The Sections of the Genus Primula.

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With Plates CCXXIV–CCXXV.

Some introductory notes are necessary in explanation of the reasons for presenting a revision of the sections of this extensive genus. It is now clear that its greatest development is in the alpine regions of western China and secondarily in the Himalaya. Since the time of the last Primula Conference in 1913 there has been added a considerable number of new species, collected by various explorers, as well as further material of known species which has served to elucidate many doubtful points.

In dealing with the sections of Primula, reference must first be made to the pioneer work of Professor Pax in his Monograph on Primulaceae dated 1905. Grateful tribute has been paid to the author by all workers on the genus. In his paper on the "Chinese Species of Primula" at the 1913 Conference Professor Bayley Balfour in introducing his own analysis of the sections of the Chinese species expresses his appreciation of the Monograph and his own indebtedness to it (Journ. R.H.S. xxxix, p. 130). At the time of that Conference it was already clear that the numerous additions in the way of Chinese and Himalayan species necessitated modifications of Pax's treatment of the sections concerned and Balfour's tentative list of sections was an attempt to deal with the problem as far as the material then available permitted. But Balfour put these modifications forward without suggestion of finality as he was only too well aware that much further analysis was needed. In regrouping the species he instituted a considerable number of new sections, increasing Pax's twenty-one to double that number. These new sections were however provisional, were defined in a general way, and were not clearly discriminated one from the other by the insertion of any key. Some of them, especially the smaller sections, were convenient placements for certain little-known or little-understood species which had then no clear affinity with the larger sections. Obvious examples are Sertulum and Glacialis. Of these difficulties Balfour was well aware, and in his subsequent papers on the new species which continued to stream in he gives here and there clear indication of changes of view. Unfortunately he did not live to give these complete written expression.

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As the written record of Primula sections stands, the position is consequently somewhat indefinite. The Monograph of Pax is no longer adequate for the treatment of the East Asiatic species, while the Balfourian sections require that adjustment which he would undoubtedly have given them. The present authors were closely associated with Professor Balfour during the last 20 years of his life and had frequent opportunities of discussion with him on Primula, especially as regards the species of the Himalaya, Tibet and China. They may be permitted to mention that they have collected widely in these regions with Primula as one of the main objectives, and have seen " living " or " dead " all the described species of the genus with the exception of some twelve which they still hope to view. The dried material accumulated in the Edinburgh Herbarium is probably the most ample collection of the genus in the world. It is not therefore the lack of opportunity which can be held responsible for any defects which may appear in the analysis of the sections submitted to this Conference of 1928.*

It will lend to a better understanding of the proposed arrangement if we revert to Pax's Conspectus of the sections (Monogr. p. 18). Of his 21 sections some will remain unaltered in their general scope :—Auricula, Bullatae, Carolinella, Vernales ; some are amplified :—Minutissimae, Petiolares, Nivales ; one is retained as to name but modified as to character :—Soldanelloideae ; some are retained as sections but modified as to name :—Monocarpicae (Malacoides), Sredinskya (Grandis), Floribundae (Verticillata), Cordifoliae (Rotundifolia), Cankrienia (Candelabra), Fallaces (Reinii) ; some have been subdivided and the names retained in a restricted sense :—Sinenses, Capitatae ; some are withdrawn :—Macrocarpae for the reasons given under the section Cuneifolia, Dionysiopsis for reasons given under Verticillata, Callianthae partly merges in Nivales, Tenellae is divided among other sections, Omphalogramma is a distinct genus. In the choice of sectional names, it has not been possible to retain in all cases the original name of each section ; a preference has been given in some cases to later names which appear more appropriate and more easily remembered. The name of the outstanding species of the section is the most useful if otherwise applicable. We do not want to recall Monocarpicae† and Sredinskya if Malacoides and Grandis serve better. But we have introduced no new ones and have endeavoured to adhere to those which have gained a general currency.

As regards the Balfourian sectional names as they appeared in the Journal R.H.S. xxxix and in the Herbarium the following sections are absorbed in greater aggregates—Auriculatae in Farinosae (as Pax in his Monograph), Elongata in Nivales, Gemmifera in Farinosae, Geranioides in Cortusoides, Glacialis in Nivales and in Farinosae,

* This paper was prepared for the Primula Conference of 1928.
† Not applicable to section as now constituted.

Mollis in Cortusoides, Maximowiczii in Nivales, Chartacea and Davidi in Petiolares, Sertulum in Farinosae, Sonchifolia in Petiolares, Tongolensis in Petiolares, Yunnanensis in Farinosae. Some of these, however, can be retained as names for subsections. We have used Pax's Bullatae in preference to Suffruticosa as the latter name invites unwarranted association with *P. suffrutescens*; so too Pinnatae of R. Knuth is a good name and is prior to Filchnerae.

The sections consequently are as follows:—

1. **Amethystina,** Balf. f.
2. **Auricula,** Duby.
3. **Bella,** Balf. f.
4. **Bullatae,** Pax emend. (Suffruticosa, Balf. f.).
5. **Candelabra,** Balf. f. (Cankrienia, De Vriese).
6. **Capitatae,** Pax emend.
7. **Carolinella,** Pax emend.
8. **Cortusoides,** Balf. f. (including Mollis, Balf. f. and Geranioides, Balf. f.).
9. **Cuneifolia,** Balf. f.
10. **Denticulata,** Balf. f. (Capitatae, Pax, pro parte).
11. **Dryadifolia,** Balf. f.
12. **Farinosae,** Pax amplif.
13. **Grandis,** Balf. f. (Sredinskya, Stein).
14. **Malacoides,** Balf. f. (Monocarpicae, Franch.).
15. **Malvacea,** Balf. f.
16. **Megaseaefolia,** Balf. f.
17. **Minutissimae,** Pax.
18. **Muscarioides,** Balf. f. (Capitatae, Pax, pro parte).
19. **Nivales,** Pax.
20. **Obconica,** Balf. f. (Name curtailed).
21. **Obtusifolia,** Balf. f.
22. **Petiolares,** Pax.
23. **Pinnatae,** R. Knuth (Filchnerae, Balf. f.).
24. **Pycnoloba,** Balf. f.
25. **Reinii,** Balf. f. (Fallaces, Pax, pro parte).
26. **Rotundifolia,** Balf. f. (Cordifoliae, Pax, pro parte).
27. **Sikkimensis,** Balf. f.
28. **Sinenses,** Pax (sensu restricto).
29. **Soldanelloideae,** Pax emend.
30. **Souliei,** Balf. f.
31. **Vernales,** Pax.
32. **Verticillata,** Balf. f. (Floribundae, Pax, pro parte).

KEY TO THE SECTIONS.

A1. INVOLUTAE.

Young leaves folded *inwards*.

B1. Leaves ± fleshy or leathery; flowers in umbels; bracts not leafy - - - - - - - - - - - **Auricula**

B2. Leaves membranous; flowers in superposed whorls; bracts leafy - - - - - - - - - - **Verticillata**

A2. REVOLUTAE.

Young leaves folded *outwards*.

B1. Campanulatae.

Flowers campanulate or cylindric; corolla-lobes not reflexed.

C1. Efarinose; glabrous; leaves gland-punctate - **Amethystina**

C2. Inflorescence farinose; flowers pedicelled; corolla cylindric **Grandis**

C3. Inflorescence farinose; flowers pedicelled; corolla campanulate **Sikkimensis**

C4. Inflorescence farinose; flowers sessile; corolla campanulate **Soldanelloideae**

B2. Infundibuliformes.

Flowers infundibular; corolla-lobes patent or reflexed.

C1. Efariniferae.

No farina; leaves in all sections with articulated hairs, except three or four glabrous species; leaves in most sections with distinct petiole and lobed lamina. (Flowers never sessile; bracts never saccate.)

D1. Leaves decurrent, not lobed - - - - - **Vernales**

D2. Leaves very distinctly petioled.

E1. Leaves ± lobed.

F1. Leaves *pinnate* and almost bipinnate - - **Pinnatae**

F2. Calyx very large, *much exceeding corolla* - **Pycnoloba**

F3. Calyx inflated, *widest at base*, lobes not patent **Sinenses**

F4. *Calyx cupular*, foliaceous, narrow at base, lobes patent, exposing fruit, *flowers in many superposed whorls or racemose* - - - - - - - **Malvacea**

F5. *Calyx cupular*, foliaceous, narrow at base, fruit included, *flowers generally in simple umbels* - - **Obconica**

F6. *Calyx ± tubular*, rigid, prominently ribbed, capsule ± included - - - - - - - **Cortusoides**

F7. Calyx ± tubular, rigid, prominently ribbed, capsule elongate, *much extruded* - - - - - **Reinii**

E2. Leaves not lobed.

F1. Inflorescence a congested raceme; capsule opening by a lid - - - - - - - - **Carolinella**

F2. Inflorescence a simple umbel; capsule opening by irregular teeth - - - - - - **Megaseaefolia**

C2. Fariniferae.

All sections ± farinose (very slightly in Cuneifolia); certain sections as Candelabra and Farinosae contain some obviously related efarinose species; articulated hairs rarely present and then associated with farina; leaves usually not lobed except in Malacoides and Souliei and occasionally in Muscarioides.

D1. Flowers ± sessile in dense capitula or spikes; bracts not saccate; no woody rhizome.

E1. Flowers of capitulum ± erect - - - - **Denticulata**

E2. Flowers of capitulum pendent - - - - **Capitata**

E3. Flowers of spike pendent - - - - **Muscarioides**

D2. Flowers ± sessile in few-flowered capitula; bracts not saccate, foliaceous; rhizome massive, woody, covered with old leaves - - - - - - **Dryadifolia**

D3. Flowers 1–3, ± sessile; corolla-throat with ball of hairs; no rhizome - - - - - - - **Bella**

D4. Flowers pedicelled, rarely sessile and then with saccate bracts.

E1. Capsule globose, not opening by teeth, crumbling at maturity - - - - - - **Petiolares**

E2. Capsule globose or cylindric, opening by definite teeth.

F1. Leaves ± fleshy, glabrous, with shape and toothing *recalling Saxifraga umbrosa*; very obscurely farinose on pedicels and calyx only; chiefly Japanese **Cuneifolia**

F2. Leaves membranous, ± *lobed*, orbicular to ovate, *pubescent* with *articulated* hairs, base ± cordate, petiole distinct; inflorescence farinose; capsule globose included - - - - **Malacoides**

F3. *Massive woody rhizome*, clothed with cushion of old leaves; leaves ± *bullate*, glandular-pubescent and farinose; bracts large ± *foliaceous*; capsule globose, included - - - - - - - **Bullatae**

F4. Leaves decurrent, membranous to chartaceous, generally efarinose; inflorescence in *many superposed umbels*, usually farinose; several efarinose species with the inflorescence of this section belong here; capsule ± globose, included, rarely subcylindric exserted **Candelabra**

F5. Leaves ± membranous to chartaceous, rarely fleshy; bracts ± *saccate or produced below insertion*; some

non-saccate species of Farinosae affinity included here; a few efarinose species belong here; capsule usually cylindric, sometimes ± globose - **Farinosae**

F6. Leaves membranous, *finely scabrid*, lamina usually *pinnately cut or indented*; petiole distinct; bracts not saccate; capsule cylindric - - - **Souliei**

F7. Leaves *fleshy*, glabrous, usually farinose; lamina decurrent; bracts not saccate; capsule *cylindric*, generally *far extruded* - - - - **Nivales**

F8. As Nivales but *leaves long-petiolate, lamina rotundate*, base cordate - - - - - **Rotundifolia**

F9. As Nivales but leaves *membranous, petioles very elongated weak*, capsule cylindric ± *equalling* calyx **Obtusifolia**

F10. Very dwarf species, *often stoloniferous*, flowers *minute, solitary or few*; bracts not saccate - **Minutissimae**

ALTERNATIVE KEY TO SECTIONS.

1.	Young leaves folded inwards - - - - -	2
	Young leaves folded outwards - - - - -	3
2.	Flowers in umbels; bracts not leafy - -	**Auricula**
	Flowers in superposed whorls, bracts leafy -	**Verticillata**
3.	Flowers campanulate or cylindric (no eye) -	4
	Flowers infundibular (eye distinct) - - -	7
4.	Flowers cylindric - - - - - - -	**Grandis**
	Flowers campanulate - - - - - -	5
5.	Flowers sessile - - - - - - - -	**Soldanelloideae**
	Flowers pedicelled - - - - - - -	6
6.	Inflorescence farinose - - - - -	**Sikkimensis**
	Inflorescence efarinose - - - - -	**Amethystina**
7.	All parts efarinose; leaves generally lobed, long-petiolate, pubescent - - - - -	8
	Farina present, copious or scanty; leaves rarely lobed, generally decurrent - - - -	17
8.	Leaves decurrent, not lobed - - - -	**Vernales**
	Leaves very distinctly petioled - - -	9
9.	Leaves ± lobed - - - - - - -	10
	Leaves not lobed - - - - - - -	16
10.	Leaves pinnate, almost bipinnate - - -	**Pinnatae**
	Leaves not pinnate - - - - - -	11
11.	Calyx exceeding corolla - - - - -	**Pycnoloba**
	Calyx shorter than corolla - - - -	12
12.	Calyx very wide at base - - - - -	**Sinenses**
	Calyx narrowed at base - - - - -	13
13.	Calyx cupular, foliaceous - - - - -	14
	Calyx tubular, rigid - - - - - -	15

14. Flowers in many superposed whorls or racemose **Malvacea**
Flowers generally in simple umbels - - - **Obconica**
15. Capsule ± included - - - - - - - **Cortusoides**
Capsule far exserted - - - - - - **Reinii**
16. Flowers in congested racemes - - - - **Carolinella**
Flowers in a simple umbel - - - - - **Megaseaefolia**
17. Flowers ± sessile; bracts not saccate - - 18
Flowers pedicelled; bracts occasionally saccate 22
18. Corolla throat with ball of hairs - - - **Bella**
Corolla throat open - - - - - - 19
19. Massive rhizome; capitulum few-flowered - **Dryadifolia**
No rhizome; inflorescence many-flowered - 20
20. Flowers in dense spikes - - - - - **Muscarioides**
Flowers in dense capitula - - - - - 21
21. Flowers ± erect - - - - - - - **Denticulata**
Flowers ± pendent - - - - - - - **Capitata**
22. Capsule globose, crumbling, not opening by teeth - - - - - - - - **Petiolares**
Capsule globose or cylindric, opening by teeth - 23
23. Leaves shaped and indented as in *Saxifraga umbrosa* - - - - - - - **Cuneifolia**
Leaves quite unlike those of *Saxifraga umbrosa* - 24
24. Massive woody rhizome; leaves ± bullate; bracts leafy - - - - - - - **Bullatae**
No woody rhizome - - - - - - - 25
25. Leaves ± lobed or strongly indented, petiolate - 26
Leaves not lobed nor deeply cut - - - 27
26. Capsule globose included - - - - - **Malacoides**
Capsule cylindric exserted - - - - **Souliei**
27. Lamina orbicular and cordate, petiole long distinct - - - - - - - **Rotundifolia**
Lamina not orbicular, decurrent - - - 28
28. Bracts generally ± saccate - - - - **Farinosae**
Bracts never saccate- - - - - - 29
29. Minute species, often solitary flowers - - **Minutissimae**
Robuster species, inflorescence many-flowered - 30
30. Capsule globose - - - - - - **Candelabra**
Capsule cylindric - - - - - - - 31
31. Leaves fleshy; capsule exserted - - - **Nivales**
Leaves membranous; capsule equalling calyx - **Obtusifolia**

We believe that it may be useful to give here some account of the characters which have been used in the discrimination of the sections, to point out the relative values of these characters, and also to indicate where, owing to exceptional species, caution is necessary in the use of the key.

The infolding of the leaves in two of the sections is a character long recognised and quite trustworthy. The division line between these sections Auricula and Verticillata is easy to draw and requires no further explanation. Use is then made of the corolla-shape. In four sections the corolla is distinctly bell-shaped or cylindric, with the lobes more or less *in line* with the tube or at the most not sharply bent back as in most Primulas. This is in our opinion a very important divisional mark. In most Primulas the junction of tube and corolla-lobes is marked by a distinct "eye," often by an annulus, and the lobes usually lie more or less at right angles to the tube. The four sections thus cut off are readily distinguished from one another and the *only* exceptional species occur in Amethystina where *P. Dickieana* and *P. aureostellata* have patent lobes and consequently non-campanulate corollas. They have however the peculiar leaves of the Amethystina section and are best retained there. All the sections which follow have the corolla-lobes more or less patent, sometimes completely reflexed as in *P. szechuanica* and its allies.

The next character, presence or absence of farina, requires caution in its use. The sections placed under Efariniferae show no exceptions in their lack of farina; but in the Fariniferae instances occur in several sections of species which are free from farina. The affinities of these exceptional species are so obviously with farinose species that they must be included in the farinose sections. Fortunately the lack of farina in the Efariniferae is correlated with other relatively strong characters and the sum of these criteria make discrimination fairly certain. We find in the Efariniferae that in all sections the leaves have long articulated hairs except in one or two glabrous species, that the leaves have usually a long and very clearly marked-off petiole except in the section of the common primroses (Vernales), and that in seven of the ten sections the leaves are distinctly lobed. This lobing usually goes far beyond marginal indentation; the outline of the leaf frequently becomes pentagonal or heptagonal as in the leaves of the species of Geranium.

From the ten sections of the Efariniferae, Vernales is easily discriminated by the more or less decurrent non-lobed leaves, the only marked exception being in *P. Juliae* where the glabrous leaf is rounded-cordate with the long and distinct petiole of the other sections. Two other sections have leaves without lobing but with distinct petioles. One is the peculiar Chinese Carolinella with distinctive inflorescence and capsule; two of the three species are *glabrous*. The other is Megaseaefolia with a solitary species.

The seven sections with lobed leaves present little difficulty in discrimination from one another. If we leave out Pinnatae which was not known at the time of the Monograph (1905), Pax very correctly indicates three possible divisions based on the character of the calyx (p. 19). He recognises *P. sinensis* as standing apart, his Poculiformia

with cupular-foliaceous calyx would correspond to Malvacea and Obconica, and his Cortusina with rigid tubular calyx to Cortusoides. We have brought Reinii into the group ; half of Pax's Fallaces belongs in any case to Cortusoides. The only noteworthy deviations in these seven sections are :—(1) the inflorescence in dwarf specimens of certain species of Malvacea may be a simple umbel ; (2) in some Obconicas the lobation of the leaf becomes obscure ; (3) the calyx of *P. neurocalyx* in Malvacea verges on the tubular shape.

We now come to the main assemblage of the sections where the species are generally more or less farinose. The farina is somewhat fluctuating in its appearance ; it may be copiously present or almost absent on the same species ; some sections such as Candelabra rarely show it on the leaves ; others like Nivales are rarely efarinose on the leaves ; but in doubtful cases its final stronghold is to be looked for at the apex of the scape, on the bracts, pedicels and at the base of the calyx.

The last character of primary importance is the type of inflorescence. Almost sessile flowers are comparatively infrequent but five sections can be segregated by that feature. But it must be noted in connection therewith that the bracts in those sections are non-saccate. It happens that almost sessile flowers occur in some Farinosae but in these the bracts are distinctly saccate. These five sections are readily separable, one from the other, by the points given in the key. The only caveat necessary is that in some species of Denticulata the pedicels become somewhat manifest.

A character of secondary importance—the dehiscence of the capsule —is of service in marking off the large aggregate of Petiolares. This section contains several subsections, each almost entitled to sectional rank, but it seems better to keep all together as one unit. The capsules of most Primulas open at the apex by a series of teeth, the degree of splitting being variable. In Petiolares the capsule is globose, at the base very adherent to the lower part of the calyx ; the apex of the capsule appears to be of very different consistency from the lower portion ; it is often semi-transparent and the outline of the seeds can often be seen through the wall ; as we have observed on several occasions in the field in the Himalaya and China, this upper part gives way ; it tends more to crumble than to come off in a piece while the seeds, lying on a broad convex placenta, are usually washed out by the rain ; these seeds appear to lose their germinating power quickly and only one or two species of this large section have ever been brought into cultivation. These remarks apply to all the species of which we have had sufficient fruiting material to examine, but it has to be allowed that of many species in this section further observations of the fruiting stages are necessary before general application of these characters is possible. Calyx-shape is not a character of much service for sectional divisions in the Fariniferae but it may be noted here

that the calyx of the Petiolares is rather distinctive, recalling somewhat that of Obconica.

That part of the key which deals with the remaining ten sections presents a little more difficulty. Certain secondary characters are of service but the sections require to be taken almost individually for explanation. The Candelabra inflorescence serves for the section so-named but some of its species have simple umbels while stout species in other sections may attain to a candelabroid inflorescence. Saccate bracts are characteristic of Farinosae but some species within that section and undoubtedly in their proper place have no signs of gibbosity in the bracts. This gibbosity occurs only rarely outside Farinosae and then obscurely. The stoloniferous habit is marked in Minutissimae but it occurs also in Farinosae and Denticulata. Something can be done with the contrast between globose and cylindric capsules; some sections are restricted to one type, but in some important sections both kinds of capsule may occur. The calyx in some cases gives to the eye some indication of the affinity but its qualities are not easily expressed in words. The woody rhizome in Bullatae is diagnostic but stout rhizomes are found occasionally elsewhere. The rotundate leaf with long petiole is rare in the Fariniferae but marks out Rotundifolia.

The fleshy glabrous saxifrage-like leaves are for Cuneifolia the best guide. The species of this section have been described as efarinose but farinipotent hairs are sparingly present on the pedicels and base of calyx. The section, however, need run no chance of confusion with any member of the Efariniferae. One species in it—*P. suffruticosa*—has a stout rhizome.

The pubescent petiolate lobed leaves and globose capsule of Malacoides are reminiscent of Obconica but farina is usually abundant except in the glabrous efarinose species *P. Cavaleriei* and *P. pellucida*. The calyx of the section is not that of Obconica.

Bullatae is easy of recognition by the characters given. The close mat of desiccated old leaves is very characteristic of Bullatae and Dryadifolia.

Candelabra is a natural section. As has been already pointed out, the numerous superposed umbels are present in most species but the smaller species may have only one umbel or two at most while superposition of umbels is of not infrequent occurrence in other sections. The leaves are efarinose except occasionally in *P. Cockburniana*. But the appearance of minute globose glands on the under-surface of the leaves in Candelabra Primulas suggests *potential* mealiness. Where farina occurs it is usually on the inflorescence and especially on the outside or inside of the calyx lobes. But nearly half the section are efarinose even on the inflorescence (as *P. anisodora*, *P. Poissonii* and *P. serratifolia*). However, the characteristic hairs of the Efariniferae are entirely absent. The leaves otherwise often resemble

those of the common Primulas of the section Vernales. The capsule is almost always globose, the only exception being *P. Poissonii* where it is shortly cylindric. In spite of these inconsistencies the only species included which are likely to cause hesitation in ascription to Candelabra are the dwarf ones such as *P. prenantha*.

The remaining six sections are nearly allied to each other, and lines of distinction are consequently less easy to draw. The two dominant sections, Farinosae and Nivales, are of close kinship. Use must here be made of the character of saccate bracts. Where these occur they are diagnostic for Farinosae. But the degree of gibbosity varies and several species must be included in Farinosae although their bracts show no decided evidence of pouching. Several instances occur of pairs of closely allied species, one with saccate bracts and one with the gibbosity obsolete. The same holds with regard to farina, but in this respect the same species may be farinose or almost efarinose. In many cases it would appear to be a matter of environment. Pax saw clearly enough that several species with bracts scarcely gibbous must be included in his Farinosae, and we are in entire agreement that the ones he specified—with the proviso that some of them such as *P. tibetica* really show ample gibbosity and need no concession for admission. The following seem to us necessarily within the section :—

(*a*) *P. flava, P. macrocarpa, P. sertulum, P. yunnanensis* and its associates *P. annulata, P. kialensis, P. membranifolia, P. Umbrella* ; all these show evident kinship with *P. farinosa* and *P. modesta* ; *P. yunnanensis* and its allies represent the section Yunnanensis, Balf. f., which in our opinion comes within the scope of Farinosae ;

(*b*) Dwarf species associated with *P. concinna—P. glabra, P. kongboensis, P. pseudoglabra, P. pygmaeorum, P. Walshii*, some with gibbous bracts ;

(*c*) Associated with *P. sibirica* and *P. tibetica—P. fasciculata, P. oxygraphidifolia* (in which the flowers are solitary and so without bracts), *P. Reginella* ;

(*d*) *P. gemmifera* and its subspecies ; these are related to *P. involucrata* and *P. sibirica* in the shape and texture of the leaves and in the flower-structure—but differ as to the bracts. They represent the section Gemmifera, Balf. f., but are better kept as a subsection under Farinosae.

The section Souliei is closely akin to Farinosae, but a distinct petiole is usually developed and the finely scabrid lamina is generally more or less indented, often deeply cut.

There follows the large aggregate of Nivales. These have a very fleshy leaf, most often markedly farinose ; the bracts are never

saccate ; the calyx is of characteristic shape, marked generally along the edges of the lobes with farina ; the capsule is in most cases *far* exserted. In the introduction to the section will be found a short review.

Rotundifolia is of Nivales kinship and can be marked off readily by the long distinct petiole and orbicular lamina.

Obtusifolia is a small group of Himalayan species of Nivales affinity with leaves of slender texture, long weak petioles, and capsules which are but shortly cylindric. We regard this section as somewhat intermediate in character between the two large aggregates of Farinosae and Nivales.

Last and least is Minutissimae. The flowers are generally solitary and half-hidden in the mat of small leaves. The majority tend to be stoloniferous. The section appears to have kinship with Farinosae.

The sections are now taken up in alphabetical sequence and a brief introduction is given to each, along with a list of the included species. An attempt has been made in some cases to arrange the species so that their relationships one to another may be understood, but much detailed work still requires to be done. Keys to the species in each section have yet to be undertaken.

The numerous synonyms occurring in the record of Primula are not fully dealt with in the pages which follow. Only a few have been quoted. A complete index of Primula names will appear in a future publication. The index appended to this paper has reference only to the names which appear in the detailed account of the sections.

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AMETHYSTINA, Balf. f.

This is a section containing many very beautiful species but none are in cultivation. Seed has been secured in the past of some four or five but we have seen only one, *P. brevifolia*, brought to flowering stage. That too is now lost. The section is characterised by the horny margin to the leaves, which have a peculiar glandular punctulation, and by the pendent bell-like flowers. The species are quite glabrous, without hairs and generally without farina. The corolla lobes are

usually in line with the tube and not bent at right angles as in most Primulas. *P. Dickieana* and *P. aureostellata* depart from this bell-like corolla, however, though very similar in the nature of their leaves. They are not akin to any other section and are probably best included here. Although the species of this section have been described as efarinose, there is more than a suspicion of farina at the apex of the scape of *P. Faberi* and also of *P. aureostellata* and *P. Dickieana*. There is also a marked tendency to the development of gibbosity in the bracts of *P. Faberi* and *P. aureostellata*. In spite of the difference in corolla shape between these two, they are akin, and if *P. aureostellata* must accompany *P. Faberi* so must also *P. Dickieana*. Another peculiar feature of *P. aureostellata* and *P. Dickieana* is the hairiness of the throat and inner part of the corolla-tube—a feature alien to the other species of Amethystina.

The section is at first sight an isolated one, but if any weight is to be given to the peculiarities noted above as regards farina and gibbosity of bracts there is a suggestion of approach to such species as *P. algida* and consequently a link, perhaps slender, with the all-pervading Farinosae. The species are restricted to the Eastern Himalaya and to S.W. China.

P. amethystina, Franch.
    Subspecies.
        P. brevifolia, Forrest.
P. argutidens, Franch.
    P. Riae, Pax.
P. aureostellata, Balf. f. et Cooper.
P. Dickieana, Watt.
    var. chlorops, W. W. Sm.
    var. Pantlingii, (King) W. W. Sm.
P. Faberi, Oliv.
    P. cylindriflora, Hand.-Mzt.
P. Kingii, Watt.
    Subspecies.
        P. Gageana, Balf. f. et W. W. Sm.
P. silaensis, Petitm.
P. Valentiniana, Hand.-Mzt.
P. Virginis, Lévl.
    P. leimonophila, Balf. f.
    Subspecies.
        P. petrophyes, Balf. f.

AURICULA, Duby.

The list given below is based, with a few minor alterations, on the very complete analysis of the section given by Pax in his Monograph.

No attempt has been made here to insert the many synonyms and the names of hybrids. These will find a place in an index to Primula which is in preparation.

Auricula is a well-known and readily recognisable section. With Verticillata it shares the characteristic involute folding of the young leaves and need not therefore be confused with any other section. The species cited are all in cultivation in this country. The section is European in its distribution, extending from the Pyrenees to the Alps and then onwards to the Apennines, the Carpathians and the Balkan Peninsula.

Pax divides the section into seven subsections which are cited below, with the species contained in each.

Subsection Euauricula.

P. Auricula, Linn.
- var. ciliata, (Moretti) Koch.
- var. Obristii, (Stein) Beck.
- var. serratifolia, Rochel.
- var. Widmerae, Pax.

P. Palinuri, Petagna.

Subsection Brevibracteatae.

P. carniolica, Jacq.

P. marginata, Curtis.

P. viscosa, All.

Subsection Arthritica.

P. Clusiana, Tausch.

P. glaucescens, Moretti.
- Subspecies.
  - P. longobarda, Porta.

P. spectabilis, Tratt.

P. Wulfeniana, Schott.
- Subspecies.
  - P. Baumgarteniana, Degen et Moesz.

Subsection Erythrodrosum.

P. apennina, Widmer.

P. hirsuta, All.
- var. angustata, Widmer.
- var. exscapa, Pax.
- var. nivea, Sims.

P. oenensis, Thomas.

P. pedemontana, Thomas.

P. villosa, Jacq.
- Subspecies.
  - P. commutata, Schott.
    - f. cottia (Widmer), Lüdi.
      - *P. cottia,* Widmer.

Subsection Rhopsidium.

P. Allionii, Loisel.
P. integrifolia, Linn.
P. Kitaibeliana, Schott.
P. tyrolensis, Schott.

Subsection Cyanopsis.

P. deorum, Velen.
P. glutinosa, Wulf.

Subsection Chamaecallis.

P. minima, Linn.

BELLA, Balf. f.

The affinities of this section are with the smaller species of Farinosae and with Minutissimae. Its members are all dwarf and somewhat delicate. Among the small-growing Primulas, the section Bella is recognisable at once by the dense cushion or pompon of hairs in the throat of the corolla. The spathulate leaves are more or less incised or toothed, and may be farinose or not. They are ultra-alpines but lack the woody rootstock of section Dryadifolia. The two outstanding species are *P. pusilla* of the Himalaya and *P. bella* of S.W. China. Both of these are in cultivation but their hold is precarious. *P. bella* has persisted for several years outside in Wigtownshire.

The remaining members of the section may be regarded as subspecies of *P. bella*. They differ from typical *P. bella* in stature, in size of corolla, in presence or absence of white or yellow meal, and other minor points. *P. stragulata* is the most distinct. *P. oreina*, Balf. f. et Cooper and *P. triloba*, Balf. f. et Forrest, formerly referred to this section, belong to Dryadifolia.

P. bella, Franch.

Subspecies.

P. Bonatiana, Petitm.
P. coryphaea, Balf. f. et Ward.
P. cyclostegia, Hand.-Mzt.
P. indobella, Balf. f. et W. W. Sm.
P. moscophora, Balf. f. et Forrest.
P. nanobella, Balf. f. et Forrest.
P. sciophila, Balf. f. et Ward.
P. stragulata, Balf. f. et Forrest.

P. pusilla, Wall.

BULLATAE, Pax.

The nearest ally of this section is probably Dryadifolia. Both have well developed often massive rhizomes, densely clad with a cushion of withered leaves. In this section the leaves are markedly rugose. To cultivators *P. Forrestii* is well known and is a good representative for the characters of the section. The species fall into two groups. The first comprises species of robust habit, with long scapes, and many-flowered umbels. To this belong *P. bullata, P. Forrestii, P. rufa,* and *P. redolens.* These are all closely allied and differ in minor points. *P. bullata* is farinose and not glandular-pubescent ; leaf-base cuneate. *P. Forrestii* is densely glandular-pubescent, with cordate leaves. *P. rufa* differs from the last in having a cuneate base to the leaf while *P. redolens* is akin to *P. rufa* except in colour of flower—rose and not yellow as in the other three. Except typical *P. bullata,* all are or have been in cultivation.

The other group is of dwarfer habit, with a very short scape (sometimes none), hidden among the leaves. Yellow-flowered are the three closely-allied species (possibly all variations of one), *P. bracteata, P. pseudobracteata,* and *P. pulvinata. P. Dubernardiana* and *P. tapeina* have white to rose flowers. *P. Henrici* is imperfectly known to us but is certainly near *P. Dubernardiana* while *P. ulophylla* suggests a dwarf *P. rufa.* Of these last *P. Dubernardiana* is in cultivation and apparently prefers, like *P. Forrestii,* a situation on a wall.

P. bracteata, Franch.
P. bullata, Franch.
P. Dubernardiana, G. Forrest.
P. Monbeigii, Balf. f.
P. Forrestii, Balf. f.
P. Henrici, Bur. et Franch.
P. pseudobracteata, Petitm.
P. pulvinata, Balf. f. et Ward.
P. redolens, Balf. f. et Ward.
P. rufa, Balf. f.
P. tapeina, Balf. f. et Forrest.
P. ulophylla, Hand.-Mzt.

CANDELABRA, Balf. f.

This is a section now well known in gardens. The species are nearly all of easy culture and the majority of them are more or less established in cultivation. Most produce a tall scape with numerous whorls of flowers—the candelabra inflorescence. But every Primula with this inflorescence does not belong to this section. Additional characters are found in the leaves resembling those of *P. acaulis,* in the calyx

and in the fruit which is usually globose, though occasionally somewhat elongate. The section is to a certain extent an isolated one, but it invites comparison with Nivales and Sikkimensis. From the latter section, equally amenable in cultivation, the corolla-form is an easy distinction. The Nivales section, more or less intractable in culture, differs in habit, foliage, calyx and fruit.

The species of the section are separable by fairly good characters, but the following sets are of close relationship :—*P. burmanica* with *P. Beesiana* ; *P. chungensis* with *P. Cockburniana* ; *P. Smithiana* with *P. helodoxa* ; *P. mallophylla* with *P. japonica* ; *P. brachystoma* and *P. microloma*, both dwarfs with the dwarf *P. prenantha* ; *P. melanodonta* and *P. Morsheadiana* with *P. serratifolia* ; *P. khasiana* with *P. prolifera*.

P. anisodora, Balf. f. et Forrest.
P. aurantiaca, W. W. Sm. et Forrest.
P. Beesiana, G. Forrest.
    Subspecies.
        P. leucantha, Balf. f. et Forrest.
P. brachystoma, W. W. Sm.
P. Bulleyana, G. Forrest.
P. burmanica, Balf. f. et Ward.
P. chungensis, Balf. f. et Ward.
P. Cockburniana, Hemsl.
    P. operculata, R. Knuth.
P. Cooperi, Balf. f.
P. helodoxa, Balf. f.
    Subspecies.
        P. chrysochlora, Balf. f. et Ward.
P. ianthina, Balf. f. et Cave.
P. imperialis, Jungh.
P. japonica, A. Gray.
P. khasiana, Balf. f. et W. W. Sm.
P. mallophylla, Balf. f.
P. melanodonta, W. W. Sm.
P. microloma, Hand.-Mzt.
P. Miyabeana, Ito et Kawakami.
P. Morsheadiana, Ward.
P. Poissonii, Franch.
    Subspecies.
        P. angustidens, (Franch.) Pax.
        P. Wilsoni, Dunn.
            P. glycyosma, Petitm.
            P. oblanceolata, Balf. f.
P. prenantha, Balf. f. et W. W. Sm.
P. prolifera, Wall.

P. pulverulenta, Duthie.
P. serratifolia, Franch.
P. biserrata, Forrest.
P. Smithiana, Craib.

CAPITATAE, Pax.

The section is here restricted to *P. capitata* and its subspecies. It lies between the sections Denticulata and Muscarioides. In Denticulata the flowers are more or less erect; in the other two sections they are pendent. The inflorescence in Muscarioides is more in the nature of a spike; in Capitatae a round head. The three sections tend to run one into the other, but it is worth while emphasizing the three divisions. In nature as well as in cultivation Denticulata flowers much earlier than Capitatae. This is particularly well marked in the Himalaya where they often occupy the same areas. The section extends into Tibet and S.W. China. *P. capitata* is now well known in cultivation and specially valued as a late flowerer.

All the described plants of this section can be grouped round *P. capitata* as a centre. They differ somewhat in habit, in degree of mealiness, in the dentation of the leaves and in size of truss and of flower. These distinctions are observable in the cultivated plants but transitions are numerous.

P. capitata, Hook.
Subspecies.
P. Craibeana, Balf. f. et W. W. Sm.
P. crispata, Balf. f. et W. W. Sm.
P. lacteocapitata, Balf. f. et W. W. Sm.
P. Mooreana, Balf. f. et W. W. Sm.
P. sphaerocephala, Balf. f. et W. W. Sm.
P. pseudocapitata, Ward.

CAROLINELLA, Pax.

Three Chinese Primulas belong to this peculiar section. None are in cultivation. It is an isolated group. The foliage suggests that of certain members of the Davidii subsection of Petiolaris, but calyx, corolla, and fruit are very different. The leaves are not lobulate but the species seem nearer to the Primulas with lobed leaves than to any of the other sections.

P. Henryi, (Hemsl.) Pax.
P. obovata, (Hemsl.) Pax.
P. Partschiana, Pax.

CORTUSOIDES, Balf. f.

This section represents a large part of what was included by Pax in his section Sinenses. It combines the three sections instituted by Balfour—Cortusoides, Mollis and Geranioides. It has not been found possible to draw a definite line between Mollis and Cortusoides ; Geranioides has been retained as a subsection ; the species therein are in the majority of cases readily separable from Eu-cortusoides but some are of intermediate character. It seems better therefore to keep them under the wing of Cortusoides.

The section like its allies lacks farina, has articulated hairs and a tendency to marked lobing of the leaves. Its calyx characters separate it readily from Sinenses, Obconica and Malvacea. The Geranioides subsection is marked by the somewhat orbicular leaves, more often broader than long and by the palmate venation as opposed to the more oblong leaves of Eu-cortusoides with pinnate venation.

The distribution of the section is chiefly N.E. Asia, including Japan and the northern and western provinces of China, extending into adjoining parts of Tibet and the Eastern Himalaya.

Horticulturally it is one of the less difficult sections, and several of the species are well established in cultivation.

Subsection Eu-cortusoides.

P. cinerascens, Franch.
Subspecies.
P. sinomollis, Balf. f.
P. sylvicola, Hutch.
P. violodora, Dunn.
P. cortusoides, Linn.
P. Kaufmanniana, Regel.
P. lactiflora, S. Turk.
P. mollis, Nutt.
Subspecies.
P. seclusa, Balf. f. et Forrest.
P. polyneura, Franch.
P. lichiangensis var. *hapala*, Balf. f. et Forrest.
Subspecies.
P. hymenophylla, Balf. f. et Forrest.
P. lichiangensis, G. Forrest.
P. sataniensis, Balf. f. et Farrer.
P. sikuensis, Balf. f. et Farrer.
P. Veitchii, Duthie.
*P. saxatilis, Komarov.
P. Sieboldii, E. Morren.

* The prior name is *P. patens*, Turcz.

Subsection Geranioides.

P. alsophila, Balf. f. et Farrer.
P. coreana, Nakai.
P. eucyclia, W. W. Sm. et Forrest.
P. geraniifolia, Hook. f.
P. heucherifolia, Franch.
P. lanata, Pax et Hoffm.
P. oculata, Duthie.
Subspecies.
P. humicola, Balf. f. et Forrest.
P. jesoana, Miq.
P. kisoana, Miq.
P. latisecta, W. W. Sm.
P. Maclareni, Balf. f.
P. palmata, Hand.-Mzt.
P. Pauliana, W. W. Sm. et Forrest.
P. Paxiana, Gilg.
P. septemloba, Franch.
P. vaginata, Watt.

CUNEIFOLIA, Balf. f.

This small but very distinct section of Primula finds its centre in Japan and extends into N.E. Asia and the Rocky Mountains. It is a part of what was included by Pax in his section Macrocarpae. The residue including *P. macrocarpa* itself is referable to Farinosae or to its adjunct the section Souliei.

The section is easily distinguished by the characteristic leaves, of firm texture, often markedly cuneate in shape, with few but regular teeth, recalling in outline the leaves of some of the Geum saxifrages. The species have been described as efarinose and that is true of the leaves; there is, however, usually on the pedicels and at the apex of the scape a thin covering of minute farinipotent hairs. The section is, therefore, not so completely efarinose as the section Amethystina, with which the consistency and shape of the leaves invite comparison. The two sections differ widely in their floral character.

Cuneifolia is somewhat isolated and its nearest kindred are probably to be found in Farinosae. The only species of which much is known in cultivation is *P. suffrutescens* from the Rocky Mountains, which with its remarkable woody rhizome is fairly amenable to greenhouse cultivation.

P. cuneifolia, Ledeb.
Subspecies.
P. hakusanensis, Franch.
P. heterodonta, Franch.
P. saxifragifolia, Lehm.

P. nipponica, Yatabe.
P. suffrutescens, A. Gray.

DENTICULATA, Balf. f.

The position of this section is between Farinosae and Capitatae. It is connected with the former through *P. glabra* and its allies and no very definite line can be drawn between the two sections. The inflorescence is usually a dense many-flowered head, the flowers being sessile or shortly pedicelled and tending to be erect. This latter character distinguishes the section from Capitatae and its ally Muscarioides, where the flowers are pendent. Among the Farinosae those species with subsessile flowers have usually saccate bracts, and these are not a feature of Denticulata.

The species listed in the section all centre round *P. denticulata* itself, many deviating from it in comparatively minor points. How far some of them are only geographical forms of the Himalayan species it is difficult to say without further knowledge of their behaviour in cultivation. As a garden plant *P. denticulata* is well known and it is usually grown without difficulty. Its allies should also prove quite amenable, but few of them are likely to prove serious rivals in the estimation of the horticulturist.

The distribution of the section is chiefly Himalayan extending into Tibet and the alpine areas of Szechwan and Yunnan, as well as of Northern Burma.

P. aequalis, Craib.
P. alta, Balf. f. et Forrest.
Subspecies.
P. limnoica, Craib.
P. atrodentata, W. W. Sm.
Subspecies.
P. orestora, Craib et Cooper.
P. crispa, Balf. f. et W. W. Sm.
P. denticulata, Sm.
Subspecies.
P. cachemiriana, Munro (? Garden origin).
P. cyanocephala, Balf. f.
P. erythrocarpa, Craib.
P. Harsukhii, Craib.
P. Hoffmeisteri, Klotzsch.
P. paucifolia, Craib.
P. sinodenticulata, Balf. f.
P. stolonifera, Balf. f.
P. erosa, Wall.
P. glomerata, Pax.

P. platycrana, Craib.
P. pseudodenticulata, Pax.
Subspecies.
P. polyphylla, (Franch.) Petitm.
P. Schlagintweitiana, Pax.

DRYADIFOLIA, Balf. f.

This section is a somewhat isolated one. Its habit recalls the Bullatae section but its foliage and flowers are very different. Some of its smaller members such as *P. triloba* invite comparison with section Bella and have been associated with that section. The corolla-tube and throat are sometimes hairy but the characteristic pompon of Bella is absent. We regard it rather as a suffruticose parallel to Minutissimae and Bella and cannot favour the view of Franchet, adopted by Pax, of relegating it to section Soldanelloideae. The head of flowers and the bracts of its larger members are certainly suggestive of Soldanelloideae but the leaves and the flower-structure are quite alien to that section. The massive rhizomes covered with the remains of many leaves mark the section easily from all the sections except Bullatae.

P. dryadifolia is rare in cultivation. It is one of the most beautiful of the Primulas but does not take kindly to garden conditions. It seems to do best on a wall as in the case of the Bullatae Primulas. In nature *P. chrysophylla* and *P. dryadifolia* grow on limestone, *P. congestiflora* and *P. cycliophylla* on gneiss and granite.

P. dryadifolia, Franch.
Subspecies.
P. chrysophylla, Balf. f. et Forrest.
P. congestifolia, G. Forrest.
P. oreina, Balf. f. et Cooper.
P. philoresia, Balf. f. et Ward.
P. cycliophylla, Balf. f. et Farrer.
P. Jonarduni, W. W. Sm.
P. mystrophylla, Balf. f. et Forrest.
P. triloba, Balf. f. et Forrest.

The last three are very dwarf but are undoubtedly within the section. It is they which indicate a link with section Minutissimae.

FARINOSAE, Pax.

This section has the widest geographical distribution in the genus. It is found throughout the greater part of Europe and Northern Asia, in Japan, in the Himalaya and the western provinces of China, in the Rocky Mountains, in the Arctic and also in the Antarctic. As defined

by Pax in his Monograph, it is a very natural assemblage, and the species quoted in his section all come very adequately within the section. For various reasons we have been compelled to add considerably to the list and somewhat to the scope of the section. One of the outstanding characters of the section is the form of the bracts which are either saccately produced at their insertion or markedly gibbous or enlarged at the base. While this is true of the typical members of the section, this bract character gradually becomes less prominent and passes insensibly into forms where the basal thickening is practically absent or very obscure. Consequently there are several instances of contrasted species, indubitably allies, which differ in the gibbosity or non-gibbosity of the bracts. This is illustrated by the addition of *P. yunnanensis* and its allies to the section, for that assemblage has marked affinity with *P. modesta* and thus leads straight to Farinosae. *P. glabra* and its associates are also more satisfactorily placed here. *P. gemmifera* shows less kinship but the alternative is a small allied section for it and its variants. The other additions are chiefly species described since the publication of the Monograph.

The section is a dominant one and shows marked linkage with certain other sections. It is connected with the large section of Nivales through the species assembled under Obtusifolia. *P. glabra* and its allies lead to section Denticulata. It may in the wide sense be held to include the section Souliei—characterised by the more membranous and usually much indented leaves. Through *P. yunnanensis* it touches on the small section Bella. Some members of the section Minutissimae may well be dwarf representatives of allies in Farinosae.

On the whole the section is not easy for the cultivator, and few of its members are retained long in gardens. The most amenable are probably *P. involucrata* and *P. rosea*.

P. algida, Adam.
    Subspecies.
        P. caucasica, C. Koch.
P. annulata, Balf. f. et Ward.
P. auriculata, Lamk.
        var. calva, Hausskn. et Bornm.
            P. Olgae, Regel.
P. baldschuanica, Fedtsch.
P. blandula, W. W. Sm.
P. borealis, Duby.
P. caldaria, W. W. Sm. et Forrest.
P. capitellata, Boiss.
P. concinna, Watt.
P. darialica, Rupr.
    Subspecies.
        P. farinifolia, Rupr.

P. efarinosa, Pax.
P. egalliccensis, Wormskiold.
P. elliptica, Royle.
P. farinosa, Linn.
Subspecies.
P. davurica, Spreng.
P. exigua, Velen.
P. fistulosa, S. Turk.
P. groenlandica, Warming.
P. Hornemanniana, Lehm.
P. incana, M. E. Jones.
P. americana, Rydb.
P. longiscapa, Ledeb.
P. magellanica, Lehm.
P. mistassinica, Michx.
P. scotica, Hook.
P. specuicola, Rydb.
P. fasciculata, Balf. f. et Ward.
P. flava, Maxim.
Subspecies.
P. citrina, Balf. f. et Purdom.
P. flexuosa, S. Turk.
P. Fortunei, Vatke (Origin?).
P. frondosa, Janka.
P. gemmifera, Batal.
P. Hemsleyi, Petitm.
Subspecies.
P. chrysopa, Balf. f. et Forrest.
P. conspersa, Balf. f. et Purdom.
P. monantha, W. W. Sm. et Forrest.
P. rupestris, Pax et K. Hoffm.
P. zambalensis, Petitm.
P. carnosula, Balf. f. et Forrest.
P. Genestieriana, Hand.-Mzt.
P. doshongensis, W. W. Sm.
P. glabra, Klatt.
P. involucrata, Wall.
Subspecies.
P. yargongensis, Petitm.
P. Wardii, Balf. f.
P. kialensis, Franch.
P. scopulorum, Balf. f. et Farrer.
P. Knuthiana, Pax.
P. kongboensis, W. W. Sm.
P. longiflora, All.
P. luteola, Rupr.

P. macrocarpa, Maxim.
P. membranifolia, Franch.
P. modesta, Bisset et Moore.
Subspecies.
P. Fauriei, Franch.
P. yuparensis, Takeda.
P. ossetica, Kusnetzow.
P. oxygraphidifolia, W. W. Sm. et Ward.
P. pseudoglabra, Hand.-Mzt.
P. pumilio, Maxim.
P. pygmaeorum, Balf. f. et W. W. Sm.
P. Reginella, Balf. f.
P. rosea, Royle.
Subspecies.
P. elegans, Duby.
P. Harrissii, Watt.
P. radicata, Balf. f. et W. W. Sm.
P. rhodantha, Balf. f. et W. W. Sm.
P. rosiflora, Balf. f. et W. W. Sm.
P. Warshenevskiana, B. Fedt.
P. sertulum, Franch.
P. sibirica, Jacq.
P. stenocalyx, Maxim.
P. Biondiana, Petitm.
P. cognata, Duthie.
P. kanseana, Pax et K. Hoffm.
P. leptopoda, Bur. et Franch.
P. Loczii, Kanitz.
P. stricta, Hornem.
P. tanupoda, Balf. f. et W. W. Sm.
P. tibetica, Watt.
P. Umbrella, G. Forrest.
P. maikhaensis, Balf. f. et Forrest.
P. Walshii, Craib.
P. yunnanensis, Franch.
P. calcicola, Balf. f. et Forrest.
P. kichanensis, Petitm.
Subspecies.
P. fragilis, Balf. f. et Ward.

GRANDIS, Balf. f.

This section contains only one Primula, *P. grandis*, a Caucasus species having a remarkable corolla with a cylindric tube and linear lobes. It is an interesting but not a showy plant. It was introduced

into Europe in 1877 and is not difficult to cultivate. It is an isolated type among Primulas and its affinity to other sections is doubtful.

P. grandis, Trautv.

MALACOIDES, Balf. f.

The chief species in this section is *P. malacoides* itself. Of garden interest are also *P. Forbesii* and *P. effusa*. The majority of the others are referable to *P. Forbesii* as subspecies. The members of the section are chiefly habitants of rice-fields and other cultivated areas and show much variation in size in accordance with different conditions of environment. They are short-lived plants, usually seeding freely. The section has affinity with Obconica, but differs in the presence of farina and in the character of the calyx. *P. pellucida* and *P. Cavaleriei* have no farina, however, and their position is somewhat doubtful. They are scarcely of Malacoides aspect and yet they do not appear referable to Obconica.

P. Cavaleriei, Petitm.
P. effusa, W. W. Sm. et Forrest.
P. Forbesii, Franch.
Subspecies.
P. androsacea, Pax.
P. Barbeyana, Petitm.
P. delicata, Petitm.
P. Duclouxii, Petitm.
P. refracta, Hand.-Mzt.
P. hypoleuca, Hand.-Mzt.
P. meiantha, Balf. f. et W. W. Sm.
P. multicaulis, Petitm.
P. Willmottiae, Petitm.
P. Licentii, W. W. Sm. et Forrest.
P. malacoides, Franch.
Subspecies.
P. pseudomalacoides, Stewart.
P. pellucida, Franch.
P. debilis, Bonati.
P. speluncicola, Petitm.

MALVACEA, Balf. f.

This is a very distinct section of Primula, allied in its lobed leaves and lack of farina to the section Sinenses. The leaves are usually orbicular; the elongated scape bears numerous flowers arranged in irregular whorls or strung out in a racemose fashion in some species;

the calyx enlarges in fruit into a green leafy expansion with very patent lobes exposing the globose capsule. The flowers are rose to rose-purple, sometimes yellow. The larger species are very beautiful and showy, but have not taken kindly to cultivation. *P. malvacea*, *P. blattariformis* and *P. bathangensis* have been flowered in culture but are now lost.

P. aromatica, W. W. Sm. et Forrest.
P. barybotrys, Hand.-Mzt.
P. atrotubata, W. W. Sm. et Forrest.
P. bathangensis, Petitm.
P. pintchouanensis, Petitm.
P. racemosa, Bonati.
P. stephanocalyx, Hand.-Mzt.
P. blattariformis, Franch.
Subspecies.
P. Tenana, Bonati.
P. blattariformis, Franch, var. *Duclouxii*, Bonati.
P. celsiaeformis, Balf. f.
P. racemosa, Lévl.
P. malvacea, Franch.
var. alba, Forrest.
Subspecies.
P. Rosthornii, Diels.
P. malvacea, Franch. var. *intermedia*, W. W. Sm. et Forrest.
P. microstachys, Balf. f. et Forrest.
P. neurocalyx, Franch.
Subspecies.
P. riparia, Balf. f. et Farrer.

MEGASEAEFOLIA, Balf. f.

This is represented by only one species, *P. megaseaefolia* from Asia Minor. Like *P. grandis* it is an isolated species without near kinship. It does not accord well with the section Carolinella in which it has been placed. Rather does it tend towards *P. Juliae*, especially in its flower characters, and thus towards the section Verna'es. It is cultivated often as a greenhouse plant, but can be grown outside, if not always satisfactorily.

P. megaseaefolia, Boiss.

MINUTISSIMAE, Pax.

This small section of dwarf high-alpine Primulas is found in the Himalaya and Tibet, with one outlier in Western China. The

inflorescence is very reduced, in many cases only a single flower with the shortest of scapes. The species of the section tend to be stoloniferous, forming dense low-growing little mats. The majority are farinose, but the meal is very feebly developed in some. The section can fairly be regarded as a dwarf development from the Farinosae aggregate. The bracts, however, are never of the auriculate type. Their line of contact with the Farinosae runs through *P. yunnanensis* and its allies. The relationship with the little section Bella is also very close. Through *P. tenella* they touch on the Himalayan section of Obtusifolia but much less closely. *P. flagellaris* has the most pronounced stolons of any known Primula.

None have been satisfactorily established in cultivation. They are much too small to be of garden interest.

P. flagellaris, W. W. Sm.
P. glandulifera, Balf. f. et W. W. Sm.
P. Heydei, Watt.
P. minutissima, Jacquem.
P. muscoides, Hook. f.
P. petrocharis, Pax et K. Hoffm.
P. reptans, Hook. f.
P. rhodochroa, W. W. Sm.
P. spathulifolia, Craib.
Subspecies.
P. melichlora, Balf. f. et W. W. Sm.
P. Stirtoniana, Watt.
P. tenuiloba, (Hook. f.) Pax.
P. Waddellii, Balf. f. et W. W. Sm.

MUSCARIOIDES, Balf. f.

The section Muscarioides comes very near to Capitatae and there is probably no clear line of division between the two sections. *P. capitata* and its allies form a massive round head of flowers while the inflorescence in Muscarioides is more of a spike—sometimes as in the giant form of *P. Littoniana* it may be over one foot in length, apart from the scape. The corolla is very similar in the two sections as regards shape and proportion of tube to limb. From Soldanelloideae the section is discriminated by the corolla shape. In Soldanelloideae the corolla forms a bell, with an amplified limb ; the lobes are not bent at an angle with the tube while the insertion of the stamens is always low down in the true tube which is usually much abbreviated.

The section is distributed over the Eastern Himalaya, Tibet and the provinces of Western China. There has been and still is uncertainty as to the limits of the described species. The study of these in cultivation has served to clear up some points. The species are not

so easy of culture as *P. capitata* but cannot be termed difficult. The best is *P. Littoniana* which may be a large form of *P. Viali*. Of merit are also *P. muscarioides, P. pinnatifida, P. Menziesiana, P. lepta, P. cernua,* which are all in cultivation. *P. apoclita, P. bellidifolia, P. cyanantha, P. deflexa, P. gracilenta, P. Watsoni* have also been flowered in this country.

P. aerinantha, Balf. f. et Purdom.
P. bellidifolia, King.
Subspecies.
P. adenantha, Balf. f. et Cooper.
P. atricapilla, Balf. f. et Cooper.
P. cernua, Franch.
P. deflexa, Duthie.
P. euchaites, W. W. Sm.
P. Giraldiana, Pax.
P. gracilenta, Dunn.
P. lepta, Balf. f. et Forrest.
P. Littoniana, G. Forrest.
P. Menziesiana, Balf. f. et W. W. Sm.
P. micropetala, Balf. f. et Cooper.
P. muscarioides, Hemsl.
P. tsarongensis, Balf. f. et Forrest.
Subspecies.
P. conica, Balf. f. et Forrest.
P. pinnatifida, Franch.
Subspecies.
P. apoclita, Balf. f. et Forrest.
P. cephalantha, Balf. f.
P. Mairei, Lévl.
P. Viali, Franch.
P. violacea, W. W. Sm. et Ward.
P. Watsoni, Dunn.
Subspecies.
P. cyanantha, Balf. f. et Forrest.

NIVALES, Pax.

This is one of the largest sections of Primula and contains some of the finest in the genus. Its members are more amenable to cultivation than those of the Petiolares section but are much more difficult than those of either Candelabra or Sikkimensis. The stout fleshy resting bud takes badly to the fluctuating conditions of our winter with resultant rotting at the collar. Reasonable success has been attained with *P. chionantha, P. Ellisiae, P. Maximowiczii, P. Parryi,* and *P. Rusbyi.* There is a chance of establishing *P. Agleniana, P. Inayatii,*

P. leucops, P. melanops, P. nivalis, P. pulchella, P. obliqua, P. russeola, P. sinopurpurea, and *P. szechuanica.* Some have flowered in cultivation only to disappear—*P. brevicula, P. calliantha, P. limbata, P. minor, P. orbicularis, P. Prattii,* and *P. Purdomii.*

The section has no near kinship with Sikkimensis, Candelabra or Petiolares and is marked off quite clearly from these important sections. Along with the allied section Rotundifolia, its connection is rather with Farinosae, although the members of this latter section are usually of much less robust habit.

The central species is the Siberian *P. nivalis* and associated with it are *P. Bayernii, P. eximia* and *P. longipes.* In the Himalaya *P. nivalis* is replaced by *P. macrophylla* and its subspecies, all with purplish flowers. Associated with *P. macrophylla* and long confused with it are a series of yellow-flowered species :—*P. Duthieana, P. elongata, P. obliqua, P. strumosa,* and *P. Stuartii.* In the three western provinces of China appears another large series of purple, rarely white, robust species :—*P. chionantha, P. Farreriana, P. ingens, P. leucochnoa, P. limbata, P. optata, P. Purdomii, P. russeola, P. sinopurpurea,* etc. Another marked development of the section is seen in S.W. China with *P. calliantha* and its subspecies, these with *P. brevicula* and *P. helvenacea* lead on to *P. muliensis, P. falcifolia* and *P. Agleniana,* the latter one of the finest of all Primulas.

A striking subsection is also shown by *P. Maximowiczii* and its allies, *P. aemula, P. orbicularis, P. szechuanica* and *P. tangutica.* In these the corolla segments tend to be strongly reflexed. In S.W. China there is further a series of dwarf species belonging to the section. They grow chiefly in rocky high alpine situations, often on limestone. Included there would be *P. amabilis, P. glacialis, P. leucops, P. minor, P. pulchella, P. pulchelloides,* and *P. rigida* with purplish flowers, and *P. crocifolia* and *P. Prattii* with yellow flowers. These have all elongate capsules, some very markedly so. Himalayan dwarfs of Nivalid affinity have a short capsule and constitute section Obtusifolia.

The few American species, *P. angustifolia, P. Cusickiana, P. Ellisiae, P. Parryi* and *P. Rusbyi* have kinship with *P. nivalis,* but the three robuster species have a facies of their own and the merit of being moderately amenable to cultivation.

P. aemula, Balf. f. et Forrest.
P. Agleniana, Balf. f. et Forrest.
P. amabilis, Balf. f. et Forrest.
P. angustifolia, Torr.
P. Helenae, Auct.
P. Bayernii, Rupr.
*P. brevicula, Balf. f. et Forrest.

* *P. brevicula* is almost certainly the same as *P. glacialis,* Franch.

P. calliantha, Franch.
P. junior, Balf. f. et Forrest.
P. proba, Balf. f. et Forrest.
var. albiflos (Balf. f. et Ward).
P. albiflos, Balf. f. et Ward.
var. nuda, Farrer.
Subspecies.
P. boreiocalliantha, Balf. f. et Forrest.
P. propinqua, Balf. f. et Forrest.
P. bryophila, Balf. f. et Farrer.
P. shwelicalliantha, Balf. f. et Forrest.
P. tribola, Balf. f. et Forrest.
P. kiuchiangensis, Balf. f. et Forrest.
P. chionantha, Balf. f. et Forrest.
P. crocifolia, Pax et K. Hoffm.
P. Cusickiana, A. Gray.
P. diantha, Bur. et Franch.
P. Duthieana, Balf. f. et W. W. Sm.
P. Ellisiae, Pollard et Cockerell.
P. elongata, Watt.
P. eximia, Greene.
P. Macounii, Greene.
P. falcifolia, Ward.
P. Farreriana, Balf. f.
P. Fedtschenkoi, Regel.
P. glacialis, Franch.
P. Handeliana, W. W. Sm. et Forrest.
P. helvenacea, Balf. f. et Ward.
P. Inayatii, Duthie.
P. ingens, W. W. Sm. et Forrest.
P. leucochnoa, Hand.-Mzt.
P. leucops, W. W. Sm. et Forrest.
P. limbata, Balf. f. et Forrest.
P. longipes, Freyn et Sintenis.
P. longipetiolata, Pax et K. Hoffm.
P. macrophylla, Don.
P. purpurea, Royle.
var. lineariloba, (Watt).
var. macrocarpa, (Watt).
Subspecies.
P. Aitchisonii, Pax.
P. plantaginea, Watt mss.
P. Moorcroftiana, Wall.
P. Meeboldii, Pax.
P. Maximowiczii, Regel.
P. melanops, W. W. Sm. et Ward.

P. minor, Balf. f. et Ward.
P. atuntzuensis, Balf. f. et Forrest.
P. petraea, Balf. f. et Forrest.
P. muliensis, Hand.-Mzt.
P. Coryana, Balf. f. et Forrest.
P. ninguida, W. W. Sm.
P. nivalis, Pallas.
var. farinosa, Schrenk.
P. turkestanica, Regel.
P. obliqua, W. W. Sm.
P. optata, Farrer.
P. orbicularis, Hemsl.
P. ochracea, Pax et K. Hoffm.
P. reflexa, Petitm.
P. Parryi, A. Gray.
P. Prattii, Hemsl.
P. sulphurea, Pax.
P. pulchella, Franch.
Subspecies.
P. compsantha, Balf. f. et Forrest.
P. pulchelloides, Ward.
P. sulphurea, Pax et K. Hoffm. var. *rosea*.
P. pumila, Pax.
P. arctica, Koidzumi.
P. Purdomii, Craib.
P. rigida, Balf. f. et Forrest.
P. Rusbyi, Greene.
P. russeola, Balf. f. et Forrest.
P. ionantha, Pax et K. Hoffm.
P. nivalis, Pallas var. *melanantha*, Franch.
Subspecies.
P. lancifolia, Pax et K. Hoffm.
P. sinonivalis, Balf. f. et Forrest.
P. sinoplantaginea, Balf. f.
Subspecies.
P. graminifolia, Pax et K. Hoffm.
P. sinopurpurea, Balf. f.
P. strumosa, Balf. f. et Cooper.
P. Stuartii, Wall.
P. szechuanica, Pax.
P. declinis, Balf. f. et Forrest.
P. decurva, Balf. f. et Forrest.
P. Gagnepainiana, Hand.-Mzt.
P. tangutica, Duthie.
P. silenantha, Pax et K. Hoffm.
P. Woodwardii, Balf. f.

OBCONICA, Balf. f.

The many described species of this section all centre round *P. obconica* and for the most part can be regarded as subspecies of that very variable plant. The section is very fully discussed by Professor Balfour in Trans. Bot. Soc. Edin. xxvi. (1914) p. 301, with numerous illustrations. We have placed under *P. obconica* those which appear to deviate least from the typical plant. Those which present somewhat marked differences from *P. obconica* have been retained meanwhile in the rank of species. Observations on their behaviour in cultivation are much needed, but it is doubtful if living plants of any apart from *P. obconica, P. sinolisteri* and *P. werringtonensis* are available in gardens.

The section is usually included in that division of Primula which has lobed leaves and no farina. The lobing in some is obscure, but the affinity of the section is undoubtedly with the lobed Primulas.

P. ambita, Balf. f.
P. dumicola, W. W. Sm.
P. filipes, Watt.
P. flavicans, Hand.-Mzt.
P. kweichouensis, W. W. Sm.
P. Listeri, King.
    Subspecies.
        P. austrolisteri, Balf. f.
P. obconica, Hance.
    P. Bonatii, Knuth.
    P. poculiformis, Hook, f.
    Subspecies.
        P. barbicalyx, Wright.
        P. begoniiformis, Petitm.
        P. densa, Balf. f.
        P. parva, Balf. f.
        P. Petitmengini, Bonati.
        P. sinolisteri, Balf. f.
        P. Vilmoriniana, Petitm.
        P. werringtonensis, Forrest.
P. oreodoxa, Franch.
P. subtropica, Hand.-Mzt.

OBTUSIFOLIA, Balf. f.

This is a small section of Himalayan and Tibetan Primulas which has close association with the Farinosae on the one hand and Nivales on the other. In one way they form a link between the smaller Nivalids and the section Rotundifolia. They are all high alpines, in most cases covered with snow for six months. The leaves have an

elongated weak petiole while the lamina is spathulate in shape and thin in texture. The crown is usually well encased in a covering of dead leaves from the previous season. The bracts are non-auriculate and the capsules short and broad, more or less equalling the calyx.

The section Rotundifolia is separated by its leaf-shape; Nivales by the characters of the leaf and the usually elongated capsule; the dwarf Nivalids of Western China are akin but yet separable. On the Farinosae side the section shows an approach to such non-auriculate species as *P. gemmifera* and *P. yunnanensis*, but the difference in habit and leaf-character is evident enough.

None of the species are in cultivation. They are almost certainly difficult of culture.

P. Caveana, W. W. Sm.
P. cana, Balf. f. et Cave.
P. hazarica, Duthie.
P. Jaffreyana, King.
Subspecies.
P. lhasaensis, Balf. f. et W. W. Sm.
P. obtusifolia, Royle.
P. tenella, King.
P. Traillii, Watt.
P. Younghusbandiana, Balf. f.

PETIOLARES, Pax.

This is a very large assemblage of species confined in their distribution to the Himalaya and the alpine regions of Western China and Tibet. It is a section which presents great difficulties to the cultivator. Only one species—*P. Winteri*—is at all well known in culture and it is not an easy subject. *P. sonchifolia* lived to flower feebly but is no longer in Europe. It seems necessary that the seed should germinate in a green state as it is resentful of drying. The section contains many fine Primulas, but it will be long ere these become denizens of our gardens. But if *P. Winteri* can be grown, there is no reason to despair of the establishment of some of its relations.

The section Petiolares is comparable in importance to Candelabra, Nivales and Sikkimensis, but is quite distinct from each of these three sections. These sections constitute four distinct developments without transitions or intermingling. The species of Petiolares enumerated below have been arranged in five subsections.

As pointed out by Sir Isaac Bayley Balfour the members of the series have in common the "characteristic enlargement of the scape and pedicels in fruit-ripening and for the fruit itself a discoid operculate capsule occupied by a broad convex placenta upon which the seeds lie."

The largest subsection is Petiolaris-Sonchifolia, very fully discussed by Professor Craib in Notes Roy. Bot. Gard. Edin. vi. (1917) 257. Among the species of this subsection Professor Craib indicates seven natural groups. For these groups names (given by Balfour in Herb.) have been suggested. The very distinct subsection Davidii is dealt with by Craib in Notes Roy. Bot. Gard. Edin. xi. (1919) 179. We have included *P. chartacea* and its allies as a subsection touching very closely on Davidii but with a very well defined petiole and more or less orbicular leaf. The peculiar *P. tongolensis* is also of Petiolares type and appears in a special subsection. With it we have associated with some doubt two aberrant species, *P. Clarkei* and *P. pulchra*, which seem to me to favour a Petiolarid connection. Roylei comes also within Petiolares as a subsection.

Many of the species flower in nature long before Primulas of other sections—Petiolarids have often shed their seed before the other Primulas even come into flower. Much more material, including that of the early stages is needed before a satisfactory analysis can be made of this complex section. Evidence is given in a recent issue of the Botanical Magazine (tab. 9064) that *P. Winteri* and *P. Edgeworthii* are the same, the plant exhibiting an "exquisite seasonal dimorphism—the spring stage being *P. Winteri* and the summer stage *P. Edgeworthii*."

Subsection Petiolaris-Sonchifolia :

Group Hookeri :
P. Hookeri, Watt.
P. vernicosa, Ward.

Group Taliensis :
P. praticola, Craib.
P. taliensis, G. Forrest.

Group Sonchifolia :
P. calthifolia, W. W. Sm.
P. chamaethauma, W. W. Sm.
P. chionota, W. W. Sm.
P. drymophila, Craib.
P. sonchifolia, Franch.
P. taraxacoides, Balf. f.
P. Whitei, W. W. Sm.

Group Edgeworthii :
P. Edgeworthii, Pax.
P. nana, Wall.
P. saxicola, Craib.
P. Winteri, W. Wats.

Group Vera:
P. Cunninghamii, Craib.
P. deuteronana, Craib.
P. Drummondiana, Craib.
P. gracilipes, Craib.
P. Hoffmanniana, W. W. Sm.
P. petiolaris, Wall.
? P. pseudopetiolaris, Pax et K. Hoffm.
P. Scullyi, Craib.
P. sessilis, Royle.
P. sulphurea, Craib.

Group Scapigera:
P. Boothii, Craib.
P. bracteosa, Craib.
P. irregularis, Craib.
P. moupinensis, Franch.
P. scapigera, Craib.

Group Odontocalyx:
P. candidissima, W. W. Sm.
P. euosma, Craib.
P. hupehensis, Craib.
P. odontocalyx, Franch.
P. plebeia, Balf. f.
P. sinuata, Franch.
P. nemoralis, Balf. f.
P. Ragotiana, Lévl.

Subsection Roylei:
P. Griffithii, Pax.
P. Roylei, Balf. f. et W. W. Sm.
Subspecies.
P. Calderiana, Balf. f. et Cooper.
P. Dianae, Balf. f. et Cooper.
P. Gammieana, (King mss.) Balf. f.
P. Tanneri, King.

Subsection Davidii:
P. aequipila, Craib.
P. breviscapa, Franch.
P. coerulea, Forrest.
P. crassa, Hand.-Mzt.
P. Davidii, Franch.
P. epilosa, Craib.
P. Esquirolii, Petitm.
P. fagosa, Balf. f. et Craib.
P. hylobia, W. W. Sm.
P. hylophila, Balf. f. et Farrer.

P. Klaveriana, G. Forrest.
P. leptophylla, Craib.
P. Limprichtii, Pax et K. Hoffm.
P. macropoda, Craib.
P. ovalifolia, Franch.
P. polia, Craib.

Subsection Chartacea:

P. chartacea, Franch.
P. lacerata, W. W. Sm.
P. pyrolaefolia, Lévl.
P. Veitchiana, Petitm.

Subsection Tongolensis:

P. Clarkei, Watt.
P. pulchra, Watt.
P. tongolensis, Franch.
P. Dielsii, Petitm.
P. gentianoides, W. W. Sm. et Ward.

PINNATAE, R. Knuth.

This is a very small section of peculiar Primulas, no one of which is in cultivation. They are allied to the sections Sinenses and Cortusoides and are distinguished readily by their pinnatifid to pinnate leaves with the lobes again pinnatifid or markedly serrate. As in the allied sections there is no farina ; the leaves may be pubescent or glabrous.

They appear to be small and rather delicate species of some two to six inches in height. They are found in Eastern China and have been collected in flower during February and March.

A similar cutting of the lamina of the leaf occurs also in the section Souliei where *P. pectinata* shows it quite to the same degree but only occasionally. But there is no kinship indicated with Pinnatae.

P. cicutariifolia, Pax.
P. erodioides, Schltr.
P. Filchnerae, R. Knuth.
P. Merrilliana, Schltr.

PYCNOLOBA, Balf. f.

P. pycnoloba is a curiosity among Primulas by reason of its remarkable calyx. In its leaf characters and lack of farina it is akin to Sinenses and the allied sections. It has been in cultivation since 1906 but is still uncommon.

P. pycnoloba, Bur. et Franch.

REINII, Balf. f.

This small section contains two species, natives of Japan. In their orbicular lobulate leaves and lack of farina they are akin to Sinenses and the sections associated with it. *P. Reinii* has been in cultivation and may be so still. It and its ally have very large cylindric capsules, much exceeding the calyx.

P. Reinii, Franch. et Sav.
P. tosaensis, Yatabe.

ROTUNDIFOLIA, Balf. f.

The distribution of this small section is confined to the Himalaya and Tibet. Its members are easily recognised by the long petioles and the more or less orbicular leaves with cordate base. The capsules are of Nivalid type but are usually shorter and broader. The species are all high alpines. A very dense white farina appears on most of them. The nearest affinity is with the section Obtusifolia with which they have everything in common except the shape of the leaf. These two small sections might well be combined but it favours recognition to keep them under the two heads. Rotundifolia is clearly akin to the Nivalids, allowance being made for the very characteristic leaves. It shows relationship also through *P. Baileyana* with the section Souliei.

P. Clarkei and *P. pulchra*, sometimes placed in this section by reason of their leaves will be found under one of the subsections of Petiolares. They may not be allowed to rest there but they do not belong to Rotundifolia.

P. Baileyana and *P. cardiophylla* are in cultivation. The section must be reckoned a somewhat difficult one. Its members in their native habitat have a covering of snow for some six months and resent changes during the winter months.

P. Baileyana, Ward.
P. cardiophylla, Balf. f. et W. W. Sm.
P. cordata, Balf. f.
P. cordifolia, Pax, non Rupr.
P. Gambeliana, Watt.
P. Littledalei, Balf. f. et Watt.
P. rotundifolia, Wall.
P. tzetsouensis, Petitm.

SIKKIMENSIS, Balf. f.

This is a section well known to the gardener. It is one of the easiest in cultivation and none of its members should deter even the tyro. The nearest affinities of the section appear to be the huge

aggregate of the Nivalids and the section Candelabra. But it is quite distinct from both of these sections. Among other points, the shape of the corolla and the fruit and seed characters serve to distinguish it. The species quoted below are all undoubtedly of the Sikkimensis alliance. *P. tzetsouensis*, sometimes included here, is of Nivalid affinity and best placed under Rotundifolia. As many of the species are in cultivation it may be useful to add a few notes which may serve as means of recognition. Plants with yellow or whitish-yellow flowers and cuneate base to lamina are *P. sikkimensis*, its subspecies from limestone areas in Yunnan *P. pseudosikkimensis*, a whitish Bhutan subspecies *P. Hopeana* (lost probably in cultivation) and a dwarf alpine condition *P. pudibunda*. Yellow with cordate base to leaf are the robust *P. Florindae* with very glossy leaves and *P. microdonta* with matt leaves and a much wider corolla-bell; also the slenderer species—*P. firmipes*—with its subspecies *P. flexilipes*, both with rounded leaves, and *P. reticulata* and *P. chumbiensis* with more elliptic leaf-lamina. Purple to wine-coloured flowers and cuneate base to lamina are found in *P. Waltoni* and its subspecies *P. prionotes*; also in *P. secundiflora* and in *P. vittata*. Purple flowers associated with a cordate base to the lamina are seen in *P. microdonta* var. *violacea*.

P. chumbiensis, W. W. Sm.
P. firmipes, Balf. f. et Forrest.
    Subspecies.
        P. flexilipes, Balf. f. et Forrest.
P. Florindae, Ward.
P. microdonta, Franch. ex Petitm.
    var. alpicola, W. W. Sm.
    var. violacea, W. W. Sm.
P. reticulata, Wall.
P. secundiflora, Franch.
P. sikkimensis, Hook.
    Subspecies.
        P. Hopeana, Balf. f. et Cooper.
        P. pseudosikkimensis, G. Forrest.
        P. pudibunda, W. W. Sm.
P. vittata, Bur. et. Franch.
P. Waltoni, Watt.
    Subspecies.
        P. prionotes, Balf. f. et Watt.

SINENSES, Pax.

This small section consists of the well known garden plant *P. sinensis* with two allies, one (*P. rupestris*) from Kansu and one (*P. calciphila*) from Hupeh. There is no representative outside the

confines of China. From the allied sections Malvacea and Obconica it is readily distinguished by the character of the calyx—inflated with a broad truncate base. The exact relationships of the two wild species with the cultivated plant are not fully determined, but the question is dealt with in Kew Bull. (1923) 97 and in Bot. Mag. 8986 where *P. calciphila* is figured.

P. calciphila, Hutch.
P. rupestris, Balf. f. et Farrer.
P. sinensis, Lindl.

SOLDANELLOIDEAE, Pax.

This section comes close to Muscarioides but differs markedly in the form of the corolla. The inflorescence is either capitate or shortly spicate. The corolla is bell-shaped without reflection of the lobes. The tube is usually short, but, above the tube proper, the limb is amplified in campanulate fashion. The bell-shaped corolla suggests association with the Amethystina section, but the leaves of this latter section are very different and the flowers pedicelled.

The distribution embraces the Himalaya, Tibet, S.W. China and Siam. Closely allied as they may be to Muscarioides, the members of the section are much less amenable to garden conditions. *P. nutans* has flowered and seeded outside but requires much care. *P. Reidii* is one of the most beautiful of Primulas in cultivation, but few gardeners hazard it outside. The following have flowered in this country but are probably lost meanwhile—*P. chasmophila, P. eburnea, P. Cawdoriana, P. sapphirina, P. soldanelloides, P. spicata, P. siamensis, P. uniflora* and *P. Wattii.* All are high alpines with a six months' winter. The section contains several species of great beauty and grace.

P. Buryana, Balf. f.
P. Cawdoriana, Ward.
P. chasmophila, Balf. f.
P. eburnea, Balf. f. et Cooper.
P. Harroviana, Balf. f. et Cooper.
P. Fargesii, Franch.
P. fea, Ward.
P. metria, Balf. f. et Cooper.
P. nutans, Franch.
Subspecies.
P. penduliflora, (Franch.) Petitm.
P. Reidii, Duthie.
P. sapphirina, Hook. f.
P. siamensis, Craib.
P. siphonantha, W. W. Sm.

P. soldanelloides, Watt.
P. spicata, Franch.
P. umbratilis, Balf. f. et Cooper.
P. uniflora, Klatt.
P. Wattii, King.
P. Wollastoni, Balf. f.

SOULIEI, Balf. f.

This is a small section of closely allied plants and finds its nearest affinity with certain members of the Farinosae. It shows kinship with *P. yunnanensis* and *P. gemmifera*. In a general way the section can be distinguished from the dominant Farinosae by the long and distinct petioles, by the thin texture of the membranous leaves which usually show a fine scabridity on the upper surface while the lamina is moreover either markedly serrate or even deeply and pinnatifidly cut ; the bracts of the pendent and usually secund flowers are non-saccate, as in *P. yunnanensis* and *P. gemmifera*. The section shows great variation in the degree of marginal indentation. Thus *P. Souliei* with little serration and *P. incisa* where the cutting is very marked are connected together by a regular series of intermediates, some of which have received specific names.

It is a series containing many beautiful plants and some have been in cultivation—*P. florida* and *P. rupicola*—but they are readily lost, owing to lack of the necessary conditions for seeding as they are usually late to flower—July to September—in their native habitat.

The distribution of the section is chiefly in the Western provinces of China, extending into the Eastern parts of Tibet and the Himalaya.

P. incisa, Franch.
P. laciniata, Pax et K. Hoffm.
Subspecies.
P. pectinata, Balf. f. et Forrest.
P. rupicola, Balf. f. et Forrest.
P. Souliei, Franch.
Subspecies.
P. florida, Balf. f. et Forrest.
P. humilis, Pax et K. Hoffm.
P. Legendrei, Bonati.
P. parvula, Pax et K. Hoffm.
P. oresbia, Balf. f.
P. Blinii, Lévl.
P. urticifolia, Maxim.
P. xanthopa, Balf. f. et Cooper.

VERNALES, Pax.

This is the section containing the common primrose and oxlip. It is chiefly European, extending also into Western and Northern Asia. The section is very fully and adequately dealt with by Pax in his Monograph. The list given below is based, with certain minor changes, on that work. We have not introduced here the many names given to the varieties, forms and hybrids of this section. These must be dealt with in an index to the genus Primula which is in preparation.

As its geographical distribution would indicate, the section Vernales is somewhat isolated and has no near kindred. In its preference for lax hairiness and corresponding lack of farina it resembles Sinenses and its allies, but differs widely from them in the shape and in the lack of lobing of the leaves.

P. amoena, Bieb.
Subspecies.
P. Meyeri, Rupr.
P. elatior, Schreber.
Subspecies.
P. carpathica, Fuss.
P. cordifolia, Rupr.
P. intricata, Godr. et Gren.
P. Pallasii, Lehm.
P. pseudoelatior, Kusnetzow.
P. Juliae, Kusnetzow.
P. leucophylla, Pax.
Subspecies.
P. Ruprechtii, Kusnetzow.
P. veris, L.
P. officinalis, Hill.
Subspecies.
P. canescens, Opiz.
P. Columnae, Ten.
P. macrocalyx, Bunge.
P. Velenovskyi, Domin.
P. vulgaris, Huds.
P. acaulis, Hill.
Subspecies.
P. balearica, Willkomm.
P. heterochroma, Stapf.
P. Sibthorpii, Hoffmsgg.

VERTICILLATA, Balf. f.

The species of this section and of Auricula are distinguished from all other species by the involute folding of the young leaf. From the

allied section Auricula, it is easily separated by the membranous leaves, superposed verticels of flowers and the leafy bracts. It is a small section of limited distribution—West Himalaya, Arabia, Sinai and Abyssinia. All have been or are in European culture as greenhouse plants with the exception of *P. Aucheri*. More familiar is possibly the hybrid *P. kewensis*, a cross between *P. verticillata* and *P. floribunda*.

Pax included in this section with some doubt *P. Lacei*, Hemsl. et Watt from Baluchistan. Balfour in Journ. R. H. S. xxxix (1913), 170 considered it should be placed in his section Suffruticosa (Bullatae). See also Balfour in Trans. Bot. Soc. Edin. xxvi, p. 202. The characters of *P. Lacei* as regards habit and structure of flower lead rather to the genus Dionysia. It comes from near the Persian border and thus would link up geographically. Pax in Jahr.-Ber. Schles. Gesell. lxxxvii (1909), Zool.-Bot., II Abt. p. 20, describes a new section of Primula under the name of Dionysiopsis. In this he includes *P. Bornmuelleri*, Pax (*Dionysia Bornmuelleri*, Strauss mss.), and *P. hissarica* (Lipsky), Bornm. This section he defines as being intermediate between Primula and Dionysia. *P. Lacei* undoubtedly belongs to this alliance. There seems to be almost a general agreement to uphold the genus Dionysia although there is little to mark it off from Primula. The flowers are remarkably like those of the section Verticillata; there are, however, marked differences in habit and in the vernation and texture of the leaves. These Dionysias are the Persian Primulas presenting a parallel development to Verticillata. But if Dionysia is to be retained as a genus, then the members of section Dionysiopsis along with *P. Lacei* are preferably kept under Dionysia. Pax is clearly right in seeing this connection of Primula through Verticillata with Dionysia and the question is simply where the line is to be drawn.

P. Aucheri, Jaub. et Spach.
P. floribunda, Wall.
P. verticillata, Forsk.
Subspecies.
P. Boveana, Dcne.
P. simensis, Hochst.

ADDENDUM I.

As the genus Omphalogramma has been included in Primula by various authors, it may be of service to give here as an addendum the species of that genus.

OMPHALOGRAMMA.

Omphalogramma is distinct from Primula. The earlier species were described under Primula, then assembled under the new generic name by Franchet and brought back again to Primula by Pax. More ample material is now available and there seems little doubt but that Franchet was right. The single-flowered ebracteate scape, the non-heteromorphic and somewhat irregular flowers, the six-partite corolla and the peculiar seeds serve to distinguish the genus readily from Primula. Of the species *O. vinciflorum* is the finest and the one which so far has succeeded best in cultivation. *O. Delavayi*, *O. Elwesianum*, *O. Farreri*, *O. Rockii* and *O. Souliei* have flowered in this country.

O. Coxii, Balf. f.
O. Delavayi, Franch.
O. elegans, Forrest.
O. Elwesianum, Franch.
O. Engleri, (Knuth) Balf. f.
O. Viola-grandis, Farr. et Purd.
O. Farreri, Balf. f.
O. Forrestii, Balf. f.
O. minus, Hand.-Mzt.
O. Rockii, W. W. Sm.
O. Souliei, Franch.
O. vinciflorum, Franch.

O. Delavayi and *O. Farreri* are closely allied ; *O. Forrestii* is probably a subspecies of *O. Souliei* ; *O. Rockii* comes near *O. vinciflorum*.

ADDENDUM II.

As two of the species of Primula quoted—one in section Malacoides and one in section Nivales—are undescribed, diagnoses are appended:—

Primula Handeliana, W. W. Sm. et Forrest. Sp. nov.

Species sectionis Nivalium, *P. aemulae*, Balf. f. et Forrest affinis, a qua foliorum forma et textura et serratione atque petiolis praelongis magnopere differt.

Planta robusta glabra. Folia ad 13 cm. longa, petiolo fere discreto anguste alato laminam plus minusve aequante; lamina 3–8 cm. longa, 1–2 cm. lata, forma irregularis, oblonga vel lanceolata vel elliptica vel nunc suborbicularis, apice acutata vel rotundata, basi cuneata vel subrotundata, margine crebre serrulata, in sicco chartacea, supra atroviridis, nervis conspicuis, infra glauca, quasi farina crustacea induta, costa prominula, nervis obscuris. Scapus ad 30 cm. altus, umbellas plerumque binas 5–13-floras gerens, glaber, efarinosus; bracteae a basi lato sublineares, acuminatae, circ. 1 cm. longae; pedicelli 1–3 cm. longi, ut videtur decurvi. Calyx tubulosus, 10–11 mm. longus, in lobos anguste lanceolatos acuminatos paulo ultra medium fissus. Corollae flavae tubus 14–18 mm. longus, distincte annulatus, lobi 7–10 mm. longi, oblongi vel anguste obovati, integri. Stamina in flore brevistylo fere ad annulum pertinentia, antheris 2.5 mm. longis; stamina floris brevistyli ad medium tubum attingentia. Ovarium globosum; capsula immatura breviter cylindrica.

Northern China:—Province of Shen-si; slopes of Tai-pei-shan. Alt. 8–9,000 ft. Plant of 9–18 inches. Flowers yellow. July 2nd 1910. Coll. W. Purdom. No. 397. Type in Herb. Kew.

This Shensi plant with yellow flowers favours the Maximowiczii subsection of Nivales, finding its nearest affinity with *P. aemula* but with very different leaves. The reflection of the corolla lobes is slight as in *P. aemula*. The specific name is given in honour of Dr. Handel-Mazzetti, the distinguished botanist and explorer.

Primula Licentii, W. W. Sm. et Forrest. Sp. nov.

Species sectionis Malacoides; foliis epilosis, lamina basi cuneatim angustata, petiolo elongato anguste alato a lamina haud discreto inter socios facile cognoscitur.

Planta radicibus gracilibus ut saepe in sectione Malacoides. Folia plerumque 8–12, spathulata vel anguste oblanceolata, 5–9 cm. longa petiolo incluso, 1.5–2 cm. lata, apice subrotundata, basi in petiolum vix discretum anguste alatum laminam plus minusve aequantem attenuata, margine grossius atque irregulariter dentata, in sicco membranacea, ut videtur glabra sed sub lente pilis minutissimis farinipotentibus conspersa, costa conspicua, nervis lateralibus obscuris. Pedunculi

folia excedentes, ad 15 cm. alti, umbellam simplicem vel binas superpositas 4–7-floras gerentes, infra glabri, supra sub umbella pilis farinipotentibus obscuris conspersi, ut pedicelli et bracteae et calyx ; bracteae sublineares, acuminatae, 4–5 mm. longae ; pedicelli graciles suberecti, 1–2 cm. longi. Calyx cupularis, tenuiter chartaceus, circ. 4 mm. longus, ad tertiam partem vel ad medium in lobos triangulares acuminatos fissus. Corollae lilacinae floris brevistyli tubus circ. 1.2 cm. longus, lobi 6–7 mm. longi, anguste obcordati, emarginati. Ovarium globosum

Northern China :—Province of Chansi (Shan-si) ; " en Montagne " ; May 15th 1916. Coll. Abbé E. Licent. No. 1882. Type in Herb. Kew.

The species of the section Malacoides have hitherto been confined to S.W. China and the adjoining parts of Burma where most of them are found in cultivated areas. In this species we have an interesting extension north-eastwards—far removed from the centre of the section. No species of this section has yet been found in the wide intervening region. *P. Licentii* deviates considerably in the form of its leaf from the general type of the leaves of its section. The blade has a cuneate, not cordate base, and the petiole is not sharply marked off. The lack of prominent hairs on both blade and petiole is unusual. It comes near to *P. Forbesii,* Franch. in its inflorescence but the corolla has a much longer tube. Its foliage characters make it a very distinct member in its section.

EXPLANATION OF PLATES.

PLATE CCXXIV.

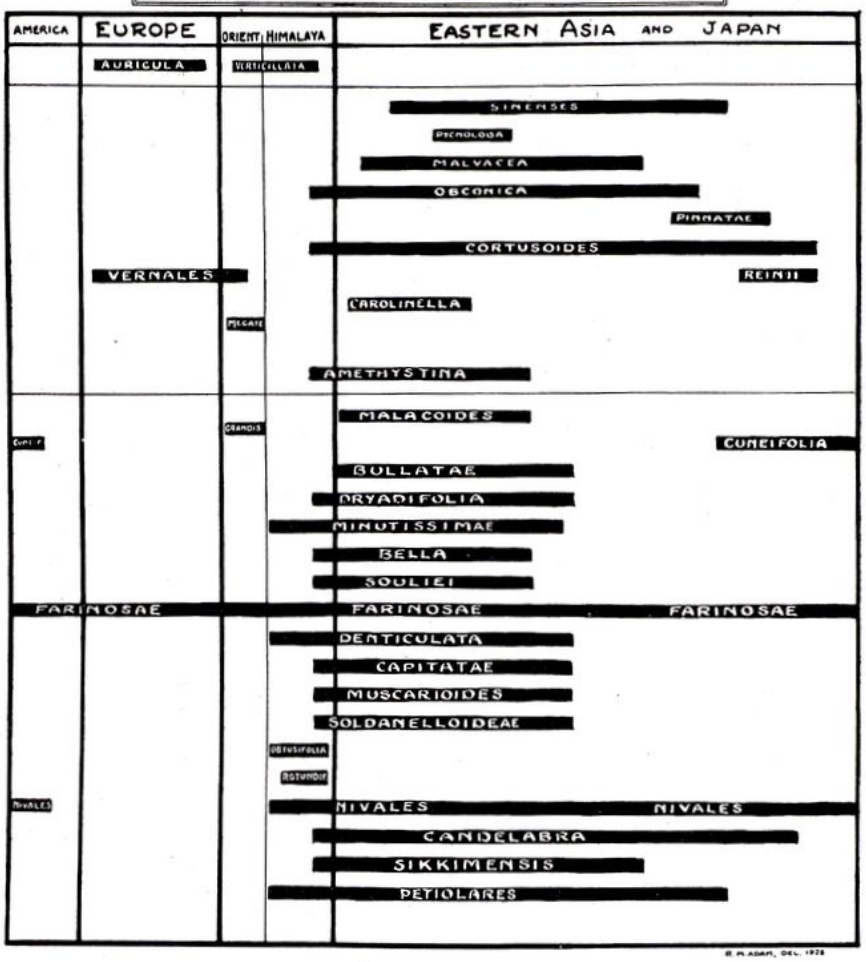
This plate is designed to give merely the geographical extension of the sections of the genus from West to East. It is not intended to represent the relative size of the sections. The sections are arranged in three groups corresponding to the three named groups in plate CCXXV.

PLATE CCXXV.

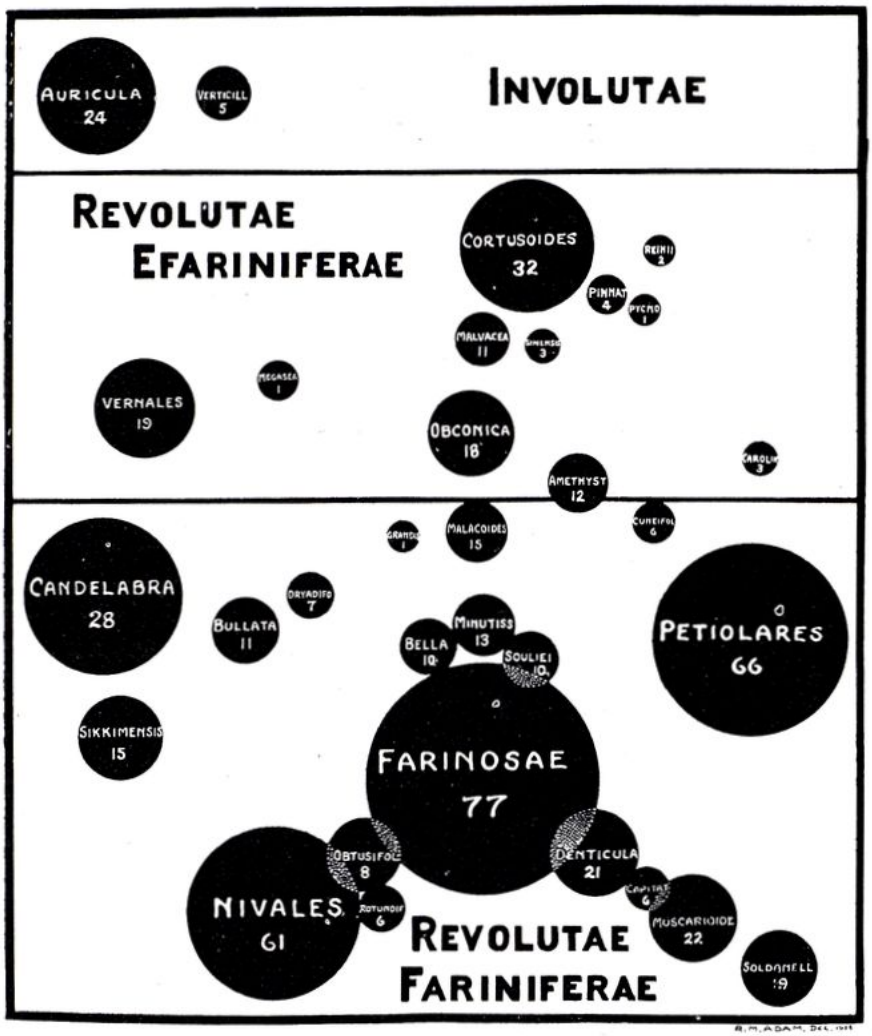
This plate is an attempt to represent the relative sizes and the affinities of the various sections. The sections are not drawn strictly to scale, as the smaller ones have been considerably enlarged for the sake of clearness. But the numbers inserted within the circles indicate the number of species and subspecies contained in each.

The sections are arranged in three groups. This is not quite in harmony with the arrangement in the principal key p. 4. In the key the Primulas with campanulate corollas are separate from both the fariniferous and efariniferous groups—solely for ready means of identification. In the plate they are distributed from the point of

DISTRIBUTION OF THE SECTIONS OF PRIMULA



THE SECTIONS OF PRIMULA



view of their presumed affinities. For example it is clear that Soldanelloideae is akin to Muscarioides in spite of the difference in shape of corolla.

The relationships of the groups are discussed in the text and a detailed explanation of the plate is hardly necessary. The following points, however, may be noted:—

(1) The affinity of Obconica with Malacoides as indicated by their approximate juxtaposition.

(2) The slight tendency of Amethystina to the development of farina.

(3) The relatively feeble development of farina in Cuneifolia.

(4) The prominence of the Farinosae centre with its attendant sections. The near approach of certain of these sections to Farinosae is indicated by the touching or by the intersection of the circles. In the case of the intersections it is probable that no very definite line can be drawn between the sections concerned.

INDEX.

Names of Species of Primula mentioned in the preceding pages.

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