THE RHODODENDRON HANDBOOK 1947

CONTAINING THE LIST OF species with descriptions and synonyms, together with list of hybrid Rhododendrons and Azaleas, list of collectors' numbers and the Rhododendron Stud Book formerly published in the Rhododendron Association's Year Book. This book has been completely revised by a sub-committee of the Rhododendron Group and contains their valuation of each species and hybrid.

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R.H.S. PUBLICATIONS

YEAR BOOKS

FRUIT

THIS IS THE FIRST NUMBER of this book to appear under the auspices of the newly-formed Fruit Group of the R.H.S. It contains many important articles on fruit growing, including a special section on methods of growing Peaches, both outside and under glass. The selection of dessert varieties of Apples is discussed by Mr. Potter of the National Fruit Trials, while there is also an account of some new dessert Apples raised at East Malling Research Station. Insecticides are discussed by Mr. H. Martin of the Long Ashton Research Station while Miss B. A. Crang contributes a most useful article on fruits for preserving.

LILY

THIS BOOK CONTAINS an unusually interesting and important account of the raising of new hybrid lilies in America by Mr. J. de Graaff. The authoritative account of *Lilium nepalense* by Mr. A. D. Cotton from the Supplement to Elwes Monograph continues our series of reprints from that work, while a description of the finding of a new lily in Alabama is given by Mrs. Norman Henry. Mr. W. Bentley, one of our most famous growers, discusses Lilies in his woodland, while there are also important articles on Fritillaria by Miss Beetle, Miss Beck and Peter Davis.

DAFFODIL AND TULIP

THIS NUMBER OF THE DAFFODIL AND TULIP YEAR BOOK contains many important articles on aspects of Daffodil growing and breeding in many countries as well as a full account of the Daffodil Shows for 1947 together with the lists of new Daffodils registered in 1947 as well as those which have received Awards. Mr. E. A. Bowles, the Chairman of the Narcissus and Tulip Committee, writes on the origin of the name Narcissus Leedsii, while Mr. Hoog of the famous firm of C. G. Van Tubergen Ltd. gives us his experiences in Daffodil breeding. There is a most important article on the preparing of Tulips for early forcing by Professor Dr. E. Van Slogteren, while Dr. E. H. Krelage writes on the Flemish Tulip and Mr. Ogilvie-Grant on the collecting of Tulips in Greece.

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R.H.S. RHODODENDRON YEAR BOOK 1947

THE RHODODENDRON YEAR BOOK 1947

THIS IS THE SECOND NUMBER of the Rhododendron Year Book to be published under the auspices of the Rhododendron Group of the Royal Horticultural Society. It contains an account of Rhododendrons at Bodnant by Lord Aberconway, President of the R.H.S., as well as accounts of Rhododendrons in New Zealand and on the North West Pacific Coast of America. Captain Kingdon-Ward takes us on a Rhododendron tour of the mountains of Burma, Assam and Tibet. There is a most important revision of the Anthopogon and Cephalanthum Series by Dr. J. Macqueen Cowan and Mr. H. Davidian of Edinburgh, while the classification and origin of Rhododendrons is also discussed by Dr. J. Hutchinson of Kew and Captain Kingdon-Ward. There is also an account of the Rhododendron Show together with descriptions of Rhododendrons which have received Awards during the year.

THE ROYAL HORTICULTURAL SOCIETY

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FOREWORD

THIS is the second issue of *The Rhododendron Year Book* to appear under the auspices of the Rhododendron Group of the R.H.S., and I think we can claim that it has gone from strength to strength. The Rhododendrons from Bodnant are world famous and the article by our President will be particularly welcome to members of the group. It will form a fitting successor to the account of the Rhododendrons at Exbury which we were able to publish last year.

For most notable scientific contributions we are much indebted to DR. J. MACQUEEN COWAN and MR. DAVIDIAN of Edinburgh and to DR. J. HUTCHINSON of Kew. Rhododendron is one of the most complicated and difficult of all genera in its classification and origins.

We welcome also contributions from CAPTAIN KINGDON-WARD, who not only takes us on a Rhododendron tour of the Burmese mountains, but also gives us his views on the value of seed characters in the classification of the genus. As one who has seen more Rhododendrons in their native habitat than any other living person, his ideas on the development and origin of the genus are of the greatest interest.

We are also particularly glad to welcome contributions from two famous Rhododendron growers overseas, MR. EDGAR STEAD of New Zealand and MR. HERBERT IHRIG of the North-West Pacific coast of America. We hope that future Year Books may contain even more information from gardeners overseas.

The planting of Rhododendrons on Battleston Hill at Wisley has made good progress during the year and the collection should well repay a visit next spring from all members of the Rhododendron Group. The collection of Rhododendron species in their Series has been completed so far as present collections in this country can provide the plants. A collection of 'Kurume Azaleas' (*R. obtusum* var. *japonicum*) has been planted for which the plants have been derived by cuttings or layers from the original fifty varieties collected by WILSON in Japan, while a 'Kurume carpet' of mixed varieties has also been planted.

During 1947 a new and completely revised edition of *The Rhododendron Handbook* was published. It is proposed to revise this volume every five years. A new edition of *The Species of Rhododendron*, published by the Rhododendron Society, has also been made available to members of the Group and descriptions of thirty-one new species have been added.

During 1949 the Council of the R.H.S. hope that it may be possible to hold a Rhododendron Conference, but details of this will be published next year.

J. B. STEVENSON

RHODODENDRONS AT BODNANT

BY LORD ABERCONWAY, C.B.E., V.M.H.

WHEN the Bodnant gardens were originally laid out by my grandfather in 1875 and the following years, it was not thought that Himalayan Rhododendrons would be successful, and therefore he planted only a certain number of the hardy garden hybrids.

Among those hybrid Rhododendrons 'Ascot Brilliant' and 'Lady Eleanor Cathcart,' both now of very large size, still hold their own in beauty with many of the modern hybrids.

Rhododendron planting at Bodnant on any scale really began in 1909, when WILSON'S earliest Chinese Rhododendrons had been raised by VEITCH and were being distributed. In that year a first planting of Chinese and Himalayan Rhododendrons was made—the two types being mixed so that if one did not succeed the other might take its place.

Both types, however, succeeded admirably in spite of the fact that in a few cases in the early plantings unsuitable ground was chosen. In one place notably there was a bed of clay, with springs in it, which kept it always wet, covered by a very thin top soil; but in this Rhododendrons curiously enough did excellently, the roots spreading, however, only in the top soil and in the annual top dressing, the roots being limited in depth to a few inches.

While some of the Himalayan Rhododendrons suffered occasionally from spring frosts, WILSON'S Chinamen always did splendidly. The very great majority of them were never injured even by a zero frost in winter, and were only affected by a very late and unexpected frost in spring. The climate at Bodnant is not mild, as, although the estate is close to the sea, the coast is east of Anglesey, and the warm Gulf Stream affects it comparatively little.

15° to 20° of frost is experienced most winters, while in the last few years we have had as much as 34°. Spring frosts are, as usual, erratic, but we do not often have one after the beginning of May.

When this Rhododendron planting began, certain flowering plants of leading hybrids were also acquired, among them a substantial number of that most lovely of all Rhododendrons 'Penjerrick.' At the same time came also large plants of *Rh. arboreum* × *Rh. barbatum*, of *Barclayi* (which has proved quite hardy at Bodnant), of 'Cornish Cross' and of *Loderi* with its most excellent variety 'King George.' Certain large plants were added of *Rh. Luscombei* × *Rh. Aucklandii*, of *Rh. Thomsonii* × *Rh. Fortunei*, and of the Leonardslee form of *Shilsonii*, a form that I have always thought superior to the

original cross in which the parentage is reversed. In all these the late LADY ABERCONWAY took the very keenest interest.

Subsequently seedlings from WILSON's later expeditions were obtained from the Arnold Arboretum and elsewhere. While from the earlier of FORREST's expeditions there were raised seeds generously presented by MR. REGINALD CORY, who had helped in organizing their collection.

Shares were subsequently taken in the seeds from FARRER's, KINGDON-WARD's, ROCK's and FORREST's later expeditions, while on the death of FORREST, his collectors were employed by me for three or four years collecting seeds in China for Bodnant. The successful raising, by the skill of MR. PUDDLE, of thousands of plants from these many expeditions gave to the garden the great majority of the hardy Rhododendron species that have been introduced into cultivation.

Of these species, those which, on the whole, have given most pleasure as garden plants have been *Rh. orbiculare*, of which we were fortunate enough to have a good deep coloured form; *Rh. Williamsianum*, where again we had a good pink form with an exceptionally large flower (Fig. 1); the two Triflorums, *Rh. Augustinii*, which shows to such advantage in a shady place, and *Rh. Davidsonianum*. To these one might add two of the forms of *Rh. Wasonii*, which have always been most attractive, the yellow form and the form called *rhododactylum*, both with beautiful leaves and the latter with pink and white striped flowers. Two forms of *Rh. pachytrichum* have been outstanding nearly every year, one with pink flower buds which turn to white as the flowers fade, and the other with scarlet buds, which turn to a fine pink, though with a touch of purple in it. *Rhododendron insigne* is largely represented inasmuch as seedlings of this species survived a journey across the Atlantic from the Arnold Arboretum in a way that other seedlings did not. *Rh. calophytum*, though a somewhat shy flowerer, and *Rh. haematodes* have also been of great beauty in the garden, and with them must be named KINGDON-WARD's 'Orange Bill' (*Rh. concatenans*).

It was not until the year 1920 that the work of hybridizing Rhododendrons first started at Bodnant. Here there was available the skill and taste of the head gardener, MR. F. C. PUDDLE, long an experienced hybridizer of orchids.

One of the earliest hybrids made was *Cilpinense* (*Rh. ciliatum* × *Rh. moupinense*) which received an Award of Merit in 1927. Soon a small plant of *Rh. Griersonianum* flowered at Bodnant. This was used as a parent with MAGOR's 'Soulbut' (*Rh. Souliei* × *Rh. Fortunei* var. 'Mrs. Butler') to make 'Vanessa.' This proved a very good hybrid, which received an F.C.C. in 1929; the colour inherited from *Rh. Griersonianum* and the beautiful shape of the flower from *Rh. Souliei*, makes it outstanding even among the later hybrids. Some of the

RHODODENDRONS AT BODNANT

FIG. 1—*R. Williamsianum*, A.M. 1938. A good pink form

Photo, R. A. Malby

RHODODENDRONS AT BODNANT

FIG. 2—The Dell

FIG. 3—*R.* 'Ethel,' F.C.C. 1940 (See p. 10)

Photos, R. A. Malby

RHODODENDRONS AT BODNANT

FIG. 4—*R.* 'Dainty,' F.C.C. 1944 (See p. 10)

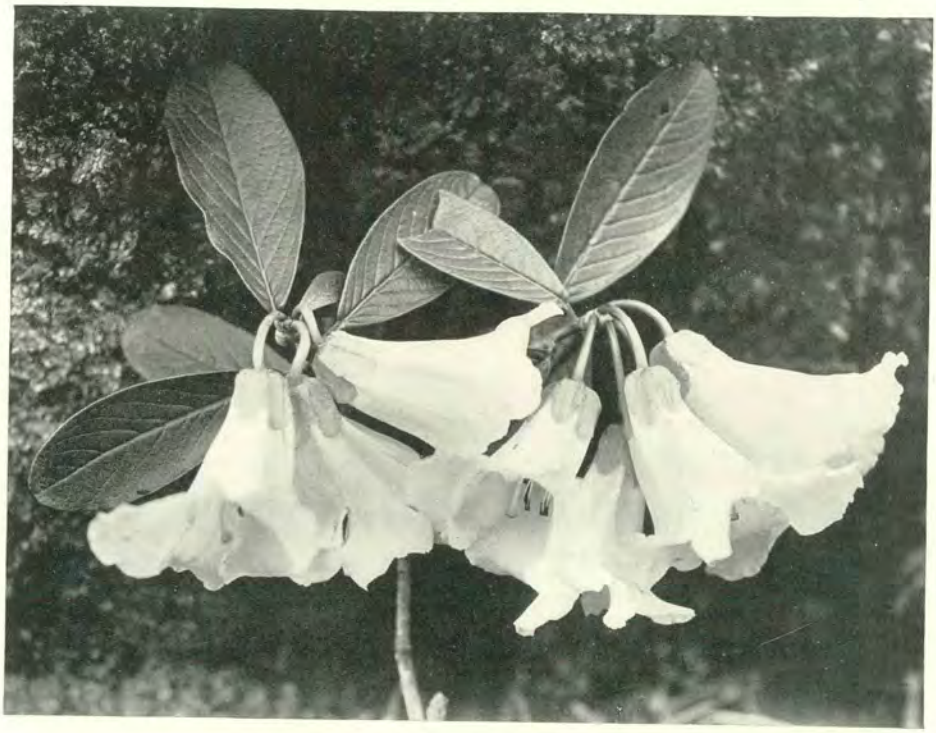

FIG. 5—A truss of *R. megacalyx* in the Mishmi Hills. The white flowers have a scent recalling nutmeg

FIG. 6—The prostrate *R. patulum* growing on a steep grassy face in the Mishmi Hills

(See p. 19)

plants were of a paler colour with a dash of cream in them ('Vanessa' var. 'Pastel').

The possibilities of *Rh. Griersonianum* as a parent were recognized at the start, and a large number of hybrids of it were made in early years, including 'F. C. Puddle,' A.M. (*Rh. neriiflorum* × *Griersonianum*), and 'Fabia,' A.M. (*Rh. dichroanthum* × *Rh. Griersonianum*). Certain of the crosses first made were with some of the paler Rhododendrons, giving a number of what were then known as 'art shades.'

Later on, by forcing indoors plants of *Rh. Griersonianum*, hybrids were secured with some of the early reds, such as *Rh. Barclayi*, making 'Laura Aberconway,' F.C.C., with *Rh. strigillosum* making 'Matador,' F.C.C., and with 'Arthur Osborn' making 'Toreador,' A.M. At the same time 'Portia,' A.M. (*Rh. strigillosum* × *Rh. euchaites*), 'Red Wing,' F.C.C. (*Rh. Barclayi* × *Rh. Shilsoni*), and 'Cardinal,' F.C.C. (*Rh. Barclayi* × *Rh. arboreum*), were made.

From these crosses there resulted plants of good habit with fine shaped flowers of various shades of scarlet—the outstanding one among them being 'Laura Aberconway.'

Unexpectedly enough, the Griersonianum hybrids had two striking and useful characteristics—they were very hardy, and they flowered most freely and very early in life. As an example, a cross was made between *Rh. Griersonianum* and *Rh. calophytum*—the latter a plant which does not flower to any appreciable extent for the first twenty years of its life—but in the bed of the seedling hybrids about half showed flower buds in the first three or four years from seed.

Two other parents were used freely—*Rh. Aucklandii* and *Rh. haematodes*. These gave us 'Sunrise,' F.C.C. (*Rh. Aucklandii* × *Rh. Griersonianum*), 'Hiraethlyn' (*Rh. Aucklandii* × *Rh. haematodes*), 'Coremia,' A.M. (*Rh. haematodes* × *Rh. arboreum*), and *Rh.* 'Aspansia,' A.M. ('Astarte' × *Rh. haematodes*). *Rh. Fortunei* and its allies *Rh. decorum* and *Rh. discolor* were very little used as parents because in some of the offspring the centre of the flower has poor colouring with greenish-yellow markings, which is not the case when *Rh. Aucklandii* is the parent.

As the original hybrids flowered, the work was carried on and further hybrids were made from them such as 'Dorinthea,' F.C.C. (*Rh. Griersonianum* × *Rh.* 'Hiraethlyn'); 'Radiance' ('Vanessa' × *Rh. Griersonianum*); 'Gretia,' A.M. ('Portia' × *Rh. Griersonianum*); 'Welkin,' A.M. ('Eros' × *Rh. haematodes*); 'Charmaine' ('Charm' × 'Mayday'); 'Ouida,' A.M. ('Astarte' × *Rh. Griersonianum*); 'Siren,' A.M. ('Choremia' × *Rh. Griersonianum*); 'Felicity,' A.M. ('Radiance' × 'F. C. Puddle'), and others.

There were also two special branches of hybridization which we followed up.

The first was an endeavour to obtain plants with flowers of an orange or a yellow tint. It was often found that in hybridizing Rhododendrons the yellow of the parent was very apt to vanish in the offspring. Success, however, was achieved in the good orange 'Fabia' var. 'Tangerine' (*Rh. dichroanthum* × *Rh. Griersonianum*) and in 'Lady Rosebery' var. 'Bodnant Yellow,' F.C.C., while a pleasing type of cream colour was obtained in 'Clotted Cream,' A.M. (*Rh. auriculatum* × 'Neda'), 'Cowslip,' A.M. (*Rh. Williamsianum* × *Rh. Wardii*), and 'Peace,' A.M. (*Rh. caeruleum album* × *Rh. concatenans*).

Attempts were also made to get a good yellow by using certain Rhododendrons on the borderline of hardiness, and 'Valpinense,' A.M. (*Rh. moupinense* × *Rh. Valentinianum*), 'Chrysaspis,' A.M. (*Rh. chrysodoron* × *Rh. leucaspis*), and 'Valaspis,' A.M. (*Rh. Valentinianum* × *Rh. leucaspis*), were the result.

They require a little protection, however, and although pretty little shrubs, the yellow colour is only pale.

The second branch was an endeavour to produce free flowering dwarf Rhododendrons in scarlet and pink colours. *Rh. repens* and *Rh. aperantum*, both hardy and charming in themselves, are in most cases shy flowering. In their hybrids, however, while the dwarf habit is to a great extent kept, in almost all cases flowers are most freely produced.

Of these crosses 'Elisabeth,' F.C.C. (*Rh. repens* × *Rh. Griersonianum*), is one mass of scarlet flowers every year, and the same applies to 'Ethel,' F.C.C. (Fig. 3) ('F. C. Puddle' × *Rh. repens*), while of the pinks, 'Charmaine,' A.M. ('Charm' × 'Mayday'), and 'Dainty,' F.C.C. (Fig. 4) ('Mayday' × 'Elisabeth'), are equally free flowering. In difficult times small Rhododendrons for small gardens may be appropriate.

The arrangement and re-arrangement of all these Rhododendrons provided constant problems. They required, when small, a well trenched bed, although when they grew to a fair size and the roots were shaded by the foliage, they quite held their own in isolated holes in semi-woodland ground. Even planted in trenched beds, however, they did not do well in the North Wales climate under trees. They liked to be clear of the branches and the roots of the trees, but were quite content to be on the shady side of them.

On the other hand, they did quite well in fairly sunny situations, although as sunny situations were essential for most other shrubs, the Rhododendrons had chiefly to take their place in some shade.

It was always rather a struggle to control the invasion of rapidly growing seedling plants so skilfully raised by MR. PUDDLE and to prevent them from filling those places in the garden where other plants than Rhododendrons appeared more suitable. It was not desired that the garden should be limited to Rhododendrons, nor could its size be unduly increased, so to find room for newer Rhodo-

dendrons great care had to be taken to eliminate those hybrids and species which were of inferior merit. In the slaughter 'Pink Pearl' for one disappeared entirely.

Above all, in all the planting every endeavour was made to place and group the Rhododendrons so that they helped the general garden design.

The garden at Bodnant is well suited to Rhododendrons not only from the point of view of its soil, but also by its situation and its contours.

The three sloping lawns round the house, shaded with large forest trees, have each of them beds of Rhododendrons on one or on two sides. In two cases, these beds are formed as rock gardens by the placing of large rocks fallen ages ago from a near-by cliff.

The Rhododendrons on these rock gardens, although all dwarf or semi-dwarf kinds, have grown so rapidly that the rocks are now practically covered.

The other beds have Magnolias, and in one case the upright Cherry, planted among the Rhododendrons.

All these Rhododendrons get a fair amount of sun and some wind from the south-west.

One lawn is bounded by formal terrace walls, and on another side of the house walled terraces stretch down the hill. No Rhododendrons are planted on these walls or terraces.

The portion of the garden that is best adapted to Rhododendrons is perhaps the Dell, a valley just below the main garden, some 120 feet deep with an abrupt oak-clad slope on one side. The flat floor of the valley is planted with a collection of Conifers, now over 100 feet high, and the more gentle slope on the far side has a permanent planting of a few large Larches and Corsicans below and scattered Cypress and Cherries above, all approaching 100 feet in height.

The oak-clad slope is too dry for Rhododendrons; the floor of the little valley is for the most part taken up by the Conifers and a stream, although there are one or two plantings of Rhododendrons at the sides. The more open places on the more gentle slope have proved admirable places both for Rhododendrons and Azaleas.

The formation there is very stiff boulder clay with 1 foot to 18 inches of good soil over it. It is probable that rainfall on the hill above percolates over the top of the impervious clay and is available for the roots of trees and Rhododendrons lower down the slope.

The upper part of the slope was originally planted with close *Rhododendron ponticum*, between the Cypress and Wild Cherries. Parallel paths have been made along the slope on each side of which the *Rh. ponticum* has been cut back, leaving space for better Rhododendrons. In all cases, however, a background of *ponticum* has been

left, which greatly enhances the beauty of the plants in front of it by giving them a quiet and shapely background. On this hillside is the main collection of *Rh.* 'Penjerrick.'

The Dell itself has two tributary streams running into it. One is steep and has been edged with rocks on which grow again dwarf Rhododendrons and Primulas. The other stream is larger and more gently falling. It was thickly planted by my grandfather for perhaps fifty yards on each side with Yew among older forest trees. The poorer of the forest trees were cut away and two-thirds of the Yews, leaving a background of the latter for shelter and appearance.

This tributary valley is given up almost entirely to Rhododendrons. Many of the first planting of species and hybrids have attained a large size, while between them grow smaller plants of those raised more recently.

This part of the garden, confined as it is to Rhododendrons, can be ignored when the plants are not in flower. although it is perhaps a mistake to regard Rhododendrons merely as flowering plants, for many of them are quite the most beautiful of all evergreens.

Finally, one should emphasize how much interest and beauty has been added to the garden by gifts of plants from gardening friends.

RHODODENDRONS
IN BURMA, ASSAM AND TIBET

BY F. KINGDON-WARD, B.A., F.L.S., V.M.H.

WHAT the orchid hunter was in the nineteenth century, the Rhododendron collector has been in the twentieth. Not that Rhododendrons have taken the place of orchids. The two can hardly be compared, so different, and in fact contrasted, are their functions. Each has its own niche, and we should be the poorer without either. But there is a certain parallelism in the story of their introduction and acceptance into the life and manifold activities of a great and rich civilization.

Rhododendrons are pre-eminently plants of a cold temperate ever-moist climate—cold enough to have a heavy snowfall in winter, moist enough to have not less than about 75 inches of rain well distributed through 7 or 8 months of the year, and a *humid atmosphere* all the year round. It will be remarked immediately that these ideal conditions are rarely attained in the temperate zone, which lies mainly across the greatest breadth of the northern hemisphere, resulting in a generally continental type of climate; but that it *is* attained in most of the transverse—and in some of the meridional—tropical and sub-tropical mountain ranges (or in parts of them) of the northern hemisphere.

Yet obviously ideal climatic conditions are not of themselves enough to ensure the presence of Rhododendrons. A climate such as that described above can be found in New Zealand, in Southern Chile, in Oregon, and doubtless in other parts of the world, where Rhododendrons do not occur at all, or only sparingly. And it is the peculiar good fortune of the great sub-tropical mountain ranges of South-East Asia that not only do they offer the ideal conditions outlined above, but also that one or more species of Rhododendrons reached them in pre-glacial or inter-glacial times, and that they reacted in an amazing manner, with results well known to-day.

That the same result, on a smaller scale, *might* have happened in New Zealand, had the genus reached that island a million or more years ago, is suggested by the ease with which Rhododendrons can be cultivated there; and the same may be true of other regions. But there can be no doubt that the glaciation of South-East Asia had much to do with the success of the genus there. Neither snow in winter, nor an ever humid atmosphere is absolutely essential for all species of Rhododendron, some being adapted to much bleaker, others

to softer conditions; indeed the degree of toleration shown by the genus as a whole, and by particular species, is remarkable. But the further we get away from the ideal climate the more rapidly the number of species falls off. Even under extreme conditions, however, Rhododendrons may still be the dominant plant, growing socially in vast numbers, though only one or two species are represented.

Thus in the Burmese Alps, (26°–28° N. lat.), conditions are ideal between about 10,000 and 12,000 feet, and it is in this comparatively narrow belt, from a little below to a little above the highest forest—here represented mainly by *Abies Fargesii* and *Larix Griffithiana*, together with a few small broad-leafed trees such as Acer, Betula and Sorbus—that the greatest concentration and variety of Rhododendron is found. Within this belt they range in size from stout gnarled trees, 30–40 ft. high, through big bushy shrubs and tuffety undershrubs, to creepy crawly plants plastered flat against the rocks, and to floppy epiphytes perched jauntily in the trees—though in this cold zone epiphytes are as a matter of fact rare; that is through practically the whole gamut of Rhododendron habit.

If we as gardeners were to divide our Rhododendrons into groups according to their uses, we would naturally divide them into trees, shrubs and bushes, undershrubs, rock shrubs (pygmies) and epiphytes, the latter being, with few exceptions, greenhouse plants. The field collector in Burma and Assam would then say that *trees* are found mainly in the cool temperate or mixed forest zone; *shrubs* almost throughout the forest zone from temperate forest to tree line; *epiphytes* mainly in the warm to cool temperate forest; *undershrubs* in the sub-alpine and alpine regions. It would not be difficult to find exceptions to all these—nature abhors a strait-jacket; but that is the general background of this noble family.

As to the actual habitat, Rhododendrons grow almost anywhere, except in water. In the Burmese Alps we find them growing on rocks in the river bed; or fringing the grassy banks of torrents, on the cliffs; in bogs; in pastures; and on screes or amongst piled boulders. In the alpine region particularly there is great variety of habitat, not one of which is disdained by Rhododendron; nor are the conditions, though conforming with the somewhat elastic term alpine, by any means everywhere the same in the alpine region. Screes, for example, which face south or west, are clear of snow long before north slopes. The surface gets hot, and owing to the perfect drainage little water is available except deep down in the finer material of the scree, though towards the end of the rainy season the water situation improves considerably.

Cliffs again offer very different conditions from bogs. It is a measure of the remarkable flexibility of Rhododendrons that they can adapt themselves to such a variety of extremes. Nor is that all.

For while the above-mentioned optimum conditions appear to encourage the greatest variation and the maximum number of species—and be it added of individuals, nevertheless many species steal beyond, sometimes far beyond, the limits of the peak zone, and by means of more exact adjustment live happily ever after.

Let us then take a look first at Rhododendrons growing in the "Burmese Oberland," as we might nickname Burma north of Myitkyina, and observe their sequence as we climb the hills. We had better start in the early spring if we wish to see the greatest number of them in bloom, remembering that the highest alpines do not flower before June, by which time enough snow has melted to expose them. Our present journey is to the Htawgaw-Hpimaw hills, following the eastern branch of the Irrawaddy (Nmai Hka) along the China frontier. After that we might go, *via* the western Irrawaddy (Mali Hka) to Fort Hertz, and thence across the mountains to the very sources of the river, and the snow peaks of the Tibet frontier—no easy journey.

From Myitkyina itself on a fine winter's day we can see mountains 7,000–10,000 ft. high virtually unexplored, though the ranges eastwards to China have been crossed along a beaten track a number of times. Still there are unexplored mountains within 100 miles of Myitkyina over 10,000 ft. high.

We are likely to get a shock as we follow up the Nmai Hka in March, for no sooner do we come down to the bed of that river on the fourth day out, than we find the rocks glowing with a brick red crust of Azalea (*R. Simsii*); and this less than 1,000 ft. above sea level, in the midst of tropical jungle. We shall not see another Rhododendron till we are at least 5,000 ft. above sea level; so evidently our Azalea is exceptional, or at any rate an exception to the general rule that Rhododendrons are cold temperate plants.

Leaving the river and ascending into the hills towards the distant crest of the main watershed, we begin to come across Rhododendrons again between 5,000 and 7,000 feet altitude. Here they are trees—and epiphytes. Unless they are in bloom we are likely to miss the former, and will certainly miss the latter, which are high up in the thick canopy, out of sight, betrayed only when their great milk-white corollas strew the ground. This epiphytic shrub is *R. dendricola*. In the same type of evergreen rain forest are the shrub or small tree species, *R. Kyawi*, with gorgeous scarlet-crimson flowers, and the tree species *R. stenaulum*, with rose-purple flowers sometimes lathering the whole tree—which must attain an age of well over a century. We can easily recognize *R. stenaulum* out of flower by its great smooth tawny trunk—if it happens to grow near the path side. But if *it* is in flower—and then we couldn't miss it if we tried—*R. Kyawi* will *not* be in flower, and we might easily overlook it. For *R. stenaulum* flowers in March, *R. Kyawi* not till after the rains have fully broken, in June.

Still deeper in the hills, no higher but sheltered now by lofty ranges from the hot breath of the Nmai valley, we find several shrubby species, including the curious little Azalea *R. microphyton*, growing along the river bank with many other shrubs.

Stepping up a couple of thousand feet, that is from about 6,000 to about 8,000 feet, several more species appear—the beautiful *R. decorum*, commonly scattered in the woods with such trees as *Rhodoleia Forrestii* and Gordonia; and on the open downs, the flaming scarlet *R. Delavayi*. As we approach solid conifer forest, Rhododendrons increase rapidly both in numbers and variety, especially along the exposed and steep flanked ridges. *R. Genestierianum*, a curiosity but no beauty, with thin willow-like leaves, snow-white beneath, and small fleshy, dark purple flowers, hanging like little plums, puts in an appearance, and with it *R. sulfureum*, which if it ever had any flowers on it, would be a lovely shrub. In the conifer belt proper, comprising hemlock spruce (Tsuga) below, silver fir and larch above, we approach optimum conditions, and Rhododendrons begin to dominate the scene completely. In May and June, when all the scuppers of the mountains are foaming with snow water, and avalanches are thundering down the gullies, the alpine valley is dynamic with colour. Whole mountain sides glow with the pinkish shimmer of *R. arizelum*, its brown woollen-gloved leaves beginning to spread themselves out again after being curled up and put away for the winter. *R. sinogrande*, too, with yellow lamp globes to illuminate its enormous green and silver leaves, and the sticky *R. habrotrichum*, bearing a too generous display of rather muddy purple flowers in reduced circumstances, are sure to occur. There are epiphytes also, sunk in the voluptuous moss which smothers the trunks of the firs—brassy yellow of *R. megeratum*, chick-down yellow of *R. seinghkuense*, sickly yellow of *R. micromeres*, atoned for by the brilliant gamboge and scarlet of its autumn leaves, and others. Thus we climb by easy stages up the long slanted valleys, or perhaps up and down along the crest of a ridge, to emerge at last on the windswept braes of the alpine zone. Now for the first time we gaze over square miles of rock and Rhododendron, and not much else, the swirling colours of pygmy Lapponicums, Saluenenses, aromatic Anthopogons and bubbling Campylogynums making a never-to-be-forgotten picture; the whole Rhododendron sea is flecked with shimmering foam, sulphur, apricot, salmon, Tyrian purple, violet. On the sheltered side of the valley the Neriiflorums in their various crouching attitudes glow blood red against the irregular patches of snow.

About fifty species of Rhododendron are known from the Htawgaw-Hpimaw hills, of which less than twenty have been found north of Fort Hertz. On the other hand, nearly fifty species are recorded from the northern valleys (Nam Tamai, Seinghku, Adung,

RHODODENDRONS IN BURMA, ASSAM AND TIBET

FIG. 7—*Rhododendron brevistylum*, a species with purple flowers and highly aromatic leaves which forms thickets at 10,000 feet

FIG. 8—*Rhododendron bullatum*, perched on the topmost branch of a silver fir, in the Mishmi Hills, Assam frontier. The white flowers are flushed with pink bands and are deliciously fragrant (See p. 20)

RHODODENDRONS FOR INDOOR DECORATION

FIG. 9—Purple lustre vase with *R. racemosum*, *cantabile*, *intricatum*, *Degronianum*, *saluenense*, and an Azalea species, *Albrechtii* (See p. 30)

Photos, N. K. Gould

Taron) which have not been collected in the Htawgaw-Hpimaw area. This speaks for itself; it seems highly probable that many new species will yet be discovered in the immense unexplored areas of North Burma.

Before leaving Burma, I will add a few notes on particular species. *R. imperator* is, I think, one of the most extraordinary of the pygmy Rhododendrons, though some people say it is difficult. It grows in the Seinghku valley on cliffs and in rock scuppers where the snow lingers late, at 9000–10,000 feet—that is far below the tree line. I found only one plant bearing flowers, and not many of them, so that I dared not pick more than a couple, and the type material is scanty in consequence. I believe I found five capsules containing seed in the autumn. The species has never been found again since 1926. In cultivation it has proved itself one of the most popular and floriferous of the pygmies, a first-class rock garden plant.

R. calciphilum is another pygmy from the same valley, this time from 12,000 feet, which does not seem to have been collected again since I discovered and introduced it in 1926. It is a plant of limestone screes, prostrate, clothed over with purplish-rose flowers, which, as in all the Saluenenses, are large.

R. myrtilloides is now fairly well known to rock gardeners. I found it at a low altitude, 8,500 feet, which is certainly low for a Campylogynum or indeed for any pygmy Rhododendron, though it was in a cold valley under the shadow of Imaw Bum. It has been found and re-introduced once or twice since 1919, but I do not know where or at what altitude. I found only a single bushlet, which was still there in 1939—twenty years on.

A species I referred to *R. neriiflorum*—K.W. 9561 and also apparently 9483, both from the Adung valley—has been described by a correspondent, who is a good judge of a plant, as having flowers "of a salmony shade and extremely beautiful." I confess I have no clear recollection of the plant—perhaps I collected seed of it "blind." Can it by any chance be the mysterious *R. euchroum*? Anyway it belongs to the Neriiflorum series.

In the Adung valley grew a gnarled tree Rhododendron, 25–30 feet high, forming a sort of filling in material amongst stunted Abies on a sheltered slope at over 12,000 feet—the highest tree Rhododendron I ever came across. I do not know what the flowers are like—it is one of the 'Grande' series—but it should be of cast iron constitution. It may be a form of *R. praestans*.

In the Seinghku valley, too, grows a form of *R. cerasinum*, originally discovered in Tibet, with rich cherry-crimson flowers. The Seinghku plant, however, has cream-coloured flowers with a broad cherry-red band round the top; connoisseurs say it is the more handsome form.

There are not many Lapponicums in far northern Burma,

probably the climate is too wet for this type. I recall four only, including the delightful yellow-flowered *R. chryseum*, another with dusky purple corollas and bronze stamens—a notable contrast—which I called *R. luridum*, and one with tiny purple flowers which were unexpectedly fragrant. Saluenenses and Anthopogons, however, are abundant and include such favourites as *R. keleticum*, *R. riparium*, and the charming *R. crebreflorum*.

In 1937 I found in the Nam Tamai valley what looked very much like *R. fulgens*, though I did not see it in flower. *R. fulgens* is a Himalayan species.

Now let us take a quick look at Assam, so often headlined during the war. There are three or four mountainous areas here, more or less separate from one another—the Assam Himalaya bounding the valley to the north, the Manipur and Naga Hills to the south, the great tangled knot of mountains—Mishmi and Abor hills—at the apex of the Assam valley, running up into Tibet, and the Khasi plateau (with three species of Rhododendron) athwart the mouth of the valley.

The Rhododendrons of the Assam Himalaya are on the whole like those of Sikkim and Bhutan, and include *R. fulgens*, *R. Wightii* and other well-known species. But there is at least one which appears to be different, a pink flowered species with the habit and leaves of *R. lanatum*, but with always four flowers to the truss instead of the five to six flowers characteristic of *R. lanatum*. As this last-named also grows in the Assam Himalaya—though the two forms, or species, never mix, the correct diagnosis of their relationship is not easy. Other good Assam Himalayan species are the very late flowering *R. polyandrum*; the dwarf Saluenense, *R. fragariflorum*, originally discovered north of the Tsangpo in Tibet; and the beautiful apricot flowered *R. concatenans*, which might be described as a variety of the well-known Sikkim *R. cinnabarinum*. Over twenty-five species have been collected in the Assam Himalaya, but there must be many more.

Crossing the Assam valley to the southern boundary ranges, which run first in a south-westerly direction, then, after shaving the eastern end of the transverse Khasi plateau, turn almost due south, we find a very different assemblage of Rhododendrons. Nor is this due to the fact that the mountains here are far lower than the Himalaya, at any rate not entirely. The finest species is the tree *R. Macabeanum*, with furry leaves and spherical trusses of clear yellow flowers. It does not grow below 9,000 feet, but is common towards the summit of Japvo mountain, where it forms small forests, mingled with other Rhododendron species, birch, and other temperate similar trees. More gorgeous, though less hardy, is the crimson-scarlet flowered form of *R. Elliottii*; while a third good species is *R. Johnstoneanum*. In 1946 I collected seed of an unknown species, not yet seen in flower, in Manipur; and there are undoubtedly others on

the high ridge separating Manipur from Burma. Further north, on Saramati peak, which is over 12,000 feet, are dwarf species and alpine shrubs; of these we know nothing.

But the part of Assam which is least known is the knot of steep high mountains beyond the apex of the valley where the Brahmaputra river breaks up into its three principal affluents. Follow the main stream up through the hills, and you come to the fabulous gorge of the Tsangpo. Follow the Lohit, and after passing through the Mishmi Hills you reach a drier country of forest and pasture, beyond Rima, where there are still forests of Rhododendron.

Between the Lohit and the Dihang (or Tsangpo) is the Dibang, with its tangle of mountain, gorge and wind-swept ridge, where no botanist or collector has ever been.

Even of the Mishmi Hills we know next to nothing; so deep and narrow are the gorges, that it is impossible to follow even quite large streams like the Delei river, and one is forced high up the mountain sides. To reach the alpine region one must follow the toothed ridges, never an easy matter, and in this wet climate made infinitely worse by the most resistant and impenetrable barrier it is possible to imagine—a mixture of cane brake (Arundinaria) and Rhododendron scrub. It was on one such ridge that I found the mat-like *R. patulum*, its thin branching thread-like stems jewelled with relatively huge funnel-shaped flowers of old rose (Fig. 6). It is, in habit, a perfect rock garden species, but is alleged to be difficult. However, when I recollect the job I had to get seed of it, which included a long slither down the icy face of the crag, and three horrible nights spent in a cave—or rather a hollow—high up on the ridge, I am thankful it is in cultivation at all. It has been I think quite wrongly placed in the Lepidotum series.

Another fine species from the Mishmi Hills is the Maddeni *R. Headfortianum*; the even more magnificent *R. Griffithianum* also grows there.

There can be few genera of plants which produce a higher ratio of viable seed to flower than Rhododendron. In the temperate rain forest region which stretches from the Eastern Himalaya to Western China, and from Tibet to Assam and Burma, where moss clothes rocks and trees and banks with a soft green dripping sponge, Rhododendron seedlings spring up by the million. A new clearing, a path through the forest, a roadside bank, every tree trunk and branch, every rock and cliff is seized on as a nursery for Rhododendrons, which often come up in dense masses, touching one another, to the exclusion of all other plants. Indeed this huge amount of easily germinating viable seed may account in some measure for the success of the genus; and the readiness with which the seeds germinate in damp moss may account for the epiphytic habit. Nearly all epiphytes will grow equally well on logs of wood lying about

in the open, or on rocks. Conversely, almost any Rhododendron, including the largest tree species, will grow epiphytically for a year or two. I have seen *R. sino-grande* growing thus.

Amongst some of the finest epiphytic species are *R. bullatum* (Fig. 8), *R. megeratum*, *R. Taggianum* and a primrose-yellow flowered species I collected in North Burma in 1937. The Vaccinioides series are all epiphytes, but their flowers are too small, and usually too drab in colour, to matter. *R. seinghkuense* has flowers of good colour and shape, but it is an untidy little shrub, at least as seen growing on the derelict fir trees of the Seinghku valley. *R. Nuttallii* is perhaps the finest, as it is the largest flowered, of all epiphytes. Never shall I forget a specimen I saw hanging out over the Adung river when it was carrying its peak load of snow water, so that the spray formed a mist for several feet above the surface. In that savage thunderous setting, *R. Nuttallii* struck just the right note of wild beauty.

I have left myself no time to mention the fourth area of this rain forest land—Tibet, with its incredible gorges, filled from crashing whirlpools to grinding glaciers with every colour of Rhododendron known, trees, shrubs, tufts, and carpets. Here grow *R. leucaspis*, *R. pemakoense*, *R. vellereum*, *R. hirtipes*, *R. tsangpoense* and many more.

It may be that in the next fifty years we shall throw out many species of Rhododendrons from our gardens as being either too difficult, or not quite first class. But there can be no doubt whatever that there is still an almost inexhaustible supply of new species and varieties awaiting discovery to take their place.

THE RHODODENDRONS OF EUROPE

BY W. E. TH. INGWERSEN, V.M.H.

IT is at the request of the Committee that I cast back my mind to write for *The Rhododendron Year Book* about the species and natural hybrids of the great Rhododendron family I have encountered in my wanderings over the mountain ranges of Europe.

Indeed, these Rhododendrons of our own continent seem to be in danger of being neglected and overlooked in the great spate of exciting species and the still greater number of startling hybrids that claim our attention since a steady succession of intrepid collectors have gone forth to search the untrodden mountains of India, China, Tibet and Burma and opened our eyes to the great wealth of these lovely and fascinating trees and bushes from the very cradle of their race.

When I regard with wonder the awe-inspiring book of about 850 pages compiled by MR. J. B. STEVENSON for the Rhododendron Society in 1930 I am astounded at my own temerity to write about the mere baker's dozen of Rhododendrons it has been my good fortune to encounter upon their native heaths. A few humble outliers of a mighty family who by some means managed to stray far from the fold.

And yet, are they quite so humble and unimportant as one might think at first? Has not the tiny *Rhododendron lapponicum* of northern Sweden and one or two tiny areas in Norway given its name to an important series of proud little Asiatic mountaineers? and one might wonder whether recent collectors would have braved great heights, difficulties of transport, dangers among wild tribes and untold hardships of unchartered travels if *R. ponticum*, *R. caucasicum* and *R. flavum* and their garden offsprings had not first whetted our appetite for more and yet more members of this great and beautiful race of plants.

It has become a habit to snarl at ubiquitous *R. ponticum*. I know it has become a bit of a pest in some places by seeding itself far and wide, and I am fully aware of the danger of using it as a stock for scions of choice garden hybrids which, unless very carefully watched, are almost certain to become overgrown by insidious shoots of the stronger stock plant. The remedy for this is, of course, to resort to root-grafting if grafting must be resorted to as a means of propagation.

Although *R. ponticum* has become a nuisance in gardens, yet I would not willingly miss its great drifts in woodlands among pines

and birches where it has become naturalized and furnishes unforgettable sights of purple splendour in May or early June. I know some woodlands in Surrey where *Azalea pontica*, now *R. luteum*, has become naturalized with it and the joint display of the two in the wild setting is a sight for the gods. No, we owe a great debt of gratitude to these Rhododendrons of Europe that must not be forgotten, quite apart from the hybrid offspring of theirs which are yet greatly valued in parks and gardens. They give great joy to those of the population who humbly walk and cycle along our country roads and lanes and are not privileged to visit the gardens where great collections of the newer and rarer kinds are grown and who never would travel far enough to see these glories in their really wild and natural setting.

After all this preamble I will begin to write of the two species I have already mentioned, although it was originally my intention to begin with *R. ferrugineum*. I suppose *R. ponticum* might not be considered a European species as it grows chiefly along the southern and thus Asiatic side of the great Caucasus range. But few people realize that it has a truly European outlier in *R. baeticum*, which occurs somewhat sparingly and localized in some of the mountain ranges of Spain and Portugal. This Iberian does not differ materially from the type species and I do not know that it has ever been popular in our gardens or that it has been used as a parent in hybridizing, and I mention it chiefly to establish the fact that *R. ponticum* through its variety *R. p.* var. *baeticum* establishes its right to be considered a European, even though this be achieved at second hand, as it were. Nobody, I suppose, will deny the right to rank as a European to *R. flavum* Don., which most of us older people still like to think of as *Azalea pontica*. Indeed, I think even DON'S name for it should give way to SWEET'S name, *R. luteum*. This species is a native of Eastern Europe, but I only remember it in its fullest glory and in countless thousands on the northern slopes of the Caucasus, where for miles it flanks the Georgian Military Highway as it climbs and winds its long and weary loops to the top of that stupendous range, to dip finally down into Asia. Forgive a little geography lesson here which seems necessary to me; I have so often been pulled up by speaking of plants from the Caucasus as European. Most people realize that Europe and Asia really constitute only one great landmass and that the dividing line between the two is, or appears to be, somewhat arbitrarily drawn. Few would like to take a pencil and draw a line on a plain map of Russia and say here ends European Russia and there begins Asiatic Russia. That matter becomes easier in the Caucasus, where the watershed of that great range is considered the dividing line between the two continents.

The Russians have most obligingly marked this division on the top of the few main passes by stone obelisques, marked on the north

side "Europe" and on the south side "Asia." That, to diverge a little further, brings into Europe some seven or eight peaks higher than Mont Blanc, ay, some of them higher by round about three thousand feet. And so, now we are clear on that subject, I will return to *R. luteum* and again, in memory, inhale with delight the sweet fragrance it shed around us as we toiled up the long and weary loops of the road, and the warm, golden haze it shed between dark woodlands of *Pinus hamata*, the Russian version of our own Scots Pine. I was looking for honeysuckle when first the breeze wafted its fragrance towards us. There it grew much as gorse grows on our commons, mostly low sprawling bushes, here isolated, there in great drifts, and it was a sticky business wandering about among them trying to spot outstanding forms. There appeared no variation worth mentioning; they were remarkably uniform in their flowers, although the bushes varied widely in size and habit. I could have wished to see these sloping hillsides again in the autumn to note if they assumed the same wonderful tints which are assumed by the hybrid offspring of this species in our gardens, where the typical plant seems to be something of a rarity. Alas! I found no seeds left in the capsules, and if there had been seedling plants they had been eaten down with the rest of the herbage between the drifts by the hungry sheep and goats of the inhabitants of these lonely valleys.

Much, much higher up this same highway, probably three thousand feet or more, the climate became bleak and the sunshine had changed to cold drizzle, but again I had to leave the road to wade about acres of stunted and sprawling bushes of *R. caucasicum*. It must have been fully 9,000 feet before we fell in with this species and I remembered the advice of my late friend G. REUTHE to look for yellow-flowered forms of this Rhododendron if ever chance brought me among it. Here in the dripping wet tangle they were just opening the first blooms of the season and most of them were white or pink and some almost of a rose shade and the spotting within their funnels varied in heaviness and extent, but there was never a yellow one among the thousands I must have examined. The next day, though, after a night spent at an Ingushty inn, we climbed Mt. Ortsweri on our way to Kasbek, the second highest peak of the range, and there at eleven or more thousand feet were pale yellow forms at least as frequently as the white and pink ones of the day before. It was still wet and misty and it did not do to stray too far from the slight trail along which our packhorses plodded, and the going in between the tangled branches and great granite boulders was far from pleasant.

The alpine plants which shared this rough ground with the Rhododendrons were unbelievably unvaried, *Oxyria digyna* and *Sibbaldia procumbens* and here and there a little patch of the incredibly uninteresting and all but petal-less yellow Kabschia

Saxifrages of that particular district. There certainly were no good yellow *R. caucasicum*, there were no full seed capsules left, and I could not spot any seedling plants, and I fear I wearied of my search and returned to my party, who had unpacked the food packs and were enjoying such a luncheon as is possible in districts where most of your provisions have to be carried in tins.

We were full early for this Rhododendron and had struck a bad patch of weather for mountaineering, and so my acquaintance with this species is not as extensive as I would have liked it to be. We went on to regions of limestone and did not strike another good patch of *R. caucasicum* again for the rest of that tour. I have a few, a very few, seedling plants of it which yet have to flower; they have been sadly neglected during the long war years and I can only hope that good yellows may turn up among these. Whilst we are in the Caucasus we might as well have a look at two more Rhododendrons that find their home there. They are both members of the series Ponticum and the Subseries Caucasicum. The first one is a bushy species which may reach ultimately about five to six feet high and in diameter and is called *R. Smirnowii*. It has foliage much like *R. caucasicum*, but its younger branches are heavily felted for a year or two, after which they become bare. The flowers are borne in a loose corymb of about a dozen campanulate flowers about two inches across and of a fair shade of rosy-purple. This has been long in cultivation but is now rarely seen. A plant I brought home in 1935 still survives here, and it always attracts attention by reason of the white tomentum which envelops the new leaves. I fear that its main distribution is on the Asiatic side, but my plant was actually found on the northern slopes of the range.

R. Ungernii is the last of the Caucasian Rhododendrons and occurs both in the form of shrubs or, when aged, as a small tree up to fifteen or twenty feet high. It differs from the preceding chiefly in the apiculate leaftip and by having the ovaries glandular. The thick and leathery leaves have the lower surfaces densely felted with grey or tawny wool and the young shoots are at first covered with a white tomentum, which, however, soon disappears. The campanulate flowers are slightly smaller than those of *R. Smirnowii* and they are of pale rose colour more or less heavily spotted within.

As we are in the East we will take the other eastern Rhododendron next; it is *R. Kotschyi* and is a very different plant to those we have been looking at so far, and it should be regarded as the easternmost of the real Alpenrosen or Ferrugineum Series. It is only known to occur in the Alps of Transylvania and in N. Bulgaria, where we found it in the Balkan range of mountains on Umrucktchal at an elevation of about 6,000 to 7,000 feet and thought at first, indeed, that we had found *R. ferrugineum* itself, until looking into the Bul-

garian Flora assured us that we had found *R. Kotschyi* in one of its classical stations.

It is a dwarf and twiggy shrub rarely more than eighteen to twenty inches high and all its branches are densely set with oblanceolate leaves little more than an inch long and very scaly below. It is a typically alpine shrub and all but unknown in gardens. Its flowers are borne in little terminal umbels of rarely more than five or six rather tubular flowers that are finely downy inside and out and of a quite nice shade of pink. Albino forms are said to be found occasionally, but this was not our luck and, indeed, we had struck an off season in which relatively few of the plants we saw were flowering freely. A plant we brought home has grown into a nice round bush and has provided us with numerous cuttings which rooted freely in a cold frame. So far it has not flowered freely here.

This brings us to typical *R. ferrugineum*, which has a distribution ranging from the Pyrenees in the West to the Austrian Alps in the East. In its typical form it is restricted to limefree formations and in suitable surroundings it occurs in enormous quantities, sometimes covering whole mountain sides at fair elevations. I do not recollect seeing it much below 5,000 feet and from about there up to the tree limit or a little higher. In alpine woodlands it is often a straggling and rather leggy shrub, but in open positions it becomes much neater and more compact, and seen at its best, every shoot terminating in a somewhat racemose inflorescence of tubular reddish-pink flowers, it is a very delightful shrub fully deserving of the veneration given to it by the peasantry of Switzerland and Austria, who interweave it in their legendry and commemorate it in their songs. Stöber wrote about it as follows:

„Ein Blümchen blüht in Lieblichkeit
Auf hoher Alpen Rücken
Es weiss der Myrte dunkles Kleid
Mit Rosenroth zu schmücken.

Doch treu dem hohen Vaterland
Mag's nicht in Betten prangen
Noch gab's in keines Freiers Hand
Sein freies Herz gefangen.“

The last verse needs a little qualification, I feel, for even if the Alpenrose does not lend itself to the planting of the average flower-bed it can be made very thoroughly at home in the rock garden or even in the heath garden and looks happy there and flowers as freely as on its native heights. *R. ferrugineum* varies a good deal in its colour, and in some districts its flowers are overlaid with a chalkiness that detracts from the scintillating glory of its flowers at their best. The flowers

are somewhat tubular, with five slightly spreading segments at their ends; some scaly grains appear upon their outside that glitter like bits of gold dust and give added charm to the flowers.

I remember looking at our best form of *R. ferrugineum* with the late LORD WAKEHURST after having examined a collection of the Asiatic Lapponicums, and his remark, "Asia has given us nothing more beautiful."

As the poem quoted above has it, there is some similarity to a myrtle in the general appearance of this Rhododendron, but there is no myrtle I know of that can bedeck its dark greenery with such a glittering wealth of rose-red flowers. The leaves of this Rhododendron are oblanceolate in shape, rounded and slightly mucronate at the tip and densely scaly with rust-brown on their lower surface.

In nature occasional plants bear glistening pure white flowers, and these are readily propagated from cuttings and a few of these albinos interplanted into a group of the type add greatly to the effect.

We had here for years a form we called *R. ferrugineum major*; it had but very slightly larger flowers than the type plant, but the flowers were of an extra glowing and rich shade, and we trust that a specimen or two of this have survived the war years and the wholesale clearing that had to be made here in the interest of food production.

A mountain side of this Rhododendron in full bloom is a sight never to be forgotten and one that should be imitated in open woodland or hillside gardens that possess a suitable soil and a sufficiently moist climate to suit this very attractive plant.

The limestone ranges of South Central Europe are the home of a companion plant to the Alpenrose, *R. hirsutum*. There are great affinities between these two, and there are districts in the Alps where geological faults allow the two to grow sufficiently near each other—I mean within easy beeflight—to enable them to hybridize and to produce intermediate and fertile offspring which seed and intermarry again and again until the beholder wonders if the limehating and limeloving characteristics ascribed to these two species really hold good. But I shall have more to say about this a little further on.

R. hirsutum, in my experience, can be somewhat taller than *R. ferrugineum*. I have often noted bushes of it well over two feet high especially when growing among *Pinus montana Mughus* and big, tumbled boulders on the upper shoulders of Mt. Triglav in Yugoslavia. Its leaves are bristly hairy, particularly along the margins, and there are but few and widely spaced patches of scales on their lower surfaces. Its flower colour is often richer and more glowing and the segments of its corolla appear to be rather more deeply cut. Really fine forms of it in the levelling rays of the rising or westering sun appear almost crimson-scarlet. A big drift of such a fine form seen at the right moment of lighting is a wonderful sight. Pure white forms

of this are rather more commonly met with than albino *R. ferrugineum*; they are lovely and very pure. It is a really fine shrub and should be more frequently grown and planted in goodly drifts for massed effect. I do not think that this Rhododendron is as widely distributed; I cannot recall finding it in the Pyrenees, the Maritime Alps or in the Savoy Alps, but it is the predominant Rhododendron of the Eastern Alps.

I have already mentioned the hybrid offspring between these two and must admit I found these very puzzling. I devoted a whole afternoon to them on one occasion to try and make out the typical, intermediate hybrid between the two which is known as *R.* × *intermedium* Tausch.

We had been wandering since earliest morning over the truly marvellous Seiser Alp, a huge undulating upland lawn stretching for many miles in the Southern Tyrol, the home of untold numbers of choice alpine plants, growing here in vast drifts and patches in the short, fine turf, for all the world like a gigantic golf course in the most wonderful setting. We finally dipped down toward Bad Ratzes, where we designed to spend the night before exploring the Schlern Klamm on the following day. Skirting along under the stupendous Weisse Wand, gleaming sheer in the evening sun on our left and reflecting the accumulated heat of the day, we came upon Rhododendrons for the first time that day. Nice, dwarf, compact plants, at first isolated specimens and presently in groups and drifts interspersed with patches of Junipers, Willow Gentians and *Geum montanum*, etc. Not two of them appeared precisely alike, some of them I would have unhesitatingly pronounced as *R. ferrugineum* and others as typical *R. hirsutum*, but there was every possible intermediate variation between these two as well.

The Weisse Wand being sheer limestone and the ground below it freely interlarded with the debris of the great cliff, it was impossible that limehating *R. ferrugineum* could possibly grow there, so it became plain that here we had come across *R.* × *intermedium* seeding back in both directions towards the parent plant, and there remained nothing but to regard those that stood nearest to midway between the two parents as the typical hybrid. Next day I found on top of the Weisse Wand good stands of typical *R. hirsutum*, but I had to hunt for a longish while before I found a volcanic outcrop on which grew a limited number of *R. ferrugineum* itself. Very much as near Pordoi, along the Bindelweg, one comes upon *Eritrichium nanum*, often on small isolated lumps, scarce a foot across, of black volcanic rock piercing through the limestone crust. I fear all the young plants of this hybrid Rhododendron I brought home were distributed to interested friends and I have no personal experience to pass on of its behaviour under cultivation. I have no doubt, however, in surmising

that it will be as easy to grow as either of the parents and in all possibility it will not have any pronounced views about lime-holding or lime-free soils. Writing about Rhododendrons and lime brings me to the last European Rhododendron I have met in nature, and that one, curiously enough, I have only found on Mt. Lulja and Mt. Kep-na-Kaise in Swedish Lapland and at Bessheim and Jotunheimen in Norway, in all four cases in those rare spots where lime penetrates to the surface in that great northern and granitic peninsula. I have paid two special visits to the home of *R. lapponicum*, in 1939 and again in 1946, and I am ashamed to confess that I have failed most utterly to make this one European member of its series at home in my garden where many of its Asiatic cousins grow with the greatest ease and freedom. I have selected medium-sized plants and young plants of all sizes down to tiny seedlings and brought them home by the quickest possible routes, but with no effect; they died on me within a few short months and never attempted to take roothold with me or in the gardens of friends who had made these two trips with me.

I do not think I am wrong if I say that *R. lapponicum* is the shortest-growing one of all the Lapponicum series. It is never more than two or three inches high, but it makes neat tuffets up to nearly a foot across. The leaves, resembling those of the charming little *Daphne rupestris*, have impressed scales above and a dense covering of scales below and even the little leafstalks are scaly. The quite pretty purplish-lilac flowers are borne in little terminal clusters rarely more than three to four in a head. It is a charming little arctic and alpine shrublet, a surprising plant to find a hundred miles or more north of the arctic circle, and even there only on the highest mountains. It is a great pity it remains so untractable to garden conditions. We managed to find a few capsules that had wintered without opening and brought home a pinch of seeds, but even with these we have not been any more successful than with most carefully collected plants. Perhaps some member of the Rhododendron Group will have better success with this plant in the years to come. I hope so.

RHODODENDRONS FOR INDOOR DECORATIONS

BY ROZA M. STEVENSON

RHODODENDRON SPECIES in particular are my favourites for floral decorations indoors, for they possess all the best and most beautiful qualities for which one could wish. There are as well so many series to draw upon, covering many months in their varied periods of blooming. This includes all forms of Azaleas—Kurumes, Ghent and Mollis, and the beautifully scented Americans.

Then I have the further enjoyment of arranging the early and later hybrids; but I must point out that I find it difficult to put the usual elepidote (without scales) hybrids with the species, for I feel that the latter do not like the 'crossbreds' amongst them, excepting possibly when they are a first cross of two species. On the other hand, the lepidote (with scales) hybrids appear to me to be much more at home with the species and can be freely used. This is not to say that *all* the species combine well, for such primitive types as *sino-grande* (or even *calophytum*) look clumsy if associated with, say, Triflorums and Lapponicums. Some of the so-called 'Hardy Hybrids' have a remarkable endurance when cut, and this is naturally valuable and saves many renewals.

I must mention I have a really interesting outlook upon my Rhododendron decorations, for they evolve from my good deeds to the plants, namely, trimming and shaping the bushes; I do not go out with the set intention of cutting solely for the flower bowl or bowls; when I have collected my trimmings, then I design my bowls with the greatest joy, for I have usually plenty of treasures to choose from. I then decide my colour schemes according to the position, surroundings and light in the room or rooms and then choose the vases suitable for the various arrangements.

Further, I prefer an opaque vase or bowl so that the ugly and unnatural break of the stems cannot be seen. Such a receptacle seems more suitable for shrub flowers.

My floral decorations are chiefly all Rhododendrons, but occasionally I break away and have some other shrub or flower to make a variety or to accentuate some bloom I particularly fancy and feel needs bringing forward.

These Rhododendron bowls begin in early February and carry through till August starts, a matter of six months. What other single genus could give so much pleasure for so long a time? But even then

many pretty bowls can be arranged with odd second flowers from many species.

Starting with Rhododendron 'Tessa,' a hybrid made by us, she delights in being with *R. oreodoxa* and the hybrid 'Bo-peep'; *Erica darleyensis* occasionally helps as a backing. Then follow *R. praecox*, *moupinense*, *scabrifolium* to draw from.

A bowl consisting of *Stewartianum* (yellow), *praecox* (light mauve), *caloxanthum*, *trichocladum* and *lutescens*, all various shades of yellow, made a handsome show at the end of March, as also another vase containing 'Nobleanum,' *venustum* (pink), *ciliatum* (pale pink), *leucaspis* (white), and here sprays of *Prunus Vilmoriniana* (pale pink) to help lighten the heavier flowers of *R.* 'Nobleanum.'

On the 25th April I had three most enjoyable vases:

PURPLE LUSTRE VASE (Fig. 9)

Rhododendron species *racemosum* (pale pinks), *cantabile* (deep mauve), *intricatum* (pale mauve), *Degronianum* (large pink blooms), *saluenense* (deep plum), and an Azalea species *Albrechtii* (bright rose). Here is a typical arrangement of species alone all happy together, the chief features being the dainty fairy-like flowers of the Lapponicums with the spot-light upon *Azalea Albrechtii* and *R. Degronianum*. The various shades of pink and mauve toned perfectly with the purple vase.

CREAM GRECIAN VASE (Fig. 10)

Very simply filled with *R.* 'Rosa Mundi', *racemosum* and *pubescens*; but I took particular care to pick out the pearl pink shades of *racemosum* and *pubescens* to match 'Rosa Mundi'.

MILK BOWL (fig. 11)

Another simple one, but in order to show the quality of the beautiful cream yellow *selense* I introduced *Mahonia pinnata*, a strong green-yellow.

During May we had the following bowls:

PURPLE LUSTRE VASE (Fig. 12)

This time containing as the main feature three white blooms of the Series Irroratum *McL. T41* right in the centre—on either sides pale pink *tephropeplum*, incidentally beautifully scented, then came the deep mauve *cantabile*, 'Blue Diamond' (the only hybrid), pale mauve *timeteum*, more *tephropeplum*, all crowned by our deepest blue *Augustinii*.

CREAM GRECIAN VASE

Azalea species *Vaseyi*, a beautiful fresh pale pink, with *Magnolia Brozzonii* (pure white).

MILK BOWL (CREAM SHADE) (Fig. 13)

With *R. Wardii* the prominent feature, possibly the most perfect of the yellow Rhododendron species; with it I put as a complete contrast

the deepest shaded plum-coloured *R. pseudo-yanthinum*; this was chiefly in the centre of the bowl; on the outskirts I had *R. ambiguum*, a green-yellow, and on the topmost *R. concinnum*, a paler plum shade. This bowl gave us much pleasure, not only for the quality of the species blooms but their magnificent colours were an absolute feast for the eyes.

CHINESE SOUP TUREEN (Fig. 14)

Filled entirely with our red-blotched *R. yunnanense*; one could not wish to have these beautiful sprays of trusses disturbed by any other mixture.

This display is a true example of trimmings, for *R. yunnanense* is inclined to grow too straggly, so I am able to cut really big sprays, needless to say much to my delight when I am shaping the bushes.

The very beautiful Kurume Azaleas give a good example of pruning serving the dual purpose of providing excellent material for flower bowls and at the same time greatly improving the appearance of the plants. In the garden I like to see them rather dwarf and applying their growing energies to lateral rather than vertical extension, when they then form almost thick mats of foliage and flowers all over. It will, however, be noticed that they tend to send up vertical flowering spikes here and there, and the removal of these gives very ample and beautiful flower bowl material.

CHINESE FOOT BATH (Fig. 15)

I can only describe this bowl as a frolic with straggly growths from different Rhododendron species, and what fun it gave me to arrange! *R. sinogrande*, too handsome for words, stands as a sentinel amongst its fellow species and a complete contrast to the smallest leaved, which in the photograph has unfortunately lost itself amongst the design on the bowl!

GLAZED BLUE JAPANESE FLOWER POT

Containing *R. suberosum* (white) with clumps of *tsarongense*, a pure white daphne-flowered looking species. Here I made a feature of a young *Barbatum* series growth which had the appearance of a starfish. It was a glorious shade of copper and went well with the pure whites and the blue bowl.

GREEN VASE (Fig. 16)

R. Augustinii, a beautiful blue Triflorum series, with the broom *Cytisus praecox* (yellow) as a contrast.

June produced a further supply, and one combination was really delightful, the predominant features being 'Purple Splendour,' a hybrid (very deep purple), and *Magnolia Sieboldii*, helped by a later Triflorum series, *R. villosum*, which toned perfectly with 'Purple Splendour' and an Azalea Mollis 'Nina van Houte' × *alba odorata*, again toning with *Magnolia Sieboldii*. I used a cream-coloured milk bowl for this.

Then we had Azalea species *calendulaceum* and *atlanticum* with white Irises.

Purple vase with hybrid *R.* 'Amor' and *Kalmia latifolia*, beautiful shades of pink.

Chinese soup tureen filled with large sprays of *R.* 'Norman Shaw' or *R.* 'Azor,' both hybrids, with white Foxgloves.

Another bowl with *R. Fastuosum flore pleno* or *R. ponticum* with the purple Foxglove—these all toned perfectly.

Now July is here we have a milk bowl filled with hybrid *R.* 'Redcap,' a very deep red, *R. Griersonianum* (flame) lightened by *R. micranthum*, a very small-trussed species of ivory white.

Grecian vase contains trusses of hybrid *R.* 'Polar Bear,' pure white and strongly scented. Another bowl contains Azalea species *canescens* and *viscosum* with about three trusses of *R. diaprepes*, an all white display.

We have still to look forward to having *R. auriculatum*, *Keysii*, *Ungernii* and, as previously mentioned, the many odd second flowers, with a final ending about October of a bowl of *R. neriiflorum*, a most beautiful red and one sufficient to gladden the heart before the cold winter months arrive once more.

FIG. 10—Cream Grecian vase with *R.* ' Rosa Mundi,' *racemosum* and *pubescens*
(See p. 30)

RHODODENDRONS FOR INDOOR DECORATION

FIG. 11—Milk bowl with *Rhododendron selense* and *Mahonia pinnata*
(See p. 30)

RHODODENDRONS FOR INDOOR DECORATION

FIG. 12—Purple lustre vase with *R.* Series Irroratum *McL. T41*, *tephropeplum*, *cantabile*, ' Blue Diamond,' *timeteum* and *Augustinii* (See p. 30)

FIG. 13—Milk bowl (cream shade) with *R. Wardii, pseudo-yanthinum, ambiguum* and *concinnum* (See p. 30)

RHODODENDRONS FOR INDOOR DECORATION

FIG. 14—Chinese soup tureen with *R. yunnanense* (See p. 31)

RHODODENDRONS AT THE SUNNINGDALE NURSERIES

BY J. P. C. RUSSELL

THE SUNNINGDALE NURSERIES were started by MESSRS. STANDISH and NOBLE in 1847, when they moved their nursery here from Bagshot Bridge. The ground was then entirely uncultivated and consisted partly of typical Bagshot heath country and old gravel pits and partly of Scots Fir planted during or directly after the Napoleonic wars.

NOBLE mentions in one of his catalogues that "the nursery ground in question is rated in the Poor's Rate book at £8. The soil, which is from 12 to 15 inches in depth, is a black sandy peat, resting upon a clayey sub-soil very deficient in vegetable matter, and naturally incapable of producing any crop whatsoever." To get it into condition he drained it from 3½ to 4 feet deep, trenched 2 feet deep, and dug in 30 to 40 tons of manure to every acre. He recommends everyone who wishes to grow Rhododendrons to do the same and adds with great complacence that "as in many districts agricultural labourers are in excess, to trench the land once in four years would not only be the means of greatly increasing the productive powers of the land, and thus enriching the producer, but, by giving employment to the poor, would tend to the decrease of crime, save them from the degradation of the Union Workhouse, and be a material saving to the farmers in poor-rates."

None of the catalogues from their earlier nursery appears to survive, but in their first year here they offer *catawbiense*, *dauricum*, *ferrugineum*, *hirsutum* and *ponticum* as species and a number of hybrids. It is very difficult to tell whether any of these original hybrids are still in cultivation or not. 'Sappho' and *Standishi* are both mentioned in this first list. But from the colouring given they cannot be the same as the two plants which are still fairly common to-day and in any case the present-day *Standishi* is a *Griffithianum* hybrid. It is curious to note how in an over-hybridized genus such as Rhododendron, the names repeat themselves. Many of the names from these early catalogues are now borne by the newest arrivals to the stud book.

Their early hybrids have little interest to-day, but a number of them may still be grown in America. Those which were grown until a few years ago include *Towardii* (1847), *Blandyanum* (which won a Banksian medal at Chiswick in 1848), *delicatissimum* (1848, of which

a huge bush still survives here). They won a Gold Medal at Ghent with 'Minnie' in 1858, and in 1860 produced 'Rosa Mundi,' 'Cynthia' and *Bodartianum*.

When NOBLE was left on his own in 1860 he produced 'The Queen,' which he had no hesitation in pronouncing the finest white Rhododendron of the century, much to the fury of STANDISH, who evidently thought that he should have had it or possibly even that it had been stolen from him. A great deal of acrimonious correspondence was carried on about this and large notices were printed on their catalogues in which the word "gentleman" in large letters and heavily underlined occurred with great frequency. NOBLE eventually won, and his victory was crowned by the Queen herself saying that "it was indeed the queen amongst Rhododendrons."

To look at its rather dingy white flowers, faintly flushed violet and with yellow markings, it is difficult to understand the fuss.

There are two curious omissions from the catalogues. 'Royal Purple' was raised here very early on, but was never considered worth propagating until HARRY WHITE'S day. The old plants here are magnificent now and the yellow eye which is not attractive on a small plant gives a much greater brilliance to the purple in a large plant. 'Prometheus' was raised about 1860, but again was never propagated until HARRY WHITE'S day, yet this must have been amongst the best of the reds at that period.

The catalogues show a curious lack of interest in the hybrid Azaleas. In 1847 'Nosegay,' *coccinea speciosa* and *coccinea major*, 'Taylor's Red' and *pontica* are mentioned by name and in 1850 a collection of MORTIER'S new hybrids are offered. Apart from this, no hardy hybrid Azalea is mentioned throughout the catalogues from 1847–1872, although in NOBLE'S notebook and stud-book for 1850, nearly 500 varieties of Ghent Azaleas are listed, and these include varieties which are still amongst the best. Two outstanding varieties were raised here in *Standishi*, a yellow *viscosepala* in effect, and 'Unique.'

'Unique' was raised before 1850 and a bush of it measures 16 feet by 30 feet to-day, and this is growing in the worst frost-pocket in the nursery and in the open so that its growth cannot have been rapid.

These Ghent Azaleas contain some of the best of all garden shrubs and it is very odd that their first appearance should not have created more of a sensation.

The introduction to the catalogue for 1850 throws an interesting light on the cultivation of Rhododendrons at that period. They were considered gorgeous but difficult to grow. A damp situation was considered essential, and deep trenching is recommended for any dry ground. Island sites were evidently considered ideal.

"At Highclere, the seat of the EARL OF CARNAVON, in the lake at Milford, are several small islands of from ten to twenty yards in diameter, planted with American plants, presenting the highest state of luxuriance; many of them from ten to fifteen feet high, and presenting in the blooming season, masses of beauty, from their summits to the very surface of the lake. The soil of these islands is not more than eighteen inches above the water."

In large bogs artificial islands of faggots are recommended where a very fine effect may be created, fine enough even to be viewed from one of "our noblemen's princely mansions" (a favourite phrase).

DR. WALLICH is quoted in favour of bogs "on the Himalaya mountains, the Rhododendron is invariably found growing near or on the margin of morasses. So magnificent is the appearance of masses in flower of the scarlet species of these mountains, that the effect may be compared with that of regiments of soldiers in scarlet uniforms, in the full sun when viewed at a distance."

The first of the catalogues coincide with the fierce arguments about the value of the early hybrids from *arboreum*. STANDISH and NOBLE belong to the 'anti-arboreum' party. In 1848 they state that "although the Indian Rhododendrons excel all others in their gaudy colours, still they are not hardy and very shy to bloom, and the first crosses from them with the American varieties are also too early flowerers to be considered hardy. For many years MESSRS. STANDISH and NOBLE have been trying to remedy these great objections, and have succeeced at last, in producing perfectly hardy plants, with beautiful foliage, flowering in May and June, consequently out of the way of spring frost, and many of them equal in colour to the Himalaya kinds."

In 1855 there was a discussion in the pages of the *Gardeners' Chronicle* upon the merits of the *arboreum* hybrids, and NOBLE and STANDISH took part in this and reproduced the gist of their remarks in their catalogue. Extracts from this are interesting:

"The hybrid Rhododendrons now so generally grown are from crosses and intercrosses between the Indian *arboreum* and some hardy kind as *ponticum*, *catawbiense* or *caucasicum*; with these materials the hybridizer has produced the greater part of our innumerable cultivated varieties, and which are every year being added to."

"Now it is well known that seedlings from, or even once removed from *arboreum* are not suited for general culture. We have nothing to say against the beauty of their flowers, for they are undoubtedly very attractive; but as they are generally produced very early in the spring, they are, in the majority of seasons, and in the absence of artificial protection, much damaged or wholly destroyed."

"We are frequently told that in the garden of Mr. So-and-So there is a magnificent hardy Rhododendron, with deep red or crimson

flowers which are generally in bloom in February or March. Sometimes we are induced to have a peep at these prodigies; not for our own gratification, however, for we are always well prepared for the kind of exhibition which awaits us. The plants are generally surrounded by an ugly frame-work of poles and rods, with an addition in the shape of scraps of canvas, and a bundle or two of straw, laying at hand in a convenient corner to protect with in frosty nights (and in the day too, when cutting winds and pelting rains prevail) forming altogether by no means a gardenesque scene. But of course that is of little consequence; doesn't the plant live in the open air and bloom in winter?"

They continue by saying that most of these *arboreum* hybrids take some twenty years to flower, and finish on a very optimistic note:

"Although so much has been already done—so many valuable points gained and secured by hybridizing the Rhododendron—we may confidently look for still greater results. In the Sikkim Rhododendrons we have the material for giving new features to succeeding crosses. In fact, we now possess a large number of plants, the result of hybridizing between our best hardy hybrids and *Edgeworthii*, *Dalhousiae*, *ciliatum*, *glaucum*, etc.; amongst which we believe there will be found some very remarkable kinds. Then from *fulgens* and *Thomsonii* we shall obtain brilliancy of colour, rivalling even *arboreum* itself; while *Wightii* will contribute a yellow tint, and *Hodgsonii* the beautiful form of its individual flowers, as well as that of its fine compact truss."

One of the results of this orgy of hybridization was 'Ascot Brilliant,' produced by STANDISH shortly after he and NOBLE parted company in 1860.

STANDISH and NOBLE had a wide and catholic taste in plants and subscribed to most of the collectors of their day.

In 1847 they were offering *Azalea scabra* and in 1848 *A. ovata* and *A. obtusa* as hardy plants from China. At this period FORTUNE was collecting for the nursery and in 1849 he sent "six new Azaleas from a district in China further north than from whence any have previously been introduced; consequently they will be much hardier. One of them is particularly handsome, its leaves being very large and fleshy, with flowers of deep red and very fine. There is little doubt but that this plant will prove perfectly hardy. Another has white flowers marked like a carnation with deep purple stripes; and the other kinds are very distinct from any previously known in this country."

This striped Azalea, *Vittata*, was a form of *Simsii* var. *eriocarpum* which appears to have since died out, but not before it had contributed a lot to the strain of greenhouse Azaleas.

Azalea obtusa rapidly became popular and is even recommended as "excellent for bouquets."

In 1852 *Azalea amoena* is offered: "this unique plant from the north of China was exhibited at the London Horticultural Society Rooms, in Regent Street, this spring, and was awarded a Knightian medal; it also was awarded the large silver medal at Chiswick, in May.

". . . for forcing and cutting for bouquets nothing can excel this, and it is perfectly hardy. Plants in September 21*s*. ea."

In 1854 *Azalea crispiflora* appears: "evidently a true species, as it differs much from the numerous varieties of *A. indica*."*

"The flowers are large, with very reflexed petals, the edges of which are much waved, or perhaps it will convey a better idea, to say they have the appearance of being irregularly gaufred like a lady's frill, and the colour is a rich rose lake."

In 1857 a number of hybrids are offered from *Azalea amoena*, but it is impossible to trace these now.

The Sikkim Rhododendrons are first offered in 1851 in collections of unnamed species.

DR. HOOKER lived very near to the nursery and sent the seed here in the spring of 1850, and by 1853 they were attracting considerable attention. The catalogue for that year says that "Many persons thought that when the plants bloomed, they would not come up to the drawings published by DR. HOOKER, but having flowered two of the species we can testify that they not only equal, but surpass them, as the flowers we bloomed were one third larger than the drawings. With the exception of *Rh. Dalhousiae* and *Rh. argenteum*, we have proved the whole of them to be perfectly hardy and we may safely say our plants are the largest in the trade."

By 1854 most of these had been named, and *glaucum*, *ciliatum*, *Hodgsonii*, *Thomsonii*, *Dalhousiae*, *Falconeri*, *niveum*, *fulgens*, *campylocarpum*, *lanatum*, *argenteum*, *cinnabarinum*, *cinnabarinum Roylei*, *Wightii*, *Wallichii*, *lepidotum*, *salignum*, *elaeagnoides*, *obovatum*, *Edgeworthii*, *aeruginosum*, *setosum*, *barbatum*, *Aucklandii*, *Campbellii* and *Maddenii* are offered in the catalogue for that year.

In 1855 a number of seeds were sent from MR. HUGH LOW, collected in Bhutan. The first batch never reached its destination, but a further collection sent in August included *Nuttallii*, *Boothii*, *calophyllum*, *Hookeri*, *Keysii*, *virgatum* and *Windsori*. In April 1856 DR. HOOKER sent *calophyllum*, *fulgens* and *leptophyllum*, also from Bhutan.

In 1857 it is claimed that *Thomsonii*† flowered at the nursery for

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* *Azalea crispiflora* has been known to the trade ever since as *macrantha*. It is in fact *indica* var. *crispiflora* and the *indica* mentioned here is properly *Simsii*.

† It may seem unlikely that *Thomsonii* should flower in seven years from seed, but S. & N. had a number of old standards in a greenhouse on which they used to graft scions of new hybrids and species, thus getting a flower much sooner then they would from the parent plant.

the first time in Europe, and it is possibly from this first flowering that STANDISH raised 'Ascot Brilliant.'

In 1858 *Aucklandii* or *Griffithii* is offered for the first time.

In 1859 or early 1860 NOBLE and STANDISH parted company. The stock was divided between them and STANDISH started a separate nursery at Ascot.

In 1860 'Cynthia' was sent out by both firms, one calling it 'Cynthia' and the other 'Lord Palmerston.'

Apart from a lot of plants sent back by JAMES GOULD VEITCH in 1862 the catalogues lose much of their interest after STANDISH'S departure, and it becomes obvious that he must have been the plantsman of the two.

The rare species Rhododendrons gradually drop out of the catalogue and are not mentioned after 1870.

When left on his own NOBLE adopts a distinctly hectoring attitude to his customers on the subject of hardy hybrid Rhododendrons.

"My collection embraces all the really distinct and good varieties worthy of cultivation, those raised on the continent, as well as in this country; a great number of new ones are offered for the first time, and as every collection of any note is watched by me during the blooming season, I can with confidence offer them, feeling assured that my collection will be found second to none in Europe. . . . In purchasing I would recommend the selection being left to me (mentioning any already possessed), I am then enabled to select kinds suitable, and in many cases superior, to those which might be chosen.

"Allow me to add that the commoner kinds are grown by thousands, and sold at a very cheap rate,—no respectable grower shall undersell me."

In 1898 NOBLE sold the nursery and retired to the seaside. At his retirement the greater part of the nursery land (then between 200 and 300 acres) was sold. A portion of it was bought by MR. KEMP-WELCH and was continued as a nursery under the management of HARRY WHITE. Before the 1914 war it became the property of SIR HUBERT LONGMAN. HARRY WHITE had been NOBLE'S manager for some time and was an extremely keen plantsman.

He began by putting down a large stoolground of the Ghent Azaleas and the *molle-japonicum* hybrids as they were introduced.

At this time WILSON'S Chinese Rhododendrons began to arrive, and by 1913 *decorum*, *oreodoxa*, *Wiltonii*, *floribundum*, *Souliei*, *argyrophyllum* and its variety *cupulare*, *calophytum*, *bracteatum*, *concinnum*, *lutescens*, *pachytrichum*, *longesquamatum*, *Przewalskii*, *Augustinii* and *yunnanense* were in the nursery.

From then until the last war a continual stream of species Rhododendrons arrived from the Asiatic expeditions of FARRER, FORREST,

KINGDON-WARD and ROCK. The late MR. J. C. WILLIAMS, the late MR. L. DE ROTHSCHILD and many others used to send their surplus expedition seeds to HARRY WHITE and at one period there were so many thousands of seedlings that they had to be shovelled into the cart-tracks to clear the ground for the next batches.

HARRY WHITE did a lot of hybridizing amongst the species, especially between *Souliei*, *Thomsonii*, *campylocarpum* and *dichroanthum*. He never bothered to name any of these hybrids, and although many of them must have been very good when he raised them thirty years ago they are not worth propagating now. Amongst the hardy hybrids he raised 'Countess of Derby' and 'Lady Longman,' the latter a very pretty hardy hybrid.

The best things he has left are the colour forms of many species selected over a long period of years. He would cross the best colour forms from a large batch of one species and pick out the best seedlings resulting from the cross. In this way he selected a number of very fine forms which have been propagated by cuttings.

In 1913 the late MR. F. R. S. BALFOUR brought plants of all the early *Loderi* varieties and these first flowered in 1918. About the same time the late SIR GEORGE HOLFORD, who had been staying at Caerhays, brought cuttings of the extremely beautiful cream and pink forms of 'Royal Flush.' While this is hardy here, it is unfortunately bud-tender and is best in a cold house.

Several Kurume Azaleas were sent from Caerhays in 1919 and between 1920 and 1923 the late MR. F. R. S. BALFOUR sent many rare Azalea species from America, including the magnificent *prunifolia* and the charming *atlantica*.

In 1907 the late MR. GRAY came down from London to help HARRY WHITE, and although he was then thirty and had worked in London all his life, he became extremely enthusiastic, and at HARRY WHITE'S death in 1936 he took over the management of the nursery. At the outbreak of war the majority of the men were sacked by order of the then owner, and he was left with two men and an overgrown nursery. It is due to his skill as a propagator and his enthusiasm for Rhododendrons that many of the rare and difficult species survive at all.

In NOBLE'S day the nursery extended from its present site to the Lady Margaret Road in Sunningdale, and he had some land on the other side of the main road as well. He had a considerable wholesale and retail trade and a number of up-to-date propagating houses. When HARRY WHITE took over, the majority of this was sold and he was left with a nursery of some 36 acres, much of it then uncultivated. He put down a large stoolground of Azaleas and various shrubs but at no time had any heated frames or even a cold greenhouse. The grafting was all done on beds of half-rotted leaves beneath wooden frames covered in thick semi-transparent paper and the

cuttings were all taken under bell-jars, and at this latter art MR. GRAY was a great expert. After the 1914 war HARRY WHITE lost interest to a certain extent and the outlying portions of the nursery began to get overgrown. When we took over during the war the buildings were in a state of near collapse and couch-grass had a strong hold over most of the nursery. The war did not improve matters and it is only during the last year that things have begun to clear up.

At the present day the nursery consists of about 50 acres, which meander from Surrey to Berkshire and back into Surrey. The Rhododendrons are grown in two large woods and there are many fine specimens about which give more the impression of a garden than a nursery.

The large wood by the house was not much cultivated in NOBLE'S day, but HARRY WHITE moved in a few superb specimens from another part of the nursery when he took over.

There are two of HOOKER'S original *Thomsonii* in this wood now about 18 feet high and perhaps more beautiful at this time of year (August) than at any other. The glistening metallic blue of the young foliage is set off to perfection by the cinnamon-coloured trunks. These are rivalled by *cinnabarinum Roylei*, also from HOOKER'S 1850 sending, and this old tree will often produce a few flowers of var. *blandfordiaeflorum* and of the type after a bad season.

FORTUNE'S original sending of *R. Fortunei* does not survive, but the seedling from the first batch of this, known as 'Mrs. Charles Butler,' has made a huge bush.

There are many plants from WILSON'S first sendings. By far the most decorative are a small tree of *Houlstonii* with its beautifully shaped, sweet-scented white flowers, and two large bushes of *Souliei*, one white-flowered and one pink-flowered. An interesting plant here is a *yunnanense* which WILSON brought back as a small plant from China and which went to VEITCHES. HARRY WHITE was very friendly with the VEITCHES, and when the Chelsea nursery was given up he was sent a number of plants, including this *yunannense*. It is much more tender than any of the plants raised from its own seed or from other imported seed.

Beside the house there is a fine bank of *molle-japonicum* hybrid Azaleas planted some thirty years ago and a big bank of sweetly scented *occidentalis* hybrids raised by HARRY WHITE.

Close to these is a very fine plant of *cinnabarinum* itself, also a HOOKER survival.

Below the house is a strip of ground from NOBLE'S original nursery known as the Italian ground. This is presided over by the hearse-like plumes and contorted head of a Weeping Wellingtonia. Down one side there runs a wall of old hybrid Rhododendrons and *Azalea Standishii* some 17 feet high, and at the far end is a huge bank of

R. 'Royal Purple' and Azalea 'Unique,' barbaric in their purple and orange splendour in late May. The whole of this ground is full of Rhododendrons and Azaleas of every colour and is a remarkable sight when at its best. Many of the specimen plants here must be as old or older than the nursery. Many of the Ghent Azaleas are an enormous size and these grow almost imperceptibly here after about 5 feet. The late MR. GRAY told me that when he came here forty years ago these old specimens seemed exactly the same size as they are to-day.

From the Italian ground a river of Azaleas runs right round the large wood and up to a small wood known as Land's End some 300 yards further on.

Across the stream in Berkshire is a new wood which slopes fairly steeply to the west and so should escape the worst of the spring frosts which are our particular bane here. About six acres of this are being made into a show garden for all types of plants, but especially Rhododendrons and the Kurume Azaleas.

During the war it was not possible to do much about the nursery, but a large collection of rare species, new hybrids and a great many rare Azaleas, particularly of the evergreen section, were added to the stock here, and there are also a number of batches of interesting hybrids coming along.

The nursery itself is gradually coming into order again, and we hope to take up its tradition of growing rare Rhododendrons with renewed vigour, and despite the new tradition that it should take thirty forms and three months' delay to get the slightest repair done.

RHODODENDRONS IN NEW ZEALAND

BY EDGAR F. STEAD

BEFORE writing anything about Rhododendrons in New Zealand it is necessary to say something about the climate. The two main islands extend over a thousand miles in a north and south line with a maximum width of about two hundred miles, and exhibit a very wide variety of climates. The west coast is wetter than the east, and is warmer in any given latitude. The atmosphere is very clear (visibility on fine days is seldom under fifty miles, and is often over a hundred) and this results in very bright sunlight which produces well-ripened wood in plants, and has a tendency to induce early blooming. The outstanding difference between this climate and that of Great Britain is that the summer lasts for at least two months longer here. In Canterbury, where my garden is situated, Rhododendrons and Azaleas bloom almost exactly one month earlier than the corresponding time for the south of England—*Azalea mollis* bloom during the latter half of October (April in England) while the *calendulaceum* hybrids are at their best in the first half of November (May). We have hard enough frosts in Canterbury during the three winter months to keep the plants in good health, but although we get up to 18° F. of frost on occasion, even mild frosts when there is any wind are almost unknown. Our worst trouble is that, owing to our insular climate, we are liable to get late spring frosts that cut bloom and young growths. However, in the Auckland province, where even winter frosts are rare, Rhododendrons, generally speaking, cannot be successfully grown at low levels, partly, I think, because the winter is not long or cold enough to give the plants a sufficient period of rest, but chiefly because the winter will not kill thrips, which play havoc with most species and hybrids.

A question I have often been asked is, "How long do imported plants take to acclimatize themselves?" If the plants are shipped from England before the end of December, and travel in cool storage, they will begin to grow very soon after their arrival, and will behave quite normally from the winter on, so that a few months is all that is necessary for plants to adapt themselves to their new climate. The best time for shipment is early in the season—October or November.

And now as to the plants. Prior to 1915 there were very few Rhododendrons in the country other than the earlier hardy hybrids (which were plentiful) and some Himalayan species. The latter included *Griffithianum*, *arboreum*, *grande*, *barbatum*, *Falconeri* and *Thomsoni*, but there were very few of them. Not more than half a

dozen gardens in the whole country had any of the more modern hybrids (in those days chiefly *Griffithianum* crosses) and few were being imported. Only occasional efforts were made to raise Rhododendrons from seed, but two of these are noteworthy. SIR CRACROFT WILSON brought to New Zealand about 1860 some seed of a form of red *R. arboreum*, and a number of plants were raised. The colour was first class—a deep blood red—and, while the majority of the plants had only medium-sized trusses, two plants had exceptionally large trusses of about twenty-three large flowers. I crossed these two and it was twelve years before the first of the seedlings bloomed. They have all flowered now, and some were good, but none was as good as its parents. This plant is probably a form of *R. Kingianum* as its blooms do not open for three weeks after all the *R. arboreum* are over. The leaf has a silver under surface with yellowish mid-rib and veins. The blooms do not all open at once, but open in considerable numbers over a period of three or four weeks, and there is then a scattered blooming that continues for over two months more. The best plant I have of this species is apparently the tenderest, for it was badly cut by a severe frost and snow two winters ago. By way of parenthesis I may say that I have used this plant extensively as a parent, and the prolonged blooming period is shown by only some of its offspring. A whole batch of 'Ilam Cornubia' (the above × *R. Shilsoni*), however, have a blooming period of a month, or more.

The second noteworthy seedling raised in the early days was a plant that has been called by North Islanders *R.* 'Lady Galway.' It is reported to have been raised by a MR. MASON of Wellington from imported seed. It is of the Maddenii series and sub-series, but does not fit any description given in *The Species of Rhododendron*. It blooms early (September–October) and has large sweetly scented white blooms much tinted with mauve pink.

The publication of MILLAIS' *Rhododendrons* caused a number of New Zealand gardeners to sit up and take notice, and from then on importations by private gardeners and nurserymen became much more frequent. For the next few years quite a lot of Chinese Rhododendron seed came to New Zealand, through the generosity of British subscribers to the expeditions. In 1925 I paid a visit to England and was given a wonderful collection of Rhododendrons by MR. LIONEL DE ROTHSCHILD, LORD STAIR, GERALD LODER (later LORD WAKEHURST), LORD HEADFORT, SIR JOHN RAMSDEN and LADY LODER. Through the generosity of these enthusiasts I received plants of the latest introduced species, and many personally raised hybrids, which I had no other means of acquiring. Of five hundred and twenty plants I landed over four hundred and ninety in my garden. Since then, a considerable number of the latest hybrids to get into commerce have been introduced by various importers, so that, while we

have only a fraction of the multitude of good things grown in England, we have in New Zealand to-day a reasonably representative collection.

Of most Rhododendrons it may be said that they will grow well in some part or other of this country. In the coastal parts of Canterbury, where the rainfall is under 27 inches annually, even the large-leafed species grow quite well if given some shade; but the hot dry nor'-west winds seem to be anathema to many of the *sanguineum* subseries. I raised many hundreds of these from seed, but they gradually dwindled away until to-day I have very few left, yet this may have been largely due to my not getting the situation they liked. I tried a group of ROCK's *R. racemosum* in several situations and they did no good until I put them on the north side of some Hydrangeas in full sun, and there they have thriven amazingly. So it seems that as I can grow *RR. mallotum*, *neriiflorum*, *dichroanthum* and *sperabile* with success, I may still find a site to suit the *sanguineums*. Two other effects of nor'-west weather in Canterbury are noticeable: (1) it seems to have a very activating effect on pollen and plants in bloom at the time set great quantities of seed, and (2) it is sometimes accompanied by very high sun temperatures, so that the tips of the leaves of young growths of Rhododendrons are scorched. The latter effect is unusual, but the former is very frequent. So much so, that I have for many years been aiming at the production of Azaleas which are sterile to their own pollen, and so set practically no seed. But of this, more anon.

On the west coast of the South Island, where the rainfall is heavy (up to 100 inches a year) and mostly falls during the summer months, Rhododendrons grow very well, yet not so much better than on the east coast as one might expect. I personally think that they grow better in the South Island than in the North, though this view is not shared, I know, by many North Islanders. Around Dunedin they do exceptionally well, and further south still, at Gore, a close planting of about one-eighth of an acre with mixed species raised from Chinese seed, has resulted in a growth of 8 to 10 feet in height with a solid canopy of foliage and leafless branches below.

There are few really spectacular specimens of the larger growing species here. What were probably the most notable were some fine plants of the *R. arboreum* variety introduced by SIR C. WILSON, which were up to 30 feet high and of good spread, and made a wonderful show when in full bloom, but they were neglected and many were cut down. A similar fate befell most of the plants which were in a garden near Wellington when this was cut up for building sections. Perhaps the largest Rhododendrons in the country to-day are plants of 'Sir Robert Peel' and 'Cornish Early Red,' but it is doubtful if any of these exceeds 25 feet in height.

During the past twelve years I have flowered a number of forms

of *R. giganteum* and/or *protistum*, some of them imported plants and some raised from imported seed. The blooms varied considerably in size and also in the attractiveness of their rose or mauve-pink colour. Last year a plant in the garden of MR. DEANS, Homebush, bloomed for the first time, and it proved to be really outstanding. It carried enormous trusses of large blooms of a most pleasing colour, dwarfing even the largest forms of *R. Loderi*. The large broad leaf is rugulose above, the underside green with only the suspicion of silvering around the outer edge. This form is superior to any other that I have seen, and, in years to come, will be the most impressive Rhododendron in any garden where it can be grown.

Azaleas do very well here and the *calendulaceum* hybrids attain a large size. I have a plant of 'Unique' in my garden which is 15 feet high and as much in width which gives a wonderful show of bloom every year. *Coccinea speciosa* next to it is 12 feet high, but blooms really profusely only every other year. Many of the 'Ilam' hybrid Azaleas are fast growers and send up, when well established, sucker growths which will reach 6 feet in two years. The *Azalea indica* section does well in most parts of the country and gives a good show of bloom excepting in years of late spring frosts.

The hybridizing of Rhododendrons here was done very little prior to 1918. A MR. SEATON of Fairfield, near Dunedin, raised about 1900 a plant from *R. Thomsonii* × *Griffithianum* which he called 'Marquis of Lothian.' It is, I think, perhaps the best colour of any of this cross that I have seen, being a red-pink on the outside and pale pink within, but the flower is not so large as 'Cornish Cross,' and the truss is very floppy. In 1918 I began hybridizing by crossing *R.* 'Pink Pearl' with 'Gill's Triumph.' The resulting plants were among the best growing Rhododendrons I have, and a few produced good quality blooms. It is interesting to note that all the pinks and mauves of these were scented, while any that tended towards red were not. These plants indicated, too, that 'Pink Pearl' is a *R. Fortunei* or *decorum* hybrid (probably the latter) for many had somewhat crinkled blooms and a good blotch, as is frequently the case with *R. decorum* crosses.

Since then I have raised many thousands of seedlings of both Rhododendrons and Azaleas. Of species crosses the following may be noted (the *R. arboreum* is the good plant already referred to):

R. arboreum, red × *R. arboreum*, pink—pink-red blooms, small trusses, very early flowering (July and August).

„ × *Shilsoni*—'Ilam Cornubia.' Large flowered, blood red, long blooming period.

„ × *Griersonianum*. Very good reds, and some plants with good trusses.

R. arboreum, red × *decorum*. Very good growers. Trusses large, and colour in best examples rich pink.

„ × *Griffithianum*. Large trusses of large flowers opening red-pink and fading to pale pink.

R. Griersonianum × *eriogynum*. 'Tally Ho.' The most uniform batch of hybrids I have ever seen. The reverse cross, using *R. eriogynum* as seed parent, is a straighter growing more compact bush, and while most of the blooms are very similar to 'Tally Ho' one plant has exceptionally brilliant flowers.

R. Griersonianum × *diaprepes*. Fast growing and inclined to be straggly. Large flowers of pink suffused with cream.

R. Sinonuttallii × *Lindleyi*. I tried for some years before I got this cross, and I never succeeded with the reverse cross. One only has bloomed to date. Flower creamy white with corolla lobes well expanded. I have not seen the flower, but capable judges give it praise.

R. grande × *giganteum*. Not yet flowered. The bush is a very good grower, with fine foliage dark green above and silver beneath. There may be some of these at Exbury as I sent MR. L. DE ROTHSCHILD some seed in 1935.

R. eriogynum × *auriculatum*. Good growers with very fine slightly bullate foliage. At seventeen years not all have bloomed, but among those that have, is a fine rich pink with light yellow centre.

A low growing form of *R. sperabile* from FORREST'S seed, crossed with an erect growing form gave some fine plants, with blood-red blooms larger and of heavier texture than those of either parent.

The above detail most of my first crosses that call for comment. Many others gave results similar to those obtained in England. Perhaps because I like to see a lot of variation in a batch of seedlings I have chiefly used hybrids or more complicated mongrels as parents. I got the variation all right, and here and there plants (and sometimes whole batches) that were well worth while. For instance, *R. barbatum* × a pink *R. arboreum* × *Griffithianum* (this is a guess at its parents) gave only one plant that was good—a nice compact truss of bright red. This crossed by *R. Griersonianum* gave a batch of very good plants—pinks, brick reds and deep reds.

R. arboreum × the above pink *R. Griffithianum* hybrid produced some good reds with paler centres. These ('Ilam Alarm') crossed with *R. Griersonianum* gave some of the best dark reds I have seen, with well built up trusses.

R. 'Lady de Rothschild' × *arboreum* gave one plant only that was notable—a brilliant cerise-red. *R. Thomsonii* × *Loderi* gave nice pinks, and one of these crossed back to *Loderi* gave a large-flowered, lovely pale pink.

Two pink Loderis crossed gave a rich pink of large size which does not fade. I named it 'I.M.S.' after my wife. A cream *R. campylocarpum* × *discolor* (an Exbury plant) × a lemon *Loderi* cross gave one good plant I called 'Canary'—a pale yellow, good truss and lasting well. *R. arboreum* × 'Pink Pearl' resulted in two good plants out of a whole batch—a large-flowered mauve-pink with a fine red blotch, and a good late-flowering red. The latter used on *R. dichroanthum* gave some nice plants. One has flowers clear rich yellow inside and yellow flushed orange-red outside.

I have what I regard as a very good form of *R. chasmanthum* raised from Chinese seed, and this I crossed with my best *R. Augustinii* and the result with a very good *R. russatum*. Most of the plants had blooms of pale blue, but one has blooms of clear violet. Named 'Ilam Violet,' I think it perhaps the best flowering shrub of this colour that we can grow here.

A big batch of seedlings of *R. eriogynum* × *R. Loderi*, *Loderi* × *auriculatum* and *Loderi* × *discolor* are now seventeen years old and up to 9 feet high. Some have bloomed, producing flowers of good quality and large size, which last well although they flower in mid-summer. Many have tints of cream or yellow and are attractive flowers. The plants are going to be tall growers for they are putting on longer growths now than they did earlier.

Enough of evergreen Rhododendrons. The above is too much of an *ex parte* statement, but not many other gardeners were breeding Rhododendrons until more recently, and as I have not seen any of their results, I cannot describe them.

One interesting deduction to be drawn from the results of some of my crosses is that the rigid upright rachis of *R. maximum* is dominant over a floppy rachis such as that of *R. Thomsonii*. I have not got *R. maximum*, but using some of its hybrids (especially *R. Halopeanum*), I have got good upstanding trusses, even when the other parent had a floppy rachis.

About 1917 I received from PROFESSOR C. S. SARGENT seeds of a number of North American deciduous Azaleas, including three varieties of *R. calendulaceum*—yellow, orange and red. From this last I got no reds, but rich orange flowers. In 1925 I purchased some

plants of the late ANTHONY WATERER'S breeding from Knap Hill Nurseries, and when these plants arrived in New Zealand (I had arranged for them to get here at the end of October) I crossed them with the varieties of *R. calendulaceum*. The resulting plants mostly had orange or yellow flowers, very sweetly scented, and all sterile to their own pollen. I have said that nor'-west weather here causes plants to set much seed (peaches, apricots and all fruit trees as well as Rhododendrons) and Azaleas particularly are so affected. I had noticed that some *R. calendulaceum* hybrids did not set seed (or only very occasionally) so I used the pollen of my own *R. calendulaceum* hybrids with the idea of producing self-sterile plants.

Digressing, I would say that honey bees will not cross two plants, even closely related ones, and even if they are growing mixed up together. A lady lecturer in botany from London University who was at 'Ilam' one day doubted this, and I put a bee in a bloom from one *R. occidentale* hybrid (one of the "issima" series) into a very similar plant next door. The bee finished in its bloom and, coming out, entered the next flower, but immediately emerged and entered the next. After trying four blooms it flew back to the plant it had come from, and again settled down to work. This is their ordinary behaviour here (and, I do not doubt, elsewhere)—they will work on one Rhododendron at a time—so that if a plant is sterile to its own pollen it will set practically no seed. Bumble bees, which are rather partial to the flowers of some evergreen Rhododendrons, do not seem to be attracted by the deciduous Azaleas.

The self sterility of *R. calendulaceum* hybrids is probably associated with the different chromosomal numbers of *R. calendulaceum* and the other Azaleas. By far the greater proportion of the second generation of *R. calendulaceum* hybrids are self sterile, and I have continued using these as parents, and at present have a great number of good plants—good trusses of large blooms of bright colours—which set very little seed unless artificially pollinated, and not always then. Curiously, the red colours in Azaleas are, as a whole, much more self-fertile than the other colours.

As this matter of setting seed is of the utmost importance to the Rhododendron grower, it is perhaps worth while enlarging on it. Many *R. Griersonianum* hybrids set very little seed unless crossed. A fine red I have from *R.* 'Doncaster' × *Griersonianum* has never set a seed despite all my efforts. A very good red *R. Griffithianum* hybrid has likewise defied me, and I have quite a lot of Azaleas that have yet to produce a seed pod. A nice flowered *R. yunnanense*, raised from Chinese seed, never sets seed naturally, and this type should be much more valuable as a garden plant than the normal forms, which tend to exhaust themselves through seed production. An examination of the chromosome numbers in the above plants may give some clue as

to the reason for their self-sterility, and this I hope to have done in the near future; but, whatever the cause, self-sterility is a most valuable character in Rhododendrons, from the viewpoint of the ordinary gardener.

In 1930, when I was in England, I was able, through the kindness of MR. LIONEL DE ROTHSCHILD, to make some crosses among Exbury Azaleas, and the seed when ripe was forwarded to me here. So I had some good stock to start with, and have done a considerable amount of crossing with them and WATERER'S plants, using some large-flowered *mollis* as an out-cross, but mainly keeping to ANTHONY WATERER'S plan of crossing similar colours. In 1925 WATERER'S best reds were first class in colour, though the blooms were small and the trusses carried only seven or eight flowers. Among my first crosses I had the luck to get a red with twelve good blooms to the truss, and using this, have now got very good reds with fair sized blooms. This particular line is less fertile than my other reds.

In regard to cultivation, I had a lot of trouble many years ago through digging in leaf mould in one area when planting Rhododendrons. The mould was derived partly from lawn mowings, and although well rotted (it was a brown powder that my head gardener said "Would make your mouth water") caused yellowing of the leaves and stunted growth for about eight years. Since then I have used leaf mould only as a mulch. Being afflicted with a soil with a tendency to "cake" I tried various schemes for keeping it open until, some fifteen years ago, I tried sawdust. The results were so spectacular that I have used it in large quantities ever since. I am fortunate in being nearer to a mill than its sawdust dump, and I can get quantities for the asking. It is almost entirely sawdust from *Pinus radiata* and I use it as a mulch, or dig it in, fresh and green, straight from the mill. It is most useful for covering a good layer of fresh leaves, to stop them blowing away, but by itself, a layer four to six inches thick has wonderful moisture retaining properties. I have used many hundreds of cubic yards of it, and to date have found nothing that did not benefit from it. Magnolias particularly thrive on it, and will layer in it readily, even those that are regarded as difficult to layer in ordinary soil. I think I remember that in England you have a fungus that lives on pine roots, and that attacks Rhododendrons, but if there is no reason of this sort against the use of sawdust I feel sure that it will be found most useful as a provider of humus. One word of warning, however: it must be applied when it and the ground are both thoroughly wet, otherwise it may dry up the soil instead of causing a retention of moisture. Sawdust has the great advantage over most other forms of humus that it is entirely free of weed seeds, and by its use I have reduced the hoeing of my Rhododendron beds by 90 per cent.

The New Zealand Rhododendron Association, which was formed some three years ago, is flourishing, and the genus will undoubtedly receive much more attention from gardeners here in the coming years. This article is intended to give some idea of Rhododendrons in this country, but what New Zealand growers would like would be for English enthusiasts to come out and see the plants for themselves.

HYBRID RHODODENDRONS IN THE PACIFIC NORTHWEST

BY HERBERT G. IHRIG

FINE hybrid Rhododendrons have been grown in the Pacific Northwest for a number of years, but it is only within approximately the last decade that a widespread interest has been evident. This is due in a large measure to the fact that there was a very limited American literature on Rhododendrons and most of this dealt with conditions prevailing along the North Atlantic seaboard where hardiness was a factor of first importance. As a result only a few really choice hybrids were known and nursery stocks were confined chiefly to the early Waterer hybrids and similar ultra hardy varieties.

To appreciate the conditions under which Rhododendrons are grown in this area it is necessary to realize first that our climatic conditions are entirely different from the rest of the United States. This is especially true of the western slope of the coast mountains. In Seattle, for instance, while the average rainfall is only thirty-six inches, it is fairly well divided with frequent light rains during the spring and summer months. There is an absence of extremes of heat or cold and many winters the thermometer touches freezing on only five to twenty days. Late frosts after February are the exception.

Garden conscious people who realized this fact led in the introduction of the finer English and Dutch hybrids. Many of us did this sparingly at first, wondering just how applicable the English hardiness ratings were to our conditions. Time and experience, however, have adjusted our thinking and proved the merit of these ratings. My first English purchases, which were made about seventeen years ago, included such hybrids as 'Glory of Littleworth,' 'Cornubia,' and *Barclayi* var. 'Helen Fox,' all rated *E*. These are now huge plants and over this period have produced a gorgeous display of flowers each year with the exception of 1943. Later *fragrantissimum* (*F*) was among the more tender varieties added, and this likewise has never been cut excepting the same year and then only the flower buds and some new wood which had not fully matured.

To-day I do not hesitate to purchase any plant as tender as *E*, but hasten to add that I have a favoured garden near salt water and with splendid air drainage. There are many other such locations in the Pacific Northwest, but plants with tender ratings are not recommended for the average garden.

Following the winter of 1942–3, which was the coldest in over fifty years, the writer as chairman of the Rhododendron Committee of the Arboretum Foundation sent out questionnaires to most of the principal growers of the Northwest, from Vancouver, British Columbia, to San Francisco, California, to determine just how various Rhododendrons had withstood this experience and check with the English ratings. The result of this study indicates that plants rated *A*, *B*, and *C* withstood temperatures as low as five degrees above zero without serious injury, and therefore can be considered hardy for the average garden. Plants rated *D* showed some defoliation and many buds were cut, but few plants were lost. This rating seems applicable to the more favoured gardens which are free from high winds and have suitable natural protection. *E* ratings proved suitable only for the gardener with ideal conditions. Plants rated *F* all suffered and while there were many losses a large number recovered and are again flowering nicely.

There are two summer factors which have an influence on the growth and flowering of Rhododendrons in this area. They are sun and shade. Here the periods of brilliant sunshine are comparatively short, broken by light clouds or filtered by moisture in the air. Therefore many plants are successfully grown in so-called "full sunlight," although this does not apply to all. The word "shade" is so loosely used that here more than most places it may be a retarding factor in flowering rather than a help. This is partly due to the heavy conifers which are indigenous of the Pacific Northwest. Their branches are so dense they often form a dark canopy over plants, and such excessive shade will definitely retard the flower crop. Our experience proves that a prime factor in the flowering of Rhododendrons is light and plenty of it. North light is preferable, but since that is not always available, shade where it is used should be studied to see that while it gives protection from continuous sunshine it is nevertheless of a soft quality which permits the free access of light to the plants. A proper balance of these factors is one which varies with different plants and different locations, but this balance may often be a determining factor in growing fine flowers.

Growers of hybrid Rhododendrons in the Pacific Northwest area are confronted with several other problems which arise from our inexperience and lack of adequate information. Chief among these are the eventual size of the plant, the rapidity of growth and the flowering time. As a result plants are often misplaced and sometimes condemned, for they may soon outgrow their location, fail to flower at the desired time or prove inappropriate for the space available. Information of this nature is published in the year book for species, but there is no adequate information to aid us on hybrids.

The creation of Rhododendron hybrids has been carried on in

Eastern United States for a number of years, but is comparatively recent in the Pacific Northwest. This is probably due to the limited number of species available and a difference in objectives. In the east, especially in the North Atlantic States, their purpose has been to secure good hybrids primarily of the so-called ultra hardy types which will withstand the rigours of their winter weather. In our area this has not been the case and we have in a large measure preferred to take advantage of the long experience of hybridizers in England and Western Europe. Not only can this be done in our climate and thereby gain more immediate beauty, but the background of appreciation evidenced in the long period of English Rhododendron study is far too important to be overlooked. While few people can agree on the relative merits of an individual plant, the widespread acceptance of the English merit ratings is proved in the sale of plants at the nurseries.

We do sometimes wonder why the four star ratings seem to be given so freely to the "reds," but few of us would question their merit, especially since the finer reds of to-day are so far superior to the off-colour reds which we formerly grew and which are still so much in evidence in Eastern United States.

Now that many fine species are flowering in the Pacific Northwest, hybridizing is increasing and some excellent results have already been obtained, but few are in commerce as yet. It would take a brave and extremely optimistic man to attempt to better such plants as *Loderi* var. 'King George,' 'Earl of Athlone' and many others, so I am of the opinion that efforts here will be directed towards different types and new "breaks" rather than by following the old trails so well marked by British experience. There is great need of more hybrids with fine flowers which remain of modest height more suitable for the small garden. Already some effort is being directed toward this end.

There are also several growers trying to transmit the fragrance of such plants as *R. crassum* and *fragrantissimum* into more hardy varieties, so far without much success.

R. occidentale is also being experimented with, not only on account of its fragrance but its natural beauty as well. This plant varies greatly in the wild, both in colour and fragrance, and will surely produce some notable offspring when hybridizers use it more freely.

There is also a great need of hybrids which will flower in late June and July. While we read of some splendid ones growing in England, very few have been imported into the United States. This offers an excellent field for the Pacific Northwest hybridizer, and no doubt many new varieties will be developed here as soon as more stock suitable for parentage is available.

Undoubtedly some years will elapse before hybrids from this section will assume any real importance in the garden world, not only because of the time required for new crosses to reach flowering age, but because we lack the experience that has gone into the long period of trial and error which lies back of the modern Rhododendron hybrid.

A REVIEW OF RHODODENDRONS IN THEIR SERIES

1. *The Anthopogon Alliance*

BY DR. J. MACQUEEN COWAN AND H. H. DAVIDIAN, B.Sc.

WHILE all Rhododendrons share certain common characteristics which distinguish them from other plants, those in one or other of the well-marked natural associations within the genus have certain particular linking features which serve to indicate the close relationship between them. Rhododendrons which have small flowers, narrowly tubular with a spreading limb, arranged in a compact, rounded, terminal cluster, constitute one such distinctive group. The first dwarf evergreen Rhododendron to be described, having the above characteristics, was *R. anthopogon* D. Don, and this was so unlike any other known Rhododendron that it was placed in a group by itself, which was known as the Pogonanthum (Beard-flower) Section, but later other species from China were placed with it in the same section. Eventually, when some thirty-three species with the above-mentioned characteristics had been described—from India, Burma, Tibet and China—they were taken to constitute, not one, but three distinctive series—the Anthopogon, the Fragrans and the Cephalanthum Series.

At the time when *The Species of Rhododendron* was published it was thought that segregation had gone too far and the three series were reduced to two by the amalgamation of the Fragrans Series with the other two; moreover it was emphasised that between the remaining Anthopogon and Cephalanthum Series a very close affinity exists.

Recently the similarity between the species of these two series was forcibly impressed upon me. In the course of an examination of the hairs and scales on the leaves of Rhododendrons I had discovered a further feature shared in common by the species of the two series—a distinctive type of scale. The scale is funnel-shaped and the margin of the funnel is deeply indented. Now this distinctive type of scale, which I have called a Lacerate Scale and which is illustrated (Fig. 22), is common to every Rhododendron in the two series; and yet no other Rhododendron whatsoever has scales of this description. (The scales of most Rhododendrons are peltate and have an entire, unindented rim.) A feature so remarkable and shared by a number of species is suggestive not merely of a very close affinity between them but is also a strong indication of a single natural association rather than of more than one.

With this in mind, I turned to investigate the criteria upon which the two series, and earlier the three separate series, had been founded. SIR ISAAC BAYLEY BALFOUR, who first arranged the species in three series, used the colour and the compactness of the indumentum as the main criterion of distinction. Later collectings have shown, however, that there is a gradation of colour and a varying degree of compactness, indeed, a very wide variation even in the leaves of one species, so that for the determination of series these criteria are unreliable. This fact was fully realised when *The Species of Rhododendron* was published, and the Fragrans Series was therefore suppressed, and new characters were found to distinguish the reconstituted Anthopogon and Cephalanthum Series. But what of the new criteria? The characters chosen were the number of stamens (more than 5 in the Anthopogon Series, 5 in the Cephalanthum Series) and the persistence or non-persistence of the "perulae" or leaf-bud scales. To test the validity of these criteria, it is necessary only to refer to the descriptions in *The Species of Rhododendron* and to the original descriptions, comparing the species in the two series. It will be observed that in the Anthopogon Series the species *R. haemonium* Balf. f. & Cooper, *R. rufescens* Franch. and *R. tsarongense* Balf. f. & Forrest have, or sometimes have, only 5 instead of more than 5 stamens, while in the Cephalanthum Series one species (*R. crebreflorum* Hutch. & Ward) has 6 stamens. Again, *R. cephalanthum* Franch. itself, said to have 5 stamens, has, according to the original description, 7–8 (Franchet in *Bull. Soc. Bot. Fr.*, vol. xxxii (1885), p. 9), while an examination of authentic specimens shows that the number may be 5, 6, 7, or 8 with variation even in different flowers of the same inflorescence. As to the leaf-bud scales, it will be observed that the majority of species in both series have deciduous leaf-bud scales, whilst in several species in both series they are persistent. Thus, these criteria are no more consistent than is the colour and compactness of the indumentum. To segregate species into different series on unstable characters such as these, merely leads to confusion.

What has been said confirms the opinion of DR. HUTCHINSON, who remarked, when in 1937 he described *R. kongboense* (*Bot. Mag.*, t. 9492): "I have indicated the affinity of this new species with *R. daphniflorum* Diels, and on account of that relationship the species should be included in the Cephalanthum Series, although it might be equally well placed in the Anthopogon Series. As noted in the Rhododendron Society's book, however, these two series are scarcely separable and a better classification would be attained if they were amalgamated and the species regrouped, paying particular attention to the gradual reduction in the number of stamens from ten to five."

The whole evidence is so convincing that I have no hesitation in uniting the two series into one, to be known as the Anthopogon

Series, and there will be no dubiety about the species which fall into this series—they all have a narrowly tubular corolla with a 5-lobed spreading limb, and lacerate scales.

Accordingly, when I was asked to contribute a paper to the *Rhododendron Year Book*, I considered that a review of the Anthopogon Series in the wider sense would be a fitting subject to choose. Such a review might serve as a first instalment towards the revision of *The Species of Rhododendron* which in due course must be contemplated, and which altogether will involve a large amount of work, best begun early and continued from time to time. To complete the work in the time at my disposal would not have been possible had I not been fortunate in securing the co-operation of MR. H. H. DAVIDIAN, B.SC. It is he who has undertaken much of the careful dissection and detailed investigation that a revision, even of a single series, entails.

OBSERVATIONS ON THE ANTHOPOGON SERIES

In the Anthopogon Series we can follow in outline almost the whole history of the growth of the genus.

It begins with *R. anthopogon* D. Don, which appears in Wallich's Catalogue (No. 759) from Gossain Than in Nepal and from Kumaon, and was described in 1821. By then it had already been introduced and was well established in cultivation. The illustration (Fig. 17), from a photograph by the late SIR GEORGE WATT, shows it in its natural habitat, as it grows on Mt. Hattii in the N.W. Himalayas; the other (Fig. 18) shows it in the Rock Garden at the Royal Botanic Garden, Edinburgh.

SIR JOSEPH HOOKER added no new species to this series but records finding *R. anthopogon*, and in his Monograph on Sikkim Rhododendrons writes of "the rich blush of the first opening blossoms which insensibly passes into snowy white, then faintly tinged with sulphur—all colours seen on one and the same plant."

From Eastern Siberia we have *R. Adamsii* Rehd., described as *R. fragrans* by MAXIMOWICZ in 1870, but discovered by ADAMS on the banks of the Lena as early as 1808. DE CANDOLLE had included this plant in the genus Osmothamnus, so that it was lost sight of as a Rhododendron for some time.

Then came *R. anthopogonoides* Maxim. from Kansu in 1872, described by MAXIMOWICZ in 1877, and *R. Collettianum* Aitch. & Hemsl., collected by GENERAL COLLETT and DR. AITCHISON in Afghanistan during the Kurram Expedition of 1879.

To the French missionaries in Yunnan we owe, in this as in other series, the earlier species from Western China—*R. cephalanthum* Franch., *R. primulaeflorum* Bur. & Franch., and *R. trichostomum* Franch.

All the remaining twenty-four species in the series were first found during the present century—the majority in Yunnan but with representatives from Kansu, Szechuan, Tibet, Upper Burma, Bhutan and Assam, discovered by FORREST, FARRER, WARD, WILSON, LUDLOW and SHERRIFF, and FANG.

When we turn to examine the species in detail, we notice in this as in other series that while the earlier species are distinguished by fairly well marked characteristics, those that are later described are less well defined and that for their diagnoses we generally must depend upon a number of minor distinctions, which frequently seem liable to fluctuation. It is a common tendency, when interest has been aroused in a genus, that differences rather than similarities should be looked for and, when a genus is subjected to critical study, what might have been regarded as a variable species is apt to be transformed and to become a series of closely allied microspecies. This tendency is marked in various series of Rhododendrons, and undoubtedly is evident in the series under discussion. It partly accounts for the relatively large number of species added in more recent years, and it is in conformity with this tendency that *R. anthopogon* D. Don became three species—*R. anthopogon* D. Don, *R. haemonium* Balf. f. & Cooper and *R. hypenanthum* Balf. f.

A very full and critical account of this series by SIR ISAAC BAYLEY BALFOUR will be found in the Notes of the Royal Botanic Garden, Edinburgh, vol. ix (1916), and many new species are described therein. But by 1916 only about half the pre-war period of active collecting in Western China and neighbouring regions had elapsed, and since then a very large number of specimens have been collected, and we have learnt more about the newer plants in cultivation.

We have already seen how, when *The Species of Rhododendron* was published, the Pogonanthum Section, which had become three series, was reduced to two, and in fact we have but a single natural alliance. As to the species, all the later evidence points to the conclusion that at this level also there has been over segregation. Indeed our newfound material places us in a dilemma because we frequently come across plants which do not agree exactly with any described species but have some features of one species, others of another. Many of the recent collections have an equal claim to one or another specific name. How are we to name such plants as these? Are we again to make new species, new varieties or forms? From our further knowledge of the genus it has become clear that certain closely allied species, apparently distinct enough when only a single specimen of each was known, are linked by numerous intermediate forms.

Take as an example the sequence *R. trichostomum* Franch., *R. ledoides* Balf. f. & W. W. Sm., *R. hedyosmum* Balf. f., *R. radinum*

Balf. f. & W. W. Sm. and *R. sphaeranthum* Balf. f. & W. W. Sm. From *R. trichostomum*, the first to be described, *R. ledoides* in its typical form differs *mainly* in its linear-lanceolate leaves, *R. hedyosmum* in its larger flower, *R. radinum* in the corolla being densely scaly outside, and *R. sphaeranthum* in having linear-lanceolate to oblong-lanceolate leaves and a partially scaly or not scaly corolla.

But let us investigate more closely. We find that in the original description of *R. trichostomum* the leaves are described as ovate to ovate-oblong, but the description in *The Species of Rhododendron* is modified to narrowly oblanceolate in order to include the co-type (Delavay No. 2626). In Soulié No. 186, generally accepted as *R. trichostomum*, the leaves are linear-lanceolate. Some specimens of *R. trichostomum*, therefore, correspond to *R. ledoides* in their leaf shape, and also to *R. radinum*, where again the leaves are linear-lanceolate or oblanceolate. It is interesting to note that among specimens of *R. radinum* we find some with leaves which are oblong to ovate-oblong as in typical *R. trichostomum* (e.g. Rock 17657) and others with both ovate-oblong and linear-lanceolate leaves (e.g. F. 15449), so that there is variation within fairly wide limits. Again the leaves of *R. sphaeranthum*, described as oblong-lanceolate, are for the most part elliptic, but they also are very variable. It is obvious, therefore, that leaf shape cannot be regarded as a reliable characteristic by which to recognise *R. ledoides*.

Now as to scales on the corolla—the main distinguishing feature of *R. radinum*—we find that in the type of *R. radinum* the corolla, both tube and lobes, is densely scaly outside, but in other specimens the lobes only are scaly. As to *R. ledoides*, according to the original description the corolla is sparsely scaly, but this is contradicted in *The Species of Rhododendron*, where the description emphasises that the corolla is elepidote. To *R. sphaeranthum* the same remarks are applicable. We find both—sparsely lepidote and elepidote corolla lobes—in different specimens of *R. ledoides* and *R. sphaeranthum*.

We have then, within this group of recognised species, a wide range in the two characters we have discussed. Nor can we correlate the variations in the characters with each other. Plants with linear-lanceolate leaves have corollas with varying degrees of scaliness, plants with densely scaly corollas are not constant as to leaf shape, and so on. It is clear, therefore, that neither of these characters can provide definite lines of demarcation between the species, nor are any other characters, such as the size of corolla or the persistence of the leaf-bud scales, more consistent. Of the unreliability of the diagnostic criteria we have the further evidence of plants in cultivation, confirming what has been said in the preceding paragraphs. Indeed, they seem to show that from seed of any one of these species it is possible to raise plants of the others—for example, when seed

of *R. radinum* is sown we are likely to raise seedlings not only of *R. radinum* but also of *R. ledoides* and *R. sphaeranthum*.*

For all the reasons given, in this instance, we have come to the conclusion that the five presumed species represent, in fact, only one true species which has a number of variant forms, or at best a number of varieties. The first published name *R. trichostomum* must therefore be applied to the group, and this species must now be regarded as more variable than was originally supposed.

We have discussed this problem in some detail in order to explain why we have thought it necessary to make certain changes in nomenclature and to illustrate the sort of problem by which, at various points in the course of this survey, we have been confronted.

The Anthopogon Series is doubtless one of the more difficult assemblages of Rhododendrons, in which lines of demarcation between the species are seldom well marked. Therefore, before deciding which species, in the light of the latest evidence, should retain their status, which should disappear and what among the collector's discoveries still remains to be named, we must consider in some detail the somewhat inconsistent characteristics which are available as diagnostic criteria and these are found in the analytical keys to the two series in *The Species of Rhododendron* and in the original diagnoses. We may take these characteristics in turn and endeavour to assess their value.

First, let us consider the number of stamens, which is one of the most stable characters that can be used, but even here, as we have seen, there is inconsistency. The majority of species have 5 stamens, one species has 10 (*R. Collettianum* Aitch. & Hemsl.), four species have 6–8 (*R. anthopogon* D. Don, *R. haemonium* Balf. f. & Cooper, *R. hypenanthum* Balf f., and *R. crebreflorum* Hutch. & Ward), one species (*R. cephalanthum*, Franch.) has 5, 6, 7 or 8.

Secondly, the filaments are hairy or not hairy—but vary even in the same flower. Hairs when present are confined to the base of the filament except in *R. Collettianum* Aitch. & Hemsl., where the whole filament may be hairy. Moreover the filaments are sometimes minutely puberulous and, unless very carefully scrutinised, appear to be glabrous, and besides, in one flower some of the stamens are minutely or sparsely puberulous, others are glabrous. Since this character seems comparatively unimportant and is unreliable we have avoided its use in the analytical key.

Then in this series the ovary is normally scaly, but in the two species *R. laudandum* Cowan and *R. anthopogonoides* Maxim. the

* In other species, e.g. *R. Sargentianum*, where there is no confusion, cultivated plants, in our experience, come true to type, except that the undersides of the leaves of cultivated plants of *R. anthopogon* and *R. hypenanthum* are not always the typical reddish-brown.

ovary is hairy as well as scaly, a useful and important diagnostic mark, though inconstant in the latter species. *R. primulaeflorum* is said by FRANCHET to have a glabrous ovary. We have seen in several other species casual examples of ovaries without scales or very sparsely scaly; but this condition (as we shall explain more fully later) would appear to be merely incidental. The length of the style varies in different species—shorter than the ovary, equalling the ovary or somewhat longer than the ovary.

Again the presence of scales on the outside of the corolla is a noteworthy feature of the following species:—*R. Sargentianum* Rehd. & Wils., *R. lepidanthum* Balf. f. & W. W. Sm., *R. radendum* Fang and *R. radinum* Balf. f. & W. W. Sm. In these species the corolla is *densely* scaly, in all others it is sparsely scaly or not scaly. When we use this character as diagnostic the contrast is between *densely* scaly on the one hand, not scaly or very slightly scaly (1–2 scales on each lobe) on the other.

The corolla tube is densely hairy outside in *R. laudandum* Cowan, *R. kongboense* Hutch. and *R. cephalanthoides* Balf. f. & W. W. Sm. (part) and is a useful diagnostic character. The corolla of *R. cephalanthoides*, however, is normally glabrous outside. The size of the corolla is too variable to be an absolute criterion of distinction, but *R. kongboense* Hutch. can sometimes be distinguished from *R. cephalanthoides* Balf. f. & W. W. Sm. by its exceedingly short corolla and *R. hedyosmum* Balf. f. is outstanding amongst its associates because of an exceptionally long corolla tube.

Also in the series the colour of the flowers is variable—white, white with yellow tube, yellow, pink, white flushed with pink, rose or purple. As in *R. anthopogon*, and remarked by SIR JOSEPH HOOKER, there is often more than one colour form in a single species.

An exceptionally small calyx is a constant characteristic of *R. trichostomum* Franch., *R. ledoides* Balf. f. & W. W. Sm., *R. radinum* Balf. f. & W. W. Sm., *R. sphaeranthum* Balf. f. & W. W. Sm. and *R. hedyosmum* Balf. f. The calyx varies in *R. rufescens* Franch., short or sometimes longer. A calyx long in relation to the corolla tube is a feature of *R. kongboense* Hutch. As to the calyx lobes, scaly or not scaly outside, there is wide variation in the same species, even in a single inflorescence; sometimes the scales are confined to the back of the lobes, sometimes to the margin, or they appear on both back and margin or are entirely absent, moreover, the scales are either densely or sparsely distributed. *R. anthopogonoides* Maxim., however, appears to be consistent in that the calyx is invariably not scaly. Further, the margins of the lobes are ciliate or eciliate. The cilia are densely or sparsely and irregularly distributed, confined to the apex or to the upper part of the lobes or over the entire margin. This character is so variable that we are compelled to consider it of

little diagnostic value, although in *The Species of Rhododendron* it is used in both series. Finally in some species the surfaces of the calyx lobes are puberulous, but this again is an inconsistent character.

The flower stalk is invariably short, from 2–4 mm. long, and is glabrous or scaly or sometimes bristly.

Leaf-bud scales when persistent are a conspicuous character and probably more constant for the diagnosis of species than many other available criteria. We find it holds in most instances, none the less in *R. lepidanthum* Balf. f. & W. W. Sm. the bud-scales are somewhat persistent on the type but are deciduous on the co-type, and in *R. ledoides* Balf. f. & W. W. Sm. and *R. radinum* Balf. f. & W. W. Sm. more or less persistent. We have avoided using this character for species variable in this respect.

The presence of bristles on the branchlets is not a definite diagnostic character since all gradations from non-bristly to densely bristly may be observed. The branchlets are invariably scaly.

But bristles on the surface and margin of the leaf is a noteworthy feature in *R. radendum* Fang and *R. pogonophyllum* Cowan & Davidian. As to the form and size of the leaves typical *R. ledoides* Balf. f. & W. W. Sm. and *R. radinum* Balf. f. & W. W. Sm. both have linear-lanceolate leaves, 4–5 times as long as broad. The relatively large leaves (up to 5 cm. long and 2·6 cm. broad) make it possible to recognise *R. platyphyllum* Balf. f. & W. W. Sm. at a glance. In all other species the size and shape of the leaves are variable, mainly elliptic, oblong, ovate or obovate, varying within these limits in a single plant. The under side of the leaf is notably reddish to dark reddish-brown in *R. anthopogon* D. Don, *R. haemonium* Balf. f. & Cooper, *R. hypenanthum* Balf. f., *R. rufescens* Franch. and sometimes in *R. chamaetortum* Balf. f. & Ward; a darker reddish or chocolate-brown in *R. laudandum* Cowan. In other species the under surface varies from olive-brown to fawn or pale reddish-brown—in *R. tsarongense* Balf. f. & Forrest, *R. cephalanthum* Franch., *R. chamaetortum* Balf. f. & Ward, *R. cephalanthoides* Balf. f. & W. W. Sm. and *R. clivicola* Balf. f. & W. W. Sm. being either olive-brown or reddish-brown, and in cultivated plants of *R. anthopogon* D. Don and *R. hypenanthum* Balf. f. frequently olive-brown.

The lacerate type of scale illustrated in Fig. 22 is common to all species.

SPECIES IN THE SERIES

Thus far we have been considering the species as set out in *The Species of Rhododendron*. Herbarium material has been available of all the described species except *R. Adamsii* Rehder and *R. radendum*

recently described by Fang, and we have seen many of them in cultivation. After a detailed and careful investigation, we have come to various conclusions.

We have seen how varying the species are in the criteria which distinguish them and we find it necessary to make "reductions"; a number of those which have been given full status in *The Species of Rhododendron* will appear as synonyms or varieties; the "reductions" indeed might have gone further. Our aim has been to make it possible to assign the many variant plants in the collections each to a definite specific name; for this reason we have amplified the descriptions of certain species, which by later collections are shown to be variable. Further segregation would depend upon the use of characters (such as the size and colour of the flower, the scaliness of the calyx, the number of cilia on the calyx margin, and the presence or absence of hairs on the filaments) which we have shown to be so fluctuating that their general use makes it impossible to name plants with any certainty. As a matter of convenience we have retained some specific names as varieties to denote certain aspects of variable species, although in this series, those and other variant forms would seem to be sufficiently designated by the specific name. A number of errors in the descriptions in *The Species of Rhododendron* have been corrected and one new species has been added.

We find, after a detailed examination of all the species in the series, that some may be recognised by more outstanding characters and that they fall into the following groups. First, species characterised by bristles on the leaves: *R. radendum* Fang and the new species of LUDLOW and SHERRIFF, to which we give the name *R. pogonophyllum* Cowan & Davidian. Second, species with more than 5 stamens: In this group we have four species—*R. Collettianum* Aitch. & Hemsl. (10 stamens), *R. anthopogon* D. Don, *R. hypenanthum* Balf. f. and *R. cephalanthum* Franch. Since in all but *R. Collettianum* the number is occasionally reduced to 5 we have had to reintroduce these species a second time in the key. *R. pogonophyllum*, mentioned above, also has 6 stamens. Third, species in which the ovary is distinctly hairy as well as scaly: *R. laudandum* Cowan and *R. anthopogonoides* Maxim. In *R. laudandum* var. *temoense* and rarely in *R. anthopogonoides* the ovary is, however, sparsely hairy or not hairy, as shown in the analytical key. Fourth, species in which the leaves are linear-lanceolate and the calyx is short, only 1–2 mm. long: *R. trichostomum* Franch. (except a few specimens with ovate-oblong leaves); *R. ledoides* Balf. f. & W. W. Sm. and *R. radinum* Balf. f. & W. W. Sm. also fall into this group. Fifth, species or varieties in which the corolla tube is markedly puberulous outside: *R. kongboense* Hutch., *R. laudandum* Cowan and *R. primulaeflorum* Bur. & Franch. var. *cephalanthoides* (= *R. cephalanthoides* Balf. f. & W. W.

Sm.). Sixth, species or varieties with the corolla tube and lobes densely scaly outside: *R. Sargentianum* Rehd. & Wils. and *R. trichostomum* Franch. var. *radinum* (part) (= *R. radinum* Balf. f. & W. W. Sm.). Seventh, one species with broadly ovate or rounded, leafy, persistent bud-scales: *R. platyphyllum* Balf. f. & W. W. Sm. The remaining species are less well defined; the most reliable character by which, in the first place, to separate them is the persistence or non-persistence of the leaf-bud scales. *R. cephalanthum* Franch. is in the first category. In the second category, *R. rufescens* Franch. may be segregated because the under sides of its leaves are dark reddish-brown. We are left with *R. anthopogonoides* Maxim., where the calyx is invariably not scaly (the leaves are ovate, broadly rounded at the base), and with the two variable species, *R. primulaeflorum* Bur. & Franch. and *R. trichostomum* Franch., where the leaves are elliptic, hardly rounded at the base. In *R. primulaeflorum* Bur. & Franch. the calyx is relatively large (4–5 mm.) and the leaves are narrowly elliptic, whilst in *R. trichostomum* Franch. the calyx is small (1–2 mm.) and the leaves (with few exceptions) are linear-lanceolate. We have explained why we regard *R. trichostomum* Franch. as a variable species; to *R. primulaeflorum* Bur. & Franch. and *R. cephalanthum* Franch. similar arguments apply, which are set out in the notes following the descriptions.

For an assemblage of closely allied species with varying features, such as the Anthopogon Series, it is difficult to draw up an analytical key, and in order to avoid possible confusion we have had to introduce 5 of the species in more than one section of the key. The new key has been tested, and with its use the specimens examined (with a few exceptions) fall readily into their proper place.

Following the sequence in *The Species of Rhododendron*, the Anthopogon Series as revised is set out in the following pages, with amended descriptions and explanatory notes.

ANTHOPOGON SERIES

General character: Small shrubs; leaf-bud scales deciduous or less often persistent on the branchlets. Leaves evergreen, small, densely scaly below, *scales of the lacerate type*. Inflorescence terminal, *capitate*, flowers few to many, white, yellow, rose or purple; *flower stalks very short*; calyx usually well developed, often scaly outside and fringed with hairs. *Corolla narrowly tubular with a 5-lobed spreading limb*, villous within the throat, glabrous or densely scaly, or puberulous outside. *Stamens* 5–10, usually 5, *included*; ovary 5-celled, usually scaly, rarely hairy and scaly, seldom glabrous; style short and thick, glabrous. Capsule small, scaly, often enclosed in the persistent calyx.

THE ANTHOPOGON ALLIANCE

FIG. 17—*Rhododendron anthopogon* in its natural habitat, N.W. Himalayas, summit of Mt. Hattii near Simla (See p. 57)

Photo by Sir George Watt

FIG. 18—*Rhododendron anthopogon* in the Rock Garden, Royal Botanic Garden, Edinburgh (See p. 57)

THE ANTHOPOGON ALLIANCE

FIG. 19—*Rhododendron cephalanthum* in the Rock Garden, Royal Botanic Garden, Edinburgh (See p. 69)

KEY TO THE SPECIES

A. Leaves bristly.
  B. Leaf-bud scales deciduous; corolla densely scaly outside; calyx 1–2 mm. long, ovate; stamens 5. (Flowers purplish-white) . . . . . *radendum*
  B. Leaf-bud scales persistent; corolla not scaly outside; calyx 5–6 mm. long, pointed; stamens 6. (Flowers white to pink) . . . . . *pogonophyllum*

A. Leaves not bristly.
  B. Stamens 6–10.
    C. Stamens 10. (Flowers white tinged with rose) . *Collettianum*
    C. Stamens 6–8.
      D. Leaf-bud scales deciduous. (Flowers pink, white or yellow) . . . . . *anthopogon* (part)
      D. Leaf-bud scales persistent.
        E. Flowers yellow.
          Under surface of leaves usually dark reddish-brown . . . . . *hypenanthum* (part)
        E. Flowers pink or white.
          Under surface of leaves usually pale brown to fawn . . . . . *cephalanthum* (part)
  B. Stamens 5.
    C. Ovary hairy, scaly.
      D. Corolla tube hairy outside; under surface of leaves chocolate brown; calyx scaly outside; flower stalk scaly. (Flowers palest pink, almost white) . . . . . *laudandum*
      D. Corolla tube not hairy outside; under surface of leaves yellowish-green or fawn; calyx not scaly outside; flower stalk not scaly. (Flowers white, yellow, greenish-yellow, whitish-pink) . . . . . *anthopogonoides* (part)
    C. Ovary not hairy, scaly.
      D. Leaves linear or linear-lanceolate, 4–5 times as long as broad; calyx minute, 1–2 mm. long. (Flowers pink or white) . . *trichostomum* (part)
      D. Leaves wide, elliptic to oblong, obovate or rounded; calyx large, 4–8 mm. long (except *R. rufescens* 2–3 mm.)
        E. Corolla densely scaly outside.
          F. Corolla tube and lobes scaly outside; leaf-bud scales persistent. (Flowers lemon-yellow) . . . . *Sargentianum*
          F. Corolla lobes scaly outside; tube not scaly; leaf-bud scales deciduous. (Flowers white) . . . . *primulaeflorum* var. *lepidanthum*

E. Corolla not scaly or sometimes lobes slightly scaly outside.
F. Corolla tube markedly puberulous outside.
G. Under surface of leaves chocolate-brown; leaf-bud scales persistent. (Flowers white) . . *laudandum* var. *temoense*

G. Under surface of leaves pale brown or fawn; leaf-bud scales deciduous.
H. Corolla short, 8–10 mm. long. Flowers rose . . . *kongboense*
H. Corolla long, 12–14 mm. long. Flowers white with yellow tube, or white or yellow . *primulaeflorum* var. *cephalanthoides*

F. Corolla tube not puberulous or sometimes very slightly puberulous outside.
G. Leaf-bud scales persistent.
H. Leaves about 5 cm. long, nearly 2·6 cm. broad; leaf-bud scales broadly ovate or rounded. (Flowers white, occasionally faintly flushed rose) . . . . *platyphyllum*
H. Leaves 1·3–4·2 cm. long, 0·8–2 cm. broad; leaf-bud scales narrow, linear or lanceolate.
I. Under surface of leaves usually dark reddish-brown. Corolla not scaly outside. Flowers yellow *hypenanthum* (part)

I. Under surface of leaves usually fawn.
J. Corolla not scaly outside. Flowers white or rose . . . *cephalanthum* (part)

J. Corolla lobes sparsely scaly outside. Flowers yellow . . . *cephalanthum* var. *nmaiense*

G. Leaf-bud scales deciduous.
H. Under surface of leaves dark reddish-brown.
I. Leaves 1–1·9 cm. long. (Flowers white or pink) *rufescens* (part)
I. Leaves 2·6–3·8 cm. long.
J. Calyx 2–3 mm. long. (Flowers white or pink) . . . *rufescens* (part)
J. Calyx 4–5 mm. long. (Flowers pink, white or yellow) . . *anthopogon* (part)

H. Under surface of leaves pale brown, olive-green or fawn.
I. Calyx large, 4–5 mm., sometimes 3 mm. long.
J. Flower stalk scaly; calyx scaly outside; leaves narrowly elliptic, 5–8 mm. broad, rarely more, narrowed at base or narrowly rounded. (Flowers white with yellow tube, white, yellow, purplish or pale rose) *primulaeflorum*
J. Flower stalk not scaly; calyx not scaly outside; leaves broadly elliptic, 1·3–1·9 cm. broad or rounded, base broadly rounded. (Flowers white, yellow, greenish-yellow, whitish-pink) . . *anthopogonoides* (part)
I. Calyx small, 1–2 mm. long. (Flowers pink or white) . . . *trichostomum* (part)

DESCRIPTIONS OF SPECIES *

R. anthopogon D. Don. Mem. Wern. Soc. III (1821) 409. Balf. f. in Notes R.B.G. Edin. IX (1916) 286, descript. ampfl.

ILLUSTRATION: Bot. Mag. LXVIII (1842) t. 3947.

HABIT: shrub 30–45 cm. high; branchlets slightly setulose and scaly when young; leaf-bud scales deciduous.

LEAVES: obovate-elliptic, obtusely mucronulate, rounded at the base, 2·6–3·8 cm. long, 1·3–1·9 cm. broad, slightly scaly or glabrous above, densely scaly mostly reddish-brown below (in cultivated specimens often greenish); leaf stalks about 6 mm. long, scaly.

INFLORESCENCE: terminal, subumbellate, several flowered; flower stalks about 2–4 mm. long, scaly.

CALYX: deeply lobed, lobes broadly elliptic 3–5 mm. long, scaly, or not scaly, margin ciliate.

COROLLA: narrowly tubular, 1·3–1·9 cm. long, white, pink or yellow, not scaly outside, densely hairy within the tube.

STAMENS: 5–9, included, glabrous.

OVARY: scaly, 4–5-celled; style glabrous, equal in length to ovary or slightly longer.

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* Descriptions as in "The Species of Rhododendron" amplified or emended as necessary.

CAPSULE: 3 mm. long, embraced by the persistent calyx lobes.
HABITAT:

Nepal. F. B. HAMILTON, 1083.
Sikkim. HOOK. f. & THOMSON. ANDERSON, 767. WATT, 2504, 5284, 5293, 5418, 5447. CAVE, 1377, 2383, 6728, 7139 and in July 1922. RIBU & RHOMOO, 6480, 937.
Assam. WARD, 11569.

This well-known plant extends from the west to the extreme east of the Himalayan range, and is found at elevations between 9,000 and 16,000 ft. The leaves are aromatic and often used in Tibetan monasteries as incense. It is represented in the Edinburgh Herbarium by the above collections.

R. anthopogon is very closely related to *R. hypenanthum*; but in the former the leaf-bud scales are deciduous, whereas in the latter (typically with yellow flowers) they are persistent. *R. anthopogon* also approaches *R. Collettianum*, which is, however, a taller plant with larger flowers which have 10 stamens.

R. anthopogon D. Don var. **haemonium** comb. nov.
Syn. *R. haemonium* Balf. f. & Cooper in Notes R.B.G. Edin. IX (1916) 283.

HABITAT:

Bhutan. COOPER, 3903.
Sikkim. CAVE, 28 May, 1914. WATT, 5217. RIBU & RHOMOO, 15 June, 1912.

We can find no significant difference between *R. anthopogon* and *R. haemonium*. The glabrous calyx of the latter emphasised in the original description is not a constant characteristic; the calyx is scaly or not scaly. In *R. anthopogon* the number of stamens is usually 6–8 but varies from 5–9; in the original description of *R. haemonium* the number of stamens is given as 5, in *The Species of Rhododendron* as 5–6, whilst we find that in the type the number is 8. The colour of the flowers in *R. anthopogon* is white, pink or yellow (*fide* HOOKER & CAVE); the Bhutan plant named *R. haemonium* cannot therefore be regarded as a distinct species because it has yellow flowers. Since, however, yellow forms of *R. anthopogon* are in cultivation, it is convenient to have a varietal name.

R. anthopogonoides Maxim. in Bull. Acad. Petersb. XXIII (1877) 350. Balf. f. in Notes R.B.G. Edin. IX (1916) 297.

Description as in *The Species of Rhododendron*, p. 201, except:
HABIT: Shrub up to 1·80 m.
INFLORESCENCE: flower stalks not scaly, sparsely puberulous.
CALYX: margin ciliate.
COROLLA: white, whitish-pink, greenish-yellow or yellow.
OVARY: scaly and *usually hairy*; style short, turbinate.

HABITAT: *Kansu.* PRZEWALSKI in 1872. FARRER, 584. CHING, 525, 615. ROCK, 12723, 13279, 13636. Alt. 10,000–11,000 ft., in rhododendron scrub and spruce forests.

A distinct species of comparatively restricted distribution of which the outstanding features are the broadly elliptic leaves, obtuse or broadly rounded at the base; the sparsely puberulous not scaly flower stalks; the calyx not scaly outside, and the scaly ovary usually hairy in the lower half.

R. cephalanthum Franch. in Bull. Soc. Bot. France, XXXII (1885) 9; descript. ampfl. Balf. f. in Notes R.B.G. Edin. IX (1916) 318.

Syn. *R. chamaetortum* Balf. f. & Ward in Notes R.B.G. Edin. IX (1916) 218.

ILLUSTRATION: Gard. Chron. Ser. III, XCI (1932), Sup. t. p. 133.

HABIT: small shrub up to 75 cm. high; young branchlets densely tomentose, bristly, densely scaly; *leaf-bud scales persistent.*

LEAVES: oblong-elliptic or broadly oblong, mucronate 1·3–3·5 cm. long, 8 mm.–1·5 cm. broad, thick and leathery, margin recurved; glabrous above, densely covered with fawn, reddish or dark brown scales below.

INFLORESCENCE: terminal, capitate, several flowered; flower stalks 2–4·5 mm. long, scaly and sometimes slightly puberulous.

CALYX: 4–7 mm. long, lobes scaly outside, fringed with hairs.

COROLLA: narrowly tubular 1·3 cm.–2 cm. long, white or pink, not scaly outside, villous within the throat.

STAMENS: *5–8*, included, glabrous or hairy towards the base.

OVARY: scaly; style very short, turbinate; glabrous.

CAPSULE: about 4 mm. long, scaly.

HABITAT:

Yunnan. DELAVAY, 2218, 26 May 1886. HANDEL-MAZZETTI, 8857. FORREST, 6756, 12754, 14055, 14750, 17451, 19492, 19990, 20058, 20739, 21583, 21923, 23321, 25493, 28302, 29107. ROCK, 6323, 8869, 9141, 9357, 9358, 9491, 10924, 10935, 11019, 11455, 18334, 22964, 23559, 25188.

Tibet. FORREST, 14788, 14801, 15345, 16701, 16707, 20062. ROCK, 22011, 22963, 23164, 23231.

Szechuan. FORREST, 16363. ROCK, 8878, 9074, 9124.

Upper Burma. FORREST, 24571, 24991, 27122, 27501. Alt. 9,000–15,000 ft.

R. cephalanthum, like *R. trichostomum*, was discovered by the ABBÉ DELAVAY in Yunnan near Lankong and Hokin in 1884. It was later found by WILSON, FORREST, ROCK and WARD in other parts of Yunnan, and in the adjoining territory in Szechuan, Tibet and Upper Burma.

According to the original descriptions and to *The Species of Rhododendron*, *R. cephalanthum* and *R. chamaetortum*, may be distinguished by the size and colour of the flowers—in the former the corolla is 1·9 cm. long and rose; in the latter, 1·3 cm. long and white. But we have examined specimens with corollas up to 1·9 cm. long which are white, and others with corollas 1·3 cm. long which are pink, and others again where the flowers are of intermediate size and sometimes pink, sometimes white. Again emphasis is laid upon the compactness of scales on the under surface of the leaves as an outstanding feature of *R. chamaetortum*. Material subsequently collected shows that this is variable. As to the colour of the under side of the leaf, in pink-flowered *R. chamaetortum* this is said to be reddish-brown, but in white-flowered *R. cephalanthum* the colour is very variable, and various specimens of both species have an identical indumentum. Nor are other outstanding characteristics, such as the scaliness of the calyx or the puberulous or glabrous nature of the stamens, more reliable. Further, the leaves of *R. cephalanthum* are said to be oblong-elliptic, nearly 2·6 cm. long, 8 mm. broad, whilst in *R. chamaetortum* they are broadly elliptic, about 1·3 cm. long, 8 mm. broad; between these limits both the said species vary, and specimens with different coloured flowers and with more or less compact indumentum are identical as regards the form and size of leaf. It is clear therefore that there is no character by which these two species may be separated.

Similar arguments can be advanced to show that *R. nmaiense* and *R. crebreflorum* also have all the characteristics of *R. cephalanthum*—persistent leaf-bud scales, flowers identical in size and structure, leaves of the same size and shape with similar indumentum—except that the former has yellow flowers, whilst the latter is of dwarf habit.

There is no doubt that *R. cephalanthum* is a somewhat variable species. The number of stamens ranges from 5–8, the filaments are puberulous or glabrous at the base, the colour of the flowers is white, pink, or yellow, the colour of the under side of the leaves varies from pale yellowish-brown to fawn or reddish-brown.

The affinity is with *R. anthopogon*, but *R. cephalanthum* is distinguished by its conspicuous persistent leaf-bud scales. From *R. hypenanthum* it is less easily separable. The north-west Himalayan plant usually has larger leaves, a dark reddish-brown indumentum and either 5 or 6 stamens. From *R. cephalanthoides*, which has deciduous leaf-bud scales and 5 stamens, *R. cephalanthum* differs in its persistent leaf-bud scales and varying number of stamens.

R. cephalanthum Franch. var. **crebreflorum** comb. nov.

Syn. *R. crebreflorum* Hutch. & Ward in Notes R.B.G. Edin. XVI (1931) 173.

HABITAT: *Assam*. WARD, 8337. Alt. 13,000 ft.

The variety is a dwarf form with pink flowers, 6 stamens and glabrous filaments.

R. cephalanthum Franch. var. **nmaiense** comb. nov.

Syn. *R. nmaiense* Balf. f. & Ward in Notes R.B.G. Edin. IX (1916) 252.

HABITAT: *Upper Burma.* WARD, 1791. Alt. 12,000–13,000 ft.

The only characters which distinguish this variety are its yellow flowers; its corolla glabrous or sometimes sparsely (never densely) scaly outside; its stamens never more than 5 with glabrous or minutely puberulous filaments.

R. Collettianum Aitch. & Hemsl. in Journ. Lin. Soc. XVIII (1891) 75.

ILLUSTRATION: Journ. Hort. Ser. 3, 36: p. 331.

Description as in *The Species of Rhododendron*, p. 6, except:

LEAVES: 3·8–7·6 cm. long, 1·3–1·9 cm. broad; leaf stalk 6 mm.–1·3 cm. long.

COROLLA: 1·9–2·6 cm. long.

STAMENS: 10, *the whole filament hairy* or hairy only towards the base.

HABITAT: *Afghanistan and Indian frontier.* J. E. T. AITCHISON, in 1880.

This species, from Afghanistan, which grows at altitudes of 10–13,000 ft., has been in cultivation since 1880, when it flowered for the first time in the rock garden at Kew, raised from seed sent by DR. AITCHISON. In having 10 stamens it is unique in the series. Its closest ally is *R. anthopogon*, with which it agrees in its early deciduous leaf-bud scales, but it is a taller shrub with larger leaves and larger flowers.

R. hypenanthum Balf. f. in Notes R.B.G. Edin. IX (1916) 291.

Description as for *R. anthopogon* on pp. 67–68, except that the leaf-bud scales are persistent, the leaves are from 1·7–4·2 cm. long, 0·9–2 cm. broad, and the flowers are yellow.

HABITAT:

N.W. Himalayas. HOOK. f. & THOMSON, no date. STEWART, no date. LUDLOW & SHERRIFF, 1475, 7660, 9145. COOPER, 5738. DRUMMOND, 22164, 22708. MRS. STEANE, 2. BISKAM, 2279. LACE, 231, 1578. WATT, 2463, 2522, 3337, 8641, 13576, 13631. LUDLOW, 96.

Nepal. LAL DWOJ, 187, 384. Alt. 11,000–18,000 ft.

This species appears to have a more restricted distribution than *R. anthopogon*, spreading no farther east than Nepal. LUDLOW & SHERRIFF'S plants, Nos. 3216, 3428, named *R. hypenanthum* in Notes R.B.G. Edin. XIX (1938) 316, are definitely not this species. As the collector remarked, the upper surface of the leaves is covered

with long white hairs. These numbers are the species we have now named *R. pogonophyllum*.

R. hypenanthum is so closely allied to *R. anthopogon* that it might well be regarded as a variety. We have, however, retained the specific name since the species is readily distinguished by its conspicuous leaf-bud scales and is well known in cultivation. The features which distinguish it from *R. cephalanthum* are given on p. 70.

R. kongboense Hutch. in Bot. Mag. CLX (1937) t. 9492.

HABIT: a small twiggy undershrub up to 30 cm. high, branchlets densely scaly and hairy; leaf-bud scales deciduous.

LEAVES: oblong to oblong-lanceolate, 1·3–2·6 cm. long, 5–10 mm. broad, variable, apex mucronate, sparsely scaly above, densely scaly below; leaf stalks 4–6 mm. long, scaly.

INFLORESCENCE: terminal, capitate, several flowered; flower stalks short, scaly and sparsely hairy.

CALYX: 3–5 mm. long, large for the size of the flower, lobes scaly outside, margin ciliate.

COROLLA: narrowly tubular, about 8–10 mm. long, rose, not scaly; *tube densely hairy outside* and inside.

STAMENS: 5, included; filaments glabrous.

OVARY: scaly; style shorter or longer than the ovary, turbinate.

HABITAT:

Tibet-Bhutan border. WARD, 5850.

Tibet. WARD, 5700, 6021. LUDLOW, SHERRIFF & TAYLOR, 3629, 3802, 3933. Alt. 11,000–15,000 ft.

R. kongboense, which was introduced to cultivation by KINGDON WARD is very closely related to *R. primulaeflorum* var. *cephalanthoides* but is distinguished from it by its shorter rose-coloured corolla.

From *R. rufescens* it differs in its larger calyx and in having hairs on the outside of the corolla tube. The scales on the underside of the leaf are olive-brown or brown in *R. kongboense* but dark reddish-brown in *R. rufescens*.

R. laudandum Cowan in Notes R.B.G. Edin. XIX (1937) 222.

HABIT: shrub up to 1 m. high; branchlets densely scaly, bristly, leaf-bud scales deciduous or subpersistent.

LEAVES: oval to oblong-oval, obtusely mucronate at the apex, broadly cuneate at the base, 1·5 cm. long, 8 mm. broad; young leaves sparsely scaly above, mature leaves with vestiges of scales, very densely covered with *dark reddish-brown scales below* except for the midrib; leaf stalk 3–4 cm. long, scaly.

INFLORESCENCE: terminal, several flowered; flower stalks 5–6 mm. long, densely scaly, sparsely hairy.

CALYX: reddish-green, deeply lobed, lobes unequal, about 5 mm. long, densely scaly outside, margin densely ciliate.

COROLLA: narrowly tubular, about 1·3 cm. long; pale pink almost white, not scaly, *tube densely hairy outside* and within.

STAMENS: 5; filaments glabrous.

OVARY: scaly, 2 mm. long, ovoid or broadly ovoid, scaly, *the lower half densely clothed with long hairs*; style stout, shorter than the ovary.

HABITAT:

Southern Tibet. LUDLOW & SHERRIFF, 2160.

Tibet-Bhutan Border. WARD, 5733. Alt. 15,000 ft.

First discovered by LUDLOW & SHERRIFF in 1936, this species comes near *R. rufescens*. In both species the under sides of the leaves are reddish- or chocolate-brown. *R. laudandum* has well marked hairs as well as scales on the ovary, and moreover the outside of the corolla tube is densely hairy. *R. anthopogonoides*, the only other species in the series with a hirsute ovary, differs from *R. laudandum* in many respects, particularly in its very large rounded leaves and in the absence of scales on the calyx.

R. laudandum Cowan var. **temoense** Ward MSS.

Varietas nova a typo alabastrorum perulis persistentibus, ovario basi sparsim piloso vel epiloso, tubo corollae haud dense hirsuto, floribus albis recedens.

HABITAT: *Tibet-Bhutan Border.* WARD, 5848. Alt. 12,000–13,000 ft.

The name *R. temoense* appeared in the Rhododendron Association Year Book of 1932 against WARD'S numbers 5733 and 5848, but no description of the species was ever published. In 1937 Cowan described *R. laudandum*, a new species found by LUDLOW & SHERRIFF. At that time the connection between WARD'S and LUDLOW & SHERRIFF'S plants escaped notice. One of WARD'S collections, No. 5733, is typical *R. laudandum*, the other, No. 5848, is a similar plant but differs in that the leaf-bud scales are persistent, the ovary is sparsely hairy or not hairy, the corolla tube is not densely hirsute and the flowers are white. To this plant we have given the name *R. laudandum* var. *temoense*.

R. platyphyllum Balf. f. & W. W. Sm. in Notes R.B.G. Edin. IX (1916) 259.

Syn. *R. cephalanthum* Fr. var. *platyphyllum* Franch. MSS. ex Diels in Notes R.B.G. Edin. VII (1912) 211.

Description as in *The Species of Rhododendron*, p. 214, except:

HABIT: a shrub up to 1·5 m. high; branchlets scaly; *leaf-bud scales long, broadly ovate or rounded*, leafy apiculate.

LEAVES: *about 5 cm. long and nearly 2·6 cm. broad.*

CALYX: large 5–6 mm. long, deeply lobed, lobes scaly outside and sparsely or densely fringed with hairs.
COROLLA: white, creamy white or flushed with rose.
STAMENS: glabrous.
OVARY: scaly; style as long as ovary, turbinate, glabrous.
HABITAT: *Yunnan.* M. L'ABBÉ DELAVAY, 27 June, 1887. FORREST, 4155, 13526, 18041, 18770, 28241, 28282, 28321. ROCK, 22710. Alt. 10,000–14,500 ft.

The nearest relation of this distinct species is *R. cephalanthum*, which, however, has 5–8 stamens (not constantly 5). *R. platyphyllum* has exceptionally large leaves for the series, but its broadly ovate, rounded, leafy persistent leaf-bud scales are its outstanding characteristic.

R. pogonophyllum Cowan & Davidian sp. nov.
HABIT: a prostrate shrub, 3–10 cm. high; branchlets scaly and hairy; *leaf-bud scales persistent.*
LEAVES: obovate to ovate, emarginate, 0·8–1 cm. long, 4–6 mm. broad, shining, rugulose, *bristly not scaly above*, *margin* recurved, *bristly*, densely covered with fawn or light brown flaky scales below; leaf stalks 2–3 mm. long, bristly.
INFLORESCENCE: terminal, capitate, few flowered, flower-bud scales persistent; flower stalks 2–4 mm. long, sparsely scaly, not bristly.
CALYX: well developed, 5–6 mm. long, deeply lobed, lobes unequal, acute or mucronate; sparsely hairy or not hairy, not scaly or sparsely scaly outside, margin ciliate.
COROLLA: narrowly tubular, 1·6 cm. long, white to pink, glabrous outside or very slightly scaly, densely villous within the throat.
STAMENS: 6, unequal, included; filaments glabrous.
OVARY: scaly, not hairy; style exceeding the ovary, turbinate not scaly.
CAPSULE: Not seen.
HABITAT: *Central Bhutan.* LUDLOW & SHERRIFF, 3216, 3428. Alt. 14,000–15,500 ft., creeping over rocks.

This plant was at first confused with *R. hypenanthum* and given this name in *Records of Bhutan Rhododendrons found by Ludlow & Sherriff in 1937*, in Notes R.B.G. Edin. XIX 1938, p. 316. There is no doubt we have here a new species, distinguished from *R. hypenanthum* by the size and shape of the leaves, by the long hairs or bristles on the upper surface and margin of the leaves, by its prostrate habit and white to pink flowers.

In the bristly nature of its leaves and leaf stalk it resembles *R. radendum*, differing in that the leaf-bud scales are persistent, the

calyx is large with acute lobes, the corolla is not scaly or only very slightly scaly outside and the stamens are 6. No other species with more than 5 stamens has bristly leaves*

R. primulaeflorum Bur. & Franch. in Journ. de Bot. V (1891) 95, descript. amplf.

Syn. *R. fragrans* Maxim. in Rhodo. As. Or. (1870) 16 non Paxton. *R. acraium* Balf. f. & W. W. Sm. in Notes R.B.G. Edin. IX (1916) 209. *R. clivicola* Balf. f. & W. W. Sm., *ibid.*, p. 221. *R. cremnophilum* Balf. f. & W. W. Sm., *ibid.*, p. 223. *R. gymnomiscum* Balf. f. & Ward, *ibid.*, p. 230. *R. praeclarum* Balf. f. & Farrer, *ibid.*, p. 261. *R. tsarongense* Balf. f. & Forrest, *ibid.*, vol. XI (1919) 150. *R. Adamsii* Rehder in Rehd. & Wils. Monog. Azal. (1921) 190.

HABIT: shrub up to 1·50 m. high; branchlets usually *short and twiggy*, shortly bristly and scaly; *leaf-bud scales early deciduous.*

LEAVES: oblong, oblong-elliptic, or ovate-oblong, mucronate, 8 mm.–3·2 cm. long, 5–13 mm. broad, glabrous and shining or

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* *R. pogonophyllum* Cowan & Davidian sp. nov.

Species cum *R. hypenantho* Balf. f. olim confusa sed inquisitione curiosa notis sequentibus facile distinguenda:—

habitu, foliorum et magnitudine et forma, foliis supra et margine, setuloso-hirsutis, corolla alba vel rosea.

Suffruticosum prostratum, 3–10 cm. altum, parvifolium, fastigiatum ramulis plurimis intertextis. Ramuli juniores circ. 2 mm. diam. squamis peltatis stipitatis et setulis et alabastrorum perulis externis annos plures persistentibus obtecti, seniores grisei verruculosi decorticantes. Folia crasse coriacea, ad 3 mm. longa, petiolata; lamina obovata vel ovata, apice profunde emarginata, margine revoluta, integra, setulosa. basi attenuata, supra atro viridis, nitida, setuloso-hirsuta, costa media sulcata, caeteroquin venuloso-reticulata, rugulosa, subtus fuscoferruginea squamis peltatis et longi-stipitatis et brevistipitatis dense induta, costa media elevata dense lepidota. Flores in umbellam 2–3-floram terminalem dispositi; bracteae late ovatae apiculatae, dorso lepidotae, pilosae, margine ciliatae, circ. 8 mm. longae ; prophylla lineari-claviformia, extus elepidota, margine ciliata, circ. 8 mm. longa, calyce breviora vel aequantia; pedicelli 2–4 mm. longi, sparse lepidoti, haud puberuli. Calyx fere ad basim in lobos 5 inaequales fissus, lobis ipsis membranaceis extus glabris vel sparse lepidotis vel pubescentibus circ. 5 mm. longis, apice apiculatis margine ciliatis. Corolla longe tubulosa, circ. 1·6 cm. longa, alba vel rosea, extus glabra vel sparsissime lepidota, intus pubescens, sursum in lobis 5 circ. 7 mm. longos ampliata. Stamina 6, inaequalia, filamentis glabris. Ovarium circ. 1 mm. longum squamis lepidotum; stylus ovarium aequans glaber; stigma 5-lobulatum.

"Central Bhutan, Tang Chu, Ritang. Alt. 14–15,000 ft. Shrub 1–2 ins. high. Corolla white to pink, tube hairy at the throat. Filaments and style inserted, glabrous. Calyx leafy, lobes fringed with hairs. Leaves, upper surface dull green covered with long white hairs; lower surface covered with rough, brown, coarse tomentum. Creeping along rocks and on rocky thin soil. Open hillside. 7th June 1937. No. 3216."

" Central Bhutan, Rinchen Chu (Chore). Alt. 15,500 ft. Shrub 2–4 ins. Corolla pale pink, tube hairy, style and filaments inserted, glabrous. Calyx large, pink, hairy on margins of lobes. Leaves, upper surface shining green; lower surface covered with rough brown scales; margins hairy. Crawling over rocks. Open hillside. 13th June 1937. No. 3428."

reticulate above, densely covered with pale brown, fawn or brown scales below; leaf stalk 2–4 mm. long, scaly.

INFLORESCENCE: terminal, capitate, several flowered; flower stalk 3–4 mm. long, scaly, not hairy.

CALYX: 3–5 mm. long, scaly outside, not puberulous or rarely puberulous outside, margin ciliate or not ciliate.

COROLLA: narrowly tubular, 1·3–1·9 cm. long; white, white with yellow tube or tinged orange at base, yellow or rose; not scaly or very slightly scaly outside, not hairy outside, villous within the throat.

STAMENS: 5, included, pubescent or glabrous at the base.

OVARY: scaly or not scaly; style very short, turbinate, glabrous.

CAPSULE: very short, about 4 mm. long.

HABITAT:

Tibet. M. BONVALOT and PRINCE H. D'ORLÉANS, 10 mai 1890; FORREST, 14334, 14518.

Tibet-Yunnan Frontier. WARD, 505.

Yunnan. WARD, 4160, 5200, 5256. FORREST, 5866, 5878, 10585, 10652, 12631, 12714, 13841, 14020, 14042, 14139, 15077, 15079, 15080, 15081, 15082, 15092, 15093, 15126, 15127, 15155, 15169, 15245, 15271, 15371, 15398, 15399, 15403, 15406, 15409, 15411, 15466, 15959, 16112, 16113, 16115, 16117, 16118, 16119, 16146, 16590, 16646, 17087, 17093, 17101, 17106, 17168, 17361, 17364, 17398, 17403, 19702, 22320, 23091, 23094, 23322, 23323, 23324, 28340, 29283, 29288, 29335. ROCK, 3357, 3432, 3600, 3604, 3738, 3943, 9031, 11468, 24800, 24854, 25013, 25350, 25376.

Szechuan. FORREST, 16306, 16308, 16312, 16436, 20429, 21029, 21032, 21034. ROCK, 18181.

Kansu. FARRER, 88. Alt. 11,000–15,000 ft.

R. primulaeflorum was discovered in Tibet between Lhasa and Batang in 1890. Subsequently, plants which we now regard as the same species were discovered in S.E. Tibet, on the Yunnan-Tibet frontier, in various parts of Yunnan and in the adjoining parts of Szechuan and Kansu. It would appear that the one species in somewhat variant forms has a wide distribution extending to N.E. Asia.

But before further consideration of *R. primulaeflorum* let us first look at other species which have similar characteristics. Of *R. cephalanthoides*, which we regard as one of the variants of *R. primulaeflorum*, we have ample material from a wide area. We find differences in the colour and size of flowers, in the size and scaliness of the calyx, in the hairiness of the calyx margin, in the hairiness of the stamens, in the leaf size and in the colour of the under sides of the leaves.

Then, after a critical examination of the species, which have been listed above as synonyms, we find that they cannot be distinguished from the somewhat variable *R. cephalanthoides* by the characters given for them as diagnostic.

If the descriptions of these species (in *The Species of Rhododendron*, pp. 10, 199–215) are carefully compared, the close similarity between them will be evident; for the most part indeed the particulars read almost word for word alike. Compare, for example, the descriptions of *R. cephalanthoides* and *R. gymnomiscum* (pp. 202 and 209), where the only differences to be noted are as to size of leaf (in *R. gymnomiscum* 1 in. long, *R. cephalanthoides* ¾ in. long), and as to the colour of the flowers (yellow in the former, white or white with yellow tube in the latter). Diagnostically these distinctions are insignificant, and as we have seen they are unreliable.

Then if the descriptions of *R. cephalanthoides* and *R. praeclarum* (p. 215) are scrutinised, it will be noticed that the only difference lies in the calyx, which in the one is fringed with hairs, in the other eciliate. This again is an inconstant character, for example, the calyx is eciliate in the type of *R. praeclarum*, but in the co-type is sparsely ciliate.

It will be observed that the above mentioned three species all agree in that the filaments of the stamens are described as glabrous, whilst in the remaining species, *R. acraium*, *R. clivicola*, *R. cremnophilum*, *R. tsarongense* and *R. Adamsii*, they are said to be puberulous, but this, as we have seen, is no sound distinction.

As to *R. acraium*, the flowers are said to be white, but we find variation in flower colour as in *R. cephalanthoides*. Yet again, *R. cremnophilum*—which is described as an intricately branched, dwarf shrub with leaves about ½ in. long and ¼ in. broad—is not separable from *R. cephalanthoides*, which is also a more or less intricately branched shrub—often quite dwarf with leaves varying in size, frequently no larger than those of *R. cremnophilum*. On the contrary, even in the type of the latter species, we find leaves ⅜–¾ in. long. As to the flowers, they are pale rose in *R. cremnophilum*, but in *R. cephalanthoides* they are not invariably white; they are sometimes pink. (ROCK, 23740.)

Considering *R. clivicola* it is stated that the calyx lobes are scaly outside and that the margin is ciliate, but there is a gradation in this group from glabrous to more or less scaly and more or less densely fringed with hairs; the hairs may be confined to the apex of the lobes or spread over the whole margin. Compare, for example, *R. praeclarum*, where, as was stated, the calyx is eciliate in the type and sparsely ciliate in the co-type.

In typical *R. tsarongense*, the leaves are reddish below, but they are pale brown in later collected specimens and sometimes reddish-brown in *R. cephalanthoides*. The calyx is described as ⅛ in. long, but

this is incorrect; in the type it is only $\frac{1}{6}$–$\frac{1}{5}$ in. long, the same length as in typical *R. cephalanthoides*.

R. Adamsii is said to differ in having purplish flowers (p. 200), but this not substantiated.

If the stated differences were constant and could be correlated there would be no difficulty in recognising a number of distinct forms or microspecies, but the plants merge with each other to such a degree that no reasonably clear lines of demarcation can be drawn between them. We recognise that there is variation, but rather than multiply names, which can have no definite significance, we have preferred to regard this whole complex as a single variable species, recognising only two varieties.

Having discussed *R. cephalanthoides* and other allied species, we now revert to *R. primulaeflorum*.

Our material of this species is scanty, but it is enough to show that if *R. cephalanthoides* differs from *R. primulaeflorum* it does so only in one respect. In their description of *R. primulaeflorum*, BUREAU and FRANCHET make no reference to the ovary, but in the note following the description they make the following remark: " Le *R. primulaeflorum* appartient au même groupe que les *R. anthopogon*, *R. anthopogonoides* et *R. cephalanthum*; mais son ovaire est glabre, tandis que dans tous les autres il est couvert d'écailles." We have not had the opportunity of examining BUREAU and FRANCHET'S type, but on examining the co-type we find the ovary to be densely scaly. In *The Species of Rhododendron*, on p. 198, the ovary is said to be glabrous, on p. 216, to be scaly.

In the course of this investigation we have come across isolated instances of flowers with a glabrous ovary, once in each of the following species: *R. anthopogonoides* (PRZEWALSKI in 1872), *R. chamaetortum* (F. 16707). *R. kongboense* (WARD 5850), and *R. laudandum* var. *temoense* (WARD 5848). In these species when other flowers of the same inflorescences were examined, the ovary was found to be scaly. We therefore conclude that in this series the ovary is normally scaly and that flowers with a non-scaly ovary are merely fortuitous. Accordingly there is a strong presumption and we are justified in assuming that in *R. primulaeflorum* the ovary is normally scaly as it is in the co-type. In every other respect, *R. cephalanthoides* agrees with *R. primulaeflorum*. (It should perhaps be noted also that in *R. primulaeflorum* the corolla is of the same shape as in other species of the series, that it should therefore be described as narrowly tubular rather than as funnel-shaped as it is on p. 216 of *The Species of Rhododendron*.) It follows, therefore, that *R. primulaeflorum* comes within the complex which we have aligned with *R. cephalanthoides*. But *R. primulaeflorum* is the first published name. This name must therefore be applied to the whole complex, which for the reasons

stated we now regard as a single variable species. We have accordingly amplified the original description of *R. primulaeflorum* to include the variant forms.

R. primulaeflorum, as now defined, finds its nearest ally in *R. cephalanthum* in which the stamens vary from 5–8, and the leaf-bud scales are persistent, while in the former species they are constantly 5, and the leaf-bud scales are deciduous.

Two varieties are distinct enough to be separated. First, those in which the corolla tube is puberulous outside. *R. cephalanthoides* has commonly been interpreted as including plants with a non-hairy corolla outside as well as plants with a hairy corolla. In fact the majority of plants commonly known as *R. cephalanthoides* have a glabrous corolla. But in the original description of *R. cephalanthoides* the corolla is described as puberulous outside, so that we may apply this name to plants with this characteristic and we name them *R. primulaeflorum* var. *cephalanthoides*. In the second variety, the corolla lobes are densely scaly outside as in *R. lepidanthum* and we give it the name *R. primulaeflorum* var. *lepidanthum*.

R. primulaeflorum Bur. & Franch. var. **cephalanthoides** comb. nov.

Syn. *R. cephalanthoides* Balf. f. & W. W. Sm. in Notes R.B.G. Edin. IX (1916) 216.

HABITAT:

Tibet. WARD, 5641.

Yunnan. FORREST, 2182, 15088, 16593, 16595, 23097, 29267. ROCK, 9359, 9368.

Szechuan. FORREST, 20452. ROCK, 5547, 16100, 18115, 23737, 24067, 24285. Alt. 11,000–15,000 ft.

This variety differs from the species in that the corolla tube is densely puberulous outside.

From *R. kongboense* it differs in its larger corolla and relatively shorter calyx and in the colour of its flowers.

It is distinguished from *R. rufescens* by its indumentum.

R. primulaeflorum Bur. & Franch. var. **lepidanthum** comb. nov.

Syn. *R. lepidanthum* Balf. f. & W. W. Sm. in Notes R.B.G. Edin. IX (1916) 245.

HABITAT: *Yunnan*. FORREST, 10034. Alt. 11,000–14,000 ft.

This variety differs in that the lobes of the corolla are densely scaly outside.

The description of *R. lepidanthum*, given in *The Species of Rhododendron*, p. 212, is incorrect. The corolla is described as not scaly outside, whereas the original description states (as the name implies) that the lobes are densely scaly outside. The type confirms the original description. Moreover, the calyx is described as not

fringed, whereas the original description states that the calyx is fringed with hairs. In the type the calyx is sparsely ciliate or eciliate, in the co-type it is ciliate.

It has also been observed that while in the type the stamens are minutely puberulous, in the co-type they are glabrous.

R. radendum Fang in Contrib. Biol. Lab. Sc. Soc. China XII (1939) 62.

HABIT: a small shrub up to 1 m. high; branchlets covered with scales and usually bristly; leaf-bud scales early deciduous.

LEAVES: ovate-lanceolate or obovate-lanceolate, 1–1·8 cm. long, 3–6 mm. broad, acute or blunt at the apex, cuneate at the base, bristly and scaly above, bristly and densely scaly below; leaf stalks about 3 mm. long, bristly and scaly.

INFLORESCENCE: terminal, capitate, 8–10 flowered; flower stalks 2–3 mm. long, scaly and bristly.

CALYX: *small, 1–2 mm. long*, scaly outside, margin ciliate.

COROLLA: narrowly tubular, 8–10 mm. long, purplish-white, *densely scaly outside*, hairy within.

STAMENS: 5, included; filaments glabrous.

OVARY: ovoid, 1 mm. long, scaly; style 1 mm. long, turbinate, glabrous.

HABITAT: *Sikang*. CHENG, 921.

This plant was found in 1930 by the Chinese collector W. C. CHENG near Tatsienlou, at an altitude of 10,000 ft. It has not yet been introduced into cultivation. Like *R. pogonophyllum* it has bristles on the leaves, an unusual feature in the Series. The 5 stamens, densely scaly corolla, small calyx and early deciduous leaf-bud scales of this species readily distinguish it from *R. pogonophyllum* with 6 stamens, glabrous corolla, a large calyx and persistent leaf-bud scales.

The small calyx of *R. radendum* recalls that of *R. trichostomum* and its varieties; the latter species has usually linear-lanceolate leaves and is always without bristles.

R. rufescens Franch. in Journ. de Bot. IX (1895) 396. Balf. f. in Notes R.B.G. Edin. IX (1916) 286, descript. ampfl.

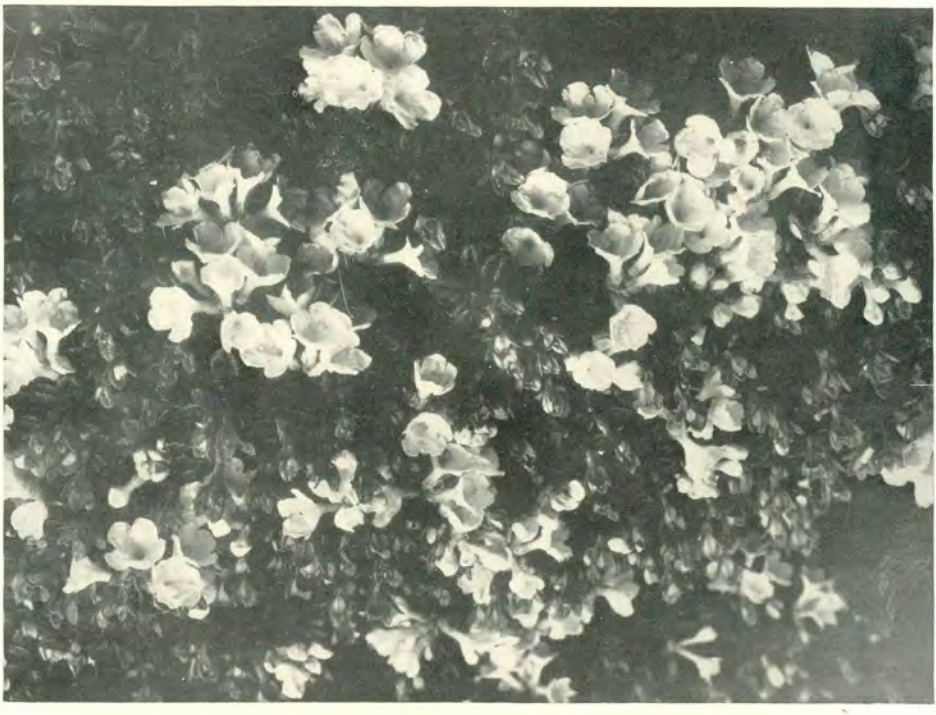
Syn. *R. daphniflorum* Diels in Act. Hort. Gothob. 1 (1921) 180.

HABIT: a small shrub, 0·5–1·25 m. tall; branchlets densely scaly, sparsely hairy; leaf-bud scales early deciduous.

LEAVES: oblong-elliptic to oblong-ovate, mucronate at apex, rounded at base, 1–2·6 cm. long, 0·5–1·5 cm. broad, glabrous above, *densely covered with dark reddish-brown scales below*; leaf stalks about 2–4 mm. long, scaly.

INFLORESCENCE: terminal, several flowered; flower stalks 3–4 mm. long, scaly.

FIG. 20—*Rhododendron trichostomum* var. *ledoides* in the Rock Garden, Royal Botanic Garden, Edinburgh (See p. 84)



THE ANTHOPOGON ALLIANCE

FIG. 21—*Rhododendron Sargentianum* in the Rock Garden, Royal Botanic Garden, Edinburgh (See p. 81)

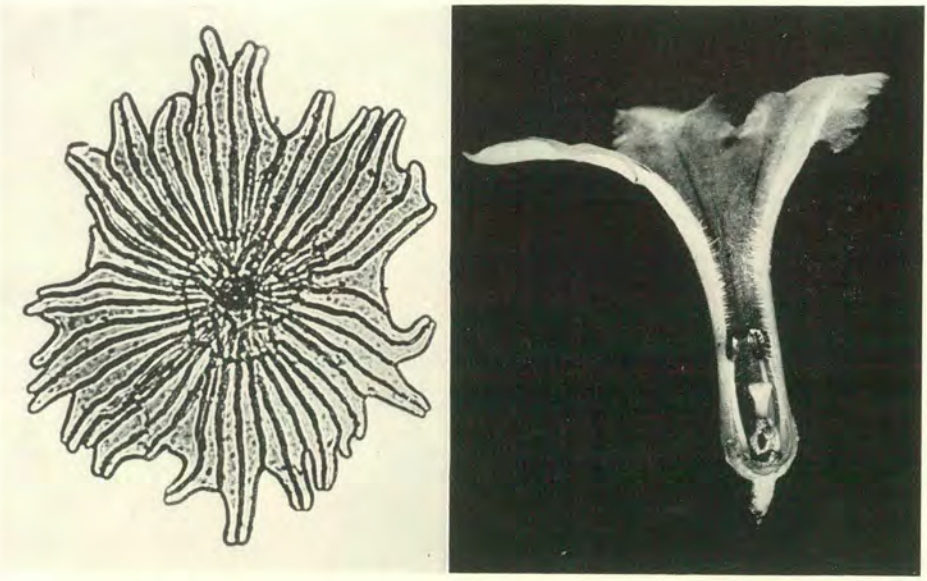
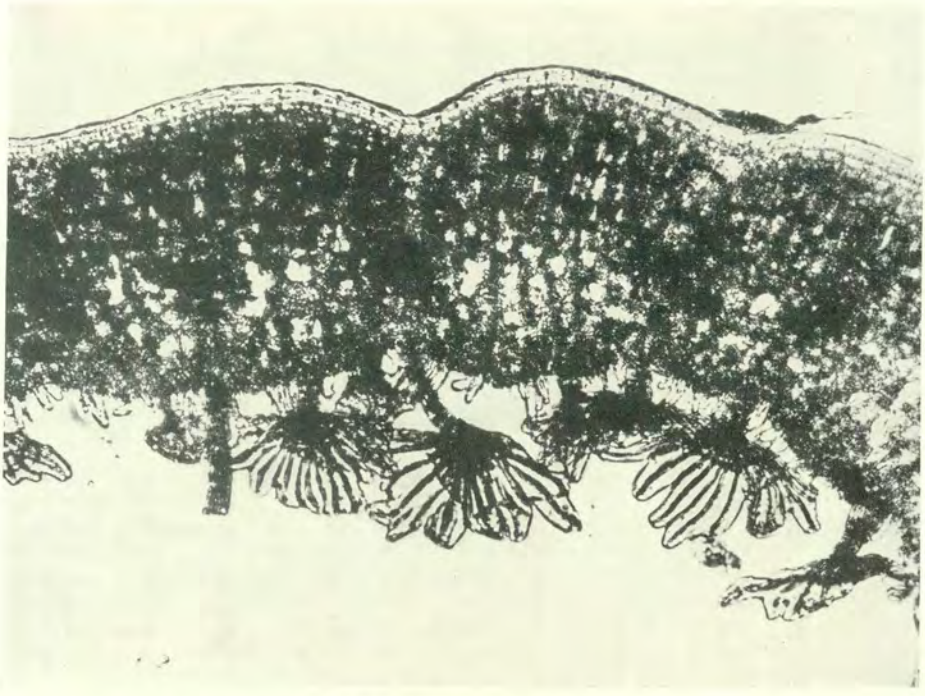


FIG. 22—(Left) A lacerate scale, enlarged about 500 times (See pp. 55 and 62)
FIG. 23—*Rhododendron anthopogon*, flower in section highly enlarged



THE ANTHOPOGON ALLIANCE

FIG. 24—A transverse section of a leaf of *R. anthopogon* with funnel-shaped lacerate scales on the lower surface

CALYX: deeply lobed, commonly dark red, 2–5 mm. long, usually 3 mm., sparsely or densely scaly outside, margin sparsely or densely ciliate.
COROLLA: narrowly tubular, 1–1·6 cm. long, white to rose, not scaly and not hairy outside.
STAMENS: 5, included, glabrous.
OVARY: scaly; style glabrous, equal in length to the ovary.
HABITAT: *Szechuan.* SOULIÉ, 487. WILSON, 3455. ROCK, 16084, 17502, 17509, 17532, 17693 and 17724. SMITH, 3700. Alt. 11,000–13,000 ft.

This species, first discovered by SOULIÉ, approaches closely *R. anthopogon*, the main difference being in the number of stamens, variable from 5–8 in *R. anthopogon*, constantly 5 in *R. rufescens*. (In the former the flowers are white, yellow or pink, in the latter, white to rose.) It agrees with *R. laudandum* in that the scales on the under surface of the leaves are dark reddish-brown, but differs in important characteristics, particularly in that the ovary is not hairy.

Affinity is shown also with *R. cephalanthoides*, in which species, however, the under surface of the leaves is pale brown.

R. Sargentianum Rehd. & Wils. in Pl. Wilsonianae (1913) 504.

Description as in *The Species of Rhododendron*, p. 218, except:
ILLUSTRATION: Bot. Mag. CXLVI (1920) t. 8871.
HABIT: a small shrub 50–60 cm. high with short twiggy branchlets and persistent leaf-bud scales.
LEAVES: 8–15 mm. long, 5–8 mm. broad.
HABITAT: *Western Szechuan.* WILSON, 1208. Alt. 9,000–11,000 ft.

R. Sargentianum is represented in the Edinburgh Herbarium by the above number only, but we have ample cultivated material. It is well distinguished by three characteristics: first, the corolla is densely scaly outside; second, the leaf-bud scales are persistent; and third, the leaves are small and broadly elliptic. The cultivated specimens we have seen agree very closely with WILSON'S specimen from Western Szechuan.

The affinity of *R. Sargentianum* is with *R. cephalanthum*. Both species have persisent leaf-bud scales. In *R. Sargentianum* the number of stamens is constantly 5, the corolla is densely scaly outside, whilst in *R. cephalanthum* the stamens are 5–8 and the corolla is not scaly outside.

It approaches most closely *R. cephalanthum* var. *nmaiense*, a variety with yellow flowers and sparsely scaly corolla lobes which in some respects is intermediate between *R. Sargentianum* and *R. cephalanthum* but very definitely with the habit, leaves and aspect of the latter species.

From *R. primulaeflorum* var. *lepidanthum*, with which *R. Sargent-*

ianum shows also some kinship, it is easily distinguished because the former has deciduous leaf-bud scales and white flowers which are scaly only on the corolla lobes (Fig. 21).

R. trichostomum Franch. in Journ. de Bot. IX (1895) 396, descript. ampfl.

Syn. *R. fragrans* Franch. Bull. Soc. Bot. Fr. XXXIV, p. 284 (non Maxim.), forma parviflora. Syn. *R. sphaeranthum* Balf. f. & W. W. Sm. in Notes R.B.G. Edin. IX (1916) 278.

ILLUSTRATION: Gard. Chron. Ser. III, LXXXI (1927), Sup. t. p. 447.

HABIT: shrub up to 1·20 m. high; branchlets often short and twiggy, closely covered with scales and short bristles; leaf-bud scales persistent, subpersistent or deciduous.

LEAVES: *linear-lanceolate, narrowly oblanceolate,* ovate or ovate-oblong, acutely or obtusely mucronate, 0·8–3·2 cm. long, 4–8 mm. broad, scaly or not scaly above, densely scaly below; leaf stalk 2–4 mm. long, scaly.

INFLORESCENCE: terminal, capitate, several flowered; flower stalks 1–5 mm. long, scaly.

CALYX: very small, *1–2 mm. long*, scaly or not scaly outside, margin ciliate or not ciliate.

COROLLA: narrowly tubular, 0·8–2 cm. long, white, pink or rose, tube and/or lobes not scaly, sparsely or densely scaly outside, villous within the throat.

STAMENS: 5, included, minutely puberulous towards the base or not puberulous.

OVARY: scaly; style very short, turbinate, glabrous.

CAPSULE: about 4 mm. long, scaly.

HABITAT:

Yunnan. DELAVAY, 2626. FORREST, 12505.

Szechuan. SOULIÉ, 186. WILSON, 1328. CUNNINGHAM, 620.

The type of this species in the Paris herbarium was collected by DELAVAY near Lankong in Yunnan, and is in our opinion representative of a variable species which was subsequently collected in other parts of Yunnan. Later the following species were described: *R. ledoides* Balf. f. & W. W. Sm., *R. radinum* Balf. f. & W. W. Sm., *R. sphaeranthum* Balf. f. & W. W. Sm., from material collected by FORREST in Yunnan, and *R. hedyosmum* Balf. f., which appeared in cultivation raised from seed under WILSON'S number 1208. But all these are, in our opinion, merely variant forms of *R. trichostomum.* Material collected in later years proves that the features by which the species were distinguished, when only the types were available, are inconstant, and consequently it is not possible to draw lines of demarcation between one and another of the presumed species. We have already shown how there is variation from plant to plant in

leaf form and shape and in the degree of scaliness of the corolla, and how the slight differences that exist cannot be correlated (pp. 58–9).

In other characteristics, the plants are no less variable. As to the leaf-bud scales, we note that in *The Species of Rhododendron*, those of *R. trichostomum* are described as early deciduous, whereas in the co-type they are persistent, and in other specimens variable. Again, the original description of *R. radinum* states that the leaf-bud scales are persistent, but in *The Species of Rhododendron* they are said to be early deciduous. The facts are that in the type the leaf-bud scales are persistent, and in the co-type they are subpersistent. As to other representatives of the species, we find that in one out of ten specimens, the leaf-bud scales are markedly persistent, in three out of ten, somewhat persistent, and in six out of ten, early deciduous. Then in *R. ledoides*, according to the original description, the leaf-bud scales are deciduous, but in the type they are persistent on at least two or three branchlets. In other specimens they are sometimes persistent and sometimes deciduous.

Next, as to size of the corolla, we find corollas varying from $\frac{1}{3}$–$\frac{3}{4}$ in. in length, irrespective of other characteristics. *R. sphaeranthum* is said to be distinguished from *R. radinum* by its corolla, $\frac{1}{2}$–$\frac{3}{4}$ in. long, against $\frac{1}{3}$ in. long, but certain flowers of *R. radinum* are just as long as those of *R. sphaeranthum* (see FORREST No. 15087) It is only in the case of *R. hedyosmum* (which in *The Species of Rhododendron* is regarded as equivalent to *R. ledoides*) that we have flowers which are distinctly longer than the average.

Then the filaments are glabrous, minutely puberulous or hairy. The original description of *R. ledoides* refers to "stamina—supra basim leviter puberulis," the note below the description to the "glabrous not puberulous stamens." In a flower from the type, some of the stamens were found to be glabrous, others to be minutely puberulous. The stamens are usually, but not invariably, glabrous in *R. radinum*, puberulous in *R. sphaeranthum*. The style is equal to or shorter than the ovary.

Again, the flower colour is variable, and so are the calyx lobes, ciliate or non-ciliate and more or less scaly or not scaly. We have, however, in the very short calyx (1–2 mm.) one distinctive characteristic common to all these species.

Taking *R. trichostomum* as a variable species, its short calyx is the feature by which it is best distinguished from other species in the Series; but it is also recognisable by the leaves, which are usually 4–5 times as long as broad. Only two other species have a similar short calyx: *R. radendum*, which has, however, bristly leaves, and *R. rufescens*, where the leaves are dark reddish-brown below.

Since certain forms are recognised in cultivation, we have retained three varietal names, but only such plants as show the varietal char-

acter to an outstanding degree are given a varietal name, others which do not strictly conform to the description or which may equally well be assigned to one or another variety, are cited under the species.

R. sphaeranthum is a variable plant of intermediate form in which the leaves are broadly lanceolate, varying in length from 3–5 times as long as broad; the corolla lobes are sparsely scaly or not scaly, never, however, densely scaly as in *R. radinum*.

We have used the varietal name, *ledoides*, for plants with linear-lanceolate leaves, with 1–2 or no scales on the corolla lobes, and the name *radinum* for plants with linear-lanceolate or sometimes ovate-oblong leaves and with the corolla densely scaly on the outside.

R. trichostomum var. **hedyosmum** comb. nov.

Syn. *R. hedyosmum* Balf. f. in Notes R.B.G. Edin. IX (1916) 234.

ILLUSTRATION: Bot. Mag. CLIII (1929–30) t. 9202.

HABITAT: *Szechuan*.

This variety has exceptionally large flowers (corolla tube long), long bracteoles and elongate-oblong not linear or linear-lanceolate leaves. This plant appeared in cultivation in the Royal Botanic Garden, Edinburgh, raised from seed of WILSON's No. 1208, the type of *R. Sargentianum*. Although in *The Species of Rhododendron*, *R. hedyosmum* is united with *R. ledoides*, in our opinion it is one of the more outstanding variants of the complex.

R. trichostomum var. **ledoides** comb. nov.

Syn. *R. ledoides* Balf. f. & W. W. Sm. in Notes R.B.G. Edin. IX (1916) 243.

ILLUSTRATION: Bot. Mag. CXLVI (1920) t. 8831.

HABITAT:

Yunnan. FORREST, 11246. WARD, 5106.
Szechuan. SCHNEIDER, 3483.

This plant was found by FORREST in Yunnan in the mountains north-east of the Yangtse bend. In its typical form it is easily distinguished by its linear-lanceolate leaves; the corolla is not scaly; the flowers are pale rose (Fig. 20).

R. trichostomum Franch. var. **radinum** comb. nov.

Syn. *R. radinum* Balf. f. & W. W. Sm. in Notes R.B.G. Edin. IX (1916) 268.

In the note which follows the original description of *R. ledoides*, the two species *R. ledoides* and *R. radinum* are compared. The statement is made that, "*R. radinum* has persistent not deciduous leaf-bud scales, has sessile flowers, corolla densely lepidote on the outside and the style is usually shorter than the ovary." *R. ledoides* is des-

cribed as having leaf-bud scales which are deciduous. Examination of the type and co-type will, as we have noticed, show that this description is incorrect. The leaf-bud scales are persistent; on several branchlets there are rows of leaf-bud scales, on others they are scattered here and there. In cultivated plants the leaf-bud scales are subpersistent. Moreover, it is incorrect to say that the flowers of *R. radinum* are sessile while those of *R. ledoides* are shortly stalked. In both instances the flower stalks are short, 1–2 mm. Further, the corollas of plants which have been determined as *R. radinum* are by no means invariably densely scaly, in several specimens the corolla is sparsely scaly and in both the type and co-type of *R. ledoides* a few scales are present on the lobes, whilst on another specimen under this name the corolla is densely scaly.

HABITAT:

Yunnan. FORREST, 10278, 15087, 15137, 15449, 15452, 20690, 21299, 21451, 29250, 29270, 29271, 29336, 29342, 30936. HANDEL-MAZZETTI, 3773. WARD, 3998. ROCK, 3500, 4153, 5136, 5138, 5209, 11260, 17219, 17223, 24635, 24709.

Szechuan. FORREST, 16311, 20476, 20480, 21253. HANDEL-MAZZETTI, 2745. ROCK, 16005, 16675, 16676, 17623, 17657, 17658, 17996, 23732, 23783, 23890, 24128. SCHNEIDER, 3545.

LIST OF SPECIES AND SYNONYMS

acraium Balf. f. & W. W. Sm. = PRIMULAEFLORUM
Adamsii Rehd. = PRIMULAEFLORUM
ANTHOPOGON D. Don
ANTHOPOGON D. Don var. HAEMONIUM (Balf. f. & Cooper) Cowan & Davidian
ANTHOPOGONOIDES Maxim.
cephalanthoides Balf. f. & W. W. Sm. = PRIMULAEFLORUM var. CEPHALANTHOIDES
CEPHALANTHUM Franch.
CEPHALANTHUM Franch. var. CREBREFLORUM (Hutch. & Ward) Cowan & Davidian
CEPHALANTHUM Franch. var. NMAIENSE (Balf. f. & Ward) Cowan & Davidian
CEPHALANTHUM Franch. var. *platyphyllum* Franch. MSS. ex Diels = PLATYPHYLLUM Balf. f. & W. W. Sm.
chamaetortum Balf. f. & Ward = CEPHALANTHUM
clivicola Balf. f. & W. W. Sm. = PRIMULAEFLORUM
COLLETTIANUM Aitch. & Hemsl.

crebreflorum Hutch. & Ward = CEPHALANTHUM var. CREBREFLORUM
cremnophilum Balf. f. & W. W. Sm. = PRIMULAEFLORUM
daphniflorum Diels = RUFESCENS
fragrans Maxim = PRIMULAEFLORUM
gymnomiscum Balf. f. & Ward = PRIMULAEFLORUM
haemonium Balf. f. & Cooper = ANTHOPOGON var. HAEMONIUM
hedyosmum Balf. f. = TRICHOSTOMUM var. HEDYOSMUM
HYPENANTHUM Balf. f.
KONGBOENSE Hutch.
LAUDANDUM Cowan
LAUDANDUM Cowan var. TEMOENSE (Ward MSS.) Cowan & Davidian
ledoides Balf. f. & W. W. Sm. = TRICHOSTOMUM var. LEDOIDES
lepidanthum Balf. f. & W. W. Sm. = PRIMULAEFLORUM var. LEPIDANTHUM
nmaiense Balf. f. & Ward = CEPHALANTHUM var. NMAIENSE
PLATYPHYLLUM Balf. f. & W. W. Sm.
POGONOPHYLLUM Cowan & Davidian
praeclarum Balf. f. & Farrer = PRIMULAEFLORUM
PRIMULAEFLORUM Bur. & Franch.
PRIMULAEFLORUM Bur. & Franch. var. CEPHALANTHOIDES (Balf. f. & W. W. Sm.) Cowan & Davidian
PRIMULAEFLORUM Bur. & Franch. var. LEPIDANTHUM (Balf. f. & W. W. Sm.) Cowan & Davidian
RADENDUM Fang
radinum Balf. f. & W. W. Sm. = TRICHOSTOMUM var. RADINUM
RUFESCENS Franch.
SARGENTIANUM Rehd. & Wils.
sphaeranthum Balf. f. & W. W. Sm. = TRICHOSTOMUM
temoense Ward MSS. = LAUDANDUM var. TEMOENSE
TRICHOSTOMUM Franch.
TRICHOSTOMUM Franch. var. HEDYOSMUM (Balf. f.) Cowan & Davidian
TRICHOSTOMUM Franch. var. LEDOIDES (Balf. f. & W. W. Sm.) Cowan & Davidian
TRICHOSTOMUM Franch. var. RADINUM (Balf. f. & W. W. Sm.) Cowan & Davidian
tsarongense Balf. f. & Forrest = PRIMULAEFLORUM

THE DISTRIBUTION OF RHODODENDRONS

BY J. HUTCHINSON, LL.D., F.R.S., F.L.S., V.M.H.

THE original title for this paper was to have been "Rhododendrons in Time and Space." But largely through the lack of time, coupled with that of space, I have rather regretfully been compelled to limit the account to space only. The distribution of plants in general is a fascinating subject, and especially of a fairly homogeneous genus such as Rhododendron. It will be found, however, that the following notes are rather sketchy in some parts and more detailed in others, largely as the result of my own imperfect knowledge of the genus, for I have in the past confined my studies mainly to the *lepidote* or scaly Rhododendrons, being content to leave the remainder of the genus to my colleagues at Edinburgh and the Arnold Arboretum, who collaborated with me in preparing the Rhododendron Society's book on the genus.

To have given an account of Rhododendrons in *Time* would have taken up a considerable amount of that valuable commodity, and would have entailed a great amount of bibliographical research on fossil records. The little I have done on this subject has not been encouraging. For example the genus is known in the fossil state in North America * from three places, one in the early tertiary of Alaska and another in the Trout Creek beds of eastern Oregon. I have not been able to check the evidence for these. Recently, however, a third supposed fossil species, described as *R. sierrae*, has been recorded from the Pliocene deposits of Table Mountain, in Central California. According to its author, this is not comparable with any North American species, but is considered to be related to some of the Chinese species such as *R. floccigerum*, *R. poecilodermum*, and especially *R. Rockii*.

Photographs of two cotype specimens were published and it seems to me that neither of them could be identified as a *Rhododendron* with any degree of certainty. This fossil species was described from these two cotypes and both are illustrated by excellent photographs. The single leaf shown on one plate (20) might be a *Rhododendron*, but on the other hand it might equally well belong to many other genera. At any rate I do not consider it to be the same as the other cotype of which there is an excellent photograph shown in the second plate (21). This is a shoot with eight leaves. In the single leaf shown in plate 20 the lateral nerves are definitely alternate, and looped well within the margin, whilst in the leaves shown in plate 21

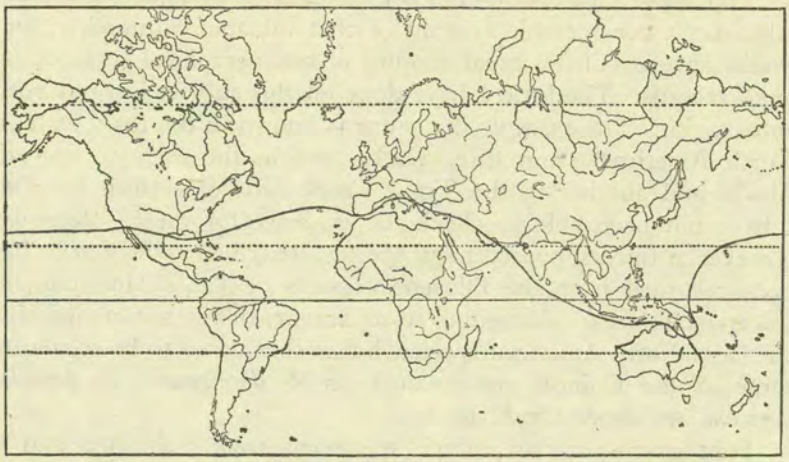
* See CHANEY, *Pliocene Floras of California and Oregon*, 88 (1944).

the nerves are strictly opposite each other, and the loops are contiguous with the margin. Furthermore I suspect that the leaves in plate 21 are opposite and not alternate as they are in all Rhododendrons, though sometimes in a pseudo-whorl. If I were to attempt to identify the fossil plant shown in plate 21, I would not search for it in *Rhododendron* but in such families as *Loganiaceae* and *Apocynaceae*, which have opposite leaves.

The above example is sufficient to indicate that fossil specimens should be examined with very great care, preferably by a systematic botanist who knows the plants of the region, and with this I pass on to the consideration of our lovely genus in *space*.

PRESENT DAY DISTRIBUTION OF RHODODENDRONS

The range of the genus is shown in the accompanying map, from which it will be observed that it is mainly confined to the northern hemisphere. The most striking fact is that there are no Rhododendrons in Africa, none in Central and South America, and none in Polynesia. There is only one species is Australia, *R. Lochae*, which



The black line marks the southern limit of distribution of the genus *Rhododendron*; the greatest concentration of species is in the eastern Himalaya-south-east Thibet-Yunnan-Szechuan region.

grows high up on the mountains of northern Queensland. This lonesome species is related, as one might expect, to the Javanese Rhododendrons. A considerable number of species are found in the mountains of Borneo and New Guinea.

From this it is natural to infer that *Rhododendron* was evolved somewhere in the northern hemisphere. We can only guess as to the location of its birth and the nature of its progenitors. The most primitive groups of *Rhododendron*, the *Falconeri* and *Grande* series,

are to be found at the present day in a relatively small area extending from Nepal eastward through the Himalayas into Upper Burma, Yunnan and Szechuan. These two series especially show ancient characteristics linking them with a more primitive family, the Tea family (*Theaceae*), and further back still with the Dillenia family (*Dilleniaceae*), and the Magnolia family (*Magnoliaceae*).

The reasons for considering these two groups to be related to the more primitive families of flowering plants mentioned were given in my previous paper,* and they may be briefly recapitulated. Their leaves are large and evergreen with numerous coarse parallel nerves and with a rough hairy covering, as in many of the Dillenia family, and they are mostly small trees with a central bole; the flowers are numerous and rather coarse and arranged in a raceme-like truss; there are more than five corolla-lobes (7–10); the stamens are more numerous (12–18) than in all other Rhododendrons, and there are more than five chambers in the ovary (sometimes as many as 18). There is also very little range in colour, most of them having creamy-white or pink flowers. Associated with these other primitive characters, therefore, this flower-colour may be regarded as relatively primitive in the genus.

More recently evolved groups of Rhododendrons have more "refined" leaves, often protected by highly modified hairs in the shape of peltate scales (lepidote), and sometimes with a dense coating of papillae; the inflorescence is reduced to a close truss almost equivalent to an umbel or even to one flower, the axis being very short; the stamens are reduced to ten or even five, and the ovary-chambers to five. In addition the corolla of some groups has become somewhat zygomorphic (irregular), as in certain of the *Triflorum* series and in many of the *Azalea* series, and there is a great range in flower-colour to deep red and various shades of blue.

NON-LEPIDOTE RHODODENDRONS

The series Falconeri, Grande, Arboreum, Barbatum, Glischrum, Crinigerum line of descent

The series shown in the above heading in an ascending order seem to represent a clear evolutionary line. The tree habit is maintained almost throughout, the greatest modification being the loss of the rough hairy covering and its replacement by bristles from *Barbatum* upwards. In some species these are found on the margins of the leaves and petioles, and in others they are confined to the midrib or all over the surface of the leaves and very often tipped by a gland.

* "Evolution and Classification of Rhododendrons," *The Rhododendron Year Book*, 1946, p. 42.

The area occupied by the **Falconeri** and *Grande* series may with some reason be regarded as the focal point for the evolution and distribution of the genus, for it is in this region that the greatest concentration of species is found at the present day. *R. Falconeri* itself has not a very wide range in this area, and is found only in the Himalayas from Nepal to Bhutan, at about 10,000 ft. altitude. It has some very close relatives in China, especially *R. sinofalconeri*, in Yunnan. There are numerous parallel examples of pairs of species in India and China which are nearly identical, and they are often very difficult to separate by any definite characters. Two other species of the *Falconeri* series are confined to the Himalayas. These are *R. decipiens* and *R. Hodgsonii*. *R. arizelum* occupies the Upper Burma-South East Thibet-Yunnan triangle. Six species are found in Yunnan, two of them, *R. fictolacteum* and *R. rex*, extending into Szechuan, whilst *R. galactinum* is found only in Szechuan.

Of the closely related **Grande** series only one, *R. grande* itself, is found in the Himalayas, from Sikkim to Bhutan. Thence the remainder of the series spread eastwards, mostly into Yunnan, with two, *R. Watsonii* and *R. peregrinum*, exclusively in Szechuan.

The **Arboreum** series seems to be next in evolutionary sequence. Its leaves are much less coarse, with a more delicate type of hairy covering, whilst the flowers are smaller and congested into compact neat trusses and less difficult of access to insects than those of the two series already dealt with. The tree habit is maintained. There is a striking north and south range of distribution, which is lacking in most other series, for they are found as far down on the map as Ceylon (*R. zeylanicum*). The connecting geographical link is provided by *R. nilagiricum* in the mountains of Madras. *R. arboreum* itself does not range beyond the Himalayas, though its east and west distribution is quite extensive, from Kashmir to Bhutan, and its exceedingly close relative, *R. Delavayi*, continues the series to its eastern limit in Yunnan. This is another example of a closely allied pair of species, the one in the Himalaya, the other in China. The flowers of the two are scarcely distinguishable, and the difference, a very slight one, has to be sought for in the indumentum.

From the *Arboreum* series it is but a short step to **Barbatum.** This series has not wandered from its ancestral home, though it is found a little farther west, from Kumaon in the west-central Himalayas to Bhutan in the east. *R. imberbe* is one of the few Rhododendrons found west of Nepal. The tree habit is maintained in the series, the flowers are uniformly deep red, and the tubular corollas have conspicuous nectar-pouches.

Series **Glischrum** is quite separated geographically from *Barbatum*, for nowhere do they overlap, so far as we know. They are found more to the east, in Upper Burma, south-eastern Thibet and

Yunnan, with a solitary species, *R. diphrocalyx*, in Szechuan. The tree habit is still maintained in most of the species, but there is a much greater development of bristly and glandular hairs, sometimes spread over the whole surface of the leaves. There is, too, a marked break away from the red colour, to white, pink, and purplish crimson, often accompanied by a large and more deeply coloured blotch at the base. **Crinigerum** is a small series of two species closely related to *Glischrum*, but of dwarfer habit. They are found in the same region, south-east Thibet and Yunnan.

In the "family tree" in my previous paper (*Rhododendron Year Book*, 1946) I showed the **Irroratum** series to be directly derived from the *Arboreum* series. They are connected by *R. agastum* and allied species, which have retained a thin indumentum similar to that of *R. arboreum*. They represent one of the largest series and, as may be seen from the key to the species given in the Rhododendron Society's book, many of the so-called species are extremely difficult to distinguish. They, too, have their "roots" in the Himalayas, but only in Bhutan and Upper Burma, the greater number being concentrated in Yunnan, with only one or two in Szechuan, and one, *R. Annae*, in Kweichow.

In series **Parishii,** also related to *Arboreum*, the leaves have a fugitive indumentum of *stellate* hairs. This type of hair is not found elsewhere in the genus and one wonders whether it is just a local development, or whether it points to the beginning of the evolution of the *lepidote* Rhododendrons, for the scales on the leaves of these are perhaps nothing more than highly modified stellate hairs or modified tree-like (dendriform) hairs. No species of the *Parishii* series is found in the Himalayas, their habitats being more to the east, from Assam (*R. Elliottii*) and north-east Upper Burma to Yunnan. Most of them are found at comparatively low altitudes.

Parallel with the *Irroratum* series out of *Arboreum*, but more directly from *Barbatum*, is the **Maculiferum** series. It is very remote from *Barbatum* in distribution, being found in Szechuan, Hupeh, eastern China and Formosa. The tree habit has disappeared, and the species are of a hardier type, and only one, *R. strigillosum*, retains the red flowers of the ancestral stock.

The line of descent of series Lacteum, Fulvum, Campanulatum, Adenogynum, Taliense, Wasonii and Roxieanum

So far we have only dealt with what may be considered the main stem of the Rhododendron family tree. One of the principal side-branches will now be considered, beginning with the lovely series **Lacteum.** This group is very sparsely represented in our Rhododendron "Garden of Eden," i.e. the Eastern Himalayas, only one

species, *R. Wightii*, being found there. It occurs from Nepal to Bhutan. With one or two exceptions in south-eastern Thibet, all the other species are found in Yunnan, and the series does not occur further east. A few are trees up to 30 ft., but the majority are more shrubby, with one, *R. dumosulum*, dwarf and found on open moorlands. Only two species, *R. Wightii* and *R. lacteum*, have yellow flowers, and they are two of the most beautiful of the genus.

Fulvum series embraces only five species, all of which are found only in Yunnan, so that its distribution conforms with its close phylogenetic relationship with the *Lacteum* series. The flowers are white or flushed with pink. The next series in this line of evolution seems to be **Campanulatum,** also with five species and purely Himalayan. They are large shrubs or small trees, showing some parallelism with the *Arboreum* series, *R. fulgens* having deep blood-red flowers. *R. lanatum* has yellow flowers, and the others are lilac or rosy-purple.

From the *Fulvum* series a most interesting line of development is represented by the *Adenogynum*, *Taliense*, *Wasonii* and *Roxieanum* series. Towards the end of it the species become increasingly dwarf and of very close growth. Series **Adenogynum** embraces about seventeen closely allied species, about half of them in Yunnan, the other half in Szechuan. They have thus wandered quite away from their ancestral stocks in the Himalayas. Series **Taliense** has a much wider range, from south-eastern Thibet to Kansu and Shensi. Series **Wasonii** is confined to Szechuan, except for *R. rufum*, which grows also in Kansu, whilst the species of **Roxieanum** occupy the south-east Thibet-Yunnan-Szechuan triangle, which is the headquarters of the genus at the present day.

Another branchlet of this part of our "tree" bears the **Haematodes, Neriiflorum** and **Martinianum** series, and parallel with them the **Argyrophyllum, Sanguineum, Selense** and **Forrestii** series. For want of space * I can deal with them only very briefly. Like a few other lines of development they end up with dwarf or creeping species with few or solitary-flowered inflorescences, and they grow at very high altitudes like most of the *Lapponicum* series. Their distribution calls for little comment. There are a few in Northern Burma, but most are found in south-eastern Thibet and Yunnan, but none in the Himalayas west of Burma.

The Calophytum, Davidii, Fortunei, Thomsonii, Campylocarpum, Souliei line of descent

The **Calophytum** series, which forms the base of a big left hand branch of our family tree (see *Year Book* for 1946 opposite p. 46),

* These are groups which I have had little opportunity to study in detail.

retains some of the ancient characters of the *Grande* and *Falconeri* series. These are the numerous (15–25) stamens and the 14–16-locular ovary. Moreover the general relationship with these groups is very obvious. There are only two species, *R. calophytum* and *R. Openshawianum*, both in Szechuan.

Davidii is a small series of about four species which seem to follow on naturally after *Calophytum*, *R. sutchuenense* especially providing the link. The species are found only in Szechuan and Hupeh.

Fortunei series centres round about Yunnan and Szechuan, though the type species, *R. Fortunei*, is isolated in eastern China (Chekiang). Its nearest approach to the Himalayas is in Upper Burma, where *R. diaprepes* is found at 10,000–11,000 ft. The series retains a few relatively ancient characters, especially in the number of stamens, which exceed ten in number, except *R. Hemsleyanum*, on Mt. Omei, in Szechuan.

From this point the branch in our "tree" forks in two directions, embracing a large number of species, bearing on the one hand the *Thomsonii*, *Campylocarpum*, *Souliei* and *Orbiculare* series, and on the other the *Griffithianum*, *Auriculatum*, *Ponticum* series. These groups diverge considerably from the parent stocks, not only in their morphology, but in their geographical distribution.

Thomsonii series has its "roots" in the Himalayas, *R. Thomsonii* being found in Nepal and Sikkim at 11,000–13,000 ft. Otherwise the series has a restricted range in the Upper Burma-Thibet-Yunnan triangle. The same remarks apply also to the **Campylocarpum** series, *R. campylocarpum* being the sole representative in the Himalayas. *R. orbiculare* is the only species of the series of that name. It is found in Western Szechuan. Series **Souliei,** an association of very closely allied species, as befits its high place in our "family tree," is confined to Yunnan and Szechuan.

It is in the second fork of the branch of our "tree," however, that a wider range of distribution is encountered. **Griffithianum** series is confined to the Himalayas, **Auriculatum** to Yunnan and Hupeh, but **Ponticum** and **Caucasicum** are scarcely represented at all in the Himalaya-Chinese regions. *Ponticum* series is found in such widely separated regions as North America (*R. catawbiense*, *R. maximum* and *R. californicum*) and South West Asia (*R. ponticum*). *R. ponticum* is also found in Southern Spain, but is very doubtfully native there. Series *Caucasicum* ranges from the Caucasus (*R. caucasicum*) to Siberia and Manchuria, Japan, and there is one species (*R. hyperythrum*) in Formosa. In connection with their great range in distribution, the interrelationships of these series need further study.

LEPIDOTE RHODODENDRONS

The second main trunk of our hypothetical "family tree" bears along its branches the various series of *lepidote*, or scaly, Rhododendrons. In a varying degree the leaves of these, especially on the lower surface, are clothed with mushroom-like bodies described as *peltate scales*. This type of indumentum probably serves to prevent excessive transpiration during hot weather, and also, no doubt, to afford some protection during the winter. Very often the scales are accompanied by a dense undercoat of minute papillae, short club-like or rod-like cells, arising from the epidermis and frequently coated with wax. The papillae are confined to the lower surface and probably also serve to protect the stomata.

Whether *lepidote* and *non-lepidote* Rhododendrons have been evolved separately from some common ancestral stock, it is not possible to more than guess. Certainly they have diverged sufficiently to render cross-fertilisation between members of the two groups extremely difficult. Although this has once been accomplished artificially,* no natural cross or suspected cross has so far been observed. However, in this paper we are dealing with distribution and have not space to more than mention this interesting aspect of the subject.

The EDGEWORTHII, MADDENII, MEGACALYX, CILIICALYX, TRIFLORUM, VIRGATUM, LAPPONICUM line of descent

The **Edgeworthii** series provides something of a connecting link between the two groups, though not a very close one. In some respects the woolly hairs of the bullate leaves suggest a remote affinity with the basic groups of the non-lepidote series, and this was indicated in the family tree in my previous paper by an arrow from the *Grande-Lacteum* groups. In addition to the woolly hairs, there are peltate scales on the lower surface of the leaves which places them in the lepidote group, and they are undoubtedly related to the larger *Maddenii* series. Except for one species, *R. bullatum*, in Yunnan, the *Edgeworthii* series are confined to the eastern Himalayas and Upper Burma, where they sometimes grow as epiphytes on other trees, like some of the *Maddenii* series. This epiphytic mode of life is perhaps quite fortuitous and not essential, for they flourish equally well on *terra firma*.

Camelliaeflorum series contains only two species which are found in the Himalayas in Sikkim and Bhutan, and are not far removed from the *Maddenii* series. Likewise the **Cinnabarinum** series of three or four species shares the same distribution, and

* See COWAN, "The Significance of *Rhododendron Grierdal*," *The Rhododendron Year Book*, 1946, 48.

provides something of a link between *Maddenii* and the *Triflorum* series.

The more primitive species of the **Maddenii** series are found in the subtropical zone. These were treated in the Rhododendron book as a subseries. They show primitive characters in the number of the stamens, which varies from 25 to 15, and in the ovary loculi, from 12 to 10. They thus show more or less parallel development with the *Falconeri* and *Grande* series. The most primitive species, *R. Maddenii* itself, is confined to the Himalayas, and only two, *R. crassum* and *R. excellens*, are found as far east as Yunnan.

Megacalyx, *Moupinense*, *Boothii*, and *Vaccinioides* series seem to represent short side branches from the Maddenii stock. They provide us with some species of surpassing quality. The species of *Megacalyx* are found mostly in Bhutan, though *R. Dalhousiae* and *R. Lindleyi* occur also in Sikkim. An outlier is *R. liliiflorum* in Kweichow, well away to the south-east. **Moupinense** is a small series of three species with a more easterly range, from south-eastern Thibet and Szechuan. They, also, are epiphytes or they grow on rocks.

Series **Ciliicalyx** is a considerable group which provides the link between the *Maddenii* and *Triflorum* series. They have very few "roots" in our Rhododendron "Garden of Eden," only *R. ciliatum* being found in the Sikkim Himalaya, though several are natives of Upper Burma, Assam and Siam. But the headquarters of the series is in Yunnan. *R. Lyi* is an outlier in Kweichow. Again a few are epiphytes, but they also grow equally well on the ground.

The large series **Triflorum** is of exceptional interest, not only because it extends the geographical range of the lepidote series considerably, but also because it is in this group that we meet with flowers having corollas and stamens rather like those of *Azalea*. And in a few species the leaves are deciduous or semi-deciduous, which adds to the deception. For we should beware of coming to the conclusion that this is the point of contact with *Azalea*, and personally I consider the resemblances, such as they are, to be due to parallel or convergent evolution from two quite distinct and separate stocks. Reference to the chart published last year will make this more clear. Though on the whole considerably advanced, the series still has a "root" in the eastern Himalayas, for *R. triflorum*, from which the series gets its name, is found in Sikkim and Bhutan. The greatest concentration, however, is in Yunnan and Szechuan, and there are outliers as far away as Afghanistan (*R. afghanicum*), Kweichow (*R. Bodinieri*), and Japan (*R. Keiskei*). The more primitive species have yellow flowers and the more advanced blue and white. Outstanding garden plants are *R. Augustinii*, *R. yunnanense* and *R. Davidsonianum*.

Series **Dauricum** and **Trichocladum** are but small offshoots of *Triflorum* affinity, some with deciduous or subevergreen leaves. The *Dauricum* series with two species is found in north-east Asia and Japan, and *Trichocladum* has a limited distribution in Upper Burma, south-eastern Thibet and Yunnan. The close relationship between the *Triflorum* and *Trichocladum* groups is shown by *R. rubrolineatum*, which might be equally well placed in either.

Although the dwarf *Lapponicum* group seems quite removed from *Triflorum*, there are connecting links such as **Virgatum** and **Scabrifolium.** In a few species of *Triflorum*, like *R. siderophyllum*, *R. stereophyllum* and *R. yunnanense*, there are often in addition to the terminal inflorescence a few flowers in the upper leaf-axils, a condition more completely carried out in the **Virgatum** series. This series is found in Sikkim, Bhutan and Yunnan. In two of them, *R. virgatum* and *R. oleifolium*, these axillary inflorescences are reduced to a solitary flower, a similar reduction being found in the *Ciliicalyx* series. In *Scabrifolium* the inflorescences are also axillary. They are confined to Yunnan and Szechuan.

The **Lapponicum** series is of great interest because it seems to represent a climax development as regards both growth and habitat. They are low growing shrublets, often forming extensive carpets at very high altitudes in the landscape of western China and south-eastern Thibet, the headquarters of the group. Only a few have spread far away from the main centre of distribution, one of the most interesting being *R. lapponicum* itself, which is circumpolar. There is only one species, *R. nivale*, in the eastern Himalayas, and one, *R. parvifolium*, in north-east Asia from Altai to Kamchatka and Sakhalin, where it grows in cold, alpine marshes. A few species have yellow flowers, but the dominant colours are mauve, blue and various shades of purple. One of the most interesting and highly evolved species is *R. intricatum*, in which the stamens are hidden in the corolla-tube. Several species have the stamens reduced to five, like many Azaleas.

The series Heliolepis, Saluenense, Anthopogon, Cephalanthum line of descent

A parallel branch of our "tree" bears the above series in the order shown, together with a few "side shoots" such as *Lepidotum*, *Glaucum*, *Campylogynum*, *Ferrugineum* and *Micranthum*. As their distribution is very similar, I shall deal with them only very briefly.

The most advanced group appears to be *Cephalanthum*, which, like *Lapponicum*, consists of small shrublets with clusters of very small flowers and a reduced number of stamens. **Heliolepis** series is quite closely related to *Triflorum*, and only one or two species are found outside Yunnan and Upper Burma. **Saluenense** is a small

THE ANTHOPOGON ALLIANCE—*RHODODENDRON POGONOPHYLLUM*

FIG. 25—Type specimen (See p. 75)

FIG. 26—Leaves magnified four times (See p. 75)

RHODODENDRONS ON MT. OMEI

FIG. 27—*R. Pingianum* (See p. 120)

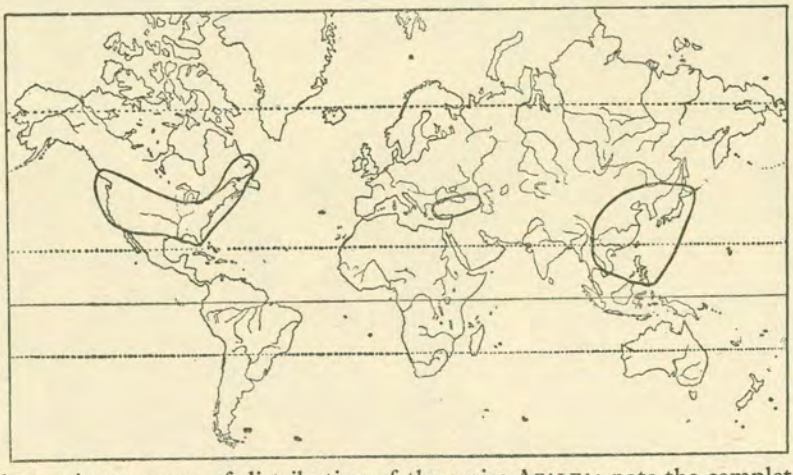
and distinct series of low and often prostrate shrublets which flourish at high altitudes in north-east Burma, south-eastern Thibet and Yunnan. The **Anthopogon** and **Cephalanthum** series seem something of a parallel development with *Lapponicum*, and they may be considered together. They range from Afghanistan to north-eastern Asia, usually at very high altitudes. The variable number of stamens in the *Anthopogon* series is reduced to five in *Cephalanthum*.

Lepidotum, Glaucum and **Campylogynum** range from Kashmir to Yunnan, and **Ferrugineum** is found only in the mountains of southern Europe from the Pyrenees to Transylvania. A rather puzzling series, **Micranthum,** represented by only one species of that name, occupies an isolated position in the genus, though it is distantly related to *Ferrugineum*. It ranges from western Szechuan to the Pekin district.

This completes our survey of the **Lepidote** Rhododendrons except for the species which occur in tropical regions to the south, from the Malay Peninsula, the Malay Archipelago, New Guinea and North-East Queensland. These are of little interest to horticulturists in this country, and are not dealt with in the present paper.

AZALEA SERIES

The **Azalea** series consists of about 65 species and the group taken as a whole probably represents a later stage of evolution than *Rhododendron* proper. From a phytogeographical point of view it is of exceptional interest. The species are found in a wild state in three widely separated regions (see map), one in eastern Asia, stretching



Approximate range of distribution of the series AZALEA; note the complete isolation of *R. luteum* in south-east Europe, Asia Minor and the Caucasus. Over 40 species are found in Eastern Asia, and about 17 in North America.

from Japan and northern Korea to south-western Annam, China and the Philippines, a second in North America from Labrador to Florida and eastern Texas, and in California, and there is one quite isolated species in south-eastern Europe and the Caucasus region. As the relatives of this species, *R. luteum*, are quite 3,000 miles away to the east, and more than 6,000 miles to the west, one can only conclude that it is but the remnant of a former wide distribution of *Azalea*, perhaps right across the north-temperate zone, like *Magnolia* and *Liriodendron*. It is a singular fact that no *Azalea* is found in the Himalayas or in the Indian region to the south, for *Rhododendron indicum* is a misnomer, being found wild only in Japan.

The *Azalea* series was classified by REHDER into six subseries: *Obtusum*, *Tashiroi*, *Schlippenbachii*, *Canadense*, *Nipponicum* and *Luteum*. Subseries *Obtusum* embraces about thirty species found in the temperate regions of eastern Asia, from Korea to the Philippines and Annam. The Philippines, of course, are well within the tropics. Some of the species bear a superficial resemblance to certain of the *Triflorum* series. *Tashiroi* contains only one species of that name and is found in southern Japan and neighbouring islands. *Schlippenbachii* is represented by six species in eastern Asia, *Canadense* by four species, two of them in eastern North America and two in Japan, *Nipponicum* by one species of that name in the mountains of central Japan, and *Luteum* about twenty species, fifteen of which occur in eastern North America, one in western North America, one in south-eastern Europe, Asia Minor and the Caucasus, and two in China and Japan.

OBSERVATIONS ON THE CLASSIFICATION OF THE GENUS RHODODENDRON

BY F. KINGDON-WARD, B.A., F.L.S., V.M.H.

(Founder's Medal, Royal Geographical Society; Livingstone Medal, Royal Scottish Geographical Society)

A CLASSIFICATION, though it serves the purpose of an index, is much more than that. It shows, or tries to show, the lines along which evolution has proceeded. Thus species are gathered into genera, genera into families, and families into orders. Such a classification is based on broad distinctions and similarities in floral structure. But species of the same genus often have flowers so alike that no further subdivision on these lines is possible, and we are forced to rely mainly on differences of the vegetative organs, and on minor details of flowers, in order to distinguish them. The tests are artificial—and often arbitrary—because we have no scale by which to measure the relative importance of minor differences.

But in so large a genus as Rhododendron the often well-marked aggregates of species (here named series)* are akin to genera, and the genus as a whole is more like a family. Some approach to a natural classification should therefore be possible.

In taxonomic botany flower structure is accepted as the basis for a natural classification of flowering plants. The flower it would seem is the most stable part of the plant, less influenced by environment than the vegetative organs; and plants with the same type of flower structure, however different their general appearance may be, are regarded as more or less closely allied.

Of the several parts of the reproductive machinery, the seed itself is probably the most stable of all, and it occurred to me to examine the possibility of a natural classification of the eight or nine hundred species of Rhododendron based mainly on the seeds. If such a classification by seed and flower structure threw any light on the evolution of the genus, and helped to account for its distribution in space, it would serve a useful purpose; if it did not, it could be discarded.

* Throughout I have used the classification of the late SIR I. BAYLEY BALFOUR, and PROFESSOR SIR WILLIAM WRIGHT SMITH, with slight modification.

THE SEED

In an earlier paper* I pointed out that all Rhododendron seeds belong to one of three well-marked types:

(i) Alpine type. (Seed wingless, rounded or angular.)
(ii) Forest type. (Seed flattened, winged all round, about twice as long as broad.)
(iii) Epiphytic type. (Seed spindle shaped, with end tails 4–6 times as long as broad.)

Starting with the assumption that the alpine wingless seed is the most primitive, let us see where it leads us. It is no rash assumption. In the first place this is the commonest and most widely distributed type of Rhododendron seed. It is associated with a great variety of flower structures; and it is almost confined to species with lepidote leaves, which, on other grounds, appear to be the oldest group. Finally, most of the species with *axillary* flowers: e.g. *R. Keysii*, *R. racemosum*, *R. spinuliferum*, *R. pubescens*, *R. scabrifolium* and *R. hemitrichotum*, regarded as primitive, have alpine seeds. *R. virgatum* also has axillary trusses, but the seeds are of the epiphytic type—probably a modification to meet special conditions.

There is fairly strong evidence for the view that the lepidote Rhododendron is the most primitive type. The circumpolar distribution of *R. lapponicum* itself as well as the wide distribution of the Lapponicum type on the colder and drier ranges of eastern Asia, may be cited in support. HUTCHINSON has suggested that Rhododendron is derived from Ledum.

The following series have wingless seeds, rounded or angular, accounting for nearly 300 species. Some of the series are small—thus Dauricum 2 species, Moupinense 3 species—and possibly recent.† But large series like Azalea, Lapponicum and Triflorum have an almost world wide distribution and are probably very much older:

Anthopogon	Glaucum	Moupinense
Aureum	Heliolepis	Ovatum
Azalea	Lapponicum	Saluenense
Campylogynum	Trichocladum	Scabrifolium
Cephalanthum	Lepidotum	Triflorum
Cinnabarinum	Micranthum	Trichocladum
Dauricum		

Although the alpine seed is almost entirely confined to species with lepidote leaves, there is no such close connection between alpine *seed* and alpine *plant*. Most alpine Rhododendrons have alpine seeds; but by no means all species with alpine seeds are alpine plants. There

* *Journal of Botany*, September 1935.

† But see "Evolution and Classification of Rhododendrons" by J. HUTCHINSON. *The Rhododendron Year Book*, 1946.

is a tendency for species whose nearest allies are high alpines, e.g. *R. sphaeranthum*, *R. ravum*, to establish themselves in the forest zone, and for forest species, e.g. of series Neriiflorum, to invade the alpine region. This indeed is just what we should expect from the geographical history of Sino-Himalaya, where the greatest concentration of the genus is located. Alpine species which have invaded the forest zone, such as those of series Cephalanthum and Lapponicum, retain the alpine seed; similarly forest species which invade the alps retain their winged seeds, even when like *R. repens* they adopt a peculiarly alpine habit. One suspects that these invasions by a few species, the bulk of whose close allies stick to the original environment, are recent. Nor is it very dissimilar with the large and widespread Azalea, Trichocladum and Triflorum series. These are probably of north temperate origin, but have left comparatively few species behind them in their trek to the south. In Sino-Himalaya these plants appear to be ascending towards the alpine region (e.g. *R. triflorum* itself); while *R. trichocladum* is a true alpine.

If there is no longer any indissoluble connection between alpine seed and alpine (or north temperate) plant, still less can we trace any constant connection between lepidote leaf and alpine plant. We shall have indeed to account for the surprising fact that all Malaysian Rhododendrons appear to be lepidote.* All epiphytes too are lepidote, and these are necessarily forest plants, though they retain more or less the alpine habit; and it is amongst the epiphytic species that the Lepidotae depart most widely from their typical wingless seed. Though all epiphytic Rhododendrons—those which retain the epiphytic habit throughout life—are lepidote, the seed is generally of that peculiar type, long and spindle shaped, with end tails, which I have called the epiphytic type, since it is hardly found outside the group. The Malaysian Rhododendrons also, or many of them, appear to have seeds of this type.

No alpine plant ever has epiphytic seeds; but a few forest shrubs, not necessarily epiphytes, approach the epiphytic type, e.g. *R. virgatum*.

The following series have epiphytic seeds, spindle shaped or occasionally flattened, but then at least four times as long as broad, with end tails:

Boothii (in limited sense)	Megacalyx (in part)
Camelliaeflorum	Stamineum
Ciliicalyx	Vaccinioides
Edgeworthii	Virgatum
Maddeni (in part)	

In all, sixty or seventy species.

* I have examined some 25 species, from Malaya to New Guinea, and from the most diverse altitudes. All proved to be lepidote.

With the exception of Stamineum, all the above have lepidote leaves. In series Edgeworthii, the leaves are woolly as well as lepidote beneath, the hairs completely concealing the scales.

The seeds of *R. stenaulum* are epiphytic, although series Stamineum comprises trees rather than shrubs, and includes no epiphytes. Moreover they have glabrous leaves, which are hairy only in young plants. Like series Ovatum, their distribution is southwards and eastwards of the great Sino-Himalayan concentration. But the long slender capsule of *R. stenaulum*, in which the valves remain attached to the central axis at the tip, approaches that of *R. vacciniodes*. Apart from the anomalous capsule and epiphytic seed—enormously exaggerated in Vaccinioides—there does not appear to be much in common between the two series. Indeed it would be difficult to find two species outwardly more dissimilar than *R. stenaulum* and *R. vaccinioides*, the one a small tree with glabrous leaves and moderate-sized flowers, the other an epiphytic bushy undershrub with lepidote leaves and tiny flowers. But the relationship, albeit not a close one, is there in the seed. The species of Stamineum are anomalous, and it would be difficult to point to any closely related series, with or without the same type of seed. Both REHDER and HUTCHINSON suggest a relationship with Azalea; their distribution however, is against this.

There is nothing in what has been said so far to invalidate the argument that the lepidote Rhododendrons as a whole are the most primitive group, from which the rest may have been derived. One would hardly expect in nature such clear cut distinctions as that all alpines have alpine seeds or that all species with alpine seeds are lepidote. But it is worth remarking that *all alpine Rhododendrons which have alpine seeds are lepidote.*

It is possible that if seeds throw any light on the evolution of the genus, seedlings might do the same. I therefore examined a number of seedling Rhododendrons in the hope that some general truth would appear which would give a clue to their descent. Amongst the lepidote species examined I find three types of seedling: (i) those with lepidote leaves only, (ii) those with lepidote and bristly leaves, the bristles soon disappearing, (iii) those with lepidote leaves developing bristles which are retained in adult life.

SEEDLING RHODODENDRONS

The first point to notice is that lepidote leafed Rhododendrons are always lepidote from the beginning, and in the case of one of the most widely distributed series—Lapponicum—generally lepidote only. That is to say, species of Lapponicum very rarely produce hairs. The cotyledons are sometimes glabrous, but often bear a tiny

scale each; the second and every subsequent leaf bears one or more scales. This is probably more or less true of another widely distributed series, Triflorum; although mature plants of several species may have the midrib downy, especially when growing in forest, as most of them do.

To group (i) above belong the following species:

TABLE I

SPECIES	SERIES	SEED	2ND LEAF
*R. aureum**	Aureum*	Alpine	Lepidote only
R. tephropeplum	,,	,,	,, ,,
R. deleiense	,,	,,	,, ,,
R. patulum†	Imperator†	,,	,, ,,
R. cinnabarinum	Cinnabarinum	,,	,, ,,
R. Keysii	,,	,,	,, ,,
R. yunnanense	Triflorum	,,	,, ,,
R. manipurense	Maddeni	,,	,, ,,
R. virgatum	Virgatum	,,	,, ,,

A few of the above may develop pubescent hairs here and there in the adult state, e.g. *R. virgatum* on corolla and style; but the seedling leaves, and usually the adult leaves also, are hairless.

To group (ii), in which the seedling leaves produce hairs which soon disappear, as well as scales, belong the following species:

TABLE II

SPECIES	SERIES	SEED	2ND LEAF
R. racemosum	Virgatum	Alpine	Lepidote & hairy
R. timeteum	Oreotrephes	,,	,, ,,
R. crebreflorum	Anthopogon	,,	,, ,,
R. Genestierianum	Glaucum	,,	,, ,,
R. concinnoides‡	Ciliicalyx	Epiphytic	,, ,,
R. Lindleyi	Megacalyx	,,	,, ,,
R. megacalyx	,,	,,	,, ,,

To group (iii), in which permanent hairs are developed in the seedling stage, usually from the second leaf on, belong a number of alpine species, and the entire series Boothii, as here restricted:

* Aureum=species excluded from Boothii: *R. aureum, auritum, chrysodoron, deleiense, tephropeplum.*

† Imperator = species excluded from Lepidotum.

‡ DR. HUTCHINSON assigns this species to series Triflorum. He would probably agree that it might equally well be classed with series Ciliicalyx. I have placed it there because of its epiphytic habit and seed. There are no epiphytic species in Triflorum, whose seeds are alpine.

TABLE III

SPECIES	SERIES	SEED	2ND LEAF
R. riparium	Saluenense	Alpine	Lepidote & bristly
R. saluenense	,,	,,	,, ,,
R. trichocladum	Trichocladum	,,	,, ,,
R. spinuliferum	Scabrifolium	,,	,, ,,
R. pubescens	,,	,,	,, ,,
R. megeratum	Boothii	Epiphytic	,, ,,
R. leucaspis	,,	,,	,, ,,
R. sulfureum	,,	,,	,, ,,

It is a fact of some significance that amongst the comparatively small number of epiphytic Rhododendrons there are species belonging to each of the above seedling groups.

If we now examine seedlings of the other main groups, those with hairy but not lepidote leaves (Lanatae) and those with glabrous leaves (Glabratae), we find certain differences. The mature plant may depart widely from the seedling stage. Seedlings of all Glabratae which I have examined have bristly or glandular hairy leaves; some species do not lose these hairs or bristles for two or three years. Even on mature plants, hairs may still persist on the young leaves, though they gradually disappear as the leaf expands.

On the other hand, the big leafed tree species sometimes take several years to develop their mature pelt, and in the meantime the full-grown leaves may be glabrous, or nearly so.

Thus there appears to be no clear cut line between Glabratae and Lanatae. At one stage of their lives, Glabratae may be hairy; at a similar stage, Lanatae may be glabrous. The following species belonging to the Glabratae are more or less hairy in the seedling stage:

TABLE IV

SPECIES	SERIES	SEED	SEEDLING
R. stenaulum	Stamineum	Epiphytic	Softly hairy
R. tanastylum	Irroratum	Forest	Floccose hairy
R. Kendrickii	,,	,,	Very hairy (bristly)
R. coelicum	Neriiflorum	,,	Glandular hairy
R. repens	,,	,,	,, ,,
R. Beesianum	Lacteum	,,	Hairy
R. cerasinum	Thomsonii	,,	Glandular hairy
R. campylocarpum	,,	,,	Hairy

These are nearly all forest shrubs or small trees, except *R. repens*, which is an alpine. Though nearly glabrous when mature, *R. repens* does not rightly belong to the Glabratae, the majority of its nearer allies being woolly leafed species. In fact it seems that Rhododen-

drons can change their skins without much difficulty. There can be little doubt that the Forrestii subseries of series Neriiflorum are Lanatae which have lost their hairy coats. It is very possible too that Ovatum are alpine Lepidotae which have lost their scales; as some of the Azaleas have done.

If the distinction between Glabratae and Lanatae breaks down, however, the distinction between the lepidote species and the elepidote is on an altogether different footing. That time has split the great Rhododendron family in two is a fact well known to the hybridizer. Lepidote species can be crossed with lepidote, and elepidote with elepidote whether lanate or not. But in spite of many attempts, only *one* authentic hybrid between a lepidote species and an elepidote is known, namely the cross *R. Griersonianum* × *R. Dalhousiae* raised by ADMIRAL WALKER-HENEAGE-VIVIAN.* Nevertheless it is difficult to believe that the cleavage between the two groups is fundamental or that the presence or absence of scales is the external sign of such incompatibility.

But since all Lepidotae, with the exception of those which have adopted an epiphytic mode of life, have wingless seeds, we may say that the refusal to mate is, in general, a prohibition as between wingless and winged seeds.

There is, however, still another distinction between the lepidote and the elepidote groups, to which MR. F. C. PUDDLE has lately drawn attention,† namely that of flower colour. MR. PUDDLE points out that a primary colour is missing from each group. Red is lacking in Lepidotae, blue in Elepidotae; and this too may be a fundamental distinction.

It may be added that both red and blue are missing from the *epiphytic* Lepidotae, all of which have white, yellow, or rarely pinkish flowers.

From the fact that glabrous seedlings are apparently unknown, all species which I have examined—and these the most diverse—having either scaly and/or hairy leaves, we may infer that the Glabratae are a later development. They are Lanatae which have lost their hairs. This view receives direct support from *R. repens* and its allies, whose nearest relations are hairy leafed species inhabiting the forest belt; *R. repens*, however, has established itself in the alpine region as a result of extensive deglaciation opening up new areas for colonisation. Though glabrous when mature, it is glandular hairy in the seedling stage, and has taken its winged forest seeds with it into the Alps, where it lives amongst species most of which have

* I think DR. COWAN exaggerates its significance. A single exception which is not even drawn from nature, can hardly invalidate the general rule so far observed. ("The Significance of Rhododendron 'Grierdal'," by J. M. COWAN. *The Rhododendron Year Book*, 1946.)

† *Journal of the Royal Horticultural Society*, September 1937.

wingless seeds. Other species of series Neriiflorum which have ascended above the forest line have remained shrubs and small trees; *R. repens* appears to be the only species which has acquired an alpine habit without acquiring the alpine seed.

If Lanatae can lose their hairs, there is no reason why Lepidotae cannot lose their scales, as appears to have happened with species of Azalea (e.g. *R. Schlippenbachii*). In all the lepidote Azaleas, the scales are far apart. Probably Ovatum is derived from alpine Lepidotae, as the seed suggests. DR. HUTCHINSON however would put it the other way round.

Whether the process is reversible or not we cannot say. *R. Edgeworthii* and *R. seinghkuense* (which, however, ought not to be placed in the same series) show that leaves can be lanate and lepidote at the same time. Some at least of the species enumerated in Table III suggest this. Series Edgeworthii and *R. seinghkuense* might be classed either with Lanatae or with Lepidotae. But I can find no evidence that *R. bullatum* or *R. Edgeworthii* has ever been crossed with an elepidote species; in this respect at any rate they act as Lepidotae, and the lanate pelt seems to be a later acquisition. Further it may be observed that the species named in Table III in which permanent hairs have appeared, mostly tend to come right down into the forest belt. For the epiphytes, of course, this is essential; but it is equally noticeable with the species of series Scabrifolium. The only glaring exception is *R. saluenense*. This is equally true of the species in Table II, which eventually lose their hairs. *R. Genestierianum* is a tree (in north Burma) of the middle forest zone, as is *R. timeteum*. The number of seedling species examined, however, does not warrant any very definite conclusions. There is, in fact, as yet no direct evidence of the evolution of elepidote Rhododendrons from lepidote ancestors.

A point, however, which seems to have been overlooked, and which may furnish indirect evidence, is worth noting. In many of the Lanatae, e.g. *R. praestans*, the bud scales are sticky, and it will be found that they are covered with minute dots half concealed amongst the silky hairs. These dots are really glandular scales secreting a gummy substance, and are perhaps comparable with the scales on the under leaf surface of many Lepidotae, some of which at least are known to secrete a gummy substance (e.g. in Cephalanthum). Bud scales are modified leaves, but so long as they fulfil their function of protecting the bud there is no reason why they should continue to alter as the plant alters. They may represent a more primitive type of leaf than is apparent in the vegetative leaves. It is noteworthy that these lepidote bud scales are prominent in Grande (though by no means confined to it) which, so far as the flowers indicate, is a primitive group. The transition from scale—

originally no doubt a secreting organ—to hair may be through glandular hairs, found on many Rhododendrons. Such glandular hairs also appear on the bud scales and on the seedling leaves of species with ultimately glabrous leaves, e.g. *R. campylocarpum*. Glandular hairs are in fact typical of series Neriiflorum and Thomsonii, in which both lanate and glabrous leafed species are found.

Taking then the *seed type* as the basis of classification for the moment, we can draw up a table as follows:

Alpine Seed (without any wing)		Lepidotae only with very few exceptions, e.g. Series Ovatum and Subseries Schlippenbachii which are glabrous or nearly so.
Epiphytic Seed	(winged)	Epiphytic Lepidotae; also series Stamineum (elepidote) and Edgeworthii (the latter both lepidote and lanate)
Forest Seed	(winged)	Glabratae and Lanatae only. A few species of series Maddeni have seeds transitional between epiphytic and forest type.

As already remarked, the widely distributed type of alpine seed is by no means confined to the alpine regions. Even in hot climates it may descend almost to sea level (e.g. *R. Simsii* in north Burma). And it is circumpolar. Obviously all species with this type of seed have the same chance of dispersal, in so far as this depends on the seed and not on the environment. Hence, regarding the series of Lepidotae as genera for the moment, according to WILLIS' Age and Area hypothesis, (which is peculiarly applicable here), being the most widespread they should be the older. It is surely significant that the alpine type of seed is more widespread than the forest type, though the latter is clearly better adapted for dispersal.

THE FLOWER

The Rhododendron flower shows wide variation; but in no group is the variation so great as it is amongst the lepidote leafed species, or in that portion of the Lepidotae grouped together by reason of their alpine seeds. Amongst the series with the forest type of seed, the flower structure is, as a matter of fact, fairly constant.

The commonest type of Rhododendron flower has a tubular or campanulate almost regular corolla, with 10 stamens arranged in a

close column round the longer slightly curved style. At the base the corolla is pouched to form five honey glands. In some species the glands are even better defined, being composed of different tissue, and specially coloured: e.g. *R. cerasinum*. The stamens are arranged in two bundles of five, comprising four pairs (two pairs in either bundle), and an odd one over in each bundle, these two being the longest and shortest in the column. This arrangement can be simply expressed by the formula:

$$1 + (2 + 2) + (2 + 2) + 1$$

This arrangement is obvious in such otherwise apparently diverse series as Arboreum, Barbatum, Campanulatum, Fulvum, Irroratum, Lacteum, Neriiflorum, Ponticum, Taliense, Thomsonii.

But in all the above series, comprising some 300 species and subspecies, the seed is probably of the forest type; that is to say more or less flattened, with usually an all-round wing, and not above three times as long as broad. The species themselves are all elepidote, whether lanate or glabrous leafed. Series Fortunei, though characterised by a 7-lobed corolla, also belongs here.

Wide divergence from this typical elepidote flower is found in only two series, Falconeri and Grande. These have an 8–10-lobed corolla and 16–24 stamens arranged in an open ring. The ovary too is many celled. This is certainly a more primitive type, nevertheless these sections have a limited range, though certain species, e.g. *R. arizelum*, are prolific in their localities. With these exceptions, the elepidote species show comparatively little variation in flower structure.

It is quite otherwise with the Lepidotae. Here extreme variation is the rule. The corolla may be regular and rotate (series Lapponicum), pentagonal (series Saluenense), butterfly shaped (series Triflorum), broadly or narrowly funnel or trumpet shaped (series Maddeni) or salver shaped (Anthopogon and Cephalanthum).*

It is less, however, the shape of the corolla than the arrangement of androecium and gynaecium which is important. And here also there is considerable variation. The simple column or closed bundle (fascis) so typical of the Lanatae is never seen in the Lepidotae; nor is there any corresponding arrangement typical of a majority of the species. Each series of the Lepidotae seems to have evolved a device of its own. However, they fall into two fairly well-defined groups: (i) those in which ovary and style are together longer than the stamens, the latter being loosely arranged and of unequal length,

* HUTCHINSON suggests that these two series should be merged, though he points out that they fall into two groups, an "advanced" group with reduction to 5 stamens and a primitive group with more than 5 stamens. There is also something to be said for the view that these plants are not Rhododendrons at all!

(ii) those in which ovary and style are together shorter than the stamens, the latter being rigidly arranged in a ring and generally of two lengths only, long and short, alternating. It is fairly certain that this adjustment between corolla and essential organs is bound up with devices to ensure cross pollination. The wide range of variation, from the simple Lapponicum mechanism to the complicated Triflorum and Boothii type of flower suggests a long period of time to attain such perfection.*

The most beautiful arrangement is perhaps that of *R. triflorum* and its near allies, where the deciduous corolla, caught up on the long upwardly curving style, scrapes alien pollen entangled in its hairy posterior groove on to the stigma. Much the same arrangement is met with in species of series Maddeni, which according to HUTCHINSON are closely allied to the Triflorums.

In *R. cerinum* (Boothii) the corolla is more or less rotate, with a short tube, the lower rim of which is bent under the gynoecium. The lumen is not quite central, but pushed slightly forward. The corolla stands almost on edge, that is facing outwards instead of upwards or downwards, and the posterior lobes are spotted. The stamens form an open ring, their filaments, slightly expanded at the base, cottony, making an almost continuous palisade round the ovary; the posterior three are more hairy than the other seven. On the posterior side of the disc is a small button or swelling, and the posterior filament is kinked at the base so as to get over this; but this kink leaves an aperture in the pallisade on either side, and it is just here that honey is secreted between the pallisade and the corolla tube. The style is shorter than the shortest stamen, and bent down almost at right angles to the ovary. It is pushed forward and to one side—right or left—so that the stigma comes to be thrust out between two anterior stamens, and clear of them. The pollen threads trail all over the back of the flower, and an insect probing on either side of the kinked posterior stamen for honey cannot but get covered with it. The first thing he touches on visiting the next flower is the out-thrust butt of the protruding style—that is, the stigma.

The Triflorums are amongst the most widely distributed Rhododendrons in south-eastern Asia to-day, being found from Afghanistan to Japan; although *R. afghanicum* is not typical, the style being shorter than the stamens, thick and *bent* rather than curved. But it has the typical seed. This wide extension of the series, divisible into several well-marked sub-series, is strongly in favour of ancient lineage.

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* I hope sometime to give an account of the ingenious cross-pollination devices seen in many species of Rhododendron. They can be matched probably only amongst the Orchidaceae. Certain cross-pollination is perhaps one of the causes of the success of this genus.

One would expect these series of the genus which include the largest number of species, and are most widely spread, to be the most ancient. Section Azalea contains 65 species divided into 6 subseries. But Azalea is probably a mixed lot, including both lepidote and elepidote species, and will probably have to be revised. The seeds of those species which I have examined, however, are of the alpine type. The series as a whole is certainly primitive. Incidentally, it is probably amongst the Azaleas that a cross between a lepidote and an elepidote species is most likely to be effected.*

Excluding Azalea we have the following:

TABLE V

SERIES	NO. OF SUBSERIES	NO. OF SPECIES
Taliense (E)	3	56
Triflorum (L)	6	56
Lapponicum (L)	A single series	52
Maddeni (L)	3	49
Thomsonii (E)	5	39 + 12 subspecies.
Irroratum (E)	2	33 + 9 ,,
Neriiflorum (E)	4	28 + 36 ,,

The four large elepidote series (E) with 156 species almost exactly equal the three lepidote series (L) which have 157 species. The considerable number of subspecies amongst the Elepidotae suggest that these are less fixed, more unstable than the presumably more ancient Lepidotae.

It is to be noted that the Lepidotae as a whole are more widely distributed than the Elepidotae, only the Maddeni series amongst the former showing a more restricted distribution; but none of the Maddeni have the lepidote alpine type of seed.

This at first sight looks like a reversal of what we should expect from an examination of the seeds, since winged seeds should be more widely dispersed than wingless seeds. It almost looks as though winged seeds were a handicap to dispersal! But clearly it is the forest habitat, not the winged seed, which has militated against wide dispersal; and since Maddeni, though they happen to be Lepidotae, are also forest plants with winged seeds, they do not share in the advantages gained by alpine species such as Lapponicum, or those of open woods, like the Triflorums whose dust-like seeds can be blown about. Of the forest trees with winged seeds, only *R. arboreum* spread far, and none appear to have reached Malaya. On the other hand, the Ponticum series reached North America.

In conclusion, taking seed type and flower structure into consideration, the chief Sino-Himalayan series seem to me to fall into

* This was written in 1939, before the advent of *R.* × 'Grierdal.'

more or less closely related groups, although any series, through particular species, may show close relationship with more than one group. As I see them, these groups are as follows:

LEPIDOTAE: Alpine Seed Type

GROUP I	REMARKS
Anthopogon Cephalanthum	Doubtful Rhododendrons. Should probably form a single series.
GROUP II	
Aureum	New section comprising species removed from Boothii, characterised by tubular corolla, long straight style exserted, and alpine seed. Truss several flowered, *RR. aureum*, *auritum*, *chrysodoron*, *deleiense*, *tephropeplum*.
Imperator	New section comprising species removed from Lepidotum, characterised by long straight exserted style and alpine seed. Truss much reduced, *RR. imperator*, *patulum*, *pemakoense* (from section Glaucum) *pumilum*, *uniflorum*. Related to Group III.
GROUP III	
Campylogynum	Style very short, sharply bent. Truss reduced. Related to Boothii and to Imperator through *R. pumilum*.
Glaucum	Style short and bent. Truss larger.
Lepidotum	Flower as in Boothii, but seed alpine. Judged from the structure of their flowers alone—the Imperator group being removed—Lepidotum and Boothii might be combined.
Trichocladum	Style bent. In *R. trichocladum* the style is shorter than the stamens, in *R. semilunatum* slightly longer. The flower structure resembles that in Boothii, but the more butterfly-shaped corolla, deciduous leaves and alpine seed relate Trichocladum more closely to Triflorum.
GROUP IV	
Scabrifolium	Perhaps not very closely related to any living series. An ancient alpine group which has descended into the forest. The leaves, hairy and lepidote, suggest affinity with Edgeworthii, but this is not borne out by flowers, seeds or habit. Possibly more closely related to section Cinnabarinum through *R. spinuliferium*, which bears some resemblance to *R. Keysii*. *R. racemosum*, which also has axillary flowers and alpine seeds, might be included here, in spite of its different leaves.
GROUP V	
Cinnabarinum	*R. cinnabarinum* is closely related to Triflorum through *R. concatenans*, *R. timeteum* and *R. xanthocodon*.
Heliolepis	Closely allied to Triflorum, but with enlarged truss. The greater crowding of the flowers makes for greater regularity, the very unequal stamens pointing to an originally more oblique corolla.
Lapponicum	Flowers very simple, corolla almost regular rotate, with 10 sub-equal stamens, and style never much longer or much shorter. Some species show heterostyly. No specialized honey glands. A primitive type, but closely related to Triflorum through *R. ravum*, *R. rupicola*, *R. cuneatum*, *R. stereophyllum*.

LEPIDOTAE: Alpine Seed Type (*cont.*)

GROUP V—*cont.*	REMARKS
Triflorum	Related to Ciliicalyx as well as to the above, but seeds alpine. For this reason, *R. concinnoides*, *R. flavantherum* and *R. kasoense* should be removed to the latter group, having epiphytic seeds.
Saluenense	Pentagonal corolla as in some Triflorums, but reduction of truss to one or two, more rarely three flowers.

LEPIDOTAE: Epiphytic Seed Type

GROUP I	REMARKS
Boothii	Flowers like Lepidotum, when Aureum is excluded from the former and Imperator from the latter. Related to Edgeworthii (and hence to Megacalyx) through *R. seinghkuense*, which has the typical Boothii flower. *R. chrysolepis* should be excluded.
GROUP II	
Maddeni	The three sub-series Ciliicalyx, Megacalyx, Maddeni, might equally well be regarded as series; Maddeni itself is the most aberrant. Related to Triflorum through Ciliicalyx, but with epiphytic seeds. *R. concinnoides*, *R. flavantherum*, *R. kasoense* seem to belong here. Megacalyx has seeds intermediate between epiphytic and forest type. *R. chrysolepis* from Boothii seems to be nearer Ciliicalyx.
Virgatum	Axillary flower trusses. Related to Scabrifolium and perhaps more remotely to Cinnabarinum, but with epiphytic seeds. *R. racemosum* seems misplaced here.

ELEPIDOTAE: Forest Seed Type

GROUP I	REMARKS
Arboreum Barbatum Campanulatum Fulvum Irroratum Neriiflorum Ponticum Taliense Thomsonii	All these are closely related by their flower structure and seeds; all have the typical arrangement of stamens, although in certain species, e.g. *R. lanatum*, it is looser. In Fulvum the fruit departs from the common type; so also in Thomsonii, e.g. *R. campylocarpum*. In *R. cerasinum* (Thomsonii) the long pedicel bends twice through 180°.
GROUP II	
Falconeri	Big leafed trees, with more primitive flowers. Leaves with spongy indumentum. Bud scales often with scale-like glands secreting gum comparable with the leaf glands of some species of Cephalanthum, Anthopogon, etc. (leaf scales). *R. Macabeanum* seems to belong here rather than to Grande.
Grande	Very near Falconeri, but with plastered shining indumentum, sometimes becoming cobwebbed, or disappearing entirely. Bud scales with lepidote scales (glands) as in Falconeri.

LEPIDOTAE: Forest Seed Type (*cont.*)

GROUP III	REMARKS
Fortunei	Corolla 7-lobed.
GROUP IV	
Stamineum	Flower structure recalls some of the Malaysian species, but the leaves are elepidote. Fruit unlike that of any other Sino-Himalayan section; probably a southern type. Seeds epiphytic—the only tree or bush group to have this seed. Undoubtedly of Malaysian affinity or origin.

The species whose position seems to me to need reconsideration are the following:

SPECIES	PRESENT SECTION	PROPOSED SECTION	
R. aureum	Boothii	Aureum (new section)	Alternatively to section Glaucum.
R. auritum	,,	,,	
R. chrysodoron	,,	,,	
R. deleiense	,,	,,	
R. tephropeplum	,,	,,	
R. chrysolepis	,,	Maddeni (Ciliicalyx)	
R. imperator	Lepidotum	Imperator (new section)	
R. patulum	,,	,,	
R. pumilum	,,	,,	
R. uniflorum	,,	,,	
R. pemakoense	Glaucum	,,	
R. concinnoides	Triflorum	Maddeni (Ciliicalyx)	
R. kasoense	,,	,, ,,	
R. flavantherum	,,	,, ,,	
R. seinghkuense	Edgeworthii	Boothii	

It may be that, while the above species do not fit easily into their accepted positions, to remove them in the present state of our knowledge would do even more violence to them. That appears to me to depend largely on the importance attached to seed and flower structure.

I do not think there is anything in the above sketch—necessarily incomplete and tentative—which conflicts with the universally accepted classification put forward by the late SIR I. BAYLEY BALFOUR and SIR WILLIAM WRIGHT SMITH. My aim has been to supplement that great work, to point out profitable lines of research, and to test doubtful cases; certainly not to challenge it. The few minor adjustments proposed are expressions of opinion which any competent field botanist is entitled to offer. In this study I have, of course, had the invaluable advantage of the work of MAXIMOWICZ, HOOKER, BAYLEY BALFOUR, REHDER and TAGG, as well as of my contemporaries, PROFESSOR SIR WILLIAM WRIGHT SMITH, DR. J. HUTCHINSON and

DR. J. MACQUEEN COWAN as a basis to supplement my ideas. It is probable that few of my observations have escaped the notice of these botanists. But I have not seen them set forth in the correlation which I have tried to establish between seeds, seedlings, flowers, etc. As stated above, these observations are incomplete. Until *all* species of Rhododendron, including the many species now known from Malaysia, have been examined on the same lines, it is unjustifiable to draw final conclusions or to generalize widely. Nevertheless certain provisional inferences may legitimately be drawn, and I trust I have not gone beyond that. I have tried rather to indicate a comprehensive method of approach to the great genus which has given so much pleasure to tens of thousands.

RHODODENDRONS OF MOUNT OMEI, WESTERN CHINA

BY DR. WEN-PEI FANG

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[*The following paper appeared originally in the* JOURNAL OF THE WEST CHINA BORDER RESEARCH SOCIETY, *series B, Vol.* 16, 200–218 (1946). *It has been condensed by omitting some of the references to botanical literature, the detailed lists of specimens examined, and the Chinese characters, for which the original should be consulted. Summaries of the altitudinal range of the species on Mount Omei, their habit of growth and their flower colour have been added by the author, who has also supplied further illustrations.*]

MOUNT OMEI (Omei Shan, 29° 28 N., 103° 41 E.), situated in the south-western corner of Szechwan province, is well known the world over for its very rich flora. Since it has been explored by various botanists, DR. E. FABER, DR. E. H. WILSON. PROFESSOR S. S. CHIEN, MR. C. L. SUN, MR. H. C. CHOW, and the writer, many new genera and new species have been discovered. The species of Rhododendron are also very rich, and their distribution, which has been unknown to botanists and horticulturists, is of special interest.

For the convenience of discussion the mountain can be divided into three regions, namely, the lower slopes, the middle slopes and the upper slopes.

1. The lower slopes include all the localities from the foot of the mountain to the vicinities of Niu-hsin-ssü, and Wan-nien-ssü, from 450 to 1,000 metres above sea-level. The vegetation of the lower slopes is generally similar to that of low hills in Szechwan province and even the same as in other places in western China. There are two species of the Azalea series of Rhododendron. *R. Simsii* Planchon, a very popular species in China, grows abundantly on cliffs or at the sides of forests, especially those of pines. It flowers in the spring and the late autumn, owing to the good climate there. The second species, *R. stamineum* Franchet, grows as a small tree in pure forests of itself or in company with other broad-leaved trees, commonly from 450 to 1,000 metres, rarely up to 1,600 metres above sea level.

2. The middle slopes begin above Niu-hsin-ssü, and Wan-nien-ssü, to the foot of Tsuan-tien-po, from 1,001 to 2,000 metres above

sea level. There are nine species of Rhododendron, most of which belong to the Elepidote group, and only two species to the Lepidote group. The Azalea group is absent excepting that *R. stamineum* Franchet occasionally grows in the lower part of this region.

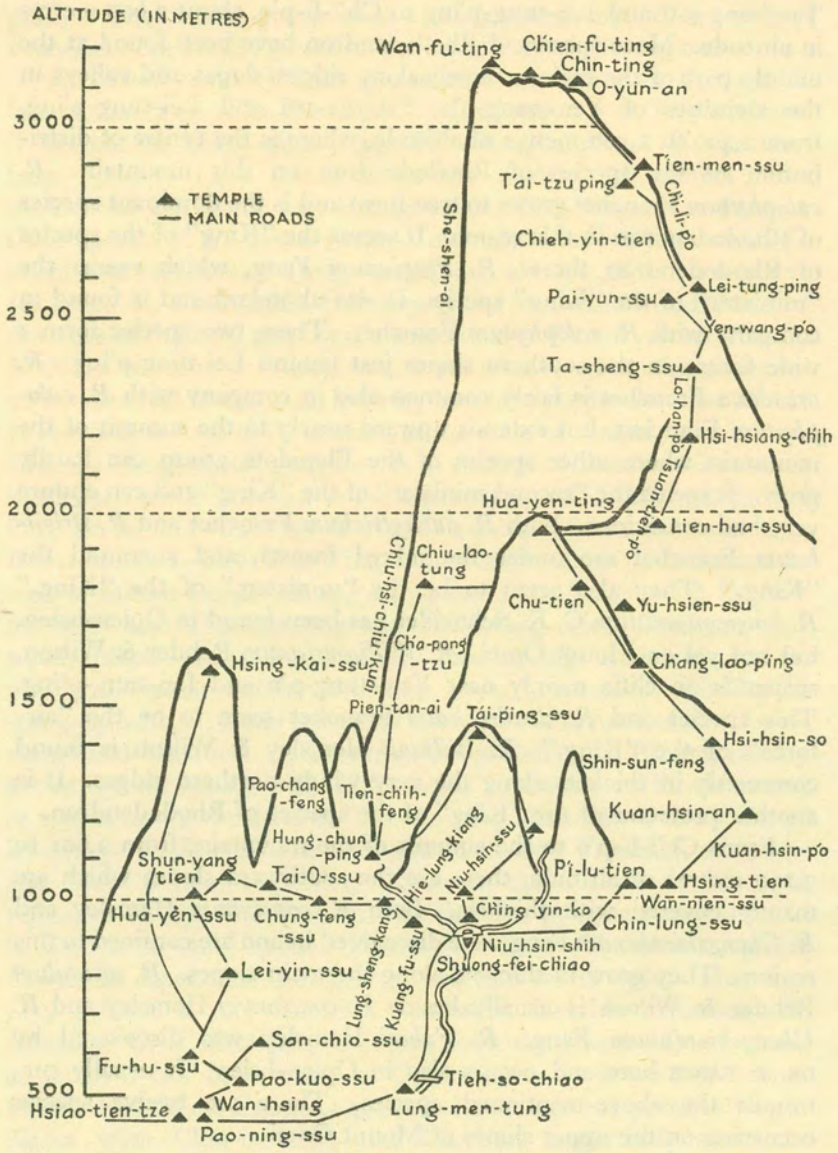
R. Hemsleyanum Wilson grows as a small tree in thickets or forests, rarely on cliffs. Its centre of distribution is at Ta-p'ing, and it extends to Hung-chun-p'ing, Pao-chang-feng and Hsi-hsin-so, from 1,200 to 1,400 metres above the sea-level. It prefers moist places, but can stand very strong winds. *R. Chengianum* Fang, a sister species of *R. Hemsleyanum*, has been found only in forests or at sides of forests near Hung-chun-p'ing, about 1,200 metres above sea level. *R. Hanceanum* Hemsley grows as a small shrub in or at the sides of thickets, and usually surrounds *R. Hemsleyanum* Wilson. *R. Ririei* Hemsley & Wilson, which was discovered on the mountain and is confined to this area, is a very beautiful purple-flowered shrub. It grows in forests or in thickets at the sides of forests, mainly near Chiu-lao-tung, about 1,800 metres in altitude. From here it extends northward and downward to the lower slopes of Chia-p'ong-tze and Pian-tan-ai, and westward through Yu-shien-ssü and Hua-yen-ting. But it occurs again at Sha-p'ing, Opien-hsien, about 30 miles south-west of Mount Omei. *R. argyrophyllum* Franchet grows in thickets on cliffs near Hua-yen-ting and Hsi-hsiang-chin. Both are very windy places. It is comparatively rare on this mountain, but its variety, *omeiense* Rehder & Wilson, is fairly common, growing in company with *R. Ririei* in forests along all the ravines of the above-mentioned localities. *R. Openshawianum* Rehder & Wilson, usually a tree, grows mixed with Lithocarpus in forests at Yü-shien-ssü, as well as in the vicinities of Chiu-lao-tung, Pian-dan-ai and Chiang-lao-p'ing. *R. Davidii* Franchet and *R. discolor* Franchet, with rose and white flowers respectively, grow in the thickets of the same region as *R. Openshawianum*. But they are in open situations and isolated from other species of Rhododendron. The former species flowers in April and the latter species flowers in July. Therefore they provide a very beautiful decoration for this mountain. *R. orbiculare* C. K. Schneider is absent from the proper Mount Omei, although it has been found at Opien-hsien, south-west of Mount Omei. *R. lutescens* Franchet grows in thickets in comparatively open places from Chiu-lao-tung and Chu-tien respectively along the ridges to Lien-hua-shin. It is also isolated from other species of Rhododendron.

3. The upper slopes are from Tsuan-tien-p'o to the summit of the mountain, from 2,001 to 3,150 metres above sea-level. In the vicinity of Hsi-hsiang-ch'ih, the lower part of this region, *e.g.* from Tsuan-tien-p'o to Lo-han p'o, from 2,001 to 2,200 metres in altitude, there is no Rhododendron growing excepting that *R. dendrocharis*

Franchet is epiphytic on high trees of Abies, Tsuga, Acer and other species of broad-leaved trees. It is also distributed upward through Ta-cheng-ssü and Lei-tung-p'ing to Ch'i-li-p'o, about 2,600 metres in altitude. More species of Rhododendron have been found at the middle part of the region, namely along ridges, slopes and valleys in the vicinities of Yen-wang-p'o, Pai-yüa-ssü and Lei-tung-p'ing, from 2,400 to 2,560 metres of altitude, where is the centre of distribution of the species of Rhododendron on this mountain. *R. calophytum* Franchet grows to tree-form and is the dominant species of Rhododendron in this region. It seems the "King" of the species of Rhododendron there. *R. Pingianum* Fang, which seems the "minister" of the "King" species, is also abundant and is found in company with *R. calophytum* Franchet. These two species form a wide forest on the southern slopes just behind Lei-tung-p'ing. *R. oreodoxa* Franchet is fairly common also in company with *R. calophytum* Franchet, but extends upward nearly to the summit of the mountain where other species of the Elepidote group can hardly grow. It seems the "second minister" of the "King" and can endure very bad conditions. Both *R. pachytrichum* Franchet and *R. strigillosum* Franchet are under the mixed forests, and surround the "King." They also seem to be the "ministers" of the "King." *R. longesquamatum* C. K. Schneider has been found in Opien-hsien, but not yet on Mount Omei. *R. Williamsianum* Rehder & Wilson, suspends on cliffs mainly near Yen-wang-p'o and Lei-tung-p'ing. This species and *R. dendrocharis* Franchet seem to be the "air-force" of the "King." *R. Wilsonii* Hemsley & Wilson is found commonly in thickets along the very windy northern ridges. It is another protector of the "King" of the species of Rhododendron.

From Ch'i-li-p'o to the summit of the mountain, from 2,601 to 3,150 metres of altitude, there are the southward slopes which are mainly covered with thickets. Both *R. concinnum* Hemsley and *R. Chengshienianum* Fang were discovered in and are confined to this region. They grow in thickets along the main slopes. *R. nitidulum* Rehder & Wilson is usually beside *R. concinnum* Hemsley and *R. Chengshienianum* Fang. *R. Faberi* Hemsley was discovered by DR. E. FABER here and occurs also in Opien-hsien. It usually surrounds the above-mentioned species. There are twelve species occurring on the upper slopes of Mount Omei.

Altogether twenty-three species of Rhododendron have been reported from Mount Omei. Among them there is only one species, *R. Simsii*, which is widely distributed in the northern, eastern, and southern provinces of China; two species, *R. stamineum* and *R. discolor*, are found also in other western provinces, Hupeh, Hunan and Kweichow. The remaining twenty species are very limited in distribution. Furthermore, of the twenty species, excepting only one



A SKETCH MAP OF MOUNT OMEI

species, *R. calophytum* which is distributed also in Nan-ch'wan-hsien of south-eastern Szechwan, nineteen are rather local in distribution on the high mountains of the border of western Szechwan and eastern Sikang provinces. Again, four of the species just referred to, *R. Hemsleyanum*, *R. Chengianum*, *R. concinnum* and *R. Chengshienianum*, are confined to Mount Omei. The other fifteen species, which are *R. argyrophyllum*, *R. Pingianum*, *R. Ririei*, *R. stigillosum*, *R. pachytrichum*, *R. Openshawianum*, *R. Davidii*, *R. oreodoxa*, *R. Williamsianum*, *R. Faberi*, *R. Wiltonii*, *R. dendrocharis*, *R. nitidulum*, *R. lutescens* and *R. Hanceanum*, have nevertheless been reported from certain districts of Pao-hsing-hsien, T'ien-ch'uan-hsien, K'ang-ting-hsien, Hung-ya-hsien, Han-yuan-hsien, Opien-hsien and Mapien-hsien. The latter localities possess the same floral condition on the southern Chiung-lai Range, and should constitute the "Plateau of Mount Omei." Therefore these fifteen species of the nineteen recorded ones may also be considered as endemic to this area. In view of the great richness of species and high percentage of the endemic ones on Mount Omei, this may be considered as the centre of the distribution of the genus Rhododendron in Szechwan and Sikang provinces.

The following is an enumeration of all the species of which the author has studied specimens from Mount Omei:

Series AZALEA Subseries OBTUSUM

1. **Rhododendron Simsii** Planchon in Flore des Serres, **9:** 78 (1854); Fang, Icon. Pl. Omeien. **1** (1) t. 17 (1942); Journ. W. China Border Res. Soc. **16** (B): 203 (1946).
MOUNT OMEI: 470–600 m. Shrub 1–3 m.; flowers rose-coloured.

Series STAMINEUM

2. **Rhododendron stamineum** Franchet in Bull. Soc. Bot. France, **33:** 236 (1886); Fang, Icon. Pl. Omeien. **1** (1) t. 18 (1942); Journ. W. China Border Res. Soc. **16** (B): 204 (1946).
MOUNT OMEI: 470–1,400 m. Small tree 3–7 m.; flowers white or pinkish-white.

Series ARBOREUM Subseries ARGYROPHYLLUM

3. **Rhododendron argyrophyllum** Franchet in Bull. Soc. Bot. France, **33:** 231 (1886); Fang, Icon. Pl. Omeien. **1** (1) t. 19 (1942); Journ. W. China Border Res. Soc. **16** (B): 205 (1946).
MOUNT OMEI: 1,950–2,100 m. Shrub 2–3 m.; flowers white.

Rhododendron argyrophyllum Franchet var. **omeiense** Rehder & Wilson in Sargent, Pl. Wilson. **1:** 527 (1913); Fang, Icon. Pl. Omeien. **1** (1) t. 19 (1942); Journ. W. China Border Res. Soc. **16** (B): 265 (1946).
MOUNT OMEI: 1,800 m. Shrub 3–5 m.; flowers white.

4. **Rhododendron Pingianum** Fang in Contrib. Biol. Lab. Sci. Soc. China, Bot. Ser. **12** (1): 20 (1939); Icon. Pl. Omeien. **1** (1) t. 20 (1942); Journ. W. China Border Res. Soc. **16** (B): 206 (1946) (Fig. 27).
MOUNT OMEI: 2,300–2,700 m. Small tree 5–9 m.; flowers purple or purplish-red.

5. **Rhododendron Ririei** Hemsley & Wilson in Kew Bull. **1910:** 111; Fang, Icon. Pl. Omeien. **1** (1) t. 21 (1942); Journ. W. China Border Res. Soc. **16** (B): 206 (1946).
MOUNT OMEI: 1,200–11,921 m. Shrub or small tree 3–5 m.; flowers purple or purplish.

Series BARBATUM Subseries MACULIFERUM

6. **Rhododendron pachytrichum** Franchet in Bull. Soc. Bot. France, **33:** 231 (1886); Fang, Icon. Pl. Omeien. **1** (1) t. 22 (1942); Journ. W. China Border Res. Soc. **16** (B): 207 (1946).
MOUNT OMEI: 2,400–2,800 m. Shrub 1·5–3 m.; flowers pinkish or pale rose.

7. **Rhododendron strigillosum** Franchet in Bull. Soc. Bot. France, **33:** 232 (1886); Fang, Icon. Pl. Omeien. **1** (1) t. 23 (1942); Journ. W. China Border Res. Soc. **16** (B): 208 (1946).
MOUNT OMEI: 2,300–2,400 m. Shrub 3–5 m.; flowers rose, red or purplish.

8. **Rhododendron longesquamatum** C. K. Schneider, Ill. Handb. Laubholzk. **2:** 483 (1909), 1045 (1912); Fang in Journ. W. China Border Res. Soc. **16** (B): 208 (1946).
South-west of MOUNT OMEI: OPIEN-HSIEN, alt. 3,000 m. Shrub 2 m.; flowers rose to pink.

Series FORTUNEI Subseries CALOPHYTUM

9. **Rhododendron calophytum** Franchet in Bull. Soc. Bot. France, **33:** 230 (1886); Bot. Mag. **153:** t. 9173 (1929); Fang, Icon. Pl. Omeien. **1** (1) t. 27 (1942); Journ. W. China Border Res. Soc. **16** (B): 209 (1946).

MOUNT OMEI: 2,300–2,560 m. Small tree 5–9 m.; flowers rose or rose-white.

10. **Rhododendron Openshawianum** Rehder & Wilson in Sargent, Pl. Wilson. **1:** 543 (1913); Fang, Icon. Pl. Omeien. **1** (1) t. 27 (1942); Journ. W. China Border Res. Soc. **16** (B): 209 (1946) (Fig. 28).
MOUNT OMEI: 1,400–1,800 m. Tree 4–12 m.; flowers purplish-white.

Subseries DAVIDII

11. **Rhododendron Davidii** Franchet in Bull. Soc. Bot. France, **33:** 230 (1886); Fang, Icon. Pl. Omeien. **1** (1) t. 28 (1942); Journ. W. China Border Res. Soc. **16** (B): 210 (1946).
MOUNT OMEI: 1,800–2,400 m. Shrub 3–5 m.; flowers purple or purplish-blue.

Subseries FORTUNEI

12. **Rhododendron discolor** Franchet in Morot, Journ. de Bot. **9:** 391 (1895); Bot. Mag. **143:** t. 8696 (1917); Fang, Icon. Pl. Omeien. **1** (1) t. 29 (1942); Journ. W. China Border Res. Soc. **16** (B): 210 (1946).
MOUNT OMEI: 1,600–1,771 m. Small tree 2–7 m.; flowers white and fragrant.

13. **Rhododendron Hemsleyanum** Wilson in Kew Bull. **1910:** 109; Fang, Icon. Pl. Omeien. **1** (1) t. 30 (1942); Journ. W. China Border Res. Soc. **16** (B): 211 (1946) (Fig. 29).
MOUNT OMEI: 1,200–1,400 m. Small tree 3–6 m.; flowers white.

14. **Rhododendron Chengianum** Fang, Icon. Pl. Omeien. **1** (1) t. 31 (1942); Journ. W. China Border Res. Soc. **16** (B): 211 (1946).
MOUNT OMEI: 1,200 m. Small tree 6–7 m.; flowers white (Fig.30).

Subseries OREODOXA

15. **Rhododendron oreodoxa** Franchet in Bull. Soc. Bot. France, **33:** 230 (1868); Fang in Journ. W. China Border Res. Soc. **16** (B): 211 (1946). Syn. *R. haematocheilum* Craib in Gard. Chron. 3rd ser. **53:** 214 (1913); Bot. Mag. **139:** t. 8518 (1913).
MOUNT OMEI: 2,300–3,150 m. Small tree 2–5 m.; flowers purple or purplish-red.

Subseries ORBICULARE

16. **Rhododendron orbiculare** Decaisne in Fl. des Serres, **22:** 169 (1877); Bot. Mag. **144:** t. 8775 (1918); Fang in Journ. W. China Border Res. Soc. **16** (B): 212 (1946).
South-west of MOUNT OMEI: OPIEN-HSIEN, 2,000 m. Shrub 2–3 m.; flowers purplish-rose.

Series TALIENSE Subseries ADENOGYNUM

17. **Rhododendron Faberi** Hemsley in Journ. Linn. Soc. Bot. Ser. **26:** 22 (1889); Fang, Icon. Pl. Omeien. **1** (1) t. 24 (1942); Journ. W. China Border Res. Soc. **16** (B): 213 (1946).
MOUNT OMEI: 2,540–3,135 m. Shrub 1–3 m.; flowers white.

Subseries WASONII

18. **Rhododendron Wiltonii** Hemsley & Wilson in Kew Bull. **1919:** 107; Fang, Icon. Pl. Omeien. **1** (1) t. 25 (1942); Journ. W. China Border Res. Soc. **16** (B): 213 (1946).
MOUNT OMEI: 2,556–2,560 m. Shrub 2–3 m.; flowers pale red.

Series THOMSONII Subseries SOULIEI

19. **Rhododendron Williamsianum** Rehder & Wilson in Sargent, Pl. Wilson. **1:** 538 (1913); Bot. Mag. **148:** t. 8935 (1922); Fang, Icon. Pl. Omeien. **1** (1) t. 32 (1942); Journ. W. China Border Res. Soc. **16** (B): 214 (1946)..
MOUNT OMEI: 1,800–2,560 m. Shrub 1–2 m.; flowers pale rose.

Series LAPPONICUM

20. **Rhododendron nitidulum** Rehder & Wilson in Sargent, Pl. Wilson. **1:** 509 (1913); Fang, Icon. Pl. Omeien. **2** (1) t. 108 (1945)
MOUNT OMEI: 2,800–3,150 m. Shrub about ½ m.; flowers purple or reddish-purple.

Series MOUPINENSE

21. **Rhododendron dendrocharis** Franchet in Bull. Soc. Bot. France, **33:** 233 (1886); Fang, Icon. Pl. Omeien. **1** (1) t. 33 (1942); Journ. W. China Border Res. Soc. **16** (B): 215 (1946).

RHODODENDRONS ON MT. OMEI

FIG. 28—*R. Openshawianum* (See p. 121)

RHODODENDRONS ON MT. OMEI

FIG. 29—*R. Hemsleyanum* (See p. 121)

RHODODENDRONS ON MT. OMEI

FIG. 30—*R. Chengianum* (See p. 121)

RHODODENDRONS ON MT. OMEI

FIG. 31—*R. Chengshienianum* (See p. 123)

MOUNT OMEI: 2,300–2,540 m. Small shrub 30–70 cm. epiphytic on trees; flowers reddish or purple.

Series TRIFLORUM Subseries HANCEANUM

22. **Rhododendron Hanceanum** Hemsley in Journ. Linn. Soc. Bot. **26:** 24 (1889); Bot. Mag. **142:** t. 8669 (1916); Fang, Icon. Pl. Omeien. **1** (1) t. 34 (1942): Journ. W. China Border Res. Soc. **16** (B): 215 (1946).
MOUNT OMEI: 1,147–1,400 m. Shrub 1–4 m.; flowers white.

Series TRIFLORUM Subseries POLYLEPIS

23. **Rhododendron concinnum** Hemsley in Journ. Linn. Soc. Bot. **26:** 21 (1889); Bot. Mag. **141:** t. 8620 (1915); Fang, in Journ. W. China Border Res. Soc. **16** (B): 216 (1946). Syn. *R. coombense* Hemsley in Bot. Mag. **135:** t. 8280 (1909).
MOUNT OMEI: 2,560–3,150 m. Shrub 0·5–2 m.; flowers purplish.

Series TRIFLORUM Subseries TRIFLORUM

24. **Rhododendron lutescens** Franchet in Bull. Soc. Bot. France, **33:** 235 (1886); Bot. Mag. **146:** t. 8851 (1920); Fang, Icon. Pl. Omeien. **1** (1) t. 35 (1942); Journ. W. China Border Res. Soc. **16** (B): 217 (1946).
MOUNT OMEI: 1,800–1,900 m. Shrub 1–3 m.; flowers light yellow.

25. **Rhododendron Chengshienianum** Fang, Icon. Pl. Omeien. **1** (1) t. 36 (1942); Journ. W. China Border Res. Soc. **16** (B). 216 (1946) (Fig. 31).
MOUNT OMEI: 2,800–2,900 m. Shrub 0·5–2 m.; flowers greenish-yellow.

REPORT OF THE RHODODENDRON SHOW

April 29th and 30th, 1947

BY N. K. GOULD

THE competitive classes for Rhododendrons held at Westminster on April 29 and 30, 1947, again proved a popular event with both amateur exhibitors and visitors. There were six more classes than in the previous year's competition, and only five failed to receive any entry.

The only nurserymen's exhibit was the fine floor group of hardy evergreen Rhododendrons staged in Class 2 by MESSRS. W. C. SLOCOCK, LTD. of Woking, who were awarded the Society's Silver-gilt Flora Medal. At one end of the group a large specimen of 'Red Riding Hood' stood among massed bushes of the cream 'Letty Edwards' and 'Unique'; at the other end the rose flowers of 'Betty Wormald' were associated with 'Mother of Pearl.' Other varieties employed were 'Rosy Bell,' ' Starfish,' 'Mme B. de Bruin' and *fastuosum* var. *plenum*, and the group was bordered by bushes of a large variety of small-flowered species.

A wall group of cut flowers was entered in Class 5 by the Commissioners of Crown Lands, Windsor Great Park, who were awarded the Silver-gilt Banksian Medal. The centre was occupied by vases of *Thomsonii*, *campylocarpum* and a fine form of *fictolacteum*, supported by 'Handsworth White,' *Albrechtii* in beautiful condition, *Vaseyi*, *emasculum* and many others. Although the quality was good throughout, rather too close arrangement detracted somewhat from the appearance of the exhibit.

In Class 6, for eight single trusses of species, the first place was taken by MAJOR E. DE ROTHSCHILD, who showed very fine specimens of *lacteum*, *euchaites* and *campylocarpum*, as well as *fictolacteum*, *eximium*, *niphargum*, *concatenans* and *irroratum*. COLONEL E. H. W. BOLITHO'S entry was second, and included good trusses of *Macabeanum*, *sinogrande* and *Davidsonianum*. SIR HENRY PRICE secured third place with a varied set including *lacteum*, *coriaceum*, *dichroanthum* and *sperabile*. The interest of this class is indicated by the fact that among the three entries noted no fewer than twenty species were to be seen.

Similarly, in Class 7, requiring single trusses of eight hybrids, competition was keen and the range of variety extensive. The first place was secured by LORD ABERCONWAY with 'Gretia,' 'Phoebus,' 'Tregedna,' 'Cornish Cross,' 'Beauty of Tremough,' 'Bella,' 'Kewense' × 'Cornish Cross' and *Griffithianum* × *barbatum*.

'Ibex,' 'Carex,' 'Aries' and 'Avalanche' were prominent in MAJOR DE ROTHSCHILD'S second prize entry. Third place was given to another entry from Bodnant, which included the neat scarlet 'Mureun,' 'Elisabeth,' 'Corma' of deep blood-red, and 'Shilsonii.' ADMIRAL WALKER-HENEAGE-VIVIAN took fourth place with a selection in which the dense, lavender-blue truss of 'Singleton Blue' and the dusky purple of 'Graham Vivian' were conspicuous.

For a single truss of a species in Class 8, SIR HENRY PRICE won the McLaren Challenge Cup with a splendid truss of *lacteum*, closely followed by a fine, deep-coloured example of *Macabeanum* from ADMIRAL WALKER-HENEAGE-VIVIAN and a good form of *fictolacteum* staged by the Commissioners of Crown Lands.

The Loder Challenge Cup, awarded annually for the best truss of a hybrid, was won in Class 9 by MR. J. B. STEVENSON with the clear yellow Logan variety of 'Damaris.' LORD DIGBY'S 'Queen Wilhelmina' and LORD ABERCONWAY'S 'Cardinal' were placed second and third respectively.

The Crosfield Challenge Cup, offered in Class 10 for a truss or spray of each of six hybrids raised by the exhibitor was won by LORD ABERCONWAY with 'Phoebus,' 'Bella,' 'Mureun,' 'Cardinal,' 'Gretia' and a clear pink, un-named hybrid raised from (*arboreum* × *Griffithianum*) × 'Penjerrick.' The Exbury entry, placed second, comprised 'Eleanore,' 'Biskra,' 'Grisette,' 'Aries,' 'Ibex' and 'Carita.' An all-red exhibit from Bodnant, made up of 'Red Queen,' 'Matador,' 'Aperemia,' 'Corma,' 'Redwing' and 'Aspansia,' was third; and SIR GILES LODER won the fourth place with a set which included 'Sanctity,' 'Spring Beauty' and 'Seagull' var. 'Seamew.'

Class 11, for one truss of any Rhododendron of the Series Arboreum, Barbatum, Campanulatum, Fortunei, Fulvum, Irroratum or Lacteum, attracted only four entries. SIR HENRY PRICE and MAJOR DE ROTHSCHILD showed well-coloured examples of *lacteum*, COLONEL STEPHENSON R. CLARKE had a nice truss of clear mauve *vernicosum*, and LORD ABERCONWAY exhibited *calophytum*.

A shapely truss of *Macabeanum* won first place for COLONEL BOLITHO in Class 12 (Series Falconeri or Grande). LORD ABERCONWAY'S *Hodgsonii* was placed second and the superior mauve form of *fictolacteum*, from the Commissioners of Crown Lands, was third.

In Class 13, for one truss of the Series Neriiflorum, LORD DIGBY'S *euchaites* was first, COLONEL BOLITHO'S *haemaleum* second, and ADMIRAL WALKER-HENEAGE-VIVIAN'S *euchaites* third.

In Class 14, for one truss of the Series Maddenii or Edgeworthii, COLONEL BOLITHO'S very large, pink-flushed *bullatum* was placed first, LORD ABERCONWAY'S delicately beautiful *carneum* and *inaequale* took second and third places, and SIR GILES LODER'S *Veitchianum* was fourth.

All the prize-winning entries in Class 15, for a truss of the Subseries Thomsonii, were won by the species *Thomsonii*, shown by SIR GILES LODER, LORD DIGBY and LORD ABERCONWAY. MR. STEVENSON showed *Meddianum*.

In Class 16, for a single truss or spray of the Subseries Campylocarpum or Souliei, SIR GILES LODER'S *campylocarpum* secured first place, MR. STEVENSON'S *cyclium* was second, followed by LORD ABERCONWAY'S *Williamsianum*.

Class 17, requiring one spray of any deciduous Rhododendron of the Series Azalea, was not very strongly supported. COLONEL STEPHENSON CLARKE'S lovely spray of *Schlippenbachii* made the greatest appeal to the Judges, and the third prize was won for ADMIRAL WALKER-HENEAGE-VIVIAN by the same species. MR. STEVENSON'S well-coloured *Albrechtii* was placed second.

The first prize in Class 19, for one spray of the Series Anthopogon, Cephalanthum, and similar small-flowered Series, was awarded to LORD ABERCONWAY for a very floriferous branch of *myrtilloides*. SIR HENRY PRICE showed *campylogynum* in an almost mahogany shade for second place, and the third was secured by MR. STEVENSON with a good pale rose *crebreflorum*.

Two Exbury exhibits, *intricatum* and *flavidum*, were given first and third places in Class 20, for a spray of the Series Lapponicum, COLONEL STEPHENSON CLARKE took second place with *scintillans*, and LORD ABERCONWAY'S *ravum* was placed fourth.

To Class 21, for one spray of *Augustinii*, LORD DIGBY sent a very superior blue form which gained first place. ADMIRAL WALKER-HENEAGE-VIVIAN'S entry, given second place, was distinctly paler; LORD SWAYTHLING'S, third, was somewhat smaller but of good colour.

In Class 22, for one spray of the Series Cinnabarinum, Heliolepis or Triflorum, other than *Augustinii*, LORD ABERCONWAY'S fine sprays of *concatenans* and *Davidsonianum* took the first two places, and the third and fourth went to MAJOR DE ROTHSCHILD'S *chartophyllum* and *rubiginosum*. Some other exhibits in this class were *cinnabarinum* from SIR GILES LODER, a deeply-coloured *rubiginosum* (Rock 59199) from LORD SWAYTHLING, and *Keiskii*, shown by SIR HENRY PRICE.

A nice piece of *racemosum* from COLONEL STEPHENSON CLARKE won first place in Class 23, for one spray of the Series Glaucum, Scabrifolium or Virgatum. From Exbury came *charitopes* and *racemosum* to take second and third places, and LORD SWAYTHLING'S *pemakoense* was fourth. The species *glaucum* was shown in an unusually dark form by MR. STEVENSON, also by LORD ABERCONWAY and COLONEL BOLITHO.

In Class 24, for one species of the Series Boothii, LORD SWAYTHLING won first prize with a good spray of *deleiense*, the same species

winning second place for MAJOR DE ROTHSCHILD. LORD DIGBY and COLONEL STEPHENSON CLARKE put up examples of *tephropeplum*.

Class 25 invited a vase of any species of any series not previously covered, and an interesting variety of exhibits was displayed. The first prize went to SIR HENRY PRICE for the small, mustard-yellow *mekongense* (Series Trichocladum), LORD DIGBY'S clear pink *Makinoi* (Subseries Caucasicum) was second, and LORD ABERCONWAY put up the primrose-yellow *trichocladum* for the third place. Some other entries were *Wasonii* (Series Taliense) shown by LORD ABERCONWAY and MAJOR DE ROTHSCHILD; the pinkish form known as *rhododactylum* from LORD DIGBY; *pruniflorum* from COLONEL BOLITHO and *taliense* from LORD ABERCONWAY.

In Class 27, for a single truss of any hybrid obtained by crossing *Griffithianum* with any hybrid, LORD ABERCONWAY'S 'Bella' found favour with the Judges, followed by SIR GILES LODER'S white 'Sunkist' and an unnamed hybrid shown by ADMIRAL WALKER-HENEAGE-VIVIAN.

Class 28, for one truss of 'Penjerrick' or 'Mrs. Randall Davidson,' was supported by two entries only, from MR. W. WHITAKER and MAJOR DE ROTHSCHILD, both of 'Penjerrick.'

In Class 29, for any other hybrid obtained by crossing *Griffithianum* with any other Rhododendron, the winning exhibits were the large, shell-pink, unnamed hybrid from LORD SWAYTHLING, a hybrid from *Griffithianum* × *barbatum* sent by LORD ABERCONWAY, and LORD DIGBY'S 'Dr. Stocker.'

Any other hybrid of the Subseries Campylocarpum or Souliei was eligible in Class 30. LORD SWAYTHLING secured first prize with 'Cremorne,' LORD DIGBY'S 'Red Poll' was second, and for the third place SIR HENRY PRICE put up a pretty primrose-yellow hybrid from *campylocarpum* × *caucasicum*.

In Class 31, for one truss of any hybrid of the Series Neriiflorum, there was little to choose for brilliance of colour between MAJOR DE ROTHSCHILD'S glossy scarlet 'Aries,' given the first place, LORD SWAYTHLING'S vivid, unnamed hybrid from 'Hugh Koster' × *neriiflorum* and LORD ABERCONWAY'S 'Neriihaem.'

Intense colouring was the rule in Class 32, for one truss of any *Thomsonii* hybrid. A blood-red hybrid from 'Earl of Athlone' won first place for LORD SWAYTHLING. SIR GILES LODER'S 'Queen Wilhelmina' × *Thomsonii* was second, and MAJOR DE ROTHSCHILD'S 'Othello' third.

LORD ABERCONWAY'S entries of 'Matador' and 'Elisabeth' were placed first and third in Class 33 for *Griersonianum* hybrids. From Exbury came 'Operetta' to take second place.

A single truss or spray of any hybrid, of which one of the parents is a species of the Series Maddenii or Edgeworthii was required in Class 34. The first prize went to LORD ABERCONWAY for the immense,

fragrant 'Tyermanii,' and a truss of the pale, sulphur-yellow 'Chrysomanicum,' also from Bodnant, was given third place. COLONEL BOLITHO'S *Johnstoneanum* × *deleiense*, a delicate mauve-pink flower, was placed second, and MAJOR HARDY secured the fourth place with a fine, white unnamed *Edgeworthii* hybrid.

In Class 35, for a spray of any hybrid of the Series Cinnabarinum, MAJOR DE ROTHSCHILD was awarded the first place for 'Biskra,' LORD ABERCONWAY'S 'Peace' came next, and LORD DIGBY'S exhibit of 'Lady Chamberlain' was third.

In Class 36, for one spray of any hybrid between the Series Triflorum and the Series Lapponicum, 'Blue Tit' was selected by the three prize-winners, namely, the Commissioners of Crown Lands, LORD ABERCONWAY and LORD DIGBY.

The first place in Class 37, for a spray of any hybrid of the Series Triflorum other than with the Series Lapponicum, was won by MAJOR DE ROTHSCHILD with 'Eleanore.' LORD ABERCONWAY'S two entries, 'Fine Feathers' and 'Peace,' were given second and third places respectively.

Exhibits from Bodnant filled all three places in Class 38, for one spray of any hybrid of an alpine species. They were 'Blush,' 'Hyperion ' and 'Ardis.'

In Class 39, for a truss or spray of any hybrid between two species other than those provided for in earlier classes, MAJOR DE ROTHSCHILD showed ' Androcles' and LORD DIGBY 'Prostigiatum.'

LORD DIGBY was the only exhibitor in Class 40, which required six hardy, nurserymens' hybrids. The varieties shown were 'Russelianum,' 'Dr. Stocker,' 'Queen Wilhelmina,' 'Endsleigh Park,' 'Bodartianum' and 'Jacksonii.'

Class 41, for two leaves each of six Rhododendrons, attracted only two entries. LORD ABERCONWAY showed leaves of *fictolacteum*, *mallotum*, *sinogrande*, *Macabeanum*, *crinigerum* var. *euadenium* and a *sinogrande* hybrid. LORD DIGBY'S entry consisted of *arboreum* var. 'Sir Charles Lemon,' *mallotum*. *eximium* × *sinogrande*, *praestans*, *sinogrande* and *Bureavii*.

In Class 42, for a plant of an alpine species, LORD SWAYTHLING took first prize with *Sargentianum*, and SIR HENRY PRICE'S *impeditum* was second.

RHODODENDRON AWARDS IN 1946 AND 1947

Rhododendron 'Ailsa-Jean' (*tephropeplum* ♀ × *moupinense*). **A.M.** March 26, 1946. This distinct hybrid, raised by the exhibitor, has elliptic or obovate leaves, scaly beneath, 1½ to 2½ inches long, and trusses of three or four flowers, held horizontally. The scaly pedicel is ½ inch long; the patent, obovate calyx-lobes ¼ inch long; the funnel-shaped corolla 1⅛ inch long, and 2 inches across the mouth, with five rounded, spreading lobes. The colour is Amaranth Rose (H.C.C. 530/1) externally, paling upwards, and a lighter tint of the same hue within. The unopened buds are bright scarlet. Exhibited by Capt. Murray Adams-Acton, 37, Palace Gate, London, W. 8.

Rhododendron 'Angelo' (*Griffithianum* ♀ × *discolor*). **F.C.C.** June 3, 1947. This splendid hybrid received the **A.M.** in 1935. It forms a tall and shapely truss of about twelve flowers supported on glaucous, purplish pedicels 2½ inches long. The corolla is flattish-funnel-shaped, 3½ inches long and 5½ inches wide, with seven crimped and waved lobes. It is at first pale blush-pink outside, white with some pale green spots within. The stamens are over 2 inches long, with white, glabrous filaments, the ovary and style densely glandular. Leaf oblanceolate, 7 inches long, mat green, very pale beneath. Exhibited by Major E. de Rothschild, Exbury, Southampton.

Rhododendron 'Blancmange' ('Godesberg' ♀ × *auriculatum*). **A.M.** June 3, 1947. A very fine pure white hybrid. The shapely truss is made up of eighteen flowers on green pedicels 1½ inches long. The seven-lobed corolla is funnel-shaped, 3 inches long and 3¾ inches wide, prettily frilled at the margin. The elliptic, mat green leaf is 9 inches long and 4 inches wide. Exhibited by Major E. de Rothschild, Exbury, Southampton.

Rhododendron 'Captain Blood' ('Queen Wilhelmina' ♀ × *Griersonianum*). **A.M.** April 29, 1947. A richly coloured variety with a ten-flowered truss of Cherry Red (H.C.C. 722/1–2) flowers on 1½ inch pedicels. The five-lobed corolla is funnel-shaped, 3 inches long, 2¾ inches wide. Leaf narrow-oblanceolate, 8 inches long, dull green above, pale beneath. Exhibited by Capt. Collingwood Ingram, Benenden, Kent.

Rhododendron 'Chrysomanicum' (*chrysodoron* ♀ × *burmanicum*). **A.M.** April 1, 1947. A very pretty hybrid with flowers of Primrose Yellow (H.C.C. 601/2). The flowers have funnel-shaped

corollas about 2 inches long, with five spreading and rounded lobes. They are borne on short pedicels in trusses of eight. The leaves are elliptic, ciliate, scaly beneath, 3 inches long and 1½ inches wide. Exhibited by Lord Aberconway, C.B.E., V.M.H., Bodnant.

Rhododendron (Azalea) 'Cornish Glow.' A.M. May 20, 1947. A very showy variety with a full truss of eighteen large flowers. The long, tubular corolla has broad-ovate, spreading lobes. The colour is crimson in the bud, changing in the fully expanded bloom to orange-yellow, flushed on the outer lobes with rosy orange. The appearance of the flowers is enhanced by the bronze-flushed young foliage. Exhibited by Col. E. H. W. Bolitho, D.S.O., Trengwainton, Penzance.

Rhododendron 'Cremorne,' Townhill form ('Luscombei' ♀ × *campylocarpum*). **A.M.** April 29, 1947. The original 'Cremorne' was registered by the late Mr. L. de Rothschild in 1935, but has not been certificated. The present variety has a full 12-flowered truss of bell-shaped, 5-lobed flowers 2 inches long and 2¾ inches wide at the mouth. The unopened bud has a beautiful soft pink colour which disperses, as the flower expands, to Chinese Yellow (H.C.C. 606/3) flushed and margined with rosy Coral (about 614/2). Exhibited by the Rt. Hon. Lord Swaythling, Townhill Park, Southampton.

Rhododendron 'Golden Oriole' (*moupinense* ♀ × *sulfureum*). **A.M.** April 1, 1947. An attractive small plant suitable for the rock garden. The stems are bright cinnamon-brown, and bear elliptic, coriaceous leaves about 2 inches long and scaly beneath on red petioles. These, together with the crimson bud-scales, form a pleasing background to the three-flowered trusses of Dresden Yellow (H.C.C. 64/2) flowers. The corolla is 1½ inch long, 2 inches wide at the mouth, with five rounded and spreading lobes. Exhibited by C. Williams, Esq., M.P., Caerhays Castle, Cornwall.

Rhododendron 'Icarus' ('A. Gilbert' ♀ × *herpesticum*). A flower of unusual colouring. The deep rose-pink bud opens to a flower of biscuit colour shaded rose, with a bell-shaped, 6- or 7-lobed corolla 2¼ inches long and 2½ inches wide. The flowers are borne on reddish-brown, glandular pedicels 1½ inch long in flat-topped trusses of eight. The leaf is oblanceolate with recurving margins, dull green above, paler beneath, about 4 inches long. Exhibited by Major E. de Rothschild, Exbury.

Rhododendron 'Icarus' var. 'Organdie.' A.M. May 20, 1947. A seedling from the same cross as the preceding, differing in its slightly smaller leaf, pale green pedicels, and 5-lobed flower 2 inches long and 2½ inches wide, biscuit or lemon-yellow with a distinct rose-pink edge and a pink zone about ¼ inch deep at the base of the corolla. Exhibited by Major E. de Rothschild, Exbury.

Rhododendron inaequale. A.M. April 29, 1947. Series

Maddenii, Sub-series Ciliicalyx. Generally only suitable for the cool greenhouse. Leaves narrowly elliptic, 3 inches long, dull, dark green above with scattered brownish hairs, scaly beneath. Truss of four or five flowers on scaly pedicels ¾ inch long. Corolla funnel-shaped, about 3 inches long and 4 inches across the mouth; white with a broad yellow band extending half-way up the posterior petal. Sweetly scented. Exhibited by Lord Aberconway, C.B.E., V.M.H., Bodnant.

Rhododendron 'Jutland' (*Elliottii* ♀ × 'Bellerophon'). **A.M.** June 17, 1947. A valuable, late-flowering hybrid with high, dome-shaped truss of nearly twenty flowers. The corolla is 2¼ inches long, broadly bell-shaped, 2¾ inches wide at the mouth and constricted at the base to form five conspicuous nectaries. The colour is Geranium Lake (H.C.C. 20), flecked with darker colour. Leaf oblanceolate, dull mat green above, paler beneath, 6 inches long. Exhibited by Major E. de Rothschild, Exbury.

Rhododendron 'Karkov' (*Griersonianum* ♀ × 'Red Admiral'). **A.M.** May 20, 1947. A very attractive variety with a compact, globular truss of about sixteen flowers on short, glandular pedicels. The funnel-shaped, five-lobed corolla is 3 inches long and measures 3½ inches across the crimped and waved mouth. In colour it is a uniform carmine-rose, faintly and evenly spotted. The narrow-elliptic leaf is dull mat green above, paler beneath, the blade 6 inches long, the petiole 1½ inches long. Exhibited by Major E. de Rothschild, Exbury.

Rhododendron 'Kilimanjaro' ('Dusky Maid' ♀ × *Elliottii*). **F.C.C.** June 3, 1947. A hybrid of intensely rich colouring, matching the Currant Red of the Horticultural Colour Chart (821/1). The compact, globose truss contains eighteen flowers on glandular pedicels. The corolla is funnel-shaped, 2¾ inches long, 3½ inches wide, with spreading lobes 1¾ inches wide and 1 inch long. The narrow-elliptic leaf is 6 inches long, mat green, paler beneath. Exhibited by Major E. de Rothschild, Exbury, Southampton.

Rhododendron 'Lady Chamberlain' var. 'Golden Queen' (*cinnabarinum* var. *Roylei* ♀ × 'Royal Flush' orange var.). **F.C.C.** May 20, 1937. A delightful variety raised by the late Mr. L. de Rothschild. It is a plant of erect habit with elliptic leaves about 3 inches long, glossy dark green above, paler and covered with brown scales beneath. The truss is made up of six or seven pendulous flowers about 2½ inches long, of a soft salmon-pink shaded with orange. The waxen-textured corolla is tubular below, expanding to a smooth, open, five-lobed mouth. Exhibited by Major E. de Rothschild, Exbury.

Rhododendron 'Portia' (*strigillosum* ♀ × *euchaites*). **F.C.C.** April 15, 1947. This outstanding hybrid received the **A.M.** on April 24, 1935. It has a compact, flat-topped truss of fleshy, dark

crimson-scarlet flowers with dark nectaries at the base. The corolla is 1¾ inches long and nearly 2 inches across the mouth, the stamens and style are pinkish. The leaf is oblanceolate, about 6 inches long and 2 inches wide, dark green and rugulose above, paler beneath. Exhibited by Lord Aberconway, C.B.E., V.M.H., Bodnant.

Rhododendron 'Tortoiseshell' var. 'Wonder' (*Griersonianum* ♀ × 'Goldsworth Orange'). **A.M.** May 20, 1947. The uniform salmon-pink flowers of this pretty hybrid have widely funnel-shaped corollas 2½ inches long and 3½ inches wide, subtended by petaloid calyces up to ¾ inch long, and are arranged in a truss of up to a dozen on dark red, hairy pedicels up to 1½ inch long. The leaf is oblanceolate, with recurved margins, dull dark green above and pale beneath, 5½ inches long. Exhibited by Messrs. W. C. Slocock, Ltd., Goldsworth Old Nursery, Woking.

Rhododendron yakusimanum. F.C.C. May 20, 1947. This rare and distinct Japanese member of the Ponticum Series attracted a great deal of attention upon its appearance in the Wisley exhibit at the Chelsea Show of 1947. The plant exhibited was compact and dome-shaped, about 2½ feet high and 3½ feet across, and carried a flower-truss at the tip of almost every growth. The flattish truss carries up to twelve flowers on brown-tomentose pedicels 1½ inch long. The pink buds open to widely bell-shaped, 5- to 6-lobed white flowers 1½ inch long and 2¼ inches wide. The opening leaves, like the stems, are covered with greyish-white tomentum. The mature leaf is about 3 inches long, with recurved margins and tip, glossy dark green above, heavily covered beneath with brown tomentum. The systematic position of the species is discussed by Dr. J. Macqueen Cowan in an article in the *R.H.S. Journal*, October, 1947. Exhibited by the Director, R.H.S. Gardens, Wisley.

Rhododendron 'Yeoman' ('Choremia' ♀ × *repens*). **A.M.** April 29, 1947. A low-growing plant suitable for the rock garden, with neat, elliptic, dark green leaves 3 inches long and full trusses of seven to eleven flowers on ¾ inch red pedicels. The shining, bell-shaped corolla is 1¾ inch long and over 2 inches wide, with five broad lobes. The colour approaches Currant Red (H.C.C. 821/3). Exhibited by Lord Aberconway, C.B.E., V.M.H., Bodnant.

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OF AUTHORS AND RHODODENDRONS

[(*a*) = *Azalea*]

MEMORANDA