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LINNEAN SOCIETY OF LONDON.

ANNIVERSARY MEETING, TUESDAY, MAY 24TH, 1881.

Prof. ALLMAN, LL.D., F.R.S., President, in the Chair.—There was a numerous attendance of the Fellows.—The Treasurer presented his Annual Account, see page 3 of wrapper.—Afterwards the Secretary (Mr. B. Daydon Jackson) read his Report. Since the last Anniversary 11 Fellows of the Society had died and 4 had withdrawn. Against this 37 new Fellows had been elected, besides 1 Foreign Member and 1 Associate. During the past year there had been received as Donations to the Library 106 volumes and 125 pamphlets and separate memoirs. From Scientific Societies in exchange there had been received 96 volumes and 248 detached parts of publications, besides 23 vols. of Donations from Editors of independent periodicals. Some 90 vols. had been purchased, viz. 80 separate and 63 serials equal to 10 vols. The total additions to the Library being 315 vols. and 373 separate parts. Framed water-colour sketches of Dr. Rob. Brown's birthplace, his London residence, and of Sir Joseph Banks's Library had been presented by Mr. R. Kippist. The Society's Collections and Herbaria had been duly examined and reported on to the Council as in good condition. After 50 years' service Mr. Kippist had resigned his position as Librarian to the Society, and the Council, in acknowledgment thereof, had granted him a retiring pension.—Thereafter presentation of portraits of the late Mr. John Miers and of Prof. St. George Mivart were made.—Prof. Allman then delivered his Anniversary Address, "Recent Advances in our Knowledge of the Development of the Ctenophora."—The Secretary afterwards read Obituary Notices of the several Fellows, making special mention of Mr. E. R. Alston (late Zool. Secretary), Mr. John Gould (Ornithologist), Mr. Gerrard Krefft (of Sydney), Dr. Lauder Lindsay, and R. A. Pryor, of Herts.—The Scrutineers having examined the ballot, then reported that Mr. A. W. Bennett, Mr. F. Darwin, Prof. E. R. Lankester, Sir J. Lubbock, and Mr. G. J. Romanes had been elected into the Council in the room of E. R. Alston (deceased), Dr. T. Boycott, Prof. M. Foster, Dr. J. G. Jeffreys, and Prof. Mivart, who retired; and for Officers, Sir J. Lubbock as President, F. Currey as Treasurer, B. D. Jackson and G. J. Romanes as Secretaries.

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On Central-African Plants collected by Major Serpa Pinto.
By Prof. Count FICALHO and W. P. HIERN, M.A., F.L.S.

[Abstract, read June 16, 1881.]

THE specimens herein discussed were collected by Major Serpa Pinto, during the month of August 1878, along the upper course of the river Ninda, an affluent of the Zambesi, on the west side of the high plateau. As regards the climate of this locality, the temperature is described as variable, the weather as very dry during seven or eight months of the year, and very wet during two or three months. The nature of the soil is metamorphic argillaceous schist; the latitude is $14^{\circ} 46' S.$, the longitude $20^{\circ} 56' E.$, and the elevation 1143 metres above the ocean.

The present little collection consists of seventy-two numbers, comprising sixty-five species in thirty-nine genera; more than a quarter of these species are new or not previously described and published, and at least one new genus appears amongst them. Some of the specimens are imperfect and have been difficult of final determination, especially the grasses and sedges; the greater part have had their approximate position ascertained; five specimens are hopelessly defective, and accordingly have been excluded from the examination.

As in the case of the previously known species, the affinities of many of those of the present collection are not only with the flora of Huilla, in South Angola, but also, in several instances, with that of extratropical South Africa; only a few of the species are widely distributed in the tropics of this and other continents.

This paper, with illustrations, will appear in full in the Society's 'Transactions.'

Notes on Gramineæ. By GEORGE BENTHAM, F.R.S.

[Read November 3, 1881.]

GRAMINEÆ, so long believed to be the largest Order amongst Monocotyledons, must now yield the palm to Orchideæ in respect of number of species; but they must still be acknowledged as immensely predominant, as well in individual numbers as in the part they take in the vegetation of the globe. The great majority of Orchideæ are very local, and amongst the few that are spread over wider areas it is frequently only in a few individuals dotted here and there; whilst a considerable proportion of Gramineæ are almost cosmopolitan in their geographical distribution within or without the tropics, often covering the ground with innumerable individuals. Orchideæ are difficult to preserve; collectors bring home but few specimens from their chief stations in tropical lands, and those few often imperfect. Their study is therefore surrounded by many impediments, and, with the exception of the few European ones, is in the hands of very few botanists; whilst Grasses, easily dried, abound in herbaria in specimens readily exhibiting their most essential characters; and every local botanist considers himself perfectly competent to describe as new species or genera suggested only by comparison with the few forms known to him from the same limited locality. The consequence is that amongst the large number of new species of Orchideæ described of late years the great majority (always excepting garden hybrids or varieties) appear to be really distinct; whilst the number of bad species and genera of Gramineæ with which science has been overwhelmed is truly appalling. Looking to the future, it is only probable that the preponderance in number of species of Orchideæ over Gramineæ is likely to be greatly increased as well by new discoveries among the former, as by a critical revision of old species of the latter. On the other hand, although the interest in Orchideæ has been so much intensified of late years, as well by the extent to which they are cultivated as by the singularities observed in their fertilizing-apparatus, yet their importance in the study of the history and development of vegetation, and in their application to the uses of man, remains as nothing compared to that of Gramineæ.

This paramount importance of the latter Order in an economical point of view has called forth innumerable treatises, memoirs, and essays on cereals, on forage and other cultivated grasses, on

meadows and pastures, on ornamental grasses, on the physiology and properties of the Order, &c., to which I need not further allude, my present object being merely to consider Gramineæ with reference to their classification and affinities. In a systematic point of view, the great mistake of Linnæus and the earlier systematists was the attempt to regard the whole spikelet as a single flower, with a calyx and corolla to be compared with those of the more perfect Monocotyledons. Robert Brown, with his usual sagacity, pointed out this and other errors, and first laid down the true principles upon which the Order could best be divided into tribes and genera; but he unfortunately took up the idea that the so-called lower and upper paleæ represented three outer segments of a perianth; and although this theory has long since been proved to be groundless, especially by Hugo Mohl, whose views have been fully confirmed by all subsequent careful observers, yet so great is the authority so deservedly attached to every thing that has issued from the pen of Brown, that his explanation of the structure of the spikelet is still allowed to influence the terminology adopted in generic and specific descriptions.

Shortly after the publication of Brown's 'Prodrômus,' Gramineæ were taken up by several French botanists who had acquired materials, rich for the time, chiefly from North America and the West Indies. Some of these had already been published by Michaux or by Persoon, with more or less of assistance from Louis Claude Richard, to whom the credit of all that is good in Persoon's 'Synopsis' as well as in Michaux's 'Flora' has been attributed by several subsequent writers. The greatest value is justly attached to all of the elder Richard's observations in every Order that he worked up; and there is no doubt that such assistance as he gave to those two works added much to their importance; but we know that he declined to attach his name to Persoon's *Synopsis*, chiefly from an unwillingness to sanction the arrangement under the Linnean system, and we are by no means assured that there may not have been other details in both works which he did not concur in. We therefore are not justified in fixing on him a responsibility which he refused to undertake; and the genera and species first published by Michaux or by Persoon should be quoted as theirs and not Richard's, except where Richard's name is expressly attached to them. Michaux's 'Flora' was published in 1803, the first volume of Persoon's 'Synopsis' in 1805, both of them therefore antecedent to Brown; but two

other special agrostologists, Desvaux and Palisot de Beauvois, had ample time to avail themselves of Brown's work. Desvaux published his new genera in a memoir which first appeared in abstract in the 'Nouveau Bulletin de la Société Philomathique' for 1810, and afterwards in full in the first volume of his second 'Journal de Botanique' in 1813. Between these two periods Palisot de Beauvois published his 'Agrostographie,' in which he undertook a general arrangement of the whole Order, with definitions as well of the old-established genera as of a large number of new ones, including those of his contemporary Desvaux. The majority of these genera have since been adopted; but his arrangement of them was far too technical and his characters often so vague, that they could in most instances scarcely have been identified, were it not for the names of the species which he refers to them and for the really good analytical drawings accompanying his work. As it is, several of his names have been misapplied by subsequent botanists, who have not paid sufficient attention to, or have not seen, those drawings.

A few years later, three eminent botanists undertook the general study of Gramineæ. Kunth at Paris and afterwards at Berlin, Trinius in Germany and afterwards at St. Petersburg, and Nees von Esenbeck at Bonn, afterwards at Breslau, worked more or less contemporaneously, but with little or no communication with each other. Kunth's 'Revisio Graminum,' published in 1829 and following years, is a work not only splendidly illustrated, but remarkable alike for the accuracy of detail in the descriptions of species, as for several of the views given of their structure and arrangement. This work, however, is so costly as to be accessible to few botanists, and the more generally known first two volumes of his 'Enumeratio Plantarum,' containing the Grasses, were unfortunately a far too hasty compilation. He had entered into an agreement with old Cotta for the preparation of a compact Synopsis Plantarum on the plan of Persoon's, and had received a considerable sum of money on account of the work; but when it came to the actual drawing it up, Cotta insisted upon its being arranged according to the Linnæan system, which Kunth would no more agree to than did the elder Richard in the case of Persoon. The Synopsis or Enumeratio was therefore still in abeyance when old Cotta died; and his successors, not caring for the special plan adopted, insisted on an immediate return for the money advanced; and I several times heard Kunth himself much

bewail the necessity he was under of getting up these volumes without the care and study he could have wished to bestow on them, and which he did apply to his next volume on Cyperaceæ. Kunth also in all his works fully adopted Brown's theory as to the homology of the parts of the spikelet, carrying it out in detail to a degree which sometimes amounts almost to a *reductio ad absurdum*; as, for instance, in *Piptatherum* and *Milium*, two genera so closely connected in structure that they are still regarded by many experienced botanists as slightly different sections of one genus. In both genera we see the whole spikelet consist of two similar outer glumes without the slightest rudiment of a flower in their axis, and of a third glume enclosing a flower and its palea; and yet we are told that whilst in *Piptatherum* we have two glumes and one flower, we must in *Milium* consider them as one glume and two flowers.

Trinius published his 'Fundamenta Agrostographiæ' in 1820, something on the plan of Beauvois's 'Agrostographie,' but evidently founded on insufficient materials and bibliographical resources, and with some neglect of the already well-established rules of nomenclature. From that time, however, he devoted himself with the greatest zeal and increasing success to the study of the Order. I heard him say, *à propos* of some rather costly collection of specimens, that he would willingly sell his last coat for a new grass; and all his later works, down to his last papers worked up in conjunction with Ruprecht, and published in the Memoirs of the Petersburg Academy, are of the greatest value to agrostologists, though he never followed them up by any general synoptical view of the Order. In respect of terminology, he so far modified that of Kunth, that where a glume is theoretically supposed to have a flower in its axil, but really has not even the slightest rudiment, he does not, like Kunth, call it a whole (neutral) flower, but only half a flower.

Nees von Esenbeck never confined himself so exclusively to Gramineæ as did Trinius; he never published any general conspectus of the Order, and entered but little into general considerations of their structure and terminology; but he described with great care the grasses of various tropical and other extra-European regions; he had ample materials placed at his disposal, from the collections of Martius, Drège, Preiss, and other German travellers, and from the herbaria of Hooker, Arnott, and Lindley in this country, and he came to be regarded as the great autho-

rity for the determination of exotic Gramineæ. His 'Agrostographia Brasiliensis' is perhaps the best of all his works; and his Gramineæ for the 'Flora Africæ australis' is also very good. His generic and subgeneric groups appear to me to be often better, or at least more natural, than those of Kunth or Trinius; although they show in some degree that tendency to multiply genera as well as species, which he afterwards carried to so great an extent in Cyperaceæ, Laurineæ, and Acanthaceæ. Moreover, he worked up the grasses of each country separately, without paying sufficient attention to the cosmopolitan nature of so many species, which thus appear under different names in his different works. Brown's Australian *Panicum semialatum*, for instance, is raised by Nees to the rank of a genus under the name of *Cori-dochloa* in India, and that of *Bluffia* in South Africa, without any attempt at a comparison of the three plants.

The last general Enumeration of Gramineæ was that of Steudel, who published in 1855 the first volume of his 'Synopsis Plantarum Glumacearum,' the worst production of its kind I have ever met with. He was an excellent mechanical compiler; his 'Nomenclator Botanicus' was a most useful work; and if in the Grasses he had confined himself to collecting all the published species with references to or copies of their author's characters or descriptions, he would have rendered good service to the students of the Order; but beyond that, as he was no botanist, he was thoroughly incompetent for the task he had undertaken. Whenever he met with a grass which he could not readily make out, he set it down as new, with a new name, and a character so carelessly drawn up as to render its identification hopeless without recourse to the specimens themselves. Several of his new genera are well-known species repeated in the 'Synopsis' under their published names without recognition. A few, indeed, may have to be retained; but others, again, are founded upon the grossest errors, as, for instance, where he describes as a caryopsis the larva which had eaten up the ovary and taken its place in the enlarged pericarp. Having, moreover, no idea of methodical arrangement, his work is a perfect chaos.

Much has been done, however, for the elucidation of the Order in local Floras. Already at the close of last century and the commencement of the present one, several continental botanists proposed new genera for anomalous European grasses; but these were published in works which entered but little into general cir-

culation, and were overlooked by Beauvois, Persoon, Willdenow, and other general systematists. Several of the same genera have since been reestablished, but under other names which have now been so long and so universally adopted, that they must be considered as having acquired a right of prescription to overrule the strict laws of priority. It would indeed be mere pedantry, highly inconvenient to botanists, and so far detrimental to science, now to substitute *Blumenbachia* for *Sorghum*, *Fibichia* for *Cynodon*, *Santia* for *Polypogon*, or *Singlingia* for *Triodia*. Since the days of Kunth, Trinius, and Nees, the most important local revisions of Gramineæ are: Andersson's 'Gramineæ Scandinaviæ,' Parlatore's first volume of his 'Flora Italiana,' Cosson and Durieu's Glumaceous volume of the great unfinished 'Flore d'Algérie,' Doell's Gramineæ for the great Brazilian Flora founded by Martius, and Fournier's Gramineæ for the Mexican Flora he has undertaken; besides more partial revisions by Grisebach in his 'Spicilegium Floræ Rumelicæ et Bithynicæ,' in the fourth volume of Ledebour's 'Flora Rossica,' and in various contributions to the Floras of extratropical South America, the West Indies, the Himalayas, &c., and by Emile Desvieux in Claude Gay's 'Chilian Flora,' supplemented by new genera and species published by Philippi in various papers on Chilian plants. Andersson was a most acute observer, and had studied well the northern grasses of the old world; but from want of access to a sufficiently extensive library, his synonyms, especially when treating of extra-Scandinavian species, are often very inaccurate. Parlatore's detailed monograph of Italian grasses is thoroughly to be relied upon when the result of his own observations; but unfortunately neither he nor Andersson sufficiently distinguished the characters they had taken from other works from those they had themselves verified. Old errors, for instance, in the descriptions of the style or of the ripe fruit, which it is often very difficult to ascertain from dried specimens, have been in several instances repeated by both authors, sometimes in identical terms. Both of them also, especially Andersson, show a great tendency to the multiplication of genera and species. Cosson and Durieu's 'Monograph of Algerian Grasses,' comprising the chief portion of those of the rich West-Mediterranean Flora, is a most valuable treatise, both for methodical arrangement and specific distinctions. Grisebach has also done much for the elucidation of oriental Gramineæ. In Doell's work I have been disappointed. In many

instances I cannot approve of his distinctions or combinations of genera or species. That may, however, be a matter of opinion only; but in regard to several of the exceptional characters he gives, such as the five lodicules of *Pariana* or the three of *Aristida*, they have not been verified on reexamination; in his specific names he has not unfrequently departed from the established rules of nomenclature without giving any special reasons for so doing; and there is a general carelessness in redaction showing, for instance, on several occasions that when he had found reason to modify his first ideas as to the limits of species, he had neglected to revise his manuscript accordingly. He also makes frequent use of the expression "partis nomine," the meaning of which neither Munro nor myself, nor any of our classical friends to whom we have applied, can make out. Eugène Fournier's 'Enumeration of Mexican Gramineæ' is not yet published; but being already printed off, and M. Fournier having obligingly supplied me with a copy, I feel bound, in so far as I am concerned, to treat it as having already taken date. He has had at his disposal rich collections of the grasses of a country where they are perhaps more local and varied even than in South Africa; and he has made good use of these materials, although there is still much to be learnt with regard to Mexican forms. We have at Kew several, not only species but genera, which are not included in his work; and there are not a few of his which I cannot recognize in our generally rich Kew collections. A further comparison is also required with extra-Mexican genera and species, and especially with those of extratropical South America. His genus *Lesourdia*, for instance, had already been published for a southern species by Philippi under the name of *Scleropogon*. His *Trichloris* is represented in the south by two species separately recognized by Munro and by Jean Gay as constituting a distinct genus, but under names hitherto unpublished, which must therefore give way to Fournier's. In a systematic point of view also his work would have been much more useful if he had more frequently given the characters of the tribes, genera, or other groups which he has modified, instead of limiting himself to dichotomous keys. These dichotomous keys, when carefully drawn up, are of the greatest use as guides or indexes to direct the botanist where to look for his plant, but are wholly insufficient for its identification either generic or specific. For above sixty years I have had great experience both in using and in making them. It was with the

aid of the admirable "Analyses" in DeCandolle's 'Flore Française' that I was enabled in 1817 and 1818 to learn botany without any extraneous teaching; their principle was developed in the 'Essay on Nomenclature and Classification' which I published in 1823 as a French edition of Jeremy Bentham's 'Chrestomathia,' and I have introduced them more or less into all my local floras. I am thus well aware of the great difficulties in the way of drawing them up satisfactorily, requiring much testing before their final revision. They are chiefly useful where all, or nearly all, the plants of a country or of a group are well known; and even then they frequently require the repetition of the same plant under different branches of the key. The best genera and other groups are usually distinguished by a combination of characters, to each one of which there may be occasional exceptions, and these cannot be provided for in any key that presupposes limits definitely marked out by single characters. As a result, there are some of Fournier's groups which are evidently good, but to which we have no clue but that supplied by the species he includes in each. The two genera or subgenera, for instance, into which he divides *Bouteloua*, Lag. (*Eutriana*, Trin.), are natural and well limited; but the only character he gives, the prolongation of the rhachis of the spike beyond the last spikelet in the one and not in the other, is in fact variable in both groups. Of others, again, I can form no idea of the limits he proposes to assign them. In *Uniola*, for instance, he admits species (unknown to me) which do not appear from his description to have what we have been accustomed to consider as an essential character of the genus, the four to six empty glumes at the base of the spikelet. Where, therefore, I feel obliged to differ from him in the genus to which I would refer a species, it may as often be from the inability to ascertain what are his views as to the limits of a genus, as from that difference of opinion which so frequently prevails amongst the best of botanists.

In recent days, however, we had all been led to look up to my much lamented friend the late General Munro as the one who was to unravel the intricate web into which the order had become involved. His 'Monograph of Bambuseæ' and various detached papers and communications were instalments of great promise; he was known to have a thorough acquaintance with species, and to have already formed a well-digested framework for genera and tribes, an important sample of which he had given in the second

edition of Harvey's 'Genera of South-African Plants.' He had also amassed an immense number of notes on synonyms he had verified, on points of structure he had ascertained, &c., as materials for the general work he was preparing for DeCandolle's Monographs. His death has extinguished all such hopes as we had entertained; and although his notes, mostly dispersed in his herbarium or in the gramineous books of his library, are now left at our disposal at Kew, yet he had unfortunately not committed to paper his ideas on the limits and distinctive characters of tribes, genera, and subgenera not included in the South-African Flora; and these I could only gather from his conversation and correspondence. My own preparation for the work I have now undertaken was chiefly the study of European grasses for my 'Handbook of the British Flora,' and of Old-World Gramineæ generally for the 'Flora Hongkongensis' and 'Flora Australiensis,' when I was in constant correspondence relating to them with General Munro. Having now had to work also upon American forms and to examine with more detail the South-European, Oriental, and African ones, I have had to modify in some respects the views I had expressed as to the relative importance and constancy of some of the characters, and partially to rearrange some of the tribes and subtribes, although the general principles of classification which had been suggested by General Munro have only been confirmed by further experience.

I have already, in my paper on the classification of Monocotyledons (Journ. Linn. Soc. (Bot.) xv. p. 513), entered so fully into my reasons for adopting as to Gramineæ a terminology in accordance with the observations of Mohl and in harmony with that followed as to Cyperaceæ, that I need not repeat them on the present occasion. I would only add a few words in further reply to the objection repeatedly made to me that the falling off together of the flowering glume and palea (commonly called the two paleæ) enclosing the fruit, is a strong evidence of their being really homologous. But this is a mistake. A careful observation will show that they never do both together fall away from the rhachilla or axis of the spikelet; it is the rhachilla itself that breaks up, a portion of which always remains attached to the glume and palea and keeps them together round the fruit. In most Panicaceæ, especially in Andropogoneæ, the whole spikelet with the empty glumes as well as the flowering one falls off with the fruit. In the majority of Poaceæ the disarticulation takes place between each two

flowering glumes, leaving the intervening portion either attached to the glume next above it, when it is usually described as a callus proceeding from the glume, or to the glume next below it, when it is often half concealed between the keels of the palea and taken no notice of; or if it be a continuation of the rhachilla above the last glume, it is often termed a neuter or abortive flower. The cases where the flowering glume really detaches itself ultimately from the inarticulate and persistent rhachilla are very few, chiefly in several species of *Eragrostis*, where the glume and caryopsis fall away, leaving the palea and floral axis persistent on the rhachilla. In some cases the apparently terminal fruiting glume enclosing the palea and caryopsis falls away without any perceptible portion of the rhachilla above or below it; but that arises from the disarticulation taking place so close under it that the fragment carried off is only that minute portion actually embraced by the base of the glume.

The homology of the glumes of Gramineæ, whether empty or flowering, with those of Cyperaceæ may now be considered as generally admitted; and a total absence of perianth in the former order might not be regarded as improbable when we have traced in Cyperaceæ its gradual reduction from the regular hexamerous perianth of *Oreobolus* to its absolute deficiency in *Cyperus* and others. But we have in Gramineæ a new element on the floral axis below the stamens and pistil or actual flower, in the *palea* and *lodicules*, for which we cannot at once find any parallel in other orders, and which have been very variously accounted for. They have very recently been the subject of a very able paper in Engler's 'Botanische Jahrbücher' (i. p. 336) by Professor Hackel of Vienna. He comes to the conclusion that the palea and the pair of lodicules (when two only) are each of them single, more or less bifid, organs, and that they and the third lodicule, when present, must be regarded as two or three bracteoles inserted alternately fore and aft on the floral axis below the flower. And he has made out a good case in favour of his view, but perhaps not an unanswerable one. The first objection that strikes one is that the difficulty of finding any homologues in other orders is by no means diminished. In other orders where bracteoles do exist below the flower, they are usually lateral with reference to the main axis, not fore and aft, never more than two, unless when representing a continuation, as it were, of the sepals, and never developed, to my knowledge, when the perianth is suppressed;

the bracts performing the functions of the deficient perianth are always, I believe, on the main axis, like the glumes of Gramineæ. Then, again, the perfect union of the two lobes of the palea or of the two lodicules, or even the occasional development of a single central nerve or central lobe, is no absolute proof that they are not in fact double organs; for where the segments of a perianth are united in a tube or cup, the lateral nerves of two adjoining segments (sepals or petals) often coalesce into a single one which may protrude at the top into an intermediate tooth or lobe. Hackel has well shown that the unity or duplicity is the same in the case of the palea and of the two lodicules; but it is only conjecturally that he continues the parallel through the third lodicule, which, when present, never shows any tendency to division, and whose insertion is not perceptibly higher up than that of the two others. It is quite true that it is often much smaller than the other two, sometimes very minute; but in several species of *Stipa*, in the majority of Bambuseæ &c., I have seen the three quite equal and perfectly similar. The only instances I know of more than three lodicules are those of *Ochlandra*, where they are exceedingly irregular, and of *Reynaudia*, where I find four in two pairs, as described and figured by Kunth; but then the outer pair, although closely contiguous (on the opposite side of the floral axis) to the upper ones, appear to me to represent the palea which is otherwise deficient. The minute bodies above the lodicules in the female flowers of *Pariana*, which Doell mistook for additional lodicules, appear to me to be rudimentary staminodia; they are very minute and irregular, and not always to be found.

I have observed that the search for homologues to the palea and lodicules in the Orders nearly allied to Gramineæ has met with but little success. The only representation of the palea that I can find is that mentioned in my above-quoted paper (Journ. Linn. Soc. (Bot.) xv. p. 516), where it is compared with the hypogynous scales of *Hypolytrum pungens* and *Platylepis*; and I find that in some species of *Eriocaulon* (Flora Australiensis, vii. p. 190) the perianth is composed of two outer segments inserted near the base of the floral axis and two or three inner ones close under the andræcium, or these inner ones occasionally deficient, the arrangement passing gradually through other species to the normal two contiguous series of two or three each. It might therefore be suggested that the palea and lodicules of Gramineæ represent perianth-segments of an outer and inner series, although I by no

means pretend to assert it as a proved fact. If the suggestion be confirmed, we might be justified in designating as a neutral flower that in which the palea alone, or the palea and lodicules without stamens or pistil, are developed; but we must not include in the flower the bract or glume which subtends it.

In all cases the palea, whatever its origin, is called upon in conjunction with the subtending glume to perform more or less of the functions of the deficient or absent perianth, and thus acquires a certain fixity of character, and requires mention in all full generic characters. The lodicules, on the other hand, are generally rudimentary representatives of suppressed organs having lost all functional powers, and their slight variations in form or consistency are generally not even of specific importance, and they only require mention in generic characters in the few cases where they have retained a greater and more constant development.

There is much of interest in the question of the geographical distribution of Grasses as compared with that of Orchideæ, and in the consideration of the causes which have produced the differences observed in the two Orders, amongst which perhaps the very different agencies through which cross-fertilization is effected may be most influential; these questions may have also more or less bearing on tribal and generic arrangement; and there are numerous observations which I should have been desirous of recording. This, however, would lead to speculations which it would not be safe to indulge in without a far more detailed and closer study of ascertained facts than I have time to carry out; and I feel obliged to confine myself on the present occasion to the purely systematic consideration of real or supposed affinities and diversities.

The division of the Order into tribes and subtribes is a matter of exceptional difficulty. Whatever tribes have been proposed, whatever characters have been assigned to them, there have always been more or less ambiguous forms uniting them and preventing the restricting them within absolutely definite limits. We are obliged in Gramineæ, more perhaps than in any other Order, to rely upon combinations of characters, allowing for occasional exceptions in every one of our groups, preferring those which experience has shown to present the fewest aberrations. Following up these views, none of the general divisions of the Order hitherto proposed have proved to be more natural or more definite than Brown's original primary one into two great groups or suborders—*Panicaceæ*, in which the tendency to

imperfection is in the lower flowers of the spikelet ; and *Poaceæ*, in which the tendency is in the opposite direction. This indication of the principle kept in view is too indefinite to serve as a practical character; but, combining it with that proposed by Munro of the articulation in the axis of the spikelet being below the spikelet itself (in the pedicel) in *Panicaceæ*, and above the lowest glume or none in *Poaceæ*, the exceptional forms are reduced to the lowest possible figure. This primary division, although tacitly approved of by many partial agrostologists, has not been generally adopted in systematic works, and many attempts have been made to divide the Order according to more positive characters, but as yet with but little success.

Kunth entirely gave up Brown's primary groups and divided the Order into thirteen tribes, many of which were natural, fairly defined by a combination of characters, and have been very generally adopted. Others have been objected to on various grounds. He attached too much importance to such characters as the separation of the sexes or the increase in the number of stamens, which are exceptional in different groups rather than tribal distinctions ; in the general arrangement, his removal of the *Andropogoneæ* to a distance from the *Panicææ* is disapproved of ; and his describing flowers as actually existing when only theoretically imagined is sometimes misleading. Nees generally adopted Kunth's tribes, but improved the circumscription of some of them, and added two or three small ones. Trinius never completed his revised arrangement of the Order. Since the time, however, of these great agrostologists, systems have been sketched out which require a few words of notice.

Fries, followed by Andersson, proposed for a primary division of *Gramineæ* that into *Clisanthææ*, with the flower (*i. e.* the flowering glume and palea) closed and the elongated styles protruding at the apex, and *Euryanthææ*, with the glume and palea open at the time of flowering and the short styles protruding laterally. This division is, however, practically useless, except perhaps for the limited number of species that can be observed in a living state. The flowers of most species open only for a very short time, and in dried specimens are almost always closed. The styles, again, are in many cases so exceedingly slender and fugacious as to be very difficult to observe in dried specimens, except in the bud, when they have not yet attained their full development, or after fertilization, when they are withering away.

The long styles, moreover, would place the majority of the sub-tribe *Sesleriæ*, for instance, among *Panicææ*, when all their other characters are those of *Poacææ*; and the species are very numerous in which, from the intermediate length of the styles, or from both the lower smooth part and the stigmatic portion, or the lower part alone, being described as styles, they are differently characterized as long or short by different writers.

Fournier rejects both Brown's and Fries's primary divisions, but proposes a new one founded on the position of the lowest glume of the spikelet, next to the main axis in *Chloridææ* and *Hordeacææ*, and averted from it or external in other tribes. But, in the first place, this relative position cannot well be ascertained in loosely paniculate *Graminææ*, where there is so frequently a slight, almost imperceptible torsion of the pedicel, and, in the next place, in one-flowered spikelets it is often uncertain which is to be regarded as the lowest glume. The total number of glumes in the tribe *Panicææ*, for instance, is variable, according to the genus or section, two, three, or four; the lowest in *Reimaria*, and in a few species of *Paspalum*, corresponds to the second in the majority of *Paspala* and a few allied genera, and to the third in *Panicum*. All these genera are included by Fournier, as by all others, in one and the same tribe; and if so, are we to regard as the outer glume the small outer one of *Panicum*, called by some an extra bract, and an imaginary one in *Paspalum* and its allies, or the outer one of *Paspalum*, which is second in *Panicum*? Again, in one and the same genus, the relative position of the outer glume and the main axis is not always constant, as, for instance, in *Paspalum*, in Nees's section *Digitariæ* (*Emprosthion*, Doell, *Anastrophus*, Schlecht.), the outer glume and the flowering one above it are external, whilst in the majority of the genus they are turned towards the central rib of the main axis, and yet the two groups are not distinguished by Fournier even as sections.

Another character much insisted on of late years for tribal distinction is still more uncertain, the adherence of the ripe grain or caryopsis to the palea, as in *Festuca*, *Bromus*, &c. This is usually very conspicuous in the dry state, although even then the grain is often only closely embraced by the palea, and when moistened the adherence very generally disappears. The union of the two is perhaps never truly organic, and in hot water I have always found them readily separable without any tearing.

The consequence is that there are a considerable number of species in which the grain has been described by some as adherent and by others as free, and which have consequently been transferred from one genus to another. Yet, if not taken too absolutely, the character is sometimes a useful one, assisting, for instance, in the arrangement of the genera of some of the subtribes of the difficult tribe Festuceæ.

Considerable importance was attached by the earlier agrostologists to the presence or absence of the awn on the back or apex of the flowering glume; but this has subsequently been found to be subject to great variations. The spiral twist, however, in the lower part of the awn in some genera is more constant, and in the 'Flora Australiensis' I had taken it as an essential character of some tribes or subtribes; but there are more exceptions than I was then aware of. The awn, when present, is generally twisted in Andropogoneæ, Tristegineæ, Agrostideæ, and Avenaceæ, and not in Paniceæ, Chlorideæ, Festuceæ, or Hordeæ; but it is sometimes very slightly so in a few species of the latter group, and in the former tribes, where the awn is much reduced, if there be any twist it is scarcely perceptible. In all the tribes, also, the awn is occasionally, and in the straight-awned ones frequently, altogether deficient; and in some genera, as in *Stipa* for instance, where it is usually twisted, there are exceptional species in which it is straight or curved only. The character must therefore generally be used with more or less of reservation.

The partial or absolute separation of the sexes or the increase in the number of stamens observed in a few genera have been occasionally introduced amongst tribal characters; but further observation has shown that they occur amongst Gramineæ of very different affinities, and have thus proved to be often of no more than generic value, although in one tribe, the Maydeæ, the absolute unisexuality of the spikelets may be constant.

Differences in the size of the embryo, in the form of the so-called scutellum on the caryopsis (indicative, apparently, of the hilum of the seed), or in the longitudinal groove or cavity frequently observable on the caryopsis, have been sometimes brought forward as absolute generic, if not tribal, characters, and they may often be really important; but we know, as yet, too little about them to test their value fairly. Herbarium specimens rarely supply ripe fruits, and they have been carefully observed

and accurately described in comparatively few species. The characters thus ascertained in a single one have been supposed to belong necessarily to the whole genus; and when differences have afterwards been found in some other species, it has at once been generically separated, without ascertaining whether these differences might not be reconciled or connected through other species. Before, therefore, we can ascertain the real generic value of characters which cannot be tested in herbarium specimens, it is necessary that we should have them well and authentically described in a much greater number of species from actual observation. I have on several occasions had reason to believe that, in long-detailed descriptions drawn up by accurate botanists from dried specimens, the seminal characters have been rather guessed at on theoretical grounds, than actually verified on really ripe seeds.

Following out the views of General Munro as to the general arrangement of the Order in as far as I have been able to ascertain them, we have divided it into tribes and subtribes, of which the following are the most prominent characters, omitting for the present exceptional forms, which occur in almost all of them:—

A. **PANICACEÆ.** Spiculæ cum pedicello infra glumas articulatae, flore fertili unico terminali, addito interdum inferiore masculino v. sterili.

Tribus i. **Panicææ.** Spiculæ hermaphroditæ, rarius abortu unisexuales, spicatae v. paniculatae, rhachi inflorescentiæ inarticulata. Gluma florens exaristata, fructifera indurata v. saltem exterioribus rigidior.

Tribus ii. **Maydeæ.** Spiculæ unisexuales, masculæ terminales spicatae v. paniculatae v. (in *Pariana*) fœmineam circumdantes, fœmineæ inferiores spicatae, cum rhacheos internodio (excepta *Zea*) articulatum secedentes.

Tribus iii. **Oryzæ.** Spiculæ hermaphroditæ v. rarius unisexuales, paniculatae v. spicatae, rhachi inflorescentiæ inarticulata. Gluma sub flore summa (palea?) uninervis v. carinata.

Tribus iv. **Tristegineæ.** Spiculæ hermaphroditæ, secus paniculae ramulos inarticulatos solitariae v. rarius geminae v. fasciculatae, cum pedicello articulatae. Glumæ vacuæ aristatae v. muticae, florens hyalina v. tenuiter membranacea, arista geniculata terminata v. mutica.

Tribus v. **Zoysiææ.** Spiculæ hermaphroditæ v. nonnullæ imperfectæ, cum rhachi inarticulata spicæ simplicis sigillatim v. fasciculatim articulatae. Gluma florens membranacea, sæpius vacuis minor hyalinaque.

Subtribus 1. Anthephoreæ. *Spiculæ in pedicello 3-∞, in fasciculum deciduum confertæ. Gluma florens nunc vacuis sublongior, nunc brevior hyalina.*

Subtribus 2. Euzoysiæ. *Spiculæ in pedicello solitariae, rarius geminae. Gluma florens vacuis brevior, hyalina.*

Tribus vi. **Andropogoneæ.** *Spiculæ secus spicæ rhachin v. paniculæ ramulos, sæpissime geminae v. terminales ternæ, in quoque pari homogamæ v. heterogamæ. Gluma florens vacuis minor, hyalina, sæpe aristata.*

B. POACEÆ. Pedicellus infra glumas continuus. Rhachilla supra glumas inferiores persistentes sæpe articulata, ultra flores fertiles producta, stipitiformis v. glumas vacuas v. flores imperfectos ferens, v. interdum flos fertilis more Panicacearum unicus terminalis, sed cum gluma sua a vacuis persistentibus articulatum secedens.

Tribus vii. **Phalarideæ.** Flos hermaphroditus unicus, terminalis. Glumæ 6 (v. 5 et palea) uninerves v. carinatae.

Tribus viii. **Agrosteæ.** *Spiculæ 1-floræ, rhachilla ultra florem nuda v. in setam v. stipitem producta.*

Subtribus 1. Stipeæ. *Panicula laxa v. irregulariter spiciformis. Gluma florens arista sæpius terminata, fructifera caryopsin arcte involvens. Rhachilla ultra florem non producta.*

Subtribus 2. Phleuideæ. *Panicula spiciformis densa, cylindracea v. subglobosa. Gluma florens mutica v. aristis 1-3 terminata fructifera caryopsin laxè includens. Rhachilla interdum producta.*

Subtribus 3. Sporoboleæ. *Panicula laxa v. ad racemum reducta, rarissime spiciformis. Gluma florens mutica. Caryopsis demum sæpius glumis apertis subdenudata. Rhachilla non producta.*

Subtribus 4. Euagrostæ. *Panicula varia, sæpius laxa. Gluma florens sæpius arista dorsali instructa, rarissime mutica. Caryopsis gluma laxè inclusa. Rhachilla sæpe producta.*

Tribus ix. **Isachneæ.** *Spiculæ æqualiter bifloræ. Glumæ sæpius muticæ. Rhachilla ultra flores non producta.*

Tribus x. **Aveneæ.** *Spiculæ bi- v. plurifloræ, sæpius paniculatæ. Glumæ florentes arista dorsali v. interdum terminali sæpissime instructa. Rhachilla ultra flores sæpius producta.*

Tribus xi. **Chlorideæ.** *Spiculæ uni- v. plurifloræ, secus rhachin spicarum unilaterialium biseriatim sessiles, secundæ.*

Tribus xii. **Festuceæ.** *Spiculæ bi- v. plurifloræ, varie paniculatæ v. rarius racemosæ. Glumæ florentes muticæ v. aristis terminatæ.*

Subtribus 1. Pappophoreæ. *Glumæ florentes plurinerves tri- pluriaristatæ, v. absque aristis quadrilobæ.*

Subtribus 2. Triodieæ. *Glumæ florentes uni- v. trinerves, tridentatæ, trifidæ v. triaristatæ.*

- Subtribus 3. Arundineæ. *Rhachilla sub glumis florentibus longe pilosa.*
- Subtribus 4. Seslerieæ. *Inflorescentia spiciformis v. capituliformis, basi glumis vacuis v. spicis sterilibus sæpius stipata. Stylus v. rami sæpius longi tenues.*
- Subtribus 5. Eragrostæ. *Glumæ florentes trinerves. Cætera normalia.*
- Subtribus 6. Meliceæ. *Glumæ florentes tri- v. plurinerves, superiores duæ v. plures vacuæ, semet involventes.*
- Subtribus 7. Centotheceæ. *Foliu plana, lanceolata v. ovata, inter venas transverse venulosa. Glumæ florentes quinque- v. plurinerves.*
- Subtribus 8. Eufestuceæ. *Glumæ florentes quinque- v. plurinerves. Cætera normalia.*
- Tribus xiii. **Hordeæ.** *Spiculæ uni- v. plurifloræ, ad dentes seu excavationes rhacheos spicæ simplicis sessiles.*
- Subtribus 1. Triticeæ. *Spiculæ ad nodos solitaria, tri- v. plurifloræ, rarius bifloræ.*
- Subtribus 2. Leptureæ. *Spiculæ ad nodos solitaria, uni- v. bifloræ. Spica tenuis.*
- Subtribus 3. Elymeæ. *Spiculæ ad nodos geminæ v. plures collaterales.*
- Tribus xiv. **Bambuse.** Gramina elata, sæpius basi saltem lignosa. Folia plana, sæpissime cum vagina articulata. Spiculæ uni- v. plurifloræ. Lodiculæ sæpius 3. Stamina 3, 4, v. plura.
- Subtribus 1. Arundinarieæ. *Stamina 3. Palea bicarinata. Pericarpium tenue, semini adnatum.*
- Subtribus 2. Eubambuseæ. *Stamina 6. Palea bicarinata. Pericarpium tenue, semini adnatum.*
- Subtribus 3. Dendrocalameæ. *Stamina 6. Palea bicarinata. Pericarpium crustaceum v. carnosum, a semine liberum.*
- Subtribus 4. Melocanneæ. *Stamina 6 v. plura. Palea 0 nisi glumis simillima. Pericarpium crustaceum v. carnosum, a semine liberum.*

I now proceed to a more detailed revision of the several tribes, subtribes, and genera, in the order in which I have worked them up for the forthcoming part of our 'Genera Plantarum,' to which I must refer for the technical characters and references, as well as for the synoptical clavis of the genera.

Series A. PANICACEÆ.

This first main division of Gramineæ is very fairly defined by the combination of two characters—the articulation of the pedicel below the spikelet or cluster of spikelets, and the single fertile flower apparently terminal, with or without a single male or sterile one below it. Where either of these two characters fails, the plant should be referred to Poaceæ.

The articulation of the pedicel is usually immediately below

the lowest glume, leaving, as the spikelet falls away, a slight dilatation or callosity at the apex of the persistent portion. Sometimes it is not easily observed at the time of flowering, but becomes more marked as the fruit ripens. A similar marked articulation has not hitherto been observed in Poaceæ, except in *Fingerhuthia*. There are also a very few cases where the lowest glumes are reduced to slight callosities, or are so rudimentary as to render it difficult to say whether the articulation is in the pedicel or in the rhachilla. In the *Cenchrus* group of the tribe Paniceæ, in the subtribe Anthephoreæ of Zoysiæ, and in some Andropogoneæ, the articulation is not under each spikelet, but under a little cluster of two or more spikelets; and in Maydeæ it is the rhachis of the spike which disarticulates under each female spikelet. In Gramineæ generally, however, the articulation, whether of the rhachis, of the pedicel, or of the rhachilla, is usually under the fertile spikelets or flowers only; under the males it is apt to be very obscure or quite obsolete.

The fertile flower is above spoken of as only *apparently* terminal, because the presence of the palea and a slight obliquity tend to show that the floral axis is not really the continuation of the rhachilla, but, as in Poaceæ, a secondary or axillary branch. Doell says, indeed, that a continuation of the rhachilla behind the palea has been observed in a species of *Panicum*; but I have never succeeded in meeting with it in any Panicaceæ. In the tribe Oryzeæ, where there is no two-nerved palea, it may still remain a matter of doubt whether the floral axis is or is not distinct from the rhachilla—whether the uppermost scale is a glume on the rhachilla or a palea at the base of the floral axis. The presence or absence of a central nerve is not an absolute test; for it is occasionally, though very rarely, absent in the lower glumes.

Panicaceæ have never more than four glumes, the uppermost one usually enclosing or subtending the fertile flower, though in some Andropogoneæ it is excessively reduced or even quite obsolete or rudimentary. The next under it may be empty like the lower ones, or may enclose a palea, a rudimentary flower, or a perfect male flower, and in *Beckmannia*, and a very few species or individuals of *Setaria* and *Panicum*, this lower flower may be hermaphrodite, but usually, if not always, sterile. The two lower glumes when present are always empty. Where the spikelets are unisexual, the females have only the single terminal flower, the males most frequently two flowers, both with perfect stamens.

The tribes composing the series of Panicaceæ run much into each other, and have been very variously extended or reduced. We have adopted the following six, as having appeared to us to be rather better defined than the smaller or larger ones that have been proposed.

Tribe I. PANICEÆ.

The principal character of the Panicæ, considered as a tribe of Panicaceæ, consists in the hardening of the fruiting glume. In several of the smaller genera, however, and even in some species of *Panicum* itself, it is membranous, but usually larger than the outer ones, and forming the chief covering of the fruit, never hyaline or much reduced as in Andropogoneæ. *Oryzopsis*, *Milium*, and their allies, which were formerly included in Panicæ, have been transferred to Agrostideæ on account of the persistent lower glumes below the articulation. Among the other general characters of the tribe, the inarticulate rachis of inflorescence is constant except in *Stenotaphrum*, where, however, the articulation is very tardy and not constant, so that it has often been denied. The flowering glume never bears the twisted awn, so general in Andropogoneæ and Tristegineæ, although in *Eriochloa* and a very few species of *Panicum* its obtuse apex has a short, erect, almost dorsal point; the awns of *Oplismenus*, *Chataria*, the section *Echinochloa* of *Panicum*, &c. are straight and terminate one or more of the empty glumes only. The fertile flower terminating the spikelet is, in the normal genera, either perfectly hermaphrodite, or, at any rate, as far as I have observed, has staminodia round the pistil. It is only in a few of the abnormal genera added to the tribe that there are strictly female spikelets.

The normal genera of the tribe may be distributed in four rather distinct groups, though scarcely marked enough to be raised to the rank of subtribes; and to these we would add a few more or less abnormal genera, but little connected with each other, but all apparently more nearly allied to Panicæ than to any other tribe.

In the first group, or *Panicæ proper*, we have distinguished eleven genera—a number somewhat arbitrary; for much might be said in favour either of uniting the whole into one vast genus *Panicum*, or of dividing them still further, as some have proposed, into about twice as many as those here adopted, the distinctive characters being often either very uncertain, or such as are not universally recognized as generic in the Order.

1. *REIMARIA*, Flügge.—This old-established and universally acknowledged genus has generally been limited to two tropical and subtropical American species, with a peculiar slender habit and inflorescence, and characterized by having only one empty glume below the flowering one, and by the constant reduction of the number of stamens to two. It has since, however, been ascertained that several species which cannot well be separated from *Paspalum* have only a single lower empty glume; and Doell has distinguished *Reimaria* chiefly by the reduction of the stamens, together with the form of the spikelets more acuminate and more closely appressed to the rhachis than in any *Paspalum*. He has added, under the name of *R. aberrans*, a third species, which, with a more vigorous habit, rather invalidates the natural distinction from *Paspalum*, but has all the characters of *Reimaria*; and Munro recognizes a fourth species, allied to *R. aberrans*, but with only two, or at most three, spikes to the panicle and a much thicker rhachis, in the Florida plant distributed by Curtis with the number 3566 as *Paspalum vaginatum*, but probably not the one entered under that name in Chapman's 'Flora of the Southern United States.' It occurs also in Wright's Cuban collection under n. 3854, and may be characterized as *R. oligostachya*, Munro, spicis in pedunculo 2 rarius 3 (nec 6-15), rhachi dilatata spiculis sublatis. The true *Paspalum vaginatum*, Sw., is a synonym of *P. distichum*, Linn.

2. *PASPALUM*, Linn., ranks among the large genera of tropical Gramineæ, and in respect of the greater number of species is a natural one, readily distinguished from *Panicum* by the inflorescence and by the technical character of the deficiency of the small lowest glume. It is now, however, ascertained that neither character is quite constant. A few *Panica* of the section *Brachiaria* have the inflorescence of *Paspalum*; and the lowest glume is frequently reduced to a small callus, or is entirely deficient in the section *Digitaria*; and the consequence has been, that several species have been referred by some botanists to the one genus and by others to the other. These ambiguous species appear, however, to be best placed in *Panicum*; and all true *Paspala* have the spikelets sessile or nearly so, in two or four rows along the lower or outer side of the rhachis of the spikes or simple branches of the panicle, and they show no trace of the small lowest glume of *Panicum*. Thus defined, the number of species may be estimated at about 160, by far the greater proportion of them tro-

pical American, a few of which are also generally spread over the warmer regions of the Old World, especially *P. distichum*, Linn. (*P. vaginatum*, Sw.), which reaches southern Europe as an introduced weed. Scarcely five species can be regarded as belonging exclusively to the Old World. The above estimate of the total number is founded chiefly on the investigations of Munro, who had nearly completed the working-up of the genus, and has left full descriptions with diagnoses and synonymy of 138 species, besides a few that he had left for further inquiry. Steudel enumerates 262 species, but nearly half of them have proved to be mere synonyms or very slight varieties. Doell describes in detail 105 Brazilian species; but some of them are what I cannot consider as really distinct; and his own views of them were any thing but stable, as there are several which he at one time referred to one species and later transferred to another, forgetting to eliminate them from their former place, thus:—

Gardner, n. 2354, is repeated under *P. malacophyllum* and *P. subsesquiglume*.

Hostmann, n. 658, under *P. densiflorum* and *P. cæspitosum*.

P. distachyum, Salzmann, n. 667, under *P. pumilum* and *P. divergens*.

Gardner, n. 3496 and 3497, under *P. maculosum* and *P. notatum*.

Gardner, n. 2975, under *P. vaginatum*, *P. tropicum*, and *P. filifolium*.

P. cæspitosum, Hochst., n. 1543, } under *P. plicatulum* and *P.*
P. amazonicum, Trin., and } *dissectum*.
P. humile, Steud., }

Digitaria uniflora, Salzm., n. 659, } under *P. platycaulon* and
and Spruce, n. 679, } *P. furcatum*.

P. surinamense, Hochst., n. 1283, under *P. furcatum* and *P. scoparium*.

Spruce, n. 30, under *P. chrysodactylon* and *P. chrysolephare*.

Fournier enumerates 40 Mexican species, of which thirteen are described as new; but he is, in Gramineæ, generally disposed to admit as distinct species forms which I perfectly agree with Munro in regarding as slight varieties, corresponding to what so many local European botanists describe as critical species.

With regard to the subdivision of the genus, Trinius, in his several revisions, distributed the species chiefly according to the size of the spikelets, which, however much it may affect the general aspect of the species, is in many cases far too uncertain a character to be practically useful. Nees, in his 'Agrostologia Brasiliensis,' proposed six sections, which Doell reduced to four,

Munro, though he had so nearly completed his descriptions of species, and often indicated the sections to which he referred them, had not yet definitively grouped them, leaving his manuscripts, for convenience of reference, in alphabetical order. We have adopted three sections, founded on Nees's, which appear to us well defined by positive characters—*Eupaspalum*, *Cabrera*, and *Anastrophus*, subdividing the first, and largest, into four groups or subsections, *Anachyris*, *Opisthion*, *Pseudoceresia*, and *Ceresia*, much less marked in their outlines, but generally speaking fairly natural.

Eupaspalum comprises the great majority of the species, and is distinguished by the spikelets strictly secund along the rhachis of the spikes, with the back of the flowering glume and of the lower empty one (when present) turned outwards—that is, away from the rhachis or from its midrib; whilst in *Anastrophus*, which includes the remainder of the genus except the monotypic *Cabrera*, the spikelets are almost distichous, and the back of the flowering glume and of the lower empty one turned towards the midrib of the rhachis. This distinction was specially relied upon by Nees under the terms *spiculæ adversæ* and *spiculæ inversæ*, and followed up by Doell. It is not alluded to by Fournier with regard to the Mexican *Paspala*; but, if I understand correctly his words (*Gram. Mex.* p. vii), it nearly corresponds to the character he proposes for the primary division of Gramineæ.

Anachyris, the first subsection of *Eupaspalum*, is a purely artificial one, characterized solely by the having only a single empty glume below the flowering one. It was first proposed as a genus by Nees for the *Paspalum malacophyllum*, Trin., which has all the habit and floral and other characters of *Paspalum* except this single one; and Fournier, apparently on this account, transfers it to the tribe *Oryzææ*. Doell, however, reduces it to a section of *Paspalum* under the name of *Eremachyrion*, associating with it a few other species, some of them evidently more nearly allied to corresponding species of the section *Opisthion* than to each other. And even the technical character is not always constant; for in *P. (Eremachyrion) sesquiglume*, Doell, a species closely allied to *P. (Opisthion) maritimum*, Trin., I frequently find a minute outer glume; and, again, *P. pallidum* and *P. candidum*, H. B. K., both of which Doell places in *Eremachyrion*, are scarcely to be distinguished from each other except by the lowest empty glume absent in the one, present in the other, as originally pointed out by

Kunth. Nees describes the palea (upper palea) of the typical *Anachyris paspalodes* or *Paspalum malacophyllum* as 3-nerved; Fournier says it is 1-nerved. The species is very variable as to the size of the spikelets, the hairs or setæ on the rhachis of the spike, &c.; but in all the specimens I have examined I have uniformly found the palea normally 2-nerved.

Opisthion, proposed by Doell as a section of *Paspalum*, is our second subsection of *Eupaspalum*. It includes all the typical *Paspala* with two lower empty glumes, and the rhachis of the spikes not dilated. The species are numerous and varied, but scarcely reducible to distinct groups.

Pseudoceresia is a subsectional name I should propose for the genus *Ceresia* as understood by Elliott and other North-American botanists. In it the rhachis of the spikes is more or less dilated and concave, but green and herbaceous throughout, and the spikelets are small and glabrous or nearly so. The species are few, including *P. stoloniferum*, Bosc, *P. repens*, Berg., and their allies. *Ceresia* is the name we would reserve for our fourth subsection, being the genus *Ceresia* as originally established by Persoon, in which the dilated rhachis of the spikes is bordered by a coloured or smooth membranous margin, and the half-enclosed spikelets are larger than in *Pseudoceresia* and densely ciliate. Besides several Brazilian and other tropical species, it includes the Mexican *P. cymbiforme*, Fourn.

Cabrera, our second section of *Paspalum*, is limited to the single *P. aureum*, H. B. K. (not of Trinius), forming Lagasca's genus *Cabrera*, in which the direction of the spikelets is nearly that of *Anastrophus*; but instead of being marginal on each side of the rhachis, they are deeply embedded in alternate cavities on each side of the midrib, on the outer or lower side of that rhachis. This remarkable arrangement is very well described by Lagasca, who was a most accurate botanist. His 'Nova Genera et Species Plantarum,' forming part of the 'Elenchus Horti Matritensis,' is a model for the clearness and conciseness of the characters given, which are most thoroughly to be depended upon. The work is quoted by Nees and by Doell, but evidently at second hand; had they really read it, and had they studied Kunth's good figure and description, they could never have given to the *P. aureum* the new name of *P. immersum*, or have transferred the synonym of *Cabrera chrysoblepharis*, Lag., to the *P. exasperatum*, Nees, or to the supposed distinct *P. chrysoblepharis*, Doell, both of them at

complete variance with Lagasca's description. The genus *Axonopus*, Beauv., sometimes given as a synonym of *Cabrera*, because Beauvois had suggested that *P. aureum* might possibly be a congener, was founded on various heterogeneous species of *Paspalum* and *Panicum*; and the name has to be wholly expunged.

Anastrophus, our third section, was proposed as a genus under that name by Schlechtendahl, and includes Nees's section *Digitariæ* or Doell's *Emprosthion*. It is characterized by the position of the spikelets on the alternate margins of the narrow, somewhat flexuose rhachis of the spike, so as to be rather distichous than secund, and by their direction, the back of the flowering glume and of the lower empty one being turned outwards or away from the rhachis. The spikes are also generally several close together at the end of the peduncle, as in the section *Digitaria* of *Panicum*, suggesting to Nees his sectional name, which, however, is inconvenient as being adjective in form, and too liable to be confounded with the true *Digitaria*. Some of the species have, like *Cabrera*, long cilia on the spikes, but have otherwise all the characters of *Anastrophus*, of which they might form a subsection under the name of *Lappagopsis*, given by Steudel to the *P. dissitiflorum*, Trin., which he proposed as a distinct genus. The several species which we would include in the subsection show a curious diversity in the position of the cilia: in *P. fastigiatum*, Nees, they are long on the empty glumes, none on the rhachis; in *P. senescens*, Nees, short on the empty glumes, long on the rhachis; in *P. dissitiflorum*, Trin., long both on the rhachis and on the empty glumes; and in a few other species, referred by Nees and by Doell to *Cabrera*, although without the peculiar characters of Lagasca's genus, the rhachis alone is fringed with long cilia, the glumes having none.

Paspalum saccharoides, Trin., referred by Kunth to *Panicum*, is one of those small-flowered species which seem to connect *Paspalum* with *Panicum* (*Digitaria*), whilst the long silky hairs of the spikes and the consistence of the glumes show an approach to the *Andropogoneæ* (*Sacchareæ*). The arrangement of the spikelets along the rhachis, the number of glumes, &c. show a nearer affinity to *Paspalum* than to any other genus.

3. ANTHÆNANTIA, Beauv. (*Aulaxanthus*, Ell.), was founded upon two North-American species, with the hairy inflorescence and membranous glumes of the section *Trichachne* of *Panicum*, but without the small lowest glume of that genus; and the second

glume (corresponding to the third of *Panicum*) usually encloses a palea or a male flower—a circumstance unusual in the Order, where the exposed glumes are almost always empty. From these I cannot separate generically the South-American *Leptocoryphium*, Nees, which, besides some slight specific characters, only differs from the North-American species in the second glume being constantly, instead of occasionally only, empty. The genus *Anthænantia* thus constituted includes three species—*A. villosa*, Beauv. (*Aulaxanthus ciliatus*, Ell., *Panicum ignoratum*, Kunth), *A. rufa*, Benth. (*Aulaxanthus rufus*, Ell., *Panicum rufum*, Kunth), and *A. lanata*, Benth. (*Paspalum lanatum*, H. B. K., *Milium lanatum*, Kunth, *Leptocoryphium lanatum* and *L. molle*, Nees).

4. AMPHICARPUM, Kunth, with spikelets unisexual by abortion and a peculiar inflorescence, remains limited to the single North-American species on which the genus was founded.

5. ERIOCHLOA, H. B. K. (a name having the right of priority over *Cedipachne*, Link, and *Helopus*, Trin.), has the habit rather of the section *Brachiaria* of *Panicum* than of *Paspalum*, but wants the small lower glume of the former genus, and differs generally from both in a peculiar callous thickening of the pedicel at the articulation. There are, however, a very few species with more or less of this callosity, which on other accounts cannot well be separated from *Panicum*. The flowering glume has also the peculiar point on the obtuse apex observable in *Panicum helopus*, Trin., and in a few others, and supposed to characterize a section or genus *Urochloa*. It is, however, an uncertain character, both in *Eriochloa* and in *Panicum*. Nearly twenty supposed species of *Eriochloa* have been described; but the greater number of them are scarcely even varieties of the *E. polystachya*, H. B. K., which is widely spread over the warmer regions of the Old as well as the New World, and known under the various names of *E. punctata*, *E. annulata*, &c. There appear also to be at least four really distinct species—*E. distachya*, H. B. K., and *E. grandiflora* (*Helopus*, Trin.) from tropical America, *E. trichopus*, Hochst., from tropical Africa, and *E. villosa*, Kunth, from eastern Asia.

6. BECKMANNIA, Host, is a single species, ranging from eastern Europe across Russian Asia to North America. It has been usually placed in Phalaridæ, a tribe with which it appears to me to have but little connection. The habit and inflorescence are those of *Panicum colonum*; but it is exceptional in Paniceæ as having both the flowers hermaphrodite; the lowest flower is,

however, as far as I have observed, usually sterile; and a similar character is to be found in some species or varieties of *Setaria*, and very rarely in *Panicum* itself, next to which the genus appears to be best placed. The synonym *Joachimia*, Ten., given by Kunth, was a name intended for it by Tenore, but I believe never actually published. Tenore figures the plant as a *Beckmannia*.

7. PANICUM, Linn., after deducting *Ichnanthus*, *Oplismenus*, *Setaria*, and several smaller genera, remains one of the larger, and probably the largest, among tropical Grasses, and is still in many respects polymorphous. In habit and inflorescence it may be confounded sometimes with *Paspalum*, sometimes with *Arundinella*, or even with some *Agrosteæ*. Generally speaking, it may be easily recognized by technical characters; but the most marked, the very small size of the lowest empty glume, is not quite constant; for in a few species this glume is wholly deficient as in *Paspalum*, whilst in a few others it is of the size of the second glume; the hardening also of the fruiting glume and palea is in some species very slight. There is nothing, however, sufficiently definite or constant in these exceptional species to mark them out as intermediate genera; and here, as in so many other cases of large genera of *Cyperaceæ* and *Gramineæ*, we must admit the existence of forms which must be placed in one or the other of allied genera from considerations of convenience rather than of strict character. Taking the genus *Panicum* within the limits we have ascribed to it, nearly 800 supposed species have been published: Steudel enumerates 716; Doell has 134 Brazilian ones, Fournier 97 Mexican, Nees 44 South-African; I described 54 Australian ones; and they are rather numerous in tropical Africa and Asia; but a considerable number are repeated in several or even in all of these Floras, and a large proportion of Steudel's species are mere synonyms or blunders. The total number of fairly distinct species can therefore scarcely be estimated at much above 250. These have been variously grouped, chiefly according to their inflorescence; and no less than eighteen supposed genera have been at different times separated from it, but are now reunited, either as being founded on insufficient, uncertain, or even mistaken characters, or as being, in our opinion, more conveniently regarded as sections than as genera. But, even as sections, their limits are often as far from being absolutely definite as are those of the whole genus. The following eleven are those which have appeared to be the most distinct; but they are all more or less

connected by intermediate forms, and several of them would probably be modified, and may hereafter be much improved, by a closer study of species than I have at present been able to bestow upon them.

(1) *Digitaria*. Spikelets usually small and in alternate pairs or clusters along one side of the simple spike-like branches of the panicle; those of each pair or cluster unequally pedicellate, or one of them almost sessile, and the lowest glume often very minute or sometimes quite deficient. This section was proposed as a distinct genus in Walter's 'Flora Carolinensis' under the name of *Syntherisma*, and by Richard, in Persoon's 'Synopsis,' under that of *Digitaria*, and is still maintained as such by many botanists. It was founded originally on the cosmopolitan weed *Panicum sanguinale*, Linn., in which the spike-like branches of the panicle are clustered at the end of the peduncle like those of *Cynodon* and some other Chloridæ. There are now, however, nearly forty species to be included in the group, in many of which the spikes or branches are distant along the peduncle, as in *Schedonnardus*, *Gymnopogon*, *Leptochloa*, &c., among Chloridæ. From this tribe the structure of the pedicellate spikelets and their articulation always keep them perfectly distinct; but there is a series of small-flowered species, including the Australian and Asiatic *P. parviflorum*, Br., *P. tenuiflorum*, Br. (*Paspalum brevifolium*, Flügge), and *Paspalum minutiflorum*, Steud., and two or three from South Africa, which have been almost equally well placed by some in *Paspalum*, by others in *Panicum*. As in some species allied to *P. sanguinale*, and even in some varieties of *P. sanguinale* itself, the minute outer glume is frequently absolutely deficient. The more pedicellate spikelets and the occasional, however rare, appearance of the outer glume may justify the placing these species rather in *Panicum* than in *Paspalum*, to which I referred them in the 'Flora Australiensis.' *P. platycarphum*, Trin., from Bonin Island, with all the characters of true *Digitaria*, is remarkable for the dilated membranous rhachis of the spike-like branches as in the section *Ceresia* of *Paspalum*.

(2) *Trichachne*. In this section, distinguished as a genus under that name by Nees and others, the branches of the panicle are simple as in *Digitaria*, but usually few, loose, scattered along the peduncle, and erect. The glumes are all, or the second ones alone, ciliate or clothed with soft hairs as in the section *Tricholæna*; and the fruiting glume is not much hardened. The species

are few: *P. semialatum*, Br., is widely spread over the Old World, for I am unable to distinguish the Asiatic *Coridochloa*, Nees, and the South-African *Bluffia*, Nees, from Brown's Australian species; *P. Gayanum*, Kunth, is confined to tropical Africa; *P. leucoxphæum*, H. B. K., is frequent under various names in the tropical and subtropical regions of the New and the Old World. It is a very variable species; and specimens gathered at different stages of development look very different from each other, but are not separable into marked varieties. It was included by Beauvois in his genus *Urochloa*, and appears to have been the type of the proposed genera *Acicarpa*, Raddi, *Eriachne*, Philippi, and *Holoseetum* and *Mesoseetum*, Steud., and is probably the principal element of Presl's supposed genus *Alloteropsis*.

(3) *Diplaria*. This section is proposed for a few American species with a simple terminal spike-like inflorescence. The spikelets are sessile along the rhachis in two rows and distichous, as in the section *Anastrophus* of *Paspalum*, from which *Diplaria* differs technically in the presence of the small outer glume characteristic of *Panicum*. It comprises *P. rottboellioides*, H. B. K., *P. exaratum* and *P. ferrugineum*, Trin., *P. pappophorum*, Nees, and a few others.

(4) *Thrasya*, distinguished as a genus by Kunth, has a simple terminal spike-like inflorescence as in *Diplaria*; but the rhachis is more or less dilated as in the section *Ceresia* of *Paspalum*, and the spikelets, sessile along the midrib, although really alternate and biseriate, have all the appearance of being in a single row. The species are few, all American, and include, besides the original *Thrasya paspaloides*, Kunth, the *P. ansatum*, Trin., which is scarcely specifically distinct from it, *P. thrasyooides*, Trin., *P. petræum*, Trin., and perhaps two or three others. The *P. petræum* forms the genus *Tylothrasya* of Doell, which he characterizes by a callous thickening of the pedicel like that of *Eriochloa*; but the plant is in all other respects too closely allied to the typical *Thrasya* to be generically separated, and the callosities are slightly prominent in various species of *Panicum*.

(5) *Harpostachys*. The inflorescence is again simple and spike-like; but the spike is more or less falcate, with the spikelets crowded in two or four rows along one side of the slender rhachis, as in Chlorideæ, and the common peduncles are usually long and often clustered two or three together in the upper axils. To this section belong *P. monostachyum*, H. B. K., *P. decumbens*, R. et Schult., and *P. subfalcatum*, Doell.

The genus *Dimorphostachys* of Fournier is founded upon the above *P. monostachyum* and some other American species, which we should refer to the sections *Digitaria* or *Brachiaria*, but which he connects generically by the small lowest glume being more developed or differently shaped in one spikelet of each pair than in the others; but the difference is often exceedingly slight, and the character so little connected with any other or with habit, that it seems difficult to attach any more than specific importance to it.

(6) *Brachiaria*. This section, sometimes referred to as *Paspaloid Panica*, comprises a large number of species both from the New and the Old World, in which the inflorescence is that which is regarded as specially characteristic of *Paspalum*: the panicle consists of a number of spike-like simple branches, distributed along a simple common peduncle; but the small lowest glume of *Panicum* is always present. If we regard only such typical species as *P. flavidum* or *P. fluitans* of Retz, or *P. paspaloides* of Persoon, the section appears a most distinct one; but, on the other hand, several such species as *P. adspersum*, Trin., *P. argenteum*, Br., *P. Petiveri*, Trin., *P. polyphyllum*, Br., &c. so closely connect it with some of the sparingly-flowered species of *Eupanicum*, as to make it impossible to draw a precise line of demarcation between the two. Amongst these intermediate forms, *Paractanum*, proposed as a genus by Beauvois, appears to be only a starved state of *P. gracile*, Br.

P. helopus, Trin., bears on the obtuse apex of the flowering glume a short point, like that of most species of *Eriochloa*, and was therefore joined by Beauvois to the *P. (Trichachne) semi-alatum*, Br., to form his genus *Urochloa*; but the two are in other respects too dissimilar to be united in one section, and *P. helopus* appears to be altogether a true *Brachiaria*.

(7) *Echinochloa*, was regarded by Beauvois as a distinct genus, founded chiefly on two very widely-spread and most variable species, *P. colonum*, Linn., and *P. crus-galli*, Linn., the former often cultivated, the latter a most abundant tropical and subtropical weed. Both have nearly the inflorescence of the section *Brachiaria* but they are coarser plants, with the spikelets densely crowded on the partial spikes or branches of the panicle, and the second and third empty glumes, in the one rarely, in the other very generally, terminating in long awns. It was probably on this account that Kunth united Beauvois's *Echinochloa* with his

Oplismenus ; but the development of the awn has now been shown to be so frequently uncertain in one and the same species of Gramineæ, that the character has quite lost the absolute importance once attributed to it by Beauvois and others, and *Echinochloa* is generally admitted only as a slightly distinct section of *Panicum*. The true *Oplismenus* may, however, be well maintained as a separate genus, to which I shall presently refer.

(8) *Ptychophyllum* has been well worked up as a very distinct section of *Panicum* by A. Braun. It comprises *P. plicatum*, Lam., from the Old World, *P. sulcatum*, Aubl., from America, and a few others, which, with a peculiar foliage, have more or less of setæ in the panicle, which seem to connect them with *Setaria*. On examination, however, these setæ will be found in *Ptychophyllum* to be merely the setiform tips of the ultimate spikelet-bearing branches of the panicle, whilst the bristles or setæ of *Setaria* are abortive branchlets, forming a kind of involucre below the spikelets. The remaining floral characters of *Ptychophyllum* are entirely those of the loosely-panicled species of *Eupanicum*.

(9) *Hymenachne* of Beauvois, often retained wholly or partially as a genus, comprises a small number of species both from the New and the Old World, in which the small, very numerous spikelets are usually crowded in a long narrow cylindrical spike-like panicle. In the typical species, *P. myurus*, Linn., the spikelets are rather acuminate and the fruiting glume scarcely hardens; in *P. indicum*, Linn., and others the spikelets are small, and quite those of a large number of true *Panica*.

(10) *Eupanicum*. After deducting the nine preceding sections and the succeeding *Tricholæna*, which have all some distinguishing peculiarity, there remain a large number of species strictly normal in the structure of their awnless spikelets, and connected together by their more or less spreading panicle, the spikelets, on short or on slender pedicels, clustered or scattered along its simple or divided branches. These species, in number not far from two hundred, may vary much in the size of the spikelets, in the degree of development of the panicle, and in other minor points, but seem little capable of being classed in distinct subsections. They form Trinius's two sections *Virgaria* and *Miliaria*, characterized by the branches of the panicle being angular in the one, terete in the other—a distinction which I have been quite unable to follow out, at least in the dried specimens. All I have been able to suggest has been their distribution into seven groups or series,

vaguely distinguished chiefly by their inflorescence and general habit. Amongst the somewhat exceptional species are *P. uncinatum*, Trin. (*Echinolæna polystachya*, H. B. K.), in which the three empty glumes are nearly equal to each other, though shorter than the flowering ones, and *P. pterygodium*, Trin. (forming the genus *Otachyrium*, Nees), in which the two lower empty glumes are about equal, but shorter than the third. In all the others the lowest empty glume is much the shortest. *Coleatænia*, from extratropical South America, is proposed as a genus by Grisebach as having dicecious flowers. I have not seen any specimen; but from his description it seems to be in all other respects a true *Panicum* (*Eupanicum*); and as he has only seen the male, evidently with the flowers still young, he may have overlooked the pistil, or its abortion may not be constant. At any rate that character standing alone can scarcely be sufficient to separate it generically. Several of the cultivated Millets are species of *Eupanicum* with large, loose, often nodding panicles.

(11) *Tricholæna* (including Nees's genus *Rhynchelytrum*), raised by Parlatores and some others to the rank of a genus, has the loose panicle of *Eupanicum*; but the fruiting glumes are not much hardened, and the whole inflorescence is ciliate with long hairs as in *Trichachne*, on which account the oldest known species, the widely-spread *P. Teneriffæ*, was originally published as a *Saccharum*. There are now about fifteen species known, chiefly South-African; but one, the above-mentioned *P. Teneriffæ*, extends to the Mediterranean region, two are East-Indian, and two or three South-American. *Rhynchelytrum*, Steud., is a different genus from Nees's, and belongs to the *Tristegineæ*.

8. *ICHNANTHUS*, Beauv., is so closely allied in habit and general character to some species of *Panicum* (*Eupanicum*) that it is perhaps rather in deference to the authority of all the principal recent agrostologists, than from any conviction of our own, that we retain it as a distinct genus. The character is a purely technical one—a thin hyaline auricle or wing to the rhachilla on each side close under the flowering glume, as is observed in some species of *Cyperus*. In the species forming the section *Macropteris* of Doell these auricles are often more than half as long as the glume itself; in *I. longiflora* (*Panicum longiflorum*, Trin.) they are very small, but prominent; in *I. pallens* and its allies, forming Doell's section *Micropteris*, they are often scarcely perceptible, and Fournier has restored these species to *Panicum*, though Munro

keeps them up as *Ichnanthus*. Two species, *I. Hoffmanseggii*, Doell, and *I. oplismenioides*, Munro, are remarkable for the long spreading hairs, which give them a very peculiar aspect. There are altogether about twenty species, all tropical American.

9. OPLISMENUS, Beauv. (*Orthopogon*, Br.), though very near the section *Brachiaria* of *Panicum*, appears to be a natural genus, and is well characterized by the greater development of the lowest empty glume, which is, moreover, always awned, whilst in *Panicum* it is much smaller than the others and always unawned. Kunth adopted the genus, but, relying on the awns alone, united with it *Echinochloa*, in which the proportions of the glumes are the ordinary ones of *Panicum*, and which I have referred to above as a section of *Panicum*. Fournier adopts Kunth's view. Steudel and Doell both reduce the whole to *Panicum*. The true *Oplismeni* are widely spread over the warmer regions both of the New and the Old World, and are variable as to the number and length of the spikes or panicle-branches, &c. Some botanists adopt above thirty species, others reduce the whole to varieties of a single one; it is probable that some three or four may be fairly distinguished as species. *Hekaterosachne* of Steudel is one of the common forms of *Oplismenus*.

10. CHÆTIUM, Nees, to which Doell has properly referred *Berchtoldia* of Presl as a second species, has nearly the spikelets of *Oplismenus*, to which Kunth reduces it, the outer glumes being much more developed and awned than the flowering ones; but, besides some minor points, the inflorescence appears quite different enough to justify the maintaining it as a distinct genus. Doell considers it as a section of *Panicum*, with two species, one Brazilian, the other Mexican. Fournier retains the genus *Berchtoldia* for the Mexican one, without comparing it with *Chætium*, and adds two supposed new Mexican species: the one, *B. holciformis*, judging from the specimens he quotes, is one of the large coarse forms of *Panicum* (*Echinochloa*), very nearly allied to, if not varieties of, *P. crus-galli*; the other, *B. oplismenioides*, is unknown to me, but must from his description be referable also to *Echinochloa*.

11. SETARIA, Beauv., was included by the older authors in *Panicum*, and has been restored to that genus as a section by Steudel and by Doell, but is retained by most modern botanists as a well-marked natural genus, easily recognized by the dense spike-like panicle usually bristling with numerous setæ issuing

from the pedicels below the spikelets. These setæ are not epidermal like the rigid hairs of many Gramineæ, but, as in *Pennisetum*, are supposed to be abortive branchlets of the panicle, differing, however, from those of the latter genus by being inserted below the articulation of the pedicel, so as to remain persistent after the fall of the spikelet. The species are very variable, and a large number have been described as distinct; they appear, however, to be reducible to about ten, three of which are common weeds over a great part of the civilized world, and a fourth (*S. italica*) has been much cultivated as one of the Millets of the Mediterranean region and the Levant. The genus was first fully characterized by Beauvois in his 'Agrostographie,' chiefly from the above-mentioned common weeds; but he had previously published and figured, in his Flora of Oware and Benin, under the name of *Setaria longisetæ*, a plant which, as far as I can judge without seeing the specimen, proves to be no *Setaria* at all, but the *Pennisetum* (*Beckeropsis*) *unisetum*, to which I shall presently refer. A few species or varieties of *Setaria*—one, for instance, gathered by Hildebrandt in the Sandwich Islands, allied to *S. viridis*, another, not uncommon in the Mexicano-Texan region, allied to *S. italica*—have, like the variety of *S. glauca* figured by Trinius, t. 195, the lower flower hermaphrodite as well as the upper one, which is quite exceptional throughout all genera of Paniceæ except *Beckmannia*. *Ixophorus*, Schlecht. in Linnæa, xxxi. 420, was founded as a genus on *Urochloa unisetæ*, Presl, a Mexican grass which we do not identify in our collections; but Trinius refers it to *Panicum* and Fournier to *Setaria*, with which Schlechtendal's description agrees very fairly.

In our second or *Cenchrus* group of Paniceæ we include four genera, chiefly tropical or subtropical, characterized by the so-called involucre of bristles surrounding each spikelet or sometimes each cluster of two or three spikelets; this involucre, supposed to represent abortive branchlets of the inflorescence, being placed above the articulation of the pedicel, always falls away with the spikelets; the spikelets themselves are quite those of *Panicum*, the inflorescence usually a simple spike raceme or spikelike panicle, rarely a loose panicle of two or more pedunculate spikes. 12. *CENCHRUS* itself, as reduced from the original Linnæan genus, consists of about a dozen species, both from the New and the Old World, two or three of them of very wide geographical range, all characterized by the numerous bristles of the involucre

hardened and frequently more or less united at the base, the inner ones often broad and scale-like. In some specimens, however, of *C. calyculatus*, Cav., and its allies the hardening appears so slight as to bring the genus into very close connexion with *Pennisetum*.

13. PENNISETUM, Pers., the principal genus of the group, would now contain about forty species, chiefly African, amongst which two or three extend to the Mediterranean region, tropical or central Asia, or tropical America, and a very few may be endemic in Asia, Australia, or America. It has been at various times proposed to separate several genera from it, and two or three of these have been pretty generally adopted; but they pass so gradually one into the other, and their chief characters, derived from the hairiness or numbers of the involucreal bristles, are so little in accord with any other characters or habit, that the several following groups can scarcely be considered even as definite sections. *Pennisetum* itself has been restricted to those species in which the bristles are numerous and some or all of them more or less hairy; whilst those in which the whole of the bristles are perfectly glabrous form the genus *Gymnotrix*, Beauv. But however easy this distinction may appear at first sight, it is neither natural nor always definite. In a few African species proposed by Figari and De Notaris as their genus *Eriochæte*, the whole of the setæ are densely woolly-plumose; in some of the commoner species numerous outer setæ of each involucre are glabrous, and as many or more or fewer of the inner ones are hairy. In *P. flaccidum*, Munro, from East India, and *P. Benthamianum*, Steud., from tropical Africa, amongst very numerous glabrous ones there are generally only two or three hairy ones, or sometimes none at all, thus forming a gradual connexion with the true species of *Gymnotrix*, where the setæ are always quite glabrous; and there is nothing else whatever to distinguish the two series even as marked sections. *P. lanatum*, Klotzsch, is a remarkable Himalayan species, in which the involucreal bristles are few, sometimes reduced to a single long rigid branched one, either plumose or glabrous, showing well the true nature of the involucre of the genus. *Penicillaria*, Willd., often still retained as a genus, was founded upon a plant frequently cultivated in the Indo-African regions, which may at first sight appear to be abundantly distinct. The long dense cylindrical spike or spike-like panicle is often above a foot long and an inch in diameter, although in other cultivated specimens not above

half that size. The involucre sometimes remain persistent after the spikelets have fallen away, and the filiform styles are remarkably long; but many cultivated specimens and some East-African ones, possibly wild, offer so much variety in these respects, some passing quite into normal *Penniseta*, that it seems probable that the peculiarities of habit have arisen from long cultivation. The long styles united at the base occur in other species, amongst which *P. (Gymnotrix) macrostachyum*, Brongn., has on that account been proposed by Hasskarl as a genus, under the name of *Sericura*. *Amphochæta* of Andersson is a Galapagos species of the *Gymnotrix* group, with small spikelets in slender pedunculate spikes, forming a loosely paniculate inflorescence, very different from that which characterizes the greater number of *Penniseta*, but closely connected with them through the several varieties of *P. (Gymnotrix) tristachyum*, Kunth. In *P. (Gymnotrix) unisetum*, Nees, an African species proposed as a genus by Figari and De Notaris under the name of *Beckeropsis*, this peculiar inflorescence is carried still further, and the involucre is sometimes reduced to a single bristle (always above the articulation and falling away with the spikelet), though I usually find 2, 3, or even more bristles. It is probable that the plant figured by Beauvois as *Setaria longiseta* is this same species of *Pennisetum*. Steudel's proposed genera *Catatherophora* and *Oxyanthe* are normal species of *Pennisetum (Gymnotrix)*.

14. *PLAGIOSETUM*, Benth., is a single Australian species, which I characterized as a genus chiefly from its peculiar inflorescence and habit, which prevented my retaining it in *Pennisetum* without an extension of the generic character beyond what I felt justified in proposing.

15. *PARATHERIA*, Griseb., is a single West-Indian species, which proves to be identical with the Brazilian plant since published by Doell as a section of *Leptachyrium* of *Panicum*, but which is evidently more nearly related to *Pennisetum*. The inflorescence is a simple spike-like panicle, of which the numerous short articulate branchlets or pedicels are continued beyond the single spikelets into long awns or bristles, which fall away with the spikelet like the involucre of *Pennisetum*, thus forming in some sort a connexion between the *Cenchrus* group of genera and the following one.

Our third or *Chamæraphis* group of Paniceæ consists of seven small genera, loosely connected by a character which may be con-

sidered as rather artificial than natural, but which I believe to be constant. The spikelets are nearly those of *Panicum*, but with the fruiting glume usually less hardened; the inflorescence is nearly that of the paspaloid *Panica* or of the Chlorideæ, but distinguished from the former by the rhachis of the partial spikes or fascicles or branches of the panicle being produced beyond the spikelets into a more or less rigid point. From Chlorideæ the articulation of the pedicel below the spikelet always separates the present group. The genera are:—16. *ECHINOLÆNA*, Desv., a single tropical American species (*E. scabra*), which has quite the rigid single spike of some Chlorideæ, but the spikelets of Paniceæ intermixed with barren ones, on which account Rudge originally figured the plant as a *Cenchrus*. The loosely paniculate species added to *Echinolæna* by Kunth have been rightly restored to *Panicum* by Trinius. 17. *CHAMÆRAPHIS*, Br., four Australian or tropical Asiatic species, fully described in my 'Flora Australiensis.' 18. *SPARTINA*, Schreb. (*Trachynotia*, Mich., *Limnetis*, Pers., *Poncelletia*, Thou., *Solenachne*, Steud.), five or six European, African, or American species, chiefly maritime, has been usually placed amongst Chlorideæ; but the spikelets themselves containing a single terminal flower, and the articulation of their pedicels, are quite those of Paniceæ, not of Chlorideæ. 19. *XEROCHLOA*, Br., three Australian species, 20. *STENOTAPHRUM*, Trin. (*Diastem-anthe*, Steud.), two or three tropical maritime species, 21. *PHYL-LORHACHIS*, Trimen, a single one from Angola, and 22. *THUAREA*, Pers. (*Ornithocephalochloa*, Kurz), also a single maritime species from the shores of the Indian and South-Pacific oceans, are all perfectly isolated genera whose peculiarities have been well pointed out. *Stenotaphrum* is the only genus I know in the tribe Paniceæ which has the rhachis of the inflorescence articulate; but this can usually not be perceived except in an advanced state, and has been denied by some botanists. I have already alluded (Journ. Linn. Soc., Bot. xvii. 196) to Kunth's mistake, which induced him to alter Persoon's name *Thuarea* (abridged from Thouars's then MS. name of *Microthuarea*) to *Thouarea*.

There remain seven very anomalous genera, but little connected with each other, and still less with any other genera of Gramineæ, but which have all more of the general character of Paniceæ than of any other tribe. They have all been well defined and illustrated, and require no more than a bare enumeration on the present occasion. They are:—23. *SPINIFEX*, Linn., three Austra-

lian species, of which one extends to New Zealand and New Caledonia, with a fourth from the coasts of tropical Asia closely allied to one of the Australian ones; 24. *OLYRA*, Linn., about twenty species, of which one is tropical African, the remainder tropical American, including as a section *Lithachne*, Beauv. (*Strephium*, Schrad., *Raddia*, Bertol.); 25. *PHARUS*, Linn., five American species; 26. *LEPTASPIS*, Br., three or four tropical species from Africa, Asia, or Australia, a genus nearly allied to, but perfectly distinct from, *Pharus*; 27. *LYGEUM*, Linn., a single maritime species from the Mediterranean region; 28. *STREPTOCHÆTA*, Schrad. (*Lepideilema*, Trin.), and 29. *ANOMOCHLOA*, Brongn., both single Brazilian species.

Tribe II. MAYDEÆ.

The grasses composing this tribe are usually erect and tall, with flat, long or broad leaves, the spikelets always unisexual, the males, in all except *Pariana*, in the upper part of the plant or of the inflorescences, the females at the base or in the lower axils, the grain, in all except *Zea*, enclosed in a hard stony case, formed variously of an outer glume or of a subtending bract. Where there are several fruiting spikelets in one inflorescence they are superposed, and each one falls away separately with the internode to which it is attached, the rhachis of the spike disarticulating at each node. The male spikelets either wither away or remain persistent above at the end of the stem or on the top of the uppermost fruiting spikelet. The tribe is thus perfectly well defined and quite distinct from any other; and the eight following genera of which it is composed, all tropical or American, and mostly small or monotypic, are likewise marked by positive characters.

1. *PARIANA*, Aubl., an American genus of about ten species, is in many respects anomalous. The females, as in the other genera, are single at each node of the articulate inflorescence; but the male spikelets, instead of forming a terminal panicle, surround the female at each node and fall away with it. The stamens are also indefinite in number, ten to twenty in the spikelets examined, but Nees found as many as forty; whilst in all the other genera of the tribe there are only the normal three. Doell describes the female flower as having five lodicules; but here there is probably a mistake. I have never been able to see more than three, which are rather large; but there are

sometimes within them two or three very minute scales, which may possibly be rudimentary staminodia. Doell has also proposed to separate generically, under the name of *Eremites*, a Brazilian plant which, from the single spike I have seen as well as from his description and figure, appears to be no more than a starved state of some true *Pariana*.

2. *COIX*, Linn. (*Lithagrostis*, Gærtn.), contains three or four East-Indian species closely allied to each other, one of which, the common "Job's tears," is widely spread over the warmer regions both of the New and the Old World, but in many places of comparatively modern introduction. The hard covering of the fruit here consists of the sheath of a subtending bract, the withered glumes as well as the internode of the rhachis remaining entirely enclosed within it.

3. *POLYTOCA*, Br. (*Cyathorhachis*, Nees), three or four tropical Asiatic species in which the stony case of the fruit is formed by the outer empty glume, which is completely closed over the remainder of the spikelet as well as the internode to which it is attached. The species are:—(1) *P. bracteata*, Br. (*Coix heteroclita*, Roxb.), spicis masculis terminalibus ramosis, inferioribus androgynis v. fœmineis plerisque simplicibus, glumis exaristatis: (2) *P. Wallichiana* (*Cyathorhachis Wallichiana*, Nees), spicis masculis terminalibus ramosis, inferioribus androgynis v. fœmineis plerisque simplicibus, spicularum masularum gluma exteriore longe tenuiterque aristata: (3) *P. macrophylla*, sp. n., spicis longis (omnibus?) androgynis simplicibus, glumis acuminatis exaristatis; folia adsunt 2-pedalia, 2 poll. lata, spicæ 4-6-pollicare: from the Louisiade Archipelago (*Mac Gillivray*).

4. *CHIONACHNE*, Br., contains three species from tropical Asia or Australia, in which the hardened fruit-case is formed, as in *Polytoca*, of the outer empty glume, but the internode of the rhachis, instead of being completely enclosed within it, is embraced only by its thickened margins, and is seen lying as it were in a groove of the fruit-case.

5. *SCLERACHNE*, Br., is a single Javan species, with the fruit nearly of *Chionachne*, but with a different habit, and the hardened outer glume is produced beyond the fruit into an open membranous appendage.

6. *TRIPSACUM*, Linn., consists of two or three American species with the terminal male inflorescence usually more branched than in the preceding Asiatic genera, approaching that of *Euchlæna*

and *Zea*; and the hardened fruit-case is formed partly only by the outer glume, and partly also by the broad thickened and hardened internode of the rhachis.

7. *EUCHLÆNA*, Schrad. (*Beana*, Brign.), has, like *Zea*, the terminal male inflorescence paniculate with numerous spikelets, and the female spikes in the lower axils wrapped up in broad bracts, from which are protruded the long filiform styles; but, as in the preceding genera, the female spikelets are within each bract superposed in a single row on the articulate rhachis of the single spike. The affinity to *Zea* appears to be recognized in the country; for specimens have been received from Schaffner purporting to be known as "wild maize."

8. *ZEA*, Linn. (*Mays*, Gærtn.).—This most important, widely diffused, and most striking grass is only known in a cultivated state, or perhaps as an escape from cultivation. With most of the general characters of the tribe to which it gives its name, it is exceptional not only in that tribe, but in the whole Order, by the manner in which its numerous female spikelets are densely packed in several vertical rows round a central spongy or corky axis. How far this arrangement may have gradually arisen after so many centuries of cultivation can only be a matter of conjecture. Its gradual progress cannot be traced through the numerous cultivated varieties, many of them described as species in Bonafous's splendidly illustrated monograph; and the idea that some of them are wild indigenous forms must be traced to the insufficiency of the observations recorded by travellers.

Tribe III. ORYZEÆ.

This tribe, as originally constituted, was loosely characterized, chiefly by uniflorous spikelets and stamens more than three—a character more or less dispersed through various different tribes; and several of the genera included in it by Kunth have since been rejected. The close affinity of *Oryzæ* and *Phalareæ* has also been recognized, though the limits of the latter tribe also have been very unsettled. In the 'Flora Australiensis' I had united the two as an intermediate tribe, connecting, as it were, the two great primary series of *Panicacæ* and *Poacæ*; but upon the whole it seems better to separate them as tribes technically distinct, but representative of each other in the two great series. The essential character of both resides in having the scale immediately under the single terminal perfect flower keeled or 1-nerved like the glumes, so as to

leave it uncertain whether it is a glume or a palea—that is, whether it be attached to the end of the rhachilla or primary axis of the spikelet, or to a secondary or floral axis reduced to a mere point. There are theoretical reasons in favour of both explanations, and actual observation is insufficient for determining the point. The first of these views has appeared to me the most plausible; and I have accordingly in my diagnoses and descriptions treated the scale in question as the flowering glume, and considered the palea as deficient, as it certainly is in some *Andropogoneæ* and *Agrosteæ*. In this view the technical distinction between the two tribes would be, that the *Oryzææ* have 2, 4, or rarely 3 glumes, all above the articulation of the pedicel, and the *Phalareææ* 4, 6, or rarely 5 glumes, the lowest pair persistent below the articulation of the rhachilla. *Oryzææ* thus characterized may be thought as a whole to be a rather artificial tribe; but they are divisible into two much more natural groups or subtribes—*Zizaniææ*, tropical or American genera, often semiaquatic plants, with a loose inflorescence and stamens often, but not always, more than three; and *Alopecureææ*, European or temperate Asiatic or African genera, with a dense spike-like inflorescence and stamens never more than three.

Zizaniææ includes the following eight genera:—

1. *HYDROCHLOA*, Beauv., a single species from Carolina, and there apparently rare, differing from *Zizania* chiefly in the inflorescence reduced to few-flowered spikes, of which the terminal one male and pedunculate, the lower ones female and sessile in the axils.

2. *ZIZANIA*, Linn., comprises two species, or according to others two genera, each with two or more species. As a whole, the genus is a natural one, well characterized by the unisexual spikelets in an androgynous panicle, each one with only two glumes and the males with six stamens. The typical *Z. aquatica*, Linn. (*Hydropyrum*, Link), has the lower part of the panicle more spreading and male, and the upper part narrow and female; it is widely spread over North America, and includes the East-Russian and Japanese *Z. latifolia*, which is absolutely identical with some North-American specimens. The other species, *Z. miliacea*, Kunth (*Zizaniopsis*, Doell), has the male and female spikelets more mixed in the panicle, the awns shorter, the styles more connate, and the grain broader—characters which appear to me quite insufficient for generic distinction. It is a North-American

plant, and possibly also South-American, if Sello's single specimen described by Trinius and figured by Doell as *Z. microstachys*, Nees, was really from South Brazil. I see nothing in the figure or description to distinguish it from *Z. miliacea*.

3. *LUZIOLA*, Juss., has, like *Zizania*, unisexual spikelets with only two glumes; but the spikelets are smaller, not awned, the styles short and quite distinct, and there are usually more than six stamens in the males. Six species are known from tropical America or the southern States of North America. The relative arrangement of the males and females varies as in *Zizania*. In the typical *L. peruviana*, Juss. (*L. brasiliensis*, Moric.), in *L. alabamensis*, Chapm., and in an apparently unpublished Guiana species, both sexes are in terminal panicles, but on distinct stems. In *L. Spruceana*, Benth., described by Doell (figured by G. F. W. Meyer as *L. peruviana*, but not Jussieu's plant), the males are in a terminal panicle, whilst the females are in the lower axils of the same stem, as they are also said to be in *L. longivalvis*, Doell, a Brazilian plant which I have not seen. In the proposed genus *Caryochloa*, Trin. (*Arrozia*, Schrad.), also Brazilian, the males and females are in the same panicle, the former in the upper, the latter in the lower part. The stamens in this species appear also to be always six only, which only occasionally occurs in the others; but the other characters are entirely those of *Luziola*, to which I should unite the *Caryochloa* as *L. micrantha* (*Arrozia micrantha*, Schrad.).

4. *POTAMOPHILA*, Br., if we include in it *Maltebrunia*, Kunth, is a natural genus of three species, connecting in some measure *Zizania*, of which it has the habit, with *Oryza*, of which it has the small setaceous or acuminate outer glumes. In the typical *P. parviflora*, Br., from Australia, the spikelets are more or less polygamous, though the greater number appear to be hermaphrodite; in *P. leersioides* (*Maltebrunia leersioides*, Kunth) from Madagascar, and in *P. prehensilis* (*Maltebrunia prehensilis*, Nees) from South Africa, they are usually all, or nearly all, hermaphrodite. Kunth also distinguishes *Potamophila* from *Maltebrunia* as having two flowers to the spikelet, a character not mentioned by Brown and which I have been unable to verify. The spikelets figured by Kunth, Rev. Gram. t. 5. figs. 1, 2, & 5, must be very rare and probably abnormal; I have searched in vain for them both in Brown's and in Beckler's specimens.

5. *HYGROHIZA*, Nees (*Potamochoa*, Griff.), is a single East-

Indian semiaquatic species nearly allied to *Zizania*, but quite distinct in its hermaphrodite flowers and other characters.

6. *ORYZA*, Linn. (*Padia*, Zoll. and Mor.), an Asiatic genus, of which the typical species, the well-known Rice, appears to be really indigenous in Australia as well as in East India; but it has been so much cultivated from time immemorial, that it is now found apparently wild in various parts of Africa and America. It has produced a large number of different forms, nearly twenty of which have been published as substantive species, all of which, or nearly all, are reduced by others to varieties of *O. sativa*. The Himalayan *O. coarctata*, Griff., appears, however, to have more positive characters; and possibly two or three others may be maintained as fairly established species.

7. *LEERSIA*, Swartz (*Homalocenchrus*, Mieg., *Ehrartia*, Wigg., *Asprella*, Schreb., *Blepharochloa*, Endl.), is essentially American; but the two commonest species—*L. hexandra* in tropical, *L. oryzoides* in more temperate regions—are widely spread also over the Old World, and had probably long been so before the civilized communication between the two continents. The genus is closely connected with the Asiatic *Oryza*; but, besides the apparent diversity in geographical origin, the smaller spikelets with thinner glumes and the general inflorescence give to *Leersia* a different aspect, and, in technical character, the want of the two small outer glumes may justify its retention as a distinct genus. It is true that those who unite it with *Oryza* maintain that these outer glumes are represented by a cartilaginous ring at the base of the spikelet; but this ring is often so slight as to be rather imaginary than real, and never more than what is observable in *Eriochloa* and some other Gramineæ, where no such theoretical explanation is wanted or attempted.

8. *ACHLENA*, Griseb., is a single Cuban species, which the author compares with the Australian *Microlæna*; but the want of any glumes below the articulation places it in Oryzæ, not in Phalaridæ. It is in some other respects allied to *Oryza* and *Leersia*; but the peculiar inflorescence, the form and proportion of the glumes, &c. readily distinguish it. Grisebach found only a single stamen in the flower, a character which I have no means of testing, the spikelets in our specimens having already lost their stamens.

The Alopecuroid group of Oryzæ consists of four genera:—

9. *BECKERA*, Fresen., two or three Abyssinian species, in some

respects intermediate between the two groups. The structure of the spikelets, with the two outer glumes very minute or deficient, connects them with the preceding genera; whilst the spicate inflorescence and three stamens are nearer those of *Alopecurus*, although the spikes are much more slender and several on the same stem, on long slender peduncles. The genus is confined to those of the § *a* of Steudel's 'Synopsis;' the species arranged under § *b* have a very different structure, and form the section *Beckeropsis* of *Pennisetum*.

10. *CRYPISIS*, Ait. (*Antitragus*, Gærtn.), must be limited to the original *C. aculeata*, which alone has the characters of the tribe. All the other species usually referred to it have the 2-nerved palea and other characters of the Agrostæ, and were well separated by Host under the name of *Heleochloa*. It is true that some short-spiked varieties of *Heleochloa schoenoides* have very much of the aspect of *C. aculeata*; but besides the structure of the spikelets and the articulation of the rhachilla, they are readily distinguished by the rhachis of the spike, which is linear and cylindrical, not flat as in *Crypsis*.

11. *CORNUCOPILÆ*, Linn., is a single Oriental species, very near *Crypsis*, but well characterized by the peculiar inflorescence and by the form of the fruiting spike and peduncle, which has supplied the generic name.

12. *ALOPECURUS*, Linn., including *Colobachne*, Beauv., and *Tozzettia*, Savi, is a well-known and perfectly definite European and temperate Asiatic genus, with the habit nearly of *Phleum* and the structure of the spikelets that of *Oryzæ*. Above forty supposed species have been enumerated; but at least half of them must be regarded as trifling varieties of the two or three commonest species, which have now, and perhaps from remote times, spread over a great part of the civilized world.

Tribe IV. TRISTEGINÆ.

This tribe, first proposed by Nees, has been fully adopted and much extended by Munro, and now consists of thirteen genera, which had been variously scattered in *Panicæ*, *Andropogonæ*, and *Agrostæ*, and are really more or less connected with the three tribes. They differ from *Panicæ* and approach *Andropogonæ* in the thin, often hyaline texture of the fruiting glume and palea, and by the frequent presence of a slender, often bent awn on the flowering glume. From *Andropogonæ* they are chiefly separated

by their inflorescence; the spikelets are singly scattered or clustered along the inarticulate branches of the panicle or, in the very few cases where they are in pairs, the two of each pair are perfectly similar. Tristegineæ are distinguished from Agrostææ by the characters which separate the two primary series Panicææ and Poacææ: The tribal name was given by Nees from the genus *Melinis*, which he published as *Tristegis*, believing it to be new; and although its identity with Beauvois's *Melinis* has since been established, it does not seem worth while now to alter the tribal name, which has been pretty generally adopted. Of the thirteen following genera, several of them common to the New and the Old World, the first four, with three glumes to each spikelet, are temperate or subtropical, the following nine all tropical, with four glumes to the spikelet.

1. *THURBERIA* is a new name I have been compelled to substitute for *Greenia* of Nuttall or *Sclerachne* of Torrey, both of which had been preoccupied. The genus is limited to two North-American species which Steudel has proposed to unite with *Limnas*; but they differ essentially from it in the awn of the flowering glume terminal, not dorsal, in the distinct styles, and other characters besides habit. I have named the genus after G. Thurber, who has much studied North-American Gramineæ and worked them up for S. Watson's Californian Flora. The genus formerly dedicated to him by Asa Gray has since proved not to be distinct from *Gossypium*, to which it has been reunited by the author himself.

2. *LIMNAS* is a single perfectly distinct species from East-Russian Asia, well described and figured by Trinius.

3. *POLYPOGON*, Desf., a genus readily known by its dense inflorescence and the long awns of its empty glumes, is one of those which interferes in some measure with general classification. It has usually been placed in Agrostææ; but the very decided articulation of the pedicel removes it from that tribe to the Tristegineæ, where in many respects it is allied to *Garnotia*. It consists of about ten species, dispersed over the temperate regions both of the northern and the southern hemisphere, one of them almost cosmopolitan, but they are rare within the tropics. It was first published by Savi under the name of *Santia* in the Memoirs of the Italian Society of Science, a publication which had so little circulation that the name has not found its way into standard works, and that of Desfontaines has now been so long and so generally in use in all countries, that it would only create useless confusion now to

take up Savi's. The Mexican *P. elongatus*, H. B. K., which is Presl's genus *Nowodworskya* (first described and figured by him under the name of *Raspailia*), has the pedicels, although clavate as in the rest of the genus, yet less decidedly articulate, thus forming some real connexion with the Agrostææ.

4. GARNOTIA, Brongn. (*Miquelia*, Nees, *Berghausia*, Endl.), which sometimes comes near to some forms of *Polypogon*, has, on the other hand, the spikelets in pairs on the inarticulate branches of the panicle as in *Miscanthus*, and thus very closely connects Tristeginææ with Andropogonææ. It has, however, none of the long hairs on the rhachilla so common in Andropogonææ, and cannot well be removed far from *Arundinella*, whilst *Miscanthus* is too near to *Imperata* to be rejected from Andropogonææ. *Garnotia* comprises about eight species from East India, China, and Japan.

5. ARUNDINELLA, Raddi, includes *Goldbachia*, Trin., *Acratherum*, Link, *Thysanachne*, Presl, and *Brandtia*, Kunth. It is the principal genus of the tribe, and comprises about twenty-four species spread over the tropical regions both of the New and the Old World, but chiefly in Asia. It is generally adopted and fairly characterized, though the habit and especially the inflorescence vary much, the panicle being sometimes long, narrow, and dense, or very large, loose, and spreading, with very numerous small or minute spikelets, whilst in a few species it is short and dense, forming almost an oval head with larger spikelets. The two sections proposed by Nees—*Meliosaccharum*, with a small tooth on the flowering glume on each side of the awn, and *Acratherum*, in which the glume is quite entire, tapering into the awn—do not prove to be well defined nor conformable to habit. *A. flammida*, Trin., from Brazil and tropical Africa, has neither the habit nor the character of the genus, but is in every respect a *Trichopteryx*, with which it was not compared by Nees, Trinius, or Doell, because it was at first only known as Brazilian, and *Trichopteryx* was supposed to be exclusively African.

6. PHÆNOSPERMA, Munro, is a single Chinese species, nearly allied to *Arundinella*; but there are three lodicules to the flower and no palea (unless one of the lodicules, although apparently in the same whorl as the others, be really a small palea), and the caryopsis is half exerted from the fruiting glumes as in some species of *Sporobolus*. *Phænosperma globosa*, Munro, is a tall grass with a very large loose panicle, the slender but rigid

branches distantly verticillate along the main rhachis. It was first received from the Jardin des Plantes at Paris, where it had been raised from seeds brought from China by the Père David; but it has since turned up among Shearer's Kiu-Kiang plants.

7. MELINIS, Beauv. (*Tristegis*, Nees, *Suardia*, Schrank), is a single Brazilian species, Nees's original type of the tribe. It is very near *Arundinella*, but remarkable for the long slender awn of the third empty glume, whilst the flowering glume is short, without any awn. Doell has reduced the genus to a section of *Panicum*, a view in which I can by no means concur.

8. TRISCENIA, Griseb., is a single Cuban species unknown to me, but from the author's description it must be very near to the following. 9. ARTHROPOGON, Nees, a single Brazilian species, well described and figured by Kunth. So also is 10. REYNAUDIA, Kunth, a single West-Indian species allied to *Arthropogon*; but the awn, longest on the lowest glume, is gradually shortened and reduced to a point on the flowering one, and there is no palea: there are, however, four lodicules, a condition so unusual in Gramineæ, that we might be tempted to consider the lowest pair of lodicules, though close upon the others, as being in fact a bipartite palea.

11. RHYNCHELYTRUM, Hochst., two or three tropical African species, which appear to form a fairly distinct genus allied to *Arundinella*, but approaching nearer to the Andropogonæ in the long hairs of the lower glumes. The generic name was originally Nees's, who applied it to a South-African plant of Drège's, which proves to be scarcely even a variety of the *Panicum* (*Tricholæna*) *roseum* of that country. Hochstetter and Steudel totally misunderstood Nees's genus when they added to it their *R. grandiflorum* and *R. ruficomum*, which may now, however, retain those names, Nees's genus being suppressed.

12. THYSANOLÆNA, Nees (*Myriachæta*, Zoll. and Mor.), is a single tropical Asiatic species, a very tall grass with long broad leaves and a very large full panicle, with innumerable minute spikelets in dense clusters along its long crowded branches. The flowering glumes are more or less covered with rather long hairs; but these hairs are so closely appressed and covered by the empty glumes that Steudel could not see them, and published a supposed second species as being destitute of them. Trinius figured the plant as a *Panicum*; by other early Indian botanists it was referred to *Agrostis*.

13. *CLEISTACHNE*, is a genus I have proposed for two plants, one from East India, the other from tropical Africa, which have something of the aspect of *Sorghum tropicum*; but the spikelets all hermaphrodite, and never in pairs, remove them from the *Andropogoneæ* to the *Tristegineæ*. I purpose figuring the genus in the forthcoming part of Hooker's *Icones*.

Tribe V. *ZOYSIÆ*.

I have composed this tribe of two groups or subtribes, which might perhaps have been regarded as separate tribes, although the difference between the two is only that which lies between the *Cenchrus* group and *Panicææ* proper. In the first group, *Anthephoreæ*, the spikelets disarticulate from the rhachis of the inflorescence or from the pedicels in little clusters of two to six, or very rarely more; in the other group, or *Zoysiææ* proper, the spikelets are solitary, or very rarely two together on the pedicels. In both groups the structure of the spikelets is generally that of *Andropogoneæ*, sometimes slightly approaching that of *Panicææ*, but the pedicels are singly scattered or alternate along the inarticulate rhachis of the spike or general inflorescence. The *Anthephoreæ* have hitherto been usually placed in *Panicææ*, as having nearly the inflorescence of *Cenchrus*, but of which they have not the hardened inner fruiting glume; the *Zoysiææ* proper have mostly been considered as *Andropogoneæ*, from which they differ in inflorescence. Of the twelve following genera, the first six belong to *Anthephoreæ*, the remaining six to *Euzoysiææ* or *Zoysiææ* proper.

1. *HILABIA*, H. B. K., in which I should include *Pleuraphis* of Torrey, and, judging from the figure and description, *Hexarrhena* of Presl, comprises five or six species dispersed over the Mexicano-Texan region, extending into California. Although the forms and proportions of the glumes of each spikelet vary much in the different species, or even in different spikes of the same plant, the genus as a whole is a natural one, and readily recognized by each cluster consisting of three spikelets, the central one containing a single fertile flower, either female or hermaphrodite, the two lateral ones each with two male flowers. The spikelets are often so closely sessile in the cluster, that it requires some care to ascertain which glumes belong to each cluster, and the pairs of male triandrous flowers of the lateral spikelets have sometimes been described as single hexandrous flowers. The species I have

seen are *H. cenchroides*, H. B. K., *H. Jamesii* (*Pleuraphis Jamesii*, Torr.), *H. mutica* (*Pleuraphis mutica*, Buckl.), *H. sericea* (*Pleuraphis sericea*, Nutt.), and a West-Texan species (*Wright* n. 758 and 2109, *Berlandier* n. 168, 1428) very near *H. cenchroides*, but apparently distinct.

2. *ÆGOPOGON*, Humb. and Bonpl. (*Hymenothecium*, Lag., *Schellingia*, Steud.), extends in two species from Bolivia to Mexico. The genus has at first sight much the aspect of the Asiatic *Melanocenchrus*, or of some of the very short-spiked species of *Bouteloua*, but the real affinity appears to be with *Hilaria*. The spikelets usually vary from two to six in the cluster, mostly with one hermaphrodite flower in each, though there are usually one or two empty barren spikelets intermixed; the clusters are in a loose one-sided spike, each one very readily disarticulating from its very short pedicel.

3. *CATHESTECHUS* of Presl, a single Mexican species, is only known to me from his figure and description, which do not agree with each other in some important particulars. He says that the genus is allied to *Ægopogon*. I have no means of judging whether that be really the case.

4. *ANTHEPHORA*, Schreb., is a very well-known and perfectly characterized genus of five or six species, of which one is tropical American, the others tropical or Southern African. *Hypudæurus*, Hochst., quoted by A. Braun in 'Flora,' 1841, p. 275, and by some others, is *Anthephora abyssinica*, Steud.

5. *TRACHYS*, Pers., is a single well-known species from the East-Indian peninsula, several times figured by the earlier botanists of this century. It is slightly anomalous in the tribe by its spikes being two together at the apex of the peduncle, and, as in *Anthephora*, the excessive hardness of the clusters of spikelets after flowering renders it difficult to trace their structure unless examined young. The name *Trachys* was changed by Reichenbach to *Trachyozus*, and by Dietrich to *Trachystachys*, as having been preoccupied by zoologists, a plea not now regarded as sufficient.

6. *TRAGUS*, Hall. (*Lappago*, Schreb.), is a single annual very well known as a common weed in tropical and temperate regions almost all over the civilized world.

7. *IATIPES*, Kunth, is a single tropical-African annual, extending eastward as far as Scinde, very well described and figured by Kunth. It has been united by others with *Tragus*; but the small spikelets, usually solitary or rarely two together on the

pedicel, and the very different shape and proportion of the glumes, seem sufficient to maintain the genus as distinct.

8. *LOPHOLEPIS*, DCNE., is a little slender East-Indian annual, allied in some respects to *Latipes*, but with excessively minute curiously shaped spikelets, so rapidly ripening and so very deciduous that it is very rare to find any on the specimens in an examinable state. The plant was first sent home by Wallich under the name of *Holboellia*, and was figured as such by Hooker in the Botanical Magazine; but in the meantime Wallich published a Lardizabalous genus under that name in his Tentamen of a Nepal Flora, and Decaisne therefore changed that of the present grass to *Lopholepis*.

9. *NEURACHNE*, R. BR., three Australian species, and 10. *PEROTIS*, AIT. (*Xystidium*, TRIN.), from the tropical regions of the Old World, of which the species are variously estimated as from two to seven, are both of them well-known genera, accurately described and figured.

11. *LEPTOTHRIUM*, KUNTH, founded on a specimen brought by Humboldt from tropical America, is unknown to me. It is said to be very near the Asiatic genus *Zoysia*, and, from the description, seems to differ chiefly in its widely distant geographical station and in the presence of an additional lower empty glume.

12. *ZOYSIA*, Willd. (*Matrella*, Pers.), is a well-defined genus of two or three maritime plants, dispersed over the shores of eastern and southern Asia, Australia, and New Zealand, extending also to the Mascarene Islands.

To these *Zoysiæ* I have provisionally added a small Mexican plant, the affinities of which are very puzzling, and which I have described and figured as a new genus *SCHAFFNERA*, so named after the collector from whom we have received it. At first sight it seemed to bear some resemblance to Presl's figure of *Cathechus*; but the structure of the spikelets is quite different, being nearly that of *Zoysia*, whilst the general inflorescence, though on a much smaller scale, approaches that of some species of *Andropogon* (*Cymbopogon*) or of *Apluda*.

Tribe VI. ANDROPOGONÆE.

This tribe is chiefly characterized by the spikelets in pairs at each node of the articulate rhachis of the spike or of the branches of the panicle, or in triplets at the end of each branch, and by the inner glume under the fertile flower being much smaller and

thinner than the lower or outer empty ones, usually hyaline, and often bearing a twisted or bent awn. The two spikelets of each pair are either both of them perfect and fertile, or one of them is male only or imperfect, or even quite rudimentary, and the spikelets are often more or less surrounded by long silky hairs. But to each of these characters there are exceptions in single genera, which are retained in *Andropogoneæ* as agreeing with them in most other respects.

The plants of this tribe are for the most part tropical or subtropical, although a few are found in more temperate regions, chiefly in the northern hemisphere. More than eighty genera have at different times been proposed, which some botanists would reduce to below twenty. Following as nearly as possible the principles we have hitherto adopted, I have thought that the following twenty-six may be admitted as fairly characterized, referring them to four subordinate groups or subtribes—*Sacchareæ*, *Arthraxeæ*, *Rottboellieæ*, and *Andropogoneæ* proper.

Sacchareæ comprise seven genera, in which the two spikelets of each pair are homogamous, both of them hermaphrodite and usually fertile, and the inflorescence paniculate, excepting *Pogonatherum*.

1. *IMPERATA*, Cyr., three or four species widely spread over the tropical and subtropical regions both of the New and the Old World, extending northwards to South Europe, China, and Japan. In this and the following, *Miscanthus*, the branches of the panicle are exceptionally inarticulate, showing an approach to the *Tristegineæ*; but the long silky hairs and the very much reduced hyaline flowering glume and palea retain them in *Andropogoneæ*. Munro has shown that the common American *I. caudata*, Anders., is identical with the Old-World *I. ramosa*, Anders.; and I also can find no difference between the two, any more than between the American and the Old-World specimens of *I. arundinacea*. Fournier has, however, proposed to separate the American forms of the two species generically under the name of *Syllepis*, on the plea of their having the two lodicules connate into a single large truncate one, which I have in vain sought for in several different American specimens. It is possible that Fournier may have considered the small truncate palea as a pair of united lodicules, but, if so, they are precisely the same in the Old-World species.

2. *MISCANTHUS*, Anders., as now limited, is a genus of eight species, of which one is South-African, the others dispersed over

Eastern Asia from the Malayan archipelago to Japan. It has the inarticulate panicle-branches and most other characters of *Imperata*, from which Andersson technically separated it by the awn of the flowering glume. Exceptional unawned species occur in so many genera where they are usually awned, that this can scarcely be regarded as a generic character where there is nothing else to separate the two forms. Here, however, if we remove one species from *Imperata* to *Miscanthus*, inflorescence supplies two natural groups. In *Imperata* the panicle is long, narrow, and dense, with short erect branches buried in the copious silky hairs, the glumes are never awned, and there is only one, or rarely two, stamens; in *Miscanthus* the panicle is loose, with long spreading branches, the silky hairs are less dense and in one species almost wanting, the flowering glume is in most species awned, and there are always three stamens. The species known to Trinius were by him included in *Eulalia*; and Munro, whom I followed in the 'Flora Hongkongensis,' restricted the name *Eulalia* to the species now constituting *Miscanthus*; but as the true *Eulalia* of Kunth is the type of a section of the very different genus *Pollinia*, I have thought it necessary to adopt Andersson's later name *Miscanthus*. Besides his species, I would include in the genus *M. fuscus* (*Eriochrysis fusca*, Trin., *E. attenuata*, Nees) from East India, *M. saccharifer* (*Imperata saccharifera*, Anders.), from North China, which has the inflorescence and stamens, but not the awns, of the other species, and *M. cotulifera* (*Eulalia cotulifera*, Munro) from Japan, which has scarcely any of the hairs of the other species. Steudel proposed the latter as a distinct genus under the name of *Eccoilopus*.

With 3. SACCHARUM and 4. ERIANTHUS commence the series of true Andropogoneæ with the branches of the panicle articulate; and these two genera are so closely connected that they might well be reunited, although they are now almost universally recognized as distinct. There might indeed be no great objection to consider both, as well as *Pollinia* and *Spodiopogon*, as sections of one large genus. As now limited, *Saccharum* is chiefly characterized by the compound panicle, usually dense, sometimes very large, and the spikelets very small without any points or awns to the glumes. The species are supposed to be about ten, the typical ones belonging to the tropical or subtropical regions of the Old World, amongst which the well-known sugar-cane is now extensively cultivated also in America. The genus would also

include *S. Nareya* (*Eriochrysis Nareya*, Nees) and *S. longifolia*, Munro (*Eriochrysis longifolia*, Munro), from East India, *S. pallida* (*Eriochrysis pallida*, Munro) from South Africa, and *S. cayennense*, the typical *Eriochrysis* of Beauvois, which last differs only in the very dense almost spike-like panicle.

4. *ERIANTHUS*, Mich. (*Ripidium*, Trin.), would be a more satisfactory genus if it could be restricted to the two old species *E. saccharoides*, Mich., from North America, and *E. Ravennæ*, Beauv., from the Old World; but besides the above-mentioned connexion with *Saccharum*, there are several South-American species which run very closely into *Pollinia*. On the whole, it seems best to consider *Erianthus* as an intermediate genus between *Saccharum* and *Pollinia*, having the inflorescence of the former, but the flowering-glume more developed into a point or awn almost as in *Pollinia*. It would then consist of about twelve species, amongst which *E. stricta*, Nees, from North America, has no hairs on the rhachilla, but only a short pubescence on the glumes.

5. *SPODIOPOGON*, Trin., differs from *Pollinia*, as *Chrysopogon* does from *Andropogon*, chiefly in inflorescence. The short branches of the panicle bear three spikelets, one sessile between two pedicellate, and occasionally there is a pair of spikelets below the three terminal ones; but the branches never form the regular spikes of *Pollinia*. Besides the original *S. sibiricus*, Trin., we have two additional species, *S. pogonanthus*, Boiss., from the Levant, and *S. albidus* (*Andropogon albidus*, Wall. Cat. Herb. Ind. n. 8821), from East India. The generic name has also been often misapplied. *S. angustifolius*, Trin., is a *Pollinia*; some others of his species with 2-flowered spikelets belong to *Ischænum*. Fournier's Mexican *Spodiopogons* are evidently species of *Erianthus*; his *S. foliata* indeed (Bourgeau, n. 2979) appears to me to be identical with the original *E. saccharoides*, Mich.

6. *POLLINIA*, Trin., is now a genus of about twenty-five tropical or subtropical Old-World species, with the inflorescence of the section *Gynnandropogon* of *Andropogon*, and the homogamous spikelets of *Saccharum* and *Erianthus*; the spikelets are in pairs along the simple branches of the panicle; these branches either few, almost digitate at the end of the peduncle, or more numerous and scattered along the main rhachis. The genus is divisible into two very natural sections:—1. *Eulalia*, with the spikes and pedicels covered with long silky or rufous hairs as in *Erianthus*, includes

P. aurea, Benth. (the original genus *Eulalia*, Kunth), *P. articulata*, Trin. (*Pogonatherum contortum*, Brongn.), *P. eriopoda*, Hance (*Spodiopogon angustifolius*, Trin.), *P. longisetus* (*Erianthus longisetus*, Anders.), *P. versicolor* (*Erianthus versicolor*, Nees), *P. filifolius* (*Erianthus filifolius*, Nees), and a few others. 2. *Leptatherum*, with slender spike-like branches, of which the hairs are few or short, so as to appear sometimes quite glabrous; this section includes *P. glabrata*, Trin. (*Eulalia glabrata*, Brongn.), *P. nuda*, Trin. (*P. imberbis*, Nees), *P. Willdenowianum* (the genus *Microstegium*, Nees, *P. lancea*, Nees, published also by Nees as his genus *Leptatherum*, and probably also Steudel's *Nemastachys*). Sprengel's *Pollinia* would have had the right of priority over Trinius's; but that proved a farrago made up of a few heterogeneous species of *Andropogon*, *Chrysopogon*, and *Pollinia*.

7. *POGONATHERUM*, Beauv. (*Homoplitis*, Trin.), is a single tropical and subtropical Asiatic species, very well marked by its slender, much branched habit, the single spikes, and the slender awns arising as well from the second empty glume as from the flowering one.

The *Arthraxeæ*, or second group of *Andropogoneæ*, consist of three genera, which have the inflorescence of *Pollinia*; but the second spikelet of each pair is generally reduced to a bare stipes, or is even quite deficient, bringing a few species very near to the *Zoysieæ*, differing chiefly in their subdigitate spikes, whilst a few others, in which the spikes are single, have the rudiment of the second spikelet of true *Andropogoneæ*.

8. *APOCOPIS*, Nees (*Amblyachyrum*, Hochst.), has five or six species from East India or the Malayan archipelago, characterized by the very broad truncate outer glume enclosing the rest of the spikelet. Among the species *A. Royleanus*, Nees (*Ischænum paleaceum*, Trin., *Andropogon paleaceum* and *A. himalayensis*, Steud.), is remarkable for the awn often (but not always) reduced to a small fine point, or even entirely wanting; and *A. tridentata* (*Andropogon tridentatus*, Royle) has, on the contrary, a very long awn, and the young spikes are usually enclosed in a large spathe-like bract.

9. *DIMERIA*, R. Br. (*Haplachne*, Presl, *Didactylon*, Zoll. and Mor., *Psilostachys*, Steud., *Pterygostachyum*, Nees), about ten species from the Indo-Australian region, has very slender spikes, the lower empty glumes very narrow and rather rigid, and usually, if not always, only two stamens.

10. **ARTHRAXON**, Beauv. (*Pleuroplitis*, Trin., *Batratherum*, Nees, *Lucea*, Kunth, *Lasiolytrum*, Steud., *Alectoridia*, A. Rich., *Psilopogon*, Hochst.), has also about ten species, chiefly from the Indo-Australian region, but extending on the one hand to China and Japan, and on the other to tropical Africa. The spikes are slender as in *Dimeria*; but there are three stamens, and the lower empty glume is broad but acute, not truncate as in *Apocopis*.

Rottboellia, the third group of Andropogonæ, is often regarded as a distinct tribe, characterized by the simple spike, the spikelets in pairs at each notch or excavation of the rachis, the one sessile, the other pedicellate, and no awn to the flowering-glume. There are, however, as in other subtribes, here and there exceptions to one or more of these characters. We have seven genera.

11. **ELIONURUS**, Humb. and Bonpl., has about twelve species, chiefly South-American or African, with, however, one Australian and one from the East-Mediterranean region. They all differ little from *Rottboellia* besides the long silky hairs which clothe the spike, thus connecting *Rottboellia* with other Andropogonæ. *E. hirsuta*, Munro (*Rottboellia hirsuta*, Vahl), has been proposed by Boissier as a distinct genus *Lasiurus*, as having the spikelets in threes instead of in twos at each node of the rachis. But that character is by no means constant; in several specimens I have found the spikelets in threes or even in fours at the lower nodes; but in others they are in the normal pairs from the base of the spike.

12. **ROTTBOELLIA**, Linn. f., a tropical or subtropical genus widely spread, but chiefly in the Old World, has been either extended to nearly the whole subtribe or very variously restricted to a small number or to a single species. It seems best characterized by including all those which have the simple terete spike, without the hairs of *Elionurus* or the peculiarities of the four following genera. It would contain about eighteen species, amongst which several have been proposed as monotypic genera. *Cælorhachis*, Brongn., is *R. muricata*, Retz (*R. glandulosa*, Trin.); *Peltophorus*, Desv., is *R. myurus*: in both of these the lowest or outer glume of the perfect spikelet is rigid and bordered on each side at the apex by a membranous wing, which, however, is also present, but much less prominent, in *R. rugosa*, Nutt. *Phacelura*, Griseb. (*Pholiurus*, Trin. in Spreng. Neue Entd. ii. 67, not of the Fundam. Agrost.), is the Oriental *R. digi-*

tata, Sibth. (*R. Sandorii*, Friwaldsk.), a species striking for the long spikes, occasionally though very rarely branched at the base, and from the rather large spikelets with acuminate outer glumes showing an approach to some *Vossia*, but scarcely sufficiently distinct from *Rottboellia* to be kept up as an independent genus. *Cymbachme*, Retz, a Bengal grass, has been referred by Willdenow to *Rottboellia*. Retz's character does not quite agree; but the plant has not since been identified, and must remain doubtful. *Apogonia*, Fourn., comprises two Mexican species which I am unable to distinguish from *Rottboellia*: Nuttall's section *Apogonia* of *Rottboellia* is a species of *Elionurus*, very closely allied to, if not a variety of, *E. ciliaris*, H. B. K.

13. OPHIURUS. This genus, as first proposed by Gærtner, included two very different plants separated by Brown as *Lepturus* and *Ophiurus*. As the latter is now limited, it differs from *Rottboellia* only in the absence of the second sterile spikelet of each node, at least in the upper part of the spike or inflorescence. It consists of three, or perhaps four, Asiatic, African, or Australian species:—*O. corymbosa*, Gærtner. (*O. aethiopica*, Steud.), *O. monostachya*, Presl (*O. undulata*, Nees), and *O. laevis* (*Rottboellia laevis*, Retz, *R. perforata*, Roxb.). The latter species is remarkable for having the spikelets in the lower part of the inflorescence in pairs at each node as in *Rottboellia*, but the two of each pair separated by a kind of partition dividing the cavity of the rhachis into two; it has therefore been raised to a genus by Kunth as *Mnesithea* and by Nees as *Thyridostachyum*. Generally, however, in the upper part, and sometimes in the whole inflorescence, the sterile spikelet is wanting, as in *Ophiurus*, especially in the young spike, for the upper or *Ophiurus* portion appears to fall away very readily, leaving only the *Mnesithea* part persistent. *Lepturus*, Br., is now classed in the tribe Hordeæ.

14. RATZBURGIA, Kunth, a very elegant little flat-spiked Burmese grass, and 15. MANISURIS, Linn., a common tropical weed with little globular spikelets, have both been well described and figured.

16. HEMARTHRIA, Br., contains two or three tropical weeds or maritime grasses, separated from *Rottboellia* chiefly on account of the flattened and less distinctly articulated rhachis of the spike, and the curious way in which the stipes of the sterile spikelet is adnate to the rhachis, so as to make it appear sessile and almost opposite to a fertile spikelet, which really belongs to the next

superior node. These characters, though generally well marked, are sometimes more or less obscure.

17. *VOSSIA*, Wall. and Griff., closely connects the *Rottboellieæ* with *Ischæmum*. As in the former, the flowering glume is always unawned, and the rhachis of the spike is rigid and deeply notched, but the lower empty glume, at least of the pedicellate spikelet, is produced into a long point or awn; there are generally several spikes or simple branches along the common peduncle, and there is in each sessile spikelet a male flower below the terminal fertile one, as in *Ischæmum*. The genus was originally established on a handsome semiaquatic East-Indian grass, which has since been found also in tropical Africa, and two or three additional species have reached us from the same country. We should also refer to *Vossia* the *Ischæmum speciosum* of Nees from East India. *Eremochloa*, a Japanese plant described by Büse, is unknown to me; but the character given, if I correctly understand it, agrees well with that of *Vossia*.

To the fourth group, or subtribe *Euandropogoneæ*, may be referred nine genera, in which the two spikelets of each pair are heterogamous and the flowering glume of the fertile one is more or less awned; and in the first five the spikelets are in many pairs along the rhachis of the simple spikes or panicle-branches. These nine genera are increased to twenty-one by Andersson and others, whilst Steudel unites seven out of the nine under his *Andropogon*.

18. *THELEPOGON*, Roth (*Jardinia*, Steud.), comprises one East-Indian and two or three tropical-African species, all very elegant and closely resembling each other. Their inflorescence is that of *Vossia*, whilst the spikelets are nearer those of *Ischæmum*, but remarkable for the rigid tuberculate outer empty glumes. Nees, in working up Wight and Arnott's Peninsular grasses, gave Roth's name to a very different grass (*Ischæmum semisaqittatum*, Roxb.), adding the observation that Roth's description is very bad. The fact is, however, that it is Nees who was mistaken in his identification, whilst Roth's description of the true plant is excellent.

19. *ISCHÆMUM*, Linn., as now understood, has about thirty species, widely dispersed over the warmer regions both of the New and the Old World, the chief character connecting them being that the sessile spikelets have a male flower below the terminal fertile one. The spikes are also usually stouter than in *Andropogon*, and the genus is a fairly natural one. Beauvois restricted it to the *I. muticum*, Linn., in which the awn of the flowering glume

is small and hair-like or sometimes entirely wanting, and proposed a genus *Meoschium*, adopted by Nees, for the other species in which the awn is more developed. Trinius considered as true *Ischæma* only those in which the pedicellate spikelet has only a male flower or empty glume, and added those in which that spikelet has two male flowers to his genus *Spodiopogon*, notwithstanding the difference in inflorescence &c. *Ischæmopogon*, Griseb., is *I. latifolium*, Kunth, and *Hologamium*, Nees, is *I. laxum*, Br., both species with two-flowered pedicellate spikelets, as is also the case in *I. insculptum*, Hochst., and *I. macrostachyum*, A. Rich., from tropical Africa, and probably also in Forskâhl's genus *Sehima*, of which we have no authentic specimen. *I. pectinatum*, Trin., *I. leersioides*, Munro, *I. ophiuroides*, Munro, with a fourth unpublished species, all from tropical Asia, form a distinct section (*Pectinaria*), with slender elegant simple spikes, and the larger glume of the sessile spikelets pectinate-ciliate.

20. TRACHYPOGON, Nees, as limited by Andersson, and 21. HETEROPOGON, Pers., closely resemble each other in their simple spikes with appressed imbricate spikelets and long rigid twisted awns; but in *Trachypogon* the sessile spikelet of each pair is male or sterile and unawned, and the pedicellate one fertile and awned, whilst in *Heteropogon* the sessile one is fertile and awned, and the pedicellate one male or sterile and unawned. Andersson enumerates eleven species of *Trachypogon*, one from South Africa, the others from tropical or subtropical America; but several of the latter can scarcely be regarded as more than slight varieties. Of *Heteropogon* there are two well-marked species, *H. contortus*, Rœm. and Schult. (*H. hirtus*, Pers.), now very common in most warm regions and extending to the Mediterranean region and to North America, and *H. melanocarpus*, Ell. (*H. Roylei*, Nees, *H. acuminatus*, Trin., *Trachypogon scrobiculatus*, Nees), which is in North and South America as well as in East India. Besides these, three or four South-African species have been referred to *Heteropogon*, but are of somewhat doubtful affinity.

22. ANDROPOGON, Linn., taking it within the limits assigned to it by Munro, including all the species of the subtribe with spike-like simple branches to the inflorescence, and without the peculiarities of the three preceding genera, is still a somewhat polymorphous genus of perhaps a hundred species, very abundant within the tropics, but well represented also in Europe, temperate Asia, North America, South Africa, and Australia. The fourteen

genera into which it has been divided may be fairly reduced to the following five, perhaps too artificial, sections:—1. *Schizachyrium*, about a dozen species, with the spikes always single upon each peduncle. The genus *Schizachyrium*, Nees, was limited to a few species in which the spike is slender and not very hairy. *Diectomis*, H. B. K., is the American *A. fastigiatus*, Sw., found also in tropical Africa, which has a more rigid spike and the second empty glume conspicuously awned. *Homœatherum*, Nees, is an Asiatic species scarcely to be distinguished from the same *A. fastigiatus*. In 2. *Cymbopogon*, the spikes, often very silky-hairy or woolly, are in pairs on each peduncle, and the peduncle partly or wholly enclosed in the sheath of a leafy or spathe-like bract. The species are numerous, chiefly in the Old World, and include the *lemon-grass* and its allies. Andersson has divided the section into two genera, *Gymnanthelia* and *Hyparrhenia*, and perhaps more; but as he has never published their characters, I am unable to form any clear idea of them. It would appear, however, from the species quoted, that *A. schœnanthus* and its allies would belong to *Gymnanthelia*, and *A. hirtus* and its allies to *Hyparrhenia*. 3. *Gymnandropogon*, has two or more spikes sessile at the end of the peduncle, without any sheathing-bract. The species are nearly as numerous as those of *Cymbopogon*. Amongst them, *A. annulatus*, Forsk., though closely allied to the common *A. Ischæmum*, forms the proposed genus *Dichanthium*, Willem.; *A. serratus*, Retz, with a broad herbaceous outer glume, is Trinius's genus *Lepeocercis*; and it is most probable that Steudel's *Euklastaxon* is the common American *A. virginicus*. 4. *Amphilophis*, Trin., would include *A. laguroides*, DC., and *A. argenteus*, DC., from tropical America, with *A. scandens*, Roxb., and *A. Vachellii*, Nees, from tropical Asia, and a few others, differing from *Gymnandropogon* in the more numerous, usually long and often pedicellate spikes, sometimes even divided at the base, forming almost a saccharoid panicle. 5. *Vetiveria*, Thou. (*Mandelorna*, Steud.), is the well-known *Vitiver*, *A. muricata*, Retz, to which Munro would reduce as varieties *A. nigritana*, Benth., and *Vetiveria arundinacea*, Griseb., a species frequent in East India and tropical Africa and introduced into America, distinguished by its numerous spikes verticillate along the axis of a long simple panicle, all glabrous or only minutely hairy, and the awn of the flowering glume often very much reduced. Beauvois's genus *Anatherum*, sometimes supposed to be specially destined for this plant, included also all the species

of the sections *Cymbopogon* and *Gymnandropogon*, in which the awn is much reduced or obsolete. *Agenium*, Nees, from his character, would also refer to one of these species without prominent awns.

23. CHRYSOPOGON, Trin. (*Rhaphis*, Lour., *Centrophorum*, Trin.), and 24. SORGHUM, Pers. (*Blumenbachia*, Koel.), are two genera very nearly allied to each other and differing from *Andropogon*, as *Spodiopogon* does from *Pollinia*, chiefly in their inflorescence; the branches of the panicle bear three spikelets at the end, a sessile one between two pedicellate ones, and occasionally only one or two pairs below on the same branch. They were both included by Linnæus, and afterwards by Brown, in *Holcus*, a name since restricted to that portion of the old genus which belongs to Avenaceæ. *Chrysopogon*, as now constituted, has nearly twenty species, chiefly tropical or subtropical, but including also the European *C. Gryllus* and some other temperate species. The genus may be divided into two natural sections: in the typical form the pedicellate spikelets usually contain a male flower; in the section *Stipoides*, exclusively American, it is reduced to a long hairy stipes rarely bearing a minute rudimentary glume. This section includes *C. nutans*, *C. avenaceus*, *C. stipoides*, *C. Minarum*, and a few others. *Sorghum* differs from *Chrysopogon* in habit, in the scarcely articulate branches of the panicle, and in the glumes of the fertile spikelets more hardened after flowering. The number of species is very uncertain, for, of the two principal ones, *S. halepense* is so widely spread as a tropical or subtropical weed, and *S. vulgare* so long and so generally cultivated in warm regions for a variety of purposes, as to have produced a great variety of forms, raised by many to the rank of species.

25. ANTHISTIRIA, Linn. fil. (*Themeda*, Forsk.), if taken as a whole, is a very natural genus, of about a dozen species from the warmer regions of the Old World, easily recognized by its inflorescence. The spikelets are in short dense spikes or clusters, usually seven together, of which the four lower ones (two pairs) are either empty or with a male flower in each, and are placed apparently in a whorl, forming a kind of involucre round the three inner ones, which, as in *Chrysopogon*, are one sessile between two pedicellate ones. In a few species the number of spikelets is raised to nine, or even to eleven, by the intervention of one or even two pairs of spikelets between the involucre and the terminal ones. These slight differences in the number or in the

pedicellation of the spikelets have induced the proposal of distinct genera for most of the species, and several of them have been adopted by Andersson in a monograph most carefully worked up in as far as the materials at his command admitted, but in which, for want of access to a sufficiently rich library, he is much mistaken as to several of the synonyms quoted. These proposed genera are:—1. *Aristaria*, Jungh., for *A. frondosa*, Br. (*A. Jung-huhniana*, Nees), which forms the section *Heterelytron* of Andersson, but not Junghuhn's genus of that name. 2. *Perobachne*, Presl, is *A. arundinacea*, Roxb., forming Andersson's subsection *Chrysanthistiria*. 3. Andersson's subsection *Euanthistiria* for the common *A. ciliata*, Linn., and its immediate allies, to which some botanists would restrict the genus. Andersson distinguishes twelve species, adding at the same time that they might well all be reduced to varieties of a single widely-spread species. 4. *Androscepia*, Brongn. (*Heterelytron*, Jungh.), was founded originally on the *A. gigantea*, Cav., but became a very unnatural group when made to include *A. (Androscepia) anathera*, Anders., which very closely resembles *A. (Euanthistiria) minuta*, Anders., and a variety *armata*, Anders., of *A. gigantea*, which is much nearer to the *A. (Perobachne) arundinacea*. 5. *Iscilema*, Anders., containing two East-Indian and one Australian species, and 6. *Exothea*, Anders., comprising *A. abyssinica*, Hochst., from tropical Africa, and *A. fasciculata*, Thw., from Ceylon, have each a peculiar habit and characters, sufficient to maintain them as sections. 7. *Germainia*, Balansa, has, perhaps, two closely allied species—*A. caudata*, Nees, from Khasiya and China, and the typical *A. capitata* from Saigou; the latter, however, which I only know from Balansa's figure and description, is exactly like the Chinese plant, except that there appear to be rather more spikelets in the cluster.

26. *APLUDA*, Linn., is now universally recognized as a distinct and natural genus, limited to the two tropical-Asiatic species originally assigned to it by Linnæus, though his character was even then very imperfect, and rendered still more so by the subsequent addition of the very different American *Zeugites*, which Schreber afterwards restored as an independent genus. Beauvois, however, threw every thing into confusion; for it is evident from his figures that his *Diectomis* is *A. aristata*, Linn., and his *Calamina* is *A. mutica*, Linn., though in drawing up his character for the latter he combined it with some species of *Anthistiria*. Beauvois's *Apluda* is certainly different, probably a *Chrysopogon*.

Series B. POACEÆ.

Having already explained the difference between the two primary divisions of Gramineæ, I need only repeat here that the main characters of Poaceæ consist, firstly, in the want of any articulation of the pedicel below the lower empty glumes, which remain persistent after the fruiting one has fallen away, or fall away separately, and, secondly, in the male or imperfect or rudimentary flowers, when present, being above, not below, the fertile one. The former character is all but universal; but from the latter one exceptions are not very rare, besides that, where there is only one flower without any continuation of the rhachilla beyond it, the character entirely fails. I should add that in some tribes of Poaceæ there are two or more perfect flowers in the spikelet, which is not the case in Panicaceæ; and may now proceed to examine in detail the eight tribes into which this second series may be divided.

Tribe VII. PHALARIDÆ.

The close affinity of this tribe and the Oryzæ has been generally admitted, and the two are usually placed in juxtaposition; I had even proposed their consolidation into a single one in the 'Flora Australiensis.' They have in common the important character of the scale immediately under the single perfect terminal flower being keeled or one-nerved, so as to make it a matter of discussion whether it be a glume terminal on the main axis or rhachilla of the spikelet, or a palea at the base of a secondary floral axis. The deciduous part of the spikelet of Phalaridæ with its four glumes (or three glumes and a palea) is precisely as in Oryzæ; but there are in addition, below the articulation, the two persistent empty glumes characteristic of Poaceæ. The spikelet, therefore, in this tribe consists of six glumes (or five and a palea), the lowest pair empty below the articulation; the second pair, above the articulation, corresponding to the lowest two glumes of Oryzæ, are usually empty and small, sometimes reduced to a small bristle, rarely enclosing each a small palea or a male flower; the upper pair (or glume and similar palea) enclosing the terminal fertile flower and fruit, without any continuation of the rhachilla above it. A slight apparent exception will be mentioned under *Phalaris* itself; and in the genus *Cinna* of Agrostidæ and a very few *Bambusæ* the palea of the fertile flower is, at least apparently,

one-nerved, but otherwise the character of *Phalaridæ* is constant. They comprise the following six genera:—

1. *EHRHARTA*, Thunb. (*Trochera*, L. C. Rich.), has twenty-four species, of which two are from New Zealand, two from the Mascarene Islands, and all the rest from South Africa. In them the glumes of the second pair are the largest, empty and usually awned, and the fertile flower has six stamens. 2. *MICROLÆNA*, Br., including *Diplax*, Hook. f., has five Australian or New-Zealand species, differing from *Ehrharta* only in the number of stamens reduced to four or two. 3. *TETRARRHENA*, Br., four Australian species, with four stamens to the flower as in *Microlæna*, but the glumes are in less regular pairs, all unawned, and the fourth (one of the second pair) alone the largest. The panicle is also almost always contracted into a spike, not, however, so dense and cylindrical as in the following two genera.

4. *PHALARIS*, Linn., has nine or ten extratropical species, chiefly from the Mediterranean region, but also extending to North and South America. In this genus it is the lowest two persistent empty glumes that are the largest, usually very flat, and often winged on the keel, the second pair (like the lowest in *Oryza*) very narrow, sometimes reduced to small bristles, those of the upper pair thin and hyaline; and sometimes in both of them, but almost always in the uppermost one, the central nerve is very faint or quite obsolete, a character adduced as an argument that this upper one is a two-nerved palea on the floral axis, and not a glume on the main rachilla. The two nerves are, however, very faint, and the central keel is usually marked by a line of hairs on the outside, and the question remains a moot one. In the majority of species the panicle is contracted into a dense globular or cylindrical head; but in *P. arundinacea*, Linn., a stout tall species, forming the genus *Digraphis*, Trin. (*Baldingera*, Gärtn., Meg., and Schrad., *Typhoides*, Moench), the inflorescence, though still very dense, is more or less branched or interrupted. This genus has also been supposed to be distinguished by the want of the broad wings of the outer glumes, so conspicuous in the common *P. canariensis*; but these wings are very narrow in *P. paradoxa*, Linn., and entirely disappear in *P. intermedia*, Bosc (*P. americana*, Ell.), leaving no available character to separate *Digraphis* generically.

5. *ANTHOXANTHUM*, Linn., has four or five European species, of which one is now widely spread over various regions of the

globe, but often only as an introduced weed. One at least of the glumes of the lowest pair is the largest of the spikelet, as in *Phalaris*; those of the second pair, though small and without flowers, have a dorsal awn. The panicle is usually cylindrical and spikelike.

6. *HIEROCHLOA*, Gmel. (*Savastana*, Schrank, *Disarrenum*, Labill., *Torresia*, Ruiz and Pav.), about eight species from the colder or mountain regions both of the northern and the southern hemispheres, is usually referred to Avenaceæ next to *Holcus*; but it appears to me to be much nearer to *Anihoxanthum*, from which it differs in its looser paniculate inflorescence, and in the glumes of the second pair being but little smaller than the lower ones, and frequently, but not always, enclosing each a male flower. *Ataxia*, Br., one or two Asiatic and two South-African species, forms a section of *Hierochloa*, differing slightly from the typical form in the glumes of each pair being more unequal, the lower one only of the second pair (rarely both) having a male flower. *A. mexicana*, Rupr., seems to connect the two sections.

Tribe VIII. AGROSTÆ.

The large tribe Agrostæ is one of the most difficult to circumscribe satisfactorily, or to divide into definite genera. We have taken it nearly in the sense given to it by Trinius, so as to include the Stipeæ, of which other botanists make a distinct tribe; and we have adopted thirty-seven genera, a number which some would extend to above eighty, whilst others might reduce it to about thirty. Their general character is to have a single flower in each spikelet, either apparently terminal as in Panicaceæ, or with a slight bristle-like continuation of the rachilla beyond it; and from these Panicaceæ they are constantly distinguished by the pair of empty glumes persistent below the articulation of the rachilla, without any empty glume or male flower intervening between the articulation and the flowering glume. The single flower in the spikelet, which separates the tribe from the following ones, is not so positive a character, as it occurs also in one genus of Avenæ, in a few genera of Chloridæ, and occasionally in a few exceptional species of some genera of Festuceæ, which cannot well, from inflorescence or other accessory characters, be included in Agrostæ. There are also two species of *Sporobolus* which approach the Isantheæ in having frequently two flowers; and in *Coleanthus* the lower empty glumes are entirely deficient.

Trinius, in his elaborate monograph of the tribe, divided it into three primary groups or subtribes—*Vilfæ* with the callus scarcely prominent or quite obsolete, *Agrosteæ* with the callus globular, and *Stipeæ* with the callus obconical. In this I feel unable to follow him. In the first place he does not appear to have considered what the so-called callus really is. It is not, as the name would suggest, an appendage to the base of the flowering glume, or, as he would have termed it, to the flower, but only the upper or principal part of the rhachilla or axis of the spikelet, to which the glume and its enclosed flower are attached, and which breaks off immediately above the persistent empty glumes. Its shape depends on the distance at which the flowering glume is attached above the empty ones, a distance very variable throughout the Order. And although the long or the short interval may be more prevalent or even constant in some genera, yet I have never found the variations so precise as to be defined by actual measurement, and the species are numerous, even in *Stipa* itself, where it is doubtful whether we should call it long or short. It is sometimes a useful accessory character, but, I believe, never positive enough to be regarded as subtribual. It is true that no other simple absolute character has yet been proposed for the subdivision of the tribe; but we are obliged, here as elsewhere, to take a combination of characters, to each of which an occasional exception must be allowed. Acting on this principle, we might, whilst following in many respects the arrangements of Kunth and others, admit thirty-seven genera of *Agrosteæ*, distributed in four fairly natural subtribes, all four of wide geographical range, but chiefly in temperate regions, the tropical species mostly confined to mountain districts, and no genus, except a few monotypic ones, exclusively tropical.

Our first subtribe, *STIPEÆ*, is the long-established one of that name, slightly extended so as to include *Oryzopsis*, *Muehlenbergia*, and their immediate allies, the close connexion of which with *Stipa* has been frequently suggested. The subtribe thus formed would be characterized by the paniculate inflorescence not condensed into the cylindrical spike of *Phleoidæ*, by the rhachilla of the spikelet not produced beyond the flower except in the single species of *Brachyelytrum*, by the awn of the flowering glume terminal, not dorsal as in *Euagrostæ*, and especially by the grain being very closely enveloped in the fruiting glume. In the majority of species these characters are well marked; but

in the larger genera there occur occasional exceptions more or less decided, which prevent our taking any single one of them as an absolute test. The subtribe would include the following eight genera, in the first five of which the fruiting glume is more or less hardened or rigid as in *Panicææ*; in the succeeding three it is thinner, though still closely pressed on the grain.

1. *ARISTIDA*, Linn., is now a genus of at least a hundred species, abundant in all the warmer regions of the globe, but also represented by a few species in Europe and temperate Asia, and by several in North America. With few exceptions it is most readily recognized by the long, fine, three-branched awns, the lateral branches opposite and spreading. Doell adds to the generic character three lodicules as in *Stipa*; and Nees describes three lodicules in some South-African species; but all other Agrostologists describe two only, and I have never found more than that number. It is probable that both Nees and Doell mistook for the third lodicule the palea, which in many species is very thin and scarcely, if at all, larger than the lodicules. The genus is divided into three fairly marked sections, which Beauvois, Nees, and some others have raised to the rank of genera. In (1) *Chataria*, Beauv., the flowering glume is continuous with the awn without any articulation, and though much longer than the empty glumes, and often much attenuated at the end, is neither quite awn-like nor decidedly twisted below the branches. Amongst its species, *Curtopogon* was proposed as a genus by Beauvois for the North-American *A. dichotoma*, Mich., in which the lateral branches of the awn, instead of diverging from the central one, are short and erect at its sides, showing more or less distinctly that they are continuations of the lateral nerves of the glume. It is probable that this is the case throughout the genus, only that the lateral nerves before they diverge are so closely consolidated with the central one as to be undistinguishable from it. The genus *Ortachne* was proposed by Nees for two or three Mexican or Columbian plants, originally published by Kunth as species of *Streptachne*, Br., and afterwards transferred by him to *Aristida*, in which the lateral branches of the awn are very short, sometimes minute or even quite obsolete, thus nearly connecting the section *Chataria* of *Aristida* with the section *Aristella* of *Stipa*, but in the narrow base of the rhachilla, and some other minor points, nearer to the former than to the latter. *Ortachne retorta*, Nees (in Steud. Gram.), is probably a true *Stipa*. In

(2) *Arthratherum*, Nees, the awn is decidedly articulate on the glume and much twisted above the articulation below the branches, the flowering glume itself much shorter than the lower empty glumes, instead of exceeding them as in *Chætaria*. In (3) *Stipagrostis*, Nees, the awn is articulate on the glume, as in *Arthratherum*, but scarcely twisted, and above the branches elegantly plumose, the branches also being plumose in some species; whilst in others, forming Figari and De Notaris's proposed genus *Schistachne*, the central awn alone is plumose, the lateral branches short and glabrous. All, however, are most conveniently included in the great genus *Aristida*.

2. STIPA, Linn., is almost as numerous and as widely spread as *Aristida*. It is also strongly characterized, as to the great majority of species, by the narrow, rather hard fruiting glume, carrying off a rather long or obconical internode of the rhachilla (or so-called callus), by the long undivided awn more or less articulate on the glume and usually twisted at the base, and by the presence of three lodicules; but the exceptions to one or more of these characters are more numerous than in *Aristida*; the internode of the rhachilla varies much in length and in shape, the articulation and twist of the awn gradually disappear in some species, and the third lodicule, though often as large as the others, is sometimes much smaller or even quite obsolete. The genus is also not so clearly divisible into sections as *Aristida*, although several genera have been proposed for more or less aberrant species. *Macrochloa*, Kunth, includes *S. tenacissima*, Linn., and *S. arenaria*, Brot., both from the Mediterranean region, remarkable for their large membranous glumes, the flowering one shortly bifid at the apex. In *Aristella*, Bertol., founded on *S. aristella*, Linn., a European and Mediterranean species, in *Streptachne*, Br., a single Australian species, and in *Orthoraphium*, Nees, two or perhaps three East-Indian species, the flowering glume is 2-toothed or shortly bifid at the apex, the awn scarcely or not at all articulate, and the internode of the rhachilla very short, though still perhaps slightly thickened under the flowering glume. The *S. aristella*, however, is very closely connected with typical *Stipæ* through *S. sibirica*, Lam., *S. Redowskii*, Trin., and *S. altaica*, Ledeb. *Jarava*, Ruiz and Pav., was founded on *S. jarava*, Kunth (*S. eriostachys*, Cav., *S. papposa*, Nees), a widely-spread West-American species, to which the small spikelets in a long narrow dense panicle, with the flowering glumes crowned under the awn

by a pappus-like ring of long hairs, give a very peculiar aspect ; but precisely similar flowering glumes are observable in several South-American species with very various habits. In the European *S. pennata*, Linn., and a few other American as well as Old-World species, the awn itself is (almost entirely, or for a short distance above the base) plumose with long spreading hairs. *Lasiagrostis*, Link (*Achnatherum*, Beauv.), was proposed as a genus for the European *S. Calamagrostis*, Wahlenb., and extended by Nees and Trinius to several African and Asiatic species, only differing from other small-flowered *Stipæ* in the flowering glume itself being plumose with spreading hairs, either below the middle or in its whole length ; and in *S. mongholica*, Trin., forming the genus *Ptilagrostis* of Grisebach, these hairs extend to halfway up the awn. *S. verticillata*, Nees, from Australia, and *Apera arundinacea*, Hook. f., from New Zealand, two plants closely resembling each other, though specifically distinct, connect *Stipa* with *Muehlenbergia*. They have the inflorescence and small spikelets of the latter genus ; and in *S. verticillata* the awn is generally persistent, though the articulation is distinctly traceable on the flowering glume ; in *S. arundinacea* the awn is very deciduous ; in this species there is usually but one stamen, whilst in *S. verticillata* there are the normal three. *S. rariflora* (*Muehlenbergia rariflora*, Hook. f.), from Antarctic America, is another species closely allied to the above two ; and all three appear to be better placed under *Stipa* than under *Muehlenbergia*.

3. *ORYZOPSIS*, Mich. (*Urachne*, Trin.), is a genus of about four-and-twenty species, from the temperate and subtropical regions of the northern hemisphere or from extratropical South America, very rare within the tropics, most of them often regarded as awned species of *Milium*, but really more nearly connected with *Stipa*, from which they chiefly differ in the broader fruiting glume, often oblique at the top, the awn usually short, slender, and twisted, and very deciduous. The genus divides readily into three sections, regarded by some as distinct genera, but all united into one by Trinius and others. 1. *Piptatherum*, Beauv., comprises the Old-World species, often included in *Milium* as a section, with awned glumes, and really connecting in some measure the two genera. The obliquity of the fruiting glume is much less marked than in the typical species of *Oryzopsis* ; and the rhachilla of the spikelet is glabrous. 2. *Euoryzopsis* or *Oryzopsis* proper, including the proposed genera *Caryochloa*,

Spreng., *Piptochaetium*, Presl, and *Nassella*, E. Desv., is entirely American, with the typical character of the genus, and the rachilla bearing a ring of hairs under the flowering glume. 3. *Eriocoma*, Nutt. (*Fendleria*, Steud.), differs from *Euoryzopsis* only in the long silky hairs clothing the fruiting glume.

4. *MILUM*, Linn., was formerly extended to several unawned Paniceæ with only two empty glumes, but is now reduced to five or six European or temperate Asiatic species, one of which is also spread over North America, all removed from Panicaceæ as having the empty glumes persistent below the articulation. They differ from *Oryzopsis* chiefly in their obtuse absolutely unawned flowering glume. 5. *ACIACHNE*, Benth., is a single dwarf tufted diœcious grass from the higher mountains of Peru and Colombia. The female individual, with only one spikelet terminal on the peduncle, is fully described and figured in the last part of Hooker's 'Icones.' The male plant, if correctly matched, of which I am by no means certain, has a loose almost simple panicle with precisely the glumes of the female, but enclosing stamens only. In the few specimens seen the leaves are much longer than in the numerous females from various localities, which makes me rather doubt the specific identity of the two.

6. *MUEHLENBERGIA*, Schreb., has nearly sixty known species, chiefly American, extending from the Andes of South America over the northern continent generally, with a very few from central or eastern Asia. They connect, in many respects, *Stipa* with *Agrostis*. In general they come very near in technical character to the smaller-flowered *Stipæ*, differing in the still smaller spikelets with thinner though still closely appressed and narrow fruiting glumes, and usually with a more or less hairy rachilla. From *Agrostis* and its immediate allies they may be readily distinguished by this narrow appressed fruiting glume with a terminal never dorsal awn; a very few unawned species are scarcely separable from *Epicampes*, except by the shape of the glume. There is a considerable variety in the inflorescence and in the proportions of the glumes, but nothing definite enough to establish good sections, although several separate genera have been proposed. In the original *M. diffusa*, Schreb., and its immediate allies, the panicle is usually long, narrow, and dense, and the lower empty glumes are very minute; whilst in Trinius's proposed section *Acroxis* both the lower glumes or one only of them are nearly as large as the flowering one; but throughout the

genus the relative size of these glumes appears to vary almost from species to species. *Vaseya*, Thurb., is a Californian species, *M. comata*, Thurb., closely resembling the more common *M. sylvatica*, Torr., except in the long hairs surrounding the thin flowering glume. *Podosæmum*, Desv. (*Trichochloa*, Beauv.), comprises a number of elegant species, in which the spreading panicle has a number of small long-awned spikelets on long capillary branches and pedicels. *Tosagris*, originally separated by Beauvois from *Podosæmum* on account of the long hairs on the back of the flowering glume, was subsequently reunited with it by the author himself. *Clomena*, Beauv., is *M. clomena*, Trin. (*M. nana*, Benth.), a dwarf Andine species, in which the second empty glume is the largest of the spikelet, and rather broadly three-toothed. The same character is observable in *M. gracilis*, Trin., forming Nuttall's genus *Calycodon*.

7. BRACHYELYTRUM, Beauv., is a single North-American species, very near to some species of *Stipa*; but the rhachilla is produced beyond the flowering glume into a little bristle, sometimes bearing a minute rudimentary glume, which does not occur in any other species of the subtribe. 8. PERIEILEMA, Presl, contains three or four tropical or subtropical American species, with much of the habit and many of the characters of *Muehlenbergia diffusa*, but with the empty glumes awned as well as the flowering one.

Our second subtribe, PHLEOIDEÆ, is chiefly characterized by the inflorescence. The panicle is condensed into a globular or oblong head or cylindrical spike; the rhachilla is, in a few species only, produced beyond the flower into a small bristle; the flowering glume either is awnless or bears one or three terminal awns, and when in fruit is thinner than in Stipeæ, more loosely enclosing the grain as in Euagrostæ. The following seven genera, or most of them, have already been placed in juxtaposition by various Agrostologists.

9. LYCURUS, H. B. K. (*Pleopogon*, Nutt.), consists of two closely allied American species, perhaps varieties of a single one, readily known by the empty glumes as well as the flowering one awned, as in *Perieilema*, the lowest one having usually two or even three awns. The long dense cylindrical spike (or spike-like panicle) with sterile spikelets intermixed with the perfect ones brings the genus in connexion with the subtribe Seslerieæ of Festuceæ; but there is never more than a single flower in the spikelet.

10. *ECHINOPOGON*, Beauv. (*Hystericina*, Steud.), a single Australian and New-Zealand species, has likewise sterile spikelets intermixed with the perfect ones; but the empty glumes are awnless, and the flowering one three-lobed with the middle lobe produced into a long awn. 11. *DIPLOPOGON*, Br. (*Dipogonia*, Beauv.), also a single Australian species, has a short awn to the empty glumes and three to the flowering one, of which the central one is long and twisted. 12. *AMPHIPOGON*, Br. (*Ægopogon*, Beauv., not of Willd., *Pentacraspedon*, Steud.), five Australian species, has the flowering glume deeply three-lobed and frequently awned, and the palea also with two rigid almost awn-like lobes. *Gamelythrum*, Nees, is the *A. turbinatus*, Br., separated from *Amphipogon* only on account of a more distinct elongation of the rhachilla between the outer glumes and the flowering one.

13. *HELEOCHLOA*, Host (*Pechea*, Pourr.), contains seven or eight Mediterranean species, of which one or two are widely dispersed over Europe and Central Asia. Kunth referred them to a section of *Crypsis*; and Host himself subsequently assented to the union, probably misled by an apparent resemblance of some varieties of *H. schænoides* to the true *Crypsis aculeata*; but the resemblance is apparent only, the two genera are as essentially different in inflorescence as in the structure of the spikelets. The axis of inflorescence, or receptacle, in *Crypsis* is a flat disk; in *Heleochloa* it is a more or less elongated linear rhachis, cylindrical even in those varieties where the spike-like panicle is contracted into a sessile head. In *Crypsis* the empty glumes are above the articulation and fall off with the spikelet, and the glumes are quite those of *Oryzæ* without any two-nerved palea; in *Heleochloa* the empty glumes persist below the articulation, and the glumes and palea are entirely those of *Phleoidæ*; and although in the commonest species the spikelike panicle or head is short and sessile, yet there are others where it is long, narrow-cylindrical, and pedunculate. *Rhizocephalus*, Boiss., founded on *Crypsis pygmæa*, Jaub. and Spach, makes, with *C. ambigua* and *C. crucianelloides* of Balansa, a very good section of *Heleochloa*, distinguished by the dwarf tufted habit and the spikelets almost echinate with the rigid points of the glumes. Beauvois gave the same name *Heleochloa* to a supposed genus, apparently made up of a *Sporobolus* and a *Phleum*.

14. *MAILLEA*, Parlat., is the *Phalaris crypsoides*, Durv., a dwarf

tufted Greek plant, with the spikelets flat as in *Phalaris*, but otherwise showing nearly the structure of *Phleum*.

15. *PHLEUM*, Linn., about ten species from the temperate and northern regions of the northern hemisphere or from Antarctic America, is a well-known and already well-defined genus. It has been proposed to separate generically *Chilochloa*, Beauv. (*Achnodon*, Link), for the few species in which the rhachilla is produced beyond the flower into a minute bristle; the character, however, is in this instance very trifling and uncertain. *Achnodonton*, Beauv., is *P. tenue*, Schrad., for which I can find no separate generic character. The anomalous *Phalaris trigyna*, Host, appears to have been an individual specimen of *Phleum Michelii*, All., having abnormally three style-branches instead of two.

In a third small group or subtribe, *SPOROBOLÆ*, I should propose to place *Sporobolus* itself, with the three monotypic genera *Mibora*, *Coleanthus*, and *Phippsia*. The subtribe is not very clearly defined; but my previous endeavours to associate *Sporobolus* with *Milium* and *Isachne*, to which I shall recur further on, proved still less satisfactory. The plants now grouped together have small paniculate or almost racemose spikelets, awnless glumes, no continuation of the rhachilla beyond the flower, and the ripe grain only half enclosed in and readily falling away from the glume—characters sometimes well marked, but in some species rather vague.

16. *MIBORA*, Adans. (*Chamagrostis*, Borkh., *Sturmia*, Pers., *Knappia*, Sm.), is a dwarf slender tufted European annual, with a simple spike and the lower empty glume at least as long as the flowering one. 17. *COLEANTHUS*, Seid., is a minute annual, first found in Bohemia, then in Norway, and more recently gathered in the island of Sauvics at the mouth of the Oregon in North-west America. It is very near *Phippsia* and *Sporobolus*; but the lower empty glumes are entirely deficient. It was first discovered by Seidel, and distributed by him under the name of *Coleanthus subtilis*; but Trattinick in publishing it (as reported by Rømer and Schultes) retained only Seidel's specific name, changing the genus to *Schmidtia*. Rømer and Schultes in their 'Systema' restored Seidel's name, which Sternberg, rather later, changed again both generically and specifically to *Schmidtia utriculosa*. Under these circumstances Seidel is now considered to have published his *Coleanthus subtilis* sufficiently for general adoption, more especially as another very different genus of Grasses has

received the name of *Schmidtia*. 18. ΠΙΠΠΣΙΑ, Br., is a dwarf paniculate slender Arctic grass, chiefly distinguishable from *Sporobolus* by the minute lower empty glumes.

19. SPOROBOLUS, Br. (*Vilfa*, Beauv., *Agrosticula*, Raddi, *Triachyrium*, Hochst., *Cryptostachys*, Steud.), is now a genus of about eighty species, spread over the warmer and temperate regions of both the New and the Old World, mostly, however, American, with a very few European or Asiatic. Included by the older authors in *Agrostis*, it has since been universally acknowledged as distinct, though different characters have been assigned to it. Beauvois, who attached primary importance to the presence or absence of the awn, referred to it all the unawned species of the old genus *Agrostis*. Brown, who first pointed out the differences in the fruit, took as the principal character the loose membranous pericarp readily detachable from the seed; but this, though very conspicuous in *S. indicus*, Br., and in some other species, is not apparent in the dried state in several others; and in *S. virgicus*, Kunth, and others, it is only when soaked that the pericarp can be detached. On this account it has been attempted to establish two genera, *Vilfa* and *Sporobolus*; but the character is far too indefinite, as well as uncertain, to be available even for sectional separation. As a whole, *Sporobolus* is chiefly distinguished from *Agrostis* by the total absence of any dorsal awn, and by the grain so loosely enclosed in the glume that it usually protrudes from it when ripe, and often falls away. The palea also generally splits readily into two, and in some species is even at the time of flowering divided to the base, a character which Grisebach, who only observed it in an Argentine species, was induced to take as that of a new genus *Diachyrium*; but it exists in many other species; and this divided palea has been more than once described, and even figured (as in T. Nees's 'Genera Floræ Germanicæ'), as a two-valved pericarp, a character unknown in Gramineæ. Brown's name *Sporobolus* was rejected by Beauvois, Trinius, and others on the supposition that the genus is identical with the older established *Vilfa*, Adans. That, however, is a mistake. Adanson's character of *Vilfa* is so vague that it cannot be identified by that alone; but in his index he fixes it by quoting two European species, which are certainly both of them true species of *Agrostis*.

Two North-American species of *Sporobolus*, *S. compressus*, Trin., and *S. serotinus*, A. Gr., are exceptional, not only in the

genus, but in the whole tribe of *Agrosteæ*, by the spikelets containing occasionally two flowers (without awns or continuation of the rhachilla) as in *Isachneæ* and in some species of *Aira* and *Colpodium*; but the small spikelets and carpological characters are quite those of *Sporobolus*.

There remain for the *EVAGROSTEE*, or fourth and last subtribe of *Agrosteæ*, about sixteen genera, of which the general character is a dorsal usually twisted awn on the flowering glume, the grain neither so closely enveloped in the fruiting glume as in *Stipeæ*, nor so readily exposed as in *Sporoboleæ*, and the spikelets usually small, loosely paniculate, very rarely condensed into a head as in *Phleoidæ*; but there are exceptions to every one of these characters, and the limits of the larger genera are so vague as to render this portion of the genera of *Gramineæ* the least satisfactory of the whole series. Of the sixteen following genera, the first seven show none of that continuation of the rhachilla beyond the flower which in the others takes the form of a glabrous or hairy bristle rarely reduced to a mere tubercle; the last four of the series, as well as *Triplachne*, have, besides the dorsal awn, two or four teeth to the glume, sometimes produced into straight awns. A few species or monotypic genera have no awn to the flowering glume, but otherwise in the structure of the spikelet are nearer to *Agrostis* than to *Sporobolus*.

20. *EPICAMPES*, Presl, about sixteen species from Mexico and the South-American Andes, probably reducible to about two thirds of that number, is a genus most embarrassing to the systematist; for it seems to connect *Muehlenbergia* and *Sporobolus* with *Agrostis*. The chief general feature is the long narrow dense panicle with very numerous rather small spikelets, the awn of the flowering glume, when it exists, much smaller than in *Muehlenbergia* and often not quite terminal; the unawned species distinguished from *Sporobolus* by the fruiting glume and grain nearly those of *Agrostis*, and from the latter genus by the inflorescence and by the awn when present being very small and almost terminal. Several of the published species, however, are unknown to me; and a further study may require considerable modification of the generic character and limits. *Crypsinna*, Fourn., which appears inseparable from *Epicampes*, is founded on the *E. macroura* (*Cinna macroura* and *C. stricta*, Kunth), a Mexican species remarkable for the very long, narrow, almost spikelike panicle. *Cinna macroura*, Thurb., from California, is a

distinct species (*E. rigens*, Benth.) with a still longer and narrower rigid spike-like panicle often interrupted; and the spikelets are small, with membranous glumes, as in the typical *E. stricta*, Presl, but awnless or nearly so.

21. BAUCHEA, Fourn., a single Mexican species unknown to me, might perhaps be reduced to *Epicampes*, from which it is said to differ chiefly in a great inequality of the two empty glumes.

22. AGROSTIS, Linn., even after being shorn of a number of heterogeneous plants ascribed to it at various times from general aspect, and after the suppression of numerous names given to local representatives of cosmopolitan species, is still a genus of nearly a hundred species, generally spread over nearly the whole world, but especially common in the temperate regions of the northern hemisphere. Among the *Euagrostes* without any continuation of the rachilla they are generally known by the absence of those peculiarities which have induced the separation of several of the preceding as well as of the following genera, by the thin short broad flowering glume with the dorsal awn below the middle, and by the palea not more than half as long as the glume, and often quite minute or even deficient; the panicle is also usually loose, very elegant, with numerous small spikelets or almost capillary branches and pedicels. There are, however, here, as elsewhere, exceptional species which defy all neat classification; even the dorsal awn is sometimes reduced to a minute tubercle, or only to be guessed at by the abrupt termination of the central nerve of the glume. The American species in which the palea is minute or deficient formed Michaux's genus *Trichodium*, which has been extended to the European *A. canina*, Linn., and others with that character, to which Beauvois restricted the Linnean name *Agrostis*, whilst he gave the name of *Agraulus* to the species in which the palea is more developed.

23. CHÆTURUS, Link, is a single Spanish annual, much like some species of *Agrostis*, but anomalous in the group in having the lowest (empty) glume larger than the others, and produced into a long awn, whilst the flowering one, though shaped as in *Agrostis*, has no awn. The inflorescence is also peculiar, each branch of the panicle terminating in the three shortly pedicellate spikelets.

24. ARCTAGROSTIS, Griseb., is a single arctic species, referred by Brown doubtfully to Trinius's genus *Colpodium*, but which appears to be more nearly allied to *Deyeuxia*. It is, however,

one of those plants which, by irregularity in some characters usually very important, is very difficult to place satisfactorily. The habit and size of the spikelets are more those of *Poa* than of *Agrostis*; but, in the great majority of specimens, the one-flowered spikelets without any continuation of the rhachilla are quite those of *Agrostæ*, and the palea is fully the length of the glume as in *Deyeuxia*. Very rarely specimens have presented themselves with a minute continuation of the rhachilla; and Brown, in a single Melville-Island specimen, found it to bear an empty glume or second flower, thus showing a connexion, and possibly, in the specimen mentioned by Brown, a hybrid between *Arctagrostis* and *Poa alpina*.

25. *CALAMAGROSTIS*, Adans., as now limited, comprises four or five species from Europe and northern and central Asia, of which one has also been found in South Africa, possibly, but not certainly, introduced there. Some authors extend the genus so as to include the greater part of *Deyeuxia*, and indeed all the *Euagrostæ* with a hairy rhachilla; but it seems more natural if confined to the typical species, which, like *Agrostis*, have no continuation of the rhachilla or rarely a very slight one, and bear on the flowering glume a fine dorsal awn, rarely reduced to a minute point. They differ from *Agrostis* in the ring of long hairs surrounding the flowering glume, and generally in their tall almost reed-like habit, whence their generic name, and on which account they have often been placed in juxtaposition with *Arundo*. They appear, however, to be in every respect true *Agrostæ*; and there are two species, *C. tenella*, Kunth, and *C. olympica*, Boiss., which are almost intermediate between *Calamagrostis* and *Agrostis*, especially as a few species of true *Agrostis* are not entirely without hairs on the rhachilla.

26. *CINNA*, Linn. (*Abola*, Adans., *Blattia*, Fries), is limited by modern authors to two species from the northern regions of Europe and America, with the tall reedlike habit of the larger species of *Calamagrostis*, but with a glabrous rhachilla, and remarkable in the tribe by the palea having only one nerve, although there is every reason to believe that it is a true palea, the apparently single nerve being due to the consolidation of two. Both species appear also constantly to have but one stamen in the flower. Some botanists unite the two; but from dried specimens they appear quite distinct. Amongst other minor points, the original *C. arundinacea*, Linn., has generally a minute continua-

tion of the rhachilla, which I have never found in *C. pendula*, Trin. (*C. expansa*, Link, *C. latifolia*, Griseb.). Several American or other grasses published as species of *Cinna* are now referred to *Epicampes* or *Deyeuxia*.

27. *GASTRIDIMUM*, Beauv., has two species from the Mediterranean region, one of them also found in tropical Africa and in extratropical South America, but possibly introduced only in the latter locality. They have the small spikelets of *Agrostis*, but a narrower closer panicle, and are remarkable for the outer glumes rather hardened, shining, and ventricose at the base, whence the generic name. The older authors included them in *Milium* on account of that hardness in the glumes.

28. *CHÆTOTROPIS*, Kunth, is a single Chilian species which some would unite with *Agrostis*, and might well have been joined to *Epicampes*, but that the rhachilla is produced beyond the flower into a rather long hairlike seta.

29. *TRIPLACHNE*, Link, is the *Gastridium nitens*, Coss. et Dur., a single Mediterranean species, with the habit, but not the ventricose glumes, of that genus, and differing both from that and from *Agrostis* in the flowering glume bearing a short awn-like point on each side of the awn.

30. *APERÀ*, Adans. (*Anemagrostis*, Trin.), has two very closely allied European species extending into Western Asia, with the technical character very nearly of *Deyeuxia*, but with the elegant panicle and numerous small glabrous spikelets of many species of *Agrostis*, in which they are still included by some under the name of *Agrostis spica-venti*. The New-Zealand plant described by Hook. f. as an *Apera* is now transferred to *Muehlenbergia*.

31. *CINNAGROSTIS*, Griseb., from Tucuman in South America, is unknown to me, but is said to differ from *Deyeuxia* in having the spikelets unisexual by abortion. It should most probably be incorporated in that genus.

32. *DEYEUXIA*, Clarion (*Lachnagrostis*, Trin.), has now nearly a hundred and twenty species, dispersed over the temperate or mountain regions of the globe, particularly numerous in the Andes of South America, and extending northwards to the Arctic circle and southwards to the extreme end of South America. It is in some respects polymorphous, running on the one hand almost into *Agrostis*, to which some species have been referred, and on the other into *Calamagrostis*, with which the northern species have been often united. It differs from both in the pro-

longation of the rhachilla into a bristle or stipes usually, but not always, hairy, and from *Agrostis* in the larger spikelets, with the palea nearly as long as the glume, and the usually hairy rhachilla. There are, however, a few species where one or another of these characters fail; and one or two scarcely differ from *Apera* except in the habit and in the awn being more decidedly dorsal. *Bromidium*, Nees (to which belong *Didymochæta*, Steud., and *Chamæcalamus*, Meyer), contains a few Andine Chilian or Australian species, which, with the minute glabrous and perhaps not constant continuation of the rhachilla, might almost as well be transferred to *Agrostis*, but that they have rather the habit of *Deyeuxia*. *Relchela*, Steud. (*Agrostis sesquivalvis*, E. Desv.), *Cinnastrum*, Fourn. (at least as to *Deyeuxia pœiformis*, Kunth), *Deyeuxia mutica*, Wedd., and *D. breviglumis*, Benth., with a few other South-American species, form a little group with a glabrous rhachilla and the awn reduced to a small point. In *Achæta*, Fourn., two Mexican species, the awn appears to be deficient; but all the other characters are those of the typical *Deyeuxia* with a hairy rhachilla, to which I would also refer the *Agrostis æquivalvis*, Trin., forming Grisebach's section *Podagrostis*.

33. **AMMOPHILA**, Host (*Psamma*, Beauv.), comprises four species, two of them widely spread over the northern hemisphere chiefly near the sea, and two confined to North America. They are distinguished from *Deyeuxia* by their tall habit, their usually dense inflorescence, and especially by their larger paleaceous glumes.

34. **DICHELACHNE**, Endl., two Australian or New-Zealand species, with a narrow dense panicle, differs from *Agrostis* and its allies in the flowering glume scarcely smaller than the outer empty ones and often toothed, and in the long dorsal awns giving the inflorescence a fine bristly aspect.

35. **TRISSETARIA**, Forsk. (*Anomalotis*, Steud.), is a maritime Syrian and Egyptian plant, very near *Dichelachne*, but still more bristly, the lateral teeth of the flowering glumes being produced into fine straight awns, whilst the dorsal one is longer and flexuose. Labillardière and Delile both mention two fertile flowers in the spikelet. I have only been able to find one in several specimens examined, all from Alexandria; possibly they may have considered the rather long continuation of the rhachilla as a second flower.

36. **PENTAPOGON**, Br., is a single Australian species, with four

straight awns to the flowering glume, besides the long rigid twisted dorsal one, which, as well as the single flower, removes the genus from the Pappophoræ.

37. *LAGURUS*, Linn., is a well-known widely spread Mediterranean grass, which, like *Trisetaria*, has two slender awns to the flowering glume besides the more rigid dorsal one, but is well marked by the capitate inflorescence, to which the long hairs of the linear plumose empty glumes give a peculiar soft silky aspect.

Tribe IX. ISACHNEÆ.

This small tribe is a modification of the subtribe I proposed in the 'Flora Australiensis' under the name of *Milieæ*, and which I distinguished from *Agrostæ* by the absence of the dorsal awn, and from *Festuceæ* by the single or two equal flowers in each spikelet; and I included in the group both *Milium* and *Sporobolus*. Since I have worked up the *Agrostæ* of the northern hemisphere, however, I find that the presence or absence of the dorsal awn is much more uncertain than I had thought, that *Milium* cannot be removed far from *Oryzopsis*, and that *Sporobolus* must be referred back to *Agrostæ*. But there remain a group of genera, nearly related both to *Agrostæ* and to *Aveneæ*, but never showing the dorsal awn so general in those tribes, and enclosing in each spikelet two equal flowering glumes and flowers, apparently inserted at the same point without any development of the rhachilla between them (except in *Cœlachne*) and never any continuation beyond the flowers. The two flowers are both hermaphrodite and fertile; or occasionally only one of them, usually the upper one, is female or sterile. The tribe thus limited would consist of the following seven genera:—

1. *PRIONACHNE*, Nees, subsequently republished by the same author under the name of *Chondrolæna*, is a South-African annual with an almost simple terminal spike, distinguished by the outer empty glumes as long as the flowering ones, with a rigid pectinately-toothed cartilaginous keel. *Ktenosachne*, Steud., is most probably the same plant.

2. *ISACHNE*, Br., comprises about twenty tropical or subtropical species, chiefly from the Old World, but including a few American ones. The small spikelets with the loosely paniculate inflorescence and more or less hardened fruiting glumes give them the appearance nearly of some species of *Panicum*, to which

genus some species of *Isachne* have been referred, but from which they constantly differ in the empty glumes persistent below the articulation, and in the two flowers both hermaphrodite or female, though one may be occasionally sterile. *Graya*, Nees (judging from the reference to Wight, but not from Steudel's characters) is *Isachne pulchella*, Roth (*Panicum bellum*, Steud., *P. malaccense*, Trin.). *Panicum Gardneri*, Thw., which, as the author observes, is closely allied to *Isachne Walkeri*, Wight, appears to me to be strictly congener with that species, although one of the flowers of the spikelet is frequently, but not always, sterile. It seems to be the same as *Isachne nilaghirica*, Hochst.

3. ZENKERIA, Trin., very well described and figured in the 'Linnæa,' vol. xi., now contains two species from the East-Indian peninsula and Ceylon, both very near *Isachne*, but with membranous fruiting glumes. *Amphidonax Heynei* and *A. tenella*, Nees, do not differ from the typical *Z. elegans*, Trin. The second species is *Z. obtusiflora* (*Amphidonax obtusiflora*, Thw.). The original genus *Amphidonax* of Nees was founded on a species of *Arundo*.

4. MICBAIRA, F. Muell., is a single North-east Australian species recently figured in Hooker's *Icones*. 5. CELACHNE, Br., comprises three East-Indian, Chinese, or East-Australian species—*C. pulchella*, Br., *C. perpusilla*, Thw., and *C. simpliciuscula*, Munro (*Isachne simpliciuscula*, Wight et Arn.), which, as above observed, are anomalous in the tribe by a slight extension of the rachilla between the flowering glumes. 6. AIROPSIS, Desv., restricted to the single West-Mediterranean *A. globosa*, is a pretty little annual, formerly placed in *Milium* on account of the hardening of the glumes, or in *Aira*, which it resembles in many respects. It shows, however, all the characters of *Isachneæ*, and is indeed technically nearly allied to *Isachne* itself; but the two semiglobose fruiting glumes, closely appressed to each other by their flat faces, give the spikelets the peculiar globular shape expressed by the specific name.

7. ERIACHNE, Br., comprises twenty-two species, two of them endemic in tropical Asia, the remainder Australian, of which one is also in East India. They differ from *Isachne* generally in their rather larger spikelets, and especially in the long hairs on the back or margins of the flowering glumes, and sometimes in the fine straight awns terminating the flowering glumes, or even the teeth of the paleæ. *Megalachne*, Thw. (not of Steud.), is *Eriachne trisetata*,

Nees, in which these awns are particularly conspicuous. The African species referred by Nees to a section *Achneria* of *Eriachne*, form a distinct genus of *Aveneæ*, for which Munro has retained this name *Achneria*, the original genus *Achneria* of Beauvois having been proposed for those true Australian species of *Eriachne* which have no awn or only a very small one.

Tribe X. AVENEÆ.

This tribe has been more generally recognized and subjected to less variations than most of the others. Its general characters—the paniculate inflorescence, the spikelets with two or more perfect flowers, the rhachilla produced beyond the upper flower, and a twisted awn to the flowering glume either dorsal or terminal between the two lobes or teeth of the glume—suffer fewer exceptions than usual. *Aira* alone has no continuation of the rhachilla; and *Anisopogon* alone has only one perfect flower in the spikelets. Of the following sixteen genera, the first eleven have the awn dorsal and the lowest flower hermaphrodite; the next three have the male or sterile flower below the perfect one; and the last two have the lowest flower hermaphrodite and the awn terminal.

1. *AIRA*, Linn., was once made to include *Corynephorus*, *Deschampsia*, and indeed almost all the *Aveneæ* with loosely paniculate inflorescence and small two-flowered spikelets, but has since been so thoroughly dismembered by various European botanists as not to leave a single species to represent the old Linnean name. Taking, however, the widely spread *A. caryophyllea*, Linn., as a genuine type, and adding to it five or six European species, we have a natural genus of elegant, slender, mostly annual grasses with fine filiform leaves, the small spikelets always two-flowered without any continuation of the rhachilla beyond the upper flower, the dorsal awn of the flowering glumes rarely wanting, and the ripe grain often adhering to the palea; the latter character, however, is always uncertain. These six or seven species have all been made the types of supposed distinct genera. *A. caryophyllea*, Linn., and *A. præcox*, Linn., considered as typical *Airæ* by Parlatore and others, form the genus *Fussia*, Schur, in which the two flowers are closely contiguous and the flowering glumes usually awned. *Fiorinia*, Parlat., is the *A. Tenorii*, Guss., distinguished by the absence of the awn; but Gussone has shown that it varies with or without the awn. *Antinoria*, Parlat., is the *A. agrostidea*, Lois., with the rhachilla more or less lengthened between the

flowers, and the glume usually unawned; but *A. pulchella*, Willk., with the glume awned, cannot be otherwise distinguished from it. *Periballia*, Trin., is the *A. involucrata*, Cav., in which the two flowers are as in *A. agrostidea* rather distant from each other, the lowest flowering glume unawned, the upper one awned, but both flowers hermaphrodite, as in the rest of the genus. The inflorescence of this species is rather peculiar; the lowest whorl of branches of the panicle are usually without any or with only very few spikelets, and were regarded by Cavanilles as an involucre: but that is not always the case; I have seen some specimens with spikelets on all the branches. *A. sabulorum*, Labill., from New Caledonia, is a very doubtful plant. Labillardière's figure is a good representation of the Australasian form of *Sporobolus virginicus*, except that the spikelets are drawn as two-flowered. The specimens sent for Labillardière's plant by Paucher and by Vieillard have only one flower in the spikelet.

2. CORYNEPHORUS, Beauv. (*Weingartneria*, Bernh.), comprises two European grasses, extending into North Africa and more sparingly to the Levant, with the continuation of the rhachilla of *Deschampsia*, but readily distinguished by the peculiar articulate club-shaped awn of the flowering glumes.

3. DESCHAMPSIA (*Campelia*, Link) is a genus of about twenty species, from the temperate or colder regions of both the New and the Old World, sparingly represented in mountain regions within the tropics. It bears the same relation to *Aira* that *Deyeuxia* does to *Agrostis*; the plants are usually perennial and stouter than in *Aira*, the spikelets larger, and the rhachilla is produced beyond the upper flower into a bristle often bearing a tuft of hairs, and sometimes an empty glume on even a male flower; the flowering glumes are also frequently more or less denticulate. No less than six of the species have been proposed as distinct genera:--*Vahlodea*, Fries, is *D. atropurpurea* (*Aira atropurpurea*, Wahlenb.), a northern species, with the flowering glume not at all or only very minutely denticulate, otherwise quite a *Deschampsia*. *Avenella*, Parlat. (*Lerchenfeldia*, Schur), is the common *D. flexuosa* (*Aira flexuosa*, Linn.), with the flowering glume surrounded by hairs. The grain is said by Parlatore to adhere to the palea, which may be sometimes, but is certainly not always, the case. *Monandraira*, Em. Desv., includes two Chilian species, *Trisetum Berteroanum* and *T. airæforme* of Steudel, separated from *Deschampsia* as having but one stamen to the

flower; but in *D. Berteroanum* I have sometimes found two stamens, and in the evidently nearly allied *D. antarctica*, Hook. f., the stamens, though usually three, are sometimes two only. *Airidium*, Steud., is a species from the Straits of Magellan which I am unable to distinguish from the *D. antarctica*. *Rytidospernum*, Steud., is founded on specimens of a *Deschampsia* closely allied to, if not identical with, the common *D. cæspitosa*, in which a grub has taken possession of every spikelet remaining in the panicle, and has been mistaken by Steudel for the caryopsis, and actually described as such. *Peyritschia*, Fourn., is *D. kœlerioides* (*Aira kœlerioides*, Peyr.), which I have not seen, but which, from Peyritsch's elaborate description, must be very near to *D. antarctica*, Hook. f., *D. nitida*, Presl, and *D. holciformis*, Presl.

4. *ACHNERIA*, Munro, contains eight South-African species, with one from south-eastern tropical Africa, referred by Nees to *Eriachne*, and by Kunth to *Airopsis*, but evidently more nearly related to *Deschampsia*.

5. *MONACHYRON*, Parlat., is a single species from the Cape-Verd Islands, which we have not at Kew, and of which I have therefore been unable to verify the character given by Parlatore. The specimen he described most probably remained in Webb's herbarium, now deposited at Florence.

6. *HOLCUS*, Linn., formerly included two very different groups of grasses; and Brown specially retained Linnæus's name for that one which now forms the genus *Sorghum* in Andropogoneæ, whilst all modern botanists restrict the genus *Holcus* to the other group, consisting of about eight European or African species, chiefly western, of which one or two are common weeds in various parts of the world. All are nearly allied to *Deschampsia*, but have the upper flower of each spikelet male with an awned glume, and the lower one unawned and hermaphrodite. Two Spanish species have been added by Boissier, *H. grandiflorus* and *H. cæspitosus*; but as they have both the flowers hermaphrodite and awned (whence the sectional name *Homalachne*), they should rather be transferred to *Deschampsia*, although they may have the peculiar soft habit of the common species of *Holcus*.

7. *TRisetum*, Pers., is now known to comprise nearly fifty species, ranging over the temperate or mountain regions of both the New and the Old World. All are very near to the section *Avenastrum* of *Avena*, but differ generally in the flowering glume decidedly toothed at the apex, the two teeth often produced into

straight awns, one on each side of the dorsal twisted one, and in the grain glabrous or slightly pubescent at the apex without the longitudinal furrow of *Avena*. The inflorescence is also usually more dense than in that genus, with smaller, often shining spikelets. A few African or South-American species, however, such as *T. hirtum*, Nees, and *T. antarcticum*, Nees (which includes *Bromus antarcticus*, Hook. f., and *Bromus bicuspis*, Nees), closely connect the two genera: the flowering glume is more rigid and less keeled than in the true *Trisetum*, and the ovary is pubescent at the top; but the grain has not the furrow of *Avena*. *Trichæta*, Beauv., is the *Trisetum ovatum*, Pers., a species allied to *T. subspicatum*; but the spikelike panicle is more dense and ovoid, or almost globular. *Acrospelion* or *Acropselion*, Bess., is *Trisetum distichophyllum*, Beauv., not the *Ventenata*, Link, to which it is referred in Lindley's 'Vegetable Kingdom.' *Rostraria*, Trin., was made up of *Trisetum neglectum*, Roem. et Schult., and *Kœleria phleoides*, Pers.

8. *VENTENATA*, Kœl., has two species, *V. avenacea*, Kœl., and *V. macra*, Balansa, from the Mediterranean region and Central Europe, differing slightly from *Trisetum* in the longer, more rigid, many-nerved glumes, and the absence of any dorsal awn on the lower flowering one.

9. *AVENA*, Linn., as limited by recent authors, comprises about forty species, mostly from the temperate regions of the Old World, with a few from extratropical North and South America, and one or two of the annual ones cornfield weeds in other countries. It is generally characterized by the flowering glumes rounded on the back and several-nerved, with a dorsal twisted or bent awn, and by the ripe grain furrowed in front and more or less adhering to the palea, but is divisible into two sections almost marked enough in habit as well as character to be raised to the rank of genera. In 1. *Crithe*, Griseb., the species are all annual, usually tall, with a loose panicle of large pendulous spikelets, each containing no more than two fertile flowers, and often only a single one, and the lower empty glumes 7- or 9-nerved. This section includes the common *Oat*, which has lost its dorsal awn probably as a consequence of long cultivation; for the plant is unknown in a wild state, except here and there as an escape from cultivation. In 2. *Avenastrum*, Koch (*Helicotrichum*, Bess.), the plant is perennial, the panicle usually narrow, with erect or rarely spreading spikelets with more than two perfect flowers,

and the lower empty glumes with only one or three, or the second rarely with five nerves.

10. GAUDINIA, Beauv., two species, has the spikelets of *Avena* (*Avenastrum*); but they are singly sessile in the notches of the articulate rhachis of a single spike, thus showing the inflorescence of the tribe Hordeæ, to which Parlatores would remove the genus; but the dorsal twisted awn places it much nearer to *Avena*, from which some authors would not generically separate it. The common *G. fragilis*, Beauv., is widely dispersed over the Mediterranean region. The second species, *G. geminiflora*, J. Gay, was proposed as a genus *Arthrostachya*, Link, from garden specimens of unknown origin; it has since been detected by Seubert in the Azores.

11. AMPHIBROMUS, Nees, is a single Australian species, with many-flowered spikelets. The grain is furrowed as in *Avena*, but glabrous and free from the palea as in *Trisetum*.

12. ARRHENATHERUM, Beauv., contains three European, North-African, or Oriental species, often included in *Avena*, but differing from that genus as well as from most Poaceæ in having, as in the two following genera, the lower flower male and the upper one fertile, though the rhachilla is produced beyond it as in other Aveneæ.

13. TRISTACHYA, Nees (*Monopogon*, Presl), has eight species, of which two are tropical American, the remainder African, tropical or southern, one extending to the Levant. With the lower flower male, as in *Arrhenatherum*, they are readily distinguished by the spikelets always three together, sessile or equally pedicellate at the ends of the branches of the panicle, and by the long twisted awn of the flowering glume being terminal between two lobes or straight awns. Amongst Nees's African species, *T. simplex* must be transferred to *Trichopteryx*.

14. TRICHOPTERYX, Nees (*Loudetia*, Hochst.), about ten African species, of which one is also in Brazil, has the spikelets of *Tristachya*; but they are scattered along the branches of the panicle, not in terminal triplets. The only Brazilian species, not uncommon also in tropical Africa, *T. flammea*, has, as already mentioned, been rather negligently published and figured as an *Arundinella*, of which it has none of the characters and not much of the habit.

15. ANISOPOGON, Br., is a single West-Australian species, differing from *Danthonia* in the large spikelets containing only a

single perfect flower. Nees added a second species from South Africa which I have not seen; but from his description it can scarcely be a congener. Kunth has figured three lodicules in the Australian plant; I have always found only two long lanceolate ones.

16. *DANTHONIA*, DC., is now a polymorphous, almost cosmopolitan, genus of nearly a hundred species, of which the greater number, however, are South-African, all characterized by the spikelets containing three or more perfect flowers, and by the awn of the flowering glumes more or less twisted or bent and usually flattened at the base, but terminal between two or four teeth or straight awns. Notwithstanding considerable diversities in habit, inflorescence, and in the size and teeth of the glumes, no good natural sections have yet been proposed. Nees's *Himantochæte* (*Streblochæte*, Hochst.), with the lateral lobes or teeth of the flowering glumes entire and acute or awned, and *Pentascviste*, with the lateral teeth bifid and one or both teeth awned, are purely artificial, and relate to the African species, all the non-African ones being included in *Himantochæte*. DeCandolle originally proposed the genus for two European species, *D. procumbens* and *D. provincialis*; Brown showed, however, that they could not well be regarded as congeners, and removed the former to his new genus *Triodia*. The *D. provincialis* therefore becomes the type of the present large genus *Danthonia*, though it may be somewhat anomalous when compared with the majority of the African and Australian ones. DeCandolle's chief character connecting his original species was the great length of the outer empty glumes compared with the rest of the spikelet; and this is a general, though not quite a universal, feature of the enlarged genus. Since Brown's time the following genera have been proposed, chiefly upon single species, with characters which appear to be of little more than specific value:—*Pentameris*, Beauv., is *D. Thouarsii*, Nees, from South Africa, with nearly the habit and inflorescence of *D. pallescens*, Nees, but remarkable for the short thick grain truncate at the top. *Triraphis*, Nees (not of R. Br.), is *D. radicans*, Steud., from South Africa, nearly allied to *D. crispa*, Nees. *Chætobromus*, Nees, contains a few South-African species, in which one, or sometimes two, of the flowers in the spikelet are imperfect. *Monacather*, Steud., is *D. bipartita*, F. Muell., an Australian species, with the fruiting glumes hardened and oblique at the base and bearing a ring of hairs under the lobes. *Plin-*

tanthus, Steud., is founded on two Australian species, most probably of *Danthonia*, but which, from the evidently incorrect character given, it is impossible to identify without seeing the specimens. *Crinipes*, Hochst., is the Abyssinian species published by A. Richard as *D. abyssinica*, Hochst., in which the outer empty glumes are exceptionally shorter than the spikelet.

Tribe XI. CHLORIDÆ.

This tribe is characterized amongst Poaceæ almost exclusively by the inflorescence. The spikelets are sessile in two rows in unilateral spikes, the rhachis of which is neither articulate nor notched as in Hordeæ; and the spikes, sometimes solitary and terminal, are more frequently several, either digitate at the end of, or scattered along, the peduncle or axis of the single panicle. The inflorescence is thus nearly that of *Paspalum*, whilst the spikelets are those of Festuceæ, with the lowest or single perfect flower hermaphrodite, and the awns, when present, terminal and straight, not dorsal or twisted as in Agrostæ and Avenæ. The following twenty-seven genera are mostly, but not quite all, tropical or subtropical; the first fifteen have one fertile and only rarely a second male flower in each spikelet; the next ten have two or more fertile flowers; all, except a few very small genera or exceptional species, have the rhachilla continued beyond the flowers, and often bearing one or more empty glumes. The last three genera enumerated under the tribe are anomalous diœcious grasses, connecting Chloridæ with the subtribe Sesleriæ of Festuceæ, but showing the inflorescence of the present tribe at least in the male individuals.

1. *MICROCHLOA*, Br., comprises three species, of which two are endemic in Africa and the third widely spread over the warmer regions of the New as well as the Old World. They are slender tufted grasses with filiform leaves and single slender terminal spikes and small awnless one-flowered spikelets without any continuation of the rhachilla.

2. *SCHENEFFELDIA*, Kunth, is a single tropical-African species with one to four erect spikes at the top of the peduncle; the spikelets are one-flowered without any continuation of the rhachilla as in *Microchloa*, but not so small; and the flowering glumes bearing long capillary awns, give the spikes an elegant crinite aspect.

3. *CYNODON*, Pers. (*Dactilon*, Vill., *Capriola*, Adans., *Fibichia*,

Kœl.), a small but mixed genus, of which the typical species is a common weed in most warm or temperate parts of the civilized world. It has the slender spikes and small spikelets of *Microchloa*; but the spikes are several digitate at the end of the panicle, and the rhachilla is produced beyond it into a small point or bristle. Three Australian species have, however, been added to it with the spikelets of *Microchloa* but with the inflorescence of *Cynodon*, thus closely connecting the two genera. Persoon's generic name is far from being the oldest, but has been so long and so universally adopted, that the substitution of either of the others for it would only breed confusion without the slightest advantage.

4. *HARPECHLOA*, Kunth, has also two South-African species. The spike is single, terminal, dense, and unilateral, often falcate; and there are usually one or two male flowers above the fertile one, the glumes all unawned.

Of 5. *CTENIUM*, Panz. (*Monocera*, Ell.), we have seven species, of which four from North or South America, three from Africa or the Mascarene islands. The spikes are solitary or rarely two or even three at the end of the peduncle; the spikelets, though elegantly pectinate as in *Harpechloa*, have a very different structure: the second empty glume is larger than the others, and bears on the back a fine horizontal point sometimes reduced to a small tubercle; the third and fourth glumes are small and empty, or only enclose a palea; the fifth or flowering glume ends in a fine awn, and above it are one or two empty ones.

6. *ENTEROPOGON*, Nees, was founded on an East-Indian grass with a single long, often incurved terminal spike; otherwise very near *Chloris* except in some minor points. It now includes *Ctenium Seychellarum*, Baker, from the Mauritius, which is scarcely specifically distinct from the common East-Indian one, *E. macrostachya*, Munro (*Chloris macrostachya*, Hochst.), from Abyssinia, and an unpublished species from Mayotte in Madagascar, Boivin n. 3019, which may be thus characterized:—*E. leptophylla*, Benth., foliis angustissimis siccitate convoluto-subulatis, glumæ florentis integræ arista gluma ipsa longiore. The habit and the long unilateral spike are precisely those of the common Indian *E. mellicoides*; but the leaves are very much narrower and scarcely flattened in the lower part, the spikelets rather larger, the flowering glume nearly 3 lines long, and the awn about $\frac{1}{2}$ inch, and, at least in the spikelets examined, the flowering glume is quite entire, scarcely free at the point from the awn.

7. *CHLORIS*, Sw., contains about forty species, dispersed over the warmer regions both of the New and the Old World. It is for the most part a natural genus, with two or more spikes digitate at the end of the peduncle, the one-flowered spikelets in two regular close rows as in the allied genera, the flowering glume usually awned, and one, two, or more empty glumes above it; but these characters are not constant, and the structure of the spikelets is somewhat polymorphous. *C. monostachya*, Pourr., from the Mascarene islands, and *C. unispicea*, F. Muell., from Australia, are slender plants with only one or rarely two spikes, and the flowering glume as well as the upper empty one are narrow and awned. In *C. aciculare*, Br., and *C. Roxburghiana*, Edgew., from East India and Australia, and *C. radiata*, Sw., from America and Africa, the glumes are likewise narrow and awned, or the upper empty one reduced to a mere awn, but the spikes are normally several and digitate. *C. foliosa*, Willd., has also a narrow awned flowering glume; but the upper empty one is a double awn (or two awnlike glumes), and the spikes are not so closely clustered at the end of the peduncle, on which account Doell has transferred the species to *Gymnopogon*, from which it appears to me to be much further removed. In *C. pumilio*, Br., *C. pectinata*, Benth., and *C. divaricata*, Br., all from Australia, the flowering glume is distinctly two-lobed with the awn between the lobes. In a considerable number of species the upper empty glumes are broad and truncate at the top—these empty glumes being several in each spikelet in the Asiatic and Australian species, but one only in the American ones. In all the preceding species the flowering and upper glumes are awned; in five or six American or African species forming the proposed genus *Eustachys*, Desv. (*Schultesia*, Spreng.), both the flowering and the upper empty glume are obtuse and truncate, but without any awn, or only a minute point. They are, however, closely connected with the typical species of *Chloris* through *C. submutica*, Kunth. *C. villosa*, Pers., and *C. macrantha*, Jaub. et Spach, both of them described in detail and figured by Jaubert and Spach, must be transferred to *Tetrapogon*, as having their spikelets with at least two fertile flowers.

8. *TRICHLORIS*, Fourn., comprises two Mexican and two extra-tropical South-American species. They resemble *Trisetaria* in their dense oblong crinite panicle and their three-awned flowering glumes; but the panicle is composed of simple crowded or verticillate spikes, and the spikelets, sessile in two rows on the rachis

with one to three empty awned glumes above the flowering one, are quite those of *Chloris*. The two southern species had long been indicated and named in herbaria as constituting an independent genus (the one by J. Gay, the other by Munro); but never having been published, we must adopt Fournier's generic name for the whole. The two southern species (from Chili, Tucuman, and Buenos Ayres) are indeed so very near *T. fasciculata*, Fourn., that it will require close investigation to establish their specific differences. Another different-looking plant from Tucuman (Tweedie), much smaller, with a loose inflorescence and short-awned spikelets, shows also the essential characters of *Trichloris*.

9. GYMNOPOGON, Beauv. (*Anthopogon*, Nutt.), differs from all the preceding one-flowered genera in the spikelets not closely crowded, but more or less distant along the slender rhachis of the spikes, although still sessile in two rows and unilateral; the spikes themselves are scattered or verticillate along the common peduncle. There are four or five American species, northern or southern, and one from Ceylon, *G. rigidus*, Thw., forming Nees's genus *Dichætaria*, but only differing from the American ones in the spikes fewer in the panicle, and the spikelets rather larger with longer awns. Doell's *G. foliosus* and *G. pullulans* should be restored to *Chloris*, with which they agree in every respect except that the spikes are not quite so closely clustered at the end of the peduncle.

10. MONOCHÆTE, Doell, a single Brazilian species of which I have seen no specimen, is removed by Doell from *Gymnopogon*, where Martius had placed it, as having no continuation of the rhachilla beyond the flower. Nees, however, describes a bristle-like continuation, but not bearing any empty glume or awn as in *Gymnopogon*. The genus is as yet, therefore, in some measure doubtful.

11. SCHEDONNARDUS, Steud., is the North-American *Lepturus paniculatus*, Nutt., which, however, Steudel failed to recognize. Nuttall indicated its affinity to *Gymnopogon*, and evidently only placed it in *Lepturus* from not knowing the latter genus except from the imperfect characters then published. *Schedonnardus* has now been figured in the last part of Hooker's *Icones*; the description, accidentally omitted in printing, will appear in the next part.

12. CRASPEDORHACHIS, Benth., is a single species from east tropical Africa, allied to *Schedonnardus*, but differing in the

flexuose rhachis of the spikes bordered by a narrow membrane, in the flowering glume and palea very small and thin, resembling lodicules, and a few other minor points. It is being figured for the forthcoming part of Hooker's *Icones*.

13. *BOUPELOUA*, Lag. (*Eubriana*, Trin., *Actinochloa*, Willd.), comprises about twenty-five American species, northern or southern, but chiefly western. As in the four preceding genera, the spikes are distant along the main peduncle, and often numerous, very rarely reduced to one or two; but they are usually short, with the spikelets densely crowded in two rows on one side of the rhachis, and the rhachilla always continued beyond the single hermaphrodite flower, bearing one to three empty glumes or awns, or sometimes a male flower. The flowering and upper empty glumes usually end in three or five lobes, points, or awns; but they are often exceedingly variable in this respect even in the same specimen, and it becomes difficult to make much use of them in the arrangement of the species. The following four sections, raised by some to the rank of genera, are founded chiefly on inflorescence:—(1) *Chondrosia* or *Chondrosium*, Desv. Spikes usually few, often rather long, with numerous spikelets (more than twelve) neatly pectinate, and the terminal empty glume usually three-awned; the species rather numerous, especially in Mexico, where they run much one into another. (2) *Atheropogon*, Muehl., including *Heterostega* or *Heterosteca*, Desv. Spikes often numerous, but usually very short with few (rarely above twelve) spikelets, crowded but scarcely pectinate, or almost reduced to clusters, the terminal empty glume varying from three-awned to entire, or reduced to a single bristle. The species best known, *B. racemosa*, Lag. (*Atheropogon apludoides*, Muehl., *Dinebra curtispindula*, DC.), was associated by DeCandolle and Beauvois with the *Dinebra arabica* of Jacquin, which, however, differs essentially in its several-flowered spikelets. (3) *Triathera*, Desv. Spikes still further reduced than in *Atheropogon*, consisting usually of two to four spikelets so narrow and so close together as to appear like a single one, and perhaps sometimes really only a single one, the upper empty glume reduced to three awns, as in several species of the preceding section. There appear to be two species, *B. aristidoides* (*Dinebra aristidoides*, H. B. K., forming the genus *Aristidium*, Eudl.), with two to four spikelets to each spike, and *B. triathera*, to which I should, with Munro, refer both *Triathera*, Desv., and *Triæna*, H. B. K. The spike-

lets vary in the same panicle, one, two, or three to the spike, and are themselves polymorphous. Where there are three, I have found the lowest empty glume of the lowest spikelet very narrow and awnlike, and very probably that which Kunth has described and figured as an awn at the base of the glume; in the uppermost of the three spikelets the lowest empty glume is similar to the second, the intermediate spikelet being sometimes like the upper, sometimes like the lower one. (4) *Polyodon*, H. B. K. (*Triplathera*, Endl.). Spikes few, short, and crowded at the end of the peduncle with few spikelets, the flowering glume three-awned, the two or three upper empty glumes each with three or five awns, having together the appearance of a single cluster of many awns. We have two species, *B. disticha* (*Polyodon distichum*, H. B. K.), including apparently *Atheropogon affinis*, Fourn. (not *Eutriana affinis*, Hook. f.), with the spikelets including the awns under half an inch long, and *B. multiseta* (*Eutriana multiseta*, Nees), with the spikelets and their awns above an inch and a half long, giving the plant the aspect of *Boissiera*. *Corethrum*, Vahl, is probably the same plant. He received his specimen in a collection of Syrian plants sent him by Thouin, into which it had probably got misplaced by some carelessness in sorting. No special locality is ascribed to it nor any indication of the collector; and no plant answering to Vahl's elaborate and probably accurate description is known from Syria or any part of the Levant.

14. MELANOCENCHRIS, Nees, comprises three species from East India or tropical Africa, closely resembling each other, and at first sight having the aspect almost of *Ægopogon* but the characters are very nearly those of *Bouieloua* (*Atheropogon*); the genus is readily distinguished from both by the linear plumose empty glumes.

The preceding genera have all only a single flower in the spikelet, the second, when present, being male only; in the following ten genera there are at least two, and often several more fertile flowers.

15. TRIPOGON, Roth (*Plagiolytrum*, Nees), contains about eight East-Indian and tropical-African species, with the single elongated terminal spike of *Enteropogon*, but with several-flowered spikelets, and the flowering glumes more or less three-awned as in *Trichloris*, *Triraphis*, etc., the lateral awns sometimes reduced almost to teeth.

16. *LEPIDOPYRONIA*, A. Rich., is a single Abyssinian species which I have not seen, and of which the specimen described is said to have been imperfect. From the figure and description it would appear to be allied to the *Tripogon abyssinicus*, Nees, but with broad, very villous flowering glumes, and the single awn not quite terminal.

17. *TETRAPOGON*, Desf., has four Abyssinian, North-African, or West-Asiatic species, including the above-mentioned *Chloris villosa*, Pers., and *C. macrantha* of Jaubert and Spach. They have one, two, or rarely three terminal erect spikes, resembling *Elionurus* in the long silky hairs which cover them, but with the characters of Chloridæ, differing from *Chloris* itself in their several-flowered spikelets.

18. *ASTREBLA*, F. Muell., comprises two or three Australian species formerly referred to *Danthonia*, from which the habit and untwisted awn separate them. In the 'Flora Australiensis' I placed them near Pappophoræ on account of their many-nerved glumes; but the inflorescence places them in Chloridæ, where they come in many respects near to *Tetrapogon*.

19. *WANGENHEIMIA*, Moench (*Cynosurus Lima*, Linn.), from Spain and North Africa; 20. *CTENOPSIS*, DeNotar. (*Festuca pectinella*, Delile), from North Africa; and 21. *TETRACHNE*, Nees, from South Africa, are all single species hitherto referred to Festuceæ; but they have all the one-sided spikes with the spikelets sessile in two rows of Chloridæ, to which, following out Munro's memoranda, I have transferred them. The spikes are solitary, erect, and often slightly falcate in *Wangenheimia* and *Ctenopsis*, several scattered along the common peduncle in *Tetrachne*.

22. *DINEBRA*, Jacq., remains limited to the original African and East-Indian *D. arabica* figured by Jacquin. DeCandolle, as above mentioned, joined it with the section *Atheropogon* of *Bouteloua*, of which it has the habit; but there are always two fertile flowers to the spikelet. Kunth referred it to *Leptochloa*, from which it is further removed by its short dense awned spikes; and from both it is separated by the lower empty glumes as long as, or longer than, the rest of the spikelet.

23. *ELEUSINE*, Gærtn., taken in the sense given to it by Persoon, is a natural genus of about seven species, from the tropical and subtropical regions of the Old World, two of them common weeds also in America. The spikes are usually several, digitate

at the end of the peduncle, and in some species with the addition of others scattered or verticillate lower down. The flat spikelets have been sometimes mistaken for those of *Eragrostis*; but their arrangement in two rows is always that of Chlorideæ. The genus is often restricted to Gærtner's *E. coracana* and *E. indica*, in which the spikes are digitated and rather long, and the membranous pericarp loose on the ripe seed. This character is particularly marked in the *E. coracana*; but that is probably a plant somewhat modified by long cultivation. In the common *E. indica* the pericarp is often as loose, but sometimes remains very thin and not so easily detached. In the still more common *E. ægyptiaca*, Pers., forming the genus *Dactyloctenium*, Willd., the digitate spikes are very short and dense, and the very thin pericarp appears to wither away or to dry up in ripening, leaving the seed apparently exposed and rugose, similar to that of *E. indica*. In *E. brevifolia*, Wall. Cat., and *E. glaucophylla*, Munro (*Dactyloctenium glaucophyllum*, Courb.), the spikes are short as in *E. ægyptiaca*, and more or less of the remains of the membranous pericarp may be often seen persistent about the seed. *Acrachne*, Wight and Arn., is the *E. verticillata*, Roxb., in which the spikes are rather long as in *E. indica*; but besides the terminal digitate ones, there are others scattered or verticillate along the peduncle. *Arthrochlæna*, Boiv. in herb. J. Gay, is a remarkable Madagascar species which may be thus defined:—*E. macrostachya*, Benth., elata, foliis angustissimis rigidis crassiusculis, spicis 2-3nis terminalibus, spiculis confertis 18-20-floris, glumis acute carinatis paleaceis bifariam imbricatis. A plant of rushlike habit about 2 feet high, the spikes about 4 inches long, with very numerous spikelets varying from 4 to 6 lines long, resembling those of *Eragrostis*, but much more rigid.

24. *LEPTOCHLOA*, Beauv. (*Oxydenia*, Nutt.), about twelve species, tropical or subtropical, in the New as well as the Old World, and extending on the one hand into North America, and on the other into extratropical Australia, is one of those genera which interfere provokingly with our classifications. Nearest allied to *Eleusine*, it has also considerable affinity with *Cynodon*, *Diplachne*, and *Poa*, to which some of the species have been occasionally referred; and one has been figured as a *Cynosurus*. The chief character consists in the slender spikes scattered along the common peduncle, with numerous small flat spikelets, giving the

plants a different habit from that of the several preceding genera. The species may be distributed into two rather distinct sections. (1) *Pseudocynodon*, with only one or two flowers in the spikelet, differing but little from *Cynodon* except in inflorescence. To this section belong *L. uniflora*, Hochst. (*Cynodon gracilis*, Nees), from Abyssinia, *L. Neesii* (*Cynodon Neesii*, Thw.), from Ceylon, and *L. polystachya*, Benth. (*Cynodon polystachyus*, Br.), from Australia. (2) *Euleptochloa*, with two or more flowers to the spikelet, comprises the remainder of the species. Those which have a point or short awn to the flowering glume were formerly generically separated by Beauvois under the name of *Rabdochloa*. Amongst the published species, *L. arabica*, Kunth, is the genus *Dinebra*; *L. Lindleyana* and *L. mollis*, Kunth, are referable to *Triodia*. *L. dubia*, Nees (*Chloris dubia*, H. B. K.), and the North-American *L. (Diplachne) fascicularis*, A. Gray, appear both to be true species of *Diplachne*. Lorentz's South-American plant distributed by Grisebach as *L. fascicularis* appears to be a mere variety of *Panicum sanguinale*. *L. Wightiana*, Nees, is an *Eragrostis*. *L. plumosa*, Anders., is a *Triodia*.

There remain three anomalous monotypic genera from the Mexican-Texan region—25. BUCHLOË (*Sesleria*, afterwards *Calanthera*, Nutt.), 26. JOUVEA, Fourn., and 27. OPIZIA, Presl, which connect in some measure Chlorideæ with the subtribe Sesleriæ, and are all diœcious, and very remarkable for the great dissimilarity in the spikes and spikelets of the two sexes. Of the first, numerous specimens fully confirm Engelmann's excellent figures and description; the other two are unknown to me, and remain somewhat doubtful. Of *Jouvea*, Fournier only knew the female, which he says is allied to *Buchloe*, with a very different habit. *Opizia* is said by him to have the male plant exactly like *Buchloe*; the female figured by Presl must be very different, though his and Fournier's descriptions do not agree in all points.

Tribe XII. FESTUCEÆ.

The large tribe *Festuceæ* presents considerable difficulties to the systematist. Of the seventy genera on our list (about a hundred and ten of some botanists), the greater number are perhaps better defined than those of *Agrostæ* for instance, and afford a much greater variety of characters; but none of the various arrangements proposed for distributing them into groups or subtribes have proved satisfactory, and the two largest genera *Poa*

and *Festuca* are connected by a number of smaller ones, which are more variously associated together or separated by European botanists than almost any others of the Order. As a whole, Festuceæ should include all the Poaceæ with two or more perfect flowers to the spikelet, which have neither the peculiar inflorescence of Chlorideæ or of Hordeeæ, nor the dorsal or twisted awn of Aveneæ, nor the peculiar habit of Bambuseæ. But we have seen that there are a few species where the awn is wanting, but which must yet be left in Aveneæ; we shall find that in *Diplachne*, *Oreochloa*, and even in *Festuca* itself, there is occasionally an inflorescence very nearly that of Chlorideæ; and with regard to Bambuseæ, distinct as is the habit and foliage of the great mass of genera, yet it is exceptional in *Planotia*, and in the subtribe Centotheceæ of Festuceæ there is some approach to that of the Bambuseæ. The subdivisions proposed of the Order into subordinate groups have been so various, and often on such plausible (though sometimes contradictory) grounds, that it is not without hesitation that I have selected for adoption the following eight subtribes:—

Subtribe 1. *Pappophoreæ*, has often been raised to the rank of a substantive tribe, but with various limits; and it really is only distinguished from Triodieæ by the more numerous teeth, lobes, or awns of the flowering glumes. There are five well-established genera, requiring little comment.

1. POMMEREULLA, Linn. f., is a single East-Indian annual, with short spikes almost enclosed in the upper leaf-sheaths, and remarkable for the presence of two empty glumes between the ordinary lower pair and the flowering ones, as in *Ctenium*, *Eremochloa*, *Brylkinia*, and *Uniola*.

2. PAPPOPHORUM, Schreb., has nearly twenty species from the warmer regions of both the New and the Old World, distributed in two sections, regarded by some as distinct genera:—*Polyrhapsis*, Trin., a few American species in which the flowering glume has thirteen to twenty-three very unequal awns; and *Enneapogon*, Desv., chiefly, but not exclusively, from the Old World, in which the flowering glume has nine awns, all nearly equal, or five of them rather external and slightly different from the four inner ones.

3. COTTEA, Kunth, is a single tropical American species, differing from *Pappophorum* in the looser panicle, and in the flowers usually more than two, instead of only one or two, in each spikelet.

4. *BOISSIERA*, Hochst., is a single Oriental species, which, besides the characters derived from the glumes, has a very short membranous dilated two-lobed style, different from that of every other known grass.

5. *SCHMIDTIA*, Steud., contains two species closely resembling each other, one from the Cape-Verd Islands, the other from tropical and South Africa, with a narrow but loose panicle, and the flowering glumes ending in four inner lanceolate lobes, and five outer subulate lobes or awns.

Our second subtribe, *Triodieæ*, is not so definite as could be wished. There are usually more than two flowers to the spikelet; and the flowering glumes have rarely more than three nerves, and end in three teeth, lobes, or awns. These characters are generally very prominent; but in a few species of *Triodia* and *Diplachne* the teeth are scarcely more than what occur occasionally in some other subtribes, and in one or two species of *Triraphis* the nerves of the glumes are more numerous, bringing them technically near to Pappophoreæ. The panicle in all the genera is usually narrow, dense or loose, but very rarely spike-like, and in a few species loose and spreading. We include six genera.

6. *TRIODIA*, Br. (*Uralepis*, Nutt.), as at present limited, comprises about twenty extratropical species, northern or southern, with a very few extending into the tropics in America or Africa. It has the typical characters of the tribe without the peculiarities of the other genera, the lobes of the flowering glumes reduced to short teeth or points, or the central one rarely lengthened into a short awn. It must be admitted, however, that it is still both a vague and a polymorphous genus, comprising three rather distinct sections and a few anomalous isolated species:—1. *Isotria*, three Australian species (*I. Mitchelli*, Benth., *I. pungens*, Br., and *I. Cunninghamii*, Benth.) with the three lobes of the flowering glumes narrow lanceolate and equal; 2. *Uralepis* (*Sieglingia*, Bernh., *Merisachne*, Trin.), about sixteen American or Australian species with one European one, in which the lateral teeth of the glumes are broad and not pointed and sometimes very minute, the middle one a point or very short awn; 3. *Tricuspis*, Beauv. (*Windsoria*, Nutt.), three North-American species differing from *Uralepis* in the nerves of the lateral teeth produced into short points. Besides these, *Leptocarydion*, Hochst., is an Abyssinian species, *T. plumosa* (*Leptochloa plumosa*, Anders., *Diplachne alopecuroides*, Hochst.) with the dense soft panicle almost of *Tri-*

chloris, but with the spikelets of *Triodia*. *Trichoneura*, Anders., is *Leptochloa Lindleyana*, Kunth, from the Galapagos Islands, with the habit nearly of *Diplachne fascicularis*, but with the characters of *Triodia*. *Leptochloa mollis*, Kunth, from Senegal, which I have not seen, would appear from his figure to be a *Triodia*, near to the *T. plumosa*, but with the loose panicle of *T. Lindleyana*. *Rhombolytrum*, Link, is *T. filiformis*, Nees, a Chilean species, very near to the North-American *T. albescens*, and *T. trinerviolumis*, Munro, and also to *T. Kerquelenensis*; Hook. f., and *T. antarctica* (*Catabrosa antarctica*, Hook. f.), from extreme southern America.

7. **DIPLACHNE**, Beauv., now comprises about fourteen species, dispersed over the tropical and temperate regions both of the New and the Old World, and variously referred to *Triodia*, *Leptochloa*, or *Molinia* by different agrostologists; and the genus is really closely connected with the two first-named, but more especially with the *Triodiæ* of the typical section *Uralepis*. From these it chiefly differs in inflorescence: the branches of the panicle are long and slender; the spikelets, almost linear, scattered along the rachis and sometimes sessile or nearly so in two rows, but not regular and unilateral enough to place the genus in Chlorideæ, to which it is sometimes referred. The characteristic teeth of the flowering glumes are also sometimes very minute. Whatever position, therefore, we give to the genus, it must be more or less an arbitrary one; but that next to *Triodia* seems the least objectionable.

8. **TRIPLASIS**, Beauv. (*Diplocea*, Rafin.), has two North-American species (*Uralepis cornuta*, Ell., and *U. purpurea*, Nutt.), with a narrow, slender, slightly-branched panicle, and the flowering glumes deeply divided into three narrow lobes, the central one a slender awn. The South-American *Triplasis setacea*, Griseb., is a *Diplachne* (*D. spicata*, Doell).

9. **SCLEROPOGON**, Philippi (*Lesourdia*, Fourn.), has four species, one from Chile, the others from the Mexican-Texan region, all remarkable for the unisexual spikelets, those of the two sexes so different in aspect that without positive evidence it would have been difficult to suppose them to belong to the same plant. The Mexican ones have been very well described and one of them figured by Fournier, who, from his specimens, supposed them to be strictly diœcious; but we have specimens with the two inflorescences upon different branches of the same individual.

Fournier also was not aware of the Chilian species previously published by Philippi, whose generic name necessarily takes the precedence over Fournier's.

10. *Eremochloa*, S. Wats., contains two New-Mexican or Californian species, well described and illustrated by S. Watson. The genus is exceptional in the subtribe in its one-flowered spikelets, and in the two empty three-awned glumes between the lower pair and the flowering one.

11. *Tetraphis*, Br., comprises five or six species, one as yet unpublished from South Africa, the others from Australia. In all, the three lobes of the flowering glumes are awned, whilst in one species, *T. mollis*, Br., otherwise inseparable from the genus, there are additional small membranous lobes between the awns, and at least five nerves to the glume, showing a close connection with the Pappophoræ. *T. microdon*, Benth., from Australia, is a very anomalous plant with unawned glumes, which should be removed from the genus; but it is difficult to say where it should be placed. *T. capensis*, Nees, is a *Danthonia* (*D. radicans*, Steud.).

The third subtribe, *Arundinæ*, though often regarded as a substantive tribe, has no definite character beyond the tall habit with a rich panicle, as designated by the common name *Reed*, and the long hairs surrounding the flowering glumes, either arising from the rhachilla or from the glumes themselves. This character, however, is no more exclusive here than in Saccharæ; for there are other genera, such as *Calamagrostis*, *Grapphephorum*, &c., which have the hairs nearly as long, but which on other accounts cannot be included in *Arundinæ*. The genera certainly belonging to the subtribe are four:—12. *Gynerium*, Humb. and Bonpl., three tropical or subtropical American species with strictly diœcious spikelets. 13. *Ampelodesmos*, Beauv., two Mediterranean species with rigid five-nerved flowering glumes. 14. *Arundo*, Linn. (*Donax*, Beauv., *Scolochloa*, Mert. and Koch, *Amphidonax*, Nees), three or four species from the warmer regions of the New and the Old World, very abundant all round the Mediterranean, with three-nerved flowering glumes; and 15. *Phragmites*, Trin. (*Arundo*, Beauv., *Czernya*, Presl, *Trichodon*, Roth), two species, one of them almost cosmopolitan, only differing from *Arundo* in the lowest flower of the spikelet being male only. These last three genera are frequently, and perhaps with reason, regarded as sections only of *Arundo*. Two Mexican monotypic genera proposed by Fournier, 16. *Gouinia*, and 17.

CALAMOCHLOA, are unknown to me. They are placed by the author in Arundinæ; but both would appear, from the short character given, to have a rather different inflorescence.

We have formed our fourth subtribe *Sesleriæ* of ten genera, all except the monotypic *Elytrophorus* extratropical, and connected together for the most part by inflorescence as well as by structural characters. These are, however, not without exceptions. The spikelets are usually collected together in little heads or close clusters, which are themselves closely clustered in a dense globular or spike-like panicle; and at the base of the head or panicle are usually a few barren spikelets or empty glumes, or, sometimes single glumes, which I have elsewhere, though as I now believe erroneously, designated as bracts subtending the branches of the inflorescence. In two genera the whole inflorescence is reduced to two or three spikelets sessile in a cluster of floral leaves. In structure the flowering glumes are variable in their nerves; but the styles, in almost all the genera, are long, with barbellate or very shortly plumose stigmatic branches, forming an exception to the tribe, which has induced several botanists to refer *Sesleria* itself to the Paniceæ, from which it differs so widely in other characters. We include the following genera in the subtribe:—

18. MONANTHOCHLOE, Engelm., is a single Texan species, anomalous in habit and character, well described and figured by Engelmann. It has been compared to *Buchloe* on account of its unisexual spikelets and creeping habit; but the two sexes in *Monanthochloe* are very similar to each other, and there is no indication in the inflorescence of any affinity with Chlorideæ.

19. MUNROA, Torr., has now three or four species, two or three from extratropical South America having been recently added to the original Mexican-Texan one, figured in the last part of Hooker's *Icones*. The genus is a perfectly isolated one, showing only some slight affinity with *Monanthochloe*, especially in the very few spikelets sessile within a cluster of floral leaves; they are not, however, unisexual as in that genus.

20. ECHINARIA, Desf. (*Panicastrella*, Mœnch), a single well-known Mediterranean species; 21. AMMOCHLOA, Boiss. (*Cephalochloa*, Coss. & Dur.), two Oriental or North-African species; and 22. UROCHLÆNA, Nees, a single South-African species figured in the last part of Hooker's *Icones*, require no further comment on the present occasion.

23. *SESLERIA*, Scop., about eight European or West-Asiatic species, is an old-established distinct genus which has been but little interfered with, except that *S. tenella*, Host, has been proposed as a genus by Link under the name of *Psilathera*, but upon characters which do not appear to be of more than specific value.

24. *ELYTROPHORUS*, Beauv. (*Echinolysium*, Trin.), is a single exceptionally tropical species, widely spread, but limited to the Old World. The little heads of minute spikelets forming a spike longer than usual in the subtribe, and often interrupted, and the wings on one or both the keels of the palea readily distinguish the genus.

25. *FINGERHUTHIA*, Nees, a single species figured in the last part of Hooker's *Icones*, is exceptional in the whole primary division Poaceæ in having the very short pedicels articulate below the spikelet as in Panicaceæ, whilst the male flower or empty glume is above the fertile flower as in Poaceæ. Its geographical range is also peculiar: rather common in South Africa, it has been recently gathered by Dr. Aitchison in Afghanistan, without its ever having been observed in any intermediate station.

All the preceding genera have the long styles of the subtribe; but there remain two with the styles scarcely longer than in the other Festuceæ, whilst the barren spikelets at the base of the dense inflorescence or of its branches are very conspicuous, and show a close affinity with the Seslerieæ. These are 26. *LAMARCKIA*, Mœnch (*Chrysurus*, Pers., *Pterium*, Desv., *Tinæa*, Garzia), a single Mediterranean species, and 27. *CYNOSURUS*, Linn., three or four species with a much wider geographical range over the temperate regions of the Old World, and one of them at least now naturalized in several other countries within or without the tropics. Both genera are remarkable for the lower barren spikelets of the clusters or spikes elegantly pinnate with numerous bifarious empty glumes. The two were united by the older botanists, and have been again brought together by some modern ones under the Linnean name *Cynosurus*; but they appear to be sufficiently different in habit and character to be maintained as separate genera; and *Cynosurus* itself has two very distinct sections, raised by some to the rank of genera:—*Cynosurus* proper for the *C. cristatus*, Linn., and its annual Algerine variety *C. polybracteatus*, Poir., altered to *C. multibracteatus*, Rœm. & Schult. (*C. crista-galli*, Munby), in which the spike-like unilateral panicle

much resembles the spikes of Chloridæ, and the glumes, though very pointed, are unawned; and *Falona*, Adans., altered by Dumortier to *Phalona*, for the *C. echinatus*, Linn., and *C. elegans*, Desf., with the panicle or head more like that of a *Dactylis*, but with awned glumes.

The characters of our fifth subtribe, *Eragrostæ*, like those of Eufestuceæ, are chiefly negative. The two together comprise all the Festuceæ which have not the peculiarities of either of the other six subtribes, and differ from each other in the *Eragrostæ* having three prominent nerves to the flowering glumes, the Eufestuceæ five or more nerves, sometimes rather obscure. Trifling as this character may be, it is a fairly constant one, the exceptional species being exceedingly rare; and I have found no other one so useful in distributing these numerous genera into groups. We have included in *Eragrostæ* twelve of them, though the last of them (*Ectrosia*) might be equally well placed under the following subtribe Meliceæ.

28. *KÆLERIA*, Pers., has about twelve species, of which ten are European, temperate Asiatic, or North African, one of them extending over extratropical America north and south and South Africa; the two remaining species are endemic, one in South Africa, the other in the Sandwich Islands. The genus has been generally admitted with little variation; but it is difficult to assign to it any positive character. The panicle is usually dense and narrow, often spike-like; and the glumes are more scarious, especially on the margins, and have fainter nerves than in the others of the subtribe. It has been divided into two sections, maintained by some as genera:—1. *Airochloa*, Link, to which Reichenbach restricts the name of *Kæleria*, with the glumes obtuse or acute but without distinct points; and 2. *Lophochloa*, Reichenb., to which Link restricts the name of *Kæleria* (*Ægialitis*, Trin., altered by Schultes to *Ægialina*), in which the flowering glumes have a distinct point or short awn at or just below the tip. This section includes, besides the species enumerated by Cosson and Durieu in their 'Flore d'Algérie,' *K. Gerardi*, Munro, from South Africa, and *K. glomerata*, Kunth (*K. vestita*, Nees), from the Sandwich Islands. The last species differs slightly from the genus in the long loose panicle, which, however, is more dense in our specimens than it is figured by Kunth. C. Koch's genus *Wilhelmsia*, from the Caucasus, is, according to Grisebach, only a depauperated specimen of *K. phleoides*, Pers.

29. *AVELLINIA*, Parlat., is a single West-Mediterranean annual with the habit of *Schismus*, and placed by Savi in *Bromus*, by Gussone in *Avena*, and by DeCandolle in *Kæleria*. It is well marked amongst *Eragrostæ* by the outer glumes, of which the lowest is almost reduced to a bristle, and the second broad, membranous, and the largest of the spikelet; the flowering glumes awned.

30. *EATONIA*, Rafin. (*Reboulea*, Kunth, *Colobanthus*, Trin.), two or three closely allied North-American species, with the second empty glume the largest of the spikelet, as in *Avellinia*; but the habit is very different and the glumes all unawned.

31. *DISSANTHELIUM*, Trin. (*Phalaridium*, Nees, *Stenochloa*, Nutt.), comprises two, or perhaps three, species from the Andes of South America and the coasts of Mexico and California, figured and described in the last part of Hooker's *Icones*. They have most of the characters of *Schismus*, but, besides the widely distant geographical stations, they differ in the nerves of the flowering glumes always three, not five.

32. *MOLINIA*, Mœnch (*Enodium*, Gaudin), a single well-known European and temperate Asiatic species, and 33. *SPHENOPUS*, Trin., a very pretty little Mediterranean annual, require no further comment on the present occasion.

34. *CATABROSA*, Beauv., can only be distinctly characterized if reduced to the single *C. aquatica*, Beauv., placed by some authors in *Aira*, by others in *Glyceria*. In it the three nerves of the flowering glume characteristic of *Eragrostæ* are very prominent. The two or three Oriental species added to it by Trinius belong to the genus *Coupodium*. *C. antarctica*, Hook. f., is a *Triodia*. *C. glaucescens*, Phiippi, and *C. magellanica*, Hook. f., are true *Glyceriæ*.

35. *ERAGROSTIS*, Beauv., an almost cosmopolitan genus of above eighty species (multiplied by Steudel and others to about two hundred and fifty), is a very natural one so far as the great majority of species are concerned, and distinctly limited if we include the three-nerved glumes amongst the essential characters. Yet in other respects there are exceptional species which have been variously referred, even by modern botanists, to *Poa*, *Festuca*, *Briza*, *Dactylis*, *Eleusine*, or *Leptochloa*, which they in some measure approach respectively; and some have been proposed as substantive genera; but it has appeared to me that the genus may be best defined if retained entire, dividing it into the six

following fairly distinct sections :—1. *Cataclastos*, Doell, includes *E. ciliaris*, Link, *E. peruviana*, Trin., and a few other tropical species, which, on account of their short spikelets with few flowers and fragile rhachilla, have been restored to *Poa* by Fournier and some others; but the shape and nervation of the glumes are quite those of *Eragrostis*, and the inflorescence, though peculiar, is not more that of *Poa* than of *Eragrostis*. *Macroblepharus* of Philippi, judging from his description, does not seem to differ from the true *E. ciliaris*. 2. *Plagiostachya* comprises some African and East-Indian species, which, with the flat several-flowered spikelets and continuous rhachilla of *Eragrostis* proper, have an inflorescence approaching that of Chlorideæ. The species are rather dissimilar in habit. *E. bifaria*, Steud., has the long simple terminal spike nearly of *Tripogon*, with obtuse glumes. *E. Schimperii* (*Harpachne Schimperii*, Hochst.) has a shorter simple spike and acuminate flowering glumes. *E. brevifolia* and *E. Cælachyrum*, Benth., the latter forming the genus *Cælachyrum*, Nees, and figured in the last part of Hooker's *Icones*, have nearly the habit of some species of *Eleusine* (*Dactyloctenium*) or of *Æluropus*. *E. congesta*, Oliv., and *E. cynosuroides*, Roem. et Schultes, have very numerous short sessile spikelets crowded or clustered along the long terminal peduncle. 3. *Myriostachya* is an East-Indian species, *E. Wightiana* (*Leptochloa Wightiana*, Nees), allied to *E. cynosuroides*, but with a more complicated inflorescence. 4. *Pteroëssa*, Doell, or *Eragrostis* proper, is characterized by the usually many-flowered spikelets with the rhachilla continuous or rarely articulate when old, the flowering glumes usually deciduous, leaving the palea persistent on the minute floral axis with its back to the rhachilla. The species are numerous, and may be distributed into three rather distinct series :—*Cylindrostachyæ*, three or four Australasian species, with narrow-linear almost terete spikelets; *Leptostachyæ*, including the cosmopolitan *E. pilosa*, Beauv., and its allies, with narrow-linear flat spikelets; and *Megastachyæ*, including the widely-spread *E. megastachya*, Link, and many other, chiefly American, species, with broader linear or oblong flat spikelets. The generic name *Megastachya* has undergone many vicissitudes. It was first founded by Beauvois on the *Poa mucronata* of his Flora of Oware and Benin; but in drawing up the generic character for his 'Agrostographie' he had in view chiefly the common *E. megastachya*. Fournier, more recently, founded a genus on those American

species (*E. reptans* &c.) which have the spikelets more or less unisexual, the males usually flatter, longer, and with more flowers than the females; but this separation of the sexes is very variable, and not always accompanied by any difference in habit. Some species may be occasionally quite dioecious; in others the males and females are in different panicles on the same plant; others, again, are variously polygamous; and here, as in the Chilian *Poa*, the character is too inconstant to justify generic or even sectional separation. *Megastachya*, Fourn., does not include *E. megastachya*, Beauv. 5. *Platystachya*, includes a few African or Arabian species with broad, flat, many-flowered spikelets with rather paleaceous glumes, and the rhachilla articulate as in *Cataclastos*. Amongst these Munro would include as *E. geniculata* the *Briza geniculata*, Thunb., which in its thickened spikelets appears intermediate between *Briza* and *Eragrostis*, but has the prominently three-nerved glumes of the latter. 6. *Sclerostachya*, has three African or Asiatic species. The paleaceous glumes and articulate rhachilla are those of *Platystachya*; but the spikelets are not so broad, and the rigid habit with long and rush-like or short and pungent leaves are those of *Æluropus*.

36. *IPNUM*, Philippi, is a single Chilian species unknown to me. From the author's description, it would appear to differ from the section *Pteroëssa* (*Cylindrostachyæ*) of *Eragrostis* in the articulate rhachilla and in inflorescence.

37. *CUTANDA*, Willk., is a genus proposed for the European or North-African *Festuca maritima*, DC., *F. philistæa*, Boiss., *F. memphitica*, Boiss., *F. divaricata*, Desf., *F. incrassata*, Salzm., and *F. lanceolata*, Forsk., which, notwithstanding a general resemblance to *Festuca* in the shape of the spikelets, could not remain in that genus without an essential alteration in its generic character, the glumes being strongly keeled and three-nerved from the base. The inflorescence is also peculiar.

38. *OREOCHLOA*, Link, is a single European mountain species, formerly included in *Sesleria*, which it approaches in its short compact inflorescence and the slightly elongated stigmas; but there are no barren spikelets, the spike is simple, with almost sessile bifarious spikelets like those of some species of *Festuca* (*Scleropoa*), and the glumes are those of *Eragrostæ*.

39. *ECTROSIA*, Br., comprises three or four Australian species allied both to *Eragrostæ* and to *Meliceæ*, but technically rather better placed in the former subtribe.

As a sixth subtribe, *Meliceæ*, I have collected five genera allied both to *Eragrostæ* and *Festuceæ*, but technically connected with each other by their spikelets containing two or more empty glumes above the flowering ones. This character is also observed in *Ectrosia* and in *Lophatherum*, which I had formerly included in the group; but on other accounts the former appears better placed in *Eragrostæ*, and the latter in *Centothecæ*.

40. *CRYPTOCHLORIS*, Benth., a single species probably from Patagonia, 41. *HETERACHNE*, Benth., two Australian species, and 42. *ANTHOCHLOA*, Nees, one or two species from the Andes of South America, are very distinct dwarf grasses, described and figured in Hooker's *Icones*.

43. *MELICA*, Linn., contains above thirty species dispersed over the temperate regions of the northern hemisphere, and extending down the Andes into extratropical South America, represented also in South Africa. This genus, the typical representative of the subtribe, has been universally recognized since the days of Linnæus, and less tampered with than any other genus of equal extent, although it may be in some degree polymorphous in habit as well as in character. In the typical *Melicas*, however varied the panicle, long and narrow, or very loose and spreading, the spikelets are generally nodding or pendulous, with rarely more than two flowers; the flowering glumes more or less scarious on the margins and never awned, and the terminal empty glumes one within the other, form an obovoid obtuse mass. In a section proposed by Thurber for four North-west American species under the name of *Bromelica*, the spikelets are erect, with more rigid glumes occasionally awned and three to eight flowers, the upper empty glumes narrower and not so closely packed, giving the plants altogether so different an aspect, that I have much hesitated whether I should not, as suggested by Thurber, raise the section to the rank of a genus. In both sections the flowering glumes have five or more nerves. *M. stricta*, Boland., is in some measure intermediate between the two. *Chondrachyrum*, Nees, a Brazilian species which I have not seen, would seem from the description given to be a true *Melica*.

44. *DIARRHENA*, Rafin. (*Korycarpus*, *Corycarpus* or *Rœmeria*, *Zea*, *Onoea*, Franch. and Sabat.), two species, one from North America, the other from Japan, is very near *Melica*; but the flowering glumes have only three nerves and are hardened round the grain, which usually exceeds them, and the stamens are reduced

to two or one. The habit is nearly that of the section *Bromelica* of *Melica*.

Our seventh subtribe *Centothecæ* is formed of a small number of tropical grasses, several of which have been occasionally referred to *Bambuseæ*, but expelled from that tribe by all who have specially worked at it. The structure of the spikelet is that of some *Eufestuceæ* or *Meliceæ*; but the foliage is unusual, the lamina of the leaf is broad and flat, and between the numerous longitudinal veins are small transverse veinlets not observed in any others of the Order except in a few *Bambuseæ*. There is, however, none of that articulation of the lamina on the leaf-sheath which is almost universal in the latter tribe. The *Centothecæ* comprise five genera.

45. *CENTOTHECA*, Desv., has two or three species from the tropical regions of the Old World. They are tall grasses with a loose panicle, the spikelets awnless with usually more than two flowers, without any, or with only one empty glume above them. In the common *C. lappacea*, Desv., the flowering glumes have on their back a few reflexed rigid hairs or bristles; and that has been generally relied upon as the essential character of the genus; but the bristles are sometimes reduced to one or two minute tubercles, or even wanting, and in an African species (probably the *Poa mucronata*, Beauv.) there is no trace of them, and yet the plant is in all other respects an undoubted *Centotheca*.

46. *ORTHOCLADA*, Beauv., is a single tropical-American species, with the habit, foliage, and inflorescence of *Centotheca*; but the spikelets contain only one, or rarely two, fertile flowers, the second flower being usually male only; the glumes have never the reversed bristles of *Centotheca*; and the spikelets appear to be frequently unisexual.

47. *LOPHATHERUM*, Brongn. (*Acroelytrum* and *Allelothea*, Steud.), has one, or perhaps two, species from tropical and Eastern Asia. The habit, foliage, and inflorescence are those of *Centotheca* and *Orthoclada*; but above the single fertile flower are several small empty, very shortly-awned glumes, densely crowded in a little unilateral tuft or crest, bringing the genus into connection with *Meliceæ*.

48. *STREPTOGYNE*, Beauv., is a single species sparingly scattered over East India, tropical Africa and America, and the southern states of North America, allied perhaps in some respects to *Lophatherum*, but quite isolated in habit and a variety

of characters. The long narrow spikelets are few or numerous in a long, rigid, terminal unilateral spike; and the exceedingly long capillary styles become spirally twisted together far beyond the glumes. There is a considerable variety in the number of spikelets, in the number of flowers in each from one to four; and even the stamens and styles are sometimes two, sometimes three; but I have been unable to trace any connection of these diversities either with each other or with geographical stations so as to mark distinct species.

49. ZEUGITES, Schreb. (*Senitis*, Adans., *Despretzia*, Kunth, *Krombholtzia*, Fourn.), has five or six tropical-American species. They have not all the tall habit of the preceding genera; for the best-known West-Indian and Central-American species, originally described by Linnæus under *Apluda*, is a much weaker plant with smaller leaves; they are, however, broad and flat, with the characteristic venation of the subtribe. The spikelets in the genus generally have one fertile flower with two to five male ones above it.

I have already adverted to our eighth and last subtribe *Eufestuceæ*, or *Festuceæ* proper, as differing from *Eragrostæ* in having five or more nerves to the flowering glumes instead of three or one only. Generally speaking, they have not the several-awned glumes of *Pappophoræ* and *Triodieæ*, nor the barren spikelets nor long styles of *Seslerieæ*, nor the long hairs surrounding the flowering glumes of *Arundineæ*, nor the cluster of upper empty glumes of *Meliceæ*, nor the peculiar foliage of *Centotheceæ*; yet there are here and there exceptional species showing an approach to one or another of these characters, and interfering much with any definite line of demarcation. We include in the subtribe twenty genera, the last five of which are further characterized by the adherence of the grain to the palea; but, as already observed, this character is not quite constant even in *Festuca*, and is occasional in such genera as *Poa* and *Briza*, where the grain is usually free. I have been unable to discover any other character which would distribute the genera of the subtribe into more satisfactory groups.

The first two genera have a simple racemose inflorescence. 50. PLEUROPOGON, Br. (*Lophochlæna*, Nees), has three species, one arctic, the two others Californian, distinguished by the keels of the paleæ bearing a linear tooth or flat crest; and 51. BRYLKINIA, F. Schmidt, a single Japanese species, with two empty

glumes close under the flowering one besides the two lower persistent ones.

52. *UNIOLA*, Linn. (*Trisiola*, Rafin., *Chasmanthium*, Link), has four genuine North-American species, tall plants somewhat variable in inflorescence, but all with flat broad spikelets in which the three to six lower glumes are empty, but in size and shape pass gradually into the flowering ones, which vary from three to about twenty. If *U. racemiflora*, Trin. (*U. virgata*, Griseb.), from the West Indies, be retained in the genus as having flat spikelets with more than two empty glumes below the flowering one, it must be considered as a very exceptional species with the inflorescence nearly of *Leptochloa* among Chlorideæ. The small spikelets are closely sessile in two rows in unilateral spikes; and these spikes, shorter than in *Leptochloa*, are very numerous and crowded along the long peduncle. It would be better perhaps to regard the plant as a section of *Leptochloa* rather than as a distinct genus. Fournier has added three Mexican species of *Uniola* which are unknown to me; but, from his short characters, they would scarcely seem to be true congeners. *U. prostrata*, Trin., and its allies are now included in *Distichlis*.

53. *DISTICHLIS*, Rafin., comprises four or five closely allied species, or perhaps varieties of a single one, extending from North America down the Andes to extratropical South America, one of them found also in Australia. They are generally, but not always, maritime plants, with few spikelets nearly sessile in a dense panicle, and generally if not always strictly diœcious, though the two sexes differ but little in habit. The glumes are rather rigid and paleaceous, which induced Link to join the only American species with which he was acquainted, with the Mediterranean *Poa sicula*, Jacq., as a genus *Brizopyrum*, a name retained by Presl and by Fournier for the American species. The European *B. siculum*, however, and some African congeners have the spikelets hermaphrodite, a more regular bifarious inflorescence, and otherwise differ sufficiently from the American forms to be maintained as a separate genus which has a primary title to Link's name.

54. *ÆLUROPUS*, Trin. (*Calothea*, Spreng., *Chamædactylis*, Nees), has three species from the Mediterranean region, Central Asia, and East India, formerly included in *Dactylis*, but differing in their creeping or prostrate branching habit, short, rigid, often

pungent leaves, more numerous flowers in the spikelets, and some other minor points.

55. *DACTYLIS*, Linn., is now limited to two species :—the common and well-known *D. glomerata*, Linn., which from Europe and temperate Asia has spread over many parts of the civilized world ; and *D. cæspitosa*, Forst., the celebrated Tussock grass of the Falkland Islands, which, though a much larger plant, appears to be strictly a congener.

56. *LASIOCHLOA*, Kunth, has three or four South-African species with a close almost spikelike panicle and hairy glumes, allied in many respects to *Kæleria* ; but the inflorescence as well as the many-nerved glumes bring them nearer to *Dactylis*.

57. *BRIZOPYRUM*, Link, as now understood, is specially founded on the Mediterranean *Poa sicula*, Jacq., to which are added three South-African species. The flat broad spikelets with coriaceous glumes are nearly those of *Eragrostis* sect. *Platystachyæ* ; but the flowering glumes have seven nerves, and the spikelets are nearly sessile in a bifarious spike, or especially the lower ones closely clustered. I have already referred under *Distichlis* to the American diœcious plants for which the name *Brizopyrum* has been retained by Presl and by Fournier ; the true *Brizopyra* are all hermaphrodite.

58. *SCLEROCHLOA*, Beauv., is limited to the *S. dura*, a small Mediterranean annual well characterized by the inflorescence and shape of the glumes ; the other species, sometimes referred to *Sclerochloa*, belong chiefly to *Cutanda*.

59. *BRIZA*, Linn., about ten species, of which the typical ones are chiefly European, though one has now spread over the greater part of the civilized world ; two sections are entirely American, tropical or northern. All are characterized by the very concave, sometimes almost vesicular, glumes enclosing a much smaller broad flat palea, the grain much flattened from back to front, and sometimes, but not generally, adhering to the palea. The three best known European species have a very loose panicle with the spikelets hanging from capillary branches ; the Oriental *B. spicata*, Sibth., differs in its narrow closer panicle. The American species have been separated as two distinct genera, which may be retained as sections, though with little difference in essential characters. *Chascolytrum*, Desv., has the awnless spikelets of the European species ; but the panicle, though branched, is much more compact, the

spikelets almost sessile. *Calotheca*, Desv., with a loose spreading panicle, has broadly scarious awned glumes.

60. SCHISMUS, Beauv. (*Electra*, Panz., *Hemisacris*, Steud.), has three or four species, one of them widely spread from the Mediterranean region, eastwards to Afghanistan and Arabia and westwards to the Canary Islands, the others South African. All are annuals with a narrow panicle, and distinguished by the long empty glumes quite enclosing the flowering ones.

61. NEPHELOCHLOA, Boiss., limited to the original Oriental species, is a very elegant little grass with the habit of *Aira involucrata*, and is figured in the last part of Hooker's *Icones*. The species added to the genus by Grisebach, for which he was obliged to alter Boissier's character, are now restored to *Poa*.

62. POA, Linn., is a cosmopolitan genus, chiefly extratropical, which, after frequent extensions and reductions, has now become fairly limited to a series of about eighty species. They form a group natural enough as to the great majority of species, differing from *Eragrostis* in their five-nerved flowering glumes, from *Glyceria* and *Festuca* in their glumes keeled from the base; but here, as elsewhere, there are species apparently intermediate between these large genera, and several smaller ones are only separated by characters of little importance. *Poa* has also been distinguished from *Festuca* by the obtuse, always unawned glumes, and by the non-adherence of the grain to the palea. The former character is general, but not absolute; several species of *Poa* have acute glumes, and in *P. lanuginosa*, Poir., they bear a fine point which might almost be termed a very short awn. And as to the grain, though it is usually free, there are several Chilian or Australian species and some Asiatic ones where it is adherent to the palea, as in *Festuca*, and even in the common *Poa pratensis* it is often more or less adherent, whilst there are several true *Festucas* where it is quite free.

Most of the widely spread species of this genus are so variable, that it would require much more research into specific detail than I can at present bestow upon them to distribute them into natural groups or sections; and I can only refer to the following as having been proposed as sections or separate genera:—*Pseudopoa*, proposed by C. Koch as a section of *Festuca*, includes *P. persica*, Poir., and two other temperate-Asiatic species, with very small spikelets and with nearly the habit of *Nephelochloa*, to which Grisebach has referred them, but which appear inseparable from

Poa notwithstanding the adherence of the grain to the palea. *Leucopoa*, Griseb., is the temperate-Asiatic *P. albida*, Turcz., with the spikelets rather larger than usual, and somewhat scarious and shining glumes like those of several Chilian species. *Dioicopoa*, E. Desv. (*Dispar*, Doell), is a section proposed for *P. chilensis*, Trin., *P. lanuginosa*, Poir., and their allies, in which the spikelets are usually, but perhaps not always, dioecious. In the dried state there is very little external difference between the male and the female panicle; and there are certainly Chilian specimens otherwise very near *P. chilensis* which have hermaphrodite flowers. Doell also places *P. lanuginosa* in his hermaphrodite section, whilst Emile Desvaux describes it as dioecious, as I have generally found it. The stamens, however, are very deciduous, and the ovary at the time the stamens are still enclosed very minute; and it requires careful observation to ascertain the real absence of the one or the other. It is probable that many species hitherto supposed to be perfectly hermaphrodite are more or less polygamous. *P. lanuginosa* shows, moreover, an approach to *Festuca* in the fine though short points to the flowering glumes, and in the adherence of the grain to the palea. *Poidium*, Nees, a Brazilian species, was separated by Nees from *Poa* on account of a reduction in the number of flowers to one or two, which Doell finds to be by no means constant.

63. COLPODIUM, Trin., about ten species, from the Levant and Russian Asia, might perhaps be regarded as a section of *Poa*. It differs in very little besides the small spikelets containing only one or two flowers, thus connecting *Poa* with the *Agrostææ*. The arctic plant, published by R. Brown as a doubtful *Colpodium*, now forms Grisebach's genus *Arctagrostis*, included above under *Agrostææ*.

64. GRAPHEPHORUM, Desv., including *Scolochloa*, Link (*Flumina*, Fries), and *Dupontia*, Br., contains seven North-American, North-European, or North-Asiatic species, very well worked up and distributed into four sections by Asa Gray. They are all very near *Glyceria*, differing chiefly in the hairs surrounding the flowering glumes, which induced several botanists to refer the genus to *Arundinææ*, though very different in habit and in the shape and venation of the glumes. The hairs of the spikelets are, moreover, very variable, shorter than in true *Arundinææ*, very short in the section *Arctophila*, and not entirely absent in one or two species of *Glyceria*.

65. GLYCERIA, Br., if we include *Atropis*, Rupr., is a genus of nearly thirty species spread over the extratropical regions, northern or southern, both of the New and the Old World. It is very nearly allied both to *Poa* and *Festuca*, differing from the former in the flowering glumes rounded at the base without any prominent keel, from *Festuca* in the broader more obtuse glumes, and the grain usually free from the palea, and from both in the shortness of the nerves of the glumes. The habit is somewhat variable, but as much so in each section as in the whole genus. The two sections into which it has been divided, often raised to the rank of separate genera, are:—1. *Hydrochloa*, Hartm. (*Porroteranthe*, Steud., *Exydra*, Endl., *Glyceria* proper of many botanists), with the lodicules connate and truncate or deficient, and the thick grain only marked on the inner face with a very narrow lined furrow or quite smooth; and 2. *Atropis*, Rupr. (*Puccinellia*, Parlat.), with two distinct lodicules and the grain more or less compressed from front to back, with a broad furrow or almost flat on the inner face. But these characters are not constant. The lodicules in the typical *Hydrochloa*, *G. fluitans*, Br., though thicker than in *Atropis*, and usually connate, are readily separable and occasionally spontaneously free; in *G. aquatica*, Sm., they are so short as to render it difficult to say whether they do or do not cohere, and in *G. nervata*, Trin., and in *G. pallida*, Trin., I can find no trace of them; in *Atropis* they are usually, but not always, more developed and thinner. The shape of the seed and of its furrow seems to vary from species to species, in so far as I have been able to procure it well ripened.

66. FESTUCA, Linn., is one of the genera as to whose limits botanists are the least agreed. With the exception of the exclusion of *Cutanda* and *Brizopyrum*, we have followed generally the arrangement proposed by Cosson and Durieu, which would include between seventy and eighty species (estimated by some at above two hundred and thirty), almost cosmopolitan in their geographical distribution, but most abundant in the northern temperate regions of the Old World, with not many American and very few tropical species. They are generally distinguished in the subtribe by the flowering glumes rounded without any prominent keel at least at the base, and acute or awned at the end, and by the glabrous grain adhering to the palea. But there are exceptions to each of these characters; and some species run very much into *Poa*, whilst others are scarcely distinct from *Bromus*. The

following are the most prominent groups established as sections or proposed by some as independent genera:—1. *Vulpia*, Gmel. (*Mygalurus*, Link), panicle narrow, dense, and usually unilateral, the outer glumes very unequal, one often minute or almost obsolete, the flowering glumes awned, and frequently, but not always, only one stamen. If we had only the common European species, this might well have been kept up as a genus; but in the South-American *F. ulochæta*, Doell, and *F. leptothrix*, Trin., the panicle is loose, as in *Eufestuca*, and in *F. delicatula*, Lag., *F. setacea*, Parlat., the awn is sometimes very short and the inflorescence rather that of *Eufestuca*. The proportions of the outer glumes vary from species to species. 2. *Eufestuca*, comprises the greater number of the species, with a loose, spreading or narrow panicle, the outer glumes nearly equal, the flowering ones acute or mucronate, rarely short-awned, and three stamens. Amongst them Grisebach has distinguished a section *Phæochloa*, with the ovary slightly hairy at the top as in *Bromus*; but the character is very variable in *F. sylvatica*, *F. varia*, and their allies. Doell has proposed a section *Mallopetalum* for the Brazilian *F. ampliflora*, Doell, apparently the same as the Mexican *F. amplissima*, Rupr., characterized by the lodicules villous at the top. I find these lodicules fringed with long hairs at the top exactly as in *F. fimbriata*, Nees, which Doell places amongst his *Festuca legitima* with glabrous lodicules. *Helleria*, Fourn., is proposed as a genus for the Mexican *Bromus lividus*, H. B. K., which Sprengel afterwards and Kunth himself removed to *Festuca*, of which it has all the characters of the awned species. The inflorescence is at first very like that of some varieties of *Bromus tectorum*; but as it advances the spikelets become very much divaricate or reflexed, giving the plant a peculiar habit. 3. *Schedonorus*, Beauv. (*Amphigenes*, Janka), comprises *F. pratensis*, Huds., *F. sylvatica*, Host, *F. nutans*, Host, *F. littoralis*, Labill., *F. Hookeriana* and *F. scirpoidea*, F. Muell., and a few others, tall plants, with loose, narrow or spreading panicles, awnless glumes, and the grain quite free from the palea, thus connecting the genus with *Poa*. Fries and other Swedish botanists, whilst they rightly referred Beauvois's species of *Schedonorus* back to *Festuca*, transferred his generic name to a very different group, which now forms the sections *Festucoides* and *Stenobromus* of *Bromus*. 4. *Catapodium*, Link, including *Micropyrum*, Link, differs from *Eufestuca* in the inflorescence, which is nearly the simple spike of *Hordeæ*; but the

rhachis is not notched and the spikelets are not quite sessile, the lower ones often two or three together on a very short branchlet, not collateral. *Nardurus*, Reichb., is the *F. unilateralis*, Schrad., differing from the rest of the section in the flowering glumes mucronate or shortly awned. *Castellia*, Tineo, is the *F. tuberculata*, Coss. and Dur., in which the flowering glumes are minutely tuberculate and the spike often shortly branched. *Nardurus montanus*, Boiss., scarcely differs from *F. (Vulpia) delicatula*, Lag., and *F. cynosuroides*, Desf., is also referable rather to *Vulpia* than to *Catapodium*. *F. lolium*, Balansa, may really be said to be intermediate between *Festuca (Catapodium)* and *Lolium*. *F. unioloides*, Kunth, is *Brizopyrum siculum*. *Catapodium fusiforme*, Nees, is *Tripogon bromoides*, Nees. 5. *Scleropoa*, Griseb. (*Sclerochloa*, Reichb., not of Beauv.), annuals, often small, with one-sided panicles, the short rigid branches bearing few almost sessile spikelets, at first erect, then spreading or reflexed, giving nearly the habit of *Cutanda*, but the glumes entirely those of *Festuca*.

67. PANTATHERA, Philippi, and 68. PODOPHORUS, Philippi, are monotypic genera from the island of Juan Fernandez, both very near *Bromus*, but scarcely reducible to it.

69. BROMUS, Linn., is a fairly natural genus of about forty species, generally distributed over the temperate regions of the northern hemisphere, with a very few tropical or southern species. Very near *Festuca*, with which it is closely connected through *Festuca gigantea*, Vill. (*Bromus giganteus*, Linn.), it differs generally in the flowering glumes distinctly notched or shortly two-lobed at the end, with an awn between the notches often not quite terminal and sometimes slightly twisted, showing an approach to *Avena*, and in the grain (always adnate to the palea) crowned by a little appendage or tuft of short hairs. These characters are, however, not quite constant; and the four following sections into which the genus has been divided run also much into each other, though some of them are often regarded as separate genera:—1. *Festucoides*, Coss. and Dur. (*Schænodorus*, Griseb.), consists of *B. asper* and *B. inermis*, Linn., *B. erectus*, Huds., and their allies, tall perennials, coming nearest to *Festuca*, with the awns usually very short or reduced to small points. 2. *Stenobromus*, Griseb. (*Anisanthe*, C. Koch), mostly annuals, with narrow spikelets and long-awned glumes. *Schedonorus* of Fries and other Swedish botanists, but not of Beauvois, includes both *Festucoides*

and *Stenobromus*. 3. *Zeobromus*, Griseb. (*Serrafalcus*, Parlat.), spikelets usually broad and thick, the flowering glumes awned, and the nerves of all the glumes more numerous than in the preceding sections. *Libertia*, Lejeune (*Michelaria*, Dumort.), is the *B. ardensensis*, Kunth, differing from *B. (Zeobromus) secalinus* in the lateral lobes or teeth of the flowering glumes produced into slender points or very short awns. *Triniusa*, Steud., is the *B. Danthoniæ*, Trin., very near *B. (Zeobromus) macrostachyus*, Desf.; but most of the flowering glumes, especially the upper ones of the large spikelets, bear three long recurved awns. 4. *Ceratochloa*, DC. (or Beauv.), three or four American species, extratropical or Andine, with flat spikes not unlike those of *Uniola*, but at length often thickened as in *Zeobromus*, and the flowering glumes scarcely notched at the end, and the awn very short. Fournier rightly retains the *B. (Ceratochloa) purgans*, Linn., in *Bromus* (under the name of *B. Hookeri*), but keeps up the genus *Ceratochloa* for the original *C. unioloides*, DC., as having the lodicules connate. I have examined a number of specimens, both wild and cultivated, and have always found the lodicules attached by a broad base and contiguous, but quite free or only exceedingly shortly cohering at the very base.

70. BRACHYPODIUM, Beauv. (*Hemibromus*, Steud.), has five or six European or temperate-Asiatic species, one or two of which are also in Mexico, Colombia, and tropical and southern Africa. They closely connect *Festuca* with *Agropyrum*; the spikelets are those of the former though usually longer, and the simple spicate inflorescence is that of *Agropyrum*, except that the rhachis is not articulate and not at all or scarcely notched, and the spikelets are not so closely sessile, usually few and distant. *Trachynia*, Link, is *B. distachyum*, Roem. and Schult., which differs from the rest of the genus as an annual, with only one or two spikelets at the end of the peduncle.

Tribe XIII. HORDEÆ.

This tribe, one of the most definite of the Poacæ, is characterized chiefly by the inflorescence. The spike is always simple, except in abnormally luxuriant cultivated varieties or monstrosities, the rhachis notched and often, but not always, articulated, the spikelets (one- or several-flowered) singly or two or more collaterally sessile at each notch. The genera, mostly very distinct, belong to the temperate regions of the New as well as the

Old World, chiefly in the northern hemisphere; and scarcely any species, except as introduced weeds or escapes from cultivation, penetrate within the tropics. The twelve genera are readily ranged in three distinct subtribes, and require but little comment on the present occasion.

The first subtribe, *Triticeæ*, comprises four genera, in which the spikelets have three or more, or very rarely only one or two, flowers, and are singly sessile at each notch of the rhachis.

1. *LOLIUM*, Linn., is at once distinguished from all others of the tribe by the position of the flat spikelets with their edge to the rhachis. Steudel enumerates twenty-two species; most authors reduce them to three or four, which run much into each other. De Rouville published at Montpellier a detailed monograph, in which he rejects all the old species and redivides the genus into three primary and several subordinate races, to which he gives new characters and new names, doing little but add to the prevailing confusion. Two genera have been founded on individual species or forms—*Cræpalium*, Schrank, is the *L. temulentum*, Linn., and *Arthrochortus*, Lowe, is a Madeiran species or variety very near to *L. rigidum*, Gaudin (*L. strictum*, Parlat.), and to some varieties of *L. temulentum*.

2. *AGROPYRUM*, J. Gært. (*Elytrigium*, Desv.), contains about twenty species, formerly regarded as congeners of the cultivated Wheats, from which they differ much in habit and technically in the lateral nerves of the flowering glumes connivent at the top or confluent into the terminal awn. They are well distributed into two sections:—1. *Agropyrum* proper, mostly perennials, with the spikelets more or less distant along the common peduncle or rhachis, the outer empty glumes usually very unequal-sided and not keeled. To this section belong the common *A. repens*, *A. junceum*, *A. caninum*, and a few others. *Rægneria*, C. Koch, is, according to Grisebach, a species closely allied to *A. caninum*. *Anthosachne*, Steud., is the Australasian *A. scabrum*, Beauv. (*Festuca scabra*, Labill.), which, with the closely allied East-Indian *A. semicostatum*, Nees, and the Oriental *A. longearistatum*, Boiss., differs from the commoner species in the denser spikes and narrower glumes tapering into long awns at length diverging. *A. pectinatum*, Beauv., is an Australian species still further connecting *Agropyrum* proper with *Eremopyrum*. 2. *Eremopyrum*, Ledeb. (*Cremopyrum*, Schur, perhaps by a clerical error, *Costia*, Willk.), mostly annuals, with the spikelets distichous

and close together in a short dense spike, the narrow empty glumes nearly equal-sided and keeled. Two species, *A. villosum* (*Secale villosum*, Linn., *Haynaldia*, Schur) and *A. hordeaceum*, Boiss., form the proposed section *Dasypyrum*, Coss. and Dur. (*Pseudosecale*, Gren. and Godr.), differing slightly from the other species in the empty glumes rather unequal-sided, and one lateral nerve on one side of the keel very frequently as prominent as the keel itself, giving the glume the appearance of being two-keeled. *Heterantherium*, Hochst., from the Levant, is a species very near *A.* (*Eremopyrum*) *orientale*, with a dense villous spike, and several of the spikelets, especially near the base and apex of the spike, often sterile with empty glumes.

3. *SECALE*, Linn., is now reduced to two species or perhaps varieties, the cultivated Rye, of which *S. montanum*, Guss., is supposed to be the original spontaneous form, and *S. fragile*, Bieb. The genus differs slightly from the section *Eremopyrum* of *Agropyrum* in the dense cylindrical spike, and in the spikelets usually containing only two flowers.

4. *TRITICUM*, Linn., excluding *Agropyrum* and including *Ægilops*, can scarcely reckon more than ten botanical species; the most prominent character separating them from *Agropyrum* consists in the shape of the spikelets not so flat, and especially in the lateral nerves of the flowering glumes not connivent, but remaining parallel or nearly so, and either stopping short of the apex or produced beyond it into distinct teeth or awns. There are three rather distinct groups:—1. The cultivated *Wheats*, of unknown origin, in which the flowering glumes are keeled at the end and sometimes from the base, and terminate in a single awn, the lateral nerves usually barely reaching to the end of the glume. 2. *Crithodium*, Link, founded on *T. monococcum*, Linn. (*T. bæoticum*, Boiss.), in which the spikelets have only one fertile flower, and the flowering glume is keeled from the base and ends in a single awn. *T. bicornis*, Forsk., with two or even three fertile flowers and the lateral nerves of the flowering glumes sometimes produced into short teeth, may be referred to the same section. 3. *Ægilops*, Linn., above forty published species, which Munro reduces to seven or eight, differing from the cereal wheats in the flowering glumes more rounded at the back and not at all keeled, and in the lateral nerves of the flowering glumes often produced into long awns, especially in the upper end of the spike. The

extreme readiness with which some species hybridize with the cultivated wheats has given rise to the suggestion, strongly advocated by some, positively rejected by others, that it is in some of the common species of *Ægilops* that we must look for the original of our cereal wheats.

The second subtribe, *Leptureæ*, is characterized by the slender spikes and the spikelets solitary at the notches, each with only one or rarely two flowers. We refer to it five genera, placed by Kunth and some others in *Rottboellieæ*, from which they differ in the outer empty glumes, when present, persisting below the articulation of the rhachilla.

5. *LEPTURUS*, Br., including *Pholiurus*, Trin., has six species, five of them with the ordinary geographical range of the tribe, the sixth, *L. repens*, Br., exclusively Australasian or South Pacific and maritime. They are distinguished in the subtribe by the rigid outer empty glumes, one or two in number, much longer than the hyaline flowering glume, thus showing the nearest approach to *Rottboellieæ*. They differ from each other sufficiently to have been referred by different botanists to different genera. *L. cylindricus*, Trin. (*L. subulatus*, Kunth), included by Link in *Ophiurus*, by Reichenbach in *Monerma*, has one outer empty glume and one flower with no empty glume above it. The Australasian *L. repens*, a much larger plant than any of the others, has one outer empty glume, one flower, and above it a glume either empty or enclosing a palea, but no flower. *L. persica*, *L. incurvata*, and *L. filiformis*, Trin., have two lower empty glumes, one flower, and no empty glume above it. *L. pannonicus*, Kunth, forming Trinius's genus *Pholiurus*, and referred by T. Nees to *Ophiurus*, has two outer empty glumes and two perfect flowers.

6. *PSILURUS*, Trin. (*Monerma*, Beauv., partly, *Asprella*, Host but not of Willd.), is a single annual, near *Lepturus*, but with only one minute empty glume, a single narrow and awned flowering glume, and only one stamen in the flower.

7. *NARDUS*, Linn., is a single well-known small perennial, the position of which in the system is rather puzzling. The spikelet has only one flower without any empty glumes below it or prolongation of the rhachilla above it, which might have decided its relationship either to *Panicaceæ* or to *Poaceæ*, and its long simple style might indicate an affinity to some *Panicææ* or to *Seslerieæ*; but on the whole it seems nearest allied to the *Leptureæ*, a supposition which might be confirmed, if we regard the rather pro-

minent lower margin of the notches of the rhachis as a rudimentary glume.

8. *KRALIKIA*, Coss. and Dur., is a single Algerine species unknown to me, but well described, and evidently rightly placed in the present group. 9. *OROPETIUM*, Trin., is a dwarf East-Indian species remarkable for the cylindrical spike, with perfectly immersed spikelets as in some *Rottboellias* and *Ophiurus*, but with the outer persistent glumes of *Hordeæ*.

The third subtribe *Elymeæ* comprises three genera, in which the spikelets are two or more, collaterally sessile at each notch of the spike, or the lateral ones very shortly stipitate.

10. *HORDEUM*, Linn., was restricted by Beauvois to the common cultivated barley, *H. vulgare*, Linn.; which in a great variety of forms is of very ancient cultivation, and whose indigenous origin is no more known than that of our wheats. Amongst these forms the East-Indian *H. ægiceras*, Royle, has been proposed by E. Meyer as a genus under the name of *Critho*; but it cannot be otherwise considered than as a luxuriant monstrosity. The really spontaneous species of *Hordeum* amount to about twelve, distinguished from *Elymus* by the single flower in each spikelet, and distributed into three sections:—1. *Zeocriton*, Beauv. (*Critesion*, Rafin.), for the *H. murinum*, *H. bulbosum*, *H. jubatum*, Linn., and some others, in which the central spikelet alone of each three is fertile, the lateral ones sterile or reduced to empty glumes; 2. *Crithopsis*, Jaub. and Spach (sect. *Medusather* of *Elymus*, Griseb.), for the *H. crinitum*, Desf., and its allies, with two perfect spikelets at each notch, the intermediate one deficient or rarely represented by one or two empty glumes; 3. *Cuviera*, Koel., for the *H. sylvaticum*, Huds. (*Elymus europæus*, Linn.), with three collateral spikelets.

11. *ELYMUS*, Linn., as now generally limited, comprises about twenty species, distributed into three sections, all distinguished from *Hordeum* in having two or more flowers to each spikelet:—1. *Sitanion*, Rafin. (*Polyantherix*, Nees), for the North-American *E. Sitanion*, Schult., with the flowering glumes usually three-awned; 2. *Clinelyna*, Griseb., with the spikelets usually two only to each notched and the flowering glumes with one long awn; and 3. *Psammelyna*, Griseb., tall rigid species with often more than two spikelets to each notch, and the flowering glumes unawned or with only very short awnlike points.

12. *ASPRELLA*, Willd. (*Hystrix*, Moench, *Gymnostichum*, Schreb.), has three species, of which two are North-American, the third from New Zealand. There are two or three collateral spikelets to each notch as in the preceding genera; but the outer empty glumes are entirely deficient, except sometimes one or two slender ones to the lower spikelets of the spike. Willdenow's name has the priority over Schreber's; for although the Beschreibung of the latter author bears the date 1769 on the titlepage, the third part, in which the present genus was proposed, was only issued in 1810.

Tribe XIV. BAMBUSÆ.

The Bamboos have been so admirably monographed by Munro in the twenty-sixth volume of the Linnean 'Transactions,' that I have very few notes to make on the present occasion. Since the appearance of that memoir, Balansa has published a New-Caledonian Bamboo forming the distinct genus *Greslania*; a further acquaintance with *Thamnocalamus* has induced its reunion with *Arundinaria*; and, on the other hand, *Merostachys capitata*, Hook., is so very different in inflorescence from the rest of the genus, that I have proposed to separate it under the name of *Achroostachys*. I have also proposed as a new genus *Melocalamus*, the *Pseudostachyum compactiflorum*, Kurz, published since Munro's monograph. There is also much confusion in the generic term *Beesha*, which, though used by Rheede for a Peninsular species of Bamboo, was first characterized by Kunth chiefly from the more eastern *Bambusa baccifera*, Roxb., now *Melocanna bambusoides*. He did indeed also include the Peninsular and Ceylon species; but that was first properly characterized as a separate genus by Thwaites, under the name of *Ochlandra*, which it seems advisable to adopt, though the genus may include Rheede's *Beesha*, a name which it seems best to consider only in the specific sense first given to it.

Report on the Arctic Drift Woods collected by Captain Feilden and Mr. Hart in 1875 and 1876. By W. R. M'NAB, M.D., F.L.S., Professor of Botany, Roy. Coll. of Science, Dublin.

[Read November 3, 1881.]

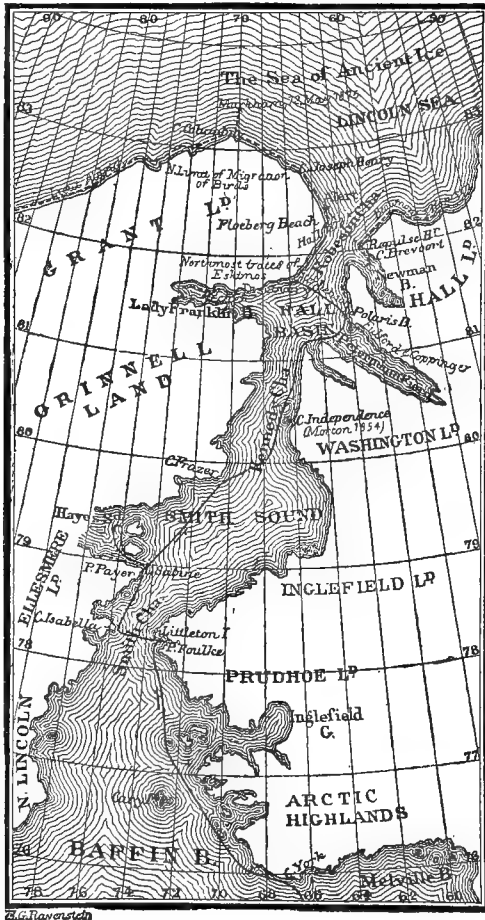
IN the following Report I have endeavoured to detail the results of my examination of the drift woods brought from the Arctic regions by the naturalists attached to the recent Arctic expedition under Captain Nares. There are thirteen specimens of drift wood and one specimen of bark, collected in different localities by Captain Feilden and Mr. Hart; and these were placed in my hands for examination by Professor Oliver, F.R.S. The specimens of wood are all completely devoid of bark; hence it was impossible to distinguish the genus to which some of the Coniferous woods belong, as, for example, *Picea* and *Larix*, the genera to which most of the woods may be referred. In general the woods were well preserved and in good condition, except on the very surface; hence there was little difficulty in obtaining proper sections for microscopic examination. The woods were all cut in three directions, as is usual in examining dicotyledonous and coniferous woods; and the sections were viewed both dry and when mounted in Canada balsam. Careful comparison of the drift woods with sections of named woods has not enabled me to identify the species in any case; hence the whole of the results obtained must be considered unsatisfactory. In the following list the specimens are lettered A to O, the letters &c. corresponding to the labels on the slides of the preparations accompanying the Report*.

1. PINUS sp. (One species.)

Two portions of wood are referable to *Pinus*. These I have indicated by the letters A and B. Both the pieces in the collection are marked as from the same locality, viz. "Head of Discovery Bay, April 1876," but one of them (B) as having been "100 yards from the water, embedded in sand." The woods are quite similar in outward appearance, and are portions of comparatively large

* I have also examined a small collection of drift woods made by Staff-Surgeon Edward L. Moss, M.D., R.N., Surgeon of the 'Alert.' His specimens are similar to those obtained by the naturalists of the Expedition, with one exception, viz. a portion of a stem of a species of *Juniperus*. The stem must have been of some size, and belongs apparently to a North-American species.

trunks or branches. The central portions of the stem are well preserved; but the outer part is soft and partially destroyed. A has well-developed annual rings, some of the rings near the periphery of the stem being, however, small and feebly developed, thus indicating a deficiency in growth. The wood of B presents the same general characters; and I am inclined to consider them portions of the same species of *Pinus*, if not parts of the same tree.



SKETCH MAP showing the route of the late Arctic Expedition between the parallels 78°-83° N. lat., with the localities generally where the drift woods were obtained.

2. *ABIES* sp. (One species.)

One piece of wood of small size; but probably a portion of a larger stem cut and rounded by man, belongs to the genus *Abies* (C). By comparison with other sections, it seems to come very close to *Abies pectinata*. The specimen is marked "Discovery Bay, 20 feet above sea-level, Aug. 1875, Captain Feilden." The annual rings of wood are large and well developed.

3. *PICEA* or *LARIX*. (Three species.)

Seven pieces of drift wood are to be referred to one or other of these genera; but, owing to the absence of the bark, it is impossible to decide definitely. One of the specimens (D) comes very near *Larix*, and differs from all the other woods in the collection.

? *LARIX* sp. This is the specimen D, marked "Dumb-bell Harbour." The stem has been large, and is well preserved, and, by comparison with named sections of *Larix*, seems to come very near *L. europæa*.

? *PICEA* sp. Two specimens seem to belong to one species, viz. E, "Label incomplete. Upon Floe. Sept. 12, 1875," and F, "On Floe, lat. 82° 30' N. Capt. Feilden." These are portions of well-preserved woods, white and firm, and having the same microscopical characters. They are probably not portions of the same stem, as I believe E is almost certain to be from Mr. Hart's collection, while F is Captain Feilden's. The annual rings are well developed in both specimens.

? *PICEA* sp. Four specimens. G, H, J, K. All similar in microscopic character, and belonging either to *Picea* or *Larix*.

(G) "1 mile inland and 150 feet elevation at 'Alert' winter-quarters, Feb. 1876. Captain Feilden." This piece of stem has well-developed annual rings.

(H) "Drift wood. Bottom of Musk-ox Fjord. Sept. 16, 1875." 35.5 inches long, 16 in circumference. Portion of a large stem with well-developed annual rings.

(J) "No. 1. No locality nor date." A small piece of very much waterworn drift wood with well-developed annual rings, and probably a portion of a large stem.

(K) "No. 1009. No locality." Small portions of a large stem in a good state of preservation, and having well-developed annual rings.

PICEA sp. Bark only. The specimen (L) is from pieces of bark evidently of a *Picea*, and marked "On floe in Dumb-bell Bay,

Sept. 1875. Found by Commander Markham." It is not improbable that this may be the bark of the commonest drift wood, and may therefore help to identify the genus of the six specimens of wood just described.

4. *TAXUS* sp. (One species.)

A single sample of very much waterworn pieces of drift wood, which have probably been embedded in mud, is referable to the genus *Taxus*, having the spiral markings clearly shown in the wood prosenchymatous cells. It is marked M, "Out of cloth bag; no locality." The annual rings are extremely imperfect and very numerous.

5. *POPULUS* sp. (One species.)

Two pieces of drift wood are to be referred to *Populus* (near *tremula*), and are interesting as being the only species of dicotyledonous wood in the collection. One of the specimens (N) is marked "Drift wood. Musk-ox Bay. Sept. 1875;" and the other (O), "East Cary Island. Capt. Feilden." The former is a portion of a large stem, and is in an excellent state of preservation, while the latter is equally well preserved, but is only a part of a small branch. In both of the woods the annual rings are well developed.

Of the 14 specimens submitted to me for examination, 13 are samples of wood, and 1 is of bark alone without any trace of wood, the bark being evidently coniferous and to be referred to the genus *Picea*. Of the 13 woods, 11 are coniferous, and only 2 dicotyledonous, both belonging to the same genus, *Populus*, and to the same species.

The 11 coniferous woods belong to four, or perhaps five, genera, there being 1 species of *Pinus*, 1 of *Abies*, 1 of *Larix*?, 2 of *Pinus* or *Larix*, and 1 of *Taxus*. Of *Pinus* there are 2 specimens, of *Abies* 1, *Larix* or *Picea* 7, and *Taxus* 1—the commonest form being some kind of *Picea*, probably an American Spruce.

I have not been able to identify the species, but, from careful comparison of specimens, am inclined to think that most of them are North-American; and as the annual rings are usually very well developed, the trees must have grown in the more northern temperate latitudes.

LINNEAN SOCIETY.

THE TREASURER'S account for the year ending 30th April, 1881. Presented at the Anniversary Meeting,
Tuesday, May 24th, 1881.

	£	s. d.
Balance at Bankers, 1st May, 1880	431	2 2
Interest on Invested Funds	£122	4 10
Admission Fees	210	0 0
Compositions	240	0 0
Annual Contributions of £2 2 0	4	4 0
Ditto ditto of 3 0 0—		
for prior years	69	0 0
for present year	855	0 0
Sales of Society's Publications:—		
Transactions	157	16 1
Journals	72	1 6
Library Catalogue	1	2 0
Donations towards Publications	61	0 0
Special Donation from Mr. Bentham	50	0 0
	1842	8 5
	£2273	10 7
Taxes and Insurance		£
Repairs and Furniture		s. d.
Coals and Gas		15 18 9
Salaries, Pension, and Collector's Commission		97 6 4
Petty Expenses (including Tea and Postage)		51 9 11
Books purchased		423 4 0
Miscellaneous Printing		66 15 8
Bookbinding and Stationery		104 8 3
Expenses of Society's Publications:—		28 6 9
Printing	£460	13 0
Plates	305	5 2
	765	18 2
Investment	£1601	9 9
Balance in the hands of the Bankers	140	0 0
	582	0 10
	£2273	10 7

FREDERICK CURREY, *Treasurer.*

The foregoing accounts have been examined and found correct.

May 14, 1881.

CHARLES J. BREESE,
FRANK CRISP,

WILLIAM S. DALLAS,
H. T. STANTON. } *Auditors.*

EVENING MEETINGS OF THE LINNEAN SOCIETY.

TO BE HELD AT BURLINGTON HOUSE, SESSION 1881-82.

On Thursday Evenings, as undermentioned, the Chair being taken at 8 P.M.

1882. January 19	1882. March 16	1882. May 4
February 2	April 6	June 1
" 16	" 20	" 15
March 2		

The Anniversary Meeting takes place on WEDNESDAY,
24th MAY, 1882, at 3 P.M.

Memoranda concerning Communications read before the Society.

The Council desire it to be understood that Authors are alone responsible for the facts and opinions contained in their respective papers.

It is to be noted that the sequence of the papers as printed in the Society's Journals do not, in all cases, absolutely follow date of reading. Some communications require reconsideration of Council; and others depend on exigencies and convenience in printing, illustrations, &c., which may delay or expedite their publication. As far as possible, precedence is given to papers in order of reading, especially when not very long or complex in kind. With contributions of a lengthened or technical character, or where the author cannot be present at the reading of his paper, as in the instance of Fellows resident abroad, the business of the Meeting and interest of the writer will be greatly facilitated if an abstract for reading be sent with the manuscript. All drawings for illustrations should be accompanied by full descriptions.

MSS. &c. may be addressed to the President, the Secretaries, or Librarian, at the Society's Apartments, Burlington House, Piccadilly, London, W.

Specimens intended for exhibition, or diagrams, maps, and objects intended to illustrate papers to be read, should, if convenient, be sent to the Society's Rooms previous to the hour of Meeting, and accompanied with any memoranda concerning them.

THE LIBRARY AND READING-ROOM.

The Library is open to the Fellows and their friends daily, between 10 A.M. and 4 P.M., and on Meeting nights at 7 P.M.; and the Reading-room adjoining from 10 A.M. till 6 P.M., except when Council is sitting and on Saturdays only till 4 P.M. With certain restrictions, Fellows are allowed to borrow Books.

LIBRARY COMMITTEE.

This consists of nine Fellows (three of whom retire annually) and of the four officers *ex officio*, in all thirteen members. The former are elected annually by the Council in June, and serve till the succeeding Anniversary. The Committee meet at 4 P.M., usually once a month. The Members for 1881-82, in addition to the officers, are:—

John Ball, M.A., F.R.S., M.R.I.A.
George Busk, F.R.S., F.G.S.
William Carruthers, F.R.S., F.G.S.
Prof. P. M. Duncan, F.R.S., F.G.S.
W. T. Thiselton Dyer, M.A., F.R.S.

Albert C. L. G. Günther, M.A., M.D.,
F.R.S.
Edward Morell Holmes.
Howard Saunders, F.Z.S.
Henry T. Stainton, F.R.S., F.G.S.

A Book for insertion of Recommendations of Volumes to be added to the Library lies on the table in the Society's Rooms at the disposal of the Fellows.

NOTE.—The Charter and Bye-Laws of the Society, as amended up to the 21st April, 1881, have now been reprinted; and any Fellow can have a copy of the same on application.

