G., deceased, 21; obituary, 62.
- Medal, Crisp, presented to Capt. Meek, 39.
- , Linnean, presented to Dr. R. C. L. Perkins, 40.
- Meek, Prof. A., admitted, 67; on the Development of the Cod, *Gadus morrhua*, 67.
- Meek, Capt. C. F. U., Crisp Award and Medal presented to, 39; Correlation of Somatic Characters, 70.
- Michael, A. D., nominated Scrutineer, 15.
- Milletia*, Revision of the genus (Dunn), 70.
- Monckton, H. W., appointed V.-P., 67; elected Councillor and Treasurer, 25.
- Moore, Sir F. W., admitted, 21; elected, 6; proposed, 1.
- Morley, C., Ichneumonidæ of the Seychelles, 10.
- Moss, Dr. C. E., elected, 18; proposed, 15.
- Mosses of New Zealand (Dixon), 6.
- Moulton, J. C., admitted, 68; exhibited Trilobites-like larvæ from Borneo, 70.
- Müller, Rev. J. S., elected, 67; proposed, 19.
- Murie, Dr. J., exhibited *Crepidula fornicata*, 2.
- Mutation problem in *Oenothera* (Gates), 3.
- Nannorrhops Ritchiana*, H. Wendl., seeds received from Dr. Henderson, distributed, 9.
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- Oenothera*, mutation problem in (Gates), 3.
- Ogilvie-Farquharson, *see* Farquharson.
- Oke, A. W., nominated Scrutineer, 25.
- Oldham, C., on the diminution of pigeons in London, 11.
- Oliver, Prof. F. W., communication by (Prankerd), 20; elected Councillor, 25.
- Oman, J. C., deceased, 21.
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- Palæozoic Ferns, *see* Scott, Dr. D. H.
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- Pearse, Miss E., exhibited living Phasmidae, 17.
- Pegler, Miss A., elected Associate, 13; proposed, 9.
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- Perkins, Dr. R. C. L., to receive Linnean Medal, 19; Linnean Medal presented to, 40.
- Phasmidae, living, exhibited (Dendy, Pearse), 17; Orthoptera-Phasmidae of the Seychelles (Bolivar and Ferrière), 17.
- Phillips, Miss E. M., exhibited water-colour drawings of Barbados flora, 15.
- Phillips, E. P., elected, 67; proposed, 19.
- Phyllody in *Trifolium repens*, exhibited (Rathbone), 17; note on the exhibit, 79.
- Phyllotoma aceris*, *see* Dendy, Prof. A.
- Phytogeographical Excursion, *see* Druce, G. C.
- Phytoplankton periodicity (W. & G. S. West), 17.
- Pigeons, P. Scherdlin on their diminution in Strassburg, 11.
- Poa trivialis*, a viviparous, exhibited (Rendle), 7.
- Polycistina, microscope-slides exhibited (Mastin), 18.
- Porter, Dr. Annie, admitted, 67; elected, 6; proposed, 1.
- Portugal, *see* Dixon, H. N.
- Poulton, Prof. E. B., appointed Vice-Presidents, 67; elected President and Councillor, 25; read alterations in Bye-Laws, 67; received Linnean Medal on behalf of Dr. Perkins, 40.
- Prankerd, Miss T. L., Structure of *Lagenostoma ovoides*, Will., 20.
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- Proliferation in rambler rose, exhibited (Silleen), 68.
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- Rathbone, Miss M., exhibited phyllody in *Trifolium repens*, 17. — note on the exhibit, 79; exhibited thick stem of *Hedera Helix*, 68.
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- Regan, C. T., New Fishes from Aldabra, 10.
- Reid, C., Vote of thanks for Address, seconded by, 39.
- Reid, Mrs. E. M., admitted, 68; elected, 67; proposed, 18.
- Rendle, Dr. A. B., Councillor retired, 25; elected Auditor, 18; exhibited a viviparous *Poa trivialis*, Linn., 7; dissected leaf-form of *Cochlearia Armoracia*, 8.
- Rhizopoda, Freshwater, of U.S.A. and Seychelles (Wailes), 20.
- Ridewood, Dr. W. G., elected Councillor, 25.
- Ridley, H. N., elected Councillor, 25.
- Rose, *see* Rambler rose.
- Rothschild, Hon. N. C., elected Auditor, 18.
- Row, R. W. H., on larvæ of a Saw-fly, 70.
- St. Andrews, its marine flora (Lawson), 9.
- Salmon, C. E., exhibited an abnormal *Orchis*, 13.
- Samuel, Miss M., admitted, 68; elected, 15; proposed, 10.
- Sands, W. N., proposed, 68.
- Sapromyzidæ, *see* Lamb, C. G.
- Saunders, Miss E. R., appointed V.-P., 67; elected Councillor, 25.

- Saw-fly, cocoons of larvæ of a, exhibited (Dendy and Row), 69.
- Sayce, O. A., deceased, 8, 21; obituary, 63.
- Scherdlin, P., letter from, on the pigeons of Strassburg Cathedral, 11.
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- Scott, Dr. D. H., appointed V.-P., 67; on *Botrychioxylon paradoxum*, a Palæozoic Fern with Secondary Wood, 19; elected Councillor, 25; on death of Sir Joseph Hooker, 7; on death of Prof. Strasburger, 24; on variations in foliage, 6; on resignation of Zoological Secretary (Prof. A. Dendy), 25; on the Palæozoic Fern *Zygopteris Grayi*, Will., 2; Presidential Address, 26-39; nominated Scrutineers, 15, 25; read alterations in the Bye-Laws, 19.
- Scott, Hugh, Coleoptera of the Seychelles, 69.
- Scrutineers appointed, 15, 25.
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- Seychelles, Aldabra, etc.:—Coccinellidæ (Sicard), 69; Coleoptera (Scott), 69; Ferns (Christensen), 70; Fourmis (Forel), 10; Freshwater Rhizopoda (Wailes), 20; Ichneumonidæ (Morley), 10; Lonchæidæ, Sapromyzidæ, Ephydridæ, Chloropidæ, and Agromyzidæ (Lamb), 69; new Fishes (Regan), 10; Orthoptera-Phasmidæ (Bolivar & Ferrière), 17; Saltatorial Orthoptera (Bolivar), 69; Sciariidæ (Enderlein), 10; Tipulidæ (Edwards), 10.
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- Sherborn, C. D., elected Associate, 15; proposed, 10.
- Sicard, Dr. A., Coccinellidæ des Seychelles, 69.
- Sillem, C., exhibited proliferation in rambler rose, 68.
- Sim, T. R., withdrawn, 24.
- Sladen Expedition, *see* Percy Sladen Expedition.
- Slater, M. B., withdrawn, 24.
- "Slipper Limpet" exhibited (Murie), 2.
- Smith, A. M., admitted, 13; elected, 6; proposed, 1.
- Snail, hybrid, exhibited (Bullen), 10.
- Socin, *see* Christ-Socin.
- Somatic characters, correlation of (Meek), 70.
- South Africa, *see* Stapf, Dr. O.
- Sponges, *see* Glass-sponges.
- Stapf, Dr. O., communication by (Domin), 20; elected Councillor and Secretary, 25; exhibited Cactoid Euphorbias from S. Africa, 16.
- Stayner, F. J., proposed, 68.
- Stead, D. G., elected, 15; proposed, 10.
- Stebbing, Rev. T. R. R., Historic doubts about *Taunthompsonia*, 16, 78; nominated Scrutineer, 25; Vote of thanks for Address moved by, 39.
- Stephens, Miss E. L., elected, 6; proposed, 1.
- Stone, H., withdrawn, 24.
- Stopes, Dr. Marie, exhibited *Cardamine pratensis* with bulbils, 68.
- Strasburger, Prof. E., deceased, 21, 24; obituary, 64-66.
- Strassburg, *see* Scherdlin, P.
- Synagoga mira* (Norman), 70.
- Tagart, F., deceased, 21; obituary, 66.
- Thames Valley, *see* Friend, Rev. H.
- Thomas, D., withdrawn, 24.
- Thomas, Miss E. N., elected Councillor, 25.
- Thompson, H. S., exhibited drawings of Alpine flowers by G. Flemwell, 69.
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- Tipulidæ of the Seychelles (Edwards), 10.
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- Trilobite-like larvæ from Borneo, exhibited (Moulton), 70.
- Turkestan, *see* Kashmir.
- Turnbull, J. G., elected, 69; proposed, 21.
- Turner, Miss E. L., showed lantern-slides of Bittern discovered in Norfolk, 9.
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- Wailles, G. H., Freshwater Rhizopoda of U.S.A. and Seychelles, 20.
- Wakefield, Miss E. M., admitted, 8; elected, 6; proposed, 1.
- Walker, A. O., Distribution of *Elodea canadensis*, Michx., in the British Isles, 2, 71-77; exhibited *Clerodendron trichotomum*, Thunb., in fruit, 3.
- Warburton, C., Acarina of the Percy Sladen Expedition, 70.
- Water-colour drawings of Barbados flora, exhibited (Phillips), 15.
- Waterfall, C., admitted, 1.
- Webb, W. M., exhibited *Lygidium hypnorum*, 20.
- West, W. & G. S., Periodicity of Phytoplankton, 17.
- White canaries exhibited (Palmer), 69.
- Whitwell, W., withdrawn, 24.
- Williams, F. N. on exhibitions at the Meetings, 10.
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- Wilmott, A. J., elected, 6; proposed, 1.
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- Worsdell, W. C., showed lantern-slides of abnormal Fungi, 8.
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INDEX
TO THE
LINNEAN HERBARIUM,
WITH
INDICATION OF THE TYPES OF SPECIES MARKED
BY CARL VON LINNÉ.

BY
BENJAMIN DAYDON JACKSON,
KNIGHT OF THE ROYAL SWEDISH ORDER OF THE POLAR STAR,
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GENERAL SECRETARY OF THE LINNEAN SOCIETY OF LONDON.

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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.

Though the original project could not be carried out, it was not forgotten, and last autumn 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 following pages are 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, such as *Flustra*, have not been catalogued specifically.

B. DAYDON JACKSON.

October, 1912.

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 afforded is often meagre, and usually absent. 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, additional of the forms were numbered on, but put nearest to their allies, disregarding their numerical order; this enlarged numbering is 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 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 185 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. 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 *Athæa*, *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 tickets or memoranda from him in the herbarium. 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 Löfving 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.
- 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.
- BJELKE, Baron STEN CARL (1709-1753). Visited Russia in 1744, 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.
- 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 plâtär," 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; *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.
- 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 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 Hartecamp, 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 thick good paper, which has been cut down from the original size, 18" x 11" (45.5 cm. x 28 cm.) to the small size noted on p. 7. 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 the 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.
- CRONSTEDT, *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 FREDRIK (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 GRÉGOIRE (d. 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. This name is attached to a few plants in the herbarium, sent by Gessner in 1763, as collected by Dick and Fuslin in the Rhætian Alps.
- DILLENIIUS, JOHANN JAKOB (1687-1747). "Many from the garden at Oxford."
- DUCHESNE, ANTOINE NICHOLAS (1747-1827). Specimens of *Fragaria*, named.
- 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, —. (d. 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 (1733-1774). Sent plants from Russia, also from Gotland.
- FERBER, JOHAN JAKOB (1743-1790). Specimens sent during his travels in the South of Europe.
- FORSSKÅHL, JOHAN CHRISTIAN (1725-1756), brother of the following, in spite of the varied spelling; sent plants from Finland.
- FORSSKÅL, PEHR (1736-1768). 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,' Havniæ, 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.
- GABRIEL, *Frater* [*Baron DE LATOURDAIGNES?*] (fl. 1757-1768). Plants sent from Aix in Provence; the collector was a Capuchin monk.
- 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 (1730-1791). Plants, etc. from Carolina, principally through Collinson and John Ellis.
- GERARD, LOUIS (1733-1819). Provençal plants.
- GERBER, TRAUOGOT (fl. 1739-1741), Prefect of the Moscow Medical Garden; drew up lists of plants observed by the rivers Volga and Don, which lists were sent by Baron Bjelke to Linné, and some of the plants by Prince Demidoff.
- 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 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 from Virginia.
- GUNNER, JOHAN ERNST (1718-1773), bishop of Trondhjem, and author of 'Flora norvegica'; a few marine algæ sent to Linné.
- 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).
- HEBENSTREIT, JOHANN ERNST (1702-1757). Plants from the East.
- HEINZELMANN, JOHANN GOTTFRIED (fl. 1732). Historiographer to the Russian government; recorded plants from Astrachan.
- 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.
- JUSSIEU, 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."
- KLEYNHOF, 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.
- LAGERSTRÖM, MAGNUS (d. 1759). Engaged in the East Indian trade; communicated some Asiatic rarities to Linné.
- LATOURETTE, MARC ANTOINE LOUIS CLARET DE (1729-1793). A few 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.
- LERCHE, JOHAN JAKOB (1703-1780). Persian plants; some from Astrachan were received in 1735.
- LEYSER, FRIEDERICH WILHELM VON (1731-1815). Sent a few plants from Central Europe.
- LINNÉ, CARL VON (1707-1778). See separate account on p. 17.
- 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; an account of these must be reserved for a future occasion.
- 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). Spitsbergen.
- 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.
- 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.
- 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.
- RATHGEB, JOSEPH VON (fl. 1744) of 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.
- 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 (1736–1782). 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.

SWARTZ, 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.

TULBAGH, C. RIJK (d. 1771). Governor of the Cape possessions, 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.

WILCKE, SAMUEL GUSTAV [?] (fl. 1760-1765; d. 1791).

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, 'Be ye my teachers,'" Fries, "Linné," ii. Bil. xviii. 9.

The citations in the foregoing are mainly from Linné's own autobiography in the 'Egenhändig 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. 22).

LINNÉ AS A COLLECTOR.

Thus far we have considered the contributors 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 autumn 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 *Linnæa 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

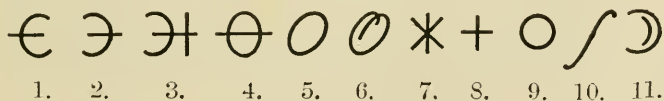
some cases the native plant is represented only by a specimen from a foreign country.

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 ∇ , 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* ∇ : *tica* (Hartman, p. 28) or *Veronica Anagall.* ∇ (Sp. Pl. ed. 1, p. 12), the latter when written out being *Veronica Anagallis-aquatica*, this pre-Linnean name appearing in the synonymy. *Scandix Pecten* ♀ (Sp. Pl. ed. 1, p. 256) is now invariably written in full as *Scandix 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, but 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:—



1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11.

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. Falek, 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 Θ , it cannot stand for ϕ , 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* 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 D, which means silver to the mineralogist, and may refer to a silvery appearance of the specimen.

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, but 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.

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 memorandum begging that the herbarium should be kept from harm by mice or moths, that no naturalist 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; 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*

sphaerocephalum, *Senecio incanus* and *Enanthe 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, Upsala 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, Royen, 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.

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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 Suecica,' 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. *Plantae Martino-Burserianae*; *resp.* R. Martin. (Am. Acad. i. 141-171.)
- *Hortus Upsaliensis*, *resp.* S. Naucler. (Am. Acad. i. 197, 198.)
- 1748. *Hortus Upsaliensis*, tom. i. (et unic.) præf. p. [2].
- 1750. *Plantæ Canitschatcensenses rariores*, *resp.* J. P. Halenius. (Am. Acad. ii. 336-363.)
- 1751. *Novæ Plantarum genera*, *resp.* L. J. Chenon. (Am. Acad. iii. 8-25.)
- 1753. *Species Plantarum*, præf. p. 4 [-5].
- 1755. *Centuria prima plantarum*, *resp.* A. J. Juslenius. (Am. Acad. iv. 263-296.)

1756. *Centuria secunda plantarum, resp.* E. Torner. (Am. Acad. iv. 298-332.)
- *Flora palaestina, resp.* B. J. Strand. (Am. Acad. iv. 447-467.)
1757. *Buxbaumia. Resp.* A. R. Martin. (Am. Acad. v. 79-84.)
1758. *Systema Naturæ.* Ed. X. Vol. i. praef. p. [2].
1759. *Flora capensis. Resp.* C. H. Wännman. (Am. Acad. v. 357, 358.)
- *Flora jamaicensis. Resp.* C. G. Sandmark. (Am. Acad. v. 375-388.)
- *Pugillus jamaicensium plantarum. Resp.* G. Elmgren. (Am. Acad. v. 389-413.)
1762. *Species Plantarum.* Ed. 2, praef. f. 4 verso, 5.
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1775. *Plantae surinamenses. Resp.* J. Alm. (Am. Acad. viii. 249-267.)
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1885. ÄHRLING, EWALD. *On Karl von Linné, Linné d.y., Linnean Society of London, Linnéska Institutet, Linnéska Samfundet, och Linnéska Samlingarna.* (Aftryck ur Nordisk Familjebok.) Stockholm, 1885. 13 pp. 8vo.

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EXPLANATION OF THE ABBREVIATIONS AND SIGNS
USED IN THE FOLLOWING PAGES.

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. C. 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. 1. 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 pp. 8-9. 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 now 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 are left for another opportunity, as are also the zoological lists which were brought to light during the preparation of this Index. 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.

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TO THE

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WITH

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ACROSTICHUM :—

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AEGINETIA :—

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Clavus.

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extinctorius.

finetarius.

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Georgii = *campestris* β

Georgii.

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mammosus.

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Cepa.
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Moly. 1.
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odorum.
oleraceum. 1.
orientale. MS.
pallens. 3.
paniculatum. 3.
parviflorum. 3.
Porrum.
ramosum. 1.
roseum. 3.
rotundum.
sativum.
Schoenoprasum. 1.
Scorodoprasum. 1.
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sibiricum = *Schoenoprasum*.
spherocephalon = *descendens*.
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 — var. *vera*.
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 — var. *margaritifera*.
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ALOE :—

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deltoideum. 3.
gemonense. 3.
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hyperboreum. 1.
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minimum. 3.
montanum. 1.
saxatile. 1.
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spinosum. 2.
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Vesicaria.

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Blitum. 2.
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flavus. 3.
gangeticus.
gracizans. 1.
hybridus. 1.
hypochondriacus. 1.
lividus.
mangostanus. 3.
melancholicus. 1.
oleraceus. 3.
paniculatus. 3.
polygamus. 3.
polygonoides. 3.
retroflexus. 1.
sanguineus. 3.
scandens. Suppl.
spinosus. 3.
tricolor. 1.
tristis.
viridis. 3.

AMARYLLIS. 416.

Atamasca = seq.
Atamasco.
Belladonna.
capensis.
ciliaris.
dubia.
formosissima. 1.
guttata.
longifolia.
lutea. 3.
orientalis.
reginae. 3.
sarniensis. (m. L. f.)
tenella. MS.
undulata. 3.
zeylanica = *Crinum zey-*
lanicum.

- AMBROSIA. 1114.**
 artemisifolia. 1.
 elatior. 1.
 maritima.
 trifida. 1.
AMBROSINIA. 1078.
Bassii (pl.).
AMELLUS. 1023.
 fruticosus. MS.
 Lychnitis. 3.
 umbellatus. 3.
AMETHYSTEA. 37.
 caerulea. 1.
AMMANNIA. 156.
 baccifera. 1.
 latifolia. 1.
 octandra. Suppl.
 ramosior. 1.
AMMI. 341.
 copticum. 3.
glaucifolium.
 majus. 1.
AMOMUM. 3.
 Cardamomum. 1.
Granum-Paradisi.
 Zerumbet. 1.
 Zingiber. 1.
AMORPHA. 894.
 fruticosa. 1.
AMYGDALUS. 639.
 communis. 2.
 nana. 1.
 Persica. 1.
 pumila. 3.
AMYRIS. 490.
 balsamifera. 3. (m. Sol.)
 Elemifera. 3.
gileadensis.
maritima.
Opobalsamum.
Protium.
sylvatica.
toxicifera.
ANABASIS. 316.
 aphylla. 1.
 foliosa. 1.
 spinosissima. Suppl.
 tamariscifolia. 3.
- ANACARDIUM. 534.**
 occidentale. 3.
ANACYCLUS. 1015
aureus.
 creticus. 1.
 nobilis. MS. (=aureus,
fide Sm.)
orientalis.
 valentinus. 1.
ANAGALLIS. 208.
 arvensis. 1.
capensis.
 latifolia. 1.
 linifolia. 3.
 Monelli. 1.
 tenella.
ANAGYRIS. 523.
 foetida. 1.
ANASTATICA. 821.
 heirochuntica. 2.
 syriaca.
ANCHUSA. 182.
 angustifolia. 1.
 lanata. 3.
 officinalis. 1.
orientalis = *Lithospermum orientale.*
 sempervirens. 1.
 tinctoria.
 undulata. 1.
 virginiana.
virginica = *præc.*
ANDRACHNE. 1155.
 fruticosa. 1.
 Telephioides. 1.
ANDROMEDA. 563.
arborea.
 anastomosans. Suppl.
bryantha.
 caerulea. 1.
 calyculata. 1.
 Daboëcia. 3.
 droseroides.
 hypnoides. 1.
 mariana. 1.
 paniculata. 1.
 Polifolia. 1.
 racemosa. 1.
 e*

ANDROMEDA :—

tetragona. 1.

ANDROPOGON. 1211.

alopecuroides. 1.

barbatum.

bicornis. 1.

caricosum.

contortum.

cymbarium.

distachyon. 1.

divaricatum. 1.

fasciculatum. 1.

Gryllus. 3.

hirtum. 1.

insulare. 3.

Ischaemum. 1.

muticum.

Nardus.

nutaus. 1.

pertusum = *Holcus pertusum*.

polydactylon. 3.

prostratum.

quadrivalve.

Ravennae.

Schoenanthus. 1.

squarrosum.

virginicum. 1.

ANDROSACE. 197.

carnea. 3.

elongata. 3.

Halleri = *carnea*.

lactea. 3.

maxima. 1.

septentrionalis. 1.

villosa. 1.

ANDRYALA. 956.

conyzoides. MS.

integrifolia.

lanata. 3.

ragusina. 3.

sinuata. 1. [= *integrifolia*.]

ANEMONE. 710.

apennina. 3.

alpina. 3.

baldensis.*canadensis*.

ANEMONE :—

capensis = *Atragene capensis*.

coronaria. 1.

decapetala. 3.

dichotoma. 1.

fasciculata.

Hepatica. 1.

hortensis.

malvifolia = *palmata*.

narcissiflora. 1.

nemorosa. 1.

palmata. 3.

patens. 1.

pennsylvanica.

philadelphus. MS.

pratensis. 1.

Pulsatilla. 1.

quinquefolia.

ranunculoides. 1.

sibirica. 1.

sulphurea.

sylvestris. 1.

thalictroides. 1.

trifolia. 3.

vernalis. 1.

virginiana. 1.

ANETHUM. 371.

Foeniculum. 1.

graveolens. 1.

patulum. MS.

segetum.

ANGELICA. 354.

Archangelica. 3.

atropurpurea. 3.

lucida.

sylvestris. 1.

verticillaris. (m. Dahl).

ANGURIA. 1092.

lobata.

pedata.*trifoliata*.*trilobata*.

ANONA. 708.

africana.

asiatica.

discreta.

glabra.

ANONA :—

- hexapetala. Suppl.
- muricata.
- obscura.
- palustris.
- reticulata.
- squamosa.
- triloba. 3.

ANTHEMIS. 1016.

- afra*.
- alpina. 3.
- altissima. 1.
- americana. (m. L. f.)
- arabica. 1.
- arvensis. 1.
- Bellidiastrum* = *Osmites*
Bellidiastrum.
- chia*.
- Cota. 1.
- Cotula. 1.
- cretica*.
- fruticosa*.
- italica*.
- leucantha* = *Osmites* *leucantha*.
- maritima. 1.
- millefolia* = *Chrysanthemum* *millefoliatum*.
- mixta*.
- montana*.
- nobilis. 1.
- peregrina.
- Pyrethrum. 1.
- repanda*.
- tinctoria. 1.
- var. *Triumfetti*.
- tomentosa*. 3.
- valentina. 1.

ANTHERICUM. 432.

- alooides*.
- annuum.
- asphodeloides. 3.
- calyculatum. 1.
- frutescens*.
- graecum. 3.
- hispidum*.
- Liliago. 3.
- Liliastrum. 3.

ANTHERICUM :—

- ossifragum. 1.
- planifolium.
- ramosum. 1.
- revolutum*.
- serotinum. 3.
- spirale.
- undulatum [*Jacq.*].

ANTHISTIRIA. 74. [= *Pomereulla*, *Linn. f.*]

- equitans. [= *P. Cornucopiae*, *Linn. f. fide Sm.*]

ANTHOCEROS. 1272.

- laevis.
- multifidus*.
- punctatus*.

ANTHOLYZA. 60.

- aethiopica. 3.
- cepacea*.
- Cunonia. 3.
- maura*.
- Meriana. 3.
- Merianella*.
- Meriana* = *Meriana*.
- ringens.

ANTHOSPERMUM. 1233.

- aethiopicum. 1.
- ciliare. 3.
- dioicum. (m. L. f.)
= herbaceum, *Linn. f.*

ANTHOXANTHIUM. 46.

- indicum*.
- odoratum. 1.
- paniculatum*.

ANTHYLLIS. 897.

- aspalathoides*.
- Barba-Jovis. 1.
- capensis. MS.
- cornicina. 1.
- cytisoides. 2.
- Erinacea. 1.
- Gerardi*.
- Hermannia* = seq.
- Hermanniae. 1.
- heterophylla. 3.
- involuta*.
- linifolia*.
- lotoides. 1.

ANTHYLLIS :—

- montana. 3.
- quinqueflora. Suppl.
- tetraphylla. 1.
- visciflora. Suppl.
- Vulneraria. 1.

ANTICHORUS. 487.

- depressus* (pl.).

ANTIDESMA. 1173.

- alexiteria. 1.

ANTIRRHINUM. 767.

- aegyptiacum.
- alpinum. 3.
- arvense. 1.
- Asarina. 1.
- bellidifolium. 1
- bicorne.
- bipunctatum. 1.
- canadense. 1.
- chalepense. 1.
- cirrhosum*.
- Cymbalaria. 1.
- dalmaticum. 1.
- Elatine. 1.
- genistaefolium. 1.
- glastifolium. MS.
- glaucum. 3.
- hastatum. MS.
- hirtum. 2.
- juncum. 3.
- Linaria. 1.
- var. Peloria.
- linarioides.
- linifolium. 3.
- majus. 1.
- minus. 1.
- molle. 1. = glaucum.
- monspessulanum. 1.
- multicaule. 1.
- organifolium. 1.
- Orontium. 1.
- papilionaceum*.
- pedunculatum. 3.
- Pelisserianum. 1.
- pilosum.
- pinnatum. Suppl.
- purpureum. 1.
- reflexum. 3.

ANTIRRHINUM :—

- repens. 3.
- sabulosum*. MS. [*cf.*
Hemimeris sabulosa,
Suppl.]
- saxatile. 3.
- sparteum. 1. = juncum.
- spurium. 1.
- supinum. 3.
- triornithophorum. 1.
- triphyllum. 1.
- triste. 3.
- villosum*.
- viscosum. 3.

APHANES. 167.

- arvensis. 1.

APHYLLANTHES. 418.

- monspeliensis. 1.

APIUM. 374.

- graveolens. 1.
- Petroselinum. 3.

APLUDA. 1213.

- aristata. 3.
- mutica. 1.
- Zeugites. 3.

APOCYNUM. 309.

- androsaemifolium. 1.
- cannabinum. 1.
- frutescens. 3.
- minutum. Suppl.
- reticulatum.
- venetum. 3.

APO[NO]GETON. 479.

- distachyon. (m. L. f.)
- monostachyon. (m.
L. f.)

AQUARTIA [Jacq.]. —

- aculeata* [Jacq.].

AQUILEGIA. 699.

- alpina*.
- canadensis. 1.
- viscosa*.
- vulgaris. 1.

AQUILICIA. 279.

- sambucina* (pl.).

ARABIS. 842.

- alpina*. 1.

ARABIS :—

- bellidifolia [*Jacq.*].
- canadensis. 1.
- capensis = *Heliophila*
- integrifolia.
- grandiflora. 1.
- Halleri*.
- hispida.
- lyrata. 3.
- pendula. 1.
- Thaliana. 1.
- Turrita. 1.

ARACHIS. 909.

- hypogaea. 2.

ARALIA. 394.

- arborea. 3.
- chinensis. 1.
- nudicaulis. 1.
- racemosa. 1.
- spinosa. 1.

ARBUTUS. 566.

- acadiensis.
- alpina. 1.
- Andrachne*.
- Unedo. 1.
- Uva-ursi. 1.

ARCTIUM. 964.

- Carduelis. 3.
- Lappa. 1.
- Personata. (m. L. f.)

ARCTOPUS. 1235.

- echinatus (pl.).

ARCTOTIS. 1036.

- acaulis.
- angustifolia.
- anthemoides. 3.
- aspera. 3.
- Calendula* = seq.
- calendulacea. 3.
- var. *coruscans*.
- var. *hypo-*
- chondriaca*.
- var. *superba* =
- A. superba*.
- var. *tristis* =
- A. tristis*.
- dentata. 3.
- paleacea. 3.

ARCTOTIS :—

- paradoxa. 3.
- plantaginea*.
- radicans*.
- superba.
- tenuifolia.
- tristis*.

ARDUINA. 265.

- bispinosa. 3.

ARECA. —

- Cathecu*.
- oleracea*.

ARENARIA. 585.

- balearica*.
- bavarica. 3.
- biflora. 3.
- ciliata. 3.
- fasciculata.
- grandiflora. 3.
- gypsophiloides. 3.
- hispida. 2.
- juniperina. 3.
- laricifolia. 1.
- lateriflora. 1.
- liniflora.
- lucida. MS.
- media. 3.
- montana. 3.
- mucronata*.
- multicaulis*.
- peplodes. 1.
- rubra. 1.
- var. *campestris*.
- var. *marina*.
- saxatilis. 1.
- serpyllifolia. 1.
- striata. 3.
- tenuifolia. 1.
- teretifolia. MS.
- tetraquetra. 2.
- triflora.
- trinervia. 1.
- verna. 3.

ARETHUSA. 1059.

- bulbosa. 1.
- Burmanni. MS. [=cili-
- aris.]
- capensis.

ARETHUSA :—

- ciliaris. Suppl.
- divaricata. 1.
- ophioglossoides. 2.

ARETIA. 196.

- alpina. 3.
- Halleri* = *Androsace*
carnea.
- helvetica.
- Vitaliana.

ARGEMONE. 670.

- armeniaca.
- mexicana. 1.
- pyrenaica.

ARISTIDA. 98.

- Adscensionis. 1.
- americana. 3. (m. Sol.)
- arundinacea.
- capensis. MS.
- plumosa. 3.

ARISTOLOCHIA. 1071.

- anguicida.
- arborescens.
- baetica. 3.
- bilabiata.
- bilobata.
- caudata.
- Clematitis. 1.
- erecta.
- hirsuta* = seq.
- hirta*.
- indica. 1. (m. Sol.)
- longa. 1.
- maurorum.
- maxima.
- odoratissima.
- peltata.
- pentandra.
- Pistolochia. 1.
- rotunda. 1.
- sempervirens. 1.
- Serpentaria. 1.
- trilobata. 3.

ARNICA. 1001.

- caffa.
- coronopifolia.
- crocea. 3.
- Gerbera. 3.

ARNICA :—

- maritima.
- montana. 3.
- var. *alpina*.
- piloselloides. (m. L. f.)
- scorpioides. 3.

ARTEDIA. 339.

- muricata* = *Daucus* *muri-*
catus.
- squamata. 2.

ARTEMISIA. 988.

- Abrotanum. 3.
- Absinthium. 1.
- aethiopica. 1.
- ambigua*.
- annua. 1.
- arborescens. 3.
- caerulescens*.
- campestris. 1.
- chinensis. 2.
- Contra.
- crithmifolia. 2.
- Dracunculus. 2.
- dubia. MS.
- glacialis. 3.
- integrifolia. 1.
- judaica*. 3.
- maderaspatana. 2.
- maritima. 1.
- minima. 2.
- nilotica* = *Cotula* *anthe-*
inoides.
- palsætina.
- palustris. 1.
- pontica. 1.
- rupestris. 1.
- Santonium. 1.
- tanacetifolia. 1.
- vermiculata.
- vulgaris. 1.

ARTOCARPUS. 1087.

- lobatus. (m. L. f.)

ARUM. 1079.

- arborescens.
- Arisarum. 1.
- auritum. 3. (m. Sol.)
- cannifolium.
- Colocasia. 1.

ARUM :—

- divaricatum. 3.
- Dracontium. 3.
- Dracunculus*.
- esculentum.
- hederaceum. 3.
- lingulatum. 3.
- macrorrhizon*.
- maculatum. 1.
- novum* [= *cannifolium*].
- ovatum. 1.
- pentaphyllum*.
- peregrinum*.
- proboscideum*.
- sagittae-folium*.
- Sequinum*.
- tenuifolium*.
- trilobatum*.
- triphyllum. 1.
- virginicum*.

ARUNDO. 97.

- arenaria. 1.
- Bambos. 1.
- Calamagrostis. 1.
- Donax. 1.
- epigeios. 1.
- Phragmites. 1.
- scriptoria* = A. Donax.

ASARUM. 608.

- canadense. 1.
- europaeum. 1.
- Hypocistis* = *Cytinus*
- Hypocistis*.
- virginicum*.

ASCLEPIAS. 310.

- amoena*.
- arborescens*.
- barbata. MS. (*cf.* undulata).
- carnosa. Suppl.
- crispa.
- curassavica. 4.
- decumbens*.
- dilatata. MS.
- exaltata* = *syriaca*.
- fruticosa. 1.
- gigantea. 1.
- Gutta.

ASCLEPIAS :—

- incarnata. 1.
- lactifera*.
- nigra. 1.
- nivea. 1.
- pubescens.
- purpurascens. 3.
- rubra*.
- sibirica. 1.
- syriaca*. 1. (m. L. f.)
- var. *exaltata*.
- tuberosa. 1.
- undulata.
- variegata*.
- verticillata. 1.
- villosa, sphalm. = pubescens.
- Vincetoxicum. 1.

ASCYRUM. 944.

- Crux-Andreae.
- Hypericoides ["angustifolium"].
- villosum*.

ASPALATHUS. 893.

- albens.
- anthylloides. 3.
- araneosa. 3.
- argentea.
- asparagoides. Suppl.
- astroites*.
- callosa.
- canescens.
- capitata.
- carnosa, *Berg.* = *thymifolia*.
- carnosa.
- chenopoda. 3.
- ciliaris.
- cretica*.
- Ebenus.
- ericifolia. 3.
- galioides, *Berg.* = *levigata*.
- galioides.
- genistoides.
- indica*.
- laxata.
- laevigata. MS.

ASPALATHUS :—

- lotoides. MS.
- mucronata. Suppl.
- nigra.
- orientalis.
- pilosa.
- pinnata.
- quinquefolia.
- retroflexa.
- spinosa. 3.
- thymifolia.
- tridentata.
- uniflora.
- verrucosa. 3.

ASPARAGUS. 434.

- acutifolius. 1.
- aethiopicus.
- albus. 1.
- aphyllus. 1.
- asiaticus.
- capensis. 3.
- declinatus.
- Draco = Dracaena
- Draco.
- falcatus. 3.
- graminifolius = Dracaena graminifolia.
- horridus.
- officinalis. 1.
- var. *altilis*.
- var. *maritimus*.
- retrofractus. 1.
- sarmentosus.
- tenuissimus.
- terminalis.
- verticillatus.

ASPERUGO. 189.

- aegyptiaca. 3.
- procumbens.

ASPERULA. 127.

- arvensis. 1.
- crassifolia. 3.
- cynanchica. 1.
- laevigata. 3.
- odorata. 1.
- pyrenaica. 3.
- rotundifolia.
- taurina. 1.
- tinctoria. 1.

ASPHODELUS. 431.

- capensis.
- fistulosus. 1. (pl.)
- luteus. 3.
- ramosus. 1.

ASPLENIUM. 1250.

- Adiantum-nigrum. 3.
- bifolium.
- capense.
- Ceterach. 3.
- cultrifolium.
- dentatum = A. Trichomanes-dentatum.
- erosum. 3.
- Hemionitis. 1.
- marginatum.
- marinum. 3.
- monanthemum. 3.
- monanthes = præc.
- Nidus. 1.
- nodosum.
- obtusifolium.
- Onopteris = A. Adiantum-nigrum.
- plantagineum. 3.
- plantaginifolium = præc.
- pygmaeum. 3.
- radicans.
- rhizophorum. 3.
- rhizophyllum. 2.
- Rhizophylla = præc.
- Ruta-muraria. 1.
- salicifolium. 1.
- Scolopendrium. 1.
- serratum. 3.
- squamosum.
- striatum. 3.
- Trichomanes. 1.
- Trichomanes-dentatum.
- Trichomanes-ramosum.
- trichomanoides = A. Trichomanes.

ASTER. 997.

- acris. 3.
- alpinus. 3.
- Amellus. 1.
- annuus. 1.
- aurantius.
- chinensis. 1.

ASTER :—

- concolor. 1.
 cordifolius. 1.
 crinitus. 3.
 divaricatus. 1.
 dumosus. 1.
 ericoides. 3.
 fruticosus. 1.
fruticulosus = *praec.*?
 grandiflorus. 3.
 hyssopifolius. 3.
 indicus. 3.
 laevis. 3.
 linariifolius. 1.
 linifolius. 1.
 macrophyllus. 3.
miser.
mutabilis. 1.
 Novae-Angliae. 1.
 Novi-Belgii. 1.
 odoratus. MS.
oppositifolius.
 polifolius. 3.
 puniceus. 1.
 reflexus. 3.
rigidus.
sedifolius = *acris.*
 sibiricus. 1.
 tardiflorus. 3.
 tataricus. Suppl.
 taxifolius.
 tenellus. 3.
 tenuifolius. 1.
 Tradescanti. 1.
 Tripolium. 1.
 undulatus. 1.
vernus.
zephyrinus = *poli-*
 folius.

ASTRAGALUS. 926.

- alopecuroides. 1.
 alpinus. 1.
 arenarius. 1.
 austriacus. 3.
 baeticus. 1.
biflorus = *Crotalaria*
 biflora.
 campestris. 1.
 canadensis. 1.

ASTRAGALUS :—

- capitatus.*
caprinus.
carolinianus.
 chinensis. 3.
 Christianus. 1.
 Cicer. 1.
 contortuplicatus. 1.
 depressus. 3.
 epiglottis. 1.
exscapus.
 galegiformis. 2.
 Glaux. 1.
 glycyphyllos. 1.
grandiflorus = *Hedy-*
 sarum argenteum.
 hamosus. 1.
hedysaroides = *Hedy-*
 sarum obscurum.
hypoglottis.
 incauus. 3.
 melilotoides. MS.
 microphyllus. 1.
 monspessulanus. 1.
montanus.
 Onobrychis. 1.
pentaglottis.
physodes.
 pilosus. 1.
 sesamens. 1.
 sinicus. 3.
Stella = *seq.*
 stellatus [*Gouan*].
 sulcatus. 1.
 syriacus. 1.
 tenuifolius. 3.
 Tragacantha. 1.
 tragacanthoides. 1.
tragoides.
 trimestris. 1.
 uliginosus. 1.
 uncatus. 3.
 uralensis. 1.
 verticillaris. (m. L. f.)
vesicarius.
- ASTRANTIA. 334.
 ciliaris. Suppl.
 major. 2.
 minor.

ASTRONIUM [Jacq.]
graveolens [Jacq.].

ATHAMANTA. 345.

annua.

Cervaria. 3.

chinensis. 1.

condensata. 3.

cretensis. 3.

Libanotis. 1.

Meum = *Aethusa Meum*.

Oreoselinum. 1.

sibirica. 1.

sicula. 3.

ATHANASIA. 986.

annua. 3.

canescens = *pubescens*.

capitata.

crenata.

crithmifolia.

dentata.

genistifolia. 3.

laevigata = *dentata*.

maritima. 3.

parviflora.

pubescens. 3.

squarrosa. 3.

trifurcata. 3.

ATRACYLIS. 971.

cancellata. 1.

ciliaris.

fruticosa.

gummifera. 1.

humilis. 1.

oppositifolia.

spinosissima. MS.

ATRAGENE. 711.

alpina. 1.

capensis. 3.

sibirica cf. *alpina*.

zeylanica.

ATRAPHAXIS. 462.

Polygonum. MS.

spinosa. 1.

undulata. 1.

ATRIPLEX. 1221.

glauca.

Halimus. 1.

hastata. 1.

ATRIPLEX :—

hortensis. 1.

laciniata. 1.

littoralis. 1.

marina.

patula. 1.

pedunculata. 2.

portulacoides. 1.

rosea.

sibirica. 3.

tatarica. 1.

ATROPA. 246.

arborescens.

Belladonna. 1.

frutescens. 1.

guineense. MS.

Mandragora. 3.

physalodes. 1.

solanacea = *guineense*.

AVENA. 95.

bromoides. 3.

elatior. 1.

fatua. 1.

flavescens. 3.

fragilis. 1.

hispida. Suppl.

Loeflingiana. 1.

nitens. MS. (an m.

Sol.?)

nodosa.

nuda. 2.

pennsylvanica. 1.

pouderosa. MS.

pratensis. 1.

pubescens. 3.

sativa. 1.

sesquitertia. 3.

sibirica. 1.

spicata. 1.

sterilis. 3.

stipiformis.

AVERRHOA. 592.

acida.

Bilimbi. 3.

Cerambola.

AVICENNIA. 813.

nitida [Jacq.].

officinalis (pl.).

AVICENNIA :—

tomentosa [Jacq.] = officinalis.

AXYRIS. 1101.

Amaranthoides. 1.

Ceratoides. 1.

hybrida. 1.

prostrata. 1.

AYENIA. 1069.

magna. 3.

pusilla. 3.

tomentosa.

AZALEA. 215.

indica. 3.

lapponica. 1.

lutea = *nudiflora*.

nudiflora. 3.

pontica = *Rhododendron*

ponticum.

procumbens. 1.

viscosa. 1.

BACCHARIS. 992.

arborea.

brasiliانا.

Dioscoridis. 3.

foetida.

halimifolia. 1.

indica. 1.

ivaefolia. 1.

neriifolia. 1.

tenuifolia = *Chrysocoma*

scabra.

BAECKEA. 505.

frutescens. 1.

BALLOTA. 737.

alba. 3.

disticha. 3.

lanata. 1.

nigra. 1.

suaveolens. 3.

BALTIMORA. —

recta.

BANISTERIA. 589.

angulosa.

benghalensis. 3.

brachiata.

BANISTERIA :—

dichotoma.

fulgens. 3. (m. Sol.)

laurifolia.

lupuloides = *Gouania*

domingensis.

purpurea.

BARLERIA. 805.

buxifolia.

coccinea.

cristata. 1.

Hystrix. 3.

longifolia. 3. (m. L. f.)

Prionitis. 1.

sericea. MS.

solanifolia.

BARNADESIA [Mutis, 1778].

972.

spinosa, Linn. f.

BARRINGTONIA [Forst.]. 864.

speciosa [Forst.].

BARRERIA. —

capensis = *Diosma*

capensis.

BARTRAMIA. —

indica = *Triumfetta Bar-*

tramia.

BARTSIA. 756.

alpina. 1.

coccinea. 1.

pallida. 3.

Trixago = *Rhinanthus*

Trixago.

viscosa.

BASELLA. 390.

alba.

lucida.

rubra.

BASSIA. 610.

Illipe. MS.

longifolia.

BATIS. —

americana, sphalm. =

Trophis americana.

maritima.

BAUHINIA. 525.

aculeata. 1.

acuminata. 1.

BAUHINIA :—

- divaricata.*
- purpurea.* 3.
- scandens.*
- tomentosa.*
- ungulata.*
- variegata.* 1.

BEFARIA. 613.

- acstuanis* (pl.).

BEGONIA. 1125.

- capensis* Suppl.
- ferruginea.* Suppl.
- obliqua.* 3.

BELLIS. 1006.

- annua.* 1.
- perennis.* 1.
- var. *hortensis.*

BELLIIUM. 1007.

- bellidioides.*
- minutum* = *Pectis*
- minuta.*

BELLONIA. —

- aspera.*

BERBERIS. 453.

- cretica.* 3.
- vulgaris.* 2.

BERGERA. 548.

- Koenigii* (pl.).

BERGIA. 597.

- capensis.*

BERLINIA [Sol.]. 530 a.

- guineensis.*

BESLERIA. 771.

- cristata* = *Drupina cris-*
- tata.*
- lutea.*
- melittifolia.* (m. L. f.)

BETA. 314.

- Cicla.*
- maritima.*
- vulgaris.*
- var. *Cicla.*
- var. *perennis.*
- var. *rubra.*

BETONICA. 735.

- Alopecuroides.* 1.
- annua.* 1.
- var. *glabra* =
- Stachys annua.*

BETONICA :—

- annua* var. *hirsuta* =
- præc.*
- heraclea.* 3.
- hirsuta.*
- hirta.*
- officinalis.* 3.
- orientalis.*

BETULA. 1109.

- alba.* 3.
- Alnus.* 3.
- var. *glutinosa.*
- var. *incana.*
- excelsa.* (m. Dahl) MS.
- lenta.* 1.
- nana.* 1.
- nigra.* 1.
- pumila.* 3.
- pyrifolia.* (m. Dahl)
- MS.

BIDENS. 975.

- apiifolia* = *Anthemis*
- americana.*
- atriplicifolia* = *Spilan-*
- thes atriplicifolius.*
- bipinnata.* 3.
- bullata.* 1.
- cernua.* 1.
- frondosa.* 1.
- fruticosa.*
- minima.*
- nivea.* 1.
- nodiflora.* 3.
- pilosa.* 1.
- var. *chinensis.*
- scandens.*
- tenella.* 3.
- tripartita.* 1.
- verticillata.*

BIGNONIA. 776.

- aequinocialis.*
- caerulea.*
- capreolata.* 1.
- Catalpa.* 3.
- crucigera.*
- dubia.*
- indica.* 3.
- Leucoxydon.* 1.
- paniculata.*

BIGNONIA :—

pentaphylla.
peruviana.
pubescens.
radiata.
radicans. 1.
sempervirens.
stans.
triphylla.
Unguis-cati.

BISCUTELLA. 831.

apula = *didyma.*
auriculata. 1.
coronopifolia.
didyma. 1.
laevigata.
lyrata.
sempervirens.

BISERRULA. 927.

Pelecinus. 1.

BIXA. 674.

Orellana (pl.).

BLAERIA. 141.

articulata.
ciliaris. Suppl.
ericoides.
pusilla. 3.

BLAKEA. 612.

trinervia. 3.
triplinervia.

BLASIA. 1270.

pusilla. 1.

BLECHNUM. 1247.

australe. 3.
occidentale. 3.
orientale.
radicans.
virginicum.

BLITUM. 14.

capitatum. 1.
chenopodioides.
tataricum. MS.
virgatum. 1.

BOBARTIA. —

indica.

BOCCONIA. 609.

frutescens. 1.

BOERHAVIA. 9.

angustifolia. 3.

BOERHAVIA :—

diandra. 3.
diffusa. 1.
erecta.
hirsuta.
pubescens = *diffusa.*
repens. 3.
scandens. 3.

BOLETUS. 1280.

bovinus.
Favus.
fomentarius.
granulatus.
igniarius.
luteus.
perennis. (m. Ehrh.)
sanguineus.
suaveolens.
suberosus.
subsquamosus.
subtomentosus.
versicolor.
viscidus.

BOMBAX. —

aculeatum = *B. Ceiba.*
Ceiba.
gossypinum.
heptaphyllum.
inermis = *seq.*
pentandrum.
religiosum = *gossypinum.*

BONTIA. 812.

daphnoides. 2.
germinans = *Avicennia*
officinalis.

BORAGO. 188.

africana. 3.
indica. 1.
officinalis. 1.
orientalis. 3.
zeylanica.

BORASSUS. —

flabellifer.

BOREBONIA. 890.

cordata. 3.
crenata.
ericifolia.
laevigata. 3.
lanceolata. (m. L. f.)

BORBONIA :—

- tomentosa. 3.
trinervia.

BORRAGO v. BORAGO.

BOSEA. 320.

- Yervamora. 3.

BRABEJUM. 1223.

- stellatifolium* (pl.).
stellulifolium = *praec.*

BRABYLA. —

- capensis* = *Brabejum*
stellatifolium.

BRASSICA. 844.

- alpina*. 3.
arvensis. 3.
campestris. 3.
chinensis. 3.
Eruca. 1.
Erucastrum. 1.
Napus. 3.
oleracea.
 — var. *botrytis*.
 — var. *capitata*.
 — var. *gongylodes*.
 — var. *laciniata*.
 — var. *Napobrassica*.
 — var. *rubra*.
 — var. *sabauda*.
 — var. *sabellica*.
 — var. *selenisia*.
 — var. *sylvestris*.
 — var. *viridis*.
orientalis. 1.
Rapa.
vesicaria. 1.
violacea. 3.

BRATHYS. 702.

- juniperina*.

BREYNIA. —

- indica* = *Capparis*
Breynia.

BRIZA. 88.

- anceps*. MS.
bipinnata.
Eragrostis. 1.
maxima. 1.
media. 1.
minor. 2.

BRIZA :—

- virens*. 3.

BROMELIA. —

- Acanga*.
Ananas.
humilis.
Karatas.
ligulata.
nudicaulis.
Pinguin.

BROMUS. 93.

- arvensis*. 1.
ciliatus.
cristatus. 1.
distachyos. 3.
geniculatus. 3.
giganteus. 1.
hordeaceus.
inermis.
madritensis. 3.
mollis. 3.
pinnatus. 1.
purgans. 1.
racemosus.
ramosus.
rigens. 3.
rubens. 2.
scoparius. 2.
secalinus. 1.
squarrosus. 1.
sterilis. 3.
stipoides.
tectorum. 1.
triflorus.

BROSSAEA [Plum.].

- coccinea*.

BROWALLIA. 791.

- alienata*.
americana = *demissa*.
demissa. 3.
elata. 3.

BROWNEA. 859.

- coccinea* (pl.).

BRUNFELSIA [Plum.]. 257.

- americana*. 3.

BRUNIA. 271.

- abrotanoides*.
ciliata.

BRUNIA :—

- cupressina* = *Diosma*
cupressina.
glutinosa. (m. L. f.)
lanuginosa. 1.
Levisanus = *Protea* *Levi-*
sanus.
nodiflora. 1.
paleacea.
radiata.
uniflora = *Diosma* *cu-*
pressina.

BRUNSFELSIA, vide BRUNFELSIA.

BRYONIA. 1153.

- africana*. 1.
alba. 1.
cordifolia. 1.
cretica.
grandis. 3.
laciniosa. 1.
palmata.
scabrella. Suppl.

BRYUM. 1265.

- aciculare*. (m. am. ?)
aestivum.
albidum.
alpinum.
apocarpum.
argenteum.
*caespiticiu*m. 1.
capillare.
carneum.
Celsii.
cirrhatum. MS. (ap.
Hypnum.)
extinctorium.
flexuosum.
glaucum.
heteromallum.
hypnoides. 1.
imberbe.
murale.
paludosum.
palustre.
pellucidum.
pomiforme.
pulvinatum. (m. Ehrh.)

BRYUM :—

- pyriforme*. (m. Ehrh.)
rubrum.
rurale. 1.
scoparium.
simplex.
squarrosum. (m. L. f.
& Ehrh.)
striatum.
subulatum. (m. L. f.)
tortuosum. (ap. *Hyp-*
num.)
trichodes.
truncatulum. 1.
undulatum. (m. Ehrh.)
unguiculatum.
verticillatum.
viridulum. 2.

BUBON. 357.

- Galbanum*. 3.
gummiferum.
macedonicum. 1.
rigidius.

BUCEPHALON. —

- racemosum* = *Trophis*
americana.

BUCHNERA. 790.

- aethiopica*. (cf. *Manulea*.)
africana = *Rhinanthus*
capensis.
americana. 1.
asiatica. 1.
canadensis. 3.
capensis. 3.
cernua.
divaricata. (m. L. f.)
laciniata.
linifolia. MS.

BUCIDA. 556.

- Buceras*. 3.

BUDDLEJA. 142.

- americana*. 3.
occidentalis.
virgata. Suppl.

BUFONIA. 168.

- tenuifolia*. 1.

BULBOCODIUM. 417.

- serotinum*.

- BULBOCODIUM** :—
 vernum. 1.
- BUNIAS**. 847.
 aegyptiaca.
 balearica. 3.
 Cakile. 1.
 cornuta. 1.
 Erucago. 1.
 myagroides.
 orientalis. 1.
 sibirica.
 spinosa.
- BUNIUM**. 342.
 aromaticum.
 Bulbocastanum. 1.
- BUPHTHALMUM**. 1022.
 aquaticum. 1.
 arborescens. 3.
 capense = *Oedera* pro-
 lifera.
 durum.
 frutescens. 1.
 grandiflorum. 1.
 helianthoides. 1.
 maritimum. 1.
 salicifolium.
 speciosissimum. 3.
 spinosum. 1.
- BUPLEURUM**. 335.
 angulosum. 1.
 difforme. 3.
 falcatum. 3.
 fruticescens. 2.
 fruticosum. 1.
 juncum. 3.
 longifolium. 1.
 Odontites. 1.
 petraeum.
 ranunculoides. 3.
 rigidum. 1.
 rotundifolium. 1.
 semidecompositum. 2.
 stellatum. 1.
 tenuissimum. 1.
 villosum.
- BURMANNIA**. 404.
 biflora.
 disticha. 1.
- BURSERA** [Jacq.]
- BURSERA** :—
 gummiifera. 3.
- BUTOMUS**. 521.
 umbellatus. 1. (pl.).
- BUTTNERIA**, vide *BYTTNERIA*.
- BUXBAUMIA**. 1259.
 aphylla. 3.
- BUXUS**. 1110.
 sempervirens. 1.
 — var. *arborescens*.
 — var. *suffruticosa*.
- BYSSUS**. 1278.
 antiquitatis.
 aurea. (m. L. f.)
 botryoides. (m. Ehrh.)
 cancellata.
 candelaris. (m. L. f.)
 cryptarum.
 Flos-aquae.
 incana. (m. Ehrh.)
 Iolithus.
 lactea. (m. L. f.)
 phosphorea. 1. (m. L. f.?)
 saxatilis. 2.
 septica.
 velutina.
- BYTTNERIA**. 266.
 microphylla. (m. Jacq.)
 scabra.
- CACALIA**. 976.
 adscendens. MS.
 alpina. (m. L. f.)
 Anteuphorbium.
 atriplicifolia. 1.
 cuneifolia.
 Ficoides.
 fruticosa. MS. [v. infra.]
 hastata. 1.
 incana.
 Kleinia. 1.
 lyrata. MS.
 papillaris.
 pinnata [= pinnatifida].
 Porophyllum. 1.
 repens.
 sarracenia. 3.
 sonchifolia. 1.
 suaveolens. 1.

CACALIA :—

suffruticosa. 3. [fruticosa.]

CACHRYS. 349.

Libanotis.
sicula. 3.

CACTUS. 633.

cochenillifer.
curassavicus.
Epidendrum.
Ficus-indica.
flagelliformis. 1.
grandiflorus. 1.
heptagonus.
hexagonus.
lanuginosus.
mammillaris.
Melocactus.
moniliformis.
nobilis.
Opuntia. 3.
parasiticus. 3.
pentagonus.
Pereskia.
peruvianus.
Phyllanthus. 3.
Pitaiaya.
portulacifolius.
repandus.
Royeni.
tetragonus.
triangularis.
Tuna.

CAESALPINIA. 530.

brasiliensis.
Crista.
Sappan.
vesicaria. 2.

CALAMUS. —

Rotang.

CALCEOLARIA. 32.

integrifolia.
pinnata.

CALEA. 984.

Amellus. 3. (m. Sol.)
jamaicensis. 3. (m. Sol.)
oppositifolia. 3. (m. Sol.)
Scoparia. (m. Sol.)

CALENDULA. 1035.

CALENDULA :—

arvensis. 3.
fruticosa. 3.
graminifolia. 1.
hybrida. 1.
nudicaulis.
officinalis. 1.
pluvialis. 1.
sancta. 3.

CALLA. 1081.

aethiopica. 3.
orientalis.
palustris. 3.

CALLICARPA. 136.

americana. 1.
cana.
integrifolia.
lanata.
tomentosa.

CALLIGONUM. —

Polygonoides.

CALLISIA. 66.

repens (pl.).

CALLITRICHE. 13.

androgyna = *verna.*
autumnalis.
hermaphroditica =
autumnalis.
palustris. 1.
—— var. *bifida* =
autumnalis.
—— var. *minima* =
verna.
—— var. *natans* =
verna.
verna.

CALOPHYLLUM. 676.

Calaba. 3.
Inophyllum. 1.

CALTHA. 719.

palustris. 2.

CALYCANTHUS. 660.

floridus. 3.
praecox.

CAMBOGIA. 671.

Gutta = *Asclepias*
Gutta.

CAMELLIA. 878.

japonica. 1.

CAMERARIA. 303.

*angustifolia.**latifolia.* 3.

CAMPANULA. 221.

alpina. 3.*Alpini.**americana.* 3.*barbata.* 3.*bononiensis.**canariensis* = *Canarina**Campanula.**capensis.**carpatica* [*Jacq.*].*cenisia.* 3.*Cervicaria.* 1.*cinerea.* Suppl.*decurrens* = *patula.**dichotoma.* 3.*Elatines.* 3.*erinoides.* 3.*Erinus.* 1.*fruticosu.**glomerata.* 1.*graminifolia.* 3.*hederacea.* 1.*heterophylla.**hispidula.* Suppl.*hybrida.* 1.*laciniata.* 3.*latifolia.* 1.*lilifolia.* 1.*limonia* = *seq.**limonifolia.**lobelioides.* Suppl.*lusitanica.**Medium.* 1.*mollis.* 3.*patula.**peltatus.**Pentagonia.**peregrina.**perfoliata.* 1.*persicifolia.* 1.*petraea.* 3.*porosa.* Suppl.*portensis.**pulla.* 3.*pyramidalis.* 1.

CAMPANULA :—

rapunculoides. 3.*Rapunculus.* 1.*rhomboidalis.* 2.*rhomboidea* = *præc.**rotundifolia.* 1.*saxatilis.**sibirica.* 1.*Speculum-♀.* 1.*spicata.**stricta.* 3.*thyrsoides* = *seq.**thyrsoides.**Trachelium.* 1.*tridentata.* 3.*uniflora.* 1.*undulata.* Suppl.*unidentata.* Suppl. (an
m. L. f. ?).

CAMPHOROSMA. 165.

acuta. 1.*glabra.* 3.*monspeliaca.* 1.*monspeliensis* = *præc.*

CANARINA. 456.

Campanula.

CANARIUM. 1172.

commune. 3. (pl.)

CANNA. 1.

angustifolia. 3.*glauca.* 1.*indica.* 1.*latifolia.*

CANNABIS. 1177.

sativa. 1.

CAPPARIS. 664.

Baducca. 3.*Breynia.**Cynophallophora.**ferruginea.* 3.*flexuosa.* 3.*frondosa.**hastata.**linearis.**pulcherrima.**sepiaria.* 3.*siliquosa.* 3.*spinosa.* 1.

CAPPARIS :—

zeylanica.

CAPRARIA. 785.

biflora. 1.

crustacea.

durantifolia. 3.

gratioloides = *Lindernia**pyxidaria*.

CAPSICUM. 249.

annuum. 1.

baccatum. 3.

frutescens. 1.

grossum.

CAPURA. 454.

purpurata (pl.).

CARDAMINE. 835.

africana.

amara. 1.

asarifolia. 3.

bellidifolia. 1.

Chelidonia. 1.

graeca. 3.

hirsuta. 1.

impatiens. 1.

Lunaria.

nudicaulis. 1.

parviflora. 3.

petraea. 1.

pratensis. 1.

resedifolia. 3.

trifolia. 1.

virginica. 1.

CARDIOSPERMUM. 513.

Corindum.*Halicacabum*. (m. Sol.)

CARDUUS. 966.

acanthoides. 3.

Acarua = *Cnicus**Acarna*.

acaulis. 3.

altissimus.

argentatus.

canus. 3.

Casabonae. 3.*centauroides* = *Cnicus**centauroides*.

crispus. 1.

cyanoides. 3.

CARDUUS :—

cyanoides var. *monoclonos*.— var. *polyclonos*.

defloratus. 3.

eriphorus. 2.

— var. *spurius*.

flavescens. 3.

helenioides. 1.

heterophyllus. 3.

lanceolatus. 1.

leucographus.*Marianus*. 3.

mollis. 3.

monspessulanus.

nutans. 1.

palustris. 1.

parviflorus.

pectinatus.

polyanthemus. 3.

pynocephalus. 3.

serratuloides. 1.

stellatus. 3.

syriacus. 1.

tataricus. 1.

tuberosus. 1.

virginianus.

CAREX. 1100.

acuta. 1.

— var. *nigra*.— var. *rufa*.

arenaria. 1.

atrata. 1.

axillaris.

baldensis. 3.

brizoides. 2.

caespitosa. 1.

canescens. 1.

capillaris. 1.

capitata. 3.

Caricis. MS.

cyperoides.

digitata. 1.

dioica. 1.

distanis.

elongata. 1.

filiformis. 3.

flava. 1.

folliculata. 1.

e *

CAREX :—

- globularis. 1. (“globulifera”).
- hirta*.
- indica.
- leporina. 3.
- limosa. 1.
- lithosperma. 3.
- loliacea. 1.
- montana. 1.
- muricata. 1.
- pallescens. 1.
- panicea. 1.
- paniculata. 2.
- pedata*.
- pilulifera. 3.
- Pseudocyperus. 1.
- pulicaris. 1.
- remota. 2.
- saxatilis. 1.
- squarrosa. 1.
- tomentosa*.
- uliginosa. 1.
- vesicaria. 1.
- vulpina. 1.

CARICA. 1190.

- Papaya. 1.
- Posoposa*.

CARISSA. 295.

- Carandas. 3.
- spinarum.

CARLINA. 970.

- acaulis. 1.
- atractyloides.
- corymbosa. 1.
- lanata. 2.
- pyrenaica.
- racemosa. 1.
- vulgaris. 1.

CAROLINEA. 865. Suppl.

- Lovisa-Carolina, MS.
- [= *C. princeps*, *L. f.*]

CARPESIMUM. 991.

- abrotanoides. 1.
- cernuum. 1.

CARPINUS. 1131.

- Betulus. 1.
- Ostrya. 1.

CARTHAMUS. 973.

- arborescens*.
- caeruleus. 3.
- Carduncellus*.
- corymbosus*.
- creticus. 3.
- lanatus. 1.
- mitissimus*.
- tinctorius. 1.
- tingitanus. 3.

CARUM. 372.

- Bunius* = *Aethusa*
- Bunius*.
- Carvi. 2.
- peregrinum*.

CARYOCAR. —

- nuciferum*.

CARYOPHYLLUS. 686.

- aromaticus. 3.

CARYOTA. —

- urens*.

CASSIA. 528.

- Absus. 3.
- alata. 3.
- atomaria.
- auriculata*.
- bicapsularis. 1.
- biflora. 3.
- Chamaecrista. 1.
- diphylla. 1.
- emarginata*.
- falcata. 3.
- Fistula. 3.
- flexuosa*.
- galegifolia*.
- glandulosa. 3. (m. Sol.)
- hirsuta*.
- javanica.
- ligustrina. 1.
- marilandica. 1.
- mimosoides*.
- nictitans. 1.
- obtusifolia. 3.
- occidentalis. 3. (m. Sol.)
- pilosa*. 3. (m. Sol.)
- planisiliqua. 1.
- procumbens. 3.

CASSIA :—

- Senna. 3.
- serpens. 3. (m. Sol.)
- Sophera. 1.
- Tagera. 3.
- tenuissima*.
- Tora. 1. (m. Sol.)
- viminea. 3. (m. Sol.)

CASSINE. 380.

- barba* = seq.
- barbara.
- capensis.
- Maurocenia. 1.
- Peragna. 1.

CASSYTHA. 519.

- corniculata*.
- filiformis* (pl.).

CASTILLEJA. 757.

- Mutisii. MS.

CASUARINA. 1090.

- equisetifolia.

CATANANCHE. 961.

- caerulea. 3.
- græca*.
- lutea. 1.

CATESBAEA. —

- spinosa* (pl.).

CATURUS. 1163.

- ramiflorus*.
- spiciflorus*. 3.

CAUCALIS. 338.

- daucoides. 1.
- grandiflora. 1.
- latifolia. 3.
- leptophylla*.
- maritima [Gouan ?]
- mauritanica*.
- orientalis. 3.
- platycarpus. 1.
- pumila.
- tenuifolia. MS.

CEANOTHUS. 264.

- africanus. 1.
- americanus. 1.
- asiaticus.

CECROPIA. 1159.

- peltata* (pl.).

CEDRELA. 274.

CEDRELA :—

- Mahagoni* = Swietenia
- Mahagoni.
- odorata. 3.

CELASTRUS. 268.

- barbarus* [sphalm. =
- Cassine barbara?]
- bullatus. 2. (m. L. f.)
- buxifolius. 1.
- lucidus. 3.
- myrtifolius. 3.
- pyracanthus. 1.
- scandens. 1.

CELOSIA. 288.

- argentea. 1.
- castrensis. 3.
- coccinea. 3.
- cristata. 1.
- lanata. 3.
- margaritacea. 3.
- nodiflora*.
- paniculata. 1.
- racemosa. MS.
- trigyna*.

CELSIA. 774.

- Arcturus.
- cretica.
- orientalis. 1.

CELTIS. 1209.

- australis. I.
- occidentalis. 1.
- orientalis*.

CENCHRUS. 1217.

- capitatus. 1.
- ciliaris*.
- echinatus. 3.
- frutescens*.
- granularis.
- lappaceus*.
- muricatus. (m. L. f.)
- pubescens. MS.
- racemosus. 1.
- tribuloides. 1.
- tripsacoides. MS.

CENTAUREA. 1030.

- acaulis*.
- aegyptiaca. 3.
- alba. 1.

CENTAUREA :—

- alpina*.
- amara*.
- argentea*. 2.
- aspera*. 2.
- attica*. MS.
- babylonica*.
- benedicta*. 3.
- Behen*.
- Calcitrapa*. 3.
- calcitrapoides*. 3.
- capillata*. 1.
- Centaureum*. 1.
- centauroides*. 1.
- cichoracea*.
- ciliaris*. MS.
- Cineraria*. 1.
- collina*. 3.
- conifera*. 1.
- Crocodilium*. 3.
- Crupina*. 1.
- Cyanus*. 1.
- eriphora*. 1.
- erucifolia*.
- fruticosa*.
- galactites*. 3.
- glastifolia*. 1.
- Isnardi*.
- Jacea*. 1.
- linifolia*. 3.
- Lippii*. 3.
- melitensis*. 1.
- montana*. 1.
- moschata*. 1.
- var. *Amberboi*.
- muricata*.
- napifolia*. 1.
- nigra*. 3.
- nudicaulis*. 3.
- orientalis*. 1.
- paniculata*. 1.
- pectinata*. 3.
- peregrina*.
- phrygia*. 1.
- pullata*. 1.
- pumila*. 3.
- Pumilio* = *praec.*
- radiata*. 3.

CENTAUREA :—

- ragusina*. 1.
 - repens*. 3.
 - rhapontica*.
 - romana*.
 - rupestris*.
 - salmantica*. 1.
 - Scabiosa*. 1.
 - sempervirens*. 1.
 - Seridis*.
 - sessiliflora*.
 - sibirica*. 1.
 - sicula*. 3.
 - solstitialis*. 1.
 - sonchifolia*. 3.
 - sphaerocephala*. 1.
 - spinosa*. 1.
 - splendens*. 1.
 - Stoebe*.
 - tingitana*.
 - uniflora*.
 - Verutum*. 3.
- CENTELLA. —
- glabrata*.
 - villosa*.
- CENTUNCULUS. 147.
- minimus*. 1.
- CEPHALANTHUS. 118.
- occidentalis*. 1.
 - orientalis* = *Nauclea*
 - orientalis*.
- CERASTIUM. 603.
- alpinum*. 1.
 - aquaticum*. 1.
 - arvense*. 1.
 - dichotomum*. 1.
 - latifolium*. 1.
 - manticum*. 3.
 - maximum*. 1.
 - pentandrum*. 1.
 - perfoliatum*. 1.
 - repens*.
 - semidecandrum*. 1.
 - strictum*. 3.
 - suffruticosum*.
 - tomentosum*.
 - viscosum*. 1.
 - vulgatum*. 3.

CERASUS *v.* **PRUNUS**.
CERATOCARPUS. 1086.
 arenarius. 1.
CERATONIA. 1239.
 Siliqua. 1.
CERATOPHYLLUM. 1122.
 demersum. 3.
 (*m. Sol.*)
 submersum. 3.
CERBERA. 296.
 Abovaj. 1.
 Manghas. 1.
 Thevetia. 2.
CERCIS. 524.
 canadensis. 1.
 Siliquastrum. 3.
CEREUS *v.* **CACTUS**.
CERINTHE. 186.
 Echioides = *Onosma*
 Echioides.
 maculata.
 major. 1.
 minor. 1.
 orientalis = *Onosma*
 orientalis.
CEROPEGIA. 305.
 biflora.
 Candelabrum.
 sagittata.
 tenuifolia.
CESTRUM. 258.
 diurnum. 1.
 nocturnum. 1.
 vespertinum.
CHAEROPHYLLUM. 365.
 arborescens. 3.
 aromaticum. 3.
 aureum.
 bulbosum. 1.
 coloratum. 3.
 hirsutum. 1.
 sylvestre. 1.
 temulentum = *seq.*
 temulum. 1.
CHALCAS. —
 paniculata.
CHAMAEROPS. (*cf.* 1291. No. 1.)
 humilis (*pl.*).

CHAMIRA. 838.
 cornuta (*pl.*).
CHARA. 1088.
 flexilis. 3.
 hispida. 1.
 tomentosa. 1.
 vulgaris. 1.
CHEIRANTHUS. 839.
 africanus = *Heliophila*
 integrifolia.
 alpinus. 3.
 annuus. 1.
 Cheiri. 1.
 chius. 1.
 erysimoides. 1.
 Farsetia. 3.
 fenestralis.
 fruticulosus. 1.
 incanus. 1.
 lucerus = *Hesperis*
 lacera.
 littoreus. 3.
 maritimus.
 salinus.
 sinuatus. 3.
 tricuspidatus. 1.
 trilobus. 1.
 tristis. 3.
 virens. MS.
CHELIDONIUM. 668.
 corniculatum. 1.
 Glaucium. 1.
 hybridum. 1.
 majus. 1.
CHELONE. 765.
 glabra. 1.
 — var. β = *obliqua*.
 hirsuta.
 obliqua.
 Pentstemon. 1.
CHENOLEA. 289.
 diffusa.
CHENOPODIUM. 313.
 album. 1.
 altissimum.
 ambrosioides. 1.
 anthelminticum. 1.
 aristatum. 1.

CHENOPODIUM :—

- Atriplicis. Suppl.
- Bonns-Henricus. 2.
- Botrys. 1.
- fruticosum*.
- glaucum. 1.
- hirsutum*.
- hybridum. 1.
- maritimum. 1.
- multifidum. 1.
- murale. 1.
- polyspermum. 1.
- rubrum. 1.
- ruderales* = murale.
- salsum*.
- Scoparia. 1.
- serotinum. 3.
- urbicum. 1.
- virginicum. 1.
- viride. 1.
- Vulvaria. 1.

CHERLERIA. 586.

- sedoides. 3.

CHIOCOCCA. 233.

- alternifolia* = Cestrum
- vespertinum.
- nocturna* = Cestrum
- nocturnum.
- racemosa. 3.

CHIONANTHUS. 21.

- virginica. 1.
- zeylonica* [sic].

CHIRONIA. 252.

- angularis. 1.
- baccifera. 1.
- campanulata. 1.
- caryophylloides*.
- dodecandra*.
- frutescens. 3.
- jasminoides. (m. Dahl)
- linoides. 3.
- lychnoides.
- trinervia. 1.

CHLORA. 494.

- dodecandra*.
- perfoliata. 3.
- quadrifolia. 3.

CHONDRILLA. 951.

CHONDRILLA :—

- crepoides*.
- junceae. 1.
- nudicaulis.
- simplex. MS.

CHRYSANTHEMUM. 1012.

- Achilleae*.
- alpinum. 1.
- arcticum. 1.
- atratum. 3.
- Balsamita. 3.
- bipinnatum. 1.
- coronarium. 1.
- corymbiferum.
- corymbosum. 1.
- flosculosum. 3.
- frutescens. 3.
- graminifolium. 3.
- grande. MS.
- indicum. 1.
- inodorum. 3.
- italicum. 3.
- Leucanthemum. 1.
- millefoliatum. 3.
- monspeliense*.
- montanum*.
- Myconis. 3.
- pectinatum. 3.
- segetum. 1. (m. Leche)
- serotinum. 1.

CHRYSITRIX. 1238.

- capensis* (pl.).

CHRYSOBALANUS. 641.

- Icaco. 3.

CHRYSOCOMA. 982.

- biflora. 1.
- cernua. 1.
- ciliata. 1.
- Coma-aurea. 1.
- duriuscula. MS.
- graminifolia* = Solidago
- lanceolata.
- Linosyris. 1.
- oppositifolia. 3.
- patula*.
- scabra. 3.
- scoparia* = Calea
- scoparia*.

CHRYSOCOMA :—

tomentosa. 3.

villosa. 1.

CHRYSOGONUM. —

peruvianum = *Zinnia**pauciflora*.*virginianum*.

CHRYSOPHYLLUM. 260.

Barbasco.*Cainito*. 3.*glabrum*.*maliforme* = *C. Cainito*.*oliviforme* = *C. Cainito*.

CHRYSOSPLENIUM. 574.

alternifolium. 1.*oppositifolium*. 1.

CICCA. 1108.

disticha (pl.).

CICER. 908.

arietinum. 1.

CICHORIUM. 962.

Enãivia. 1.*Intybus*. 1.*spinosum*. 1.

CICUTA. 361.

bulbifera. 1.*maculata*. 1.*virosa*. 1.

CIMICIFUGA. 698.

foetida (pl.).

CINCHONA. 230.

caribaea.*herbacea*, sphalm. =*praec.**officinalis*. 1.

CINERARIA. 1000.

alpina. 3.— var. *alata*.— var. *helenitis*.— var. *integrifolia*.*amelloides*. 3.*asteroides*, sphalm. =*praec.**aurea*. 3.*canadensis*. 3.*cymbalarifolia*. (m.

Dahl)

geifolia. 3.

CINERARIA :—

glauca. 3.*linifolia*.*lobata*. (m. Dahl) =*geifolia*.*maritima*. 3.*othonnites* = *Othonna**frutescens*.*palustris*. 3.*purpurata*.*sibirica*. 3.*sonchifolia*.

CINNA. 15.

arundinacea. 1.

CIRCAEA. 25.

alpina. 1.*lutetiana*. 1.— var. *canadensis*.

CISSAMPELOS. 1202.

Caupeba.*Pareira*. 3.*smilacina*.

CISSUS. 149.

acida. 3.*cordifolia*.*laciniata* = *Sicyos**laciniata*.*quadrangularis*. 3.*Sicyoides*.*trifoliata*.*vitiginea*.

CISTUS. 689.

aegyptiacus. 1.*aegyptius*, lapsu = *praec.**albidus*. 1.*anglicus*.*apenninus*. 3.*arabicus*. 3.*calycinus*.*canadensis*. 1.*canus*. 3.*capensis*.*creticus*.*crispus*. 1.*Fumana*. 1.*glutinosus*.*guttatus*. 1.*halimifolius*. 1.

CISTUS :—

- Helianthemum*. 3.
heteroclitus. MS.
hirtus. 3.
incanus.
indicus, lapsu = seq.
italicus.
ladaniferus. 32.
laevipes. 3.
laurifolius. 3.
ledifolius. 3.
Libanotis. 3.
Lippii.
marifolius. 1.
monspeliensis. 1.
niloticus.
nummularius. 1.
oelandicus. 1.
pilosus. 3.
polifolius.
populifolius. 3.
racemosus. 3.
salicifolius. 3.
salvifolius. 1.
serpillifolius.
squamatus. 2.
surrejanus.
thymifolius.
Tuberaria. 1.
umbellatus. 1.
villosus. 3.

CITHAREXYLON. 777.

- caudatum*. 3.
cinereum.
fruticosum = *praec.*
quadrangulare.
spinosum (pl.).

CITRUS. 937.

- Aurantium*.
 — var. *decumana*
 = *decumana*.
 — var. *grandis*
 = *decumana*.
 — var. *sinensis*.
decumana.
Medica.
 — var. *Limon*.
trifoliata.

CLATHRUS. 1283.

- cancellatus*.
denudatus.
nudus.
recutitus.

CLAVARIA. 1286.

- Coralloides*.
digitata.
fastigiata.
Hypoxylon.
militaris.
muscoides.
ophioglossoides. (m.
 Ehrh.)
pistillaris. (m. L. f.)

CLAYTONIA. 285.

- Portulacaria*.
sibirica. 1.
virginica. 1.

CLEMATIS. 712.

- cirrrosa*. 3.
crispa. 3.
dioica. 3.
erecta.
Flammula. 1.
integrifolia. 1.
maritima.
orientalis. 3.
recta = *erecta*.
Viorna. 1.
virginiana. 2.
Vitalba. 1.
Viticella. 1.

CLEOME. 850.

- aculeata*.
arabica. 3.
capensis.
dodecandra. 1.
fruticosa. 1.
gigantea.
gynandra = *penta-*
phylla.
heptaphylla.
icosandra. 1.
monophylla.
ornithopodioides. 1.
pentaphylla. 3.
polygama. 3.

CLEOME :—

procumbens.
serrata.
spinosa.
triphylla.
violacea. 1.
viscosa. 3.

CLEONIA. 753.

lusitanica. 3.

CLERODENDRUM. 810.

calamitosum. 3.
fortunatum. 3.
infortunatum. 1.
paniculatum. 3.
scandens. MS.

CLETHRA. 567.

alnifolia. 1.

CLIBADIUM. —

surinamense.

CLIFFORTIA. 1197.

ilicifolia (pl.).
odora. Suppl. (odorata).
polygonifolia.
ruscifolia.
sarmentosa.
strobilifera.
trifoliata.

CLINOPODIUM. 742.

aegyptium. MS.
incanum. 1.
rugosum.
vulgare. 1.

CLITORIA. 902.

brasiliensis = *Glycine*
Galactia.
Galactia = *Glycine*
Galactia.
lactescens = *praec.*
Mariana.
Ternatea. 1.
virginiana.
Zoophthalmum = *Dolichos urens*?

CLUSIA. 1224.

alba = *major.*
flava.
major. 1.

CLUSIA :—

minor = *venosa.*
rosea.
venosa.

CLUYTIA. 1206.

alaternoides. 1.
androgyna. 3.
Cuscarilla = *Croton*
Cuscarilla.
Eluteria.
polygonoides.
pulchella. 1.
retusa.
stipularis. 3.
tomentosa.

CLYPEOLA. 830.

Alyssoides = *Alyssum*
calycinum.
campestris = *Alyssum*
campestre.
Jonthlaspi. 2.
maritima. 3.
tomentosa. 3.

CNEORUM. 50.

tricoccon. 1.

CNICUS. 967.

Acarua. 2.
benedictus = *Centaurea*
benedicta.
centauroides. 2.
cernuus. 1.
Erisithales. 3.
ferox.
oleraceus. 1.
pygmaeus.
spinosissimus. (m. L. f.)
uniflorus.

COCCOLOBA. 511.

barbadensis.
emarginatu.
excoriata. 3.
pubescens.
punctata.
tenuifolia. 3.
Uvifera. 3.
venosa.

COCHLEARIA. 826.

anglica. 3.

COCHLEARIA :—

- Armoracia.* 3.
- Coronopus.* 3.
- danica.* 1.
- Draba.* 3.
- glastifolia.* 1.
- groenlandica* (pl.).
- officinalis.* 1.
- saxatilis* = *Myagrum*
saxatile.

COCOS. —

nucifera.

CODARIA *vide* LERCHEA.

CODON. 535.

Royeni.

COFFEA. 232.

- arabica.* 1.
- occidentalis.*

COIX. 1098.

dactyloides = *Tripsacum*
dactyloides.

Lacryma-Jobi. 1.

COLCHICUM. 470.

- autumnale.* 1.
- montanum.* 1.
- variegatum.*

COLDENIA. 174.

procumbens.

COLLINSONIA. 43.

canadensis. 1. (pl.)

COLUMNEA. 814.

- longifolia.* 3.
- scandens.*

COLUTEA. 914.

- arborescens.* 1.
- frutescens.* 1.
- herbacea.* 3.

COMARUM. 659.

palustre. 1.

COMBRETUM. —

- laxum.*
- occidentale.*
- secundum.*

COMETES. 159.

- alterniflora.*
- surattensis.*

COMMELINA. 65.

africana. 1.

COMMELINA :—

- axillaris.*
- benghalensis.*
- communis.* 1.
- cristata.*
- cucullata.*
- erecta.* 1.
- nudiflora.* 1.
- spirata.*
- tuberosa.* 1.
- vaginata.*
- virginica.* 3.
- Zanonia.* 3. (m. Sol.)

COMOCLADIA. —

- dentata.*
- integrifolia.*
- pinnatifolium* = *integrifolia.*

CONFERVA. 1277.

- aegagropila.*
- aeruginosa.*
- amphibia.* (an m. L. f.?)
- bullosa.*
- canalicularis.*
- cancellata.*
- capillaris.*
- catenata.*
- corallina.*
- corallinoidea.*
- dichotoma.*
- fluviatilis.* (m. Ehrh.)
- fontinalis.*
- gelatinosa.*
- glomerata.*
- littoralis.*
- polymorpha.*
- reticulata.* (m. Ehrh.)
- rivularis.* (m. Ehrh.)
- rupestris.*
- scoparia.*
- vagabunda.*

CONIUM. 343.

- africanum.* 3.
- maculatum.* 1.
- rigens.* 3.
- Royeni.*

CONNARUS. 856.

monocarpus (pl.).

CONOCARPUS. 237.

- erecta. 3. (m. Sol.)
procumbens.
racemosa.

CONVALLARIA. 436.

- bifolia. 1.
fruticosa = *Dracæna*
ferrea.
majalis. 1.
multiflora. 1.
Polygonatum. 3.
racemosa. 1.
stellata.
trifolia. 1.
verticillata. 1.

CONVOLVULUS. 218.

- aculeatus.*
aegyptius.
alsinoides.
althaeifolius.
althaeoides. 1.
anceps.
angularis.
arvensis. 1.
Batatas. 1.
biflorus.
brasiliensis.
cairicus. 3.
canariensis.
cantabrica. 1.
carolinus.
Cneorum. 1.
copticus.
corymbosus.
dissectus.
Doryenium 3.
farinosus.
gangeticus.
hederaceus. 1.
hirtus. 1.
Jalapa.
lineatus. 3.
linifolius.
littoralis.
macrocarpos. 3.
macrorhizos.
malabaricus.
martinicensis.

CONVOLVULUS :—

- Medium.* 1.
muricatus.
Nil. 3.
nummularius.
obscurus.
oleraceus. MS.
panduratus.
paniculatus.
peltatus.
pentapetaloides.
pentaphyllus. 3.
 — var. *serpens.*
persicus. 3.
Pes-caprae. 1.
purpureus. 3.
quinquefolius. 3.
repens.
reptans. 1.
Scammonia. 1.
sepium. 1.
sericeus. 3.
serpens.
sibiricus.
siculus. 2.
Soldanella. 1.
spithameus. 1.
terrestris.
tomentosus.
tricolor. 1.
tridentatus.
Turpethum.
umbellatus.
verticillatus. 3.
vitifolius.

CONYZA. 993.

- anthelmintica.* 3.
arborescens. 3.
Asteroides. 3.
aurita. Suppl.
balsamifera.
bifoliata.
bifrons.
 — var. *flosculosa.*
 — var. *radiata.*
candida. 1.
chinensis. 1.
cinerea. 1.

CONYZA :—

- decurrens*. 3.
- frutivosa*.
- hirsuta*. 1.
- linifolia*.
- lobata*.
- odorata*. 3.
- pubigera*.
- rupestris*. 3.
- saxatilis*. 3.
- scabra*.
- sordida*.
- squarrosa*. 1.
- tortuosa*.
- virgata*. 3.

COPALIFERA. 557.

- officinalis*. (m. L. f.)

CORALLINA. 1293.

- corniculata*.
- fragilissima*.
- mediterranea*.
- officinalis*.
- Opuntia*.
- Penicillus*.
- rubens*.

CORCHORUS. 691.

- aestuans*. 3.
- capsularis*. 3. (*Cf.*
trilocularis in hb.)
- caryophylloides* = *sili-*
quosus?
- Coreta* = *siliquosus*.
- hirsutus*.
- hirtus*.
- olitorius*. 1.
- siliquosus*. 1. (m.
Sol.)
- tridens*.
- trilocularis*. 3.

CORDIA. 253

- Bourreria*.
- Callococca*. 3.
- Collococca* = *præc.*
- Gerascanthus*. 3.
- glabra*. 1.
- macrophylla*. 3.
- Myxa*. 1.
- Sebestena*. 3.

CORDIA :—

- spinescens*.

COREOPSIS. 1026.

- alba*.
- alternifolia*. 1.
- angustifolia*.
- auriculata*.
- baccata*.
- Bidens*. 1.
- chrysantha*.
- coronata*. 3.
- lanceolata*.
- leucantha* = *seq.*
- leucanthema*. 3.
- philadelphica*. MS.
- reptans*. 3. (m. Sol.)
- tripteris*. 1.
- verticillata*. 1.

CORIANDRUM. 363.

- sativum*. 1.
- testiculatum*. 3.

CORIARIA. 1192.

- myrtifolia*. 1.
- ruscifolia*.

CORIS. 241.

- monspeliensis*. 1.

CORISPERMUM. 12.

- hyssopifolium*. 1.
- squarrosum*. 1.

CORNUCOPIAE. 76.

- alopecuroides*.
- eucullatum*. 1.

CORNUS. 151.

- alba*. 3.
- alternifolia*. Suppl.
- canadensis*. 2.
- florida*. 1.
- Mas. 1.
- mascula* = *præc.*
- sanguinea*. 1.
- sericea*.
- suecica*. 1.

CORNUTIA. 784.

- pyramidata*. 1.

CORONILLA. 917.

- argentea*.
- coronata*. 3.
- cretica*. 1.

CORONILLA :—

- Emerus. 1.
- glauca. 2.
- juncea. 1.
- minima.
- monilis.
- scandens.
- Securidaca. 1.
- valentina. 1.
- varia. 1.

CORRIGIOLA. 386.

- litoralis. 1.

CORTUSA. 199.

- Gmelini. 1.
- Matthioli. 1.

CORYLUS. 1132.

- Avellana. 1.
- Columna. 3.

CORYMBIUM. —

- africanum*.
- glabrum*.
- scabrum*.

CORYPHA. —

- guineensis*.
- thebaica*.
- umbraculifera*.

COSTUS. 4.

- arabicus. 1.

COTULA. 1014.

- alba* = *Eclipta erecta*.
- anthemoides*. 3.
- aurea*. 3.
- capensis*.
- coronopifolia*. 1.
- grandis* = *Chrysanthemum flosculosum*.
- Lidbeckia*. MS.
- nilotica*. MS.
- prostrata* = *Eclipta prostrata*.
- pyrethraria*.
- quineloba*. Suppl.
- radiata*.
- sericea*. Suppl.
- Spilanthus* = *Spilanthus urens*.
- stricta*.
- suffruticosa*. MS.

COTULA :—

- tanacetifolia*. 3.
- turbinata*. 3.
- Verbesina*. 3.
- viscosa*.

COTYLEDON. 594.

- hemisphaerica*.
- hispanica*. 3.
- laciniata*. 1.
- orbiculata*. 1.
- serrata*.
- spinosa* = *Crassula spinosa*.
- spuria*.
- Umbilicus*. 1.
- var. *repens*.
- var. *tuberosa*.

CRACCA. —

- maxima* = *Galega maxima*.
- purpurea* = *Galega purpurea*.
- senticosa* = *Galega senticosa*.
- tinctoria* = *Galega tinctoria*.
- villosa* = *Galega villosa*.
- virginiana* = *Galega virginiana*.

CRAMBE. 849.

- hispanica*. 1.
- maritima*. 1.
- orientalis*. 1.

CRANIOLARIA. —

- annua* = *Martynia annua*.
- fruticosa*.

CRASSULA. 400.

- alternifolia*.
- barbata*. Suppl.
- caffa* = *fruticulosa*.
- centauroides*.
- ciliata*.
- coccinea*. 1.
- cordata*. MS.
- cultrata*. (m. L. f.)
- cymosa*.

CRASSULA :—

- dichotoma.
- flava*.
- fruticulosa*.
- Glaux. MS.
- glomerata. 3.
- macropetala. MS.
- muscosa.
- nudicaulis*.
- obvallata*.
- orbicularis. (m. L. f.)
- pellucida. (m. L. f.)
- perfoliata.
- Portulacaria* = Claytonia
- Portulacaria.
- pruinosa. 3.
- punctata*.
- rubens. 3.
- scabra*.
- spinosa.
- strigosa*.
- subulata.
- tetragona. 3.
- verticillaris*.

CRATAEGUS. 643.

- Aria. 1.
- var. *fennica*.
- var. *succica*.
- Azarolus. 1.
- var. *Aronia*.
- coccinea. 1.
- Crus-galli. 1.
- hybridus*.
- indica. 1.
- Oxyacantha. 1.
- tomentosa. 1.
- tormalis. 1.
- viridis. 1.

CRATAEVA. 619.

- gynandra*.
- inermis = C. Tapia.
- Marmelos*.
- spinosa. (m. Sol.)
- Tapia. 1.

CREPIS. 955.

- alpina. 1.
- aspera. 3.
- barbata. 1.

CREPIS :—

- biennis. 1.
- bursifolia*.
- Dioscoridis. 3.
- foetida. 3.
- hirta. 1.
- neglecta. 3.
- nudicaulis* = Leontodon
- hirtum.
- pulchra. 3.
- pygmaea. 1.
- rhagadioloides*.
- rubra. 1.
- sibirica. 3.
- tectorum. 1.
- vesicaria. 3.
- virens. 3.

CRESCENTIA. 779.

- cucurbitina*.
- Cujete. 3.

CRESSA. 317.

- cretica. 1.

CRINUM. 415.

- africanum. 1.
- americanum*.
- asiaticum. 3.
- barbatum. MS.
- latifolium. 1.
- zeylanicum. 3.

CRITHMUM. 347.

- maritimum. 3.
- pyrenaicum. 3.

CROCUS. 56.

- Bulbocodium*.
- sativus. 1.
- var. *officinalis*.
- var. *vernus*.

CROTALARIA. 895.

- alba*.
- amplexicaulis. 3.
- biflora*.
- chinensis. 3.
- cordifolia.
- heterophylla. Suppl.
- imbricata*.
- incana. 1.
- incanescens. Suppl.
- junceae. 1.

CROTALARIA :—

- laburnifolia. 3.
- latifolia.
- lunaris.
- perfoliata.
- perforata.
- quinquefolia. 3.
- retusa. 1.
- sagittalis. 1.
- sessiliflora.
- sessilifolia, sphalm. =
præc.
- triflora.
- verrucosa.
- villosa.

CROTON. 1140.

- argenteum. 1.
- aromaticum. 3.
- balsamiferum. 3.
- Benzoe = seq.
- Bentzoe.
- Cascarilla. 3.
- castaneifolium.
- flavens. 3. (m. Sol.)
- glabellum. 3.
- glandulosum. 3.
- hastatum.
- humile. 3. (m. Sol.)
- lacciferum. 3.
- lobatum.
- lucidum. 3.
- moluccanum. 3.
- palustre. 1.
- ricinocarpos.
- sebiferum. 1.
- spinosum.
- subtomentosum.
- Tigilium. 3.
- tinctorium. 3.
- urens = Tragia involu-
crata.
- variegatum.

CRUCIANELLA. 130.

- aegyptiaca.
- angustifolia. 1.
- latifolia. 3.
- maritima. 3.
- monspeliaca. 1.

CRUCIANELLA :—

- patula. 2.

CRUCITA. —

- hispanica.

CUCUBALUS. 582.

- acaulis = Silene
acaulis.
- aegyptiacus.
- baccifer. 1.
- Behen. 1.
- var. feminea.
- Catholicus. 1.
- fabarius.
- giganteus = Silene gigan-
teus.
- italicus. 3.
- mollissimus.
- Otites. 1.
- pumilio. 3.
- quadrifidus = Silene
quadrifida.
- reflexus. 1.
- saxifragus.
- sibiricus. 3.
- stellatus. 1.
- tataricus.
- viscosus. 1.

CUCUMIS. 1152.

- acutangulus. 1.
- anguinus.
- Anguria. 1.
- Chate. 3.
- Colocynthis. 1.
- Dudaïm. 1.
- flexuosus.
- maderaspatanus.
- Melo. 1.
- pedatus = Anguria
pedata.
- prophetarum.
- sativus.
- trifoliatus = Anguria
trifoliata.
- trilobatus = Anguria
trilobata.

CUCURBITA. 1151.

- Citrullus.
- Lagenaria. 2.

CUCURBITA :—

- Melopepo.*
nova.
ovifera. 3.
Pepo. 2.
verrucosa.

CUMINUM. 358.

- Cuminum.* 1.

CUNILA. 38.

- mariana.* 3.
pulegioides. 3.
thymoides. 3.

CUNONIA. 571.

- capensis.* 3.

CUPANIA. — (genus deest
jam anno 1767?).

- americana.*

CUPRESSUS. 1137.

- disticha.* 1.
juniperoides.
sempervirens. 1.
thyoides. 1.

CURATELLA. —

- americana.*

CURCUMA. 7.

- longa.* 3.
nova.
rotunda.

CUSCUTA. 170.

- americana.* 1.
Epithymum. 2.
europaea. 1.
 — var. *Epithymum.*
filiformis. MS.

CUSSONIA. 376.

- thyrsiflora.*

CYANELLA. 430.

- capensis.* 3.

CYCAS. 1292.

- circinalis* (pl.).

CYCLAMEN. 202.

- europaeum.* 1.
indicum.

CYMBARIA. 768.

- daurica* (pl.).

CYNANCHUM. 308.

- acutum.* 1.
aphyllum.
capense. Suppl.

CYNANCHUM :—

- erectum.* 1.
hirtum.
maritimum.
monspeliacum. 1.
planiflorum = seq.
planifolium.
racemosum.
suberosum. 1.
undulatum.
viminale.

CYNARA. 969.

- acaulis.*
Curdunculus (pl.).
humilis. 1.
Scolymus. 3.

CYNOGLOSSUM. 183.

- apenninum.* 1.
cheirifolium. 1.
laevigatum.
linifolium. 1.
lusitanicum. 3.
montanum.
officinale = vulgare.
Omphalodes. 1.
omphaloides = praec.
virginianum. 1.
virginicum = praec.
vulgare. MS.

CYNOMETRA. 533.

- cauliflora.* 3.
ramiflora.

CYNOMORIUM. 1084.

- coccineum.*

CYNOSURUS. 91.

- aegyptius.* 1.
aureus. 1.
caeruleus. 1.
coracanus. 3.
cristatus. 1.
creticus. MS. (= pro-
cumbens.)
durus. 1.
echinatus. 1.
indicus. 1. (m. Sol.)
Lima. 1.
paniceus.
procumbens. MS.
virgatus. 3.

CYPERUS. 70.

- alternifolius. 3.
- annuus. MS.
- articulatus. 3.
- arundinaceus = spathaceus.
- compressus. 1.
- difformis. 3.
- distans. Suppl.
- elatus. 3.
- elegans. 3.
- esculentus.
- ferrugineus = spathaceus.
- flavescens. 1.
- fuscus.
- glaber.
- glomeratus. 3.
- Haspan. 1.
- hexastachyos.
- Iria. (cf. C. Haspan in hb.)
- laevigatus.
- ligularis. 3.
- longus. 1.
- minimus.
- monostachyos.
- mucronatus.
- odoratus. 3.
- Papyrus. 3.
- pumilus. 3.
- rotundus. 3.
- spathaceus.
- squarrosus. 3.
- strigosus. 1.
- tenellus. Suppl.
- triflorus.
- vaginatus. MS.

CYPRIPEDIUM. 1061.

- bulbosum. 1.
- Calceolus. 1.

CYRILLA. 272.

- racemiflora. 3.

CYTINUS. 1075.

- Hypocistis. 3.

CYTISUS. 912.

- aethiopicus.
- argenteus. 1.
- austriacus. 3. (m. Jacq. et L. f.)

CYTISUS :—

- Cajan. 1.
- græcus.
- hirsutus. 1. (m. L. f.?)
- Laburnum. 3.
- monspessulanus.
- nigricans. 1.
- patens.
- pinnatus = Robinia mitis.
- psoraloides = Indigofera psoraloides.
- sessilifolius. 1.
- supinus. 1. (m. L. f.)

DACTYLIS. 90.

- ciliaris.
- cynosuroides. 1.
- glomerata. 1.
- lagopodoides. 1.
- paleacea.

DAIS. 554.

- cotinifolia. 3.
- octandra. 3.

DALBERGIA. 886. (Suppl.)

- Amerimnon. MS.

DALECHAMPIA. 1138.

- scandens.

DALIBARDA. —

- repens = Rubus Dalibarda.

DAPHNE. 500.

- alpina. 3.
- Cneorum. 1.
- Gnidium. 1.
- indica. 2.
- Laureola. 3.
- Mezereum. 1.
- oleoides.
- pontica.
- pubescens. 3.
- Tartan-raira. 1.
- Thymelæa. 1.
- villosa. 3.

DATISCA. 1196.

- Cannabina. 1.
- hirta. 1.

DATURA. 243.

- arborea.

DATURA —

- fastuosa*. 3.
- ferox*.
- Metel. 2.
- Stramonium. 1.
- Tatula. 3.

DAUCUS. 340.

- Carota. 1.
- Gingidium. 1.
- mauritanicus. 3.
- muricatus. 3.
- var. *maritimus*.
- Visnaga. 1.

DECUMARIA. 617.

- barbara*.

DELIMA. 683.

- sarmentosa* (pl.).

DELPHINIUM. 694.

- Aconiti. 3.
- Ajaci. 1.
- ambiguum. 3.
- Consolida. 1.
- elatum. 1.
- grandiflorum. 1.
- hybridum.
- monstruosum*.
- peregrinum. 1.
- Staphisagria. 1.

DENTARIA. 834.

- bulbifera. 2.
- enneaphyllos. 1.
- pentaphyllos. 2.

DIALIUM. 23.

- indum* (pl.).

DIANTHERA. 29.

- americana*. 1.
- comata*. 3. (m. L. f.)

DIANTHUS. 581.

- alpinus*.
- arboreus*.
- arenarius*. 1.
- Armeria. 1.
- barbatus. 1.
- carthusianorum. 1.
- Caryophyllus. 1.
- var. *coronarius*.
- var. *imbricatus*.
- var. *inodorus*.
- chinensis*. 1.

DIANTHUS:—

- deltoides*. 1.
- diminutus*.
- ferrugineus*.
- fruticosus*.
- glauens*. 1.
- hyssopifolius* = *superbus*.
- monspeliacus* = *seq.*
- monspeliensis*.
- plumarius*. 1.
- pomeridianus*. 3.
- prolifer*. 1.
- pungens*.
- saxifragus*.
- superbus*. 3.
- virginens*. 3.

DIAPENSIA. 195.

- helvetica*.
- lapponica*. 1.

DIASPERUS = PHYLLANTHUS.

DIASTEMA. Linn. f. MS. =

- DALBERGIA.

DICTAMNUS. 536.

- albus* (pl.).

DIGITALIS. 775.

- ambigua*.
- canariensis*. 1.
- ferruginea*. 1. (*cf.*
- lutea*.)
- lutea*. 1.
- minor*.
- obscura*.
- ochroleuca* [an m. L. f.?
- = *ambigua*?]
- purpurea*. 1.
- Thapsi*.

DILATRIS. 63.

- corymbosa*. (m. L. f.)
- viscosa*. (m. L. f.)

DILLENIA. —

- indica*.

DIODIA — (deest).

- virginiana*.
- virginica* = *præc.*

DIONÆA. 555.

- Muscipula*. (“*Musci-*
- capa*.”)

DIOSCOREA. 1184.

- aculeata*.

DIOSCOREA : —

- alata*. 1.
- bulbifera*. 1.
- oppositifolia*.
- pentaphylla*.
- sativa*. 1.
- triphylla*.
- villosa*.

DIOSMA. 270.

- barbigera*. Suppl.
- capensis*.
- capitata*. (m. L. f.)
- ciliata*. 1.
- crenata*. 3.
- crenulata* = *praec.*
- cupressina*.
- ericoides*. 3.
- hirsuta*. 1.
- imbricata*.
- lanceolata*.
- latifolia*. Suppl.
- marginata*. Suppl.
- oppositifolia*. 1.
- pulchella*.
- rubra*. 1.
- uniflora*. 1.

DIOSPIROS. 1231.

- australis*. MS.
- Lotus*. 1.
- virginiana*. 1.

DIPSACUS. 119.

- fullonum*. 1.
- laciniatus*. 1.
- pilosus*. 1.

DIRCA. 501.

- palustris*. 1.

DISA. 1060.

- uniflora* (pl.).

DISANDRA. 475.

- prostrata* (pl.).

DODARTIA. 860.

- indica*. 1.
- orientalis*. 1.

DODECAS. 623. Suppl.

- surinamensis* (pl.).

DODECATHEON. 201.

- Meadia*. 2.

DODONAEA. 495.

- viscosa* (pl.).

DOLICHOS. 900.

- altissimus*.
- aristatus*.
- biflorus*.
- bulbosus*. 3.
- capensis*.
- Catiang*.
- ensiformis*.
- erosus* = *bulbosus*.
- filiformis*. 3. (m. Sol.)
- Lablab*. 1.
- lignosus*.
- minimus*. 3.
- polystachios*. 3.
- pruriens*. 3.
- pubescens*. 3.
- purpureus*. 3.
- regularis*.
- repens*, (m. Sol.) =
uncinatus.
- scarabaeoides*. 1.
- sesquipetalis*.
- sinensis*.
- Soja*. 3.
- tetragonolobus*. 3.
- trilobatus* = *Glycine*
triloba.
- trilobus*. 1.
- uncinatus*.
- unguiculatus*.
- urens*.

DORONICUM. 1002.

- Bellidiastrum*. 1.
- incanum*.
- pardalianches*. 1.
- (m. L. f.)
- plantagineum*. 1.

DORSTENIA. —

- alexiteria*.
- caulescens*.
- Contrajerva*.
- var. *Houstoni* =
Houstoni.
- Drakena*.
- Houstoni*.

DRABA. 823.

- aizoides*. 3.
- alpina*. 1.
- ciliaris*. 3.

DRABA :—

- hirta*. 3.
- incana*. 1.
- muralis*. 1.
- nemorosa*. 1.
- pyrenaica*. 1.
- verna*. 1.

DRACAENA. 435.

- Draco*.
- ensifolia*. 3.
- ferrea*. 3.
- graminifolia*. 3.
- terminalis*.
- volubilis*. Suppl.

DRACOCEPHALUM. 746.

- altaijense*.
- austriacum*. 1.
- canariense*. 1.
- canescens*. 1.
- grandiflorum*. 1.
- Moldavica*. 1.
- nutans*. 1.
- peltatum*. 1.
- peregrinum*. 3.
- pinnatum*. 1.
- Ruyschiana*. 1.
- sibiricum*. 3.
- thymiflorum*. 1.
- virginianum*. 1.

DRACONTIUM. 1080.

- camtschatcense*.
- foetidum*. 1.
- pertusum*.
- polyphyllum*. (m. L. f.)
- spinosum*.

DRIMYS [Forst.] 696.

- "Wintera" Sm. MS.
- axillaris* [Forst.].
- granadensis* [Forst.].
- Winterana* (m. L. f.) =
- Winteri* [Forst.].

DROSERA. 398.

- capensis*. 3.
- cistiflora*. 3.
- cuneifolia*. MS.
- indica*.
- longifolia*. 1.
- lusitanica*. 3.
- rotundifolia*. 1.

DROSERA :—

verticillata.

DRUPINA. —

cristata.

DRYAS. 658.

- octopetala*. 1.
- pentapetala*. 1.

DRYPIS. 389.

spinosa. 3.

DURANTA. 806.

- Ellisia*. 3. (m. Sol.)
- erecta*.
- Plumieri*. 3.
- repens*.

DURIO. 940.

zibethinus.

EBENUS. 929.

- capensis*.
- cretica*. 1.

ECHINOPHORA. 336.

- spinosa*. 1.
- tenuifolia*. 3.

ECHINOPS. 1045.

- corymbosus*.
- fruticosus*.
- Ritro*. 1.
- sphaerocephalus*. 1.
- spinus*. 3.
- strigosus*. 1.

ECHITES. 302.

- agglutinata*.
- annularis*.
- biflora*.
- caudata*. 3.
- corymbosa*.
- nova* = *syphilitica*.
- quinquangularis*.
- scholaris*. 3.
- spicata*.
- suberecta*.
- syphilitica*. Suppl.
- torulosa*.
- trifida*.
- umbellata*.

ECHIUM. 191.

- argenteum*.
- capitatum*. 3.

ECHIUM :—

- creticum. 1.
- fruticosum. 1.
- glabrum*.
- italicum. 1.
- laevigatum. 3.
- lusitanicum. 3. (m. L. f.)
- orientale*.
- plantagineum.
- pyrenaicum.
- spicatum. MS.
- violaceum. 3.
- vulgare. 1.

ECLIPTA. 1020.

- alba. MS. [= seq. ?]
- erecta.
- latifolia. Suppl.
- prostrata. (m. Sol.)
- punctata* = erecta ?

EHRETIA. 254.

- Bourreria. 3. (m. Sol.)
- exsucca*.
- spinosa* [Jacq.].
- tinifolia. 3.

ELAEAGNUS. 160.

- angustifolia. 1.
- latifolia. 1.
- orientalis. 3.
- spinosa. 3.

ELAEOCARPUS. 681.

- serrata* (pl.).

ELAIS. —

- guineensis*.

ELATE. —

- sylvestris*.

ELATERIUM. —

- carthaginense*.
- trifoliatum*.

ELATINE. 517.

- Alsinastrum. 1.
- Hydropiper* (pl.).

ELEGIA. 1164 A.

- junceae. (m. Dahl)

ELEPHANTOPUS. 1043.

- scaber. 1.
- tomentosus. 1.

ELLISIA. 206.

- acuta*.
- Nyctelea*.

ELYMUS. 100.

- arenarius. 3.
- canadensis*.
- caninus. 3.
- Caput-Medusae. 3.
- europaeus. 3.
- Hystrix. 3.
- monococcus*.
- philadelphicus. 3.
- sibiricus. 3.
- virginicus. 3.

EMPETRUM. 1160.

- album. 1.
- nigrum. 1.

EPHEDRA. 1200.

- distachya. 1.
- monostachya*.

EPIDENDRUM. 1062.

- aloifolium*.
- amabile. 1.
- carinatum*.
- caudatum*.
- ciliare*.
- coccineum*.
- cochleatum. 3.
- cucullatum*.
- domesticum*.
- ensifolium. 3.
- Flos-aëris. 3.
- furvum*.
- graminifolium*.
- guttatum*.
- juncifolium*.
- lineare. [Jacq.]
- moniliforme.
- nocturnum.
- nodosum.
- ophioglossoides*.
- ovatum.
- punctatum*.
- pusillum. 3.
- retusum*.
- ruscifolium.
- scriptum*.
- secundum*.
- spatulatum*.
- tenuifolium*.
- terrestre.
- tuberosum.

EPIDENDRUM :—

Vanilla. 3.

EPIGAEA. 564.

repens. 1.

EPILOBIUM. 486.

alpinum. 3.

angustifolium. 1.

hirsutum. 1.

latifolium. 1.

montanum. 1.

palustre. 1.

tetragonum. 1.

EPIMEDIUM. 150.

alpinum. 1.

EQUISETUM. 1241.

arvense. 3.

fluviatile. 1.

giganteum.

hyemale. 3.

limosum.

palustre. 1.

sylvaticum. 1.

ERANTHEMUM. 24.

angustatum.

angustifolium = *praec.*

capense.

parvifolium.

ERICA. 498.

abietina. 3.

absinthoides.

albens.

arborea. 3.

articularis. 3. (m.

L. f.)

australis.

baccans.

Bergiana.

bruniades = *capitata*.

caffra.

calycina.

capitata.

carnea.

caudata. MS.

cerinthoides.

ciliaris. 3.

cinerea. 1.

coccinea.

comosa.

corifolia

cubica.

ERICA :—

cubitalis = *viscaria* ?

curvisflora. 3.

Daboëcii = *Andromeda*

Daboëcia.

denticulata.

depressa.

empetrifolia. 3.

fastigiata. 3.

gnaphalodes.

granulata.

halicacaba. 3.

herbacea. 2.

hispidula. 3.

imbricata. 3.

lntea.

mammosa.

mauritanica.

mediterranea.

melanthera.

mucosa.

multiflora. 3.

nigrita. 3.

nudiflora.

pallide-purpurea.

paniculata. 3.

parvisflora. 3.

Passerinae. Suppl.

pentaphylla.

persoluta.

Petiveri.

physodes.

pilulifera. 3.

planifolia. 3.

Plukenetii. 3.

pubescens. 3.

pulcherrima. MS.

purpurascens.

racemosa. MS.

ramentacea.

regerminans.

retorta. Suppl.

scoparia. 1.

spicata. MS.

spumosa. 3.

tenuifolia. 3.

Tetralix. 1.

triflora. 3.

tubiflora. 3.

umbellata. 1.

ERICA :—

- vagans.
- vegetula. MS.
- viride-purpurea. 3.
- viscaria.
- vulgaris. 1.

ERIGERON. 994.

- acre. 1.
- aegyptiacum. 3.
- alpinum. 3.
- bonariense. 1.
- camphoratum.
- canadense. 3.
- carolinianum.
- foetidum.
- glutinosum. 3.
- Gouani.
- gramineum. 1.
- graveolens. 3.
- jamaicense. 3. (m. Sol.)
- obliquum.
- philadelphicum. 1.
- pinnatum. Suppl.
- siculum. 3.
- tricuneatum. 3. Suppl.
- tuberosum. 3.
- uniflorum. 1.
- viscosum. 1.

ERINUS. 789.

- africanus. 1.
- alpinus. 1.
- americanus. MS.
- capensis. (m. L. f.)
- laciniatus.
- peruvianus. 3.

ERIOCAULON. 105.

- decangulare. 1.
- quinguangulare.
- setaceum.
- sexangulare. 1.
- triangulare.

ERIOCEPHALUS. 1040.

- africanus. 1.
- pectinifolius = Hippia
- frutescens.
- racemosus.

ERIOPHORUM. 72.

- alpinum. 1.
- cyperinum.

ERIOPHORUM :—

- polystachion. 1.
- vaginatum. 1.
- virginicum. 1.

ERITHALIS. —

- fruticosa.

ERVUM. 907.

- Ervilia. 1.
- hirsutum. 1.
- Lens. 1.
- monanthos. 1.
- solonienae.
- tetraspermum. 1.

ERYNGIUM. 331.

- alpinum.
- amethystinum. 1.
- aquaticum. 1.
- campestre. 1.
- foetidum. 1.
- maritimum. 1.
- planum. 1.
- pusillum.
- tricuspidatum. 2.
- trifidum.

ERYSIMUM. 837.

- Alliaria. 1.
- Barbarea. 2.
- cheiranthoides. 1.
- hieracifolium. 2.
- incanum. MS.
- officinale. 1.
- repandum. 3.

ERYTHRINA. 888.

- Corallo-dendrum. 3.
- var. *occidentalis*.
- var. *orientalis*.
- Crista-galli.
- herbacea. 3.
- picta.
- Piscipula.
- planisiliqua.
- variegata.

ERYTHRONIUM. 424.

- Dens-canis. 1.

ERYTHROXYLON. 591.

- areolatum. 3.
- havanense.

ESCALLONIA. 275.

- myrtilloides. (m. L. f.)

ETHULIA. 977.

- Bidentis.
- conyzoides. 3.
- divaricata. 3.
- sparganophora.
- tomentosa. 3.

EUCLEA. 1194.

- racemosa* (pl.).

EUGENIA. 636.

- acutangula*.
- cotinifolia* [Jacq.].
- Jambos [basin versus].
- malaccensis*.
- Pseudo-Psidium* [Jacq.].
- racemosa*.
- uniflora. 1.

EUTONYMUS. 269.

- americanus. 1.
- Colpoon* = Cassine
- capensis.
- europaeus. 1.
- var. *latifolius*.
- var. *tenuifolius*.
- japonicus. Suppl.
- verrucosus. MS.

EUPATORIUM. 978.

- album. 3.
- altissimum. 1.
- aromaticum. 1.
- cannabinum. 1.
- chinense*.
- coelestinum. 2.
- Dalea. 3.
- fruticosum*.
- hastatum. 3.
- Houstonianum*.
- Houstonis* = praec.
- hyssopifolium*.
- ivaefolium. 3.
- macrophyllum*.
- maculatum. 2.
- odoratum. 3.
- perfoliatum. 1.
- purpureum. 1.
- rotundifolium. 1.
- scandens. 1.
- sessilifolium. 1.
- sophiaefolium*.
- trifoliatum. 1.

EUPATORIUM :—

- zeylanicum*.

EUPHORBIA. 630.

- aleppica. 1.
- amygdaloides. 1.
- antiquorum*.
- Apios. 3.
- canariensis*.
- canescens. 3.
- Caput-Medusae*.
- cereiformis*.
- Chamaesyce. 1.
- Characias. 1.
- coralloides. 1.
- corollata. 1.
- cotinifolia*.
- Cyparissias. 1.
- dendroides*.
- dulcis. 1.
- epithymoides. 1.
- Esula. 1.
- exigua. 1.
- var. *acuta*.
- var. *retusa*.
- falcata. 1.
- genistoides*.
- germanica*.
- graminea*.
- helioscopia. 1.
- heptagona*.
- heterophylla*.
- hirta. 1.
- hyberna. 1.
- hypericifolia. 1.
- hyssopifolia. 3.
- Ipecacuanhae. 1.
- Lathyris. 1.
- maculata. 1.
- mammillaris*.
- mauritanica*.
- Myrsinites. 1.
- myrtifolia* = seq.
- myrtillifolia. 3. (m. Sol.)
- neriifolia. 1.
- ocymoides*.
- officinarum*.
- orientalis. 1.
- organoides. 1.
- palustris. 1.

EUPHORBIA :—

- Paralias. 1.
parviflora.
 pedicellata. MS.
 Peplis. 1.
 Peplus. 1.
 pilosa. 1.
 pilulifera. 1.
pineæ.
 Pithyusa. 1.
 platyphyllos. 1.
 polygonifolia. 1.
 portlandica. 3.
 portulacoides. 1.
 segetalis. 1.
 serrata. 1.
 spinosa. 1.
 stricta.
 sylvatica. 1.
 Terracina. 3.
 thymifolia. 1.
Tirucalli.
Tithymaloïdes.
 — var. *myrtifolia*.
 — var. *padifolia*.
tuberosa.
 verrucosa. 1.
viminalis.

EUPHRASIA. 759.

- latifolia. 3.
 linifolia. 3.
 — var. *viscosa* = Buch-
 nera linifolia.
 lutea. 1.
 Odontites. 1.
 officinalis. 1.
 tricuspidata. 3.
viscosa = Buchnera lini-
 folia.

EVOLVULUS. 393.

- alsinoides. 3.
 emarginatus. MS.
gangeticus.
 linifolius. 3.
 nummularius. 3.
 tridentatus.

EVONYMUS v. EUONYMUS.

EXACUM. 143.

- albens. Suppl.

EXACUM :—

- aureum. Suppl.
cordatum, sphalm. =
 sessile.
pedunculatum.
 sessile.

EXCOECARIA. 1162.

- Agallocha* (pl.).

FAGARA. 152.

- octandra*.
piperita.
 Pterota. 3.
tragodes [Jacq.].

FAGONIA. 546.

- arabica* = cretica.
 cretica. 1.
hispanica = cretica.
indica [Burm. f.] =
 cretica.

FAGUS. 1130.

- Castanea. 1.
 pumila. 1.
 sylvatica. 2.

FALCKIA [seu FALKIA]. 461.

- repens* (pl.). Suppl.

FERRARIA. 1065.

- undulata* (pl.).

FERULA. 350.

- Assa-foetida*.
canalensis.
 communis. 3.
Ferulago.
 glauca.
meoides.
nodiflora.
orientalis.
 tingitana. 1.

FESTUCA. 92.

- amethystina*.
 barbata.
 bromoides. 1.
 calycina. 3.
 cristata. 1.
 decumbens. 1.
 dumetorum. 3.
 duriuscula. 3.
 elatior. 1.

FESTUCA :—

- elator var. *sibirica*.
- fluitans.
- fusca. 3.
- maritima.
- Myurus. 1.
- ovina. 1.
- var. *vivipara*.
- phoenicoides*.
- reptatrix. 3.
- rubra. 1.
- serotina* = *Agrostis serotina*.
- spadicea*.

FEVILLEA. 1180.

- cordifolia*.
- scandens*.
- trilobata* (m. Sol.) [ap. ZANONIAM, 1179].

FICUS. 1240.

- benghalensis*.
- Benamina*.
- Carica*. 1.
- indica*. 3.
- lactea*. MS.
- maculata*.
- nymphaeifolia*.
- perforata*.
- pumila*. 3.
- racemosa* = *indica*?
- religiosa*. 3.
- retusa*. 3.
- serrata*.
- Sycomorus*. 1.
- toxicaria*.
- trigonata*.

FILAGO. 1041.

- acaulis* = *pygmaea*.
- arvensis*. 2.
- gallica*. 2.
- germanica*. 3.
- Leontopodium*. 3.
- maritima* = *Athanasia*
- maritima*.
- montana*. 2.
- pygmaea*. 1.
- pyramidata* = *germanica*.

FLAGELLARIA. 463.

- indica*. 1.

FLUSTRA. 1296.

FONTINALIS. 1261.

- antipyretica*. (m. Sol.)
- capillacea*.
- minor*.
- pennata*.
- squamosa*. 3.

FORSKÖHLEA. 605.

- tenacissima* (pl.).

FOTHERGILLA. 693.

- Gardeni* (pl.).

FRAGARIA. 654.

- chilensis*. MS.
- monophylla*. 3. [m. Duchesne].
- muricata*.
- sterilis*. 3.
- vesca*. 1.
- var. *chiloënsis*: cf. *F. chilensis*.
- var. *muricata*: cf. *F. muricata*.
- var. *pratensis*.
- var. *sativa*.
- var. *sylvestris*.

FRANKENIA. 457.

- hirsuta*. 1.
- laevis*. 1.
- pulverulenta*. 1.

FRAXINUS. 1230.

- americana*. 1.
- excelsior*.
- Ornus*.

FRITILLARIA. 421.

- imperialis*. 1.
- Meleagris*. 1.
- nana*.
- persica*.
- pyrenaica*. 1.
- regia*.

FUCHSIA. —

- multiflora*.
- triphylla*.

FUCUS. 1274.

- abrotanifolius*. 1.
- acinarius*. 3.
- aculeatus*. 3.
- alutus*.
- barbatus*.

Fucus:—

buccinalis. (m. L. f.)
 canaliculatus. 3.
 cartilagineus. 1.
 ceranoides. 3.
 ciliatus. 3.
 concatenatus. 3.
 confervoides.
 crispatus. 3.
 crispus. 3.
 dentatus.
 digitatus. 3.
 discors. 3.
 distichus. 3.
 divaricatus. 1.
 elongatus. 1.
ericoides.
 esculentus. 3.
excisus.
 fastigiatus. 1.
 Filum.
 foeniculaceus. 3.
 furcellatus. 3.
 gigartinus. 3.
 granulatus. 3.
 hirsutus. 3.
 inflatus. 3.
lucerus.
 lanosus. 3.
 lendigerus. 1.
 loreus. 3.
 lycoperdioides. 3.
muscoides.
 natans. 1.
 nodosus. 1.
 ornatus.
ovarius, sphalm. =
 uvarius.
palmatum.
 pavonius.
 plumosus.
 pyrifera. (m. L. f.)
 ramentaceus. 3.
 rubens. 3.
 saccharinus. 1.
 sanguineus. 3.
 selaginoides. 3.
 serratus. 3.
 siliculosus. 3.
 siliquosus. 3.

Fucus:—

spermophorus. 3.
 spinosus.
 spiralis. 3.
Tendo.
 triqueter (triquebrac-
 tus?).
 turbinatus. 3.
uranus.
usneoides.
 uvarius. 3.
 venosus.
 vesiculosus. 3.
 vittatus. 3.
 volubilis. 3.

FUMARIA. 881.

Amanni. MS.
 bulbosa. 1.
 — var. *cana*.
 — var. *intermedia*.
 — var. *solida*.
 Capnoides. 1.
capreolata = officinalis,
 var.
 claviculata. 3.
 Cucullaria. 2.
 enneaphylla. 3.
lutea.
 nobilis. 3.
 officinalis. 1.
 sempervirens. 1.
 spectabilis. 1.
 spicata. 3.
 vesicaria. 1.

FUSANUS. —

compressus.

GAHNIA. 459.

procera [Forst.].

GALANTHUS. 409.

nivalis. 1.

GALAX. —

aphylla.

GALAXIA. 851.

angustifolia. MS.

latifolia. MS.

monadelphæ. MS.

GALEGA. 924.

caribæa.

GALEGA :—

- cinerea*. 3.
- fruticosa*.
- littoralis*. 3.
- maxima*.
- officinalis*. 1.
- purpurea*. 3.
- senticosa*.
- tinctoria*.
- villosa*.
- virginiana*. 3.

GALENIA. 507.

- africana*. 1.
- procumbens*. Suppl.

GALEOPSIS. 734.

- Galeobdolon*. 1.
- hirsuta* = *Stachys hirta*.
- Ladanum*. 1.
- Tetrahit*. 1.
- var. *cannabina*.
- var. *grandifloru*.

GALIAM. 129.

- Aparine*. 1.
- aristatum*. 3.
- bermudense*.
- bermudianum* = *praec.*
- boreale*. 3.
- glaucum*. 1.
- graecum*. 3.
- hierosolymitanum*. 3.
- laevigatum*.
- maritimum*. 3.
- minutum*. 1.
- Mollugo*. 1.
- montanum*. 3.
- palustre*. 1.
- parisiense*. 1.
- purpureum*. 1.
- pusillum*. 3.
- rotundifolium*. 1.
- rubroides*. 1.
- rubrum*.
- saxatile*. 1.
- scabrum*. 1.
- spurium*.
- sylvaticum*. 3.
- tinctorium*. 1.
- trifidum*. 1.
- uliginosum*. 1.

GALIAM :—

- verum*. 1.

GARCINIA. 615.

- celebica*.
- cornea*.
- Mangostana*.

GARDENIA. 297.

- florida*.
- Mussaenda*. Suppl.
- Thunbergia*. Suppl.

GARIDELLA. 587.

- Nigellastrum*. 1.

GAULTHERIA. 565.

- procumbens*. 1.

GAURA. 485.

- biennis*. 1.
- fruticosa*.

GENIPA. —

- americana*.

GENISTA. 892.

- anglica*. 1.
- canariensis*. 1.
- candicans*. 3.
- florida*. 3.
- germanica*. 2.
- hispanica*. 1.
- humifusa*. 3.
- linifolia*. 3.
- lusitanica*. 3.
- pilosa*. 1.
- purgans*.
- sagittalis*. 1.
- sibirica*.
- tinctoria*. 1.
- tridentata*. 1.

GENTIANA. 328.

- acaulis*. 1.
- Amarella*. 1.
- aphylla*.
- aquatica*. 1.
- asclepiadea*. 1.
- aurea*. 3.
- bavarica*. 1.
- campestris*. 1.
- Centaurium*. 1.
- ciliata*. 1.
- Cruciata*. 1.
- decumbens*. Suppl.
- exacoides*.

GENTIANA :—

- exaltata* = *bavarica*?
filiformis. 1.
heteroclita.
lutea.
maritima. 3.
nivalis. 1.
perfoliata. 1.
Pneumonanthe. 1.
pulchella [Sw.].
pumila.
punctata. 1.
purpurea.
pyrenaica. 3.
quadrifolia.
quinqueflora.
quinquefolia. 1.
Saponaria. 1.
sessilis.
spicata. 2.
utriculosa. 3.
verna. 1.
verticillata.
villosa.

GEOFFRAEA. —

- spinosa*.

GERANIUM. 858.

- abrotanifolium*. Suppl.
acaule.
acetosum. 3.
aionium. MS.
alceoides. 3.
alchemilloides. 1.
althaeoides. 3.
Arduinum.
argenteum. 3.
auritum.
betulinum. 1.
bohemicum. 3.
capitatum. 1.
carnosum.
carolinianum. 1.
chium. 3.
ciconium. 3.
cicutarium. 1.
 — var. *moschatum* =
 moschatum.
columbinum. 1.
coriandrifolium. 3.

GERANIUM :—

- cotyledonis*.
crispum.
cucullatum. 1.
dissectum. 2.
flavum.
foetidum. MS.
fulgidum. 3.
fuscum.
gibbosum.
glaucophyllum. 1.
grandiflorum = *Grielum*
 tenuifolium.
grossularioides. 1.
gruinum. 1.
hermannifolium.
hispidum. Suppl.
hybridum. 3. (m. L. f.)
incanum.
incarnatum. (m. L. f.)
inquinaus. 1.
lobatum.
 — var. *hirsutum*.
 — var. *pinnatifidum*.
lucidum. 1.
macrorrhizum. 2.
maculatum. 1.
Malacoides. 1.
maritimum. 3.
molle. 1.
moschatum. 3.
myrrhifolium. 1.
nodosum. 1.
odoratissimum. 1.
palustre. 3.
papilionaceum. 3.
peltatum. 3.
phaeum. 1.
pinnatum.
pratense. 1.
prolificum. 3.
 — var. *auritum*.
 — var. *longifolium*.
 — var. *oxaloides*.
 — var. *pinnatum*.
 — var. *proliferum*.
pusillum. 3.
pyrenaicum [Burm. f.].
rapaceum.

GERANIUM :—

- reflexum*.
- Robertianum*. 1.
- romanum*.
- rotundifolium*. 1.
- sanguineum*.
- scabrum*. 3.
- sibiricum*. 1.
- spinosum*.
- striatum*. 3.
- sylvaticum*. 1.
- tabulare*. 3.
- triste*. 1.
- tuberosum*. 1.
- versicolor* = *striatum*.
- vitifolium*. 3.
- zonale*. 1.

GERARDIA. 764.

- delphinifolia*.
- flava*. 1.
- glutinosa*. 1.
- pedicularia*. 1.
- purpurea*. 1.
- tuberosa*.

GEROPOGON. 945.

- calyculatum*.
- glabrum*. 3.
- hirsutum*.

GESNERIA. 766.

- acaulis*.
- humilis*.
- nigrina*. MS.
- tomentosa*. (m. Sol.).

GETHYLLIS. 445.

- afra*. 2.

GEUM. 657.

- montanum*. 3.
- reptans*.
- rivale*. 1.
- urbanum*. 1.
- virginianum*. 1.

GINGKO. —

- biloba* (pl.).

GINORA. —

- americana*.

GISEKIA. 399.

- pharnacioides* (pl.).

GLABRARIA. 938.

GLABRARIA :—

- tersa* (pl.).

GLADIOLUS. 59.

- alatus* = *labialis*.
- alopecuroides*. 3.
- angustus*. 1.
- capitatus*.
- carneus* [Burm. f.].
- communis*. 1.
- decurrens*. MS.
- imbricatus*. 1.
- involutus* [Burm. f.].
- labialis*. MS.
- montanus*. Suppl.
- palmaris*. MS.
- permeabilis* [Burm. f.].
- phalangioides*, MS. = *montanus*.
- plicatus*. 3.
- ramosus*.
- recurvus*, cf. *trigyna*.
- scorpius*, MS. = *montanus*.
- spicatus*. 1.
- trigyna*. MS.
- tristis*. 3.
- undulatus*. 3.

GLAUX. 291.

- maritima*. 1.

GLECHOMA. 732.

- arvensis*. 1. (= *Stachys arvensis*).
- belgica* = *praec.*
- hederacea*. 1.

GLEDITSIA. 1229.

- inermis*.
- triacanthos*. 1.

GLINUS. 631.

- dictamnoides*.
- lotoides*. 1.

GLOBBA. 45.

- marantina*.
- nutans*.
- uviformis*.

GLOBULARIA. 117.

- Alypum*. 1.
- bisnagarica*.
- cordifolia*. 1.
- nudicaulis*. 3.

GLOBULARIA :—

- orientalis*. 1.
- spinosa*.
- vulgaris*. 1.

GLORIOSA. 423.

- simplex*.
- superba*. 1.

GLUTA. 1068.

- Benghas* (pl.).

GLYCINE. 901.

- Abrus* = *Abrus precatorius*.

- Apios*. 1.
- bituminosa*. 3.
- bracteata* = *monoica*.
- comosa*. 3.
- frutescens*.
- Galactia*.
- javanica*. 1.
- labiata*. (m. Dahl?)
- monoica*. 3.
- monophylla*. 3.
- nummularia*.
- subterranea*. 3.
- tomentosa*. 1.
- triloba*.

GLYCYRRHIZA. 916.

- echinata*. 1.
- glabra*. 1.
- hirsuta*.

GMELINA. 780.

- asiatica*. 3.

GNAPHALIUM. 989.

- alpinum*. 2.
- arborescens*.
- arborescens* = *præc.*
- arenarium*. 2.
- arvense* = *Filago arvensis*.
- coronatum*. 3.
- crassifolium*. 3.
- crispum*.
- cylindricum*.
- cylindriflorum* = *præc.*
- cymosum*.
- declinatum*. Suppl.
- decurrens*.
- dentatum*.
- dioicum*. 1.
- var. *mas*.

GNAPHALIUM :—

- dioicum* var. *femina*.
- discolorum*.
- ericoides*.
- eximium*.
- foetidum*. 3.
- fruticans*.
- gallicum* = *Filago gallica*.
- germanicum* = *Filago germanica*.
- glomeratum*. (m. L. f.)
- grandiflorum*. 3.
- helianthemifolium*. 3.
- ignescens*. 2.
- imbricatum* = *paniculatum*.
- indicum*. 3.
- latifolium*.
- Leontopodium* = *Filago Leontopodium*.
- luteo-album*. 3.
- margaritaceum*. 2.
- maritimum*.
- montanum* = *Filago montana*.
- mucronatum*.
- muricatum*. 2.
- niveum*.
- nudiflorum*.
- obtusifolium*. 2.
- Oculus-cati*. Suppl.
- odoratissimum*. 3.
- orientale*. 2.
- patulum*. 2.
- paniculatum*, MS. [an Berg. ?]
- pedunculare*.
- petiolatum*.
- pilosellum*. Suppl.
- plantagineum* = *seq.*
- plantaginifolium*.
- procumbens*. MS.
- purpureum*. 2.
- repens*.
- rutilans*. 2.
- sanguineum*. 3.
- saxatile* = *Conyza saxatile*.
- scabrum* = *squarrosus*.

GNAPHALIUM :—

- serratum*.
sordidum = Conyza
sordida.
squarrosus.
stellatum.
 Stoechas. 2.
stuposum.
supinum.
sylvaticum. 2.
teretifolium.
uliginosum. 2.
undulatum. 3.
verticillatum. Suppl.
virgatum.

GNETUM. 1148.

Gnemon (pl.).

GNIDIA. 502.

- oppositifolia*.
pinifolia. (m. L. f.)
radiata. 3.
sericea. 3.
simplex. 3.
tomentosa. 3.

GOMOZIA. 172.

- granadensis* (pl.).
 Suppl.

GOMPHRENA. 319.

- brasiliensis*.
brasiliensis = *praec.*
ficoidea = *Illecebrum*
ficoideum.
flava.
fruticosa. MS.
globosa. 1.
hispida.
interrupta.
perennis.
polygonoides = *Illece-*
brum polygonoides.
serrata.
sessilis = *Illecebrum*
sessile.
vermicularis = *Illece-*
brum vermiculatum.

GORDONIA. 877.

Lasianthus.

GORTERIA. 1027.

asteroidea, MS. = seq.

GORTERIA :—

- asteroides*. Suppl.
barbata. Suppl.
ciliaris. 3.
fruticosa. 3. [*cf. bar-*
bata.]
herbacea. Suppl.
personata. 3.
rigens. 3.
setosa.
squarrosa.

GOSSYPIUM. 874.

- arborescens*. 1.
barbadensis. 1.
herbaceum. 1.
hirsutum. 3.
praestantissimum. MS.
religiosum. 3.

GOUANIA. 1226.

domingensis (pl.).

GRATIOLE. 30.

dubia = *Lindernia Pyxi-*
daria.

hyssopioides. (m.
 Sparrm.)

Monnieri. 3. (m. Sol.)

officinalis. 1.

peruviana.

rotundifolia.

virginiana. 1.

GREWIA. 1076.

asiatica (pl.). 3.

Microcos. 3.

occidentalis. 1.

orientalis.

GRIAS. —

cauliflora.

GRIELUM. 599.

tenuifolium (pl.).

GRISLEA. —

secunda.

GRONOVIA. —

scandens.

GUAIACUM. 532.

afrum. 1.

officinale. 1.

sanctum. 3.

GUAREA. 489.

trichilioides (pl.).

GUERIA, sphalm. = QUERIA.
 GUETTARDA. 1121.
 speciosa. 2.
 GUILANDINA. 531.
 Bonduc. 1.
 Bonducella.
 dioica.
 Moringa. 1.
 Nuga.
 GUNDELIA. —.
 Tournefortii.
 GUNNERA. 1063.
 perpensa.
 GUSTAVIA. 863.
 Augusta.
 GYPSOPHILA. 579.
 aggregata = *Arenaria*
 tetraquetra.
 altissima. 1.
 fastigiata. 1.
 muralis. 1.
 paniculata. 1.
 perfoliata. 1.
 prostrata. 2.
 repens. 1.
 rigida. 1.
 Saxifraga. 3.
 Struthium.
 tomentosa. 3.

 HAEMANTHUS. 408.
 capensis.
 carinatus.
 ciliaris. 3.
 coccineus.
 puniceus. 1.
 HAEMATXYLUM. 538.
 campechianum. 1.
 HALEZIA. 616.
 carolina = *tetraptera*.
 diptera. 3.
 tetraptera. 3.
 HALLERIA. 778.
 lucida. 1.
 HAMAMELIS. 169.
 virginiana. 1.
 — var. *carolina* =
 Fothergilla *Gardeni*.
 virginica = *praec.*

HAMELLIA. 234.
 patens.
 HARTOGIA. —
 capensis = *Diosma*
 capensis.
 ciliaris = *Diosma*
 ciliata.
 imbricata = *Diosma*
 imbricata.
 lanceolata = *Diosma*
 lanceolata.
 pulchella = *Diosma*
 pulchella.
 HASSELQUISTIA. 348.
 aegyptiaca. 3.
 cordata [*Jacq.*].
 orientalis sphalm. =
 aegyptiaca.
 HEBENSTRETIA. 788.
 capitata. MS.
 ciliata [*Berg.*].
 cordata. 3.
 dentata. 3.
 integrifolia.
 HEDERA. 280.
 Helix. 1.
 quinquefolia. 1.
 HEDIOSMA. MS. 728. [= *Nepeta*.]
 HEDYOTIS. 123.
 Auricularia. 3.
 fruticosa. 1.
 graminifolia. Suppl.
 herbacea.
 maritima. Suppi.
 HEDYSARUM. 921.
 Alhagi. 1.
 alpinum. 1.
 argenteum. (m. L. f.)
 barbatum. 3. (m. Sol.)
 biarticulatum. 3.
 bupleurifolium.
 canadense. 1.
 canescens. 1. (m. Sol.)
 Caput-galli. 1.
 cornutum.
 coronarium. 1.
 crinitum. 3.
 Crista-galli.
 *g**

HEDYSARUM :—

- diphyllum. 1.
 Ecastaphyllum. 3.
 flexuosum. 1.
frutescens.
 gangeticum. 1.
 grandiflorum, MS. =
 argentatum.
 hamatum. 3. (m. Sol.)
 heterocarpon. 1.
 hirtum. 1.
 humile.
 imbricatum. Suppl.
inaceum.
 lagopodioides. 3.
 latebrosus.
 lineatum. 3.
 linifolium. Suppl.
 maculatum. 1.
 marilandicum. 1.
moniliferum.
nudiflorum.
nummularifolium.
 obscurum. 3.
 Onobrychis. 1.
 paniculatum. 3.
prostratum.
 pulchellum. 1.
 pumilum.
renifolium = seq.
 reniforme. 3.
 repens. 2.
 retroflexum. 3.
retrofractum, sphalm. =
 praec.
 saxatile. 3.
 sororium.
Spartium.
 spinosissimum. 1.
spinosum = cornutum.
 strobiliferum. 3.
 styracifolium. 3. (m.
 L. f.)
 triflorum. 1.
 triquetrum. 1.
 umbellatum. 1.
 vaginale. 3.
 viminaceum. MS.
 violaceum. 1.
 virginicum.

HEDYSARUM :—

- viridiflorum.
viscidum.
volubile.

HEISTERIA. —

- coccinea*.

HELENIUM. 1005.

- autumnale. 1.

HELIANTHUS. 1024.

- altissimus. 3.
 angustifolius. 1.
 annuus. 1.
atrorubens.
 decapetalus. 1.
 divaricatus. 1.
 frondosus. 2.
 giganteus. 1.
indicus.
 laevis. 3.
 multiflorus. 1.
 strumosus. 1.
 tuberosus. 1.

HELICONIA. 286.

- Bihai.
 nova [= H. psittacorum,
 Linn. f.].
 pumila = praec.

HELICTERES. 1074.

- angustifolia.
apetala.
baruensis.
carthaginensis.
 Isora. 1.
pentandra.

HELIOCARPUS. 627.

- americana*.

HELIOPHILA. 840.

- corouopifolia.
 flava. Suppl.
 integrifolia. 3.
 pinnata. Suppl.

HELIOTROPIMUM. 179.

- arborescens*.
 barbadense. MS.
 curassavicum. 1. (m.
 Sol.)
 europaeum. 1.
 fruticosum. 3.
 gnaphalodes. 3. (m.
 Sol.)

HELIOTROPIMUM :—

- indicum. 1. (m. Sol.)
- orientale. 1.
- parviflorum.
- peruvianum. 3.
- supinum. 1.

HELLEBORUS. 718.

- foetidus. 1.
- hyemalis. 1.
- niger. 1.
- trifolius. 1.
- viridis. 1.

HELONIAS. 471.

- asphodeloides. 3.
- bullata. 1.
- minuta.

HELVELLA. 1284.

- Mitra. (m. Ehrh.)
- pineti.

HEMEROCALLIS. 446.

- flava. 3.
- fulva. 3.
- Liliastrum* = *Anthericum* *Liliastrum*.
- Liliosphodelus* = *fulva*.
- var. *flavus*.
- var. *fulvus*.

HEMIMERIS. 772.

- diffusa. Suppl.
- montana. Suppl.
- sabulosa. Suppl.

HEMIONITIS. 1248.

- lanceolata. 3. (m. Sol.)
- palmata. 3.
- parasitica. 3. (m. Sol.)

HERACLEUM. 352.

- alpinum*.
- angustifolium*.
- austriacum*.
- elegans*.
- longifolium*.
- Panaces. 1.
- sibiricum. 1.
- Sphondylium. 3.

HERMANNIA. 854.

- alnifolia. 1.
- althaeifolia. 1.
- denudata. Suppl.
- grossularifolia.

HERMANNIA :—

- hyssopifolia. 1.
- lavandulifolia*.
- linifolia* [Burm. f.].
- pinnata* = *Mahernia*
pinnata.
- trifoliata.
- triphylla*.
- trifurcata. 3.

HERMAS. 1227.

- capitata. Suppl.
- depauperata. (m. L. f.)
- gigantea. Suppl.

HERNANDIA. 1104.

- ovigera*.
- Sonora. 1.

HERNIARIA. 312.

- fruticosa. 2.
- glabra. 1.
- hirsuta. 1.
- lenticulata. 3.
- Paronychia* = *Illecebrum*
Paronychia.

HESPERIS. 841.

- africana. 1.
- dentata* = *Sisymbrium*
bursifolium.
- inodora. 3.
- lacera*. (cf. *Cheiranthus*
lacerus.)
- matronalis*.
- var. *sibirica* =
sibirica.
- provincialis*.
- sibirica. 1.
- tristis. 1.
- verna. 1.

HEUCHERA. 325.

- americana*. 1. (pl.)

HIBISCUS. 875.

- Abelmoschus*.
- aethiopicus.
- brasiliensis.
- cancellatus. Cf. Suppl.
- cannabinus.
- clypeatus.
- erecta. MS.
- esculentus. 2.
- ficulneus. 1.

HIBISCUS :—

- fraterius.
 hirsutissimus. MS.
 [=urens. *Linn. f.*]
 hirtus. 1.
 Malvaviscus. 1.
 Manihot. 1.
 Moscheutos. 1.
 micranthus. Suppl.
 mutabilis.
palustris.
pentacarpus.
 populneus. 1.
 Rosa-sinensis. 1.
 Sabdariffa. 1.
 salicifolius.
simplex.
sororius.
 spinifex.
 surattensis. 1.
 syriacus. 1.
 tiliaceus. 1.
 Trionum. 1.
 virginicus.
 vitifolius. (m. L. f.)
 zeylanicus. (m. L. f.)

HIERACIUM. 954.

- alpinum. 1.
 amplexicaule.
 aurantiacum. 1.
 Auricula. 1.
 blattarioides.
capense.
 cerinthoides. 1.
chondrilloides.
cymosum.
 dubium. 3.
glutinosum.
 Gmelini. 1.
 Gronovii. 1.
hedyppoïdes.
hybridum.
incanum.
 Kalmii. 1.
Leontodontis.
 lyratum. 1.
 murorum. 1.
 — var. *myophorum.*
 — var. *pilosissimum.*

HIERACIUM :—

- murorum var. *sylvaticum.*
 paludosum. 1.
 paniculatum. 1.
 Pilosella. 1.
 porrifolium. 3.
 praeinorsum. 1.
 pumilum.
pyrenaicum.
 — var. *austriacum.*
 — var. *blattarioides.*
 — var. *helveticum.*
 — var. *pilosum.*
 sabaudum. 3.
 sanctum. 3.
 Sprengerianum. 1.
 Taraxaci. 3.
tomentosum = Andryala
 lamata.
 umbellatum. 3.
venosum.
 villosum.

HILLIA. —

- parasitica* [Jacq.].

HIPPIA. 1039.

- absinthoides. MS.
 americana. MS.
 frutescens.
 pectinifolius. MS.

HIPPOCRATEA. —

- volubilis.*

HIPPOCREPIS. 919.

- comosa. 1.
 multisiliquosa. 1.
 unisiliquosa.

HIPPOMANE. 1146.

- biglandulosa.*
glandulosa.
 Mancinella. 3.
spinosa.
 Zeocca. MS.

HIPPOPHAE. 1168.

- canadensis. 1.
 Rhamnoides. 1.

HIPPURIS. 11.

- vulgaris.* 1. (pl.)

HIRAEA. —

- reclinata* [Jacq.].

HIRTELLA. —

americana.

HOLCUS. 1212.

*bicolor.**halepensis.* 1.*lanatus.* 1.*lappaceus.* MS.*latifolius.**laxus.* 1.*mollis.* 3.*niger.* MS.*odoratus.* 1.*pertusus.**saccharatus.**serratus.* Suppl.*Sorghum.* 3.*spicatus.* 3.*striatus.* 1.

HOLOSTEUM. 109.

cordatum. 1.*hirsutum.**succulentum.**umbellatum.* 1.

HOPEA. 942.

tinctoria.

HORDEUM. 103.

bulbosum. 3.*distichon.**hevastichon.**jubatum.* 1.*murinum.* 1.*nodosum.* 3.*vulgare.* 1.*Zeocriton.* 1.

HORMINUM. 747.

pyrenaicum. 3.*virginicum.* (cf. *Salvia*
purpurea.)

HOTTONIA. 204.

indica. 3.*palustris* (pl.).

HOUSTONIA. 128.

caerulea. 3.*purpurea.* 3.

HUDSONIA. 622.

cricoides (pl.).

HUGONIA. 857.

Mystax (pl.).

HUMULUS. 1178.

Lupulus. 1.

HURA. 1144.

crepitans. 3.

HYACINTHUS. 438.

amethystinus. 2.*botryoides.* 1.*cernuus.* 1.*comosus.* 1.*corymbosus.* (m. L. f.)*lanatus.**monstruosus.* 1.*Muscari.* 1.*non-scriptus.* 1.*orchioides.**orientalis.* 3.*pusillus.* MS.*racemosus.* 3.*romanus.**serotinus.* 1.*viridis.* 3.

HYDNUM. 1281.

auriscalpium. (m. Ehrh.)*imbricatum.**parasiticum.**repandum.**tomentosum.*

HYDRANGEA. 573.

arborescens.

HYDRASTIS. 720.

canadensis. 3.

HYDROCHARIS. 1189.

Morsus-ranae. 1.

HYDROCOTYLE. 332.

americana. 1.*asiatica.* 1.*chinensis.* 1.*cordifolia.* MS.*erecta.* Suppl.*ranunculoides.* Suppl.*thelygonoides.* MS.*umbellata.* 1.*villosa.* Suppl.*vulgaris.* 1.

HYDROLEA. —

spinosa.

HYDROPHYLLUM. 205.

canadense. 3.*virginianum* = seq.*virginicum.* 3.

HYMENAEA. 526.

Courbaril. 3.

HYOBANCHE. 799.*sanguinea* (pl.).**HYOSCYAMUS. 244.**

albus. 1.

aureus. 3.

Belladonnae.

muticus.

niger. 1.

physaloides. 1.

pusillus. 1.

reticulatus.*Scopolia* (pl.).**HYOSERIS. 957.**

cretica. 1.

foetida.

Hedypnois. 1.

lucida. 3.

minima. 3.

radiata. 1.

Rhagadioloides. 1.

scabra. 3.

virginica. 1.

HYPECOM. 171.*erectum*.

pendulum. 1.

procumbens. 1.

HYPERICUM. 943.*ægypticum*.

Androsænum. 1.

Acyron. 1.

bacciferum.

balearicum. 1.

barbatum.

calycinum. 3.

canadense. 3.

canariense. 1.

cayanense.

chinense.*Coris*.

crispum. 3.

elodes. 3.

ericoides.*guineense*.

hircinum. 1.

hirsutum. 1.

humifusum. 1.

Kalmianum. 1.

Lasianthus = *Gordonia**Lasianthus*.**HYPERICUM:—***mexicanum*. (m. L. f.)*monogynum*. 3.*montanum*. 3.*mutilum*.*nummularium*.*olympicum*. 1.*orientale*. 3.*perfoliatum*.*perforatum*. 1.*petiolatum*.*prolificum*. 3.*pulchrum*.*quadrangulum*. 1.*repens*. 3.*sanguineum*. MS.*scabrum*. 3.*setosum*.*tomentosum*. 3.*virginicum*. 3.**HYPNUM. 1266.***abietinum*. 1.*acacioides*.*adiantoides*. 1.*aduncum*.*alopecurum*.*bryoides*.*clavatum*. MS.*clavellatum*.*complanatum*. 1.*compressum*.*crispum*. 1.*cupressiforme*.*Crista-castrensis*.*curtipendulum*. 1.*cuspidatum*. 1.*delicatulum*.*dendroides*.*denticulatum*.*filicifolium* = *filifolium*.*filicinum*.*filifolium*.*fluitans*. (m. L. f.)*gracile*.*illicebrum*.*julaceum*.*loreum*.*lucens*.*mysuroides*.

HYPNUM :—

- ornithopodioides.*
- palustre.*
- parietinum.* 1.
- plumosum.*
- praelongum.*
- proliferum.*
- purum.* (m. Sol.)
- riparium.*
- rugosum.*
- ruscifolium.* MS.
- rutabulum.*
- sciuroides.*
- scorpioides.* 1.
- sericeum.* 2.
- serpens.*
- spiniforme.*
- squarrosum.* 1.
- sylvaticum.*
- taxifolium.* 1.
- triquetrum.*
- undulatum.* 1.
- velutinum.* 1.
- viticulosum.*

HYPOCHAERIS. 959.

- Achyrophorus* = *Seriola*
- aethnensis.*
- glabra.* 1.
- maculata.* 1.
- pontana.*
- radicata.* 1.
- urens.*

HYPOXIS. 427.

- alba.* Suppl.
- decumbens.* 3.
- erecta.* 3.
- fascicularis.*
- minuta.* Suppl.
- plicatilis.* Suppl.
- (*plicata*).
- serrata.* Suppl.
- sessilis.*
- striata.* MS.

HYSSOPUS. 725.

- Lophanthus.* 1.
- nepetoides.* 1.
- officinalis.* 1.

IBERIS. 827.

- amara.* 3.

IBERIS :—

- arabica.* 3.
- cretica.*
- gibraltarica.*
- linifolia.* 3.
- nudicaulis.* 1.
- odorata.*
- pinната.* 3.
- rotundifolia.* 1.
- saxatilis.* 3.
- semperflorens.* 3.
- sempervirens.*
- umbellata.* 1.

IGNATIA. 251.

- nova* = *amara*, Linn. f.

ILEX. 173.

- Aquifolium.* 1.
- asiatica.*
- Cassine.* 1.
- cuneifolia.*
- Dodonaea.*

ILLECEBRUM. 290.

- Achyrantha.* 3.
- arabicum.* 3.
- alsinefolium.* 3.
- benghalense.*
- brachiatum.*
- capitatum.* 1.
- cymosum.* 1.
- ficoideum.* (m. Sol.)
- javanicum.*
- lanatum.*
- Monsoniae.* Suppl.
- Paronychia.* 1.
- polygonoides.*
- sanguinolentum.*
- sessile.* 3.
- suffruticosum.* 1.
- vermiculatum.* 3.
- verticillatum.* 1.

ILLICIUM. 704.

- acudentata.* MS.
- anisatum.*
- floridanum.*

IMPATIENS. 1053.

- Balsamina.* 1.
- chinensis.* 1.
- cornuta.*
- latifolia.* 3.
- Noli-tangere.* 1.

IMPATIENS :—

oppositifolia.
triflora.

IMPERATORIA. 366.

Ostruthium. 2.

INDIGOFERA. 923.

angustifolia.
Anil.
argentea.
cytisoides. 3.
disperma.
enneaphylla.
glabra.
hirsuta.
mexicana. Suppl.
pentaphylla.
procumbens.
psoraloides. 3.
racemosa = *præc.*
sericea.
tinctoria. 1.
tomentosa. MS.
trifoliata. 3.

INULA. 999.

aestuans.
arabica. 3.
aromatica. 3.
bifrons = *Conyza bifrons.*
Britannica. 2.
caerulea = *Aster poli-*
folius.
crithmifolia = *seq.*
crithmoides. 1.
dysenterica. 1.
ensifolia. 3.
foetida. 3.
germanica. 1.
Helenium. 1.
hirta. 1.
indica. 3.
mariana. 3.
montana.
myrtifolia.
Oculus-Christi. 1.
odora. 1.
pinifolia.
provincialis.
Pulicaria. 1.
salicina. 1.

INULA :—

spiraeifolia. 3.
squarrosa. 3.
Travis.
undulata. 3.
villosa.

IPOMOEA. 219.

aegyptia = *Convolvulus*
pentaphyllus.

alba.
Bona-nox. 3.
campanulata. 1.
carnea.
carolina.
coccinea. 1.
digitata.
glaucofolia.
hastata.
hederifolia.
hepaticaeifolia.
lacunosa.
muricata [*Jacq.*].
Nyctelea = *Ellisia*

Nyctelea.

Pes-tigridis. 1.
Quamoclit. 1.
quinquefolia = *Convol-*
vulus quinquefolius.
repanda.
rubra.
serpens. MS.
solanifolia.
tamniifolia.
triloba. 1.
tuberosa. 1.
umbellata.
verticillata.
violacea.

IRESINE. 1175.

Celosia = *seq.*
celosioides.

IRIS. 61.

aphylla.
biflora. 1.
florentina.
foetidissima. 1.
germanica. (m. L. f.)
graminea. 3.
martinicensis.

IRIS :—

- ochroleuca. (m. L. f.)
 persica. 3.
 Pseud-acorus. 1.
 pumila. 1.
pyrenaica.
sambucina.
 sibirica. 1.
Sisyrinchium.
 spuria. 3.
squalens.
 susiana. 3.
 tenuifolia [Pall.].
 tuberosa.
 variegata. (m. L. f.)
 verna. 3.
versicolor.
 virginica. 3.
Xiphium.

ISATIS. 848.

- aegyptia*.
armena.
 lusitanica. 1.
 tinctoria. 1.

ISCHAEMUM. 1214.

- aristatum. 1.
 murinum [Forst.].
 muticum. 1.

ISNARDIA. 157.

- palustris. 1.
 ramosior. MS.

ISOËTES. 1256.

- lacustris. 1.

ISOPYRUM. 717.

- aquilegioides*.
 fumarioides. 1.
thalictrioides.

ITEA. 273.

- virginica. 1.

IVA. 1116.

- absinthoides* = *Hippia*
absinthoides.
 annua. 1.
 frutescens. 1.

IXIA. 58.

- africana*.
alba.
 bulbifera. 3.
Bulbocodium. 3.

IXIA :—

- chinensis. 3.
 corymbosa. 3.
 crocata. 3.
 discolora. MS.
flexuosa.
hirsuta = *Wachendorfia*
 umbellata.
 lacera. MS.
 maculata. 3.
 pendula. MS.
plicata = *Gladiolus pli-*
 catus.
 paniculata. MS.
 polystachya. 3.
rosea.
 scillaris. 3.
 trimaculata. MS.
umbellata = *Wachen-*
dorfia umbellata.
 uniflora. 3.

IXORA. 132.

- alba*.
 americana. 3.
 coccinea. 2.
occidentalis.

JACQUINIA. —

- armillaris*.
linearis.
ruscifolia.

JAMBOLIFERA. —

- pedunculata*.

JASIONE. 1050.

- montana. 3.

JASMINUM. 17.

- azoricum. 1.
 fruticans. 1.
 grandiflorum. 3.
 humile. 1.
 odoratissimum. 1.
 officinale. 1.

JATROPHA. 1141.

- Curcas. 1.
 elastica. Suppl.
 gossypifolia. 1.
herbacea.
Janipha.

JATROPHA :—

- Manihot. 3.
- moluccana. 3.
- multifida. 3.
- urens. 1.

JUGLANS. 1129.

- alba.
- baccata.
- cinerea.
- nigra. 1.
- regia. 1.

JUNCUS. 449.

- acutus. 1.
- articulatus. 1.
- var. *aquaticus*.
- var. *sylvaticus*.
- biglumis. 1.
- bufonius. 1.
- bulbosus. 1.
- campestris. 1.
- conglomeratus. 1.
- effusus. 1.
- filiformis. 1.
- glomeratus, MS. (2) = conglomeratus.
- glomeratus, MS. (15) = spicatus.
- Jacquini.
- inflexus*.
- niveus. 3.
- nodosus. 3.
- pilosus. 1.
- punctarius. Suppl.
- spicatus.
- squarrosus. 3.
- stygius. 3.
- trifidus. 1.
- triglumis. 1.

JUNGERMANNIA. 1267.

- albicans.
- alpina. (m. L. f.)
- asplenioides. 2.
- bicuspidata*.
- bidentata. (m. L. f.)
- ciliaris.
- complanata. (m. L. f.)
- dilatata.
- epiphylla.
- furcata.

JUNGERMANNIA :—

- julacea*.
- lanceolata*.
- multifida*.
- multiflora*.
- nemorea* = seq.
- nemorosa*.
- pinguis*. (m. Ehrh.)
- platyphylla*. (m. L. f.)
- polyanthos*.
- pusilla*. (m. Ehrh.)
- quinquedentata*.
- reptans*.
- resupinata*.
- rupestris*.
- Tamarisci* = seq.
- tamariscifolia*.
- trichophylla*. (m. Ehrh.)
- trilobata*.
- undulata* [ap. Hypnum].
- varia*.
- viticulosa*.

JUNGIA. 1046.

- ferruginea*.

JUNIPERUS. 1198.

- barbadensis.
- bermudiana.
- chinensis. 3.
- communis. 3.
- lycia*.
- Oxycedrus. 1.
- phoenicea. 3.
- Sabina. 1.
- thurifera*.
- virginiana. 1.

JUSSIÉUA. 552.

- adscendens*.
- erecta*. 2.
- peruviana*.
- pubescens*.
- repens*.
- suffruticosa* = *præc.*
- tenella*.

JUSTICIA. 28.

- Adhatoda. 1.
- assurgens. 3.
- Betonica*.
- bivalvis. 3.
- carthaginensis*.

JUSTICIA :—

- chinensis. 1.
- Ecbolium. 3.
- echioides*.
- fastuosa.
- gangetica. 3.
- hyssopifolia. 1.
- infundibuliformis. 3.
- nasuta. 1. (m. L. f.)
- paniculata. MS.
- pectinata. 3.
- picta. 3.
- procumbens. 1.
- purpurea. 1.
- repens. 3. (m. L. f.)
- scorpioides*.
- sessilis*.
- sexangularis. 1.
- spinosa*.

KAEMPFERIA. 8.

- Galanga. 1.
- rotunda*.

KALMIA. 560.

- angustifolia. 1.
- latifolia. 1.

KIGGELARIA. 1191.

- africana. 1.

KLEINHOFIA. 1073.

- hospita* (pl.).

KNAUTIA. 121.

- orientalis. 1.
- palaestina.
- plumosa.
- propontica. 3.

KNOXIA. —

- scandens = *Clerodendrum scandens*.
- zeylanica*.

KOENIGIA. 110.

- islandica. 3.

KRAMERIA. —

- Ixina*.

KUHNIA. 238.

- eupatorioides* (pl.).

KYLLINGA. 69.

- monocephala* = *Schoenus coloratus*.

KYLLINGA :—

- triceps* = *Schoenus niveus*.

LACHENALIA. 405.

- tricolor* [Jacq.].

LACHNAEA. —

- conglomerata*.
- eriocephala*.

LACTUCA. 950.

- canadensis. 1.
- indica.
- perennis. 1.
- quercina. 1.
- saligna. 1.
- sativa. 1.
- var. *capitata*.
- var. *crispa*.
- Scariola. 3.
- Serriola* = *praec.*
- virosa. 1.

LAETIA. 680.

- americana*.
- apetala*.
- completa. 3.
- Thamnia*.

LAGERSTROEMIA. 684.

- indica. 3.

LAGOECIA. 282.

- cuminoides. 1.

LAGURUS. 96.

- cylindricus.
- ovatus. 1.

LAMIAM. 733.

- album. 1.
- amplexicaule. 1.
- garganicum* = *L. Orvala*.
- laevigatum. 3.
- maculatum. 3.
- multifidum*.
- Orvala. 3.
- purpureum. 1.

LANTANA. 783.

- aculeata. 1.
- africana. 1.
- annua. 1.
- bullata* = *Varronia bullata*.

LANTANA :

- Camara. 1.
- corymbosa* = Varronia
- lineata.
- involucrata. 3.
- nista*.
- odorata. 3.
- salvifolia. 3.
- trifolia. (trifoliata, m.
L. f.)

LAPSANA. 960.

- capillaris*.
- chondrilloides*.
- communis. 1.
- Rhagadiolus. 1.
- stellata. 1.
- Zacintha. 1.

LASERPITIUM. 351.

- angustifolium*.
- aquilegifolium* [Jacq.].
- Chironium*.
- ferulaceum. 3.
- gallicum. 3.
- latifolium. 3.
- nanum. MS.
- peucedanoides. 3. (m.
L. f.)
- prutenicum. 3.
- Siler. 2.
- simplex*.
- trilobum. 3.

LATHRÆA. 761.

- Anblatum*.
- Clandestina. 1.
- Phelypaea*.
- Squamaria. 2.

LATHYRUS. 905.

- amphicarpus. 1.
- angulatus. 1.
- annuus. 3.
- Aphaca. 3.
- articulatus. 1.
- bithynicus* = *Vicia bithy-*
nica.
- Cicera. 1.
- Clymenum. 1.
- heterophyllus. 1.
- hirsutus. 1.
- inconspicuus. 1.

LATHYRUS :—

- latifolius. 1.
- Nissolia. 1.
- odoratus. 1.
- palustris. 1.
- pisiformis. 1.
- pratensis. 1.
- sativus. 1.
- setifolius. 1.
- sylvestris. 1.
- tingitanus. 1.
- tuberosus. 1.

LAUGERIA. 256.

- odorata. 3.

LAURUS. 518.

- aestivalis. 1.
- Benzoin. 2.
- Borbonia. 3.
- Camphora. 1.
- Cassia. 1.
- Cinnamomum. 3.
- Chloroxylon. 3.
- Culilaban*.
- indica. 1.
- nobilis. 1.
- Persea*.
- Sassafras. 1.
- Winterana* = *Winterania*
- Canella.

LAVANDULA. 727.

- dentata. 1.
- multifida. 1.
- Spica. 1.
- Stoechas. 1.

LAVATERA. 871.

- americana. 3.
- arborea. 1.
- cretica. 1.
- lusitanica*.
- micans*.
- olbia. 3.
- thuringiaca. 1.
- triloba. 1.
- trimestris. 1.

LAWSONIA. 496.

- inermis. 3.
- spinosa. 1.

LECHIA. 115.

- major. 1.

LECHIA :—

minor. 1.

LECYTHIS. 682.

minor.

Ollaria.

LEDUM. 561.

palustre. 1.

LEE. 1118.

aequata. 3.

crispa. 3.

LEMNA. 1093.

arrhiza.

gibba.

minor. 1.

polyrrhiza.

trisulca. 1.

LEONTICE. 433.

Chrysogonum.

Leontopetaloides.

Leontopetalum. 1.

thalioides. 1.

LEONTODON. 953.

aureum. 3.

autumnale. 1.

bulbosum.

Dandelion.

dentatum.

hastile.

hirtum. 3.

hispidum. 1.

lanatum.

Taraxacum. 1.

tomentosum. Suppl.

tuberosum. 3.

LEONURUS. 739.

Cardiaca. 1.

indicus.

Marrubiastrum 1.

sibiricus.

tataricus.

LEPIDIUM. 824.

alpinum.

bonariense.

Cardamines. 3.

chalepense.

didymum. 3.

Draba=Cochlearia

Draba.

graminifolia. 3.

LEPIDIUM :—

Iberis. 1.

latifolium. 1.

lyratum.

Nasturtium. MS.

nudicaule. 1.

perfoliatum. 1.

petraeum. 1.

procumbens. 2.

ruderales. 1.

sativum. 1.

spinosum.

subulatum. 1.

suffruticosum.

vesicarium.

virginicum. 1.

LERCHEA. 851 a.

longicauda.

LEUCADENDRON. —

acaulon.

cancellatum.

Conocarpodendron.

cucullatum = Protea cucullatum.

cyanoides = Protea cyanoides.

cynaroides = Protea cynaroides.

glomeratum = Protea glomerata.

hirtum = Protea hirta.

Hypophyllocarpodendron = Protea Hypophyllocarpodendron.

Lepidocarpodendron = Protea Lepidocarpodendron.

pinifolium = Protea pinifolia.

proteoides = Protea purpurea.

racemosum = Protea racemosum.

repens = Protea repens.

Scolymocephalum.

Serraria = Protea Serraria.

speciosum = Protea speciosa.

LEUCOJUM. 410.

- aestivum. 3.
- autumnale. 1.
- vernum. 1.

LEYSERA. 1008.

- Callicornia*.
- gnaphalodes. 3.
- paleacea. 3.

LICHEN. 1273.

- ampullaceus*.
- aphthosus. 1.
- aquatilis*.
- arcticus. 1.
- articulatus*.
- atro-albus*.
- atro-virens*.
- barbatus. 3.
- Burgessii. (m. L. f.)
- byssoides. (m. Ehrh.)
- calcareus*.
- calicaris. 1.
- candelarius.
- caninus. 1.
- caperatus.
- carpineus. 1.
- centrifugus. 1.
- chalybeiformis. 1.
- chrysophthalmus.
- ciliaris.
- cinereus*.
- cocciferus. 1.
- corallinus*.
- cornucopioides.
- cornutus. 1.
- crispus*.
- cristatus*.
- crocatus.
- crocus. 1.
- cylindricus*.
- deformis. 3.
- densius*, sphalm.=seq.
- deustus. 1.
- var. *aquaticus*.
- digitatus. (m. Sol.)
- divaricatus. 3.
- ericetorum. 1.
- fagineus*.
- fahlunensis. 1.
- farinaceus. 1.

LICHEN :—

- fascicularis. (m. L. f.)
- finbriatus*.
- floridus. 1.
- fragilis. 1.
- fraxineus. 1.
- fulciformis*.
- furfuraceus. 1.
- fusco-ater*.
- gelidus*.
- geographicus*.
- glaucus. 1.
- globiferus. 3.
- gracilis. 1.
- hirtus. 1.
- horizontalis.
- islandicus. 1.
- var. *tenuissimus*.
- jubatus. 1.
- judaicus*.
- juniperinus. 1.
- lacteus*.
- lanatus. 1.
- lentiginosus. MS.
- leucomelos. 3.
- miniatus*.
- nivalis. 1.
- olivaceus. 1.
- omphalodes. 2.
- pallescens. (m. L. f.)
- Parellus*.
- parietinus. 1.
- paschalis. 1.
- perlatus*.
- pertusus. 3.
- physodes. (m. L. f.)
- plicatus*.
- polyphyllus.
- polyrrhizos. (m. Ehrh.)
- proboscideus. 1.
- Prunastri. 1.
- pubescens.
- pulmonarius. 1.
- pustulatus. 1.
- pyxidatus. 3.
- rangiferinus. 1.
- var. *alpestris*.
- var. *sylvaticus*.

LICHEN:—

- resupinatus. 1.
- Roccella. 1.
- rugosus*.
- rupicola*.
- saccatus. 3.
- sanguinarius. 1.
- saxatilis. 1.
- scriptus. (m. L. f.)
- stellaris. 3.
- stygius. 3.
- subfuscus. 3.
- subulatus. 3.
- sylvaticus*.
- tartareus. (m. L. f.)
- uncialis. 1.
- upsaliensis. 1.
- Usnea. 3.
- velleus. 1.
- venosus. 1.
- ventosus.
- vernalis*.
- verrucosus. Suppl.
- vulpinus. 1.

LIGUSTICUM. 353.

- austriacum*.
- balearicum*.
- cornubiense*.
- Levisticum*.
- peloponnesiacum. 1.
- peregrinum.
- scoticum. 1.

LIGUSTRUM. 18.

- vulgare. 1.

LILIUM. 420.

- bulbiferum. 1.
- camtschatcense*.
- canadense. 1.
- candidum. 1.
- chalconicum. 1.
- Martagon*.
- persicum*.
- philadelphicum. 3.
- pomponium. 1.
- superbum*.

LIMEUM. 477.

- africanum. 3. (m. L. f.)

LIMODORUM. 1058.

- altum. 3.

LIMODORUM:—

- tuberosum. 3.

LIMONIA. 550.

- acidissima*. (cf. tri-
foliata.)
- monophylla*.
- trifoliata.

LIMOSELLA. 794.

- aquatica. 1.
- diandra*.

LINCONIA. 323.

- aloppecuroidea* (pl.).

LINDERNIA. 796.

- gratioloides. MS.
- Pyxidaria.

LINNAEA. 792.

- borealis. 1.

LINUM. 396.

- africanum.
- alpinum. 3.
- arborescens*.
- austriacum. 1.
- campanulatum. 3.
- catharticum. 1.
- flavum. 1.
- gallicum.
- hirsutum. 1.
- maritimum. 2.
- narbonense*.
- nodiflorum. 3.
- perenne. 1.
- procumbens. MS.
- quadrifolium. 1.
- Radiola. 1.
- strictum. 1.
- suffruticosum*.
- tenuifolium. 1.
- trigynum* = galli-
cum.
- usitatissimum. 1.
- verticillatum*.
- virginianum. 1.
- viscosum*.

LIPARIA. 910.

- graminifolia.
- opposita*.
- sericea*.
- sphaerica*.
- umbellata*.

LIPARIA :—

villosa = *Borbonia tomentosa*.

LIPPIA. 801.

americana. 1.
hemisphaerica.
ovata. 3.

LIQUIDAMBAR. 1134.

asplenifolia = seq.
peregrina. 3.
Styraciflua. 1.

LIRIODENDRON. 705.

lilifera.
Tulipifera. 1.

LISIANTHUS. 213.

cordifolius. 3.
longifolius.

LITHOSPERMUM. 181.

aegyptiacum. (m. L. f. ?
= *tenuiflorum*, Suppl.)
arvense. 1.
dispermum. 3.
fruticosum. 1.
officinale. 1.
orientale. 3.
purpureocaeruleum. 1.
[*purpureum*.]
tinctorium = *Anchusa tinctoria*.
virginianum. 1.
virginicum = *praec.*

LITTORELLA. 1107.

lucustris.
uniflora. MS.

LOASA. 688.

hispida.

LOBELIA. 1051.

assurgens. 3.
bellidifolia, MS. [= *bellidiflora*, Suppl.]
bulbosa. 3.
Cardinalis. 1.
Cheiranthus = *Manulea Cheiranthus*.
Cliffortiana. 1.
comosa = *triquetra*.
cornuta.
coronopifolia.
debilis. Suppl.

LOBELIA :—

Dortmanna. 1.
elongata. MS.
erinoides. 3.
Erinus. 3.
hirsuta.
hirta.
inflata. 1.
Kalmii. 1.
Laurentia. 3.
longiflora. 3. (m. Sol.)
lutea. 3.
minima. MS.
minuta.
obscura.
Oederia. MS.
paniculata.
Phytенma.
pinifolia. 3.
Plumieri = *Scaevola Lobelia*.
simplex.
surinamensis.
syphilitica. 1.
tenella. 3.
Trapa = *L. Tupa*.
triquetra. 3.
Tupa.
urens. 3.
zeylanica. 3.

LOEFLINGIA. 54.

hispanica. 1.

LOESLIA. —

ciliata.

LOLIUM. 99.

distachyon.
perenne. 1.
temulentum. 1.
tenuе. 3.

LONCHITIS. 1249.

aurita.
hirsuta.
pedata. 3. (m. Sol.)
repens.

LONICERA. 235.

alba = *Chiococca racemosa*.
alpigena. 1.
caerulea. 1.

LONICERA :—

- Caprifolium. 1.
- corymbosa*.
- Diervilla. 1.
- dioica. 3.
- marilandica* = *Spigelia*
marilandica.
- nigra*.
- parasitica*.
- Periclymenum. 1.
- pyrenaica. 1.
- sempervirens. 1.
- Symphoricarpos. 1.
- tatarica. 2.
- Xylosteum.

LORANTHUS. 455.

- americanus*.
- europaeus. 3.
- lonicerioides*.
- occidentalis*.
- pentandrus. 3.
- Scurrula. 3.
- spicatus* [Jacq.].
- Stelis*.
- uniflorus* [Jacq.].

LOTUS. 931.

- angustissimus. 1.
- arabicus. 3.
- conjugatus. 1.
- corniculatus. 1.
- var. *tenuifolius*.
- creticus. 1.
- cytisoides. 1.
- Dorycnium. 1.
- edulis. 3.
- erecta* = *siliquosus*.
- fruticosus* = *Borbonia*
tomentosa.
- graecus. 3.
- hirsutus. 1.
- Jacobaeus. 1.
- maritimus. 1.
- mauritanicus. 3.
- ornithopodioides. 1.
- peregrinus*.
- prostratus. 3.
- rectus. 1.
- siliquosus.
- Tetragonolobus. 1.

LOTUS :—

tetraphyllus.

LUDWIGIA. 154.

- alternifolia*. 1.
- erigata*.
- oppositifolia*.
- perennis*.

LUNARIA. 832.

- annua*. 3.
- rediviva*. 1.

LUPINUS. 898.

- albus*. 1.
- angustifolius*. 1.
- hirsutus*. 1.
- integrifolius*.
- luteus*. 1.
- perennis*. 1.
- pilosus*.
- stoloniferus* = *hirsutus*.
- varius*. 1.

LYCHNIS. 602.

- alpestris*. (m. L. f.)
- alpina*. 1.
- apetala*. 1.
- chalconica*. 1.
- dioica*. 1.
- Flos-cuculi*.
- inaperta*.
- quadridentata* = *Silene*
quadrifida.
- sibirica*. 1.
- Viscaria*. 1.

LYCIUM. 259.

- afrum*. 1.
- album*.
- barbarum*. 1.
- capsulare*. 3.
- europaeum*. 3.

LYCOPERDON. 1287.

- aurantium*.
- Bovista*.
- cancellatum*.
- carcinomatis*. Suppl.
- Carpobolus*.
- cervinum*.
- Epidendrum*.
- epiphyllum*.
- parasiticum*. MS.
- pedunculatum*.

h*

LYCOPERDON :—

- pisiforme.*
- pistillare.*
- radiatum.*
- stellatum.* (m. Ehrh.)
- truncatum.*
- Tuber.*
- variolosum.*

LYCOPodium. 1257.

- alopecurioides.* 1.
- alpinum.* 1.
- annotinum.*
- apodum.* 1.
- Bryopteris.*
- canaliculatum.*
- carolinianum.*
- cernuum.* 1.
- circinale.*
- clavatum.* 3.
- complanatum.* 1.
- denticulatum.* 1.
- flabellatum.* 1.
- helveticum.*
- inundatum.* 1.
- linifolium.*
- nudum.* 1.
- obscurum.* 1.
- ornithopodioides.* 3.
- Phlegmaria.*
- plumosum.* 3.
- rupestre.* 3.
- sanguinolentum.* 1.
- selaginoides.* 1.
- Selago.* 1.
- var. *minor.*

LYCOPSIS. 190.

- aegyptiaca* = *Asperugo*
- aegyptiaca.*
- arvensis.* 1.
- Echioides.*
- orientalis.*
- pulla.* 3.
- variegata.* 1.
- vesicaria.* 1.
- virginica.*

LYCOPUS. 36.

- europaeus.* 1.
- exaltatus.* Suppl.
- italicus.* MS.

LYCOPUS :—

virginicus.

LYGEUM. 75.

Spartum. 2.

LYSIMACHIA. 207.

- atropurpurea.* 1.
- ciliata.* 1.
- Ephemerum.* 1.
- Linum-stellatum.* 1.
- nemorum.* 1.
- Nummularia.* 1.
- punctata.* 3.
- quadrifolia.* 1.
- tenella* = *Anagallis*
- tenella.*
- thyrsiflora.* 1.
- vulgaris.* 1.

LYTHRUM. 626.

- carthaginense* [Jacq.].
- Cuphea.* Suppl.
- fruticosum.* 3.
- Hyssopifolia.* 1.
- lineare.* 2.
- Melanium.*
- Parsonsia.* 3.
- petiolatum.*
- Salicaria.* 1.
- Thymifolia.* 1.
- verticillatum.* 1.
- virgatum.* 1.

MACROCNEUM. 227.

jamaicense. 3. (m. Sol.)

MADREPORA. —

Acetabulum. [= *Ace-*
tabularia mediter-
raea, Lamour.]

MAGNOLIA. 706.

- acuminata.*
- glauc.* 3.
- grandiflora.*
- tripetala.*
- virginiana.*
- var. *acuminata* =
- acuminata.*
- var. *fetida* =
- grandiflora.*
- var. *glauc* =
- glauc.*

MAGNOLIA :—

- virginiana* var. *grisea* =
glauc?
 — var. *tripetala* =
tripetala.

MAHERNIA. —

- pinnata*.
verticillata.

MALACHRA. 867.

- capitata*. 3.
radiata.

MALLOCOCCA [Forst.].

- crenata* [Forst.] = Gre-
 wia Mallococca.

MALOPE. 872.

- Malacoides*. 1.

MALPIGHIA. 588.

- angustifolia*. 3.
aquifolia. 3.
banisteroides.
coccigera.
crassifolia. 1.
glabra. 1.
nitida. 3.
obscura.
punicifolia.
urens. 1.
verbascifolia. 1.

MALVA. 870.

- abutiloides*.
aegyptia. 1.
Alcea. 1.
americana.
bryonifolia. 1.
capensis. 1.
 — var. *scabrosa*.
caroliniana. 1.
coromandeliana. 1.
crispa.
gangetica.
hispanica. 1.
limensis. 3.
mauritiana. 1.
moschata. 3.
parviflora. 2.
peruviana. 1.
rotundifolia. 1.
scabrosa = *capensis*.
scariosa. MS.

MALVA :—

- Sherardiana*. 3.
spicata. 3. (m. L. f.)
sylvestris. 1.
tomentosa. 1.
Tournefortiana. 3.
verticillata. 1.
 — var. *crispa* = *crispa*.

MAMMEA. 675.

- americana*. 1.
asiatica. 3.

MANDRAGORA. —

- officinarum*.

MANETTIA. —

- reclinata*.

MANGIFERA. 276.

- indica*. 1.

MANISURIS. 1215.

- myurus*.

MANULEA. 787.

- Cheiranthus*. 3.
tomentosa.

MARANTA. 6.

- arundinacea*. 1.
Galanga.

MARCGRAVIA. 661.

- umbellata* (pl.).

MARCHANTIA. 1269.

- androgyna*. 1.
chenopoda. (m. Sol.)
conica. (m. L. f.)
cruciata. (an m.
 Swartz?)
hemisphaerica. 1.
polymorpha. 1. ["poly-
 phylla."]
tenella.

MARGARITARIA. 1187.

- alternifolia*. MS.
oppositifolia. MS.

MARRUBIUM. 738.

- acetabulosum*. 3.
africanum. 2.
Alysson. 1.
candidissimum. 1.
crispum. 3.
hispanicum. 1.
peregrinum. 1.
Pseudo-dictamnus. 1.

MARRUBIUM :—

- supinum. 3.
- vulgare. 1.

MARSILEA. 1254.

- minuta.
- natans. 3.
- quadrifolia. 1.
- quadrifoliata* = *præc.*

MARTYNIA. 769.

- annua. 3.
- longiflora.*
- perennis. 1

MASSONIA. 414.

- latifolia. (nom. sp.
m. L. f.) Suppl.

MATRICARIA. 1013.

- argentea.*
- asteroides. 3.
- capensis. 3.
- Chamomilla. 3.
- inodora.*
- maritima. 1.
- Parthenium. 1.
- recutita.*
- suaveolens. 3.

MATTHIOLA. —

- scabra.*

MAURITIA. 1290.

- flexuosa. (m. L. f.)
Suppl.

MEDEOLA. 468.

- aculeata.*
- asparagoides.*
- virginiana. 1.

MEDICAGO. 933.

- arborea. 1.
- circinnata. 1.
- falcata. 1.
- lupulina. 1.
- marina. 1.
- polymorpha.
- var. *arabica.* 2.
- var. *ciliaris.*
- var. *coronata.* 2.
- var. *hirsuta.* 2.
- var. *intertexta.* 2.
- var. *minima.*
- var. *muricata.* 2.
- var. *nigra.*
- var. *orbicularis.* 2.

MEDICAGO :—

- polymorpha.
- var. *rigidula.* 2.
- var. *scutellata.* 2.
- var. *tornata.* 2.
- var. *turbinata.*
- radiata. 1.
- sativa. 1.
- virginica.*

MELALEUCA. 941.

- Leucadendron* (pl.).

MELAMPODIUM. 1034.

- americanum.*
- australe. (m. L. f.)

MELAMPYRUM. 760.

- arvense. 1.
- cristatum. 1.
- nemorosum. 1.
- pratense. 1.
- sylvaticum. 1.

MELANTHIUM. 467.

- capense. 3. (m. L. f.)
- ciliatum. MS.
- indicum.*
- malabaricum. MS.
- sibiricum. 1.
- virginicum. 1.
- viride. Suppl.

MELASTOMA. 559.

- Acinodendrum.*
- aspera. 3.
- crispata.*
- discolor. 3.
- grossularioides.*
- grossa. Suppl.
- hirta. 3.
- holosericea. 3.
- laevigata. 3.
- malabathrica.*
- novu* [= *fragilis.*
Suppl.].
- octandra. 1.
- scabrosa. 3.
- strigosa. Suppl.
- sessilifolia. 3.

MELIA. 543.

- Azadirachta.*
- Azedarach. 1.
- var. *semper-*
virens.

MELIANTHUS. 818.

- major. 1.
minor. 1. (m. L. f.)

MELICA. 86.

- altissima. 1.
ciliaris = seq.
ciliata. 1.
caerulea = *Aira*
caerulea.
falx. Suppl.
minuta. 3.
nutans. 1.
papilionacea. 3.
spectabilis.

MELICocca. 488.

- bijuga. 3.

MELISSA. 745.

- Calamintha. 1.
cretica. 3.
fruticosa. 1.
grandiflora. 1.
Nepeta. 1.
officinalis. 1.
pulegioides = *Cunila*
pulegioides.

MELITTIS. 748.

- Melissophyllum* (pl.).

MELOCHIA. 855.

- concatenata.
corchorifolia. 1. (m.
Sol.)
depressa. 3. (m. Sol.)
pyramidata. 1.
supina.
tomentosa. 3.
trigyna. MS.

MELOTHRIA. 51.

- pendula. 1.

MEMECYLON. 493.

- capitellatum (pl.).

MENALS. —

- topiaria.

MENISPERMUM. 1195.

- canadense. 1.
carolinum.
Cocculus.
crispum.
flavum.
hirsutum.
Myosotis = seq.

MENISPERMUM :—

- myosotoides*.
orbiculatum.
virginicum. 1.

MENTHA. 730.

- aquatica. 1.
arvensis. 1.
Auricularia.
canadensis. 1.
canariensis. 1.
cervina. 1.
crispa. 1.
exigua. 3.
frutescens. MS.
gentilis. 1.
hirsuta. 3.
perilloides = *Perilla*
ocymoides.
piperita. 3.
Pulegium. 3.
rotundifolia. 3.
sativa. 3.
spicata.
—— var. *longifolia* =
sylvestris.
—— var. *rotundifolia* =
rotundifolia.
—— var. *sylvestris* =
sylvestris.
—— var. *viridis* =
viridis.
sylvestris. 3.
verticillata.
viridis. 3.

MENTZELIA. 687.

- aspera. 3. (m. Sol.)

MENYANTHES. 203.

- indica. 3.
Nymphoides. 1.
trifoliata. 2.

MERCURIALIS. 1188.

- afra*.
ambigua. 3.
annua. 1.
perennis. 1.
procumbens.
tomentosa. 1.

MESEMBRYANTHEMUM. 649.

- acaule.
acinaciforme.

MESEMBRYANTHEMUM :—

- acinaciforme.*
- var. *flavum.*
- var. *purpureum.*
- albidum.*
- aureum.*
- barbatum.*
- bellidiflorum.*
- bellidifolium* = *præc. ?*
- bicolorum.*
- calamiforme.*
- copticum.* 3.
- corniculatum.*
- crassifolium.*
- crystallinum.*
- deltoides.*
- difforme.*
- dolabriforme.*
- edule.*
- emarginatum.*
- expansum.*
- falcatum.*
- filamentosum.*
- forficatum.*
- fulgidum.* MS.
- geniculiflorum.*
- glaucum.*
- glomeratum.*
- hispidum.*
- linguiforme.*
- loreum.*
- micans.*
- noctiflorum.*
- nodiflorum.* 2.
- pinnatum.* MS.
- pomeridianum.*
- pugioniforme.*
- ringens.*
- var. *caninum.*
- var. *felinum.*
- rostratum.*
- scabrum.*
- serratum.*
- spinosum.*
- splendens.*
- stipulaceum.*
- tenuifolium.*
- tortuosum.*
- Tripolium.*

MESEMBRYANTHEMUM :—

- tuberosum.*
- umbellatum.*
- uncinatum.*
- veruculation.*
- villosum.*
- MESPILUS. 646.
 - Amelanchier.* 1.
 - arbutifolia.* 1.
 - canadensis.* 1.
 - Chamaemespilus.*
 - Cotoneaster.* 1.
 - germanica.* 1.
 - Pyracantha.* 1.
- MESSERSMIDIA. 192.
 - Argusia* = *sibirica.*
 - sibirica.*
- MESUA. 879.
 - ferrea* (pl.).
- MICHELIA. 707.
 - Champacca.* 3.
 - Tsiampacca.*
- MICROCOS. Cf. GREWIA.
 - lateriflora* = *G. asiatica.*
 - paniculata* = *G. Microcos.*
- MICROPUS. 1042.
 - erectus.* 2.
 - supinus.* 1.
- MILIUM. 83.
 - capense.*
 - ciliare.*
 - cinicinum.*
 - confertum.* 3.
 - effusum.* 1.
 - lendigerum.*
 - paradoxum.* 3.
 - punctatum.* 3.
- MILLEPORA. 1294.
- MILLERIA. 1031.
 - biflora.* 3.
 - quinqueflora.* 1.
- MILLINGTONIA. 808.
 - hortensis,* Linn. f. (pl.).
- MIMOSA. 1228.
 - arborea.* 3.
 - asperata.* 3. (m. Sol.)
 - bigemina.*
 - caesia.*
 - casta.*

MIMOSA :—

- Ceratonia.*
Cineraria.
cinerea.
circinalis.
cornigera. 3.
Entada.
fajifolia.
Farnesiana.
glauca.
horrida.
Inga.
Intsia. (m. L. f.)
latifolia.
latisiliqua.
Lebeck. 3.
muricata.
nilotica. 3.
nodosa.
pennata.
peregrina.
pernambucana.
pigra.
plena. 1.
polystachya.
pudica. 3.
punctata. 3.
purpurea.
quadrivalvis.
reticulata.
scandens.
scorpioides = *nilotica.*
semispinosa.
Senegal. (senegalensis)
sensitiva.
tamarindifolia.
tenuifolia.
tergemina.
tortuosa. 3.
Unguis-cati. 3. (m. L. f.)
vaga.
virgata. 1.
viva. 3.

MIMULUS. 803.

- luteus.*
ringens. 1.

MIMUSOPS. 492.

- Elengi.* 3.
Kauki.

MINUARTIA. 113.

- campestris.* 1.
dichotoma. 1.
montana. 1.

MIRABILIS. 240.

- dichotoma.* 3.
Jalapa. 1.
longiflora. 3.
odorata = *dichotoma.*

MITCHELLA. 135.

- repens.* 1.

MITELLA. 577.

- diphylla.* 1.
nuda. 1.

MNIUM. 1264.

- androgynum.* (m. Ehrh.)
annotinum.
capillare.
cirrhatum.
crudum.
fissum.
fontanum.
hornum. (m. Ehrh.)
hygrometricum.
Jungermannia.
palustre.
pellucidum.
polytrichoides. (m. L. f.)
purpureum.
pyriforme. (m. Ehrh.)
ramosum.
serpyllifolium.
 — var. *cuspidatum.*
 — var. *punctatum.*
 — var. *proliferum.*
 — var. *undulatum.*
setaceum. 1.
Trichomanis. (m. Ehrh.)
triquetrum. 1.

MOEHRINGIA. 509.

- muscosa.* 1.

MOLLUGO. 112.

- oppositifolia.*
pentaphylla. 3.
Spergula. 3.
stricta. 3.
tetraphylla (= *Polycar-*
pon tetraphyllum.)
verticillata. 3.

MOLUCCELLA. 741.

- frutescens. 1.
- laevis. 1.
- persica*.
- spinosa. 1.

MOMORDICA. 1150.

- Balsamina. 2.
- Charantia. 2.
- cylindrica. 2.
- Elaterium. 1.
- indica*.
- Luffa. 3.
- operculata. 3.
- pedata*.
- trifolia*=seq.
- trifoliata*.

MONARDA. 40.

- ciliata*.
- Clinopodia. 1.
- clinopodifolia. MS.
- didyma. 1.
- fistulosa. 1.
- mollis*=fistulosa.
- punctata. 1.

MONNIERIA. —

- trifolia*.

MONOTROPA. 551.

- Hypopithys. 1.
- uniflora. 1.

MONSONIA. 936.

- Filia. Suppl.
- speciosa.

MONTIA. 106.

- fontana. 1.

MONTINIA. 1167.

- acris*, Linn. f. (pl.).

MORAEA. 62.

- iridioides*.
- juncea.
- vegeta. 3.

MORINA. 44.

- persica*.

MORINDA. 236.

- citrifolia. 1.
- Royoc. 1.
- umbellata*.

MORISONIA. —

- americana*.
- flexuosa*.

MERUS. 1112.

- alba*. 1.
- indica*.
- nigra*. 2.
- papyrifera*. 3.
- rubra*. 1.
- tatarica*. 3.
- tinctoria*. 3.
- Zanthoxylon*.

MUCOR. 1289.

- cespitosus*.
- crustaceus*.
- Embolus*.
- Erysiphe*.
- fulvus*.
- furfuraceus*.
- glaucus*.
- leprosus*.
- lichenoides. (m. Ehrh.)
- mephiticus. MS.
- Mucedo*.
- septicus*.
- sphuerocephalus*.
- unctuosus*.
- viridescens*.

MUELLERA. 911.

- moniliformis*, Linn. f.

MUNCHAUSIA. 939.

- speciosa* (pl.).

MUNTINGIA. 672.

- Bartramia*.
- Calabura. 1.

MURRAEA. 539.

- exotica* (pl.).

MUSA. 1207.

- Bihai*=Heliconia Bihai.
- paradisiaca. 1.
- sapientum*.
- trogodytarum* =
- sapientum*.

MUSSAENDA. 239.

- formosa*.
- frondosa*.
- fruticosa*.
- spinosa*.

MUTISIA. 1004.

- Clematis* (pl.).

MYAGRUM. 819.

- aegyptium*. 1.

MYAGRUM :—

- hispanicum. 1.
- orientale. 1.
- paniculatum. 1.
- pereune. 1.
- perfoliatum. 1.
- rugosum. 1.
- sativum. 1.
- saxatile. 3.

MYGINDA. —

Uragoga [Jacq.].

MYOSOTIS. 180.

- apula. 1.
- fruticosa.
- Lappula. 1.
- scorpioides. 3.
- var. *arvensis*.
- var. *palustris*.
- virginiana. 1. (virginica).

MYOSURUS. 402.

- minimus. 2.

MYRICA. 1169.

- aethiopica.
- asplenifolia* = Liquidambar peregrina.
- cerifera. 1.
- cordifolia. 1.
- Gale. 1.
- quercifolia. 1.
- trifoliata*.

MYRIOPHYLLUM. 1123.

- minus*.
- spicatum. 1.
- verticillatum. 1.

MYRISMA. 5. [= MYROSMA, Linn. f.]

cannaefolium, Linn. f.

MYRISTICA. 1204.

officinalis, Linn. f.

MYRSINE. 267.

- africana. 1.

MYRTUS. 637.

- androsaemoides*.
- angustifolia*. 3.
- biflora*. 3.
- brasiliانا*. 3.
- caryophyllata*. 3.
- Chytraculia*. 3.

MYRTUS :—

- communis. 1.
- var. *acutifolia*.
- var. *angustifolia*.
- var. *baetica*.
- var. *belgica*.
- var. *italica*.
- var. *lusitanica*.
- var. *mucronata*.
- var. *romana*.
- var. *tarentina*.
- Cumini. 3.
- dioica. 3.
- Leucadendron*.
- lucida. 3.
- Pimenta*.
- Syzygium. 3.
- zeylanica. 3. (m. Sol.)
- Zuzygium*. (cf. *M. Syzygium*.)

NAJAS. 1156.

- marina. 1.

NAMA. 322.

- jamaicensis. (m. Sol.)
- zeylanica.

NAPAEA. 1203.

- dioica. 1.
- hermaphrodita. 1.
- laevis*.
- scabra*.

NARCISSUS. 412.

- bicolor. 3.
- Bulbocodium. 1.
- calathinus*.
- Jonquilla. 1.
- minor. 3.
- moschatus. 3.
- odorus. 3.
- orientalis*.
- poëticus. 1.
- Pseudo-Narcissus. 1.
- serotinus. 1.
- Tazetta. 1.
- triandrus. 3.
- trilobus. 3.

NARDUS. 73.

- aristata*.
- articulata*.

NARDUS :—

- ciliaris. 1.
- gangitis. 1. (m. L. f.)
- indica.
- stricta. 1.
- thomaea. Suppl.

NAUCLEA. 226.

- orientalis.

NEPENTHES. — (deest).

- destillatoria.*

NEPETA. 726.

- Cataria. 1.
- hirsuta.*
- indica. 1.
- italica. 1.
- malabarica.
- multifida. 2.
- Nepetella. 3.
- nuda. 2.
- pannonica. 1.
- pectinata. 3.
- Scordotis. 3.
- sibirica. 1.
- tuberosa. 1.
- var. erecta, MS.
- ucranica. 1.
- violacea. 1.
- virginica. 3.

NEPHELIUM. 1112 a.

- lappaceum* [Linn. f.].

NERIUM. 300.

- antidysentericum. 1.
- divaricatum.*
- Oleander* (pl.).
- zeylanicum. 3.

NEURADA. 606.

- procumbens* (pl.).

NICOTIANA. 245.

- fruticosa. 3.
- glutinosa. 1.
- militaris.*
- paniculata. 1.
- pusilla.*
- rustica. 1.
- Tabacum. 1.
- urens.*

NIGELLA. 700.

- arvensis. 3.
- damascena. 1.

NIGELLA :—

- hispanica. 2.
- orientalis. 1.
- sativa. 1.

NIGRINA. —

- vesicaria* = seq.
- viscosa.*

NISSOLIA. 884.

- arborea.
- fruticosu.*

NITRARIA. 624.

- Schoberi.

NOLANA. 194.

- prostrata.*

NYCTANTHES. 16.

- angustifolia.*
- Arbor-tristis.*
- hirsuta. 3.
- Sambac. 3.
- undulata. 1.

NYMPHAEA. 673.

- alba. 1.
- Lotus. 1.
- lutea. 1.
- Nelumbo. 1.

NYSSA. 1232.

- aquatica. 1.

OBOLARIA. —

- virginica.*

OCHNA. —

- Jabotapita.*
- squarrosa.*

OCYUM. 749.

- album. 3.
- americanum. 2.
- Basilicum. 1.
- frutescens* = Perilla
- frutescens.
- gratissimum. 3.
- menthoides.*
- minimum. 1. (minus.)
- monachorum.*
- polystachyon. (m. L. f.)
- prostratum.
- purpurascens. MS.
- sanctum. 3.
- scutellarioides. 3.

OCYUM :—

- tenuiflorum. 1.
thyrsiflorum. 3.

OEDERA. 1047.

- capense [=seq.].
prolifera.

OENANTHE. 359.

- crocata*.
fistulosa. 1.
globulosa. 3.
pimpinelloides. 3.
prolifera. 1.

OENOTHERA. 484.

- biennis. 1.
fruticosa. 1.
hirta.
longiflora.
mollissima. 1.
muricata. 3.
octovalvis.
Onagra = biennis.
parviflora. 3.
perennis.
pumila. 3.
sinuata. 3.

OLAX. —

- zeylanica*.

OLDENLANDIA. 155.

- biflora. 3.
capense. Suppl.
corymbosa. 3.
paniculata. 3.
repens. 3.
stricta.
umbellata. 1.
uniflora. 1.
verticillata.

OLEA. 20.

- americana.
capensis. 1.
europaea. 1.

OLYRA. 1099.

- latifolia. 3.

OMPHALEA. 1102.

- diandra*.
triandra. 3.

ONOCLEA. 1242.

- polypodioides*.
sensibilis. 1.

ONOCLEA :—

- sensitiva* = præc.
trilocularis. MS.

ONONIS. 896.

- alopecuroides. 1.
antiquorum. 3.
arvensis. 3.
capensis.
cenisia.
cernua.
Cherleri. 3.
crispa. 3.
filiformis.
fruticosa. 1.
mauritanica (m. L. f.).
Cf. *Lotus mauritanicus*.
microphylla. Suppl.
minutissima. 1.
mitissima. 1.
natrix. 1.
ornithopodioides. 1.
pinguis. 3.
prostrata. (Cf. *Lotus prostratus*).
pubescens.
pusilla.
reclinata.
repens. 3.
rotundifolia. 3.
spinosa.
— var. *mitis*
= arvensis.
tridentata.
trifoliata.
umbellata.
variegata. 3.
villosa.
viscosa. 1.

ONOPORDUM. 968.

- Acanthium*. 3.
acaulon.
arabicum.
illyricum.

ONOSMA. 187.

- Echioides. 3.
orientalis.
simplicissima. 3.

OPHIOGLOSSUM. 1243.

OPHIOGLOSSUM :—

- flexuosum.* 3.
- lusitanicum.*
- nudicaule.* Suppl.
- palmatum.*
- pendulum.*
- reticulatum.*
- scandens.* 1.
- vulgatum.* 3.

OPHIORRHIZA. 211.

- Mitreola.*
- Mungos.*

OPHIOXYLON. 1208.

- colubrinum.* MS.
- serpentinum.*

OPHIRA. 499.

- stricta* (pl.).

OPHRYS. 1056.

- alaris.* Suppl.
- alpina.* 1.
- anthropophora.* 1.
- atrata.* 3.
- bivalvata.* Suppl.
- bracteata.* Suppl.
- caffra.*
- camtschatea.* 1.
- catholica.*
- cernua.* 1.
- circumflexa.*
- Corallorrhiza.* 1.
- cordata.* 1.
- insectifera.*
- var. *arachnites.*
- var. *myodes.*
- latifolia.*
- lilifolia.* 1.
- Loeselii.* 1.
- monophyllos.* 1.
- Monorchis.* 3.
- Nidus-avis.* 3.
- ovata.* 1.
- paludosa.* 1.
- patens.* Suppl.
- spiralis.* 3.
- volucris.* Suppl.

ORCHIS. 1054.

- abortiva.* 3.
- barbata.* Suppl.
- bicornis.*

ORCHIS :—

- biflora.*
- bifolia.* 3.
- Burmanniiana.*
- ciliaris.* 1.
- conopsea.* 1.
- coriophora.* 3.
- cornuta.*
- cubitalis.*
- cucullata.*
- Draconis.* Suppl.
- filicornis.* Suppl.
- flava.* 1.
- flexuosa.*
- fuscescens.*
- globosa.* 3.
- Habenaria.* 3.
- hispidula.* Suppl.
- hyperborea.* 3.
- incarnata.* 3.
- latifolia.* 1.
- maculata.* 1.
- mascula.* 3.
- militaris.* 1.
- Morio.* 1.
- var. *angustifolius.*
- var. *masculus* =
 mascula.
- odoratissima.* 3.
- pallens.*
- papilionacea.* 3.
- psychodes.* 1.
- pyramidalis.* 3.
- sagittalis.* Suppl.
- sambucina.* 3.
- sancta.* 3.
- satyrioides.*
- spathulata.* Suppl.
- spectabilis.* 1.
- strateumatica.*
- Susannae.*
- tenella.* Suppl.
- tipuloides.* Suppl.
- tripetaloides.* Suppl.
- ustulata.* 1.

ORIGANUM. 743.

- aegyptiacum.*
- creticum.* 1.
- Dictamnus.* 1.

ORIGANUM :—

heracleoticum.
Majorana. 1.
Maru. 3.
Onites. 1.
sipyleum. 1.
smyrnaeum.
syriacum.
vulgare. 1.

ORNITHOGALUM. 428.

arabicum. 3.
bivalve.
bulbiferum. MS.
(m. L. f.).
canadense=Albica
major.
capense.
comosum.
hirsutum=Hypoxis
erecta.
latifolium. 1.
luteum.
minus, sphalm=seq.
minimum. 1.
narbonense. 3.
nutans. 1.
pyramidale.
pyrenaicum. 1.
umbellatum. 3.
uniflorum. 3.

ORNITHOPUS. 918.

compressus. 1.
perpusillus. 1.
scorpioides. 1.
tetraphyllus. (m. Sol.)

OROBANCHE. 798.

Aeginetia.
americana. 3.
capensis. MS.
cernua. 3.
laevis. 1.
major. 1.
ramosa. 1.
uniflora.
virginiana. 1.

OROBUS. 904.

angustifolius. 1.
hirsutus.
Lathyroides. 1.

OROBUS :—

luteus. 1.
niger. 1.
pyrenaicus.
sylvaticus.
tuberosus. 1.
vernus. 3.

ORONTIUM. 448.

aquaticum. 1.

ORTEGA. 53.

dichotoma.
hispanica. 2.

ORVALA. 733 a.

garganica=Lamium
Orvala.

ORYZA. 460.

sativa. 1.

OSBECKIA. 482.

chinensis. 1.

OSMITES. 1029.

astericoides.
Bellidiastrum. 3.
calycina. Suppl.
camphorina.
leucantha. MS.

OSMUNDA. 1244.

adiantifolia.
bipinnata. 1.
capensis.
cervina.
cinnamomea. 1.
Claytoniana. 1.
crispa.
filiculifolia. 1.
hirsuta.
hirta.

Lunaria.
— var. Baeckearia.

Phyllitidis.
regalis. 3.
Spicant. 1.
Struthiopteris. 1.
verticillata.
virginiana. 1.
zeylanica.

OSTEOSPERMUM. 1037.

ciliatum.
corymbosum.
ilicifolium. 3.

OSTEOSPERMUM :—

- imbricatum.
- juncceum.
- moniliferum.
- pisiferum. 3. (“pisi-
forme.”)
- polygaloides.
- spinosum. 3.
- triquetrum. Suppl.
- Uvedalia* = *Polymnia*
Uvedalia.

OSYRIS. 1161.

- alba. 2.

OTHONNA. 1038.

- abrotanifolia. 3.
- arborescens*.
- bulbosa*.
- capillaris. Suppl.
- cheirifolia. 1.
- ciliata. Suppl.
- Cineraria* = *Cineraria*
canadensis.
- coronopifolia. 3.
- crassifolia*. (Au cheiri-
folia?)
- dentata* = ciliata.
- ericoides. Suppl.
- frutescens. (Cf. Sene-
cio rigens).
- geifolia*.
- helenitis* = *Cineraria*
alpina.
- integrifolia* = *Cin. alpina*.
- maritima* = *Cin. mari-*
tima.
- palustris* = *Cin. palus-*
tris.
- parviflora.
- pectinata.
- sibirica = *Cineraria sibi-*
rica.
- sonchifolia*.
- Tagetes. 3.
- tenuissima.
- trifida. Suppl.
- virginica. Suppl.

OVIEDA. 807.

- mitis. 3.
- spinosa*.

OXALIS. 600.

- Acetosella. 1.
- Barrelieri*.
- corniculata. 1.
- flava.
- frutescens*.
- hirta.
- incarnata. 3.
- lanata. Suppl.
- longiflora. 1. (“longi-
folia.”)
- monophylla.
- natans. Suppl.
- Pes-caprae.
- punctata. Suppl.
- purpurea.
- sensitiva. 3.
- sessilifolia.
- stricta.
- tomentosa. Suppl.
- versicolor.
- violacea. 1.

PAEDERIA. 294.

- foetida. 3.

PAEDEROTA. 27.

- Ageria*.
- Bonae-Spei*.
- Bonarota.

PAEONIA. 692.

- anomala.
- officinalis. 3.
- var. *feminea*.
- var. *mascula*.
- tenuifolia. 3.

PANAX. 1237.

- fruticosum. 3.
- quinquefolium. 1.
- trifolium* (pl.).

PANCRACTIUM. 413.

- amboinense*.
- carolinianum*.
- caribaeum. 1.
- illyricum. 3.
- maritimum.
- mexicanum*.
- zeylanicum. 3.

PANICUM. 80.

PANICUM :—

- adhaerens*.
 alopecuroides. 1.
 Alopecurus. MS.
 alopecuroideum.
americanum = Holcus
 spicatus.
 arborescens. 1.
 brevifolium. 1.
brizoides.
 capillare. 1.
 clandestinum. 1.
 colonum. 3.
 coloratum.
 compositum.
conglomeratum.
 Crus-corvi. 3.
 Crus-galli. 1.
 curvatum.
cynosuroides.
 Dactylon. 1.
 dichotomum. 1.
 dimidiatum. 1.
dissectum = Paspalum
 dissectum.
 distachyon.
 divaricatum. 3.
 filiforme. 1.
 germanicum.
 glaucum. 1.
 grossarium. 3.
 hirtellum. 3.
 incurvum. MS.
 indicum.
 italicum. 1.
 latifolium. 1.
lineare.
 miliaceum. 1.
oryzoides, Ard.
 patens. 1.
 polystachyon. 3.
 ramosum. 3.
 repens. 3.
reptans = præc.
 sanguinale. 1.
 verticillatum. 3.
 virgatum. 1.
 viride. 3. (m. Sol.)

PAPAVER. 669.

- alpinum. 3.
 Argemone. 1.
 cambricum. 1.
 dubium. 3.
 hybridum. 1.
 nudicaule. 1.
 orientale. 1.
 Rhoëas. 3.
 somniferum. 1.

PARIETARIA. 1220.

- cretica. 3.
 indica. 3.
 judaica. 3.
 lusitanica. 3.
 microphylla. 3.
 officinalis. 3.
zeylanica.

PARIS. 515.

- quadrifolia. 1.

PARKINSONIA. 527.

- aculeata. 1. (m. Sol.)

PARNASSIA. 392.

- palustris. 1.

PARTHENIUM. 1115.

- Hysterophorus. 1.
 integrifolium. 1.

PASPALUM. 79.

- dimidiatum.
 dissectum. 3.
 distichum. 3.
 paniculatum. 3.
 scrobiculatum. 3.
 virgatum. 3.

PASSERINA. 504.

- capitata. 3.
ciliata.
dodecandra.
 ericoides.
 filiformis. 1.
 hirsuta. 3.
 laevigata. (cf. Gnidia
 oppositifolia.)
 sericea. (cf. Gn. *sericea*.)
 uniflora. 3.

PASSIFLORA. 1070.

- caerulea. 1.
capsularis.

PASSIFLORA :—

- cupraea*. 3.
- digitata*.
- divaricata*.
- dubia*.
- foetida*. 1.
- hirsuta*.
- holosericea*. 3. (m. L. f.)
- incarnata*. 1.
- laurifolia*.
- lutea*. 1.
- maliformis*.
- minima*. 3.
- multiflora*.
- Murucuja*. 3.
- normalis*. 8. (m. Sol.)
- pallida*. 3.
- pedata*.
- perfoliata*. 3.
- polymorpha*. MS.
- (m. L. f.?)
- punctata*. 3.
- quadrangularis*. 3.
- rotundifolia*. 3.
- rubra*. 3. (m. Sol.)
- serrata*.
- serratifolia*.
- serrato-digitata*.
- suberosa*. 1.
- tiliaefolia*.
- vespertilio*. 1.

PASTINACA. 369.

- costina* = P. Opopanax.
- lucida*. 3.
- Opopanax.
- sativa*.

PATAGONULA. —

- americana*.

PAULLINIA. 512.

- asiatica*. 1.
- barbadensis*.
- caribaea*.
- carthaginensis*.
- curassavica*. 1.
- Cururu*.
- diversifolia*.
- mexicana*. 1.
- nodosa*.
- pinnata*. 3. (m. Sol.)

PAULLINIA :—

- polyphylla*. 3.
- Seriana*.
- tomentosa*.
- triternata*.

PAVETTA. 133.

- indica*. 1.

PECTIS. 1011.

- ciliaris*. 3.
- linifolia*.
- minuta* = Bellium
- minutum*.
- punctata*.

PEDALIMUM. 817.

- Murex*. 3.

PEDICULARIS. 763.

- canadensis*.
- comosa*. 1.
- flammea*. 1.
- foliosa*.
- hirsuta*. 1.
- incarnata*. 1.
- laponica*. 1.
- palustris*. 1.
- recutita*. 3.
- resupinata*. 2.
- rostrata*. 3.
- Sceptrum-Carolinum*. 1.
- sylvatica*. 3.
- tristis*. 1.
- tuberosa*. 1.
- verticillata*. 1.

PEGANUM. 621.

- dauricum*.
- Harmala*. 1.

PELTARIA. 829.

- alliacea* [Jacq.].

PENAEAE. 140.

- fruticulosa*. Suppl.
- fuscata*.
- furcata*, sphalm.=praec.
- lateriflora*. Suppl.
- marginata*.
- mucronata*.
- myrtoides*. Suppl.
- Sarcocolla*. 3.
- squamosa*. 3.

PENSTEMON. 313 a.

- chelonoides*.

- PENTAPETES. 860.**
acerifolia.
phoenicea. 1.
suberifolia.
PENTHORUM. 596.
sedoides. 1.
PEPLIS. 458.
Portula. 1.
tetrandra. 3.
PERDICUM. 1003.
brasiliense. 3.
radiale. 3.
semiflosculare. 3.
(m. L. f.)
PERGULARIA. 306.
glabra. 3.
tomentosa. 3.
PERILLA. 731.
frutescens. MS.
ocymoides. 3.
PERIPLOCA. 307.
africana. 1.
graeca. 1. (Cf. Cero-
pegia tenuifolia).
indica.
Secanone.
tenuifolia = Ceropegia
tenuifolia.
PETESIA. 134.
Lygistum. 3.
stipularis. 3.
tomentosa.
PETIVERIA. 472.
alliacea. 1.
octandra. 3.
PETREA. 781.
volubilis. 1.
PEUCEDANUM. 346.
alpestre. 3.
alsaticum. 3.
minus = Pimpinella
pumila.
nodosum.
officinale. 1.
Silans. 3.
PEZIZA. 1285.
Acetabulum.
Auricula. (m.
Ehrh.)

- PEZIZA :—**
cochleata.
cornucopioides.
cupularis.
cyathoides.
lentifera.
punctata. (m. Ehrh.)
scutellata.
PHACA. 925.
alpina. 1.
australis. 3. (m. L. f.)
baetica.
frigida.
sibirica. (m. L. f.)
sulcata.
trifoliata.
vesicaria. 3.
PHALARIS. 78.
aquatica. 3.
arundinacea. 1.
bulbosa. 3.
canariensis. 1.
erncaeformis. 1.
nodosa.
oryzoides. 1.
paradoxa. 3.
phleoides. 1.
tuberosa.
utriculata.
zizanioides.
PHALLUS. 1282.
esculentus. (m. Ehrh.)
impudicus.
PHARNACEUM. 387.
Cerviana. 2.
cordifolium. 3.
depressum.
distichum.
incanum.
Mollugo. 3.
pennatum. MS.
Spergula = P. Mollugo?
PHARUS. 1120.
latifolius. 3.
PHASCUM. 1260.
acaulon.
caulescens. (m. Montin?)
pedunculatum. (m.
Montin?)

PHASCUM:—

repens.
subulatum. 3.

PHASEOLUS. 899.

alatus.
Caracalla.
coccineus = *vulgaris* var.
coccineus.

farinosus.
helvolus.
inamoemus.
lathyroides.
lunatus.
Max. 1.
Mungo.
nanus.
radiatus. 1.
semi-erectus. 3.
sphaerospermus.
trilobatus. MS. = *Gly-*
cine triloba.
vevillatus.
vulgaris. 1.
 — var. *coccineus.*

PHELLANDRIUM. 360.

aquaticum. 1.
Mutellina. 1.

PHILADELPHUS. 634.

coronarius. 1.
inodorus.

PHILLYREA. 19.

angustifolia. 1.
chinensis. MS.
latifolia. 3.
media. 3.

PHILEUM. 81.

alpinum. 1.
arenarium. 1.
nodosum. 3.
pratense. 1.
schoenoides. 1.

PHLOMIS. 740.

fruticosa. 1.
Herba-venti.
indica. 1.
italica.
laciniata.
Leonotis.
Leonurus. 1.

PHLOMIS:—

lychnitis. 1.
nepetifolia. 2.
Nissolii.
purpurea. 1.
samia.
tuberosa. 1.
zeylanica.

PHILOX. 217.

carolina. 3.
divaricata. 1.
glaberrima. 1.
maculata. 1.
ovata. 1.
paniculata. 3.
pilosa.
setacea.
sibirica. 3.
subulata. 1.

PHOENIX. 1291.

dactylifera (pl.).

PHORMIUM [Forst.]. 439.

orchidioides.

PHRYMA. 755.

hians. MS.
Leptostachya. 1.

PHYLICA. 263.

bicolor.
buxifolia. 3.
dioica. 3.
ericoides. 1.
imberbis.
parviflora.
plumosa. 1.
racemosa.
radiata = *Brunia*
radiata.
stipularis.
viscosa.

PHYLLACHNE. 1089.

utiginosa [Forst.].

PHYLLANTHUS. 1105.

bacciformis.
Emblica.
epiphyllanthus. 1.
 (m. Sol.)
grandifolia.
maderaspatisensis.
 (m. L. f.)

PHYLLANTHUS :—

- Niruri. 1.
Urinaria. 1.

PHYLLIS. 330.

- indica*.
Nobla. 1.

PHYSALIS. 247.

- Alkekengi. 1.
angulata. 2.
arborescens.
campechiana.
curassavica.
flexuosa. 1.
minima.
pensylvanica. 3.
peruviana.
pruinosa.
pubescens. 2.
somnifera. 1.
viscosa. 3.

PHYTEUMA. 223.

- comosa. 3.
hemisphaerica. 3.
orbicularis. 1.
pauciflora. 3.
pinnata.
spicata. 3.

PHYTOLACCA. 607.

- americana* = de-
candra.
asiatica.
decandra. 3.
dioica. 3.
icosandra. 3.
octandra. 3.

PICRIS. 948.

- asplenoides*.
Echioides. 1.
Hieracioides. 1.
pyrenaica.

PILULARIA. 1255.

- globulifera. 1.

PIMPINELLA. 373.

- Anisum. 1.
dichotoma.
dioica.
glauc. 1.
magna.
major. MS.
peregrina. 1.

PIMPINELLA :—

- pumila* [Jacq.].
Saxifraga. 3.
— var. *hircina*.
— var. *major*.

PINGUICULA. 33.

- alpina. 1.
lusitanica.
villosa. 1.
vulgaris. 1.

PINUS. 1135.

- Abies*.
balsamea. 3.
canadensis.
Cedrus.
Cembra. 1.
Larix. 2.
orientalis.
Picea.
Pinea. 1.
Strobus. 1.
sylvestris. 1.
Taeda. 1.

PIPER. 47.

- acuminatum*.
aduncum. 3.
Amalago. 3.
Betle.
decumanum.
distachyon.
longum.
maculosum.
Malamiris.
obtusifolium. 1.
nigrum. 1.
pellucidum.
peltatum.
quadrifolium.
reticulatum.
rotundifolium. 3.
Siriboa.
trifolium.
umbellatum.
verticillatum. 3.

PISCIDIA. 889.

- carthaginensis*.
Erythrina.

PISONIA. 1236.

- aculeata. 1.
mitis.

PISTACIA. 1170.

- Lentiscus. 1.
- narbonensis. 3.
- Simaruba* = *Bursera*
gummifera.
- Terebinthus. 3.
- trifolia*.
- vera* (pl.).

PISTIA. 1072.

- Stratiotes. 1.

PISUM. 903.

- arvense*.
- maritimum*. 1.
- Ochrus. 1.
- sativum. 1.
- var. *quadratum*.
- var. *umbellatum*.

PLAGIANTHUS [Forst.]. 861.

- divaricatus* [Forst.].

PLANTAGO. 144.

- afra*. 3.
- albicans*. 1.
- alpina*. 3.
- altissima*. 3.
- asiatica*. 1.
- coronopifolia* = seq.
- Coronopus. 3.
- cretica*. 1.
- Cynops. 1.
- dubia*.
- indica*. 3.
- Lagopus. 1.
- lunceolata*.
- Loeflingii. 1.
- lusitanica*.
- major. 1.
- maritima. 1.
- media. 1.
- Psyllium. 1.
- recurvata*.
- Serraria. 3.
- subulata. 3.
- uniflora* = *Littorella*
uniflora.
- virginica. 1.

PLATANUS. 1133.

- occidentalis*. 1.
- orientalis*. 1.

PLECTRONIA. 277.

PLECTRONIA :—

- ventosa*. (m. L. f.)

PLINIA. 642.

- crocea*.
- pentapetala*.
- petiolata*.
- pinnata*.
- rubra*.
- tetrapetala*.

PLUKENETIA. —

- volubilis*.

PLUMBAGO. 216.

- europaea*. 1.
- rosea*. 3.
- scandens*.
- zeylanica*. 1.

PLUMERIA. 301.

- alba*.
- obtus*.
- pudica*.
- rubra*. 3.

POA. 87.

- alpina*. 1.
- amabilis*.
- amboinensis* = seq.
- amboinica*.
- angustifolia*. 1.
- annua*. 1.
- aquatica*. 1.
- bulbosa*. 1.
- capillaris*. 1.
- chinensis*. 1.
- ciliaris*. 3.
- compressa*. 1.
- cristata*.
- distans*.
- Eragrostis. 3.
- flava*.
- malabarica*. 1.
- maritima* = *Triticum*
maritimum.
- nemoralis*. 1.
- palustris*. 3.
- pilosa*.
- pratensis*. 1.
- rigida*. 3.
- spicata*.
- tenella*. 1.
- trivialis*. 1.

PODOPHYLLUM. 667.

- diphyllum. 1.
- peltatum. 1.

POINCIANA. 529.

- bijuga*.
- elata*. 3.
- pulcherrima*. 1.

POLEMONIUM. 220.

- caeruleum*. 1.
- dubium*. 2.
- Nyctelea* = *Ellisia*
- Nyctelea*.
- reptans*. 3.
- rubrum*.

POLIANTHES. 437.

- tuberosa*. 3.

POLYCARPA = seq.

POLYCARPON. 111.

- tetraphyllum*. 3.

POLYCNEMUM. 55.

- arvense*. 1.

POLYGALA. 882.

- acutifolia*.
- aestuans*. Suppl.
- alopecuroides*.
- amara* [m. ?]
- aspalatha*. 3.
- bicornis*. MS.
- bracteolata*. 1.
- brasiliensis*. 3.
- Chamaebuxus*. 1.
- chinensis*. 1.
- ciliata*. 1.
- cordifolia*. MS.
- cruciata*.
- diversifolia*. 3.
- glaucoides*.
- Heisteria*. 1.
- incarnata*. 1.
- lutea*. 1.
- microphylla*. 3.
- mixta*. Suppl.
- monspeliaca*. 1.
- myrtifolia*. 1.
- oppositifolia*.
- paniculata*. 3. (m. Sol.)
- Penaea*.
- sanguinea*. 1.
- seabra*.

POLYGALA:—

- Senega*. 1.
- sibirica*. 1.
- spinosa*.
- squarrosa*. Suppl.
- stipulacea*. (m. L. f.)
- theezans*.
- trichosperma*.
- triflora*.
- umbellata*.
- verticillata*. 1.
- viridescens*. 1.
- vulgaris*. 1.

POLYGONUM. 510.

- amphibium*. 1.
- arifolium*. 1.
- articulatum*. 1.
- aviculare*. 1.
- barbatum*. 1.
- Bistorta*. 1.
- chinense*. 1.
- Convolvulus*. 1.
- divaricatum*. 1.
- dumetorum*. 3.
- erectum*.
- Fagopyrum*. 1.
- frutescens*. 1.
- Hydropiper*. 1.
- lapathifolium*. 3.
- lenticulatum*.
- maritimum*. 3.
- ocreatum*. 1.
- orientale*. 1.
- pensylvanicum*. 1.
- perfoliatum*. 3.
- Persicaria*. 1.
- sagittatum*. 1.
- scandens*. 1.
- serratum*.
- tataricum*. 1.
- Uvifera* = *Coccoleba*
- Uvifera*.
- virginianum*. 1.
- viviparum*. 1.

POLYMNIA. 1083.

- bidentis*. MS.
- canadensis*. 1.
- Tetragonotheca*. 3.
- Uvedalia*. 1.

POLYMNIA :—

Wedelia.

POLYPODIUM. 1251.

aculeatum. 1.
alatum.
arboreum.
asperum.
asplenifolium.
aureum. 1.
auriculatum. 3.
Barometz.
bulbiferum. 1.
cafferorum.
cambricum. 1.
capense. Suppl.
cicutarium.
comosum.
cordifolium.
crassifolium.
crispatum.
cristatum. 1.
decussatum.
dissimile. 3.
Dryopteris.
exaltatum. 3.
Filix-femina. 1.
Filix-fragile = *fragile.*
Filix-mas. 1.
fontanum. 1.
fragile. 2.
fragrans. 1.
heterophyllum. 3.
horridum. 3.
lanceolatum. (m. L. f.)
leptophyllum (pl.).
Lonchitis. 1.
loriceum.
lusitanicum.
lycopodioides. 1.
marginale. 1.
muricatum.
noveboracense. 1.
Orites.
parasiticum.
pectinatum. 3.
Phegopteris. 1.
Phyllitidis. 3.
phymatodes.
piloselloides. 3.
pubescens. 3.

POLYPODIUM :—

pyramidale.
quercifolium. 3.
regium. 2.
reticulatum. 3.
retroflexum.
rhaeticum. 1.
scolopendrioides. 3.
simile. 3.
speluncae.
spinosum. 3.
squamatum.
Struthionis.
suspensum.
taxifolium.
Thelypteris.
tornatile. MS.
triangulum.
trifoliatum. 3.
trifurcatum.
unitum. 3.
varium.
villosum.
virginianum.
vulgare.

POLYPREMUM. 139.

procumbens. 1.

POLYTRICHUM. 1263.

alpinum.
commune. 2.
urnigerum.

POMMEREULLA [Linn. f.]. 74.

Cornucopiae [Linn. f.].

PONTEDERIA. 407.

cernua. MS.
cordata. 1.
hastata. 1.
ovata. 3.
rotundifolia.
vaginialis.

POPULUS. 1185.

alba. 1.
balsamifera. 1.
heterophylla. 1.
nigra. 1.
tremula. 1.

PORANA. —

volubilis.

PORELLA. —

pinnata.

POROPHYLLUM = **PODO-**
PHYLLUM.

PORTLANDIA. 228.
grandiflora (pl.).
hexandra [Jacq.].

PORTULACA. 625.
Anacampseros.
fruticosa.
halimoides.
oleracea. 3.
paniculata.
patens.
pilosa. 3.
Portulacastrum.
quadrifida.
racemosa.
triangularis.

POTAMOGETON. 175.
compressum. 1.
crispum. 1.
densum. 3.
gramineum. 3.
lucens. 1.
marinum. 1.
natans. 1.
pectinatum.
perfoliatum. 1.
pusillum. 1.
serratum. 3.
setaceum.

POTENTILLA. 655.
acaulis = *subacaulis.*
alba. 1.
Anserina. 1.
argentea. 1.
aurea. 3.
bifurca. 1.
canadensis. 1.
caulescens. 3.
fragarioides. 1.
fruticosa. 1.
grandiflora. 1.
heptaphylla = *opaca.*
hirta. 1.
intermedia. 3.
monspeliensis. 1.
multifida. 1.
nitida. 3.
nivea. 1.
norvegica. 1.

POTENTILLA :—

opaca.
pensylvanica. 3.
pimpinelloides. 1.
recta. 1.
reptans. 1.
rupestris. 1.
sericea. 1.
stipularis. 1.
subacaulis. 3.
supina. 1.
valderia. 3.
verna. 1.

POTERIUM. 1127.
hybridum. 1.
Sanguisorba. 1.
spinosum. 1.

POTHOS. 1082.
acaulis [Jacq.]. 3.
cordata.
crenata.
lanceolata.
latifolia.
palmata.
pinnata.
scandens.

PRASIUM. 754.
majus. 1.
minus.

PREMNA. 782.
acutifolia, MS. = *integri-*
folia ?
cordifolia, MS. = *integri-*
folia.
integrifolia.
pinnatifolia, MS. = *ser-*
ratifolia ?
serratifolia.

PRENANTHES. 952.
alba. 3.
altissima. ["5"] 1.
altissima ["7"] =
repens.
chondrilloides. 3.
japonica. 3.
muralis. 3.
purpurea. 1.
repens. 2.
tenuifolia.
viminea. 1.

PRIMULA. 198.

- Auricula. 1.
- cortusoides. 1.
- farinosa. 1.
- glutinosa [Wulf.?], MS.
- integrifolia. 1.
- minima.
- veris. 1.
- var. *acaulis*.
- var. *elatior*.
- var. *officinalis*.
- Vitaliana.

PRINOS. 452.

- glaber. 1.
- verticillatus. 1.

PROCKIA. 690.

- crucis. 3.

PROSERPINACA. 107.

- palustris. 1.

PROSOPIS. —

- spicigera*.

PROTEA. 116.

- argentea. 1.
- bruniades. Suppl.
- conifera. 3.
- cucullata.
- cyanoides.
- cumaroides*.
- divaricata.
- fusca*.
- glomerata.
- hirta*.
- Hypophyllocarpoden-*
dron.
- imbricata. MS.
- Lepidocarpodendron.
- Levisanus. (m. L. f.)
- pallens*.
- parviflora.
- phylicoides. MS.
- pinifolia.
- pubera ("pubigera").
- purpurea. (m. L. f.)
- racemosa.
- repens.
- rosacea.
- saligna* = conifera.
- Serraria.
- speciosa*.
- sphaerocephala.

PROTEA:—

- spicata.
- strobilina.
- totta.

PRUNELLA. 752.

- hyssopifolia. 1.
- laciniata. 3.
- lusitunica* = Cleonia
lusitanica.
- vulgaris. 1.
- var. *grandi-*
flora.
- var. *laciniata*.

PRUNUS. 640.

- Armeniaca. 1.
- avium. 1.
- var. *Bigarella*.
- var. *Duracina*.
- canadensis. 3.
- Cerasus*.
- var. *aetiana*.
- var. *austera*.
- var. *avium* = P.
avium.
- var. *Bigarella*.
- var. *Caproniana*.
- var. *duleis*.
- var. *Duracina*.
- var. *Juliana*.
- var. *plena*.
- var. *pumila*.
- var. *rosea*.
- domestica*.
- var. *aciniaria*.
- var. *amygdalina*.
- var. *Augustana*.
- var. *Brignola*.
- var. *cereu*.
- var. *cereola*.
- var. *damascena*.
- var. *galutensis*.
- var. *hungarica*.
- var. *Juliana*.
- var. *maliformis*.
- var. *Myrobalana*.
- var. *Pernigona*.
- var. *praeoxa*.
- insititia*.
- Laurocerasus. 1.
- lusitanica. 1.

PRUNUS:—

- Mahaleb. 1.
- Padus. 1.
- pennsylvanica. Suppl.
- pumila. 3.
- sibirica. 1.
- spinosa.
- virginiana. 1.

PSIDIUM. 635.

- Cujavus.
- Guajava = præc.
- pomiferum. 3.
- pyriferum. 3.

PSORALEA. 928.

- aculeata. 2.
- americana. 3.
- aphylla.
- bituminosa. 1.
- bracteata.
- capitata. Suppl.
- corylifolia. 1.
- cytisoides = Indigofera
- cytisoides.
- Dalea. 1.
- enneaphylla = Indigo-
- fera enneaphylla.
- glandulosa. 3.
- hirta. 3.
- palaestina.
- pentaphylla.
- pinnata. 1.
- prostrata.
- repens.
- spicata.
- tenuifolia. 2.
- tetragonoloba. 3.

PSYCHOTRIA. 231.

- asiatica. 3.
- herbacea. 3.
- serpens.

PTELEA. 153.

- trifoliata. 1.
- viscosa = Dodonæa
- viscosa.

PTERIS. 1246.

- aquilina.
- arborea.
- atropurpurea. 1.
- bianrta. 3.

PTERIS:—

- caudata. 1.
- cretica. 3.
- dichotoma.
- furcata.
- grandifolia. 3.
- heterophylla. 3.
- lanceolata.
- lincata.
- longifolia. 3.
- mutitata.
- pedata. 1.
- piloselloides.
- quadrifoliata.
- rufa.
- semipinnata. 1.
- stipularis. 3.
- trichomanoides. 3.
- tricuspidata.
- vittata. 1.

PTEROCARPUS. 887.

- Draco.
- Ecastaphyllum.
- lunatus.
- oralis.

PTERONIA. 980.

- camphorata. 3.
- pallens. Suppl.
- oppositifolia. 3.
- spinosa. Suppl.

PULMONARIA. 184.

- angustifolia. 1.
- hirta = Hyoseyamus
- physalodes.
- maritima. 1.
- officinalis. 1.
- sibirica. 1.
- suffruticosa.
- virginica. 1.

PUNICA. 638.

- Granatum. 1.
- nana.

PYROLA. 568.

- maculata. 1.
- minor. 1.
- rotundifolia. 1.
- secunda. 1.
- umbellata. 1.
- uniflora. 1.

PYRUS. 647.

- baccata. 3.
- communis. 1.
- var. *falerna*.
- var. *favonia*.
- var. *pompejana*.
- var. *Pyraster*.
- var. *Volema*.
- coronaria. 1.
- Cydonia. 1.
- Malus. 1.
- var. *Cavillea*.
- var. *Cestiana*.
- var. *epirotica*.
- var. *paradisiaca*.
- var. *Prasomila*.
- var. *rubelliana*.
- var. *sylvestris*.
- Pollveria.

QUASSIA. 545.

- amara. 3.
- Simarouba. Suppl.

QUERCUS. 1128.

- Aegilops. 3.
- alba. 1.
- Cerris. 3.
- coccifera. 3.
- dubia*.
- Esculus. 1.
- gramuntia. 1.
- Ilex. 1.
- molucca*.
- nigra. 1.
- Phellos. 1.
- Prinus. 3.
- Robur. 1.
- rubra. 1.
- Smilax* = Q. Ilex.
- Suber. 1.

QUERIA. 114.

- canadensi. 1.
- hispanica. 3.

QUISQUALIS. 553

- indica. 3.

RAJANIA. 1183.

- cordata*.

RAJANIA :—

- hastata. 1.
- quinquefolia*.

RANDIA. 214.

- aculeata. 3.
- mitis*.

RANUNCULUS. 715.

- abortivus. 1.
- aconitifolius. 1.
- acris. 1.
- alpestris. 3.
- amplexicaulis. 1.
- aquatilis. 3.
- arvensis. 1.
- asiaticus. 1.
- auricomus. 1.
- bulbosus. 1.
- bullatus.
- cassubicus. 1.
- chaerophyllos. 3.
- creticus. 1.
- falcatus. 1.
- Ficaria. 1.
- Flammula. 1.
- glacialis. 1.
- gramineus. 3.
- grandiflorus*.
- hederaceus. 3.
- illyricus. 1.
- lanuginosus. 3.
- lapponicus. 1.
- Lingua. 1.
- monspeliacus*.
- muricatus. 3.
- nivalis. 1.
- nodiflorus. 1.
- orientalis. 3.
- palustris, MS. [*cf. Sm.*
in Rees, Cycl.].
- parnassifolius. 3.
- parviflorus. 3.
- parvulus*.
- platanifolius. 3.
- polyanthemos. 1.
- pyrenaicus*.
- repens. 1.
- reptans. 1.
- rutaefolius. 3.
- sceleratus. 1.

RANUNCULUS :—

Thora. 1.

RAPHANUS. 846.

caudatus. 3.

erucoides. Suppl.

Raphanistrum. 1.

sativus. 1.

sibiricus. 1.

RAUVOLFIA. 293.

canescens. 3.

nitida. 3.

subpubescens = canescens.*tetraphylla* = nitida.*tomentosa* [Jacq.].

REAUMURIA. 701.

vermiculata. 3.

RENEALMIA. 2.

disticha.*monostachya* = Tillandsia*monostachya*.*paniculata* = Till. paniculata.*polystachya* = Till. polystachya.*recurvata* = Till. recurvata.*usneoides* = Till. usneoides.

RESEDA. 629.

alba. 1.

canescens. 1.

fruticulosa. 3.

glauca. 1.

lutea. 1.

Luteola. 1.

mediterranea.

odorata.

Phyteuma. 3.

purpurascens. 1.

Sesamoides. 1.

suffruticulosa.

undata. 3.

RESTIO. 1164.

dichotomus.

Elegia = *Elegia juncea*.

paniculatus.

simplex.

triflorus.

RESTIO :—

vimineus.

RETZIA [Thunb.]. (m. L. patr.) 209.

capensis.

RHACOMA. 146.

Crossopetalum. 3.

RHAMNUS. 262.

Alaternus. 1.

alpinus. 1.

catharticus. 1.

circumscissus. Suppl.

colubrinus. 3.

cubensis. 3.

cumanensis.

Frangula.

— var. *laevifolius*.

iguaneus. 3.

infectorius.

Jujuba. 1.

lineatus.

Lotus. 1.

lycioides. 3.

micranthus. 3.

Napeca. 1.

Oenoplia. 1.

oleoides. 3.

Paliurus. 1.

pentaphyllus.

pumilus.

Sarcomphalus. 3.

saxatilis. 3.

siculus.

Spina-Christi. 1.

theezans.

volubilis. Suppl.

Zizyphus. 1.

RHEEDIA. —

lateriflora.

RHEUM. 520.

compactum. 3.

palmatum. 3.

Rhabarbarum. 1.

Rhaponticum. 1.

Ribes.*undulatum*.

RHEXIA. 483.

Acisanthera. 3. (m. Sol.)

RHEXIA :—

glutinosa. Suppl.

mariana.

virginica. 1.

RHINANTHUS. 758.

capensis. 3.

Crista-galli. 1.

Elephas. 3.

indica.

orientalis.

Trixago. 3.

virginica. (m. L. f.)

RHIZOPHORA. 611.

Candel.

caseolaris.

conjugata. 1.

corniculata.

cylindrica.

gymnorhiza.

Mangle. 3.

RHODIOLA. 1186.

rosea. 1.

RHODODENDRON. 562.

Chamaecistus. 1.

dauricum. 1.

ferrugineum. 1.

hirsutum (pl.).

maximum. 1.

ponticum.

RHODORA. —

canadensis.

RHUS. 378.

angustifolia. 1.

Cobbe.

Cominia. 3.

Copallinum. 1.

Coriaria. 1.

Cotinus. 1.

glabra. 1.

javanica. 1.

laevigata. 3.

lucida. 1.

Metopium. 3.

radicans. 1.

sucedanea.

tomentosa. 1.

Toxicodendrum. 1.

typhina. 3.

vernix. 1.

RIBES. 278.

alpinum. 1.

Cynosbati. 1.

Grossularia.

nigrum. 1.

oxyacanthoides.

reclinatum. 1.

rubrum. 1.

sibiricum. MS.

Uva-crispa.

RICCIA. 1271.

crystallina.

fluitans.

glauca.

minima.

natans.

RICHARDIA. 451.

scabra. 1.

RICINUS. 1142.

communis. 3.

Mappa.

Tanarius.

RICOTIA. 833.

aegyptiaca.

RIVINA. 163.

canescens, MS. = humilis

var.

humilis.

— var. canescens.

— var. glabra = laevis.

— var. scandens =

octandra.

laevis. 3.

octandra. 3.

paniculata. Cf. Salva-

dora persica.

ROBINIA. 913.

Acacia.

Caragana. 1.

frutescens. 3.

frutex = praec.

grandiflora = Aeschynome-
mene grandiflora.

hispida. 3.

mitis. 3.

Pseud-acacia. 1.

pygmaea. 1.

spinosa.

violacea [Jacq.].

- ROELLA. 222.
 ciliata. 1.
 reticulata.
 RONDELETIA. —
 americana.
 asiatica.
 obovata.
 odorata [Jacq.].
 repens.
 trifoliata [Jacq. "trifolia"].
 RORIDULA. 284.
 dentata (pl.).
 ROSA. 652.
 alba. 1.
 alpina. 3.
 arvensis [Huds.].
 canina. 3.
 carolina. 3.
 centifolia. 1.
 cinnamomea. 1.
 Eglanteria. 1.
 gallica. 3.
 — var. *versicolor*.
 indica. 3.
 pendulina. 3.
 pimpinellifolia. 3.
 prolifera. MS.
 rubiginosa.
 sempervirens. 3.
 sinica.
 spinosissima.
 villosa. 3.
 ROSMARINUS. 41.
 officinalis. 1.
 ROTALA. 52.
 verticillaris.
 ROTTBOELLIA. 101.
 corymbosa [L. f.].
 dimidiata [L. f.] = *Panicum dimidiatum*.
 exaltata [L. f.].
 incurvata [L. f.] = *Aegilops incurvata*.
 ROUSSEA, MS. —
 capensis, MS. = *Russelia capensis*, Suppl.
 ROYENA. 570.
 glabra. 1.

ROYENA:—

- hirsuta*. 1.
lucida. 1.
villosa. 3.

RUBIA. 131.

- angustifolia*.
cordifolia.
lucida.
peregrina. 1.
tinctorum. 1.

RUBUS. 653.

- arcticus*. 1.
caesius. 1.
canadensis. 1.
Chamaemorus. 1.
Dalibarda. 3.
fruticosus. 1.
hispidus. 1.
idaeus. 1.
jamaicensis. 3.
japonicus.
moluccanus. 1.
occidentalis. 1.
odoratus. 1.
parvifolius. 1.
saxatilis. 1.

RUDECKIA. 1025.

- angustifolia*. 3.
hirta. 1.
laciniata. 1.
oppositifolia.
purpurea. 1.
triloba. 1.

RUELLIA. 804.

- antipoda*. 1.
biflora. 3. (m. Sol.)
Blechum. 3.
clandestina. 1.
ciliaris.
crispa. 1.
paniculata. 3.
repanda. 3.
repens. 3.
ringens. 1.
strepens. 1.
tentaculata. 3.
tuberosa. 1.

RUMEX. 464.

- Acetosa*.

RUMEX :—

- Acetosella. 1.
 aculeatus. 3.
 acutus. 1.
 aegyptiacus.
aegyptius = *praec.*
 alpinus. 1.
 aquaticus. 3.
 Britannica.
 bucephalophorus. 1.
 capensis. MS.
 crispus. 1.
 dentatus.
 digynus. 1.
divaricatus = *pulcher.*
 Lunaria. 1.
 luxurians.
 maritimus. 1.
multifidus. Cf. *R. Aceto-*
 sella, etc.
 obtusifolius. 3.
 Patientia.
 persicarioides. 1.
 pulcher. 1.
 roseus. 1.
 sanguineus. 1.
 scutatus. 1.
 spinosus. 1.
 tingitanus. 3.
 tuberosus. 3.
 verticillatus. 3.
 vesicarius. 1.

RUMPHIA. —

amboinensis.

RUPPIA. 176.

- maritima. 1.
 spiralis. MS.

RUSCUS. 1205.

- aculeatus. 1.
androgynus. 1. (pl.)
 Hypoglossum. 1.
 Hypophyllum. 1.
 racemosus. 3.

RUSSEA. MS. = ROUSSEA,
i. e. Russelia, Suppl. non
 al.

RUTA. 537.

- chalepensis. 3.
 graveolens. 1.

RUTA :—

- graveolens var. *montana*
 = *montana.*
 linifolia. 3.
 montana [*Mill.*]
patavina.
tenuifolia [*Gouan?*].

SACCHARUM. 77.

- officinarum. 1.
 Ravennae.
 spicatum. 1.
 spontaneum.

SAGINA. 177.

- apetala.*
 erecta. 1.
 procumbens. 1.
 virginica. 1.

SAGITTARIA. 1124.

- lancifolia. 3.
 obtusifolia. 1.
 pugioniformis.
 sagittifolia. 1.
trifolia.

SALACIA. 1066.

chinensis (pl.).

SALICORNIA. 10.

- arabica. 2.
 caspica. 1.
europaea.

— var. *fruticosa* =
fruticosa.

— var. *herbacea* =
herbacea.

foliata. MS.

fruticosa. 3.

herbacea. 3.

— var. *virginica.*

strobilacea [*Pall.?*].

virginica.

SALIX. 1158.

- aegyptiaca. 2.
 alba.

amygdalina.

arbuscula. 1.

arenaria. 1.

aurita.

babylonica. 1.

caprea. 1.

SALIX :—

- cinerea*.
- depressa*.
- fragilis*. 3.
- fusca*.
- glauca*. 1.
- hastata*. 1.
- Helix*.
- hermaphroditica*. 1.
- herbacea*. 1.
- incubacea*.
- lanata*. 1.
- lapponum*. 1.
- Myrsinites*. 1.
- myrtilloides*. 1.
- pentandra*. 1.
- phylicifolia*. 1.
- purpurea*. 3.
- repens*. 1.
- reticulata*. 1.
- retusa*. 3.
- rosmarinifolia*. 1.
- triandra*. 1.
- viminalis*. 1.
- vitellina*. 3.

SALSOLA. 315.

- altissima*. 3.
- aphylloides*, MS. =
aphylla, Suppl.
- arborescens*. Suppl.
- baccata*.
- fruticosa*. 3.
- hirsuta*. 3.
- hyssopifolia* [Pall.].
- Kali*. 1.
- muricata*. 3.
- oppositifolia*. MS.
- polyclonos*. 3.
- prostrata*. 1.
- rosacea*. 1.
- salsa*. 3.
- satira*. 3.
- Soda*. 3.
- Souda* = *præc*.
- Tragus*. 3.
- vermiculata*. 1.

SALVADORA. 164.

- persica*. 1.

SALVIA. 42.

SALVIA :—

- acetabulosa*. 3.
- aegyptiaca* [No. 1]. 3.
- aegyptiaca* [No. 36] =
spinosa.
- Aethiopis*. 1.
- africana*. 3.
- var. *caerulea*.
- var. *lutea*.
- agrestis*.
- argentea*. 3.
- aurea*. 3.
- canariensis*. 1.
- ceratophylla*. 1.
- ceratophylloides*.
- clandestina*. 3.
- colorata*. 3.
- cretica*.
- disermas*. 3.
- dominica*. 1.
- Forskohlei*. 3.
- glutinosa*. 1.
- graveolens*. MS.
- haematodes*.
- hispanica*. 1.
- Horminum*. 1.
- indica*. 3.
- lyrata*. 1.
- mexicana*. 1.
- napifolia* [Jacq.].
- nemorosa*. 3.
- nutans*. 1.
- officinalis*. 1.
- paniculata*. 3.
- parviflora*. MS.
- pinnata*. 3.
- pomifera*. 3.
- pratensis*. 1.
- pyrenaica*.
- Sclarea*. 3.
- serotina*. 3.
- spinosa*.
- sylvestris*. 2.
- syriaca*. 3.
- urticifolia*. 1.
- Verbenaca*. 1.
- verticillata*.
- virginica*. MS.
- viridis*. 1.

- SAMARA. 137.**
lacta (pl.).
- SAMBUCUS. 381.**
canadensis. 2.
Ebulus. 2.
nigra. 2.
 — var. *laciniata.*
racemosa. 1.
- SAMOLUS. 225.**
Valerandi. 1.
 — var. *africanus.*
- SAMYDA. 558.**
Guidonia.
nitida. 3.
parviflora. 3.
pubescens.
serrulata.
spinosa.
- SANGUINARIA. 666.**
canadensis. 1.
- SANGUISORBA. 148.**
canadensis. 1.
media.
officinalis. 1.
- SANICULA. 333.**
canadensis. 1.
europaea. 1.
marilandica.
- SANTALUM. 161.**
album. 3.
- SANTOLINA. 985.**
alpina. 3.
Amellus, cf. Calea Amellus.
annua = Athanasia annua.
anthemoides. 3.
Chamaecyparissus. 1.
crenata = Athanasia crenata.
crithmifolia = Ath. crithmifolia.
dentata = Ath. dentata.
jamaicensis, cf. Calea jamaicensis.
oppositifolia, cf. Calea oppositifolia.
pubescens = Ath. pubescens.
- SANTOLINA:—**
rosmarinifolia. 3.
squarrosa = Athanasia squarrosa.
trifurcata = Ath. trifurcata.
- SAPINDUS. 514.**
chinensis.
Saponaria. 1.
spinosus.
trifolius.
- SAPONARIA. 580.**
cretica. 3.
illyrica. 3.
hybrida. MS.
lutea.
ocymoides. 1.
officinalis. 1.
 — var. *hybrida = hybrida.*
orientalis. 1.
porrecta. MS.=seq.?
porrigens.
Struthium = Gypsophila Struthium.
Vaccaria. 1.
- SARACA. 880.**
indica (pl.).
- SARCOPHYTE [Sparm. ?]. 1112 b.**
sanguinea (pl.).
- SAROTHTA. 391.**
gentianoides. 1.
- SARRACENIA. 672 a. (plagulae desunt).**
flava.
purpurea.
- SATUREJA. 723.**
capitata. 1.
græca.
hortensis. 1.
Juliana. 1.
Mastichina = Thymus Mastichina.
montana. 1.
origanoides = Cunila mariana.
spinosa.
Thymbra. 1.
viminea. 3. (m. Sol.)

SATUREJA :—

virginiana = *Thymus*
virginiana.

SATYRIUM. 1055.

albidum. 1.

capense.

Epipogium.

hians. Suppl.

hircinum. 3.

nigrum. 1.

orobanchioides.

Suppl.

pedicellatum. Suppl.

plantagineum. 3.

repens. 3.

viride. 3.

SAURURUS. 478.

cernuus. 1.

natans.

SAUVAGESIA. 283.

erecta. 3.

SAXIFRAGA. 575.

adscendens. 3.

ajugifolia. 3.

aizoides. 1.

androsacea. 1.

aspera. 1.

autumnalis.

bronchialis.

bryoides. 3.

bulbifera.

Burseriana. 3.

caesia. 3.

caespitosa. 1.

cernua. 1.

Cotyledon. 1.

crassifolia. 1.

cuneifolia.

Cymbalaria.

geranioides.

Geum. 1.

granulata. 1.

groenlandica.

hederacea.

Hirculus.

hirsuta. Cf. *rotundifolia*,

No. 12.

hypnoides. 1.

mutata. 3.

SAXIFRAGA :—

nivalis. 1.

oppositifolia. 1.

pensylvanica. 2.

petraea. 3.

punctata. 1.

rivularis. 3.

rotundifolia, No. 12;

cf. *hirsuta*.

rotundifolia, No. 19.

sedoides. 1.

serpens, MS.

sibirica. 3.

stellaris. 1.

tridactylites. 1.

— var. *alpina*.

— var. *tectorum*.

umbrosa.

SCABIOSA. 120.

africana. 1.

alpina. 1.

amplexicaulis.

argentea. 3.

arvensis. 1.

atropurpurea. 3.

attenuata. Suppl.

Columbaria. 3.

cretica. 1.

graminifolia. 3.

gramuntia. 3.

indurata.

integrifolia. 1.

isetensis. 3.

leucantha.

— var. *spuria*.

murina, lapsu = seq.

maritima. 3.

ochroleuca. 3.

palaestina. 3.

papposa. 3.

prolifera. 3.

pterocephala.

pumila.

rigida. 3.

scabra. MS.

sicula.

stellata. 1.

Succisa. 1.

sylvatica. 3.

k *

SCABIOSA :—

- syriaca*. 1.
- tatarica*. 1.
- transylvanica*. 1.
- triandra*, sphalm. =
gramuntia.
- ucranica*.

SCABRITA. 124.

- scabra* (pl.).
- triflora*.

SCAEVOLA. 229.

- Lobelia* = seq.
- Plumieri.

SCANDIX. 364.

- Anthriscus*. 1.
- australis*.
- Cerrefolium*. 1.
- grandiflora*.
- infesta*.
- nodosa*. 1.
- Odorata*. 1.
- Pecten-Veneris*. 1.
- procumbens*.
- trichosperma*.

SCHEUCHZERIA. 465.

- palustris*. 1.

SCHINUS. 1193.

- Areira*. 3.
- Fagara* = *Fagara*
- Pterota*.
- Limonia* = *Limonia*
- acidissima*.
- Molle*. 1.
- myricoides* = *Schrebera*
- schinoides*.
- tragodes* = *Fagara*
- tragodes*.

SCHMIDELIA. 506.

- racemosa* (pl.).

SCHOENUS. 68

- aculeatus*. 1.
- albus*. 1.
- bulbosus*.
- capensis*. 3.
- coloratus*. 3.
- compar*.
- compressus*.
- deustus*. MS.
- ferrugineus*. 1.

SCHOENUS :—

- fuscus*. 3.
- glomeratus*. 1.
- lithospermus* = *Carex*
- lithosperma*.
- Mariscus*. 1.
- mucronatus*. 1.
- nigricans*. 1.
- niveus*.
- radiatus*. Suppl.
- secans* = *Carex litho-*
- sperma*.
- spathaceus* = *Cyperus*
- spathaceus*.
- thermalis*.
- ustulatus*.

SCHREBERA. 324.

- schinoides* (pl.?).

SCHWALBEA. —

- americana*.

SCHWENKIA. 31.

- americana* (pl.).

SCILLA. 429.

- amoena*. 1.
- autumnalis*. 3.
- bifolia*. 3.
- hyacinthoides*. 3.
- italica*. 1.
- Lilio-Hyacinthus*.
- lusitanica*. 3.
- maritima*.
- peruviana*. 3.
- tetraphylla*. Suppl.
- unifolia*.

SCIRPUS. 71.

- acicularis*. 1.
- antarcticus*.
- articulatus*. 3.
- australis*.
- autumnalis*.
- caespitosus*. 1.
- capillaris*. 1.
- capitatus*.
- cephalotes*.
- ciliaris*.
- corymbosus*. 3.
- cyperoides*.
- dichotomus*.
- echinatus*. 1.

SCIRPUS:—

ferrugineus. 3. (m. Sol.).

fluitans.

geniculatus. (m. Sol.).

glomeratus = Schoenus

glomeratus.

Halleri. MS.

Holoschoenus. 1.

hottentottus.

intricatus.

lacustris. 1.

lithospermus = Carex

lithosperma.

Luzulae. 3.

maritimus. 1.

Michelianus.

miliaceus. 3.

mucronatus. 1.

mutatus. 3.

palustris. 1.

retrofractus. 1.

romanus. 3.

setaceus. 1.

spadiceus. 1.

squarrosus.

supinus. 3.

sylvaticus. 1.

trigynus.

triqueter.

SCLERANTHUS. 578.

annuus. 3.

perennis. 3.

polycarpus.

SCOLYMUS. 963.

hispanicus. 1.

maculatus. 1.

SCOPARIA. 145.

arborea. Suppl.

dulcis. 3.

procumbens.

SCORPIURUS. 920.

muricata. 1.

sulcata. 1.

vermiculata. 1.

subvillosa.

SCORZONERA. 947.

angustifolia. 1.

graminifolia. 1.

hirsuta.

SCORZONERA:—

hispanica. 1.

humilis. 3.

laciniata. 1.

orientalis. 3.

picroides. 1.

purpurea. 1.

resedifolia. 3.

tingitana. 1.

tomentosa.

SCROPHULARIA. 773.

aquatica. 1.

auriculata. 1.

betonicifolia.

canina. 1.

chinensis.

coccinea.

frutescens.

lucida. 3.

marilandica. 2.

meridionalis. Suppl.

nodosa. 2.

orientalis. 1.

peregrina. 1.

sambucifolia. 1.

Scorodonia. 3.

trifoliata. 3.

vernalis. 1.

SCURRULA. --

parasitica = Loranthus

Scurrula.

SCUTELLARIA. 751.

albida.

alpina. 1.

altissima.

cretica. 3.

galericulata. 1.

hastifolia. 1. ("has-
tata.")*havanensis* [Jacq.]

hyssopifolia. 1.

indica. 1.

integrifolia. 1.

lateriflora. 1.

lupulina. 3.

minor. 3.

orientalis. 1.

peregrina. 1.

supina = lupulina.

k*2

SECALE. 102.

- cereale. 1.
- creticum. 3.
- orientale.
- villosum.

SECURIDACA. 883.

- erecta [Jacq.].
- scandens [Jacq.].
- volubilis. 1.

SEDUM. 595.

- acre.
- Aizoon. 1.
- album.
- Anacampseros.
- annuum. 3.
- atratum. 3.
- caeruleum.
- Cepaea. 2.
- dasyphyllum.
- globiferum.
- hispanicum.
- hybridum.
- libanoticum.
- miatum.
- reflexum. 3.
- rubens = Crassula
rubens.
- rupestre. 3.
- sexangulare. 3.
- stellatum. 1.
- Telephium.
- var. album.
- var. maximum.
- var. purpureum.
- verticillatum.
- villosum.

SEQUIERIA. —

- americana.

SELAGO. 786.

- capitata.
- coccinea.
- corymbosa. 1.
- dubia = Eranthemum
angustatum.
- ericoïdes = Stilbe eri-
coides.
- fasciculata.
- fruticosa. 3.
- lychnidea.

SELAGO:—

- Pinastra = Stilbe Pi-
nastra.
- polystachya.
- Prunastri = Stilbe Pi-
nastra.
- rapunculoides. 3.
- spuria. 3.
- tomentosa. 3. Cf.
Mamulea tomentosa.

SELINUM. 344.

- Carvifolia. 3.
- Cervaria = Athamantha
Cervaria.
- Monnieri. 3.
- palustre.
- pyrenaicum [Gouan?].
- Seguierii [Jacq.].
- silvestre. 1.

SEMECARPUS. 377.

- Anacardium [Linn. f.].

SEMPERVIVUM. 632.

- arachnoideum.
- arborescens.
- canariense.
- globiferum = seq.
- globuliferum. 1.
- hirtum.
- montanum.
- sediforme.
- tectorum.

SENECIO. 996.

- abrotanifolius. 3.
- aegyptius. 1.
- alpinus. Suppl.
- arabicus. 3.
- aureus. 1.
- byzantinus. 1.
- canadensis. 1.
- cordifolius. Suppl.
- divaricatus. 1.
- Doria. 3.
- Doronicum. 3.
- elegans. 1.
- erucifolius. 1.
- foetidus.
- glastifolius. Suppl.
- glaucus. 1.
- halimifolius. 1.

SENECIO :—

- hastatus*. 3.
hastulatus = *præc.*
hieracifolius. 1.
ilicifolius. 1.
incanus.
Jacobaea. 1.
 — var. *discoidea*.
lanatus.
linifolius. 3.
lividus. 1.
longifolius.
nebrodensis. 3.
nemorensis. 1.
paludosus. 1.
persicifolius.
peucedanifolius. Suppl.
polifolius.
populifolius. 3.
Pseudo-china.
pubigerus.
purpureus. 3. (m.
 Sol.)
rigens. 3.
rigidus. 3.
sarracenicus. 1.
squalidus. 1.
sylvaticus. 1.
triflorus. 1.
trilobus. 2.
umbellatus.
varicosus. 3.
virgatus. 3.
viscosus. 1.
vulgaris. 1.

SEPTAS. 480.

- capensis* 3.

SERAPIAS. 1057.

- capensis*.
cordigera. 3.
grandiflora. 3. (m.
 L. f.)
Helleborine. 1.
 — var. *latifolia*.
 — var. *longifolia*.
 — var. *palustris*.
latifolia = *S. Helle-*
borine, var.
Lingua. 1.

SERAPIAS :—

- longifolia* = *S. Helle-*
borine, var.
rubra.

SERTOLA. 958.

- aethnensis*.
cretensis.
laevigata.
urens.

SERIPHIMUM. 1049.

- ambiguum*.
cinereum. 1.
corymbiferum = *Stoebe*
guaphaloides.
fuscum. 3.
guaphaloides = *fuscum*.
plumosum.

SERPICULA. 1106.

- serpens* (pl.).

SERRATULA. 965.

- alpina*. 1.
 — var. *angustifolia*.
 — var. *cynoglossifolia*.
 — var. *lapatifolia*.
amara. 1.
arvensis. 1.
babylonica = *Centaurea*
babylonica.
centauroides. 1.
coronata. 3.
Chamaepeuce.
glauca.
multiflora. 1.
noveboracensis.
praealta. 1.
salicifolia. 1.
scariosa. 1.
spicata. 1.
squarrosa. 1.
tinctoria. 1.
 — var. *praealta* =
praealta.

SERTULARIA. 1298.

SESAMUM. 802.

- indicum*. 1.
orientale. 1.

SESELI. 367.

- Ammoides*. 3.
annaum. 3.

SESELI :—

- Carvifolia*.
- elatum*. 3.
- glaucum*. 3.
- Hippomarathrum*. 3.
- montanum*. 3.
- parvulum*. MS.
- pimpinelloides*. 2.
- pumilum* = *Pimpinella*
- pumila*.
- pyrenaicum* = *Selinum*
- pyrenaicum*.
- saxifragum*.
- tortuosum*. 2.
- Turbith*. 3.

SESUVIUM. 645.

- Portulacastrum* (pl.).

SHERARDIA. 126.

- arvensis*. 1.
- fruticosa*. 1.
- muralis*. 1.

SIBBALDIA. 401.

- erecta*. 3.
- procumbens*. 1.

SIBTHORPIA. 793.

- africana*.
- europaea*. 1.
- peregrina*.

SICYOS. 1154.

- angulata*. 1.
- Garcini*. (m. L. f.)
- laciniata*.
- trifoliata*.

SIDA. 866.

- Abutilon*. 1.
- alba*. 3.
- alnifolia*. 3.
- americana*. 3.
- amplissima*.
- asiatica*. 3.
- capitata* = *Malachra*
- capitata*.
- ciliaris*. 3.
- cordifolia*. 1.
- crispa*. 1.
- cristata*. 1.
- indica*. 3.
- inflata*. MS.
- jamaicensis*. 3.

SIDA :—

- occidentalis*.
- paniculata*. 3. (m.
- Sol.)
- periplocifolia*. 1.
- radiata*.
- retusa*.
- rhombifolia*. 1.
- spinosa*. 1.
- triquetra*. 3.
- umbellata*. 3. (m.
- Sol.)
- urens*. 3.
- viscosa*. 3. (m. Sol.)

SIDERITIS. 729.

- canariensis*. 1.
- cretica*. 1.
- hirsuta*. 1.
- hyssopifolia*. 1.
- incana*. 3.
- lanata*. 3.
- montana*. 1.
- Ocymastrum* = *Stachys*
- hirta*.
- perfoliata*. 3.
- romana*. 1.
- scordioides*. 3.
- syriaca*. 1.

SIDEROXYLON. 261.

- decandrum*.
- foetidissimum* [Jacq.].
- inermis*. 1.
- lycioides*. 3.
- melanophleas*. 3.
- mite*.
- Pacurero* [Loefl.].
- spinsum*. 1.
- tenax*. 3.

SIGESBECKIA. 1018.

- occidentalis*. 1.
- orientalis*. 1.

SILENE. 583.

- acaulis*. 3.
- alpestris* [Jacq.].
- amoena*. 1.
- anglica*. 3.
- antirrhina*. 1.
- Armeria*. 1.
- Behen*. 3.

SILENE:—

- bupleurioides. 1.
- cerastoides. 1.
- conica.
- conoidea. 1.
- crassifolia.
- cretica. 1.
- fruticosa. 1.
- gallica. 1.
- gigantea. 1.
- inaperta. 1.
- lusitanica. 1.
- Muscipula*.
- mutabilis. 3.
- noctiflora. 1.
- nocturna. 1.
- nutans. 1.
- paradoxa. 3.
- pendula. 1.
- polyphylla*.
- porrigens* = Saponaria
- porrigens.
- portensis* = *inaperta*.
- quadrifida. 3.
- quinquevulnera. 1.
- rigidula* = *cerastoides*.
- rubella. 3.
- rupestris. 1.
- Saxifraga. 1.
- stricta. 3.
- vallesia. 3.
- virginica. 1.
- viridiflora. 3.

SILPHIUM. 1032.

- Asteriscus. 3.
- connatum*.
- helianthoides*.
- laciniatum. 1.
- perfoliatum. 3.
- solidaginoides. 1.
- trifoliatum. 1.
- trilobatum. 3.

SINAPIS. 845.

- alba. 1.
- arvensis. 1.
- brassicata* = *junceae*.
- chinensis. 3.
- erucoides. 3.
- hispanica. 3.

SINAPIS:—

- incana. 3.
- junceae. 1.
- laevigata. 3.
- nigra*.
- orientalis. 3.
- pubescens. 3.
- pyrenaica. 3.
- violacea. MS.

SIPHONANTHUS. —

indica.

SIRIUM. 138.

myrtifolium (pl.).

SISON. 356.

- Ammi. 1.
- Ammoides* = *Seseli*
- Ammoides*.
- Amomum. 1.
- canadense. 1.
- inundatum. 1.
- segetum*.
- verticillatum.

SISYMBRIUM. 836.

- altissimum. 1.
- amphibium. 3.
- var. *aquaticum*.
- var. *palustre*.
- var. *terrestre*.
- arenosum. 1.
- asperum. (an m. L. f.?)
- Barbareae. 3.
- Barrelieri. 3.
- bursifolium. 3.
- catholicum.
- indicum. 3.
- integrifolium. 1.
- Irio. 1.
- Loeselii. 3.
- monense. 2.
- murale. 1.
- Nasturtium-aquaticum.
- 1.
- orientale. 3.
- Parra.
- polyceratium. 3.
- Sophia. 1.
- strictissimum. 1.
- supinum. 1.
- sylvestre. 1.

SISYMBRIUM :—

- tanacetifolium. 3.
- tenuifolium.
- valentinum. 3.
- vimineum. 1.

SISYRINCHIUM. 1064.

- Bermudiana. 2.
- palmifolium. 3.

SIUM. 355.

- angustifolium. 3.
- Falcaria. 2.
- groecum.
- latifolium. 1.
- Ninsi.
- nodiflorum. 1.
- rigidius. 1.
- siculum.
- Sisarum. 1.

SLOANEA. --

- dentata.
- emarginata.

SMILAX. 1182.

- annua. MS.
- aspera. 1.
- Bona-nox.
- caduca. 1.
- China. 1.
- excelsa. 1.
- herbacea. 1.
- lanceolata.
- laurifolia. 1.
- Pseudo-China. 1.
- rotundifolia. 1.
- Sarsaparilla. 1.
- tamnoides. 1.
- zeylanica.

SMYRNIUM. 370.

- aegyptiacum. 3.
- aureum. 1.
- integerrimum. 1.
- Olusatrum. 1.
- perfoliatum. 1.

SOLANDRA. 332 a.

- capensis. 3.
- septemdentata. MS.
- tridentata. MS.

SOLANUM. 248.

- aethiopicum. 3.
- bahamense. 1.

SOLANUM :—

- bonariense. 1.
- campechiense. 3.
- capense.
- carolinense. 1.
- diphyllum. 1.
- Dulcamara. 1.
- ferox.
- fuscatum.
- guineense = Atropa
- guineense.
- havanense [Jacq.].
- igneum. 3.
- incanum = sanctum.
- indicum. 1.
- insanum. 3.
- lycioides.
- Lycopersicum. 1.
- macrocarpon.
- mammosum. 1.
- Melongena. 1.
- montanum.
- nigrum. 1.
- var. *guineense*.
- var. *judaicum*.
- var. *patulum*.
- var. *villosum*.
- var. *virginicum*.
- var. *vulgare*.
- var. *vulgatum*
- = *praec.*
- novum*.
- obscurum*.
- paniculatum*.
- peruvianum. 1.
- pimpinellifolium. 2.
- Pseudocapsicum. 1.
- pulverulentum* = *tomentosum*.
- quercifolium. 1.
- racemosum.
- radicans. 3.
- rubrum.
- sanctum. 1.
- scandens.
- sodomaeum. 1.
- subinerme [Jacq.].
- tomentosum. 2.
- trilobatum. 1.

SOLANUM :—

- tuberosum. 1.
- verbascofolium. 1.
- virginianum.
- virginicum* = *praec.*

SOLDANELLA. 200.

- alpina. 3.

SOLIDAGO. 998.

- alpina* = *Cineraria*
- alpina*.
- altissima*. 1.
- bicolor*. 3.
- caesia*.
- canadensis*. 1.
- discolor*, MS. [an bi-color ?]
- Doronicum*.
- flexicaulis*. 2.
- lanceolata*. 3.
- lateriflora*. 1.
- lutifolia*.
- linifolia* = *Senecio lini-folius*.
- mexicana*. 1.
- minuta*. 3.
- montana* = *Cacalia saracenica*.
- noveboracensis*. 1.
- rigida*. 1.
- sempervirens*.
- serotina*. MS.
- Virgaurea*. 1.

SONCHUS. 949.

- alpinus*. 3.
- arvensis*. 1.
- canadensis*. 1.
- floridanus*. 1.
- maritimus*. 3.
- oleraceus*. 3.
- var. *asper*.
- var. *lavis*.
- palustris*. 1.
- Plumieri*. 3.
- sibiricus*. 1.
- tataricus*.
- tenerrimus*. 3.
- tuberosus*.

SOPHIA. —

- Carolina*.

SOPHORA. 522.

- alba*.
- alopécuroides*.
- australis*. 3.
- biflora*. 3.
- capensis*. 3.
- genistoides*. 1.
- heptaphylla*.
- japonica*. 3.
- lupinoides*. 1.
- occidentalis*. 3.
- tinctoria*. 1.
- tomentosa*. 1.

SORBUS. 644.

- ambigua*. MS.
- Aucuparia*. 1.
- domestica*.
- hybrida*. 3.
- sativa*. MS.

SPARGANIUM. 1095.

- erectum*. 1.
- natans*. 1.

SPARRMANIA, MS. —

- capensis* = *Melanthium monopetalum*.

SPARRMANNIA [Linn.f.]. 677.

- africana* [Linn. f.].

SPARTIUM. 891.

- angulatum*.
- capense*. 3.
- complicatum*. 1.
- contaminatum*.
- juncenum*. 1.
- monospermum*. 1.
- patens* = *Cytisus patens*.
- purgans* = *Genista purgans*.
- radiatum*. 2.
- scoparium*. 1.
- Scorpius*.
- sepiarium*.
- sphaerocarpum*.
- spinosum*. 1.

SPATHELIA. —

- simplex*.

SPERGULA. 604.

- arvensis*. 1.
- laricina*. 1. (“laricifolia.”)

SPERGULA :—

- nodosa. 1.
- pentandra. 1.
- saginoides. 2.

SPERMACOCE. 125.

- articularis. Suppl.
- capitellata. MS.
- corymbosu* = procumbens.
- hirta.
- hispida. 1.
- procumbens. 3.
- spinosa. 3.
- stricta. Suppl.
- strigosa.
- suffruticosa* [Loefl.].
- tenuior. 1. (m. Sol.)
- verticillata.

SPHAERANTHUS. 1044.

- africanus. 3. ("afer.")
- chinensis. 3.
- indicus. 3.

SPHAERIA [Weigl]. 1288.

- anastomosans, byssea,
- gregaria, laevigata,
- lichenoides, Mori,
- mucosa, pertusa,
- rugosa, tremelloides,
- variolosa.

(11 species ad eandem plagulam glutinatae.)

SPHAGNUM. 1258.

- alpinum*.
- arboreum*.
- palustre. 3.

SPIGELIA. 210.

- Anthelmia. 3.
- marilandica*.

SPILANTHES [Jacq.]. 974.

- Acmella.
- atriplieifolius.
- insipida* [Jacq.].
- oleracea.
- Pseudo-Acmella* = S. Acmella.
- urens* [Jacq.].

SPINACIA. 1174.

- fera. 3.

SPINACIA :—

- oleracea. 1.

SPINIFEX. 1216.

- squarrosus.

SPIRAEA. 651.

- argentea. Suppl.
- Aruncus. 3.
- chamaedrifolia. 1.
- crenata. 1.
- Filipendula. 1.
- hypericifolia. 1.
- laevigata*.
- opulifolia. 3.
- palnata.
- salicifolia. 1.
- sorbifolia. 1.
- tomentosa. 1.
- trifoliata. 1.
- triloba*.
- trilobata* = praec.
- Ulmaria. 1.

SPLACHNUM. 1262.

- ampullaceum. 1.
- luteum. 1.
- rubrum. 1.
- subglobosum. MS.
- vasculosum*.

SPONDIAS. 593.

- lutea*.
- Mombin* = purpurea.
- Myrobalanus* = lutea.
- purpurea*.

SPONGIA. 1295.

STACHYS. 736.

- aethiopica. 3.
- alpina. 1.
- annua. 3.
- arvensis. 3.
- bituminosa, MS. = glutinosa.
- cretica. 1.
- germanica. 1.
- glutinosa. 2.
- hirta. 3.
- italica. [an Mill. ?]
- maritima. 3. ("marina.")
- orientalis*.
- palaeestina. 3.
- palustris. 1.

STACHYS :—

- recta. 3.
- rigida, MS.=glutinosa.
- rugosa. MS.
- spinosa.
- sylvatica. 1.
- villosa. MS.

STAEHELINA. 981.

- arborescens. 3.
- centauroides=Athanasia
- dentata.
- Chamaepeuce.
- corymbosa. MS.
- dubia. 2.
- fruticosa. 3.
- gnaphaloides. 1.
- imbricata. [an Berg. ?]

STAPELIA. 311.

- hirsuta. 1.
- mammillaris.
- variegata. 3.

STAPHYLEA. 382.

- pinnata. 1.
- trifolia ("ternata"). 3.

STATICE. 395.

- Armeria. 1.
- aurea. 1.
- cordata.
- crispa. MS.
- echioides.
- Echinus. 3.
- ferulacea. 3.
- flexuosa. 1.
- fruticulosa. MS.
- incana. 3.
- Limonium. 1.
- lobata. Suppl.
- minuta.
- monopetala. 1.
- pruinosa.
- purpurata. 3.
- reticulata. 1.
- sinuata. 1.
- speciosa. 1.
- suffruticosa. 1.
- tatarica. 1.
- virginica. MS.

STELLARIA. 584.

- Arenaria. 2.

STELLARIA :—

- biflora=Arenaria
- striata.
- cerastoides. 1.
- dichotoma. 1.
- graminea. 1.
- Holostea. 1.
- nemorum. 1.
- radians. 1.

STELLERA. 503.

- Chamaejasme.
- Passerina. 1.

STEMODIA. 797.

- maritima. 3.

STERCULIA. 1143.

- Balanghas. 3.
- foetida.

STERIS. 318.

- javana (pl.).

STEWARTIA. 876.

- Malacodendron. 1.

STILAGO. 1067.

- Bunius (pl.).

STILBE. 1234.

- cernua. Suppl.
- ericoides.
- Pinastra.

STILLINGIA. 1147.

- sylvatica (pl.).

STIPA. 94.

- arguens. 3.
- Aristella.
- avenacea.
- capillata. 3.
- junceae. 1.
- membranacea. 2.
- pennata. 1.
- spicata. Suppl.
- Spinifex=Spinifex
- squarrosus.
- tenacissima. 2.

STOEBE. 1048.

- aethiopica. 1.
- ericoides.
- gnaphaloides.
- prostrata.
- scabra. Suppl.

STRATIOTES. 703.

- alismoides.

STRATIOTES :—

Aloides. 1.

STRUMPFIA. —

maritima.

STRUTHIOLA. 162.

erecta. 3.*virgata*. 3.

STRYCHNOS. 250.

colubrina.*Nux-vomica*.

STYRAX. 569.

latifolia, MS.= *Halesia*
diptera.*officinale*. 1.STUARTIA, *vide* STEWARTIA.

SUBULARIA. 822.

aquatica. 3.

SURIANA. 598.

maritima. 2.

SWERTIA. 327.

corniculata. 1.*dichotoma*. 1.*difformis*. 3.*perennis*. 3.*rotata*. 1.

SWIETENIA. 542.

Mahagoni (pl.).

SYMPHONIA. 853.

globulifera (pl.).

SYMPHYTUM. 185.

officinale. 1.*orientale*.*tuberosum*. 1.

SYMPLOCOS. —

martinicensis.

SYRINGA. 22.

persica. 1.*vulgaris*. 1.

TABERNAEMONTANA. 304.

alternifolia = *citrifolia*.*Amsonia*.*citrifolia*. 3.*cymosa*.*Echites*.*grandiflora*.*laurifolia*. 3.

TAGETES. 1009.

TAGETES :—

erecta. 1.*minuta*.*patula*. 1.

TAMARINDUS. 49.

indica. 1.

TAMARIX. 383.

gallica. 1.*germanica*. 1.

TAMUS. 1181.

communis. 1.*cretica*.

TANACETUM. 987.

annuum. 1.*Balsamita*. 1.*chamomilloides*. MS.*cotuloides*.*crithmifolium* = *Athan-*
asia crithmifolia.*frutescens* ("frutico-
sum") = *Hippia fru-*
tescens.*incanum*.*monanthos*. 3.*sibiricum*. 1.*suffruticosum*.*vulgare*. 1.— var. *crispum*.

TARCHONANTHUS. 983.

camphoratus. 1.*ericoides*. Suppl.

TARGIONIA. 1268.

hypophylla. 1.*perversa*. MS.

TAXUS. 1199.

baccata. 3.*nucifera*.

TELEPHIUM. 385.

Imperati. 1.*oppositifolium*.

TERMINALIA. 1222.

Catappa. 3.

TERNSTROEMIA. 662.

meridionalis (pl.).

TETRACERA. 697.

volubilis. 1.

TETRAGONIA. 648.

fruticosa. 1.*herbacea*.

TETRAGONOTHECA. —

helianthoides = *Polymnia*

Tetragonotheca.

TEUCRIUM. 722.

alpinum = *T. Pseudo-*
chamaepitys.

Arduini. 3.

asiaticum. 3.

Botrys. 1.

campanulatum. 3.

canadense. 1.

capitatum. 1.

Chamaedrys. 1.

Chamaepitys. 1.

creticum. 1.

cubense [Jacq.].

flavum. 1.

fruticans. 1.

hircanicum. 3.

Iva. 1.

latifolium.*Laemannii*.

lucidum. 3.

Marum. 1.

massiliense. 3.

mauritanum.

montanum. 1.

mucronatum = *spinosum*.*multiflorum*.

Nissolianum. 3.

orientale.

Polium. 1.

Pseudochamaepitys. 3.

Pseudopithys = *præc.*

pumilum. 3.

pyrenaicum. 1.

salicifolium. 3.

Scordium. 1.

Scorodonia. 1.

sibiricum. 1.

spinosum. 1.

supinum. 3.

virginicum.

THALIA. —

geniculata.

THALICTRUM. 713.

alpinum. 1.

angustifolium. 1.

aquilegifolium. 1.

THALICTRUM:—

contortum. 1.

Cornuti.

dioicum. 1.

flavum. 1.

— var. *speciosum*.*foetidum*.*hybridum* = *contortum*.*lucidum*.

minus. 1.

petalodeum.

purpurascens. 1.

sibiricum.

simplex. 3.

tuberosum. 1.

THAPSIA. 368.

Asclepium.*foetida*.*garganica*.

trifoliata. 1.

villosa. 3.

THEA. 685.

Bohea. 3.

Hyson. MS.

sinensis = *T. Bohea*.

viridis.

THELIGONUM. 1126.

Cynocrambe. 2.

THEOBROMA. 934.

angusta.

Cacao.

Guazuma. 1. (m. Sol.)

THEOPHRASTA. —

americana.

THESIUM. 292.

alpinum. 3.

amplexicaule.

capensis. MS.

capitatum.

euphorbioides. (m. L. f.)

Frisia.

funale. 3.

linophyllum. 1.

paniculatum. 3.

scabrum. 3.

spicatum. (m. L. f.)

strictum. (m. L. f.)

umbellatum. 1.

THLASPI. 825.

THLASPI :—

- alliaceum*.
- alpestre. 3.
- arvense. 1.
- Bursa-pastoris. 1.
- campestre. 1.
- hirtum. 1.
- montanum.
- peregrinum. 2.
- perfoliatum. 1.
- saxatile. 1.

THRYALLIS. —

- brasiliensis*.

THUYA (THUJA, THYA). 1136.

- aphylla. 3.
- cupressoides*.
- occidentalis. 1.
- orientalis. 1.

THUNBERGIA. 815.

- capensis* [Retz.].

THYMBRA. 724.

- spicata. 1.
- verticillata. 1.

THYMELAEA. —

- squarrosa*.

THYMUS. 744.

- Acinos. 1.
- alpinus. 1.
- cephalotes*.
- Mastichina.
- Piperella. 3.
- ptedgioides* = Cimila
- thymoides.
- Serpyllum. 3.
- Tragoriganum* = Satureia
- Thymbra.
- villosus*.
- virginicus.
- vulgaris. 1.
- Zygis. 1.

TIARELLA. 576.

- cordifolia. 2.
- trifoliata*.

TILIA. 679.

- americana*.
- europaea. 2.

TILLAEA. 178.

- aquatica. 1.
- capensis. Suppl.

TILLAEA :—

- muscosa*. 3.
- rubra* = Crassula rubens.

TILLANDSIA. 403.

- lingulata.
- monostachya. 3.
- paniculata*.
- polystachya*.
- recurvata. 3.
- serrata*.
- tenuifolia*.
- usneoides. 3.
- utriculata.

TINUS. —

- occidentalis*.

TOLUIFERA. —

- Balsanum*.

TOMEX. —

- tomentosa* = Callicarpa
- tomentosa.

TORDYLIUM. 337.

- Anthriscus. 1.
- apulum*.
- latifolium* = Caulalis
- latifolia.
- maximum. 3.
- nodosum. 1.
- officinale. 1.
- peregrinum. 3.
- syriacum. 1.

TORENIA. 770.

- asiatica* (pl.).

TORMENTILLA. 656.

- erecta. 1.
- reptans. 3.

TOURNEFORTIA. 193.

- cymosa. 3.
- foetidissima*.
- glabra. 1.
- hirsutissima*.
- humilis* = Heliotropium
- fruticosum.
- serrata*.
- sibirica* = Messersmidia
- sibirica.
- suffruticosa*.
- volubilis. 2.

TOZZIA. 762.

- alpina. 1.

TRACHELIUM. 224.

- caeruleum. 1.
diffusum, Suppl. (an
Linn. f.?)

TRADESCANTIA. 406.

- axillaris.
eristata. 3.
geniculata [Jacq.].
malabarica.
nervosa.
papilionacea.
virginiana=seq.
virginica. 1.

TRAGIA. 1103.

- Chamaelea. (m. L. f.)
involucrata. (m. L. f.)
Mercurialis. 1. (m. Sol.)
scandens=volubilis.
urens. (m. L. f., 1778.)
volubilis. 1.

TRAGOPOGON. 946.

- asperum*.
crocifolium. 3.
Dalechampii. 1.
Dandelion. 3.
hybridum = Geropogon
glabrum.
lanatum. 3.
orientale. 1.
picroides. 1.
porrifolium. 1.
pratense. 1.
villosum. 3.
virginicum. 1.

TRAPA. 158.

- natans* (pl.).

TREMELLA. 1276.

- adnata*.
Auricula.
difformis.
hemisphaerica.
juniperina.
lichenoides.
Nostoc. (m. L. f.)
purpurea. (m. L. f.)
verrucosa.

TREWIA. —

- nudiflora*.

TRIANTHEMA. 572.

TRIANTHEMA :—

- decandra. 3.
monogyna. 3.
pentandra. 3.
Portulacastrum = mono-
gyna.

TRIBULUS. 547.

- cistoides. 3.
lanuginosus. 3.
maximus. 3.
terrestris. 1.

TRICHILIA. 541.

- glabra. 3.
Guara=Guarea trichi-
lioides.
hirta.
trifolia.
trifoliata=præc.

TRICHOMANES. 1253.

- adiantoides*.
capillaceum.
canariense=Polypodium
leptophyllum?
chinense.
crispum. 1.
hirsutum.
membranaceum. 1.
polypodioides.
pyxidiferum.
scandens. 3.
tunbridgense. 3.

TRICHOSANTHES. 1149.

- amara*.
Anguina. 3.
cucumerina.
nervifolia.
palmata.
punctata (pl.).

TRICHOSTEMA. 750.

- brachiatum.
dichotomum. 1.

TRIDAX. —

- procumbens*.

TRIENTALIS. 474.

- capensis*.
europaea. 1.

TRIFOLIUM. 930.

- agrarium. 1.
alexandrinum. 3.

TRIFOLIUM :—

- alpestre. 3.
 alpinum. 1.
 angustifolium. 1.
 arvense. 1.
 biflorum. 1.
 caeruleum. MS.
 Cherleri. 2.
 clandestinum. MS.
 clypeatum. 1.
comosum.
 creticum. MS.
 filiforme. 1.
 fragiferum. 1.
fruticans.
 globosum. 2.
 glomeratum. 1.
 hybridum. 1.
 incarnatum. 1.
 indicum. MS.
 italicum. MS.
 lappaceum. 1.
 Lupinaster. 1.
 medium.
 Melilotus [var.] caerulea :
 cf. caeruleum.
 — var. *corniculata*.
 — var. *cretica* ; *cf.*
 creticum.
 — var. *indica* ; *cf.* in-
 dicum.
 — var. *italica* ; *cf.* ital-
 icum.
 — var. *officinalis* ; *cf.*
 officinale.
 — var. *ornithopo-*
 dioides ; *cf.* *ornitho-*
 podiodes.
 — var. *polonica* ; *cf.*
 polonicum.
 messanense.
 montanum [no. 29, Sp.
 Pl. I. p. 770].
 montanum [no. 37, l. c.
 p. 772] = *spadiceum*.
 ochroleucum.
 officinale. MS.
 ornithopodioides. MS.
pannonicum.

TRIFOLIUM :—

- polonicum. MS.
 pratense. 1.
 procumbens. 1.
reflexum.
 repens. 1.
 resupinatum. 1.
retusum = *strictum*.
 rubens. 1.
 scabrum. 1.
 spadiceum. 1.
 spumosum. 1.
 squarrosum. 1.
 stellatum. 1.
 striatum. 1.
 strictum. 2.
 subterraneum. 1.
suffocatum.
 tomentosum. 1.
 uniflorum. 1.
 TRIGLOCHIN. 466.
 bulbosum. (m. L. f.)
 maritimum. 1.
 palustre.
 TRIGONELLA. 932.
 corniculata. 3.
 Foenum-graecum.
 — var. *sylvestris*.
 hamosa. 3.
 indica (pl. ?).
 laciniata. 3.
 monspeliaca. 2.
 platycarpus. 1.
 polycerata. 1.
 ruthenica. 1.
 spinosa. 1.
 striata. Suppl.
 TRILIX. —
 lutea.
 TRILLIUM. 469.
 cernuum. 1.
 erectum. 3.
 sessile. 1.
 TRIOPTERIS. 500.
 jamaicensis.
 TRIOSTEUM. —
 angustifolium
 perfoliatum.
 TRIPLARIS. 103.

TRIPLARIS :—

americana. 3.

TRIPSACUM. 1097.

dactyloides. 3.

hermaphroditum. 3.

(m. Sol.)

TRITICUM. 104.

*aestivum.**caninum* = *Elymus**caninus.**compositum.**hybernum.**juncum.* 3.*maritimum.* 3.*monococcum.* 1.*polonicum.* 3.*repens.* 3.*Spelta.**tenellum.* 3.*turgidum.* 3.*unilaterale.*

TRIUMFETTA. 620.

*annua.**Bartramia.**Lappula.* 1.*semitriloba.*

TROLLIUS. 716.

asiaticus. 1.*europaeus.* 1.

TROPAEOLUM. 481.

hybridum. 3.*majus.* 1.*minus.* 1.*peregrinum.* 3.

TROPIS. 1165.

americana. 3.

TUBULARIA. 1297.

*Androsace.**divaricata* (Alga?).*fragilis.*

TULBAGHIA. 411.

capensis.

TULIPA. 425.

*Breyniana.**Gesneriana.* 1.*sylvestris.* 1.

TURNERA. 384.

cistoides. 3.*Pumilea.* 3. (m. Sol.)

TURNERA :—

sidoides ("sidiformis").

3.

ulmifolia. 1.

TURRAEA. 549.

virens (pl.).

TURRITIS. 843.

alpina. 3.*glabra.* 1.*hirsuta.* 1.

TUSSILAGO. 995.

alba. 1.*alpina.* (m. L. f.)*Anandria.* 1.*dentata.**Farfara.* 1.*frigida.* 1.*hybrida.* 1.*japonica.* 3.*nutans.* 3.*Petasites.* 1.

TYPHA. 1094.

angustifolia. 3.*latifolia.*

ULEX. 915.

*capensis.**europaeus.* 1.

ULMUS. 321.

americana. 1.*campestris.* 1.*pumila.* 1.

ULVA. 1275.

*compressa.**confervoides.**granulata.**intestinalis.**labyrinthiformis.**Lactuca.* 1. (m. L. f.)*lanceolata.**latissima.**Linza.**lumbricalis.**papillosa.**pavonia* = *Fucus pavo-**nius.**pruniformis.**rugosa.*

ULVA :—

umbilicalis.

UNIOLA. 89.

bipinnata. 3.*mucronata.**paniculata.* 3.*spicata.* 1.

UNONA, Suppl. 709.

discreta (pl.). Suppl.

UNXIA, Suppl. 1010.

camphorata. Suppl.

URENA. 873.

*americana.**lobata.* 1.*procumbens.* 1.*sinuata.* 1. (m. Sol.)*Typhalaea.*

URTICA. 1111.

aestuans. 3.*africana.* MS.*alienata.**baccifera.**balearica.* 3.*canadensis.* 1.*cannabina.* 1.*capitata.* 1.*ciliaris.**cylindrica.* 1.*dioica.* 1.*divaricata.* 1.*Dodartii.* 3.*grandifolia.* 3.*interrupta.* 3.*nivea.* 1.*Parietaria.**pilulifera.* 1.*pumila.* 1.*ureus.* 1.

UTRICULARIA. 34.

*alpina.**bifida.**caerulea.* (m. L. f.)*foliosa.**gibba.* 1.*minor.* 1.*subulata.* 1.*vulgaris.* 1.

UVARIA. —

japœnica.

UVARIA :—

zeylanica.

UVULARIA. 422.

*amplexifolia.**perfoliata.* 1.*sessilifolia.*

VACCINIUM. 497.

album. 1.*Arctostaphylos.* 3.*corymbosum.* 1.*frondosum.* 1.*hispidulum.* 1.*ligustrinum.* 1.*mucronatum.* 1.*Myrtillus.* 1.*Oxycoccus.* 1.*stamineum.* 1.*uliginosum.* 1.*Vitis-idæa.* 1.

VAHLIA [Thunb.] 329.

VALANTIA. 1219.

Aparine. 1.*articulata.* 1.*Cruciata.* 1.*Cucullaria.* 3.*glabra.* 3.*hispida.* 3.*hypocarpa.* 3.*muralis.* 1.

VALERIANA. 48.

Calcitrapa. 1.*celtica.* 3.*chinensis.* 1.*Cornucopie.* 1.*dioica.* 1.*echinata.* 3.*elongata.* 3.*Locusta*, var. *coronata.*—— var. *dentata.*—— var. *discoidea.*—— var. *mutica.*—— var. *olitoria.*—— var. *pumila.*—— var. *radiata.*—— var. *vesicaria.**niata.**montana.* 3.

VALERIANA :—

- officinalis. 1.
- Phu. 1.
- pyrenaica. 1.
- rubra. 1.
- saxatilis.
- scandens [Loefl.].
- sibirica. 1.
- supina. 3.
- tripteris. 3.
- tuberosa.

VALLEA. 678.

- stipularis* (pl.).

VALLISNERIA. 1157.

- spiralis* (pl.).

VANDELLIA. 795.

- diffusa* (pl.).

VARRONIA. 255.

- alba*.
- bullata*.
- curassavica*=*praec.*
- globosa*.
- lineata*. 3.
- martinicensis*.

VATERIA. —

- indica*.

VATICA. 614.

- chinensis* (pl.).

VELEZIA. 326.

- rigida*. 1.

VELLA. 820.

- annua*. 1.
- Pseudocytisus*. 1.

VERATRUM. 1210.

- album*. 1.
- luteum*. 1.
- nigrum*. 1.

VERBASCUM. 242.

- Arcturus*=*Celsia Arcturus*.
- Blattaria*. 1.
- Boerbavi*. 3.
- glaucum*=*phoeniceum*.
- hybridum*. MS.
- Lychnitis*. 1.
- Myconi*. 1.
- nigrum*. 1.
- Osbeckii*.
- phlomooides*.

VERBASCUM :—

- phoeniceum*. 1.
- sinuatum*. 3.
- spinosum*.
- Thapsi*=*seq.*
- thapsoides*.
- Thapsus*. 1.

VERBENA. 35.

- bonariensis*. 1.
- carolina*. 3.
- curassavica*.
- hastata*. 1.
- jamaicensis*. 1. (m. Sol.)
- indica*. 3.
- lappulacea*. 3. (m. Sol.)
- mexicana*. 1.
- nodiflora*. 1. (m. Sol.)
- officinalis*. 1.
- orubica*.
- prismatica*. 1. (m. Sol.)
- spuria*.
- staechadifolia*. 3. (m. Sol.)
- supina*. 1.
- tetrandra*.
- urticifolia*. 1.

VERBESINA. 1021.

- Acmella*=*Spilanthes Acmella*.
- alata*. 1.
- alba*=*Eclipta erecta*.
- asteroides*=*Amellus Lychnitis*.
- biflora*. 3.
- Bosvallea*. Suppl.
- calendulacea*. 1.
- chinensis*. 1.
- fruticosa*. (m. L. f.)
- Lavenia*.
- linifolia*=*Pectis linifolia*.
- mutica*=*Anthemis americana*.
- nodiflora*. 2.
- prostrata*=*Eclipta prostrata*.
- Pseudo-Acmella*=*Spilanthes Pseudo-Acmella*.
- virginica*.

VERONICA. 26.

- acinifolia. 3.
- agrestis. 1.
- alpina. 1.
- Anagallis-aquatica. 1.
(m. Ehrh.)
- aphylla. 3.
- arvensis. 1.
- austriaca. 3.
- Beccabunga. 1. (m.
Ehrh.)
- bellidioides. 3.
- biloba.
- Bonarota = Paedarota
Bonarota.
- Chamaedrys. 1.
- fruticulosa. 3.
- hederaefolia. 1.
- hybrida. 1.
- incana. 1.
- latifolia. 1.
- longifolia. 1.
- marilandica = Polypremum procumbens.
- maritima. 1.
- montana. 2.
- multifida. 3.
- officinalis. 1.
- paniculata. 3.
- pectinata. 3.
- peregrina. 1.
- pilosa = V. Chamaedrys.
- pinnata. 3. (m. L. f.)
- prostrata. 3.
- romana. 1.
- scutellata. 1.
- serpyllifolia. 1.
- sibirica. 3.
- spicata. 1.
- spuria. 1. (m. L. f.)
- Teucrium.
- triphyllous. 1.
- verna. 1.
- virginica. 1.

VIBURNUM. 379.

- acerifolium. 1.
- cassinoides. 3.
- dentatum. 1.
- Lantana. 1.

VIBURNUM :—

- Lentago. 1.
- nudum.
- Opulus. 1.
- var. roseum.
- prunifolium. 1.
- Tinus. 1.

VICIA. 906.

- benghalensis. 1.
- biennis. 1.
- bithynica. 3.
- cassubica. 1.
- Cracca. 1.
- dumetorum. 1.
- Faba. 1.
- hybrida. 1.
- lathyroides. 1.
- lutea. 1.
- narbonensis. 1.
- Nissoliana. 1.
- onobrychioides. 1.
- peregrina. 1.
- pisiformis. 1.
- sativa. 1.
- var. angustifolia.
- var. nigra.
- sepium. 1.
- sylvatica. 1.

VINCA. 299.

- lutea.
- major. 1.
- minor. 1.
- parviflora.
- rosea. 3.

VIOLA. 1052.

- arborescens.
- arborescens.
- biflora. 1.
- calcarata.
- Calceolaria.
- canadensis. 1.
- canina. 3.
- cenisia.
- cornuta.
- diandra.
- enneasperma.
- grandiflora. 3.
- hirta. 1.
- Hybanthus.

VIOLA :—

- Ipecacuanha*.
lanceolata. 1.
mirabilis. 1.
montana. 1.
odorata. 1.
oppositifolia.
palmata. 1.
palustris. 1.
pedata. 1.
pinnata. 1.
primulifolia. 1.
suffruticosa.
tricolor. 1.
uniflora. 1.

VIRECTA. 212.

- virens*. [=biflora,
Linm. f.]

VISCUM. 1166.

- album*. 1.
capense, Suppl. (m. L. f.,
desc. verso a L. patr.)
opuntioides. 3.
purpureum. 3.
rubrum.
terrestre. 1.
verticillatum. 3.

VITEX. 811.

- Agnus-castus*. 1.
Negundo. 1.
pinnata. 1.
trifolia. 1.

VITIS. 281.

- arborea*. 1.
corinthiaca. MS.
heptaphylla.
indica. 3.
Labrusca. 1.
laciniosa. 1.
trifolia.
vinifera. 1.
— var. *apyrena*.
vulpina. 1.

VOLKAMERIA. 809.

- aculeata*. 1.
inermis. 1.
scandens. (m. L. f.)
serrata.

VOLVOX. —

- globator*.

WACHENDORFIA. 64.

- hirsuta*.
paniculata.
thyrsiflora.
umbellata.
villosa = *Gladiolus*
plicatus?

WALTHERIA. 852.

- americana*. 3.
angustifolia.
indica. 1.

WEINMANNIA. 508.

- pinnata*. 3. (m. L. f.)

WILLICHIA. —

- repens*.

WINTERA. 696. (manu
Smithii). Cf. DRIMYS
[Forst.] m. L. patris.

WINTERANIA. 618.

- Canella*. 3.

WITSENIA [Thunb.]. 57.

- maura* (pl.).

XANTHIUM. 1113.

- fruticosum*. Suppl.
orientale. 3.
spinosum. 1.
strumarium. 1.

XERANTHEMUM. 990.

- annuum*. 3.
— var. *inapertum*.
— var. *orientale*.
canescens.
ciliatum.
crucifolium.
imbricatum.
paniculatum. (m. L. f.)
proliferum.
recurvatum. Suppl.
retortum. 1.
sesamoides. 3.
speciosissimum.
spinosum.

XERANTHEMUM :—

- Stachelina*. 3.
variegatum. (m. l. f.)
vestitum. 1.
virgatum.

XIMENIA. 491.

- ægyptiaca*.
americana (pl. ?).
inermis.

XYLOPHYLLA. —

- latifolia* = *Phyllanthus*
epiphyllanthus.
longifolia.

XYLOPIA. 1077.

- glabra*.
muricata. 3.

XYLOPICRUM. —

- muricata*. (m. Sol.) =
Xylopiæ muricata.

XYRIS. 67.

- indica*. 1.

YUCCA. 441.

- aloifolia*.
Draconis; cf. *aloifolia*,
Dracaena Draco.
filamentosa.
Gloriosa. 3.

ZAMIA. —

- pumila*.

ZANNICHELLIA. 1085.

- palustris*. 1.

ZANONIA. 1179.

- indica* (pl.).

ZANTHOXYLUM. 1171.

- Clava-Herculis*. 1. (m.
 Sol.)

ZANTHOXYLUM :—

- trifoliatum*. 1.

ZEA. 1096.

- Mays*. 1.

ZINNIA. 1019.

- multiflora*. 3.
pauciflora. 3.
peruviana.

ZIZANIA. 1119.

- aquatica*. 1.
palustris.
terrestris.

ZIZIPHORA. 39.

- acinoides*. 1.
capitata. 1.
hispanica. 3.
tenuior. 1.

ZOËGEA. 1028.

- capensis*. Suppl.
Leptanrea. 3.

ZOSTERA. 1083.

- marina*. 1.
oceanica.

ZYGOPHYLLUM. 544.

- æstuans*.
album. 3.
arborescens [Jacq.].
coccineum.
Fabago. 1.
fulvum.
microphyllum. Suppl.
Morgsana. 1.
Nitraria = *Nitraria*
Schoberi ?
sessilifolium. 3.
simplex.
spinosum.

OCTOBER 1912.]

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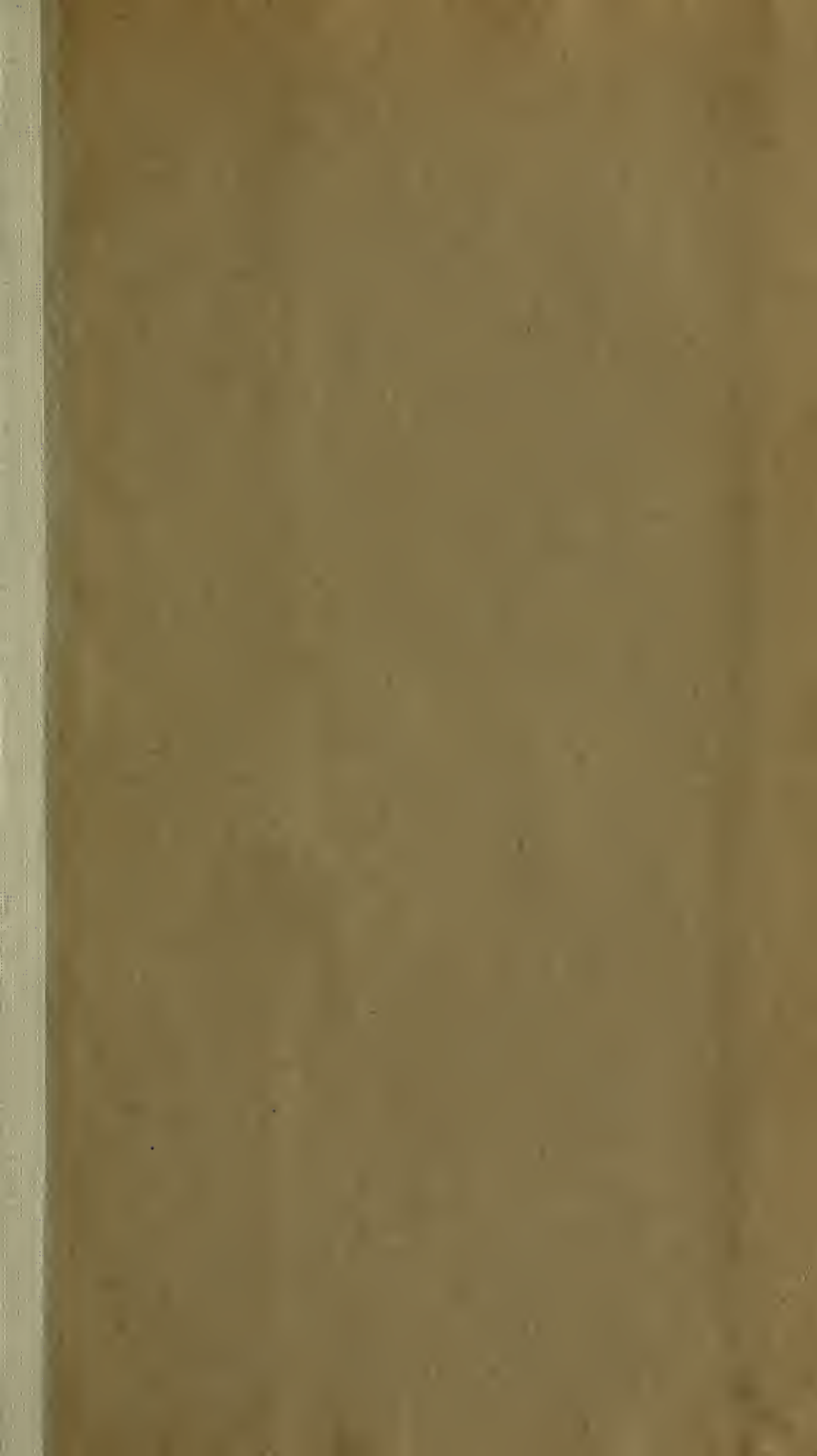
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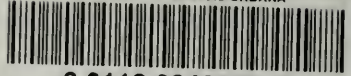
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