

THE
ORCHIDS OF THE
SIKKIM-HIMALAYA

KING AND PANTLING

OF THE

ROYAL BOTANIC GARDEN, CALCUTTA.

Vol. VIII.



THE

ORCHIDS OF THE SIKKIM-HIMALAYA.

By

Sir GEORGE KING AND ROBERT PANTLING.

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1898.

DEDICATED

TO

Sir Joseph Dalton Hooker,

G.C.S.I., C.B., F.R.S., D.C.L., OXON.; LL.D., CANTAB., EDIN., AND GLOTT.;
CORRESPONDING MEMBER OF THE INSTITUTE OF FRANCE,
ETC., ETC., ETC.,

AS A CORDIAL TOKEN OF ADMIRATION AND RESPECT.

ERRATA.

Page 1, for "4. DIDICRA" read "4. DIDICIA."

- 26, seventh line from top, omit "at" before "the sides and apex."
- 28, to the localities where *Liparis tuberculata* occurs, add "Khasin Hills, Rita."
- 36, *Liparis Assamica*; for plate "50" read "plate 53."
- 42, third line from top, for "onneate" read "cuneate."
- 49. In name of plate, for "*Dendrobium candidum*, Lindl." read "*D. candidum*, Wall."
- 56. In description of *Dendrobium densiflorum*, Wall., seventh line from beginning, for "revolute" read "convolute."
- 54, second line, add to parenthesis "(deciduous in *B. polyrhizum*)" and in *B. triste*.
- 64. In the diagnosis of *B. Griffithii*, for "striped," read "spotted."
- 66, sixth line from top of page, for "lanceolote" read "lanceolate."
- 83. In eleventh line from the bottom, omit the word "species" after Burmese.
- 84, ninth line from the bottom, for "*Tibrachis hirta*" read "*Tibrachia hirta*."
- 86, 89, and 90, for "dimediately" read "dimidiately."
- 89. In the eleventh line from the top, for "narrow," read "narrowest."
- 93. In seventh line of description of *Cirrhopetalum caudatum*, for "2 in." read ".2 in."
- 107. In top line for "trilobulate," read "trilobulate."
- 108. In description of *Phajus Wallichii*, ninth line, for "many-flowered" read "rather lax-flowered," and in third line of description of *P. Blumei* for "rather lax" read "many-flowered."
- 110. *Phajus albus*, to citation "*Pl. As. Rar.*", prefix the words "in Wall."
- 111. *Acanthephippium sylhetense* in diagnosis for "4-lamellate" substitute "5-lamellate."
- 111. In description of *Eria muscicola*, seventh line, for "Petals narrower than the petals" read "Petals narrower than the sepals."
- 119. In fifth line of description of *Eria bambusifolia*, omit the word "broad."
- 119. In first line of description of *E. graminifolia*, omit the word "and."
- 121. Name of *Eria clausa*, after "Soc." add "Beng."
- 123. In sixth line of description of *Eria acervata*, after "axils" add "of."
- 124. In second line of description of *E. coronaria* for "Levae" read "Leaves"
- 135, sixth line from bottom, for "*Broughtonia liniaris*" read "*Broughtonia linearis*."
- 140, ninth line from bottom, for "*P. aphylla*" read "*P. aphylla*."
- 153, third line from top, for "Flower" read "Flowers."
- 155, fifth line from bottom, for "to this" read "of this."
- 160, twenty-third line from top, transpose the word "directly," so that the clause shall run thus—"not attached to them directly by granular elastic threads."
- 176. In fourth line of description of Plate of *Yoania Prainii*, insert the word "cap" after "anther;" thus anther-cap.
- 183. Remove the citation (ninth line from bottom) "North-West Himalaya; at Simla, Gamble, 7,800 ft." from *Oreorchis foliosa* to *O. micrantha* in p. 184.
- 192, eleventh line from top, insert the word "they" before "appear."
- 205. In the first line of description of *Stauroopsis undulata*, omit the words "like the peduncle."
- 211, sixth line from the bottom, re-arrange these five words as follows:—Slightly bifid and more dilated.
- 248, twenty-second line from the top, omit the word "and."
- 250, name of plate, change "*Corymbis veratrifolia*, Blume" to *C. veratrifolia*, Reichb. fil.
- 285. In diagnosis of *Z. sulcata* for "lip sub-orbicular, erose" read "lip sub-quadrate," and delete "erose."
- 285. In diagnosis of *Z. Goodyersides* omit the word "not."
- 291, twenty-second line from the top, for "the processes in this being horizontal," &c., read "the processes of the lip in this being horizontal."
- 326, ninth line from the top, for "Don in Wall. Cat." substitute Lindl. in Wall. Cat. (not of Don).

ERRORS IN THE INDEX TO THE PLATES IN PART II.

For "*Cirrhopetalum candatum*, Wall." read "*C. caudatum*, King and Pantling."
 For "*Dendrobium candidum*, Lindl." read "*D. candidum*, Wall."
 Delete *Microstylis ramosum*, Reichb. fil.

ERRORS IN THE INDEX TO THE PLATES IN PART III.

For "*Appendiculata bifaria*, Lindl.", read "*Appendicula bifaria*."
 For "*Saccolabium acuminatum*, Lindl.", read "*S. acuminatum*, Hook. fil."

ERROR IN TITLE.

For KEGAN read KEGAN.

ORCHIDEAE.

HERBS, sometimes scandent, (rarely shrubs), terrestrial with tuberous or fibrous roots, or epiphytic with aerial roots, with or without pseudo-bulbs, leafy or aphyllous. *Perianth* superior, irregular, in two whorls; the outer (*sepals*) usually sub-similar; the inner (*petals*) dissimilar, the odd one or lip variously shaped, often spurred. *Stamens* and *pistils* united into a column opposite the lip. *Anthers* solitary and perfect; or two each with one perfect and one imperfect cell or staminode (*Ophrydeae*); or both perfect (*Cypripedieae*); 2- to 4-celled; pollen-grains usually cohering into one two or four pairs of oblong, globose or pyriform, sessile or caudiculate masses (*pollinia*), the caudicles when present free or attached to one or two glands. *Perfect stigma* solitary, entire or bifid; or two, approximate or distant. Apex of *column* usually modified into a rostellum. Ovary inferior, usually half-twisted, sometimes completely twisted. Fruit capsular, 1-celled. Seeds very numerous, minute, with lax testa and homogeneous nucleus. A widely distributed family consisting of probably about 7,500 species.

Anther single—

Tribe I.—MALAXIDEAE. Pollinia 2 or 4, waxy, without appendages, free or rarely attached by their bases to a ball of translucent matter.

Tribe II.—EPIDENDREAE. Pollinia 4 or 8, waxy, attached by their bases or by their backs to a single or double granular or translucent appendage, but without any gland derived from the stigma.

Tribe III.—VANDEAE. Pollinia 2, 4, or rarely 8, attached singly or in pairs or in fours by a caudicle (rarely by two caudicles) to a viscid gland derived from the stigma (in a few doubtfully from the stigma).

Tribe IV.—LISTEREAEE. *Anther* terminal (dorsal in *Epipactis*), *pollinia* two or four, cohering by their sides, without gland or caudicle (a rudimentary caudicle in *Epipogon*); pollen powdery, granular or in small masses, never waxy.

Tribe V.—GOODYEREAEE. *Anther* posticous, vertical but inverted; *pollinia* two, or four in two pairs, attached to a single gland either by one or by two caudicles, or without a caudicle; pollen granular or sectile.

Anthers two, each with only one perfect cell—

Tribe VI.—OPHRYDEAE. *Anther-cells* sessile on the column, anticus or posticus, discrete or contiguous but always distinct, parallel or diverging, often with tubes from their bases, each with a staminode on its outer surface; *pollinia* two, rarely four, usually with caudicles and always with glands; the glands naked or enclosed in the same pouch or in two distinct pouches. *Stigmas* two, distinct or conjoined below the anther-cells; pollen granular or sectile, not waxy.

Anthers two, each perfect—

Tribe VII.—CYPRIPEDEAE. Perfect anthers two, one on each side of the conjoined stigmas. Staminode single, large, fleshy; lip large, saccate.

P R E F A C E .

As regards the smaller and more obscure species of orchids indigenous to the Eastern Himalaya, the period prior to the publication of Sir Joseph Hooker's account of the family in his *Flora of British India* was to most people one of comparative darkness. Descriptions of a number of them indeed existed, but these were scattered in the volumes of periodicals many of which were accessible only to botanical experts. A large number of these descriptions had been brought together by Lindley in his fragmentary *Orchidology of India*, published in the Journal of the Linnean Society, and by Reichenbach *filius* in the sixth volume of Walper's *Annales*. But the identification of species by these means proved eminently uncertain and unsatisfactory. For many years Mr. Pantling had occupied his leisure by making drawings of the orchids found on the Government Cinchona Plantation in Sikkim, where he has lived since 1882. The appearance of the parts of the *Flora of British India* containing Sir Joseph Hooker's account of the family, gave an impetus to Mr. Pantling's studies; and when he showed his drawings to me, I most strongly urged him to continue the series until it should include one of each species found in the Cinchona Plantation and its immediate neighbourhood. The preparation of these drawings gradually worked itself into a project for the preparation of a complete Orchid Flora of the Sikkim-Himalaya; each species to be illustrated by a life-size figure of the plant, accompanied by analyses of the parts of the flower on an enlarged scale. The liberality of the Government of Bengal made it possible to publish the projected work in the *Annals of the Calcutta Garden*, and it now takes form in the present volume, which is the joint production of Mr. Pantling and myself.

The drawings from which the figures were lithographed were entirely the work of Mr. Pantling, my share in the production of these plates having been confined to the supervision of the lithographers who put them on the stone. For the exploration of the Alpine part of the country lying between the valley of the Great Rungeet and the higher snows, where it was believed some novelties might be found, a small party of trained Lepcha collectors was sent during the hot and rainy seasons of several successive years. These men were provided with a few swift coolies, by whom living plants of every species collected were quickly conveyed to Mr. Pantling who, while the plants were still fresh, made drawings of them. As a precaution, the collectors were provided with a stock of *Formaldehyd*, in a weak dilution of which they were instructed to preserve inflorescences of every species collected. These Lepcha collectors, as the following pages show, discovered a considerable number of species formerly unknown. For the letter-press Mr. Pantling and myself are jointly responsible.

Every botanist who has attempted to examine the flowers of dried specimens of orchids, and especially those of the smaller species, knows how very difficult it is to understand the structure of the column. For, in common with those of so many of the petaloid Monocotyledons, the flowers of orchids, owing to the delicacy of their tissues, lose their form during the process of drying, however carefully conducted; and they do not recover it when moistened for the purposes of study. It was therefore made a rule, when the preparation of this book was undertaken, that the drawing of every species should be made from a *living plant*; and the only exceptions to this rule (and they are very few) which have been made, occurred in cases where the living plants sent in from the higher regions by the collectors had, in spite of the precautions taken to keep them fresh, withered prior to their arrival at Mr. Pantling's house. In such cases the drawings of the flower were made from specimens preserved in *Formaldehyd*. In this excellent medium the *form* of flowers is exactly preserved; the colours, however, although in many cases remaining unaltered for some time, are found ultimately to fade. There may therefore be some departures from accuracy as to the exact coloration of the flowers of some of the Alpine species drawn from *Formaldehyd* specimens, but it is believed there are none in form. So strictly has the rule as to drawing only from living plants been observed, that neither figures nor descriptions have been given of species recorded from Sikkim (*e.g.*, *Odontochilus Clarkei* and *Cymbidium macrorhizon**), of which we were unable to collect living specimens. Several species which have large handsome flowers (*e.g.*, *Dendrobium primulinum*, *D. crystallinum*, and *D. Dalhousiænum*) recorded in the *Flora of British India* as occurring in Sikkim are believed now (probably on account of the extensive clearings for cultivation made within recent years) to be extinct. Such species have also been omitted from the book.

Three hundred copies of the book have been printed. In half the copies the lithographs have been lightly printed, and the flowers and their analyses have been coloured; in the other half the shading in the lithographs has been made darker, and they have not been coloured. The drawings have all been put on the stone by natives of Bengal educated at the Government School of Art in Calcutta. And the colouring has, under very careful supervision on Mr. Pantling's part, been done by the sons of Nepalese coolies employed on the Government Cinchona Plantations—boys who had never until Mr. Pantling took them in hand been accustomed to use any implement more delicate than a hoe. Mr. Pantling's perseverance and skill in drilling these boys into accurate colourists has been a standing marvel to everybody who has seen them at work.

In order that the species described in this volume might be represented in the great European herbaria, it was decided at the beginning of the undertaking that twelve authentically-named sets should be issued to herbaria in the different countries in Europe. These collections have just been distributed from the Calcutta Herbarium.

* This species was collected by one of us in the Runjeet valley in 1879, but has not since been met with in Sikkim.

They are by no means complete, but a list of the contents of each has been kept, and it is intended, from time to time, to fill up the blanks, so as ultimately to have every species represented in them. The specimens thus issued have been poisoned and mounted on cartridge paper, and each sheet has been examined by Mr. Pantling prior to issue; and, in token of his belief in the accuracy of its name, it bears his initials.

The herbaria to which these twelve sets have been issued are the following:—

Kew; British Museum; Jardin des Plantes, Paris; Royal Herbarium, Berlin; M. De Candolle's Herbarium, Geneva; Vienna (Hofmuseum); Brussels; Florence; St. Petersburg; Harvard (United States of America); Leiden and Upsala.

The warmest thanks of Mr. Pantling and myself are due to Sir Joseph Hooker, G.C.S.I., F.R.S., for the interest which he has taken in the progress of the work, and for much encouragement and sagacious advice; to Mr. W. T. Thiselton Dyer, F.R.S., C.M.G., C.I.E., Director of the Royal Garden, Kew, for his courtesy in allowing comparisons of critical species to be made with the rich orchid collections of the Royal Garden by Mr. R. A. Rolfe, whose knowledge of orchids is so extensive; and to Mr. W. Botting Hemsley, F.R.S., of the same Herbarium, for kind assistance.

From my colleague, Dr. D. Prain, I have received much willing help and excellent advice during the progress of the work, and also in the issue of the named sets of specimens.

GEORGE KING.

ROYAL BOTANIC GARDEN,
CALCUTTA;
28th February 1898.

INTRODUCTION.

THE morphology and classification of orchids have been so fully treated of in modern botanical literature that it appears to me to be quite unnecessary to burden these pages with any general account of either. I propose, therefore, here to allude only to a few matters, one morphologic, the others taxonomic, in which views divergent from those commonly accepted are given effect to in the following pages. The first matter is the morphology of the stamens in the Ophrydeous genera *Orchis*, *Habenaria*, *Hermidium*, *Diplomeris* and *Satyrium*. According to the view of Robert Brown and Lindley, as well as of the latest writers Messrs. Darwin, Bentham and Hooker, Bolus, Rolfe, Pfitzer and Krantzlin, the stamen is single in these genera. A minute examination of the Sikkim species convinces me that this is not the case; and that, in the Sikkim species at any rate, there are two stamens. This view is not, however, taken by Mr. Pantling, who is not satisfied with the proof of the hypothesis, and it is therefore published here on my own responsibility. According to the theory which holds the field, the orchidaceous flower consists of fifteen pieces, viz., three sepals, three petals (one of which is the lip), six anthers (in two alternating rows), and three stigmas; and, in all the sub-tribes except *Cypripediceae* only one of the six stamens is fertile. The fertile anther is said to be the middle one of the outer whorl (*i.e.*, the one opposite the odd sepal), the other two anthers of the outer whorl being represented by processes on the lip, and all the three of the inner whorl being merged in the column. One of the stigmas is supposed to be modified into the rostellum, and the other two to form the viscid stigmatic surface—a surface which, although usually simple, is in many cases bifid or quite divided into two segments. In the *Cypripediceae*, on the other hand, the fertile anthers are the lateral pair of the outer whorl, the odd one being converted into a large staminode, all the anthers of the inner whorl being infertile. The stigmas of *Cypripediceae* are all developed, but are confluent, none of them being modified into a rostellum.

If, however, the anther-cells of the Sikkim *Ophrydeae* be carefully examined, it will be found that it is difficult to explain their structure on the monantherous theory. For, although in some species the anther-cells lie close together, in many they are widely separated, the pollinia being also produced into long caudicles contained in canals, neither caudicles nor canals having any apparent attachment to a rostellum. Moreover, each of the fertile anther-cells bears on its outer surface a rugulose body which, in the descriptions in this and other works, is referred to as the *staminode*. *Habenaria stenopetala*, *H. geniculata*, *H. pectinata*, *H. malleifera*, *H. arietina* and *H. Dyeriana* are examples of species in which the fertile anther-cells are separated by a broad expanse

of cellular tissue, and of which the prolonged caudicles are enclosed in forward-projecting tubes, there being apparently no rostellum. These structural arrangements are seen in a still more pronounced form in *Diplomeris hirsuta*. They are also found in very many of the South African *Ophrydeae*, and they are very clearly shown in the excellent drawings of Mr. Bolus.* They culminate perhaps in *Habenaria Bonatea*, a remarkable South African species, the structure of the flowers of which has been figured with marvellous skill and delicacy by Francis Bauer in his well-known and magnificent drawings. The incompatibility of the monantherous theory with the arrangements in this and in other species of *Habenaria* appears to have struck Mr. Darwin, who refers to it in his book on the *Fertilization of Orchids* (pages 297 and 302, *first edition*), but he did not follow up the subject.

In my opinion the Sikkim species of *Ophrydeae* have really two anthers, one cell of each of which is fertile and the other cell infertile. The infertile cell invariably occupies a position on the outer surface of the fertile one, and is the body usually described as a "staminode".† The two fertile anthers belong in my opinion to the inner whorl, the infertile anther being merged in the column. In the Sikkim *Ophrydeae* one of the three stigmas is infertile, and the two lateral are fertile. These fertile stigmas are in many species quite distinct from each other; in other species they are conjoined into a simple or bi-lobed mass. The infertile stigma in many of the species is obscure; in others it forms a thickened and usually curved line running between the bases of the anther-cells. In *Habenaria stenantha* and *H. geniculata* it takes the form of a triangular concave plate occupying the lower part of the broad space between the bases of the anther-cells, but on a plane anterior to the web of cellular tissue by which these cells are connected with each other. The infertile stigma acquires its greatest development in *Diplomeris hirsuta*, in which (see description on page 338 and figs. 1 and 2 on plate 443) it forms a large concave hood placed well in front of the anther-cells, and (in a front view) hides the whole of the latter, except the extremities of the caudicles and their tubes. In this remarkable plant the two fertile pistils consist of two elongated parallel bodies, stigmatic at the apex, which overhang the claw of the lip and point downwards like the lip. The arrangement closely resembles that which obtains in the South African species of *Habenaria* of the section *Bonatea*.

The taxonomic matters in which there is in the following pages divergence from the current views, consist (a) in the restoration of Lindley's tribe *Malaxideae*, which has by most recent writers been merged in *Epidendreae*; (b) in the restitution to the tribe *Vandae* of a few genera (hereafter mentioned in detail) which have of late been included in *Epidendreae*; (c) in the breaking up of the

* *Orchids of South Africa, and Orchids of the Cape Peninsula.*

† I have examined many flowers and drawings of species of *Ophrydeae* in the hope of finding a species in which the infertile cells or staminodes are attached on the *inner sides* of the fertile cells. But the only case in which I have found such an appearance is in Mr. Bolus's drawing of *Pterygodium carnosum*, Lindl. (*Orchids of the Cape Peninsula*, t. 12, fig. 5). If the structures there represented as ovoid rugulose bodies really are staminodes, the fact affords a strong confirmation of my theory.

tribe *Neottieae* into two tribes, which we have named *Listereae* and *Goodyereae*. In all these changes Mr. Pantling and myself are in agreement. We are both strongly of opinion that, in limiting the larger groups, it is (as far as the Sikkim species go) the safest course to assign a supreme value to the structure and appendages of the pollen masses. In working with fresh specimens we have found that, in the genera which we have included in the old tribe *Malaxideae*, the pollinia have absolutely no caudicle and no gland; and that, in the majority of cases, they are perfectly free from each other; in only a very few, viz., in three species of *Cirrhopetalum* and in the single species of *Diglyphosa*, being attached by their bases to a ball of translucent substance. In the genera which we have arranged in the tribe *Epidendreae* the pollen masses, on the other hand, are attached, either by their backs or by their bases, to a single or double translucent appendage, but have no gland derived from the stigma. It may be that this limitation will not be found to answer in the South American *Epidendreae*; and it is also possible that, from the extreme delicacy of the translucent appendages, the character may be one difficult to work in the Herbarium. However, as the present work professes to be based on dissections of living, and not on those of dried specimens; and, moreover, as the pollinial differences are accompanied by certain differences in the *facies* of the vegetative organs, we feel bound to give full prominence to them. And in doing so we are, as already indicated, only returning to the lines followed by that great orchidologist, John Lindley. The tribe *Epidendreae* passes into *Vandaeae* by a transition suite of five genera (*Tipularia*, *Monomeria*, *Acrochane*, *Agrostophyllum*, and a new one which we have named *Ritaia*), in all of which the pollinial appendages are attached to a gland the origin of which from the stigma is doubtful. The transfer of *Cryptochilus*, *Calanthe* and *Oreorchis* to *Vandaeae* was forced upon us by the fact that the gland terminating the caudicle is, in all three, unmistakably derived from the stigma. For this reason we have also restored to *Vandaeae* the genus *Ione* which had been merged in *Bulbophyllum*,—a genus to which it has undoubtedly a great resemblance in its vegetative organs.

It only remains to say a few words in explanation of the re-arrangement of the genera formerly referred to *Neottieae*. We found that these genera may, as we believe, be arranged in two groups by following the characters afforded by the pollen. In one group the pollen is powdery (very rarely granular); in the other it is always granular or sectile. The plants with powdery pollen have a terminal anther, and their pollinia cohere by their sides, but they have neither caudicles nor glands. These we have formed into a tribe under the name *Listereae*. The genera with granular or sectile pollen have a posticous anther, and the pollinia are attached to a single gland by either one or two caudicles. These we have formed into our tribe *Goodyereae*. The location in *Listereae* of *Epipactis* and *Cephalanthera* appears rather anomalous; and there is no doubt that, in their vegetative organs, they resemble no other genus in the group; but their pollen is unmistakably powdery.

Our study of the Sikkim species convinces us that the fertilization of orchids by insect agency is by no means so universal as is sometimes supposed. We have found

the most unmistakable evidence of self-fertilization in genera far removed from each other in every respect. Only a few examples need be mentioned here, as they are dealt with in the text. Such examples are *Eria excavata*, *Dendrobium crepidatum*, *Calanthe Mannii*. Most of the species in *Goodyereae*, notwithstanding that the pollinar appendages in this tribe appear to be suitably formed for removal by insect agency, are also self-fertile. The subject is one which we believe would yield most interesting results in the hands of a careful and patient observer.

GEORGE KING.

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Tribe I.—MALAXIDEAE.

Pollinia 2 or 4, waxy, without appendages, free or rarely attached by their bases to a ball of translucent matter.

* Pollinia 4—

* *Leaves equitant*—

Epiphytal; leaves fleshy, sessile; inflorescence terminal; flowers minute, in racemes or spikes; column very short, without appendages . . . 1. *Oberonia*.

** *Leaves not equitant*—

Terrestrial; leaves membranous, usually sessile; inflorescence terminal; flowers small, in racemes or spikes; lip with basal (often very large) auricles; column very short, with broad arms 2. *Microstylis*.

Terrestrial or epiphytal; leaves 1 or 2, rarely more, membranous, sessile; inflorescence terminal, racemose, flowers small; lip without basal or side lobes; column long, with callosities or wings or with both; rostellum sometimes double 3. *Liparis*.

Terrestrial; leaf solitary, membranous, petioled; inflorescence terminal from a small pseudobulb; flowers minute, racemose; lip with a short spur, but without lobes or teeth; column without appendages 4. *Didicosa*.

Epiphytal; coespitose (rhizomatous in sect. *Sarcopodium*); leaves two or more (rarely one), from pseudobulbs or stems, membranous or coriaceous; inflorescence terminal or axillary, in short few-flowered peduncles or in few- or many-flowered racemes; flowers usually large, brightly coloured; column without appendages, itself short, but with a more or less elongated foot forming with the lateral sepals a mentum or sac; pollinia of equal length 5. *Dendrobium*.

Epiphytal with a rhizome bearing pseudobulbs or solitary leaves (rhizome sometimes absent); leaves solitary and coriaceous, or in pairs and membranous; inflorescence a scape from the base of the pseudobulb or from the rhizome between pseudobulbs; flowers solitary or in heads, spikes, racemes or umbels; lip fleshy, tumid, jointed to the foot of the column, mobile, usually without side lobes; column short and stout, toothed towards the apex; foot short or long; inner pair of pollinia small.

Flowers rarely umbellate; lateral sepals not much longer than the dorsal, free; pollinia always free 6. *Bulbophyllum*.

Flowers usually umbellate; lateral sepals much longer than the dorsal and usually connate; pollinia sometimes attached to a ball of translucent substance 7. *Cirrhopetalum*.

Terrestrial; pseudobulbs with a long leafy pseudostem; leaves 3 to 5, sessile, membranous, plicate; inflorescence lateral, raceme branched; lip without side lobes or lamellæ, convolute; column long with no foot; pollinia free 8. *Anthogonium*.

** Pollinia 2—

Terrestrial, pseudobulbous from a short rhizome; leaves solitary, membranous, plicate, petioled; inflorescence a racemose scape; lip lamellate; column long, with or without foot—
 Column with a deep sac or spur at its base and winged, with no foot; lip with side lobes; pollinia trapeziform; anther with a single apiculus; pollinia quite free 9. *Chrysoylosium*.
 Column not saccate, wingless, foot long; lip without side lobes; pollinia elliptic, attached to a small translucent mass 10. *Diglyphosa*.

1. *Oberonia*, Lindl.

Epiphytes with usually very short, often tufted, stems. *Leaves* coriaceous or fleshy, usually ensiform (rarely terete), always distichous and equitant. *Flowers* minute, numerous, sometimes whorled, arranged in a long, erect or deflexed, spike-like or raceme-like inflorescence, but expanding centrifugally. *Sepals* sub-equal, ovate or oblong. *Petals* as wide as or narrower than the sepals. *Lip* larger than the sepals, sessile, rarely entire, usually lobed and often erose-lobular, the hypochile more or less concave or with a nectar-secreting pit near its base. *Column* very short, stout, rarely winged. *Anther* terminal, incumbent; pollinia 4, cohering in pairs. A genus of about 60 species distributed in the Indo-Malayan region, but extending also to Australia and the islands of the Pacific.

NOTE.—In none of the living specimens of *Oberonia* which we have examined are the pairs of pollinia connected in any way with the rostellum. The rostellum has, however, at its extremity a minute globule of transparent viscid matter, and immediately above this lie the attenuated ends of the pollen masses. So closely do these approximate to each other that contact between them may be caused by the slightest movement of an insect in the neighbourhood, or even by the wind. Contact is probably also caused as the anther shrivels and the pollinia thus get displaced from their natural bed on the clinandrium. In dried specimens of *Oberonia* the pollinia are almost invariably attached to this rostellar viscus, and it is this circumstance which has probably given rise to the belief that they were originally connected in the living state by a viscus of their own.

* Lip without lateral lobes or basal auricles.

Lip coarsely erose from base to apex; rachis of inflorescence slender.

Apex of lip not lobulate; petals spreading, erose-dentate 1. *O. Prainiana*.

Apex with two short lobules separated by a rather wide sinus; petals reflexed, entire 2. *O. lobulata*.

Lip quite entire or very slightly erose at the apex only; petals entire, axis fleshy 3. *O. pachyrachis*.

** Lip with narrow lateral lobes; terminal lobe not elongate.

Axis of the raceme fleshy.

Lateral lobes of lip dentate; terminal lobe rounded, entire 4. *O. pachyphylla*.

Axis of the raceme not fleshy.

Lateral lobes of lip quite entire; terminal lobe large with lobulate-erose edges and a slightly bifid apex; sepals and petals spreading. 5. *O. emarginata*.

Lateral lobes sub-entire, concave; terminal lobe erose-dentate, its apex minutely mucronate; petals reflexed 6. *O. micrantha*.

Lateral lobes erose-dentate; terminal lobe with two blunt slightly incurved apical lobules separated by a sinus 7. *O. Croftiana*.

*** Lip broad, rounded or oblong in general outline; the side lobes large.

Lateral lobes pectinate, glabrous.

Terminal lobe entire except for a slight erosion at the apex 8. *O. Jenkinsiana*.

Terminal lobe coarsely erose-dentate 9. *O. iridifolia*.

Lateral lobes entire, clothed with stiff hairs and separated from the bifid hairy apical lobe by a smooth mesochile 10. *O. ensiformis*.

**** Lip with distinctly projecting lateral or basal lobes, their apices directed either outwards or forwards (towards the apex), or upwards and backwards.

Lateral lobes directed forwards.

Lateral lobes oblong, blunt.

Lateral lobes erose-dentate; terminal lobe emarginate, erose 11. *O. demissa*.

Lateral lobes entire; terminal lobe obcordate 12. *O. obcordata*.

Lateral lobes sub-crenulate; terminal lobe deeply cleft into two broadly oblong blunt lobes; surface of the lip blistered or scaly 13. *O. muriantha*.

Lateral lobes falcate, their apices acute and directed forwards.

Terminal lobe with falcate parallel lobules; petals truncate 14. *O. parvula*.

Terminal lobe with caudate-acuminate straight parallel lobules; petals acute 15. *O. caulescens*.

Lateral lobes directed horizontally outwards, small and conical; terminal lobe with rather falcate but short divergent lobules; petals blunt 16. *O. falcata*.

Lateral lobes long and filiform, curved upwards and backwards; terminal lobe with lanceolate elongate parallel lobules, the whole surface of the lip scaberulous 17. *O. rufilabris*.

***** Lip lobed only at the apex; its base broad and sometimes sub-truncate with a small auricle at each extremity; the apex with two long falcate lobules separated by a deep sinus.

Petals spreading; stems elongate.

Petals linear-oblong, truncate, entire, sepals spreading 18. *O. longilabris*.

Petals oblong, erose, spreading; lateral sepals reflexed 19. *O. auriculata*.

Petals reflexed; stem very short 20. *O. pyrulifera*.

1. OBERONIA PRAINIANA, King and Pantling in Journ. As. Soc. Bengal, LXIV, pt. 2, p. 331.

Stem very short; leaves very fleshy, oblong, slightly falcate, sub-acute, .5 to .8 in. long and .15 to .25 in. broad. Spike slender, erect, many times longer than the leaves; the peduncle sparsely bracteate, twice as long as the uppermost leaf to which it is adnate; the rachis much longer than the peduncle, rather densely-

flowered in the lower two-thirds, laxly-flowered in the upper third; *floral bracts* equal-ling and sheathing the stout sessile ovary, oblong, sub-entire. *Flowers* warm brown, minute, .05 in. long, whorled. *Sepals* oblong, blunt, entire, revolute. *Petals* narrowly elliptic, sub-acute, coarsely and unequally serrate, spreading. *Lip* not much longer than the sepals, elliptic-lanceolate, blunt, not distinctly lobed but everywhere irregularly lobulate-erose; the base truncate and with a circular nectar-bearing pit just under the column. *Pollinia* orange-coloured.

At the mouth of the Teesta valley near Sivoke, elevation about 1,000 feet; Pantling No. 225; only once collected; in flower during April and May. Distrib.—Perak; Scortechini, No. 582.

A singularly beautiful little species with charming warm-brown flowers. It is evidently a straggler northwards of the Malayan Flora, only a single specimen of it having as yet been collected in British India, and that at a spot on the outer flank of the Himalaya. Father Scortechini, who collected for several years in Perak, has left an excellent pencil drawing of the Perak plant, which, as well as his manuscript description, agrees with the Sikkim plant. This is closely allied to *O. Bertoldi*, King and Pantling, another species of which Father Scortechini collected specimens in Perak, and of which he left a drawing now in the Calcutta Herbarium.

PLATE I.—*Oberonia Prainiana*, King and Pantling. A plant of natural size. Fig. 1 front view of flower, 2 a flower in profile, showing the recurved sepals, 3 lip, 4 column with the reflexed lateral sepals *in situ*, 5 anther, 6 pollinia; all enlarged.

2. OBERONIA LOBULATA, new species.

Stems very short, not tufted. *Leaves* oblong, acute or sub-acute, very slightly falcate, .75 to 3 in. long and .25 to .50 in. broad. *Inflorescence* more than twice as long as the leaves, decurved; the peduncle 1.5 in. long, winged, ebracteate; the rachis slender, sub-terete, laxly-flowered; *floral bracts* equalling and sheathing the sessile ovary, broadly oblong, with a blunt triangular erose apex. *Flowers* scattered, solitary, green, minute, (.08 in. long). *Sepals* ovate, acute, the *petals* narrower; all entire, reflexed, and resting on the ovary. *Lip* twice as long as the sepals, sub-quadrate, narrowed towards the apex; the base broad, truncate; the edges irregularly dentate-lobulate from base to apex; the apex with a shallow broad sinus. *Stigma* convex.

In a tropical valley in the Sikkim Himalaya at an elevation of 1,000 feet; only a single specimen found; Pantling, No. 199; in flower during October.

The lip of this might be described as trowel-shaped with a truncate bilobed apex, the lobes being separated by a wide shallow sinus.

PLATE 2B.—*Oberonia lobulata*, King and Pantling. A plant; of natural size. Fig. 1 a flower, front view, 2 floral bract, flattened out, 3 pollinia of a young flower intact within the anther-cells; all enlarged.

3. OBERONIA PACHYRACHIS, Reichb. fil. in Herb. Kew ex Hook. fil. Fl. Br. Ind. V, 681.

Stems very short, tufted. *Leaves* ensiform, slightly falcate, tapering to the base, the apex acute, 1.5 to 4 in. long and .25 to .65 in. broad. Peduncle of *inflorescence* short, broad, compressed, adnate to a leaf to near its apex; the flower-bearing rachis very

fleshy, terete, tapering, erect, equalling or slightly longer than its leaf; *floral bract* ovate-rotund, irregularly but deeply serrate. *Flowers* minute (only .04 in. long, pale brown, sunk singly in rather distant pits in the fleshy rachis, the sepals and lip lying flat on its surface. *Sepals* elliptic, obtuse, glandular on the back, not reflexed. *Petals* smaller than the sepals, linear-oblong, obtuse, sub-entire. *Lip* orbicular-elliptic, obtuse, concave, quite entire or very slightly erose at the apex, and with a deep depression at the base just under the column. *Capsule* short, turgid, often gibbous.

Sikkim at elevations of from 2,000 to 4,000 feet, Pantling No. 105; extending westwards along the tropical zone of the Himalaya to Gharwal and Dehra Dun—Vicary, Gamble. Khasia Hills—G. Mann. Flowering in Sikkim from November to March.

This species is very closely allied to *O. orbicularis*, Hook. fil., from which it is distinguished only by its more distant and rather smaller flowers, which have narrower petals and broader and much more irregularly toothed bracts. We have not found any *Oberonia* in Sikkim having exactly the characters of *O. orbicularis*, as they are given by Sir Joseph Hooker in his *Flora of British India*, or in his *Century of Orchids* (Ann. Bot. Gard. Calc., Volume V, 1, t. 1, where he describes and figures the species). The only locality given for it in Sikkim is Dikkiling, to which we venture to think it may have been attributed by some misplacement of collectors' labels. At all events, we have failed to meet with it in Sikkim of recent years. The specimen of the plant which was the first to receive a name was collected in 1836 in the Khasia Hills by Mr. Gibson (a collector sent out by the Duke of Devonshire). It was sent to the Botanic Garden, Calcutta, to Dr. Wallich, who had a figure made of it, which still exists in the Herbarium, and on which is written, in Wallich's handwriting, "*O. phyllostachys*"—a name of which Sir Joseph Hooker did not know the existence when he published the species as *O. orbicularis* in the *Flora of Brit. India* (vol. V, 677).

The flowers of *O. orbicularis* as figured by Sir Joseph Hooker (*l.c.*) have larger sepals, larger and differently-shaped petals from those of the Sikkim plant here figured. Moreover the floral bract is ovate acute and regularly finely serrate in that, whereas in this it is almost rotund and irregularly erose-serrate. Sir Joseph's figure shows besides a raised fleshy margin to the nectary—a character which is wanting in this. *O. orbicularis* is probably confined to the Khasia Hills.

PLATE 3.—*Oberonia pachyrachis*, Reichb. fil. A plant; of natural size. Fig. 1 front view of a flower, 2 floral bract, 3 anther, 4 pollinia; all enlarged.

4. OBERONIA PACHYPHYLLA, new species.

Stems very short, not tufted. *Leaves* very fleshy especially at the base, broadly lanceolate, acute, .5 to 1 in. long and from .2 to .5 in. broad at the base. *Peduncle of the inflorescence* short, stout, not adnate to a leaf, with one to three lanceolate hyaline bracts. *Spike* 1.25 in. long, deflexed, thick, fleshy, terete, tapering towards the apex and also slightly towards the base. *Flowers* .04 in. long, not sunk in the rachis, covered while in bud by the broad ovate-rotund erose fleshy-based bracts. *Sepals* spreading, broadly-ovate, blunt, entire. *Petals* spreading, ovate-lanceolate, blunt, entire. *Lip* slightly shorter than the sepals and petals, obovate-rotund, with a deep pit at its base just under the column; the margin 3-lobed; the side lobes long, very narrow, erose-dentate; the terminal lobe rounded, quite entire.

Near the base of the Sikkim-Himalaya, at Salgurra, near Siliguri; elevation 900 feet; Pantling No. 429; only once collected; in flower in February.

The sepals and petals are of a pale reddish-brown, the lip being of a much darker shade of the same colour. In its thick fleshy terete rachis this species resembles *O. pachyrachis*, Reichb. fil.; and *O. orbicularis*, Hook. fil.; but it differs from both in having the inflorescence quite free from any leaf, whereas in both these the peduncle of the inflorescence is adnate to a leaf. Moreover, in both these species, the flowers are sunk in pits in the rachis; in this they are quite superficial. The leaves in this are also much shorter and more fleshy. The flowers of this are very like those of *O. orbicularis* as figured by Sir Joseph Hooker (Ann. Bot. Gard. Calc. V, t. 1); but, in that species, the lip has no side lobes and is entire; or, if in the least degree erose, it is so at the apex and not at the sides or base; whereas in this there are three lobes, and the apical one is quite entire, while the lateral lobes are very erose. From the flowers of this, those of *O. pachyphylla* differ in having much narrower petals and also somewhat narrower sepals.

PLATE 4.—*Oberonia pachyphylla*, King and Pantling. Two plants; of natural size. Fig. 1 flower, front view, 2 floral bract, 3 anther, 4 pollinia; all enlarged.

5. OBERONIA EMARGINATA, new species.

Stems slightly exceeding an inch in length. Leaves linear, falcate, sub-acute, length .35 to 1.35 in., breadth .1 to .15 in. Peduncle short, with many minute linear bracts; raceme about twice as long as the leaves, decurved, densely-flowered for five sixths of its length, but laxly-flowered in the apical sixth. Flowers very minute (less than .02 in. long), verticillate; floral bract ovate-lanceolate, with a broad base and acute apex, entire, longer than the ovary. Sepals and petals sub-equal, spreading, broadly ovate, acute, slightly narrowed to the base, the margins entire. Lip about equal in length to the sepals and petals, but broader, sub-orbicular in general outline, with a shallow depression at the base below the column, 3-lobed; the basal lobes small, rounded, entire; the terminal lobe large, with lobulate erose edges, the apex bifid, the sinus triangular. Anther transversely elliptic, pollinia ovoid.

Sikkim, at Namgah, elevation 6,000 feet; Pantling No. 423; in flower during September.

This species is allied to *O. micrantha*, King and Pantling, from which it differs in being caulescent, in having falcate leaves, and in having the floral bract entire and broader. The terminal lobe of the lip is moreover different in shape, and the sepals are smooth on the outer surface instead of being papillose as they are in *O. micrantha*.

PLATE 2A.—*Oberonia emarginata*, King and Pantling. Three plants; of natural size. Fig. 1 a flower, seen from the front, 2 floral bract, spread out, 3 anther, 4 pollinia; all enlarged.

6. OBERONIA MICRANTHA, new species.

Stems very short. Leaves linear-ensiform, sub-acute, not falcate, length .35 to 1.35 in., breadth .1 to .2 in. Inflorescence erect, longer than the leaves, slender, terete; the peduncle very short, bracteolate; the flowering-rachis four times as long as the peduncle; floral bract lanceolate, sub-acute, slightly erose, equal in length to or slightly exceeding

the ovary. *Flowers* very minute (.35 in. long) whorled. *Sepals* broadly ovate, spreading, entire, minutely papillose externally. *Petals* narrower than the sepals, ovate, entire, recurved. *Lip* broad, sub-rotund in general outline, divided into a basal and apical part by deep lateral sinuses; the basal part concave, fleshy but with no nectary, its two lobes rounded and sub-entire; the apical part or lobe thinner than the basal, transversely elliptic, erose-dentate, its apex minutely mucronate.

Sikkim Himalaya, at Tendong, elevation 6,000 feet; Pantling No. 324; in flower in July.

A species allied to *O. demissa*, Lindl., but with different leaves, a tapering, not truncate, inflorescence, and a different lip; allied also to *O. emarginata*, King and Pantling, but differing in the points noted under that species.

PLATE 5.—*Oberonia micrantha*, King and Pantling. Three plants, of natural size. Fig. 1 a flower, front view, 2 floral bract, 3 anther, 4 pollinia; all enlarged.

7. OBERONIA CROFTIANA, new species.

Stems very short, tufted. *Leaves* only slightly fleshy, shortly and broadly ensiform, tapering from below the middle to the acute apex, straight or sub-falcate, .75 to 1.5 in. long. *Peduncle of inflorescence* terete, stout, shorter than the leaves, bracteate; the raceme terete, usually much longer than the leaves (often twice as long), erect at first, afterwards much decurved; the rachis thick and deeply grooved when the fruit is ripe; floral bract elliptic, sub-acute, crenulate or sub-entire, equalling the shortly-stalked ovary. *Flowers* reddish-brown, minute (about .05 in. long). *Sepals* ovate-cordate, entire, spreading. *Petals* oblong, blunt, sub-crenulate or entire. *Lip* much larger than the sepals or petals, oblong, 3-lobed, with a large depression near the base; lateral lobes narrow, erose-dentate, the terminal lobe with two long blunt slightly incurved apical lobules separated by a deep blunt sinus.

On the Sikkim-Bhotan frontier, on the banks of the Jaldakha river; elevation about 900 feet; Pantling No. 254: in flower during October.

This is allied to *O. Falconeri*, Hook. fil., but is a smaller plant with thinner leaves. This has moreover oblong obtuse petals which are often sub-crenulate, whereas the petals of *O. Falconeri* are lanceolate-acute and quite entire. The lateral lobes of the lip of this are elongate, narrow and erose-dentate, whereas those of *O. Falconeri*, as figured by Sir Joseph Hooker (Ic. Plantar., t. 1780), are short, ovate-rotund and entire. This is also allied to *O. parvula*, King and Pantling, but that has a different lip and is a smaller plant with its inflorescence always erect.

PLATE 6A.—*Oberonia Croftiana*, King and Pantling. Three plants, of natural size. Fig. 1 front view of a flower, 2 floral bract, 3 pollinia; all enlarged.

8. OBERONIA JENKINSIANA, Griff. MSS. ex Hook. fil. Fl. Br. Ind. V, 676.

Stems about 1 or 1.5 in. long, tufted. *Leaves* narrowly ensiform, sub-acute, straight or sub-falcate, 2 to 5 in. long and .25 in. broad. *Inflorescence* decurved, produced from about the middle of the uppermost leaf and about equal to the longest leaf in length; *peduncle* terete, bracteate; raceme three times as long as the peduncle, densely-flowered, the rachis fleshy; floral bract ovate, acuminate, erose, equalling the shortly-stalked ovary. *Flowers*

minute (.06 in. long), brown, verticillate. *Sepals* and *petals* sub-equal, broadly ovate, obtuse or sub-acute, entire, spreading. *Lip* fleshy, much larger than the sepals and petals, 3-lobed; the basal lobes large, auriculate, pectinate, with an elliptic nectar-secreting concavity between their anterior ends; the terminal lobe rather smaller, reniform, entire except for a shallow elongate sub-mucronate erosion at the apex. *Clinandrium* much broader than the anther; *pollinia* resting on the minute projecting viscid rostellum. Lindl. Fol. Orchid. Oberonia, p. 4. *Malaxis Jenkinsiana*, Reichb. fil. in Walp. Ann. VI, 211.

Sikkim, in the valley of the Teesta; elevation about 1,000 feet. Pantling No. 185. Distrib. Khasia Hills up to 4,000 feet; Clarke, Hooker and Thomson.

PLATE 7.—*Oberonia Jenkinsiana*, Griff. A plant, of natural size. Fig. 1 front view of a flower, 2 floral bract, spread, 3 anther, 4 pollinia; all enlarged.

9. OBERONIA IRIDIFOLIA, Lindl. Gen. and Spec. Orchid., 15.

Stem short. *Leaves* broadly ensiform, acute, 2 to 10 in. long and .25 to 1 in. broad. *Inflorescence* longer than the leaves, decurved; *peduncle* winged, ebracteate; *spike* twice (sometimes three times) as long as the peduncle, its rachis rather slender, densely-flowered; *floral bract* minute, elliptic, obtuse, coarsely erose, convolute round the sessile ovary. *Flowers* minute (.06 in. long), sub-verticillate, pale green or yellow. *Sepals* and *petals* sub-equal, ovate, reflexed and resting on the ovary, the former entire, the latter erose. *Lip* orbicular, indistinctly 3-lobed; the side lobes pectinate, erose; the terminal lobe broad, transversely oblong, deeply and bluntly emarginate at the apex and coarsely erose. *Capsules* broadly ovoid, sessile. Folia Orchid. Oberonia, p. 1. Wall. Cat. No. 1948-2 (in part only); Hook fil. Fl. Br. Ind. V, 675. *Malaxis iridifolia*, Reichb. fil. in Walp. Ann. VI, 208.

Common in the tropical valleys of the Sikkim and Bhotan Himalaya; Pantling No. 13. Also in the hill ranges of Assam and Burma, and in the Andaman Islands. In flower in Sikkim from September to December.

This is a widely-distributed and variable species; but only the typical form, as above described, occurs in Sikkim. Sir Joseph Hooker (Fl. Br. Ind. V, 676) recognises three varieties, viz., var. *denticulata*, found in the Nilgiri and Pulney ranges of hills; var. *angustifolia*, from the Khasia Hills; and var. *brevifolia*, from Burma and the Andamans.

PLATE 8.—*Oberonia iridifolia*, Lindl. *forma typica*. A plant, of natural size. Fig. 1 a flower, front view, 2 a flower, side view, 3 floral bract, flattened out, 4 anther, 5 pollinia; all enlarged.

10. OBERONIA ENSIFORMIS, Lindl. Fol. Orchid. Oberonia, p. 4.

Stem about 3 in. long. *Leaves* linear-ensiform, acuminate, falcate, length 3 to 18 in., breadth .5 to .75 in. *Inflorescence* erect, shorter than the leaves, its apex sub-truncate, its peduncle 2 to 3 in. long and bearing numerous minute lanceolate adpressed terete; *raceme* about twice as long as the peduncle; its rachis thick, fleshy, .12 in. long, pale brown, not at all sunk in the rachis. *Sepals* sub-acute, erose. *Flowers* sub-acute, entire, not ciliolate, reflexed. *Petals* ovate, sub-acute, stiffly pubescent, the rounded entire basal lobes, a sub-quadrate smooth slightly concave mesochile which

bears on its edges two large projecting blister-like processes, and an ob-reniform terminal lobe with two rounded lobules separated by a broad sub-quadrate apical sinus; the whole surface and margins of the lip except the smooth mesochile clothed with stiff hairs. Hook. fil. Fl. Br. Ind. V, 679. *O. acaulis*, Hook. Bot. Mag., t. 5056 (not of Griff.). *O. trilobata*, Griff. Notul. III, 273. *Malaxis ensiformis*, Smith in Rees' Encycl.; Reichb. fil. in Walp. Ann. VI, 212 (excl. syn.).

Sikkim, in the valley of the Teesta, at an elevation of about 1,500? feet; Pantling No. 305; in flower in November. Nepal; Hamilton. Khasia Hills; Griffith. Nilgiri Hills; Proudlock.

This is the largest species of *Oberonia* found in Sikkim; it has the peculiarity of having all its leaves curved in the same direction. It falls into the group with *O. myriantha*, Lindl. and *O. ferruginea*, Parish, its nearest ally being probably the latter, from which, however, it differs conspicuously in having its petals and lip entire instead of fimbriate. The basal lobes of the lip, moreover, are broad, not narrow as in *O. ferruginea*, and the apical sinus is obtuse, instead of acute as in that species. Specimens recently received from Mr. R. L. Proudlock, collected by him in the Nilgiri Hills, exactly agree with those collected in Sikkim. It had not been previously suspected that *O. ensiformis* occurred in Southern India.

PLATE 9.—*Oberonia ensiformis*, Lindl. A plant; of natural size. Fig. 1 front view of a flower, 2 sepals and petals separated from the rest of the flower, 3 floral bract, flattened out, 4 pollinia; all enlarged.

11. OBERONIA DEMISSA, Lindl. Fol. Orchid., *Oberonia*, p. 4.

Stem very short. *Leaves* narrowly oblong, tapering to the sub-acute apex and also slightly to the base, sub-falcate, .5 to 3 in. long and .25 to .5 in. broad. *Inflorescence* about as long as the longest leaves, erect or decurved; the *peduncle* about .25 in. long, ebracteate, axillary; the *raceme* five or six times as long, truncate at the apex, densely-flowered; the *rachis* rather stout; *floral bract* as long as the shortly-stalked ovary, lanceolate, sub-acute, its edges obscurely crenulate. *Flowers* minute, (.05 in. long) reddish-brown, densely whorled. *Sepals* sub-equal, ovate, entire, all reflexed and lying on the ovary. *Petals* elliptic, obtuse, erose-dentate, spreading. *Lip* equalling the sepals in length but much broader, 3-lobed; the lateral lobes oblong, blunt, falcate, erose-dentate, divergent; the terminal lobe quadrate, orbicular, with broad emarginate apex and erose-dentate edges. Hook. fil. Ic. Plantar., t. 1785 B; Fl. Br. Ind. V, 680. *Malaxis demissa*, Reichb. fil. in Walp. Ann. VI, 211.

Tropical valleys in the Sikkim Himalaya; Hooker, Pantling, No. 238.

PLATE 10.—*Oberonia demissa*, Lindl. Two plants, of natural size. Fig. 1 front view of flower, 2 flower in profile, 3 floral bract, flattened out, 4 pollinia; all enlarged.

12. OBERONIA OBCORDATA, Lindl. Fol. Orchid., *Oberonia*, p. 7.

Caulescent; the *stems* short and many-leaved, or 1.5 to 3 inches long and fewer-leaved, fleshy, compressed. *Leaves* linear, falcate, acute, fleshy, .75 to 1.75 in. long. *Peduncle of inflorescence* short, with a few bracts or with none; *raceme* slender, as long as the longest leaf; *floral bract* larger than the flower, ovate-lanceolate, acuminate, minutely and irregularly toothed. *Flowers* reddish-brown, about .05 in. long, in dense whorls,

densest towards the base of the raceme. *Sepals* sub-equal, broadly ovate, the dorsal acute, the lateral pair obtuse. *Petals* linear-oblong, sub-acute, spreading. *Lip* much longer and broader than the sepals, with an oblong narrow mesochile ridged in the middle, two oblong blunt entire divergent lateral lobes, and a large ob-reniform terminal lobe, the sinus shallow and wide making the apex broadly bilobulate, the edges entire. Hook. fil. Ic. Plantar., t. 1783; Fl. Br. Ind. V, 684. *Malaxis obcordata*, Reichb. fil. in Walp. Ann. VI, 216.

Sikkim-Himalaya, at elevations of from 5,000 to 9,000 feet; Griffith, Hooker, Clarke and other collectors; Pantling No. 47. Khasia Hills, alt. 5,000 feet; Griffith, No. 5087. Naga Hills, on Japhoo, elev. 9,000 feet, Colomb. In flower in Sikkim from June to October.

This species is very variable in habit. Some specimens have only a single leaf; some have short stems and five or six leaves crowded close together, while others have stems one and a half to three inches long with three or four distant leaves. The caulescent forms are occasionally viviparous, and the whole plant is usually more or less suffused with reddish-brown. We believe *O. Trentleri*, Hook. fil., to be a form of this. The same form was recognised by Reichenbach fil. as a variety of this under the name var. *latifolia*. The nectary, which in most species of *Oberonia* is in the form of a concavity near the base of the lip, is in this a tunnelled ridge on the mesochile, with a single very minute opening at the end next the stigma. This remarkable arrangement was discovered by Mr. Pantling after the examination of numerous living flowers. The species is a very common one in Sikkim.

PLATE 11.—*Oberonia obcordata*, Lindl. Three plants, of natural size. Fig. 1 front view of a flower, 2 floral bract opened out, 3 pollinia, complete, 4 profile of two pollinia; all enlarged.

(13) *OBERONIA MYRIANTHA*, Lindl. Fol. Orchid., *Oberonia*, p. 4.

Stems short, slightly tufted. *Leaves* ensiform, acuminate, falcate, very unequal in size, from .75 to 10 in. long and .15 to .5 in. broad. *Inflorescence* much longer than the leaves, slender, much decurved; its peduncle terete, rather thickly clothed with slightly-spreading linear bracts; the rachis of the raceme not thicker than the peduncle but several times as long; floral bract lanceolate, acuminate, coarsely erose-fimbriate, equalling the long-stalked ovary. *Flowers* of a warm brown colour, .1 in. long, very numerous, more or less whorled. *Sepals* ovate, entire. *Petals* oblong, entire, truncate, spreading or reflexed on the ovary like the sepals. *Lip* longer than the sepals and petals; the lateral lobes broadly oblong, sub-crenulate, blunt, sub-divergent but pointing forwards; the terminal lobe large, deeply cleft into two broadly oblong blunt lobules separated from each other by a triangular blunt or acute sinus; the upper surface of the lip with a few irregularly scattered watery blisters ultimately changing into scales, and also with a small shallow depression at the base just under the column. *Capsules* cylindric clavate, boldly ribbed, pedicelled. Hook. fil. Fl. Br. Ind. V, 679. *O. Sikkimensis*, Lindl. Fol. Orch., *Oberonia*, 4. *O. acaulis*, Griff. Notul. III, 275; Itin. Notes 76, No. 1130; Ic. Pl. Asiat., t. 286, fig. 1. *Malaxis myriantha* and *M. Sikkimensis*, Reichb. fil. in Walp. Ann. VI, 212.

Valleys of the Sikkim-Himalaya; at elevations of 3,000 to 4,000 feet; common: Pantling No. 195; in flower in Sikkim from October to December. Khasia Hills, elevation 3,500 to 5,000 feet. Naga Hills, Clarke.

PLATE 12.—*Oberonia myriantha*, Lindl. A plant, of natural size. Fig. 1 front view of a flower, 2 column, 3 floral bract, 4 anther, 5 and 6 pollinia; all enlarged.

14. OBERONIA PARVULA, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, pt. 2, p. 330.

Whole plant under two inches in height, not tufted, or only very slightly so. Leaves two or three, lanceolate, acute, .5 to nearly 1 in. long, and .12 to .25 in. broad. Inflorescence erect, twice as long as the leaves; the peduncle slender, ebracteate, about half as long as the thickened terete tapering raceme; floral bract equalling the shortly-stalked ovary, oblong-lanceolate, sub-mucronate, the edges crenulate. Flowers minute (.06 in. long), crowded but not whorled. Sepals ovate, sub-acute, the upper one entire; the lateral pair rather larger and more spreading, keeled and with wavy edges. Petals oblong, truncate, entire, spreading, pale yellow and translucent like the sepals. Lip reddish-brown, broadly obovate in general outline, with a concavity near the base, 3-lobed; the lateral lobes small, apically-pointing, falcate-triangular, sub-acute; the terminal lobe long, deeply bifid, its sub-falcate lobules separated by a deep wide sinus mucronate at its apex. Stigma convex.

In the Teesta Valley, at Guru Bathan, elevation 1,500 feet; Pantling No. 203; in flower in February.

This, like *O. lobulata*, has a convex stigma.

PLATE 6B.—*Oberonia parvula*, King and Pantling. Two plants, of natural size. Fig. 1 front view of a flower, 2 floral bract, flattened out, 3 anther, 4 pollinia; all enlarged.

15. OBERONIA CAULESCENS, Lindl. Fol. Orchid., *Oberonia* 7.

Stems 1 to 2 in. long. Leaves about five, linear-ensiform, acute or acuminate, rather fleshy, .5 to 1 in. long and .15 to .2 in. broad. Inflorescence erect, not adnate to a leaf, twice as long as the longest leaf; its peduncle terete, short, bracteate; the raceme slender. Flowers reddish-brown, minute (.05 in. long), verticillate in the lower three-fourths of the raceme, sparse and irregular in the upper fourth; floral bract equal in length to the stalked ovary, lanceolate, its apex aristate. Sepals ovate, sub-acute, entire. Petals lanceolate, acute, entire, spreading like the sepals. Lip nearly three times as long as the sepals, 3-lobed and with a small deep elliptic depressed nectary at its base just below the column; lateral lobes triangular-falcate, their apices pointing forwards; terminal lobe deeply cleft at its apex into two caudate-acuminate sub-parallel lobules separated by a deep narrow sinus mucronate at its apex. Lip of anther acute. Lindl. in Wall. Cat. 1950; Gen. and Spec. Orchid., 15; Hook. fil. Fl. Br. Ind. V, 683. *Malaxis caulescens*, Reichb. fil. in Walp. Ann. VI, 215.

Sikkim; common at elevations of about 6,000 feet; Pantling No. 454; in flower during July and August. Nepal; Wallich. Khasia Hills; Lobb, Hooker fil., and T. Thomson.

The nearest ally of this is probably *O. caudata*, King and Pantling, a species from Perak recently described in the Journal of the Asiatic Society of Bengal; but in that species the peduncle is adnate to a leaf, the petals are very narrow and acuminate, as also are the lateral lobules of the lip; the terminal lobules of the lip are, moreover, longer than in this.

PLATE 13B.—*Oberonia cauloscens*, Lindl. Two plants, of natural size. Fig. 1 a flower, front view, 2 anther, 3 pollinia; all enlarged.

16. *OBERONIA FALCATA*, King and Pantling in Journ. As. Soc., Bengal, LXIV, pt. 2, p. 329.

Caulouscent, tufted. *Stems* 5 in. long, flexuose. *Leaves* falcate, ensiform, acute, 1 to 2.5 in. long and .2 to .25 in. broad. *Inflorescences* erect, nearly as long as the stem and much longer than the leaves; the *peduncles* very short, terete, less than half as long as the uppermost leaf, bracteate; *raceme* many-flowered; *floral bract* equalling and sheathing the stalked ovary, ovate, sub-acute, erose. *Flowers* yellowish-green, minute (.05 in. long), crowded, sub-verticillate. *Sepals* ovate, entire, reflexed or spreading. *Petals* linear-oblong, blunt, entire. *Lip* twice as long as the sepals, broadly oblong in general outline, flat except for a slight depression near its base and just under the column; side lobes small, triangular, pointing outwards; the terminal lobe with two deep lanceolate slightly diverging terminal lobules separated by a wide sinus with a narrow but rounded edentate apex. *Column* with two fleshy wings. *Anther-cap* membranous. *Pollinia* ovate, compressed, and of a dark orange colour.

Choongthang in the Sikkim-Himalaya, at an elevation of 8,000 feet; Pantling No. 218; in flower during August.

This resembles *O. longilabris*, King and Pantling in having a winged column. But it is a larger plant than that, and its lip is differently lobed; the petals also are broader and their apices are not truncate as in that species. This also resembles *O. Mannii*, Hook. fil. (Ic. Plantar., t. 2003), but has narrower petals which are quite entire.

PLATE 14.—*Oberonia falcata*, King and Pantling. Two plants, of natural size. Fig. 1 front view of a flower, 2 floral bract, flattened out, 3 pollinia; all enlarged.

17. *OBERONIA RUFILABRIS*, Lindl. Sert. Orchid. t. 8A.

Stem very short. *Leaves* narrowly oblong, sub-ensiform, flaccid, .75 to 5 in. long and .25 to .65 in. broad. *Inflorescence* erect, longer than the leaves; its *peduncle* short, bearing numerous soft filiform bracts; the *raceme* many times longer than the petiole, with very numerous flowers in whorls. *Flowers* .05 in. in diam., reddish-brown; the bracts of the flowers in the lower part of the raceme ovate with long filiform tips much longer than the stalked ovaries, those of the upper part with much shorter tips and not longer than the ovaries, the margins of all entire. *Sepals* ovate, acute, concave, spreading. *Petals* linear-oblong, sub-acute, entire, spreading. *Lip* fleshy, twice as long as the sepals and petals, and of a darker colour than the rest of the flower, narrow, the whole of its upper surface scaberulous, a minute elongate pit at the base just under the column; basal lobes filiform, much curved upwards and backwards; terminal lobe narrow, deeply cleft into two lanceolate parallel lobules separated by a deep cuspidate. Fol. Orchid., *Oberonia* 5; Hook. fil. Fl. Br. Ind. V, 683. *Malaxis rufilabris*, Reichb. fil. in Walp. Ann. VI, 213.

At the base of the Sikkim-Himalaya; Haines, Pantling No. 430. Burma; Berkeley, Kurz, No. 3278?; at Moulmein, Griffith.

PLATE 15.—*Oberonia rufilabris*, Lindl. Two plants, of natural size. Fig. 1 a flower seen from the front, 2 clinandrium and part of column, 3 floral bract from the lower part of a raceme 4 floral bract from the upper part of a raceme, 5 cap of anther, 6 pollinia; all enlarged.

18. OBERONIA LONGILABRIS, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, pt. 2, p. 330.

Caulescent. Stems tufted, slender, 2 to 3 in. long. Leaves linear-ensiform, acute, .75 to 1.5 in. long and .2 in. broad. Inflorescence three times as long as the leaves, much decurved; the peduncle about as long as the uppermost leaf, terete, slender, ebracteate; the raceme tapering to the apex; floral bract lanceolate, acuminate, slightly erose, much exceeding the stalked ovary and about as long as the lip. Flowers yellow, minute (.06 in. long), scattered. Sepals ovate, entire. Petals linear-oblong, sub-truncate, entire, spreading like the sepals. Lip oblong in general outline, three times as long as the sepals, with two small rounded auricle-like lobes at the very base; the apical lobes broadly lanceolate, sub-divergent, acute, separated by a sub-triangular sinus; the middle part of the lip (mesochile) with a lanceolate depression extending from near the column to near the apical sinus. Column with small stout wings. Pollinia orange.

Sikkim; at Song-chong-loo, elevation about 6,000 feet: at Namgah, elevation about 5,000 feet; Pantling No. 227; in flower in July.

The concavity on the lip is deep just under the column, becoming shallower towards its apex. The winged column is very unusual in the genus. This species approaches *O. caulescens*, Lindl.; but differs in its longer stem, ebracteate peduncle, in its flowers not being in the least whorled, and in having truncate petals and a lip with shorter lobes.

PLATE 13A.—*Oberonia longilabris*, King and Pantling. Two plants, of natural size. Fig. 1 front view of a flower, 2 anther, 3 pollinia; all enlarged.

19. OBERONIA AURICULATA, new species.

Stem 1 to 1.5 in. long. Leaves linear-equitant, acuminate, not falcate, .5 to 1 in. long and .15 to .2 in. broad. Inflorescence erect, three times as long as the leaves; peduncle less than one inch, naked or with a few bracts; raceme slender, sparsely-flowered; floral bract lanceolate, erose. Sepals ovate, sub-acute, the lateral pair reflexed on the slenderly stalked ovary. Petals erect like the dorsal sepal, narrowly oblong, blunt, the margins erose. Lip longer than the sepals and petals, oblong, narrowed at the truncate base, widening upwards, the apex divided into two obtuse diverging oblong lobules by a deep triangular sinus mucronate at its apex; lateral lobes none, but at each end of the base a small rounded auricle with a triangular depression inside it.

Sikkim; at Sureil and Rungbee at elevations of about 6,000 feet; Pantling No. 166; in flower in May.

Allied to *O. caulescens*, Lindl., but in that species the lip has rather large basal lobes, and the lobules of the terminal lobe are produced into tails; the petals, moreover, are entire, not erose as in this.

PLATE 16A.—*Oberonia auriculata*, King and Pantling. Two plants, of natural size. Fig. 1 a flower seen from the front, 2 anther, 3 pollinia; all enlarged.

20. *OBERONIA PYRULIFERA*, Lindl. Fol. Orchid., *Oberonia*, p. 3.

Stem very short. *Leaves* ensiform, obliquely acute or sub-acute, sub-falcate, 1 to 2.5 in. long and .15 to .30 in. broad. *Peduncle of inflorescence* slender, terete, about half as long as the leaves; the bracts slender, subulate; the *raceme* about the same length or longer, slender, decurved; *floral bract* shorter than the rather long-stalked ovary, lanceolate, acuminate, erose. *Flowers* minute (about .065), green, scattered, not verticillate. *Sepals* ovate, acute, entire. *Petals* oblong, blunt, reflexed like the sepals and resting on the ovary. *Lip* more than twice as long as the sepals, oblong, with a quadrate hypochile truncate at the base, with a small rounded shoulder-like auricle at each extremity and a shallow triangular depression between; the apical lobe deeply cleft into two oblong sub-falcate obtuse divergent lobules with a large triangular sinus between them. *Capsules* ovoid-cylindric, ribbed, .1 in. long. Hook. fil. Fl. Br. Ind. V, 678. *O. verticillata*, var. *Khasiana*, Lindl. Fol. Orchid., *Oberonia*, p. 3. *Malaxis verticillata*, var. *Khasiana*, and *M. pyrulifera*, Reichb. fil. in Walp. Ann. VI, 210, 211.

Valley of the Teesta in Sikkim, at an elevation of 1,000 feet; Pantling No. 191; in flower in October. Khasia Hills, elevation 4,000 to 6,000 feet; Hooker fil. and T.T. Munipore; Watt.

PLATE 16B.—*Oberonia pyrulifera*, Lindl. Two plants, of natural size. Fig. 1 a flower, seen from the front, 2 anther, 3 pollinia; all enlarged.

2. *Microstylis*, Nutt.

Terrestrial, sometimes epiphytic (two saprophytic), pseudo-bulbous. *Leaves* one or more, membranous, plicate, continuous with their sheaths (absent in two species). *Flowers* small, resupinate, in terminal racemes. *Sepals* spreading or recurved, sub-equal. *Petals* narrower than the sepals but of about the same length. *Lip* adnate to the base of the column, usually flat; the basal lobes large, sagittate, and produced upwards, or cup-shaped with small lobes, or without basal lobes; the apex emarginate, 2-3-lobed, erose or entire. *Column* very short (rather long in *M. congesta* and *M. Maximowicziana*), with two short spreading arms. *Anther* sub-terminal, bilocular; *pollinia* 4, ovoid or obovoid.

A genus including about sixty species, of which ten are found in Sikkim and nine in other parts of British India and in Ceylon.

Lip slightly convex; the basal auricles sagittate, projecting upwards and more or less hiding the rest of the flower.

Leafy.

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| Anterior lobe of lip transversely elliptic, erose . . . | 1. <i>M. Khasiana</i> . |
| Anterior lobe of lip rounded, notched; the basal auricles parallel, their tips not touching or overlapping . . | 2. <i>M. Wallichii</i> . |
| Anterior lobe of lip sub-quadrate, deeply bifid; the basal lobes converging, their tips touching or overlapping . | 2. <i>M. Wallichii</i> , var. <i>biloba</i> . |
| Anterior lobe of lip triangular, its apex notched . . . | 3. <i>M. Scottii</i> . |