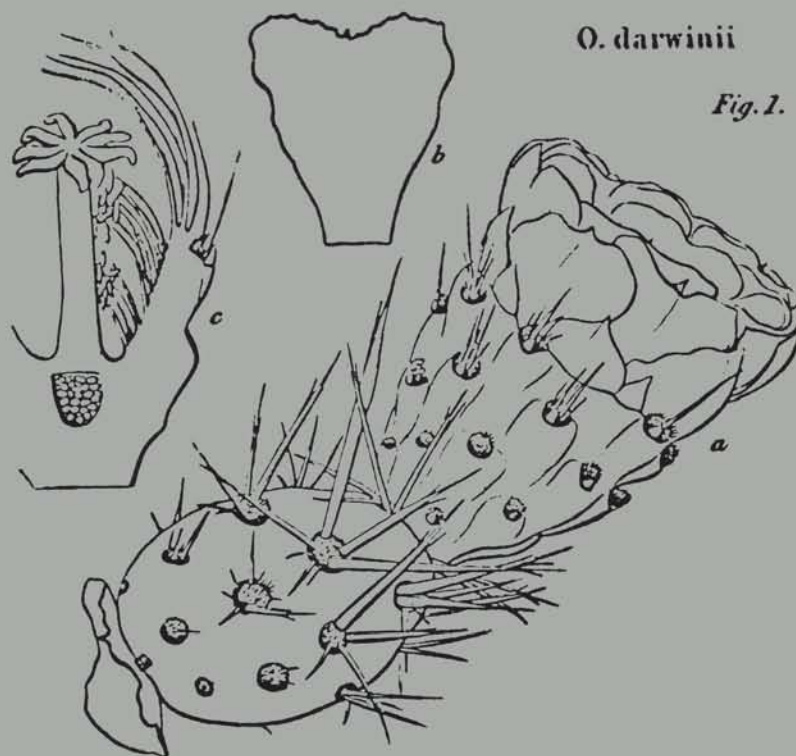


THE SUBGENUS

# TEPHROCACTUS



A historical survey with notes on cultivation

by **Gilbert Leighton-Boyce**

and

**James Iliff**



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The illustration of a plant near *O. sphaerica* was specially drawn for this book by Celia Palmer, and that of *O. platyacantha* (Fig. 77) by James Iliff.



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The Succulent Plant Trust

1973

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## Preface and Acknowledgements

We have been studying this particular sort of cactus since early in the fifties, and have found ourselves compelled to formulate our own reference book by the inadequacy of the existing literature. We do not claim to have read all the references, many of them buried in stray paragraphs in general works on succulent plants long out of print and in articles in journals now equally rare. We are conscious of gaps in our knowledge of work done in Japan and in some South American countries. But we had found enough information omitted from, or sometimes misleadingly summarised in the recent general books to feel that it might be helpful to further study of this minor subject to put together this book. The references we quote have been checked by one or other of us but in a number of cases not by both, owing to pressure of other commitments. Otherwise, the book has been very much a joint undertaking in equal partnership.

We would place on record here our thanks for their courtesy and patience to those in charge of the Linnaean Society Library, the Lindley Library of the Royal Horticultural Society, the Botany School, Cambridge, the Herbarium and Library of the Botanical

Department and the General Library of the British Museum (Natural History) and, of course, the Herbarium and Library of the Royal Botanic Gardens, Kew. We could not have written this book without handling (if that is the word here) a large quantity of living plant material, some from fellow collectors like Mr. R. Ginns, who has been most encouraging and kindness itself, and some from good friends in the trade. We cannot possibly thank them all here by name, though some are mentioned later in the text. We believe that very few of the major collections of succulent plants in this country are at present run by anyone having a special understanding of this unusual sort of cactus, but there are several nurserymen who maintain their own collections as well as selling some of the plants and a few of them are really very knowledgeable in this field. Interest in the particular plants has also been stimulated in recent years in this country by lectures by Messrs. David Hunt, Len Newton and Gordon Rowley and the tour of the late Curt Backeberg with some of his splendid slides.

# INTRODUCTION

Of all the sub-families of the Cactaceae, the Opuntioideae have the greatest range in terms of latitude, the natural habitat stretching from Canada to Patagonia. They have escaped successfully after human introduction and established themselves wild in Southern Europe, Africa, India and Australasia. They survive in conditions quite remote from those generally accepted as characteristic for the family as a whole. In a Russian newspaper in March 1969, a writer noted that some flowered and fruited after wintering under snow, with a minimum temperature down to minus 22 centigrade. Survival of intense heat and prolonged aridity is recorded from many countries. Everybody knows the prickly pear, and the genus *Opuntia* is probably the most fully documented of all the genera of cacti, and not only from the botanic point of view. It appears, for example, in plate one of Hogarth's *Analysis of Beauty*, 1753. Having been a decisive factor in at least one North American battle, having very nearly at one stage ruined the development of major tracts of Australia, the *Opuntia* has its place in history, quite apart from its own somewhat chequered career as an economic plant in the Canary Islands and elsewhere. Yet despite this, virtually nothing appears to have been written until well into the 19th century about a whole distinctive range of these plants stretching right down from the Western side of the Andes in Peru and across to the Eastern side and down as far as Patagonia, a matter of some 4,000 miles. The explanation is, first, that the high tablelands which they particularly favour were largely unexplored and, second, that, when they were, other and more spectacular phenomena seemed more worthy of attention. Even when plant hunters began to cover the vast and

often difficult terrain in more detail, they concentrated on other and more superficially interesting prizes. The splendid *Flora Chilena* (Vol. 3, 1847) has only *ovata*, *longispina*, *glomerata*, *poepigii*, *mai-huen*, *ovallei*, *andicola*, *platyacantha* and *tuberosa* of the plants that are within our field or stand near to it. To this day, there are a number of likely areas not visited by any field botanists or others with sufficient experience to identify possibly new plants which grow in low mounds generally, and very close to their rocky soil. So one can say with confidence that the tally of the *Tephrocacti* cannot yet be counted. This may also be true of the very small flat-padded *Opuntiae* (*Airampoe*) which exist over a significant part of the same range and are equally low growing. These are dwarf relatives of the big bushy prickly pears, and similarly the *Tephrocacti* may be envisaged loosely as among the miniature relatives of the tree-like or bushy cylindrical *Opuntiae*: but a statement of this crudity does no justice to the astonishing variability of the forms and sizes in which *Opuntiae* grow. It is also important to realize at an early stage that small races of *Opuntia* have evolved differently in widely separated regions. We are concerned in this book with a geographically linked range of plants and must turn away from the many fascinating, indeed superbly spined species of North America such as *clavata* and *schottii* which differ so much in their organisation and spination and the consistently clavate rather than ovoid shape of their segments, growing generally in a step-like formation so as to form a looser mat rather than a compacted clump. They cannot (questions of geography apart) be treated as *Tephrocacti* without robbing the term of any meaningful status.

## How the *Tephrocacti* got their name

L. Pfeiffer was in 1837 the first to distinguish some of the key *Tephrocactus* material of the *diademata* group from *Opuntia*. He marked this not by a new genus but by publishing three of his descriptions under *Cereus* in a new section "*Opuntiacei*". A Professor of Botany at Ghent named Charles Lemaire is the man who appears to have invented the name: certainly, he was the first to seek to establish it botanically. He explained the derivation as from *Tephra*, the Classical Greek word for ashes, particularly the ashes of mourning and of the funeral pyre, and, of course, cactus, the old Linnaean name for various species of Cactaceae known in Europe in his day.

The name seems not inappropriate, because although fresh vegetative growth is purple or red or various shades of green or glossy brown, mature stem segments are often of a dull, dead looking dirty brown or grey; and burnt is an adjective which comes readily to mind. So far as this country is concerned, the plants are generally neglected and in an article in 1968 one of us said that they may yet

be the Cinderellas of many cactus collections. Lemaire was one of a number of contemporary botanists in Europe who took up the Cactaceae as they became fashionable in the enormous conservatories and glasshouses of the wealthy in the 19th century, and he was the author of many original descriptions: indeed he seems to have engaged in a sort of international academic competition in this regard which was, in those days, conducted by reference to fairly limited numbers of imported plants, often of very uncertain provenance. Duplication of descriptions was bound to occur and was frequently denied with great vigour, and a number of dubious minor distinctions began to be elevated beyond their reasonable significance. This process earned the more extreme cactus enthusiasts a generally bad reputation with their scientific colleagues which is not altogether unknown today. Lemaire is remembered, among other achievements, as the man who created the separate genus *Astrophytum* for a small, distinctive group of plants previously described with many others under *Echinocactus*; and he ob-



viously had a certain flair for a good name. He was unlucky, or perhaps, late in life, in too much of a hurry, with *Tephrocactus*. He had years earlier in “*Cactearum Genera Nova*” (1839) when insisting that the ‘*Cerei opuntiacei*’ were true *Opuntiae* conceded that they might perhaps make up a new genus as soon as their flowers were known if they were also distinct. He never saw the flowers of most of them, and they are in fact typical *Opuntia* flowers: so in an ironic way the proposal of *Tephrocactus* could be doubly condemned by its own author’s standards both at the time and more so now. One suspects its reception would have been better if he had not launched it with a curious revival of the

Linnaean name *Cactus* for another string of *Opuntiae* which had very little internal consistency except that they were all within some unstated dimensional ceiling. In both cases he set his new concept at generic level, which was self-evidently rather high in the hierarchy. He expressed some unusual, for him, diffidence about *Cactus*; and after having worked on the plants for some thirty years without apparently doubting that they were true *Opuntiae* he was not in the best of positions to carry conviction, for he had no corpus of newly discovered material to back what was not so much a logical redivision of known species as an inspired guess that one (or more) would some day be needed. He died in 1871.

## The Lemaire position

The definitive version of Lemaire’s view of the matter is taken to be that in a small book published in Paris in 1868, “*Les Cactées, Histoire, Patrie, Organes de Végétation, Inflorescence, Culture, etc.*”. In it, he treated the *Opuntia* sub-family as divided into five genera, *Cactus*, *Tephrocactus*, *Nopalea*, *Consolea* and *Opuntia*. He said, and how right he was, of the first two: “Until the flowers of the species decide for or against us, these two genera will remain doubtful”. He placed in *Cactus* the following species: *curassavicus*, *aurantiacus*; *Salmianus*, *pubescens*, *fragilis*; *clavatus*, *Pentlandi* (sic), *bolivianus*, *eburneus*, *corrugatus*, *ovoides*, *bulbispinus*, *imbricatus*, *Emoryi*, *Parryi*, *echinocarpus*. (*Emoryi* and *imbricata* also appear in their expected place under *Opuntia*, so must have been an editorial slip). He placed in *Tephrocactus* the following species:—*diadematus*, *Turpinii*, *calvus*; *platyacanthus*, *andicolus*; *pusillus*, *retrospinosus*; *aoracanthus*. He placed *floccosa* in *Opuntia* proper, with *vestita*, *pulverulenta* and *cylindrica*. Incredibly, one may think, in view of the names cited, he said: “The habitat of the species of the two genera would seem to be South America”. The *Cactus* list included several North and Central American plants as well as South American plants of very diverse types. But his general observations are worthy of quotation, because they contribute to the foundation on which later, more thorough workers built. “We have spoken above of the extreme diversity of the *Opuntias*. It has seemed to us that one could logically separate from them the dwarf lying down or scarcely climbing species, often forming enormous clusters spread on the ground, with ovoid or oblong segments, instead of being erected, raised, arborescent, flattened or cylindrate”. Of his

*Cactus* he said “Flowers unknown [apart from the first five which he regarded as a natural transition from *Opuntia* proper and separable from the rest]. Slightly shrubby, very low, much branched, jointed, caespitose or slightly raised. Segments rounded, or egg shaped or oblong, cylindrate, very fleshy. *Short* protuberances. Biform thorns, arranged as with the *Opuntias*, long, numerous, very sharp. Skin *green*.” Of his *Tephrocactus* he said “Dwarf plants, some sub-erect with superposed segments, others with caespitose segments, branched, egg shaped, elongated. *Pronounced gibbous* protuberances. Thorns biform, directed downwards, for the most part flat foliaceous; those in the centre or the small bristles, soft fine silky. Skin smooth, of an ashen *brown*”. The italics are our own. Neither the colour of the skin, nor the relative prominence of tubercles is nowadays accepted as a limiting factor on what is or is not a *Tephrocactus*, but at least, if one discounts the obscure *pusillus* and *retrospinosus*, it is clear that Lemaire chose a very closely related group of plants as a start for what we would agree with Helia Bravo (*Cactáceas y Suculentas Mexicanas*, 7:7 (1962)) is reasonably regarded as just one of the sub-genera of the genus *Opuntia* Miller of the sub-family *Opuntioideae* Karl Schumann. Her insertion of a “*sección*” *Sphaeropuntinae* (a name she borrowed from Backeberg who used it with two i’s as a sub-tribe) between the genus and the sub-genus is not in accordance with accepted usage as we understand it. The value of her contribution to us lies (a) in its independent support for the proposal already made in 1958 by G. D. Rowley to reunite *Opuntia* Miller (*Nat. Act. Succ. Jour.*, 13:3-6 + 25) and (b) in its continued recognition of *Tephrocactus* as an identifiable sub-genus.

## The main 19th century foundation

There are three main sources from which the serious study of the *Tephrocacti* begins to take shape, although they had not then that name.

In the *Allgemeine Gartenzeitung* edited by Link and Otto there appeared in Volume One in 1833 an

article in which Otto listed the cacti in the Royal Horticultural Garden in Berlin. In the list he placed together on page 367 a group of dwarf *Opuntias*: *corrugata*, *fragilis*, *sulphurea*, *tuberosa*, *andicola*, *glomerata*, *horizontalis* Gill., *pusilla* S.-D., *longispina*,

ovata Hort. Angl., platyacantha Hort. Angl., articulata and polymorpha. Of these just over half were to become the *Tephrocacti* of later workers.

In 1837 this was followed by the impressive "Enumeratio Diagnostica Cactearum" of Pfeiffer, who provided vivid descriptions of a wider range of species and attempted a systematic classification.

Thirdly, and far more importantly, came the Salm-Dyck "Cactae in Horto Dyckensi Cultae". This appeared in 1841 (revised 1845), but the "second" edition of 1850 is for our purpose more useful. In the course of his classification into 7 tribes and 20 genera he subdivided his "Opuntia" into Sections. Section 4 "Platyacanthae" contained *andicola*, *glomerata*, *clavata*, *platyacantha* Pfeiff., *diademata* and *turpinii*. Section 5 "Glomeratae" contained *pentlandii*, *boliviana*, *aoracantha*, *ovata* Pfeiff., *corrugata*, *longispina*, *pusilla* S.-D., *parmentieri* and *tuberosa*. The germ of Lemaire's *Tephrocactus* and *Cactus* is discernible; and *floccosa* is in Section 6 "Cylindraceae" with *clavarioides*, *vestita*, *pulverulenta*, etc.

Lemaire had meanwhile contributed useful diagnoses based on plants in a rival collection, his

"Cactearum Aliquot Novarum . . . in Horto Monvilliano" published 1838, followed by his systematic "Cactearum Genera Nova" in 1839.

Labouret published his "Monographic de la Famille des Cactées" in 1858, but this revision of Salm-Dyck offers little advance in our subject except the passing interest of a note that no description of *darwinii* was available and that the plant was unknown in France. Salm-Dyck's Sections 4 and 5 are run together as "Ovatae".

Rümpler, in his revision published as a second edition (1885) of Förster's "Handbuch der Cacteenkunde" changes Sections 4 and 5 of Salm-Dyck into a consolidated "Glomeratae".

Thereafter one arrives at Weber and, of course, the monumental work of Schumann. Weber's contribution is of interest. Under *Opuntia* in Bois, "Dictionnaire d'Horticulture" published 1893-99, in volume 2 page 893 he says: "We will divide the numerous species into 4 sections or subgenera: (1) . . . (2) the *Tephrocactus*, a group of South American species with ovoid segments". This is virtually the entity acceptable today.

## Later and greater confusions

The monograph "Gesamtbeschreibung der Kakteen" Professor Karl Schumann published in 1899 was at last a botanically satisfactory treatment of the known members of the cactus family as a matter of classification and stood as such for a great many years. It represents the best and clearest of the simple approach from a basis of external morphological characteristics such as any collector can observe for himself. Since then, more sophisticated weapons have become available to the taxonomist, but before general agreement could be reached as to the best way to blend the widening range of new techniques (chromosome counts and the rest) into a satisfactory correlated system, the subject was immersed in a high tide of newly discovered material and everything became muddled over with a mass of unscientific names, often scantily described and not even in some cases anchored to any herbarium material or to any precisely dated and located habitat study. It is not the purpose of this small book to venture far into the morass of new names; indeed space would not permit us to do so.

Attempts were made from time to time to resurrect *Tephrocactus* as a genus in the thirties and even (quite irrationally as it now seems) to separate parts of it at that level: we note in passing that *Pseudotephrocactus* and *Weberiopuntia* (which appear undefined and rarely in the literature) seem to have started with Fric in 1931 and 1932 respectively. Count F. M. Knuth-Knuthenborg in "Den Stora Kaktusboken" (copyright 1930 printed Stockholm 1931) treated *Tephrocactus* on its own as one of eleven separate genera within the *Opuntieae*. He said there were 25 kinds. He gave a lengthy list of *Opuntia* synonyms and a brief reference to *aoracanthus* and to *diadematus* (which he called *glomeratus*, following Britton and Rose in confusing it with *andicola* and others). He pursued the matter more fully (44 kinds) in his "Kaktus-ABC" written in collaboration with Curt Backeberg and published in Copenhagen 1935. This was one of the most detailed general works on the *Cactaceae* of its time, denied a wide circulation

in many countries by linguistic difficulties. It contained many new descriptions which were translated into Latin by Dr. Carl Christensen and some of these have stood the test of critical scrutiny ever since. On classification above specific level however, the authors were not so successful. On our subject they begin boldly "*Tephrocactus* Lem. This genus is extraordinarily naturally defined. Species never lose their globular segments even though they can by strong forcing adopt a slightly elongated form. In this way these species separate themselves from others which in their natural habitat have globular segments but in cultivation exhibit themselves with a few cylindrical segments, for which reason they are considered to be dwarf Mountain-Cylindropuntiae (*C. Verschaffeltii*, *teres*, *vestita*, etc.)"—a point on which we shall have something to say later. The authors continue to the effect that this shoot characteristic may indicate not only that *O. floccosa* but also *O. strobiliformis* "which stands near *T. diadematus*" are borderline forms towards *Cylindropuntia* (which seems to leave such residual non-borderline contents as there may be in the proposed genus a pretty odd bunch). The genus is then divided into two series, *Elongati* and *Globulares*, with *Strobiliformes* as one of the three intermediate taxa within the first but with *Diademati* as one of the twelve within the second! After this and other apparent inconsistencies one reads "With that one attempts for the first time to formulate a survey of this hitherto rather defective genus; it takes into consideration the most recently collected material." We do not reproduce all the fifteen intermediate taxa, some of which actually separate plants later regarded (by Backeberg himself) as only varieties of the same species! An unfortunate side-effect of this premature essay in "systematic" classification was for some years to cast doubt in the minds of some expert readers on the genuineness of some of the new species carefully and faithfully described. No formal definition of the scope of this version of *Tephrocactus* Lem. was provided and it may well now be left in peace.

## The historical approach

It seems to us that what has misled several distinguished 20th century investigators who have, in the course of wider studies, looked in upon the Tephrocactus scene is that (with some industrious exceptions like Curt Backeberg) they seem to have assumed that the earliest descriptions were not worth bothering to study. True, these lack a few technical terms like glochid, and talk therefore of spines of two types, but many of them are far more detailed and far more intelligible than much of what passes for diagnosis and commentary today, and much of the recent confusion over names has arisen from a reluctance to give these descriptions their due weight or even (so it would sometimes seem) an ill founded trust that some earlier worker who quotes a reference has actually gone to the original source, and found it unhelpful. In this way, much of value has been overlaid by perfunctory and scrappy summaries, and the identity of some of the longest established entities has gradually become obscure. The thoroughgoing, indeed drastic revision of the Tephrocacti by Britton and Rose in their major work contributed in no small degree, we fear, to this obscurity: and their great and deserved authority in other parts of the cactus field led readers to place more reliance upon their judgment here than now seems advised. When dealing with obscure South American plants on the basis of their expeditions, they must have felt the lack of the valuable inheritance of work already done by Engelmann and others on their home ground, and of the enormous range of living material available to them on North American Opuntias. Their treatment of the Tephrocacti seems to us in retrospect to have been below their generally high standard. The old South American plants still exist. The processes of genetic change (which work relatively fast with the Opuntioideae) operate nevertheless on a time scale which does not make much of a century gap. So, apart from ecological changes and the break-up and loss of collected material, the rediscovery of what a species meant to Prince Salm-Reifferscheidt-Dyck (who died ten years before Lemaire) is by no means impossible, and we can identify with reasonable confidence plants which approximate closely to the earliest fully described species of Tephrocactus, which was by Adrian Hardy Haworth in 1830, three years before he died. (We do not however know *O. pusilla* S.-D. *non* Haw. of 1822). *This historical approach is not one which normally commends itself to the plantsman, but we have adopted it because we are quite convinced that unless the fog and obscurity surrounding the older names is investigated and, as far as possible, removed the treatment of the more recently discovered Tephrocacti will not be successfully rationalised.*

We had hoped that the late Curt Backeberg would co-operate with some writer of sufficient discipline and knowledge of the principles of classification (so far as they are practised in the limited and self-opinionated field of cactology) to achieve this, for no one in the last half century is likely to have known these plants better: but he went his own way

to an extreme position where his detailed knowledge, for which we have the greatest respect, is communicated in an unacceptably arbitrary framework. Between compiling his longest piece of writing on Tephrocacti for inclusion in Volume One of "Die Cactaceae" (Jena, 1958) and publication of the addenda and index in Volume Six (Jena, 1962) he had to cope with a series of new discoveries (which has, of course, continued since) and at the same time blow upon blow from other authors against the taxonomic assumptions he had made some years before he commenced this work. It was, of course, too late to restructure the whole work, not that he was a man given in his later years to changing his views easily. His insistence on heaving Tephrocactus up to generic level again which he did not propose formally until as late as "Descriptiones Cactacearum Novarum" (1956), may have been justified originally (apart from his collaboration with Knuth) simply by his genuine enthusiasm for these particular plants, which he derived to some extent from Alwin Berger, the director of the famous Hanbury gardens, "La Mortola", near San Remo, whose "Kakteen" (Stuttgart, 1929) dealt with them more generously than most popular works, in three series under *Cylindropuntia*: *Floccosae*, *Glomeratae* and *Pentlandianae*. One of the few recent pieces of evidence in favour of differentiation for Tephrocacti came from J. Poindexter of Carlsbad, California, who published (*Desert Plant Life* 23:87-9, 1951) a morphological study which showed, by magnifications up to only 160, that the apical meristem of some Tephrocacti was distinctly aberrant from that of a selection of other *Cylindropuntias*, notably the *Clavatae* or *Corynopuntias*. Poindexter suggested that this might support Tephrocactus as a separate genus. Berger had come part of the way to this position when, in an earlier work than that already mentioned ("Die Entwicklungslinien der Kakteen", 1926) he said:

"Quite peculiar *Cylindropuntiae* are the Tephrocactus, low, short-cylindric plants from the mountain country of southern and western South America, with various peculiarities, as to some extent flat or even paper-like spines, dry glochid-filled fruits, strange irregular shaped seeds, etc. These plants are as yet imperfectly known. Probably they are descendants of larger ancestors that have become dwarf. The same is the case with the series *Vestitae*, which have the same habitat, and they give us perhaps a hint of how such dwarf forms are able to arise. Britton and Rose have found that *Opuntia Verschaffeltii* Cels in its habitat Bolivia develops small round members of the appearance of *O. Pentlandii* Salm. Brought into cultivation there arise from these short members the longer cylindric shoots which we generally associate with this *Opuntia* (see Britton and Rose, Vol. 1, page 72, fig. 86)."

This sensible, tentative approach (illustrated by an excellent habitat photograph of *floccosa* "between

Oroya and Cerro del Pasco, Peru") may have encouraged Backeberg (in his *Bulletin of Cactus Research*, 1935) to put forward the view that what distinguished a *Tephrocactus* was that it did not elongate like other cylindrical *Opuntias* when brought down from the mountains into cultivation at modest altitudes. This may be, in our observation, a mistaken reading of the effect of environmental factors on the growth of these extremely variable plants: but the mistake was that of Britton and Rose. We have taken *verschaffeltii* with stem segments as long as eight inches and with a rare stretch of good sun (for London), a high temperature under glass and very little humidity made it grow little, almost rounded stem segments of half an inch or so, thus reversing their observation: and we have, of course, with less effort (and our usually available weak sunlight and all too frequent damp) made several *Tephrocacti* elongate while retaining reasonable health—though not, we would agree, to the same extent as the extraordinary versatility shown by *verschaffeltii*. The truth may be that there is here some variation in the facility of adaptation to an unnatural environment which is of significance, but we find it to occur within the spectrum of the *Tephrocacti* without looking further afield. There are a few which it is very difficult to keep healthy in this country at all, while others will survive as many disasters as any succulent we know.

Berger may have been right to assume larger ancestors for the *Tephrocacti*. He noted a parallel situation in the remote past as a likely explanation for the separate evolution of *Maihuenia*, the *Opuntias* of the series *Clavatae*, and *Pterocactus*. These fascinating and curious plants are, as we have indicated, only of peripheral interest to our present subject: though we note with a certain sense of shock that W. Taylor Marshall and R. S. Woods in their very useful "Glossary of Succulent Plant Terms" (Pasadena, California, 1945) after describing *Tephrocactus* as a "subgenus of South American *Opuntias* having short oblong or globose joints" chose to illustrate it none other than *O. clavata* from New Mexico.

We have not so far mentioned several other authors who contributed some new knowledge during the confusions of the twenties and thirties. Spegazzini must appear: as a distinguished Argentinian botanist his views upon his native flora have special interest and authority. He grasped better than his predecessors the strong polymorphic tendencies of some of the plants, and it was he who described in 1905 the extremely choice plant he was later to name *O. molinensis*, of all *Tephrocacti* the one that we have found appeals most to general succulent plant enthusiasts. And Carl Curt Hosseus (1868-1950), who also lived in Argentina, collected in 1927 the attractive *O. riojana*. But, as indicated earlier, we are adopting an historical approach largely to clear the earlier foundations of the subgenus, without, we hope,

contributing more than a modest quota of new errors of our own.

Our view of what is or what is not within the scope of the subgenus *Tephrocactus* will be amplified and, we hope, clarified by the various commentaries under the particular groups of plants discussed. In our early days we were tempted to see the quest for *Tephrocactus* rather in the light of the Hunting of the Snark, with Backeberg obviously cast in the role of Bellman: "What I tell you three times is true". But as we are not sure which members of the crew we might be taken to be, we do not press the analogy.

Having touched upon what we see as a valid distinction from the *Clavatae* or *Corynopuntiae*, we should perhaps mention the other controversial boundary, which is with plants generally placed outside *Opuntia* Miller in the separate genus *Pterocactus* K. Sch. The more stunted *Pterocacti* such as *hickenii*, *fischeri* and *skottsbergii* from the southernmost regions of Argentina are certainly in our view closely related to the *Tephrocacti*. Spegazzini had doubts about their status in 1926 and said (*Revista Argentina de Botanica*, 1:204), "Before ending this short note [on some *Tephrocacti*], I think it useful to record that in the Patagonian-Bolivian region there exist other curious cacti to which have been given the generic name of *Pterocactus*, from having their seeds surrounded with a more or less broad rim, almost membranous, as though it were a circular wing; nevertheless, that is not their real distinctive character, which is only that their flowers arise on the apex of the segments forming a completely continuous body with the same; the *Tephrocacti* which we have finished studying earlier exhibit the edge of their seeds extended in a sort of complete annular wing, such as is only a little thicker, forming a transition, because in a large number of genuine *Opuntias* it is usual to observe more or less similar annular rims, sometimes hairless and sometimes covered with a more or less visible hairy coating".

Buxbaum ("Morphology of Cacti", 1:61 et seq., 2:112 et seq.) has noted that the separate genus *Maihuenia* Phil, shows a progression from cylindrical stems towards short, determinate segments, ending with *M. poeppigii*, and concludes that the indeterminate cylindrical species are more primitive. He takes the same view of evolution of *Cylindropuntia*, *Tephrocactus* being one of a number of lines of descent from primitive cylindrical archetypes. Of living material, he regards *O. subulata* as a primitive example because apart from its growth habit it has a true terminal flower with the ovary sunk within what is really a lateral vegetative segment to start with and the spiral arrangements of the leaves continues unbroken into the perianth-segments. This suggests to us that *Opuntia* and *Pterocactus* may well be congeneric.

## How to cultivate the plants

The collector who pants for certainty in the naming of his plants will, if he has not already thrown this book away, appreciate that he had better throw his *Tephrocacti* away. If he does not put them into an incinerator, a waste disposal unit or a lidded dustbin he will thereby learn the first lesson in cultivation, which is that some of them are very hardy indeed. Even an old compost heap will do quite well as a site for some in the summer in the South of England. But before anyone imagines that we are getting near the world of the *Triffids*, let us make it clear that withdrawal of light and the constant presence of damp will beat the toughest of them in the end. The experiences we have had with a variety of environments for them, from a wire covered frame on a bare high rooftop to the windowsills of a centrally heated double glazed living room, suggest that we ought to qualify the generally sound cultural advice in recent popular books only in one rather obvious way. There are some species that like this and some that like that, and if anyone tries to grow them all, or a representative range of them all, in exactly the same conditions he will ruin a good many nice plants. We write as self-confessed assassins of quite a few, though we have usually managed to save a cutting. As we have learnt over the years a few of the traps, we will add a few hints in what is perhaps the appropriate place, after the descriptions of the group of plants concerned. One further word of explanation may be usefully added here, however. There are persistent references to half-shade in the literature which puzzle some readers. When Borg gave this advice for *O. Turpinii* ("*Cacti*" ed. 1. London, 1937) he was writing in Malta, but other writers who clearly had less brilliant climates in mind have said the same since of one species or another. The explanation is that there is a very big

difference between a recently rooted cutting or a mere seedling, and a mature plant. Most of these writers have sensibly assumed that most of their readers will be dealing with the former category, and until the root system is well established it is astonishingly easy to shrivel up and kill a new cutting of even the most sun-loving of the *Tephrocacti* if it is left on a shelf or stage of a small, poorly ventilated glasshouse in full sun, even in London, unless what root there is is very well protected from the temperature rise. Looked at in another way, small pots really are a menace unless linked with a capillary watering system, or kept under very frequent review. So the half-shade myth is not really a myth at all, but a reasonable word of caution for the novice. There is no *Tephrocactus* known to us which does not, when mature, enjoy every glint of sun this country can offer.

We would add that many growers of these plants in this country seem to assume that the plants are miniatures in the sense that a *Rebutia* is a miniature cactus. This is a misleading generalisation: *Tephrocacti* do not, on the whole, want to form neat little clumps and sit squatly in their pots. They prefer to stretch across a piece of terrain, rather like gorse and heather do among our own flora. This is obviously a plea for bedding out, which is a difficult thing to accomplish in this climate without a large glazed area. On the strictly practical level, we fear that there are too many growers like juvenile stamp collectors, who like to have a little bit of everything. It would help the comparative study of the plants much more if a few more enthusiasts would concentrate on raising and caring for a specialised, limited range of plants and get them on to a really good size so that characteristics which may only emerge on maturity could be thoroughly studied.

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# The plants discussed in detail

In 1951 in the paper edited by E. Y. Dawson "Some Results of Twenty Years of Cactus Research" (Journal, Cactus and Succulent Society of America, 23: 14-15) Backeberg, who was there recommending recognition of Lemaire's genus *Tephrocactus* as a southern parallelism to the northern *Corynopuntia* Knuth but offered no definition of it, listed 44 taxa which he considered valid at that time and within it. There are now something over 120 allegedly different so-called *Tephrocacti* in circulation among collectors. It was one of the sayings of the great Dr. N. E. Brown of Kew that if one came across a new plant in habitat and could see by looking around what its parents had been, one called it a hybrid, but if one couldn't one might describe a new species. The continuing natural hybridization of the North American *Opuntias* has been very fully covered by a number of competent field botanists, but curiously little allowance has been made for the same tendency in the treatment of the *Tephrocacti*. Minute differences of spination have been credited with varietal status, and how many species there ought to be is very much more a matter of opinion than with most groups of cacti. From all the new discoveries of recent years nothing, however, seems to have emerged so far radically to alter the pattern set by the few dozen clearly different plants known to European collectors in the latter half of the 19th Century. *In concentrating, therefore, on those plants which might be said to constitute the pre-Britton and Rose material we can still give the reader a conspectus of the subgenus as a whole, adding a few of their later relatives where clarification is helped and space permits.*

In his superbly illustrated "Wunderwelt Kakteen" of 1961, Backeberg divides his *Tephrocacti* into three instead of his earlier two main groups, those with longish shoots, those with round shoots and some very small globular bodied plants. The examples of the third (miniature) category only include one within the period we survey (*T. subterraneus*) which in fact, though very small, might just as well be called cylindrical. We have found it convenient to divide our detailed discussion of the plants within our period into rather more groups. As appears clearly from our comments, some of the plants (especially those not well-known) could with almost equal justification be attached to other groups, and we note a number which in our view should fall outside a reasonable interpretation of the subgenus. When in doubt we have allowed the balance of earlier authority to influence our placing, if it seems reasonably clear. A proper scientific appraisal of the relationships within the subgenus must inevitably await further work on the newer discoveries outside the scope of this book. We include a statement of the reasons why on the available data we favour the recombination of the diademata material under one species of *Opuntia* but make no formal proposal in that regard because we consider that alterations in the nomenclature should be based upon a wider study of habitat grown material than we have been able to carry out.

We have examined some freshly imported plants, but much of the material within our knowledge has been reproduced either vegetatively or from seed far from the country of origin in very different environments such as California, Germany, Spain, the United Kingdom, etc.

The standing definition of *Tephrocactus* as a genus is that of Backeberg in his "Descriptiones Cactacearum No varum" of 1956.

*Tephrocactus* Lem. emend. Backbg. Descr. emend.: Plantae gregariae atque humiles, subcylindricae ac pulviniformes vel breviter ramosae aut globulares, glomeratae sive laxe ramosae, sed omnes, ex adverso nonnullis speciebus pseudoglobosis generis *Austrocylindropuntia*, nunquam in cultura formam mutantem. - Habitat: Ab Peruvia centralis ad fere ultimum australe [sic] Argentinae.

To define a genus of Cactaceae as comprising plants which never change their form in cultivation is, of course, absurd if taken literally; and it is a particularly unfortunate phrase to apply to a number of plants of pronounced polymorphic tendency, which all *Opuntioideae* exhibit to some extent. Borg expressed the same thought less extremely than Backeberg when he said that plants within his subgenus *Sphaeropuntia* "do not become much elongated or cylindrical under cultivation". Having, as indicated earlier, taken the view that subgeneric treatment of the *Tephrocacti* within the genus *Opuntia* Mill. is to be preferred, we are tempted to amplify Weber's "a group of South American species with ovoid segments". Schumann said "distinguished essentially . . . by their constantly short, frequently ellipsoid or globular stem-segments". This is clearly near the mark, but Backeberg's definition (omitting the offending phrase) is also helpful: —

"Gregarious and low plants, subcylindric and cushion forming, either full of short branches or globular, heaped together in a rounded mass or loosely branched . . . Habitat: from central Peru to almost the southern extremity of Argentina."

We offer the following analysis: —

"Gregarious" = forming colonies, a point stressed by early plant hunters, but equally applicable unqualified to many pad *Opuntias*, hence

"Low" (more or less Lemaire's "dwarf") to exclude as far as a relative term can the higher growing plants.

"Subcylindric" incompletely cylindrical, i.e. ignoring tubercles round in section at right angles to the direction of growth but not necessarily of constant diameter at different levels—important as excluding all plants with stem-segments significantly flattened on the sides (pads) even if gregarious and low (exeunt *Airampoae*).

"Cushion forming" (more or less the "dense clumps" and "large mounds" of Britton and Rose) takes one little further in narrowing the field because both *Airampoae* and *Clavatae* (*Corynopuntiae*) form mats. "Full of Short Branches/Globular". We prefer the clarity of Schumann's "constantly short, frequently

ellipsoid or globular stem-segments” but the idea is no doubt the same.

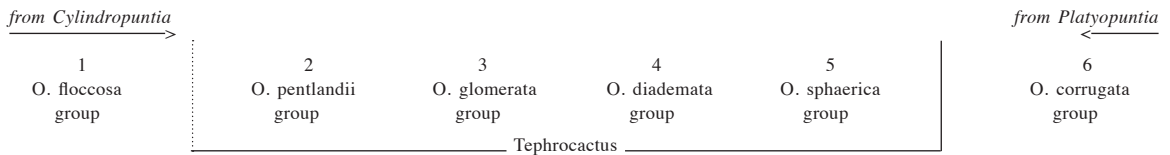
“Heaped together in a rounded mass/loosely branched”. Valuable as a line of distinction within the subgenus but not in its latter alternative helping the distinction from *Clavatae* (*Corynopuntiae*), which is left on a solely geographic basis, and should be clarified.

The definition also fails in our view to comprehend all the plants Backeberg placed within it, because although *weberi* is subcylindric (as Britton and Rose said) we cannot regard this adjective as applicable to the *Floccosae* which have characteristically cylindrical branches.

We find the following revision convenient for practical identification purposes

Gregarious and relatively low plants, generally hummock forming when mature: the individual stem-segments are rather short and subcylindric, not flattened on the sides, and not consistently clavate but often ellipsoid or globular, though sometimes conical towards the apex.

We have distinguished in our treatment six groups of plants, five hypothetically deriving from *Cylindropuntia* and one hypothetically from *Platyopuntia*, of which we would say only the four in the centre are true *Tephrocacti*, thus: —



Our four central groups may be distinguished in aspect as follows:

*O. pentlandii* group

growth dense and compact in some species, more open in others, often forming a rounded hummock in habitat; stem-segments smooth or tuberculate, ranging from globular or ovoid towards cylindrical (the latter case sometimes brought out by cultivation), generally green, in some cases glossy; spines ranging from almost absent to very numerous, not flattened in section, in several species in habitat (though very seldom in cultivation) concentrated in an erect brush at the top of the segment. Flowers recorded as red, orange or yellow.

*O. glomerata* group

growth generally dense, often heaped together in a rounded hummock (sometimes nearly a hemisphere) even in cultivation, or rather sprawling; stem-segments sometimes globose, often a rather conical ovoid, usually only slightly tuberculate and dark slightly glossy green to brown with tough joints becoming woody in age; spines never absent and usually distinguishable, when more than 1, as principal and subsidiary, principal spines (which may fail to appear on small specimens) usually with at least some trace of flattening. Flowers recorded as yellow where known.

*O. diademata* group

growth often somewhat erect, with many stem-segments superposed to form branches with some space between; segments often globular or globose-obovoid but sometimes elongate, very variable in size and colour, more or less dull, the polygonal border between the tubercles in most cases marked by a distinct line; spines very variable in character and distribution, often papery, but ranging to solid and relatively thick in section, sometimes absent; glochids dark or reddish, not yellow. Flowers relatively large, whitish to slightly rosy.

*O. sphaerica* group

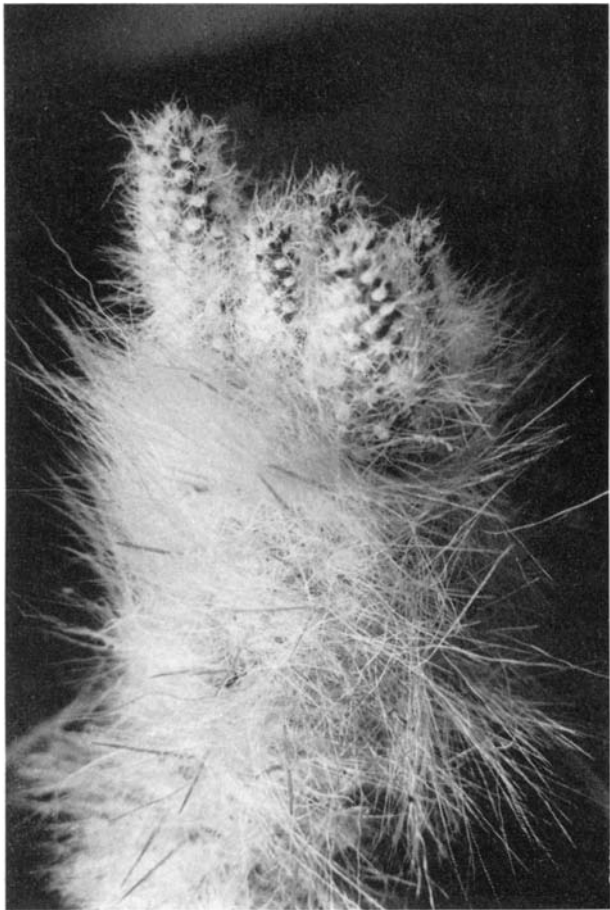
globular or ovoid stem-segments, mostly dull, forming an untidy spiny heap, often branching at the top as well as below, but spreading mostly along the ground; areoles often close-set, with tubercles slight or absent; spines generally present and sometimes very numerous (20 or more), not flat in section, often extending well down the segment. Flowers recorded as orange, yellow, and cream fading to rose.

While we believe that this fourfold scheme of division gives a reasonable conspectus we do not think that every *tephrocactus* can be allotted a place within it. We deal with other plants of the same period whose inter-relationship we have not determined under “Unassigned Plants”.

We also list without discussion the names under which a number of later discoveries (or rediscoveries?) have circulated. The list is not exhaustive and we are not ready to comment on its contents, owing to lack of material relating to several species which may be important enough to justify an expanded grouping.

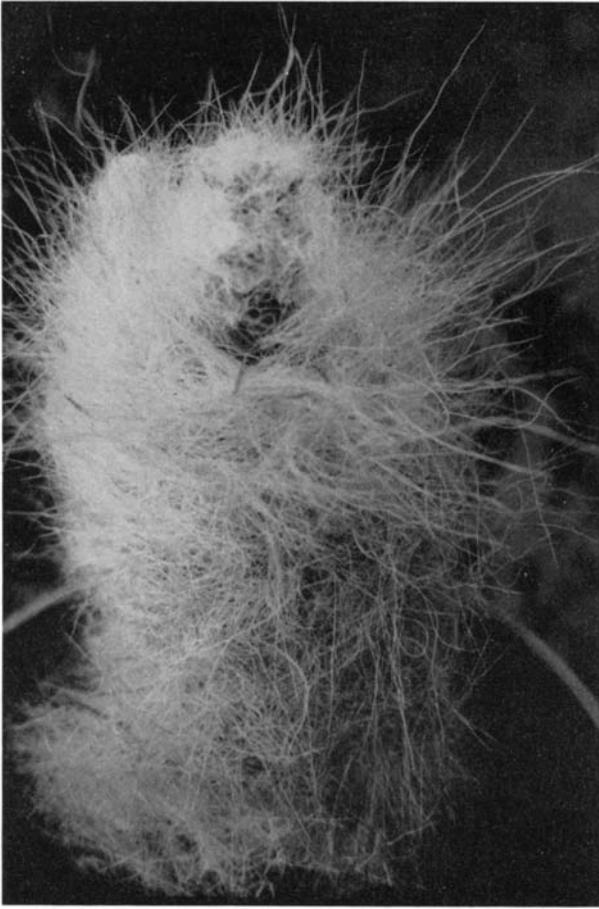
The general reader is warned to pass lightly over some of our detailed disquisition of the tangled history of the names of some of the plants. Otherwise he may run the risk of becoming more involved in nomenclatural battles and blunders of long ago instead of becoming interested, as we hope, in the plants themselves as nowadays growing and grown. The names are of no use whatever unless they can be associated with particular plants or groups of plants, and we have had, such is the unfortunate heritage of the subject, to go to some trouble in sifting a lot of dead matter to establish what may be of some technical significance still today. We have brought much of this long sifting together here and place it on record “warts and all” so as to save future workers from the same arduous process.

Fig. 1. *O. floccosa*, verging towards var. *denudata*? >



< Fig. 2. *O. lagopus*





< Fig. 3. *O. cylindrolanata*



Fig. 4. *O. atroviridis* >

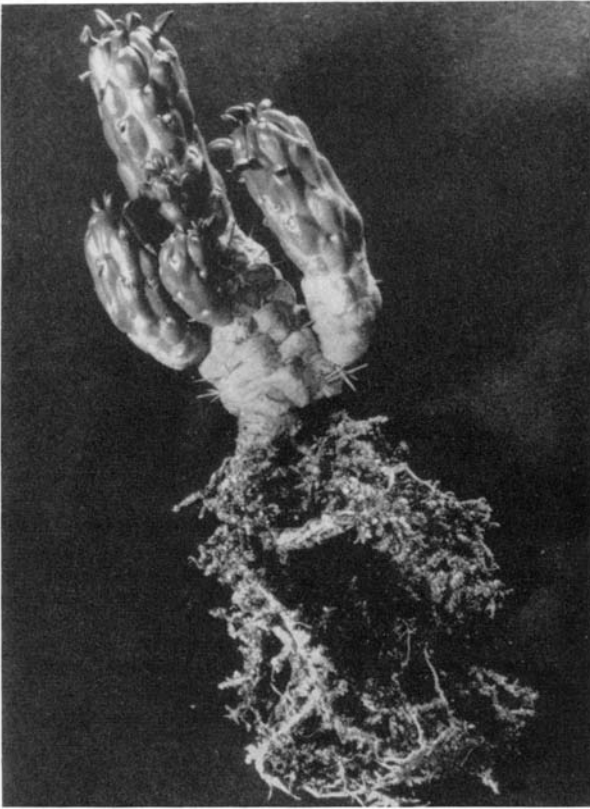


Fig. 5. Another specimen of *O. atroviridis*

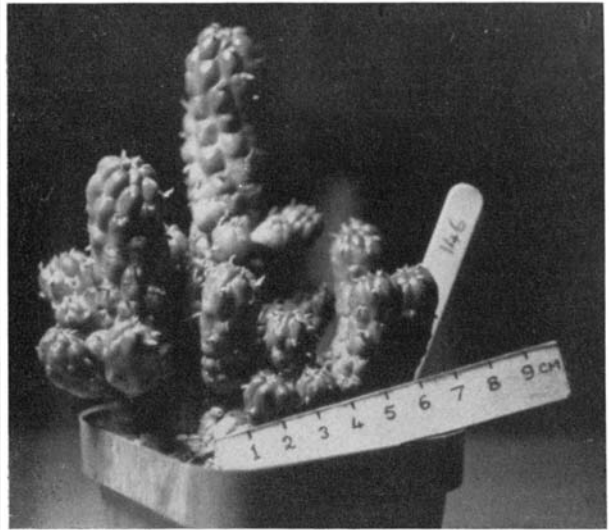


Fig. 6. The same plant as in Fig. 5, six years later.

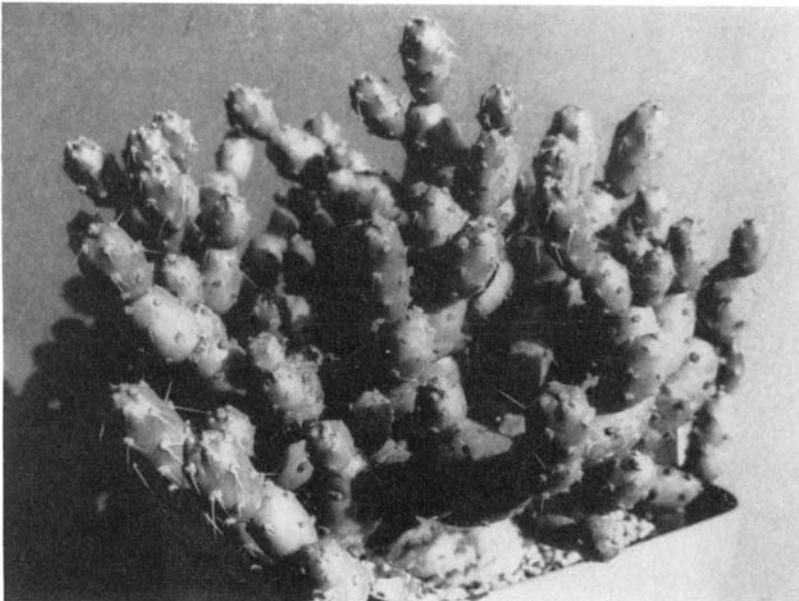


Fig. 7. *O. pentlandii*: a specimen of some 100 segments grown in nine years from a plant of six segments. Note the inverted V spine formation and occasional elongated cultivated growth.

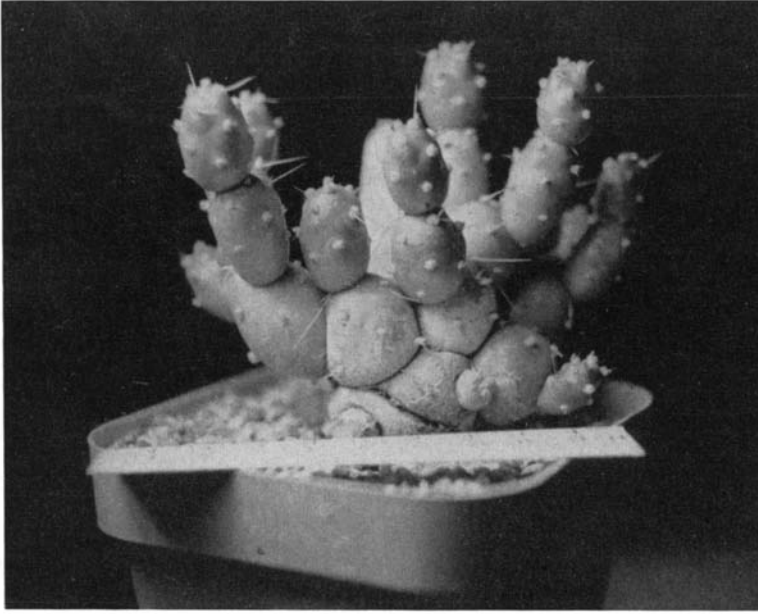


Fig. 8. *O. pentlandii*, an imported specimen of a slower-growing form, showing closely compacted growth at the base.

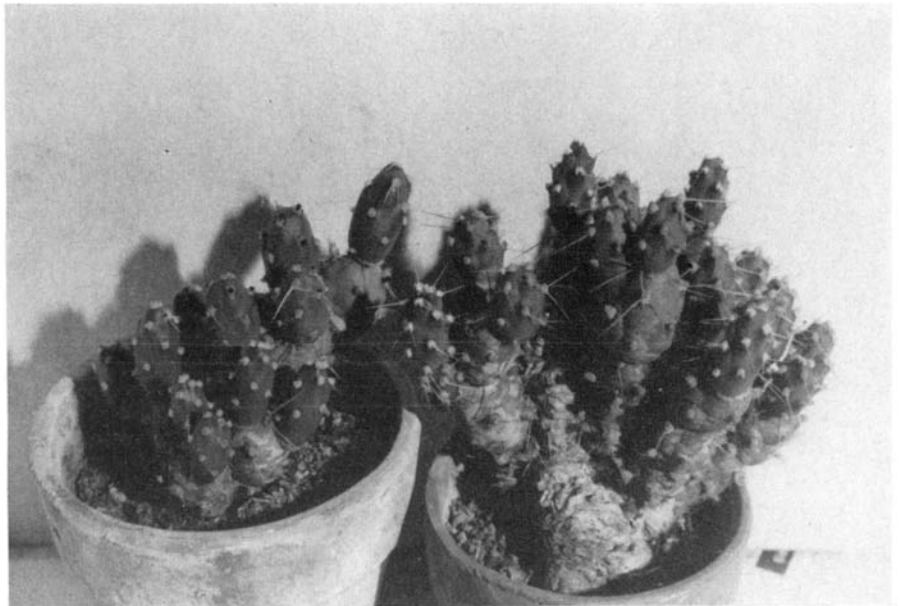


Fig. 9. *O. pentlandii* (left) and *subinermis* (right) compared.



Fig. 10. *O. subinermis*: a specimen of over 100 segments grown with the *O. pentlandii* of Fig. 7 in the same period.



Fig. 11. ? *O. backebergii* (syn. *T. minor*). A slower-growing form; the plant is of the same age as those in Figs. 7 and 10.

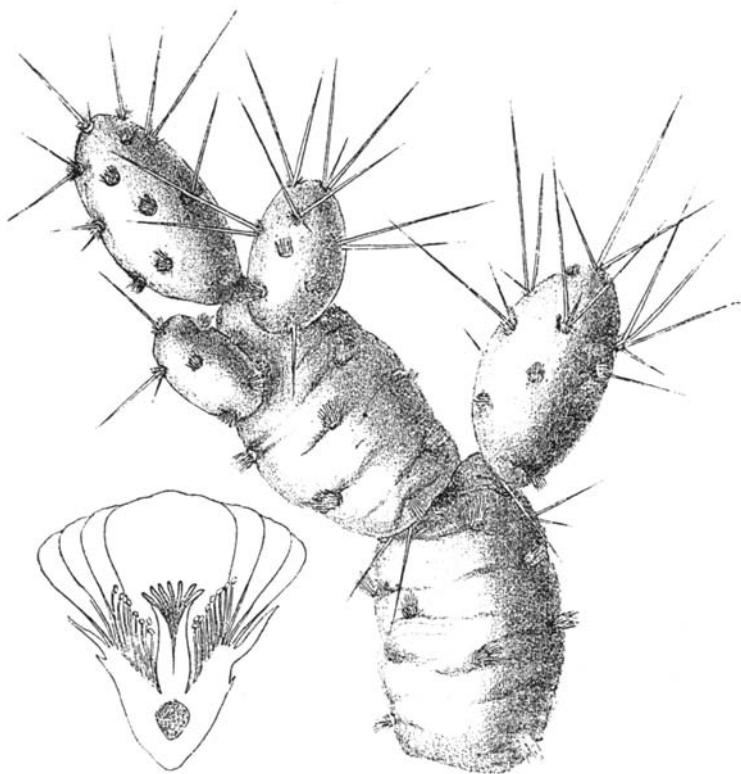


Fig. 12. ? *O. boliviana* (*O. grata* sensu K. Sch. after a drawing by T. Gürke).

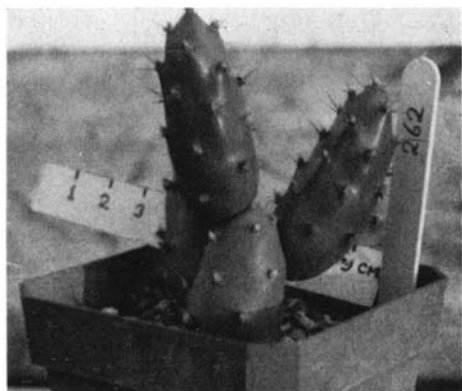


Fig. 13. An immature specimen received as *O. boliviana*.

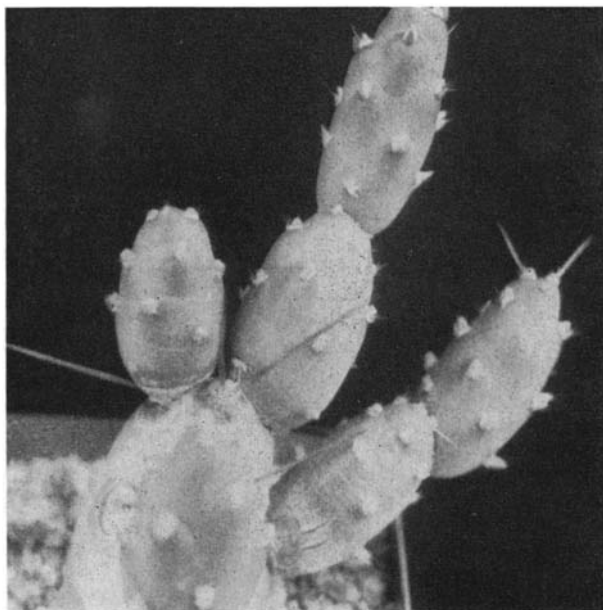


Fig. 14. *O. boliviana*: a young specimen upon which the characteristic spine formation is beginning to develop. (W. E. S. Merrett).

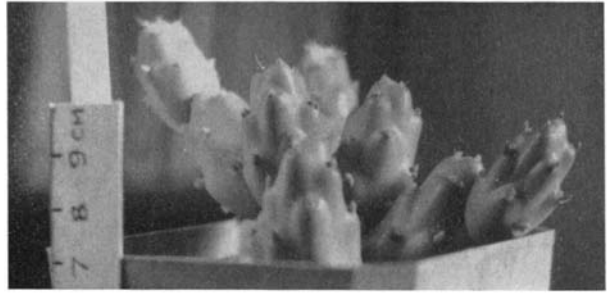


Fig. 15. *O. dactylifera*: an immature specimen lacking spine development. Note, however, the overlapping decurrent tubercles. The plant is of a glaucous green.

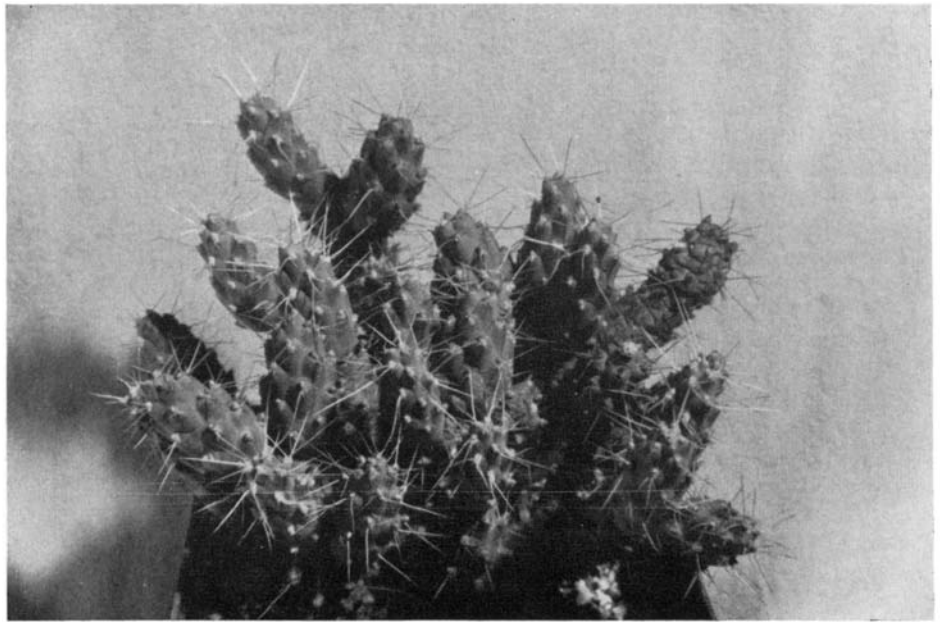


Fig. 16. An unidentified plant of the *O. pentlandii* group with strongly tuberculate green segments; till recently thought to be near *O. subinermis* but now showing signs of strong spine development concentrated at the top of the segment.



Fig. 17. A specimen received as *T. fulvicomus*.

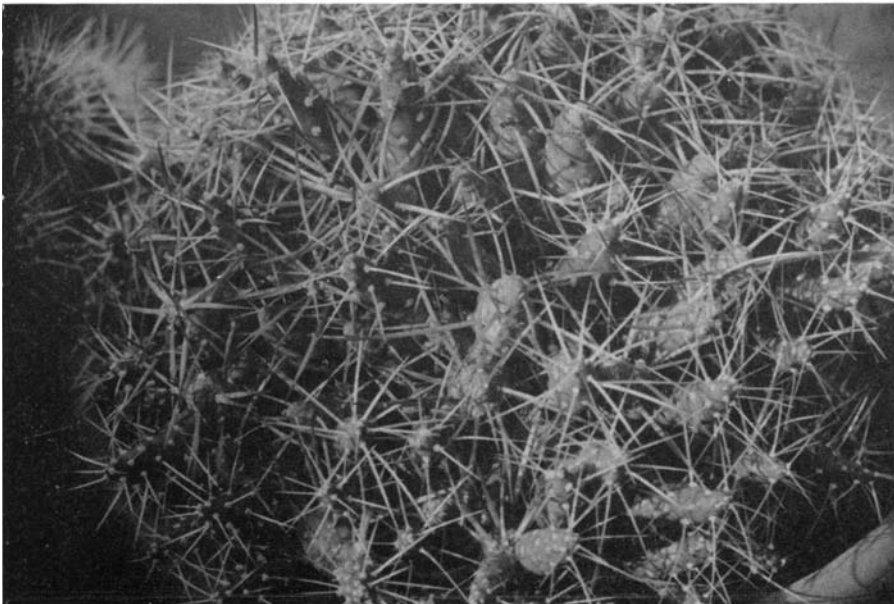


Fig. 18. *O. glomerata* (Mr. & Mrs. W. Maddams).

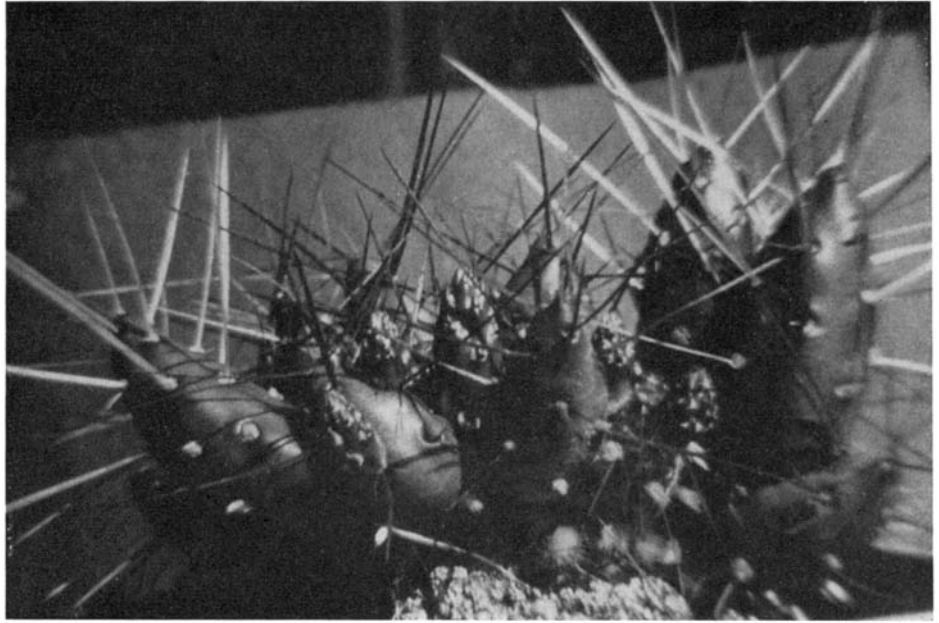


Fig. 19. *O. glomerata*: a form with larger segments. Note, however, the predominantly single spines.

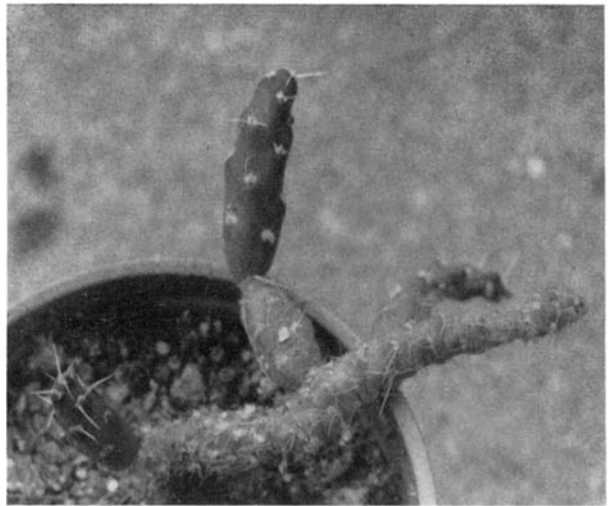


Fig. 20. *O. glomerata* var. *atratospina*. A recent variety; a six-year-old seedling.





Fig. 21. An example of the plant referred to in the text under *O. andicola* as Backeberg's *T. glomeratus* var. *fulvispinus*.

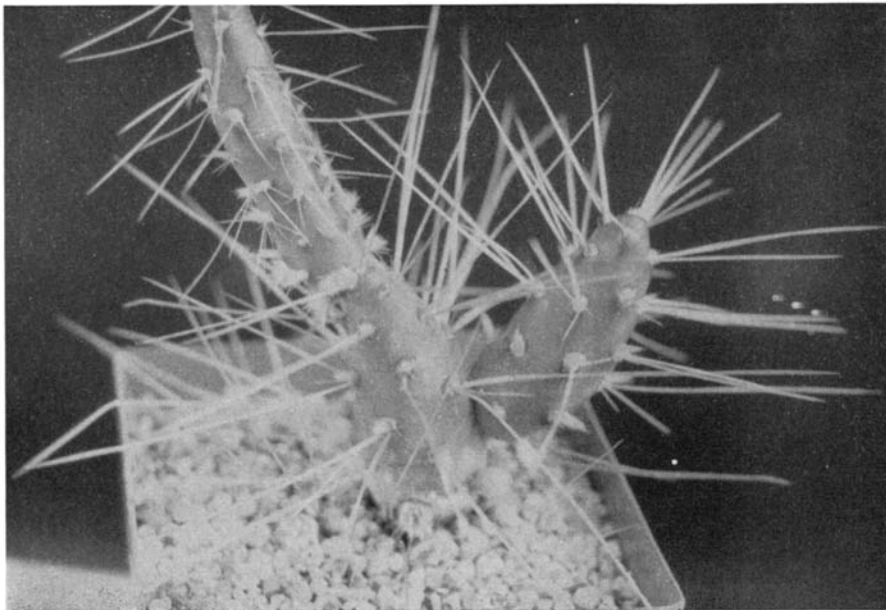


Fig. 22. *O. andicola*. The distinction from *O. glomerata* (if this is to be maintained) depends mainly upon the more numerous spines distinguishable as principal and subsidiary.

Fig. 23. *O. andicola*.

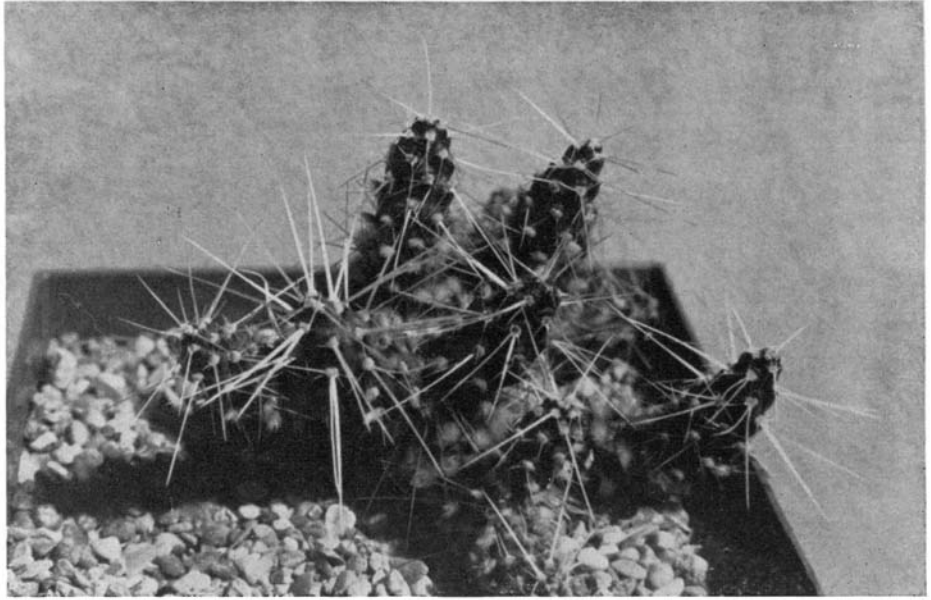


Fig. 24. *O. andicola*: the same plant as in fig. 23, two years later

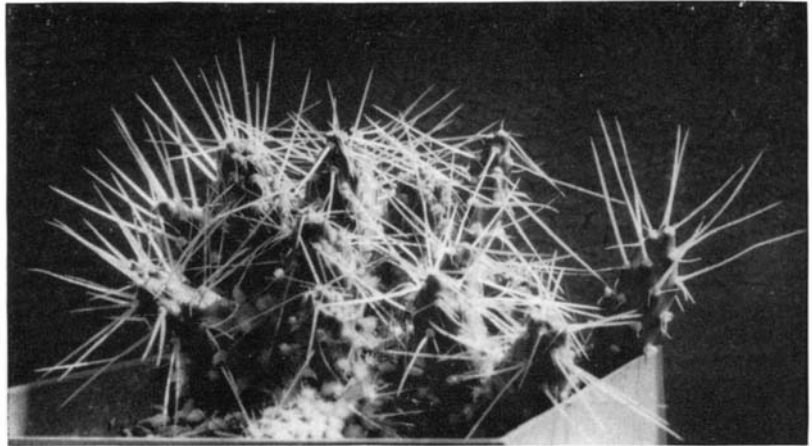
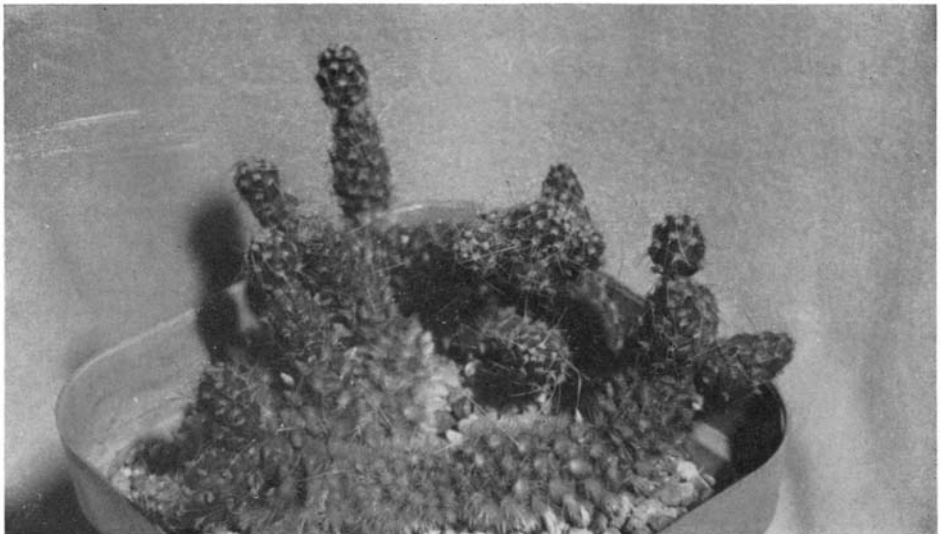


Fig. 25. *O. andicola*: a fast-growing strain with a strong tendency to retain juvenile characteristics which has a soft decumbent habit and often fails to develop principal spines.

V



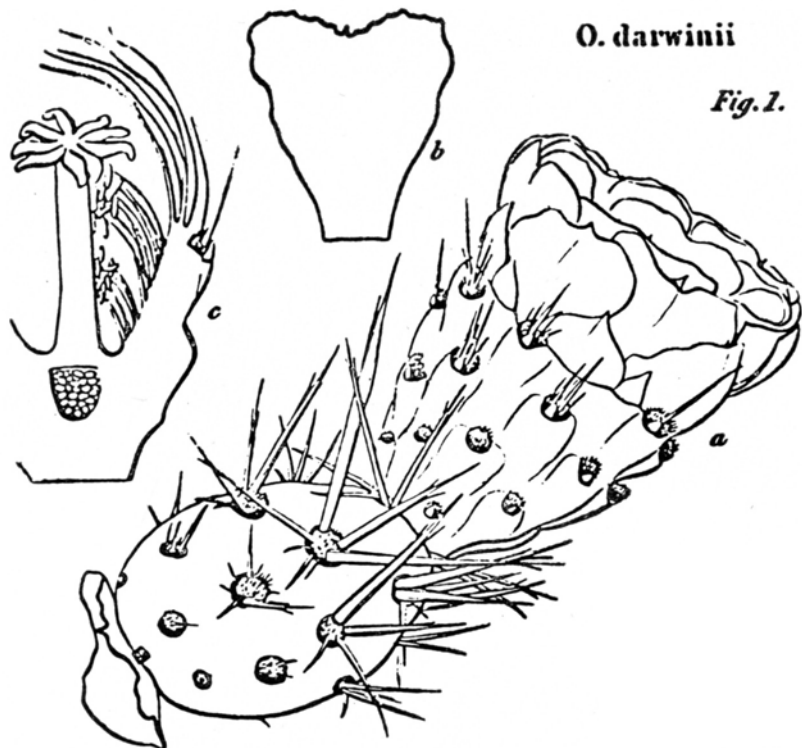


Fig. 26. *O. darwinii*: engraving after the drawing of the type specimen by Henslow in 1836 (by courtesy of the Royal Botanic Gardens, Kew).

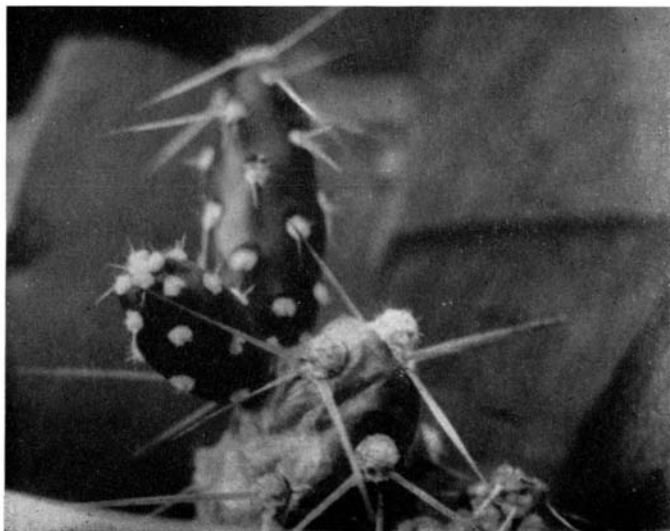


Fig. 27. A specimen received as *O. darwinii*.

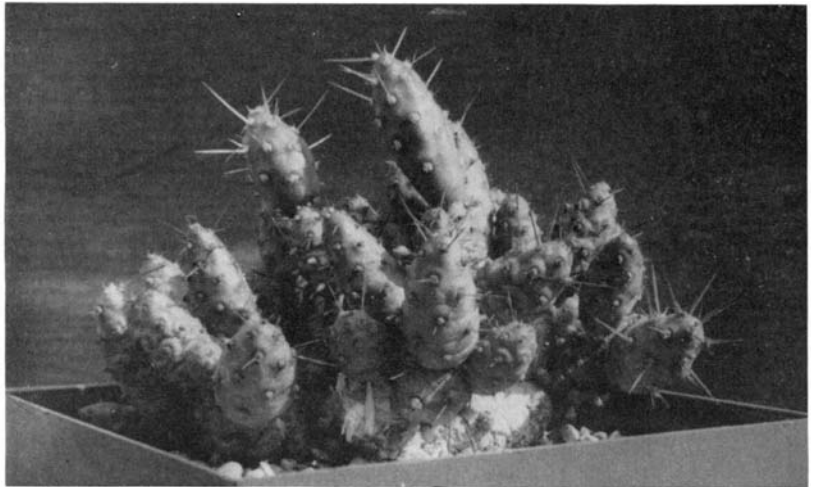


Fig. 28. The plant which we consider to be nearest to *O. russellii* of any we have seen in cultivation. This specimen was received as *russellii*.

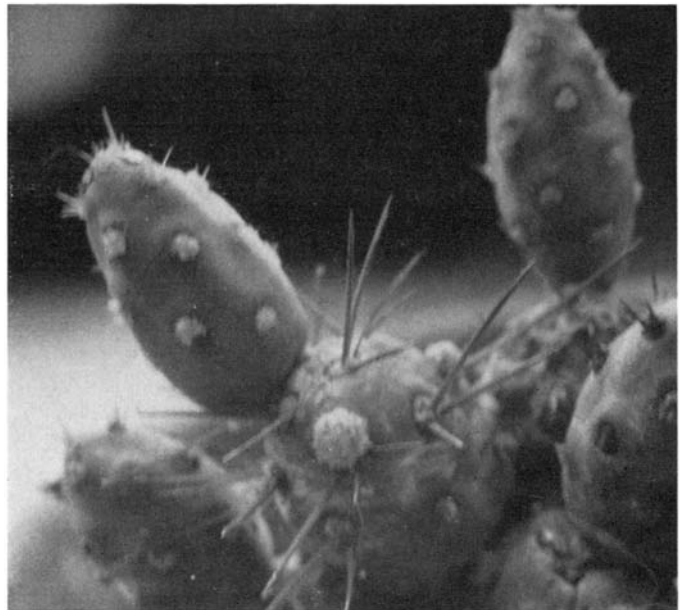


Fig. 29. A specimen of the same kind as fig. 28 received from a different source as "spec. nov.", with new stem-segment appearing in bud.



Fig. 30. *O. platyacantha* sensu Pfeiff. (G. Ellis).

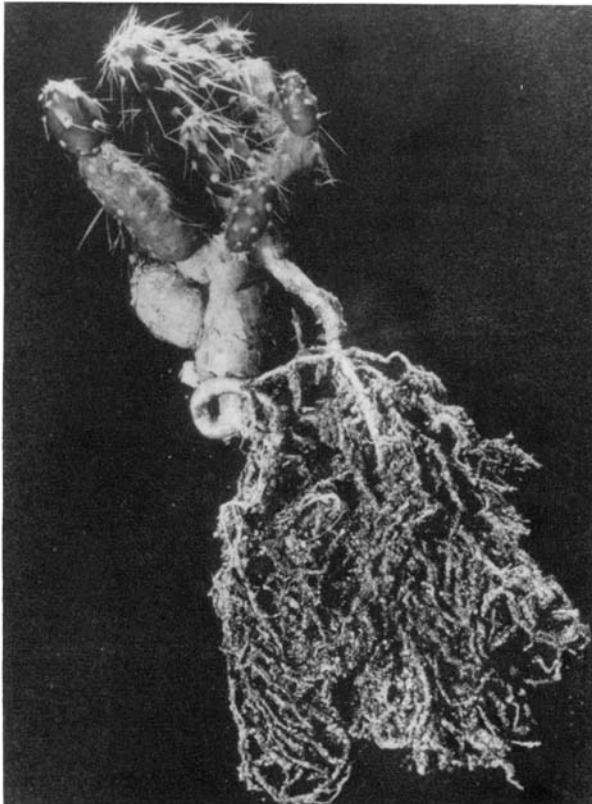


Fig. 31. *O. platyacantha*; an immature specimen later to develop growth corresponding to that described by Pfeiffer.



Fig. 32. *O. platyacantha* sensu Pfeiff. The same plant as in fig. 31 eight years later, showing a decumbent remnant of older var. *deflexispina*-like growth.

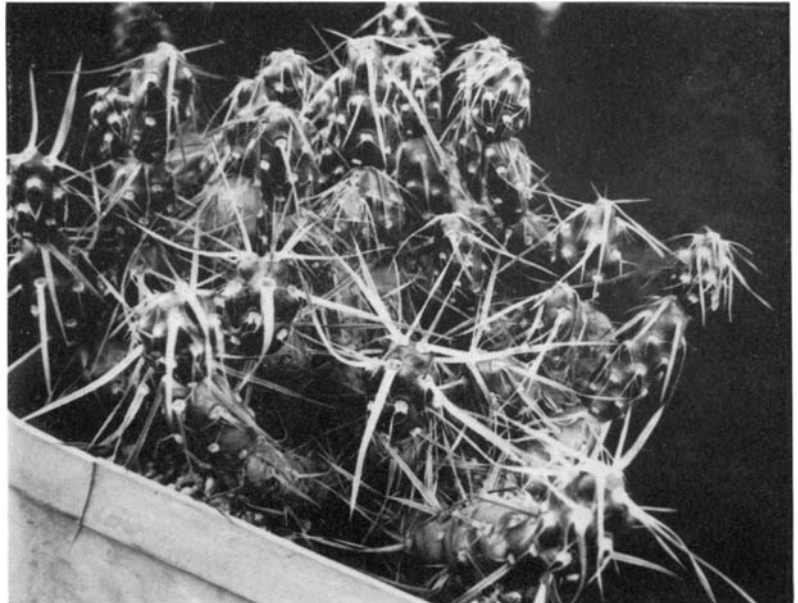
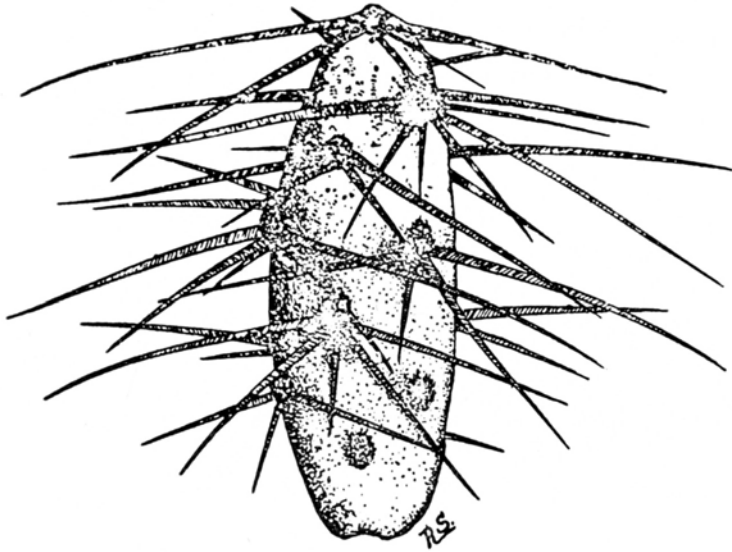


Fig. 33. *O. platyacantha* sensu Pfeiff. The same plant as in figs. 31 and 32, two years later again, with approximately 80 segments.



**Fig. 18.** *Opuntia platyacantha*.

Fig. 34. *O. platyacantha*, after Sanzin (by courtesy of the British Museum (Natural History)).

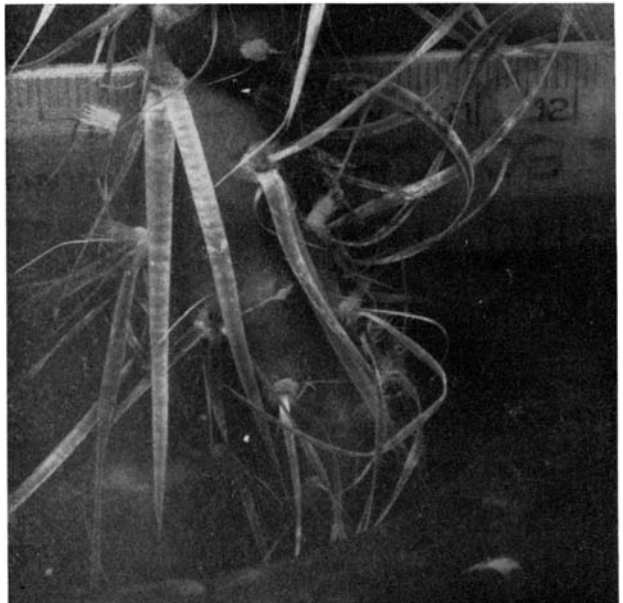


Fig. 35. *O. platyacantha*: a specimen showing the wavy markings on the spines.



Fig. 36. *O. platyacantha?* sensu K. Sch. (cutting from Ron Ginns).



Fig. 37. *O. platyacantha*: the cobby, round-segmented sort; perhaps Backeberg's var. *neoplatyacanthus?*



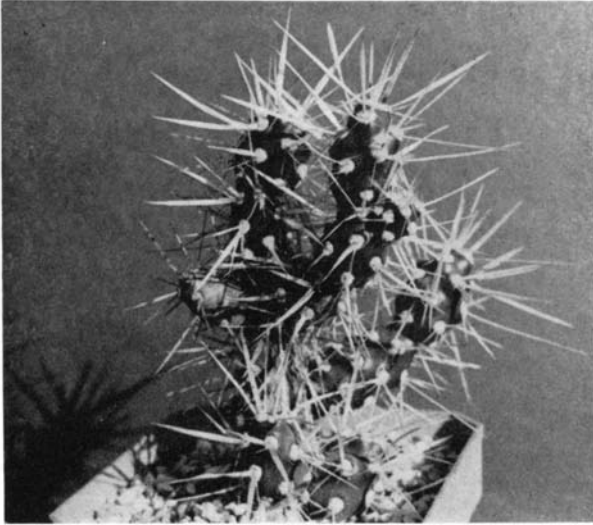


Fig. 38. A specimen received as *O. hickenii* showing marked resemblance to *O. platyacantha* but with very straight white spines.



Fig. 39. A group of forms of *O. diademata*, the typical form in the centre; note the uneven spination upon this one plant.



Fig. 40. A specimen received as *T. diadematus* var. *oligacanthus* (the label is misspelt) showing two flower buds. The spines are longer, stronger and more erect than those in Spegazzini's original photograph.



Fig. 41. The same specimen as in fig. 40, from above, with one flower open.

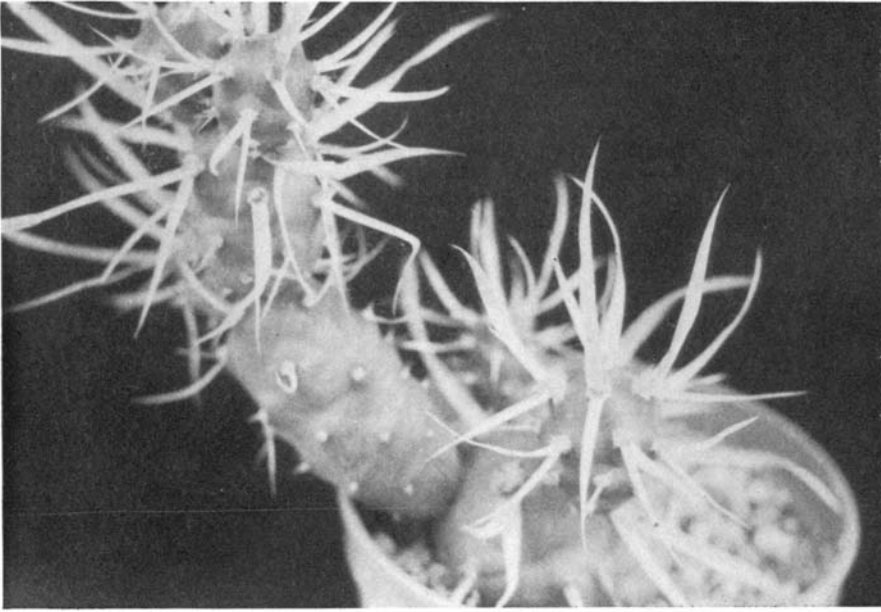


Fig. 42. *O. diademata* with variation in growth-habit, one segment very reminiscent of interforms verging on var. *inermis* (*O. strobiliformis*).



Fig. 43. A heavily spined interform approaching what often passes for *O. diademata* but with an admixture of *turpinii*-like reflexed spines.

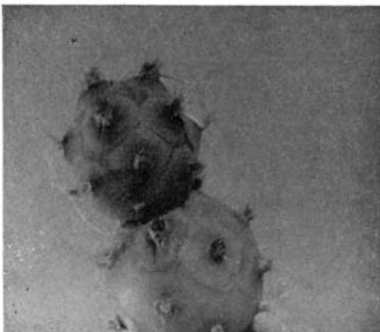


Fig. 44. *O. diademata* var. *calva*, showing lines demarcating the tubercles; note also incipient spines.

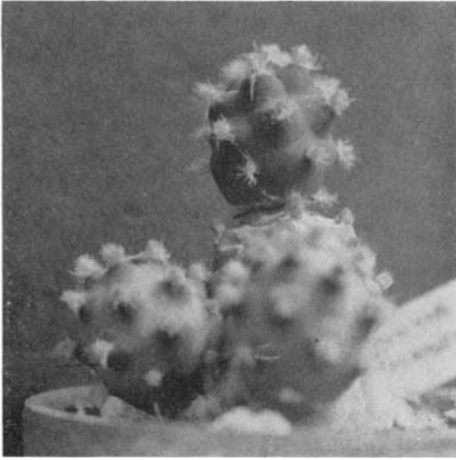


Fig. 45. Another specimen of *O. diademata* var. *calva* in growing season.



Fig. 46. The same specimen as in fig. 45, older, resting in winter; note the possibility of confusion with *O. molinensis* in this condition.

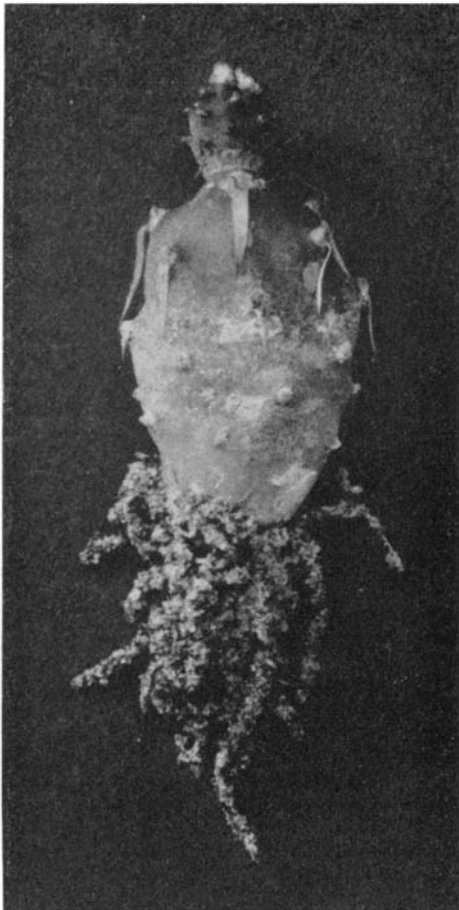


Fig. 47. Rooted segment of a plant which we consider to be near to Lemaire's original *O. turpinii*.

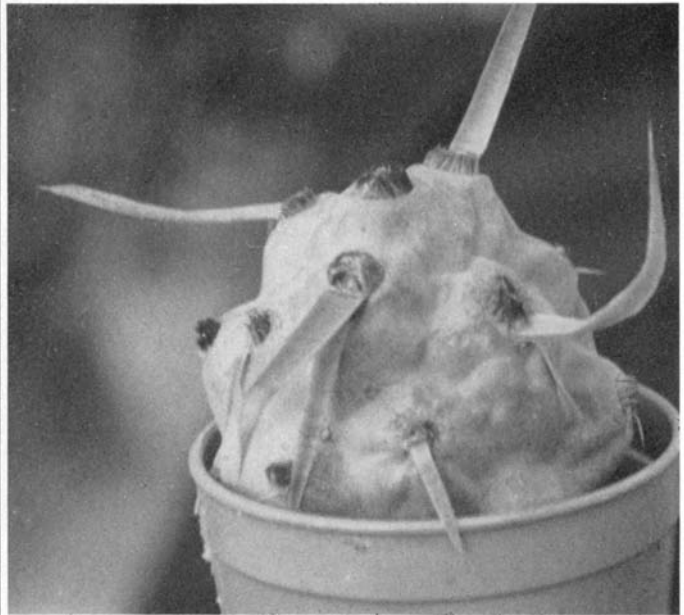


Fig. 48. Another specimen near to Lemaire's *O. turpinii*? A larger-growing form.

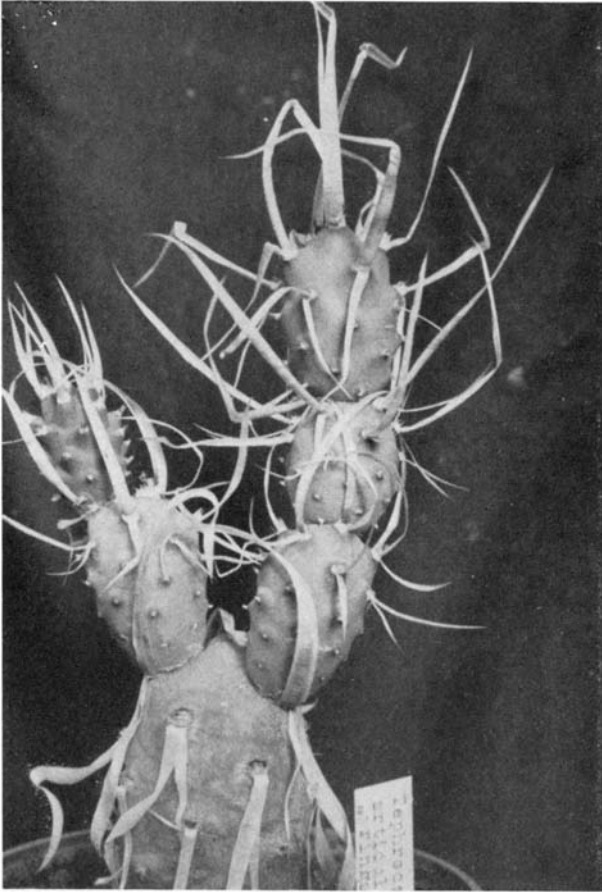


Fig. 49. A specimen received as *T. articulatus* var. *syringacanthus*, with *turpinii*-like spines, especially on the bottom segment.



Fig. 50. *O. diademata* var. *inermis* (*O. strobiliformis*): two specimens from different sources.

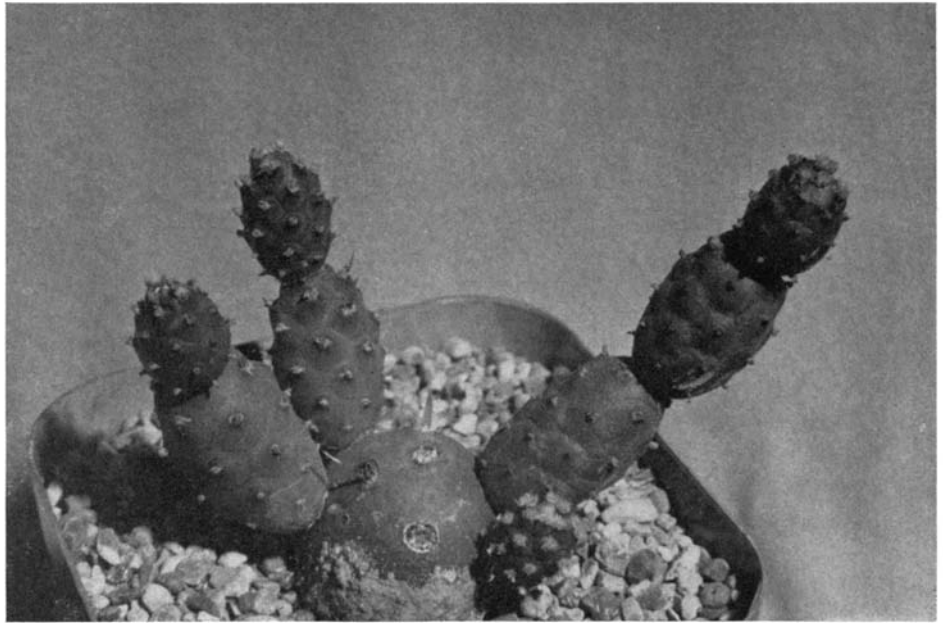


Fig. 51. An interform between the two *O. diademata* varieties *calva* and *inermis*?

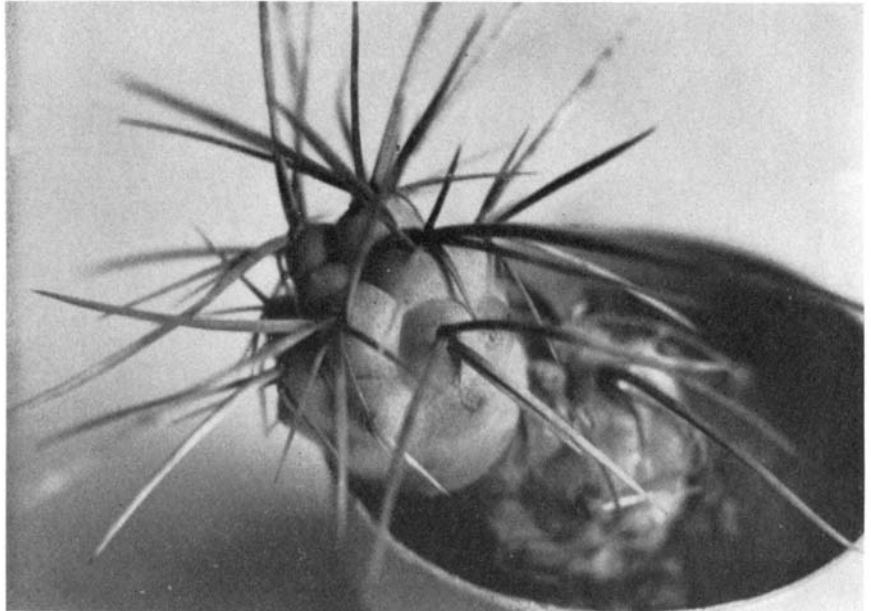


Fig. 52. *O. aoracantha*. See also Fig. 76.

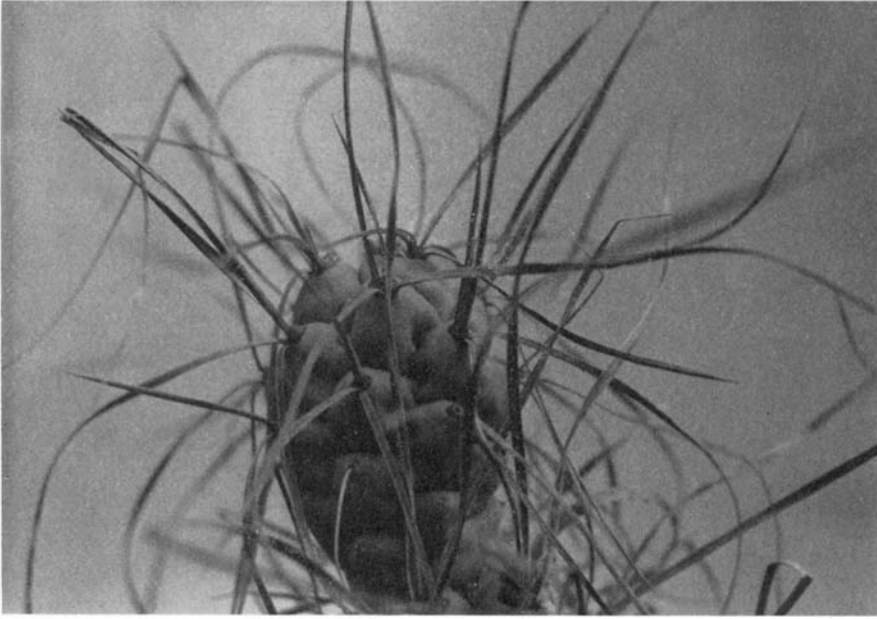


Fig. 53. *O. paediophila*: the specimen nearest in its spination to Castellanos' illustration that we have found.

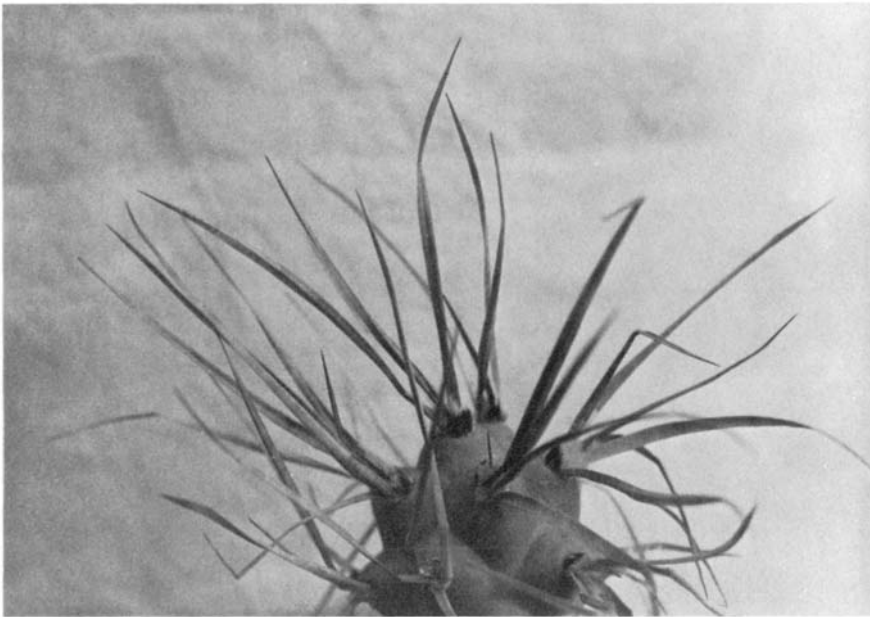


Fig. 54. *O. paediophila*: another form with slightly stiffer, less tangled spines.

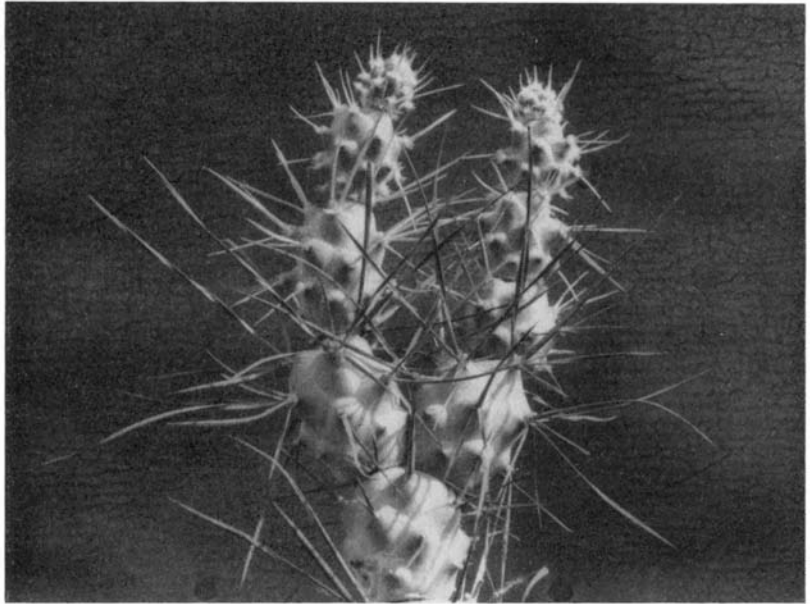


Fig. 55. *O. paediophila*: a specimen showing the erect habit described by Castellanos.

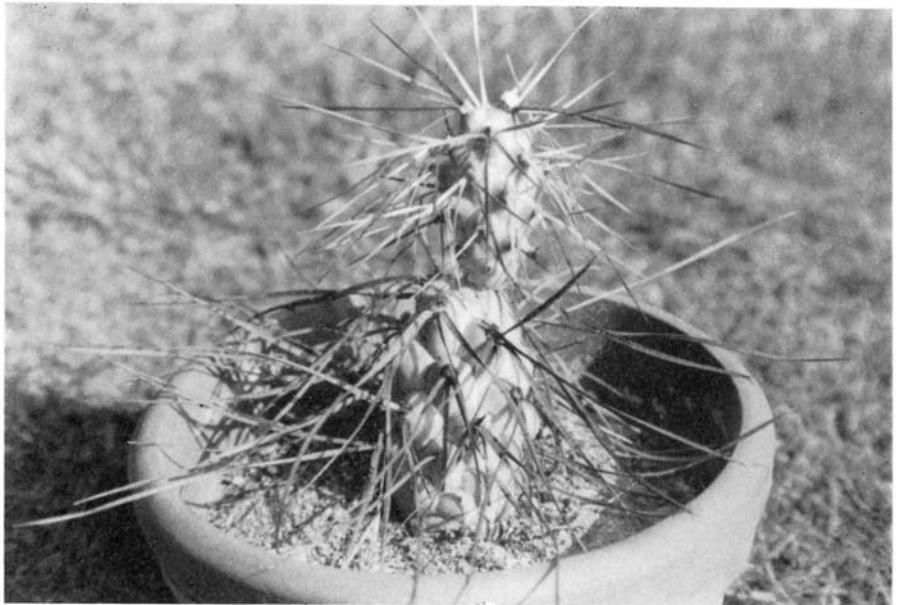


Fig. 56. *O. paediophila*: another specimen with very long spines.



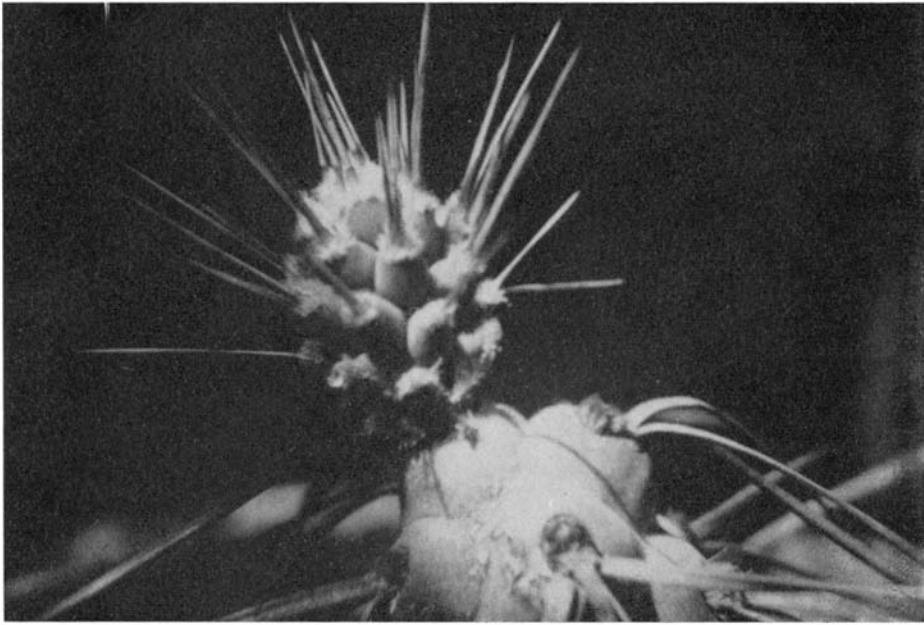


Fig. 57. *O. paediophila*: close-up of the same top segment as in fig. 56 during the previous season.

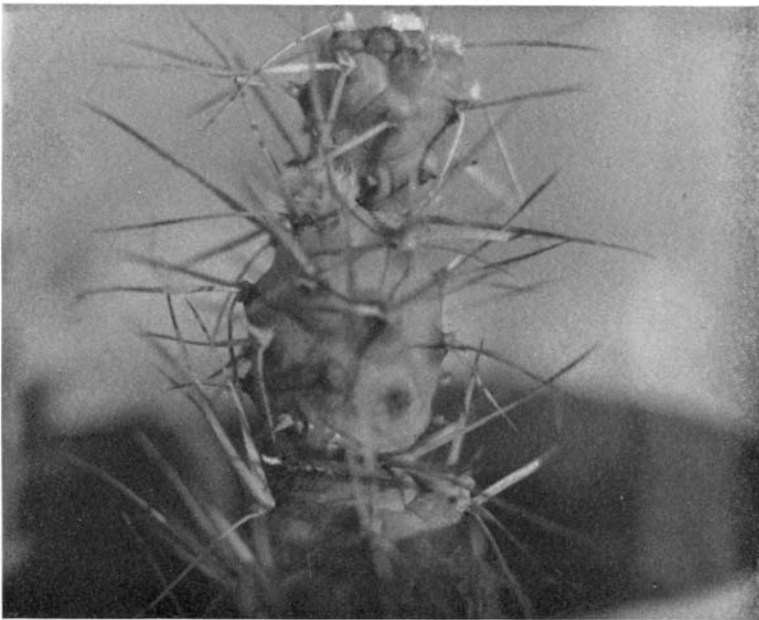


Fig. 58. A plant received as *T. hossei*.



Fig. 59. A form for which we know no name, which on the evidence of the segment-colour, tubercles and glochids clearly belongs within the *O. diademata* group.

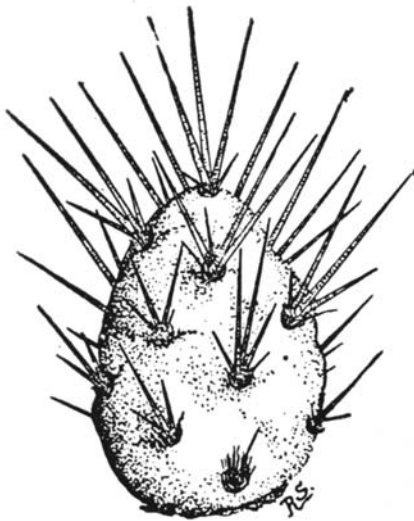


Fig. 19. *Opuntia Ovata*.

Fig. 60. *O. ovata*, after Sanzin (by courtesy of the British Museum (Natural History)).

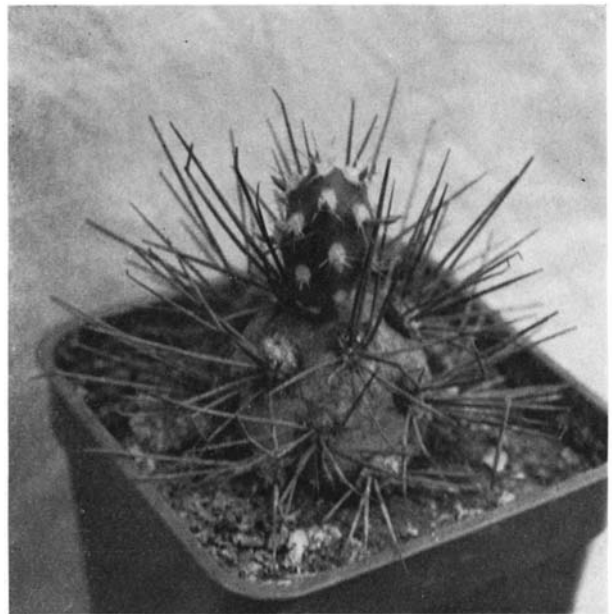


Fig. 61. A plant which we consider to be as near as any we have found to typical *O. ovata*.

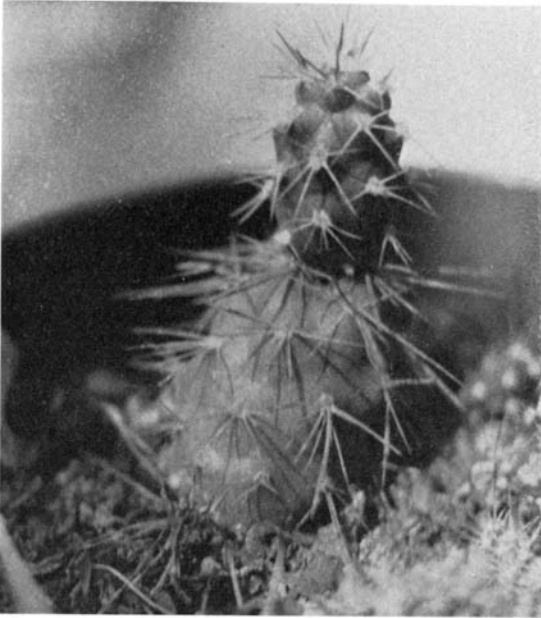


Fig. 62. Cutting from a plant in the collection of R. Ginns, obtained by him as *O. ovata*, which we consider to belong to this group.

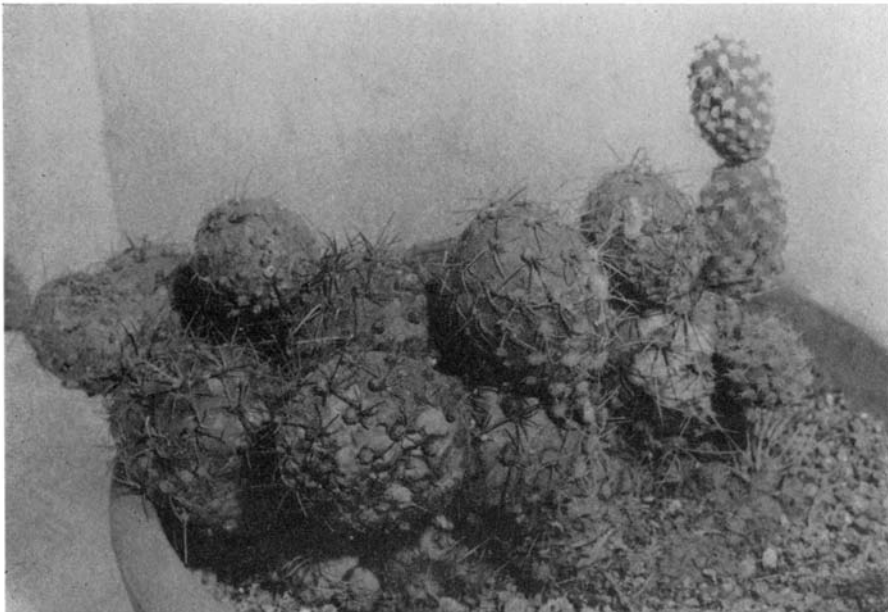


Fig. 63. *O. kuehnrchiana*, which we believe to be within a wide interpretation of *O. sphaerica*.

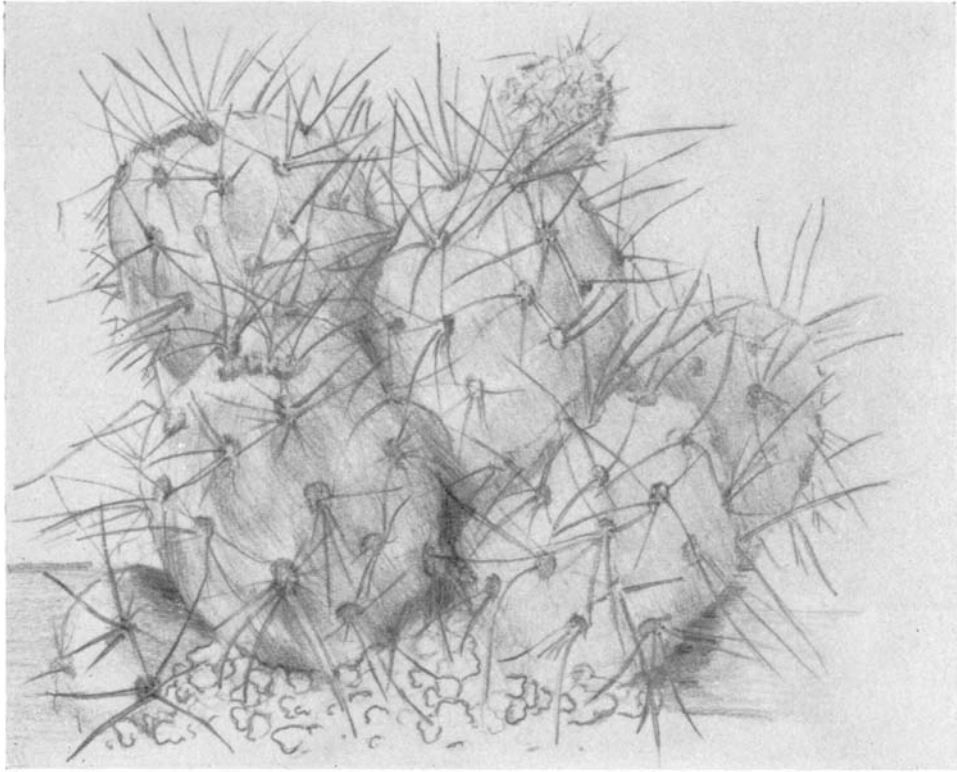


Fig. 64. Another form of *O. kuehnrichiana*. Drawing by Celia Palmer.

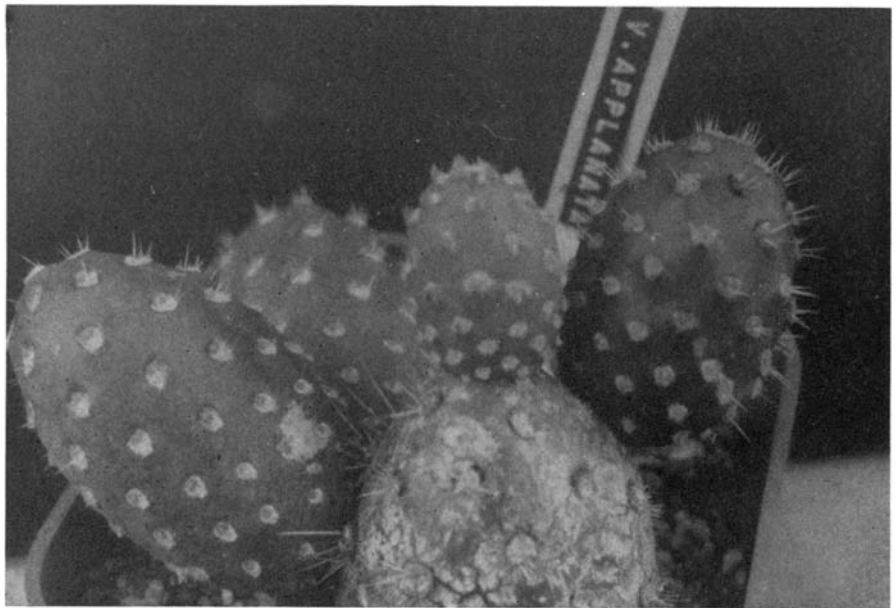


Fig. 65. A plant obtained by W. E. S. Merrett as *O. kuehnrichiana* var. *applanata*.

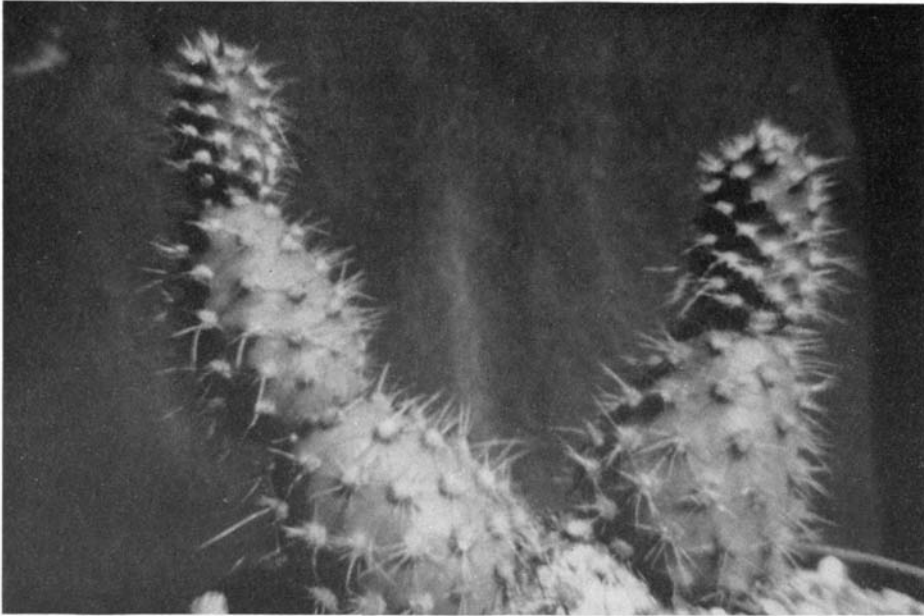


Fig. 66. A cultivated form of *O. sphaerica* commonly labelled *O. ovata*.



Fig. 67. A cutting of a plant which we believe to be *O. dimorpha*.

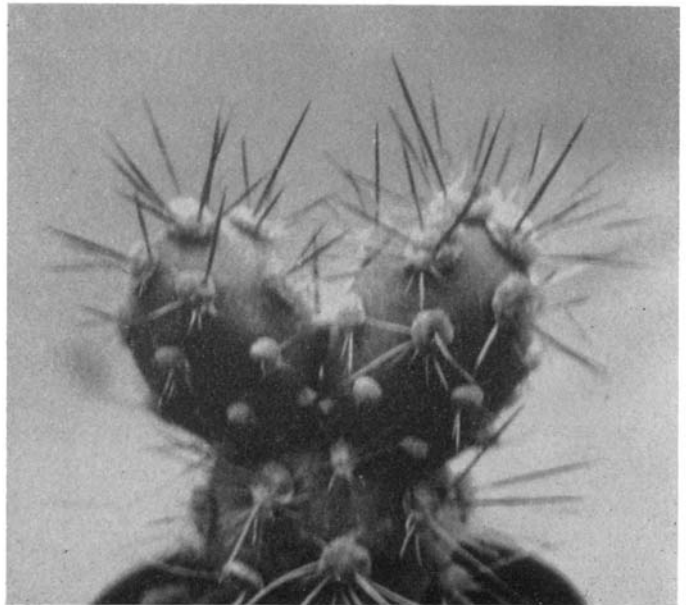


Fig. 68. A plant claimed to be *O. pseudorauppiana*.



Fig. 69. Probably a form of *O. sphaerica*.



Fig. 70. A plant claimed to be *O. retrospinosa*.



Fig. 71. An imported specimen of *O. nigrispina* showing mature spination.

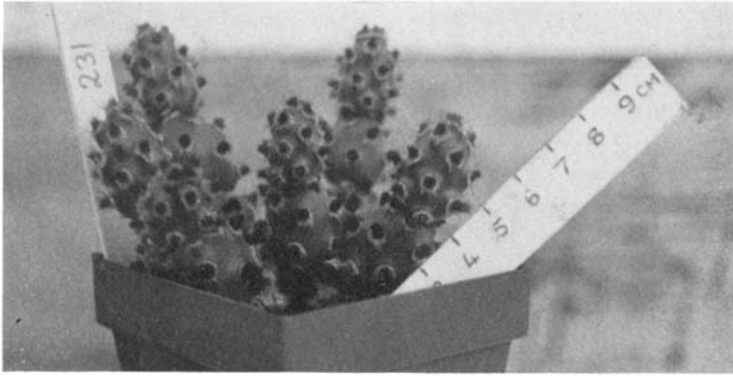


Fig. 72. *O. molinensis*.

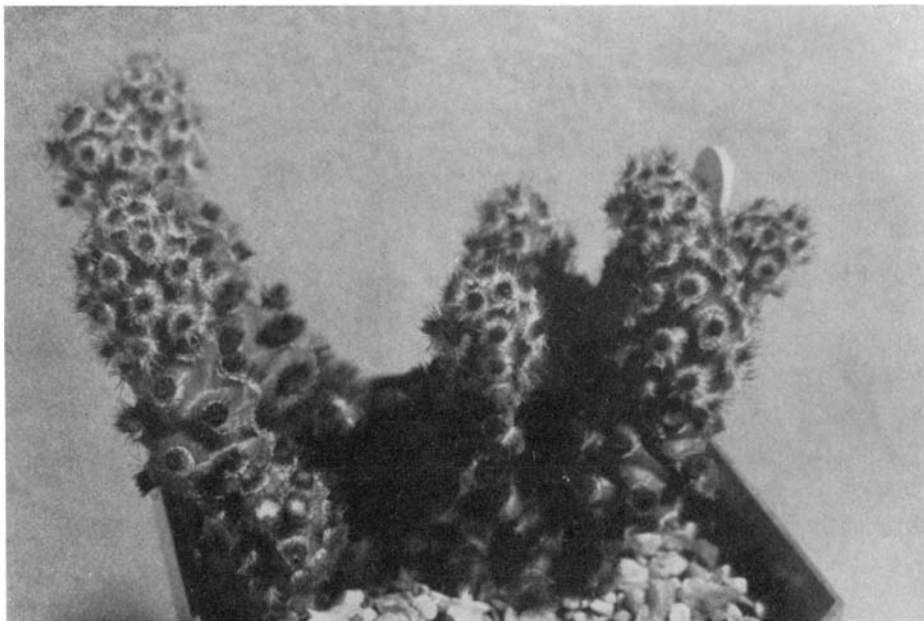


Fig. 73. *O. molinensis*: the same plant as in fig. 72, two years later.



Fig. 74. *O. alexanderi* var. *bruchii*.

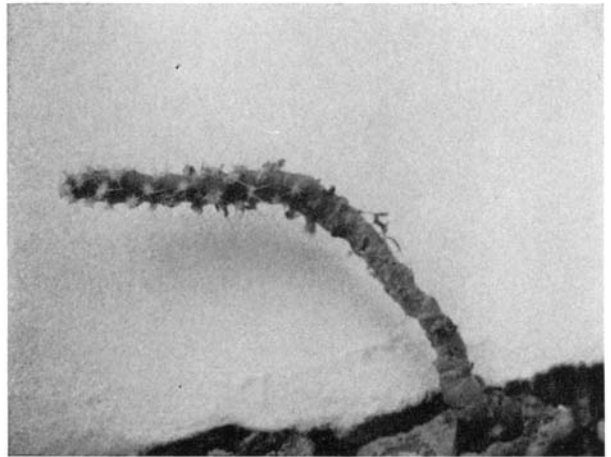


Fig. 75. A four-year-old tephrocactus seedling which had been sown seven years earlier and had lain dormant for three years.





Fig. 76. *O. aoracantha*, showing different stages of spine development. Reproduced by courtesy of the family of the late A. Cobbold, curator of the Darrah collection from its formation and for many years subsequently. His notes, kept with the plate, indicate three separate acquisitions of the species by the late C. Darrah. A photo of a less well grown plant is annotated "syn. *O. formidabilis*"; It is not certain that the one reproduced here is from the trio in the collection, none of which has survived.

# O. floccosa group

*O. floccosa* S.-D.

.....(var.) *denudata* Web.

*O. lagopus* K. Sch.

Short cylindrical forms which are placed among the *Cylindropuntia* by Salm-Dyck, Lemaire and Schumann but included among the *Tephrocacti* by Britton and Rose, Borg and Backeberg. These plants have the caespitose habit of *Tephrocacti*, but even in the smaller species are obviously close to *Cylindropuntia*. The arbitrary nature of the boundary here was revealed to any who were still not aware of it by the discovery by Rauh in 1934 of a cylindrical species forming loose mounds 40 cm high which was described by him as *Austrocylindropuntia tephrocactoides*, in other words, a South American cylindrical *Opuntia* which looks like a *Tephrocactus*. It is a good plant, but the widening of the concept of *Tephrocactus* to the point where this is said to look sufficiently like one to justify the specific name is to extend its earlier reasonable development as a subgenus so far as to make it very nearly untenable. Buxbaum (Morph. Cact., 1:65) regards the subgenus *Tephrocactus* as one line of descent out of several from the habit of the primitive

subgenus *Cylindropuntia*, with species such as *O. verschaffeltii* appearing as intermediates. The plants in the present group could be seen as further intermediates still closer to the *Tephrocactus* position. We include a brief reference to them in this book out of respect for Backeberg's memory and because many collectors seem to assume they belong here, apparently on the short-sighted view that any really choice *Opuntia* from South America must be a *Tephrocactus*! So far as we know, no one has yet seriously contemplated a ratio between the length and the girth of a single stem at full development as a convenient yardstick for dealing with the problem. The tendency has been rather to assume that if the plant forms a mound in habitat it is a *Tephrocactus* (unless on inspection it proves to consist of lots of flat or flattish pads as in the *Airampoae*). This leads to the appropriately woolly thought that the low growing cylindrical forms should be differentiated from *Cylindropuntia* on a loose analogy with *Echinocereus* and *Cereus*. We do not find this convincing.

**O. floccosa** Salm-Dyck in *Allgemeine Gartenzeitung*. 13: 388 (1845); *Cactae in Horto Dyckensi*, ed. 2: 248 (1850).

(In the original source the diagnosis alone stands in Latin. We give the text of the 1850 source in which the entire description appears in a Latin version).

*O. caule basi prolifero clavato crasse nitide perviridi, cristatim tuberculato, tuberculis confertis foliolium crassissimum ellipsoideum gerentibus, pulvillis elongatis lanigeris, lana sericea stricta alba, in pulvillis senioribus longissime dependente aculeis 1-3 vix conspicuis commixta.*

Caulis basi prolifer, valde carnosus, poll. 4-5 altus, superne crassior diametro sesquipollicari. Tubercula prominula crassa. Pulvilli in parte infera (foliolo emarcido) aculeis setaceis quibusdam brevibus albis, lanaque sericea copiosa stricta longissima floccose dependente instructi. Foliola crassa, obtusa, clavulata, erecta, mox decidua. Habitat in Bolivia.

"An *Opuntia* with a thick clavate stem branching from the base, glossy intense green with tubercles like the crest of a helmet, the tubercles close-set, bearing a very thick ellipsoid little leaf, the areoles elongated, wool-bearing, the wool silky, straight, white, on the older areoles very lengthy, hanging down, interspersed with 1-3 hardly visible spines.

"Stem branching from the base, very fleshy, 10-12½ cm high, thicker above, 3¼ cm in dia. Tubercles stout, rather prominent. Areoles on the lower part (once the leaflet has withered away) equipped with some bristle-like short white spines and with silky, profuse, straight, very long wool hanging down flock-like. Leaflets thick, blunt, somewhat clavate, erect, soon falling. Habitat Bolivia."

The same plant has subsequently been found in various localities in Peru. The height range of habitat seems to vary between 1500 and 5000 m.

Illus.: Weberbauer in Engler and Drude, *Veg. Erde*, 12: t. 14 (1911) together with *O. lagopus*, showing the difference in habit; Britton and Rose, *The Cact.*, 1: 86 (1919); Berger, *Entwickl. Kakt.*: 16 (1926); Backeberg in Möllers *Deutsche Gärtnerey.*, 46: 187 (1931) and *Neue Kakt.*: 27, 47 (1931); all photographs. Cf. also *Die Cact.*, 1.

Syn. ? *O. senilis* Roezl. non Parm., *Belg. Hort.*, 24: 39 (1874), inadequately described.

? *O. hempeliana* K. Sch., *Gesamt. Kakt.*, ed. 1: 690 (1899) sec. K. Sch., *Gesamt. Kakt. Nachtr.*: 151.

*Tephrocactus floccosus* (S.-D.) Backeb., *Kaktus-ABC*: 105 (1935).

**O. floccosa** S.-D. (var.) **denudata** Weber in Bois, *Dictionnaire d'Horticulture*, 2: 897 (1893-9).

"Is of the same type, but lacks the long hairs; spines yellow; leaflets very thick, having the form of a flattened thumb.—Huamachuco (Peru)."

Britton and Rose relegate this variety to synonymy under the species, apparently because the naked plants, as they call them, grow with the others and "have the same kind of flowers and fruits." (*The Cact.*, 1:87).

Illus.: Backeberg, *Die Cact.*, 1: 238 and t. 10A and B (1958), photographs.

Syn. *O. denudata* Web., l.c., ? nom. nud.

*T. floccosus* (S.-D.) Backeb. var. *denudatus* (Web.) Backeb. *Die Cact.*, 1: 235 (1958).

On *floccosa* itself Schumann adds that the areoles are set in 5 and 8 intersecting ranks, the glochids white, the hair up to 3½ cm long, and the 1-3 spines white, ca. 7 mm long, up to 5 cm in habitat. "Flower, according to Baron Winterfeld" (who collected the type material) "yellow, up to 3½ cm across. Fruit ovoid, 5 cm long, tuberculate, spiny . . . Peru, district of Lima, near Obrajillo . . . often in huge masses in the Cordillera . . . 4000-5000 m above sea level." (Gesamt. Kakt.: 684). Schumann adds further that similar material obtained from Arequipa in 1902 was grey-stemmed, but produced characteristic bright green shoots in cultivation like those on *floccosa* material he obtained through Dr. Weberbauer from the Lima district (Gesamt. Kakt. Nachtr.: 151). He appears by no means confident about the identity of *O. hempeliana*. Backeberg does not accept that it belongs here, because dimensions quoted suggest a much taller growing cylindrical plant, possibly *O. vestita*. There is a similar doubt about *O. involuta*. The 5- and 8-fold ordering of the areoles will surely have its basis in the Fibonacci series (1, 1, 2, 3, 5, 8, 13, . . . , each term the sum of the two preceding) which can often be found in plant formations elsewhere (cf. A. H. Church, "Types of Floral Mechanism Part 1", passim). Areole-spirals probably always follow or at least approximate to successive terms of the series, and the pattern is sometimes clearly visible on plants of the *O. diademata* group. There are several specimens under *floccosa* in the Kew Herbarium and one in the Botanical Department Herbarium, British Museum (Natural History). The last was annotated by Hutchison in 1960 "lagopus, a synonym". All are from Peru, or the adjoining frontier region of Bolivia. The earliest (Leckley, no. 2862, Kew; cf. the same collector's "pentlandii") probably dates from 1854. Exsiccate *floccosa* is particularly disappointing since the hair becomes very stained.

**O. lagopus** K. Schumann. Gesamtbeschreibung der Kakteen. Nachträge: 151-2 (1903).

Caespitosa; ramis brevibus cylindricis densissime lana copiosissima subflavanti-alba munitis; foliis in lana absconditis exsiccatis lanceolatis; aculeis solitariis albis insuper rectis tenuibus elongatis munita.

"Forming clumps; branches short, cylindrical, very densely covered with extremely profuse yellowish-white wool: the withered lanceolate leaves hidden in the wool; spines single, white, straight, thin, lengthy."

"Growth caespitose, branching from the ground. Branches erect, cylindrical, up to 10 cm high and 3-3½ cm thick, so densely covered all over with yellowish-white wool 1-1½ cm long that neither areoles nor leaves can be seen. If this is pulled away from the surface of the shoot the withered lanceolate yellowish leaves first appear, 7 mm long, clipped short at the tip. The areoles usually bear 1 spine close to the wool, almost 2 cm long, thickened at the base, white, somewhat glassy, minutely rough, very sharp, and also fine white bristles of the same length which take the place of glochids. In Bolivia (sic), on the Andes near Arequipa, at 4000 m (Weberbauer)."

Schumann notes further "reminiscent in its shoots of the paw of the snow-hare" (the connotation of the name) " . . . extraordinarily thickly covered with straight white wool; each areole bears only 1 spine.

An especially peculiar characteristic is that in correlation with the thick clothing the glochids, which remain very thin, are elongated up to 1½ cm" (ibid). The important town of Arequipa (if this was the reference intended) is well inside Peru, where this plant was also found later.

Illus.: Weberbauer in Engler and Drude. Veg. Erde, 12:t. 14 (1911); Britton and Rose, The Cact., 1:88 (1919); Backeberg, Die Cact., 1:242 and t. 13 and 14 (1958); photographs.

Syn. *Tephrocactus lagopus* (K. Sch.) Backeb., Kaktus-ABC: 106 (1935).

Britton and Rose recognized only the two species described here, and distinguished the higher shape of a *lagopus* mound from the flattened "patch of snow" appearance of *floccosa* in the distance.

Expeditions in the nineteen thirties and fifties not only produced a great deal more material of both species, sufficiently varied to warrant in Backeberg's view the description of several additional varieties, distinguished mostly only by shade of spine colour or hair colour or quantity, but also a number of hitherto unknown distinct plants which have since been described, some hairy and others not. The most spectacular of the hairy plants, *O. rauhii* (Backeb.) Rowl. is stated to have individual stems reaching 25 cm long and 8 cm thick, and from growth of smaller imported specimens we have handled this seems very likely. A comparison with *Oreocereus* is often made. We find that in our conditions this plant, like *floccosa*, will branch from quite high up on its stems, like many other cylindrical *Opuntias*, and that the new growth is a very pleasant glossy green. Some good material in this group has recently been imported by D. W. Sargent of Ventnor, I.O.W., who has hitherto grown mostly the more popular of choice succulents.

We can offer one well-attested comparison here which may relate to Salm-Dyck's description of the leaves of *O. floccosa* as "soon falling"; on material obtained as *floccosa* the leaves last some 8-10 weeks, whereas on material which, under cultivated conditions, is practically indistinguishable but which was obtained as *T. cylindrolanatus* Rauh et Backeb. (1956) the leaves last 5-6 months. Most writers have been content to regard nearly all the leaves of plants in this group as longer lasting than the generality of *Opuntias*. They are not as persistent as those of *O. subulata*.

In 1958 Ritter was, according to Backeberg, of the opinion that *lagopus* was better regarded as a variety of *T. floccosus* and that *rauhii* was another form of that species. He is also credited at that time with the view that *atroviridis* was the same as *denudata*. Backeberg maintained their separation.

The more recent names (some relating to hairy and others to hairless forms) which clearly belong to this group are listed here under year of original description (even if there has been a subsequent change of rank) without discussion, though we must warn the reader that several rest on very fine distinctions. We give the publication under *Opuntia* where this exists. In many cases this publication takes the form of a transfer in Rowley's "Reunion of the Genus *Opuntia* Mill." (Nat. Cact. Succ. Jour., 13:3-6 and 25, 1958) where the original reference may be found.

- 1931 *O. atroviridis* Werdermann et Backeb., Neue Kakteen: 63.
- 1933 *O. udonis* Weingart, Kakteenkunde: 71.  
*O. verticosa* Weingart, Kakteenkunde: 72-3.
- 1950 Not *O. posnanskyana* Card.—a version of *O. heteromorpha* Phil, which is not accepted as within this relationship other than by Backeb.
- 1953 *O. floccosa* S.-D. var. *crassior* (Backeb.) Rowl., Reun.: 5.
- 1956 *O. blancii* (Backeb.) Rowl., Reun.: 5.  
*O. crassicylindrica* (Backeb.) Rowl., Reun.: 5.  
*O. crispicrinita* (Rauh et Backeb.) Rowl., Reun.: 5.  
ditto var. *cylindracea* (Rauh et Backeb.) Rowl., Reun.: 5.  
ditto ditto subvar. *flavicoma* (Rauh et Backeb.) Rowl., Reun.: 5.  
ditto var. *tortispina* (Rauh et Backeb.) Rowl., Reun.: 5.  
*O. cylindrolanata* (Rauh et Backeb.) Rowl., Reun.: 5.  
*O. floccosa* S.-D. var. *crassior* subvar. *aurantescens* (Rauh et Backeb.) Rowl., Reun.: 5.  
ditto var. *ovoides* (Rauh et Backeb.) Rowl., Reun.: 5.  
*O. hirschii* (Backeb.) Rowl., Reun.: 5.
- O. lagopus* K. Sch. var. *aurea* (Rauh et Backeb.) Rowl., Reun.: 5.  
ditto ditto subvar. *brachycarpa* (Rauh et Backeb.) Rowl., Reun.: 5.  
ditto var. *aureo-penicillata* (Rauh et Backeb.) Rowl., Reun.: 6.  
ditto var. *leucolagopus* (Rauh et Backeb.) Rowl., Reun.: 6.  
ditto var. *pachyclada* (Rauh et Backeb.) Rowl., Reun.: 6.  
*O. pseudo-udonis* (Rauh et Backeb.) Rowl., Reun.: 6.  
*O. punta-caillan* (Rauh et Backeb.) Rowl., Reun.: 6.  
*O. rauhii* (Backeb.) Rowl., Reun.: 6.  
*O. yanganucensis* (Rauh et Backeb.) Rowl., Reun.: 6.
- 1958 *O. atroviridis* Werd. et Backeb. f. *longicylindrica* (Rauh et Backeb.) Krainz, Die Kakteen B, Oct. 1, 1970.  
ditto f. *parviflora* (Rauh et Backeb.) Krainz, Die Kakteen B, Oct. 1, 1970.  
ditto f. *paucispina* (Rauh et Backeb.) Krainz, Die Kakteen B, Oct. 1, 1970.
- 1961 *T. floccosus* (S.D.) Backeb. var. *cardenasii* J. Marn.-L., Cactus (Paris) (? no.) 72:137.
- 1971 *T. malyanus* Rausch, Kakteen und andere Sukkulente, 22:43-4.

## CULTIVATION.

There is a curious divergence in the level of success achieved by experienced succulent plant growers in this country with plants of this group. We think that the explanation may be that those who achieve success easily have started with well rooted plants or with large vigorous sections of plants for rooting up. Small cuttings from lower branches are possibly already failing in vigour before they are taken and this of course makes rooting them successfully very difficult. We have had mixed results but nothing to suggest peculiar difficulty. We have noted that a good

start is often made sooner if part of the cutting is laid along the surface of the rooting medium rather than held over it vertically or thrust down into it. The root system extends fairly rapidly once it starts, and the growth rate is nearer that of cylindrical *Opuntias* in general than it is to, say, the *O. diademata* group. It is a mistake to encourage top growth too rapidly by damp, shaded cultivation because the characteristic hairy appearance can soon be marred by lengthy extrusions of nearly bare new shoots.

## *O. pentlandii* group

- O. pentlandii* S.-D.  
*O. boliviana* S.-D.  
*O. pyrrhacantha* K. Sch.  
*O. dactylifera* Vaup.  
*O. ignescens* Vaup.

Our group should be regarded as entirely provisional. If there is a truly coherent group of forms centred about *O. pentlandii* this is probably larger than the above list would indicate, and may be much larger, though it will not extend so far as the disunited *Pentlandianae* of Britton and Rose, which includes species so diverse as *russellii*, *sphaerica* and *subterranea*. It may indeed ultimately seem better regarded as an *O. boliviana* group, since *pentlandii* in

its habitat character is a little out of line with the others. We include here only those names which have been considered close enough, by one authority or another, to be reducible to synonymy within the group. We make an exception, however, in the case of *O. grata*. This has usually been taken to belong here, but it may have been misunderstood, and we place it among the Unassigned Plants.

The forms belonging here would seem, from their generally green colour and the tendency of some of them to elongate in cultivation, to stand a little closer than those in the *O. glomerata*, *O. diademata* and *O. sphaerica* groups to the line of descent from the habit of *Cylindropuntia* which has been proposed for *Tephrocactus*.

***O. pentlandii*** Salm-Dyck in Allgemeine Gartenzeitung, 13: 387 (1845); Cactae in Horto Dyckensi, ed. 2: 245 (1850).

(In the original source the diagnosis alone stands in Latin. In the 1850 source the accompanying observations are also given in a Latin version, with minor differences which are noted below. We give the entire text of the later source).

*O. caule humili articulato-ramoso laeteviridi, articulis elongatis untrinque attenuatis plano-tuberculatis, tuberculis remotis foliolum graniforme mox deciduum, pulvillumque parvulum gerentibus superne tomentosum inferne aculeiferum, aculeis 4-6 gracilibus rigidiusculis albidis divaricatis deflexis.*

*Caulis in hac planta anomala aetate semipedalis et ultra evasit, articulisque erectis poll. 1-2 longis. Aculei graciles, subsetacei, lin. 3-4 longi, deflexi, divergentes, e tomento gilvo in parte supera pulvilli collecto. Habitat in summis regionibus Boliviae. Non dum floruit.*

“An opuntia with a low, articulate-ramose bright green stem, the segments elongate, narrowed at each end, plano-tuberculate; the tubercles spaced out, bearing a grain-shaped leaflet soon falling off and a smallish areole woolly above and spine-bearing below, with 4-6 divergently deflexed spines, thin, stiffish, whitish.

“In age the stem of this anomalous plant has extended 15 cm and more, and it has erect segments 2½-5 cm long. Spines thin, almost bristle-like, 6-8 mm long, diverging, from out of the yellowish-tan coloured wool gathered in the upper part of the areole. Habitat: the highest parts of Bolivia. Has not yet flowered.”

Allg. Gartenz. has segments “2-3 zoll. lang” (5-7½ cm) and wool “dirty yellow”.

Illus.: Backeberg in Des. Pl. Life, 22: 113 fig. 2 (1950), photograph, reproduced, Die Cact., 1: 319.

Syn. *Cactus pentlandii* Lem., Les Cactées: 88 (1868).  
? *O. cumingii* Hort. sec. K. Sch., Gesamt. Kakt. ed. 1: 698 (1899).

*Tephrocactus pentlandii* (S.-D.) Backeb. in Des. Pl. Life, 22: 113, 115-16 (1950); Die Cact., 1: 314-7.

*Non T. pentlandii* sensu Backeb., Kaktus-ABC: 108 (1935) = *O. pentlandii* sensu Br. et R. sec. Backeb., Die Cact. ut sup.

The history of *O. pentlandii* rather resembles that of *O. glomerata* in that a break in acquaintance seems to have come about after Schumann's time. Schumann's *pentlandii* differs in some details from that of Salm-Dyck, but it is evidently close, and the spines are still said to be small and few. The weak deflexed spines of Salm-Dyck's description sound indeed as if they might represent merely a cultivated character, and they may perhaps have been understood in this

sense by Britton and Rose. It now appears, however, that such an assumption would be mistaken.

Britton and Rose (The Cact., 1: 97) treat *O. pentlandii* very inclusively, referring *O. boliviana*, *pyrrhacantha* and *dactylifera* here. They seem to be discussing *boliviana* for the most part, and to lose *pentlandii* itself almost entirely in so doing. They describe their species as having “joints obovoid to . . . cylindrical . . . sometimes 4 dm.” (an obvious misprint) “—in diameter . . . tuberculate, more or less pointed . . . Spines when present mostly from the upper areoles, erect, 2-10, usually bright yellow sometimes brownish . . . the longest 7 cm long.” The reference to an “obovoid” stem-segment is surprising (cf. *O. russellii*), since the usual shape in the *pentlandii* area is an ovoid one, but it might possibly be explained by the inclusion of *O. dactylifera* (q.v.) in the composite material. Borg's *pentlandii* (Cacti, ed. 2: 115) is quoted largely from Britton and Rose.

*O. pentlandii* sensu Br. et R. naturally claimed attention—perhaps as the habitat character—so long as there was no alternative. Backeberg, however, has convincingly supplied this. He rejects *O. pentlandii* sensu Br. et R. as incorrectly identified (Des. Pl. Life, ut sup.) and claims that all the characters of the original description agree with the plant “. . . rediscovered recently by Mrs. Wilke . . . near Tupiza (S. Bolivia), nearly hidden in the soil . . . with small flat tubercles, with a little yellowish felt in the areoles. the spines deflexed and slender, just of the size given in Salm-Dyck's description. Some of the spines are at first yellowish, others white. I counted up to six.” This is good evidence in favour of his identification, but there is an apparent difficulty in that the habit of this plant differs, perhaps considerably, from that which is to be inferred from the original description. Backeberg's photograph shows a small, low clump of very squat stubby stem-segments, sometimes even broader than long and tightly compacted together. However, it is to be noted that Salm-Dyck published the experience of several years' cultivated growth. Material may be seen in cultivation today (under various names such as “grata” etc., but also as “pentlandii”) which corresponds closely to Salm-Dyck's description both in habit (as it would seem) and in detail and which supplies a probable link with Backeberg; for we have seen growth which is indistinguishable from this cultivated material arise from an almost certainly imported specimen with the stubby, tightly compacted stem-segments of the habitat plant. We believe that Backeberg is right; and that the discrepancy in habit provides a striking case of alteration of character under cultivation, due, presumably to milder insolation.

The above cultivated material (which is not uncommon) has the bright green, sometimes rather elongated stem-segments, yellowish areoles and spine formation of the description. The spines are intermittent, and by no means confined to the uppermost areoles. They often take up a characteristic inverted V formation which accords with their being described as “divergently deflexed” and which is also to be seen on Backeberg's plant. The areoles may be closer and the tubercles less distinct than the description might suggest, the tubercles being sometimes barely discernible beyond the growing-point; but, apart from these details in what are plastic, variable characters in any case, the agreement with the description is so close that we feel sure this material represents a form very near to *O. pentlandii* S.-D. if not the species itself.

Backeberg describes (Des. Pl. Life, ut sup.) the flower of the plant found by Mrs. Wilke as red, but although he does not give any location except hers in Die Cact. 1:317 (North of Tupiza, at 4000 m, Pampa Mochara) he then gives the flower as "short-funnelled, yellow (red also reported according to Wilke), 2½ cm long and 3½ cm wide." He lists two varieties under his *T. pentlandii* in "Die Cactaceae": var. *fuaxianus* Backeb. (Cactus (Paris) 8:250 (1953): Die Cact., ibid), and var. *rossianus* Heinr. et Backeb. (ibid.). The former is distinguished by less profuse, lighter wool and single "rarely appressed" spines: these are said to be "aufrecht" in the Key, but a photograph (Die Cact., 1:322) hardly confirms this character. It does suggest, however, that the stem-segments are very smooth. The variety is reputedly smaller than the species, though Backeberg does not mention this. Var. *rossianus* is said to have more prominent tubercles and 1-3 stronger, yellow or brown spines, sometimes with additional subsidiary spines, "not all strongly deflexed, but directed more sideways". Backeberg also considers a form intermediate between the two (Die. Cact., 1:325). All these varieties, however, have the habit of the species; and from the various illustrations there does not seem to be any evidence of a passage towards *O. boliviana* such as was envisaged by Britton and Rose. In 1966 A. F. H. Buining illustrated a good flowering specimen, probably var. *rossianus*, in Succulenta, 45:105. In the 1967 catalogue of the Städtische Sukkulentsammlung, Zurich, H. Krainz treated what he considered to be var. *rossianus* as a form of *O. hypogaea* Werd., a species which appears from its description to be within *O. glomerata* Haw. (q.v.), a very different plant.

At least two of the newer species described by Backeberg (*T. subinermis* and *minor*) might be liable to confusion with *O. pentlandii* in cultivation. *T. subinermis* may mimic it in general appearance and (cultivated) habit, especially in the case of small, weakly specimens, since it is also liable to elongate. The spines are rather similar at a glance, but they are usually more regularly distributed, they have an anti-clockwise tendency (though the species is by no means alone in this respect), and one at least is often longer and more porrect; while the stem-segments are a duller green, with quite prominent tubercles. We speak here of *subinermis* which we know; according to Backeberg it has several forms, some with fewer spines. (Material which we have had from Fearn of Sheffield as *subinermis* appears correctly named, but a great deal of extremely similar material has in recent years circulated from other sources quite absurdly labelled "moelleri"—a name which belongs to a choicer clavate plant from Mexico of entirely different appearance.)

The plant which we believe to be *T. minor* Backeb. (*O. backebergii* Rowl. nov. nom., Reun.: 5 non *O. minor* C. Mull. (1858) has low, somewhat flattened tubercles and brilliant green new growth such as could be supposed to agree with the description of *O. pentlandii*: but the tubercles are more sharply outlined, and persistent, while the colour soon passes to a dull dark green. Moreover the spines are very intermittent and may be absent from the entire stem-segment, while the segment itself is characteristically squat, almost globular or even with a flattish base, and unlikely to elongate. It is conceivable that this might have been Schumann's *pentlandii*: the areoles, as he indicates, are often elongated, though we have not found them to be, as he says, "obovate". The

joints of this plant break easily, as Backeberg observes, and the fragments are rather hard to root.

This plant is illustrated as "*T. subinermis*" in Des. Pl. Life, ut sup. (fig. 4), but the same photograph appears in Die Cact., 1:341 with the legend changed to "*T. minor*".

A good many specimens are referred to *O. pentlandii* both in the Kew Herbarium and the Botany Department Herbarium, British Museum (Natural History). One of these (D. Stafford, no. 1015, from Peru, Dept. Puno, at 12,500 ft. (1937) represented in both herbaria) is noted as having flattened stems, and would seem to be some form of Airampo. The remainder show, in one form or another, the erect spines from the top of the stem-segment of *O. pentlandii* sensu Br. et R. One such specimen (Brooke, no. 6391) is referred to in more detail under *O. ignescens*. What became of Salm-Dyck's herbarium and type specimens is unknown (Stafleu, Tax. Lit.: 414).

**O. boliviana** Salm-Dyck in Allgemeine Gartenzeitung. 13:388 (1845); Cactae in Horto Dyckensi, ed. 2: 245-6 (1850).

(As in the case of *O. pentlandii* we give the Latin text of the 1850 source).

*O. caule articulato suberecto laxo ramoso, articulis ovato-oblongis laevibus pallidissime viridibus, senioribus lutescentibus, pulvillis subremotis foliolo minuto erecto acuto suffultis, aculeis 1-4 erecto-divergentibus longissimis lineari-extensis flexilibus, inferne corneopellucidis albis, apice pungentibus fulvo-sphacelatis.*

*Planta senecta pedalis et ultra, laxo articulato-ramosa. Articuli ovato-oblongi, attenuati, poll. 2-2½ longi, juniores laetissime virides, sub lente punctulis albidis obsiti, seniores spurco-gilvi, laevissimi, etuberculati, pulvillis immersis. Pulvilli rotundati, juniores (praeter tomentum fulvo-griseum) lana evanida, crispatula, brevi instructi. Aculei rite 4, sed abortu saepissime solitarii, bini aut tres, longissimi (3-4 pollicares), flexile rigidi, basi erecti, collecti, superne divergentes, stricti vel flexuosi, apice acuti, pungentes.*

"An opuntia with a more or less erect articulate loosely ramose stem, with smooth very pale green ovoid-oblong segments becoming yellowish when older, the rather well spaced areoles supported by a minute erect pointed leaflet, with 1-4 erect-divergent very long flexible spines, stretching outwards, the lower part horny translucent white, the tip sharp and ? dark speckled tawny" (or ? "withered tawny").

"The plant in full age reaches 30 cm and more, loosely articulate-ramose. Stem-segments ovoid-oblong, tapered, 5-6¼ cm long, the younger a very bright green strewn with whitish dots under the lens, the older a dirty yellowish tan, very smooth, lacking tubercles, with sunken areoles. Areoles round, equipped when young (as well as with tawny greyish woolly felt) with some short rather curly wool which disappears. Spines properly 4, but very often, by aborting, only 1, 2 or 3, very long (7½-10 cm), supplely stiff, erect and close-set at the base, divergent above, straight or flexuous, pointed and sharp at the tip."

The German text in Allg. Gartenz. has these details: segments 2-2½ cm (10-12 lin.) thick towards the base but hardly 8-10 mm (4-5 lin.) above, leaves hardly 2 mm (1 lin.) long and spines subulate or

bristle-like, "reddish-yellow above and bent here and there . . . The young stem-segments never arise from the tip, but always from the side of the segment below."

The diagnosis ends upon a word (sphacelatis) which seems to have taken on a special meaning in botanical usage. The literary meaning is "withered", but Stearn (Bot. Lat.: 515) gives "brown or black speckled".

Illus.: Cardenas in Backeberg, Die Cact., 1:326, fig. 315 (1958), in full flower; Backeberg, ibid. figs. 316, 318 (left); all photographs.

Syn. *Cactus bolivianus* Lem., Les Cactées: 88 (1868). ? *O. cucumiformis* Griff. in Bull. Torr. Club, 43:524 (1916), sec. Backeb., Die Cact., 1:319. *Tephrocactus bolivianus* (S.-D.) Backeb., ibid. (1958). Non *T. bolivianus* sensu Backeb., in Des. Pl. Life, 22:116 (1950) = ? *T. ferocior* Backeb., Die Cact., 1:328.

*O. boliviano* was not known to Schumann (Gesamt. Kakt., ed. 1:748) under this name at least. Backeberg, however, thinks that the *O. grata* which Schumann describes in Gesamt. Kakt., ed. 1:697-8 is very possibly the same as *O. boliviana*. The spines on Schumann's material are shorter than those described by Salm-Dyck, but there are several points of correspondence to support Backeberg's suggestion, and this is eased in one respect which he seems not to have realised. Backeberg is troubled by the fact that the fruit, which according to Philippi's original description of *O. grata*, should be edible, is not so here; but Schumann's *grata*, we suspect, is not the same as *O. grata* Phil. (a possibility which would seem to have escaped Backeberg) and if this conjecture of ours is correct then the difficulty should not arise. See further under *O. grata* below.

The plant which Backeberg first thought to be *O. boliviano* (Des. Pl. Life ut sup.), is there described as having spines very variable in length and number (sometimes up to 20) spreading in all directions and also erect. The accompanying illustration as "*T. bolivianus*" (fig. 3) is reproduced in Die Cact., 1:335 as "*T. ferocior*". The *T. bolivianus* of Die Cact. ut sup., placed next after *T. pentlandii* by Backeberg, seems very likely to be the same as Salm-Dyck's plant. It suggests that the rather open growth described by Salm-Dyck is a genuine habitat character. Backeberg adds the details "Stem-segments . . . more or less tuberculate at the tip, later smooth . . . Spines on the upper part of the stem-segment . . . yellow . . . to reddish yellow . . . Flowers 2-3 cm long, yellow to orange, up to 5 cm across. Stamens short, style thick, lobes very short, ovary with . . . bristly spines above; fruit globular to oblong, yellowish, according to Cardenas not edible." Fig. 318 (left) suggests that the spine-formation of *O. boliviana* may tend towards that noted amongst the herbarium "*pentlandii*" and under *O. ignescens* below, where the spines stand erect from the top of the segment.

Britton and Rose (l.c.) refer *O. boliviana* to their *O. pentlandii*. Borg's *boliviana* (Cacti, ed. 2:116) is not easy to understand in the light of Salm-Dyck's description. The comparison with *O. pentlandii* must be understood to indicate *pentlandii* sensu Br. et R.; but this itself is illogical since, according to Britton and Rose, *pentlandii* includes *boliviana*.

*O. cucumiformis*, received by Griffiths in the United States from "European Collections" as, incredibly, *O. ciribe* Engelm., was supposed by its author to be native to the S. American Cordillera and may have been near *O. boliviana*. It was exceptionally large-structured (cylindric-ovoid segments up to 10 cm long and 3½ cm thick) and the spines were proportionally short (up to 2½ cm) but they are described characteristically as "yellowish, translucent, bone-like, porrect, diverging but slightly, 1-5 in upper areoles only." The flower is said to be deep yellow, having a faint tinge of red in upper edges, 4 cm across, the stigma white, variable, 6-parted, small, and the fruit oval to obovate, nearly 2 cm long, the areoles distant below, closer above, bearing 1-2 yellowish spines 12-15 mm long around the top.

We have a small piece from some material received from the University of California as "*boliviana*" (U.C.60, 1112-1, P. C. Hutch. 1273). The habit and shape of stem-segment agree with Salm-Dyck, but the growth is otherwise still too immature to discuss here. Some of the herbarium material mentioned under *O. pentlandii* may perhaps belong with *O. boliviana*.

An engraving of *O. boliviana* in Först., Handb., ed. 2:908 (1885) reproduced in Nichols., Illus. Dict. Gard., 2:502 (1885-6), in Watson, Cactus Culture for Amateurs: 197 (1889), in Bellair & St. Leger, Pl. Serre: 1199 (1900), and in Schelle, Handb.: 58 (1907), is of little value despite this repetition. It was even retained in the shortened 3rd ed. of Watson (1920) and the paperback 4th and 5th.

It should be noted that *O. boliviensis* Backeb. (1935) is an entirely different plant which belongs among the Airampoae.

#### **O. pyrrhacantha** K. Schumann, Gesamtbeschreibung der Kakteen, ed. 1:694 (1899).

Fruticosa ramosa flavo-viridis; articulis oviformibus vel ellipsoideis parvis; aculeis 5-8 validis rubro-luteis; floribus flavis; ovario inferno nudo.

"Shrubby, ramose, low, yellow-green; with small oviform or ellipsoid stem-segments; with 5-8 sturdy reddish-yellow spines; flowers golden yellow; ovary naked below.

"Shrubby, ramifying, low. Stem-segments ovoid or ellipsoid, small; up to 2 cm long and 1 cm thick, tuberculate, yellow-green, glossy. Areoles round, up to 3 mm across, those lower down on the stem segment clad only with white, flock-like wool, those above furnished with 5-8 exceedingly stiff, sharp, shiny, yellowish-red spines up to 4 cm long. Glochids small, golden yellow. Flowers lateral; overall length 3-3½ cm. Ovary top-shaped, naked below, furnished with areoles above which bear a brownish tuft of wool and yellow glochids up to 1 cm long. Perianth 3 cm across. Outer perianth-segments elliptical, obtuse, reddish yellow; inner segments obovate, golden yellow. Stamens half the length of the perianth. Filaments and anthers yellow. The very stout style outreaches them with 8 short, erect, red lobes.

"In Peru, on the Cerro Tornarape and near Tacora, 4400 m above sea level: Stübel no. 98c and 111b."

Illus.: Backeberg, Die Cact., 1:338 (1958), photograph of a herbarium specimen of 1920 considered by him to be the species.

Syn. *Tephrocactus pyrhracanthus* (K. Sch.) Backeb., Die Cact., 1:336 (1958).

Britton and Rose (l.c.) refer *O. pyrhracantha* to their *O. pentlandii*. Backeberg places *T. pyrhracanthus* in his sub-series *Pentlandiani* next to *T. atacamensis*. The same 1920 provenance (collected by Asplund in Bolivia, Dept. La Paz., Calvario, at 4000 m) applies to a variety *leucoluteus* said to have light yellow flowers and darker spines, described by Backeberg in 1956 and listed by Rowley (Reun.: 6) as *O. pyrhracantha* K. Sch. var. *leucolutea* (Backeb.) Rowl.

**O. dactylifera** Vaupel in Botanische Jahrbücher, 50 (1914), Beiblatt 111:29-30 (1913).

Planta humilis, articulata, dense ramosa. Articuli globosi vel ovato-oblongi plus minusve imbricatum sulcati. Areolae basi articularum remotae, apicem versus potius approximatae, juventute parvae, dein accrescentes, tomento brevi glochidiisque nonnullis obsitae. Aculei in areolis inferioribus 0, in areolis superioribus ca. 7 erecti validi fusco-brunnei. Flores singuli e media parte articularum; ovarium atque tubus late infundibuliformia, longitudinaliter leviter sulcata, margine superiore squamis parvis glochidia brevia aculeosque nonnullos longiores in axillis gerentibus obsita, ceterum fere nuda; perianthii phylla exteriora squamiformia, interiora accrescentia late cuneiformia obtusa, tubo fere aequilonga; stamina numerosissima toti parieti tubi affixa, inclusa, densissima, subaequilonga, perianthii phyllis multo breviora; filamenta filiformia, antherae parvae; stylus crassissimus, apice versus sensim attenuatus, stigmatibus ca. 7 stamina superans. Fructus dactyliformis, apice umbilicatus, nudus. Semina magna obovata, tomento brevi obtecta.

"A low, articulate, densely ramose plant. Stem-segments globose or ovoid-oblong, more or less overlappingly furrowed. Areoles distant at the base of the segments, rather close towards the tip, small when young, later growing larger, covered with short woolly felt and some glochids. Spines in the lower areoles 0, in the upper areoles ca. 7, erect, sturdy, dark brown. Flowers solitary from the middle part of the segments; ovary and also tube broadly funnel-shaped, longitudinally lightly furrowed, on the upper margin covered with small scales bearing short glochids and some longer spines in the axils, the rest almost bare; outer perianth segments scale-like, inner increasingly broadly obtuse wedge-shaped, almost as long as the tube; stamens very numerous, inserted all over the wall of the tube, included, very dense, almost of equal length, far shorter than the perianth-segments; filaments thread-like, anthers small; style very thick, gradually tapering towards the tip with ca. 7 short stigma-lobes topping the stamens. Fruit date-shaped, umbilicate at the tip, bare. Seeds large, obovoid, covered with short woolly felt.

"A cushion-forming plant; low, thickly ramifying. Stem-segments globular to a pointed ovoid shape up to 7 cm long, 2-4 cm thick, the older more smooth, the younger with overlapping furrows, especially in the upper part. Areoles in the lower part fairly distant, towards the tip rather more closely set, according to age 1-4 mm across, provided with a squab of wool up to 4 mm high and with not so very many glochids.

Spines only on the upper areoles, ca. 7, strong, red-brown or yellow-brown (sic), erect, the longest up to 3½ cm long. Flowers solitary at the half-way point of the segment, 3 cm long overall; ovary and tube broadly funnel-shaped, very faintly furrowed from top to bottom, almost bare, with the exception of the upper rim, which is beset with small scales the axils of which contain a certain amount of short yellowish wool and some glochids or spinelets up to 2 mm (sic) long. The outer perianth-segments scale-like, the inner broadly wedge-shaped, rounded, not quite 1½ cm long. Stamens very numerous, densely packed together, springing from the entire wall of the tube, much shorter than the perianth-segments; filaments very thin, anthers small; style very sturdy, 1½ cm long, somewhat tapering towards the tip and with ca. 7 short lobes inclined together to a certain extent to make one papilla and outreaching the stamens. Fruit prominent, date-shaped, almost 5 cm long, something over 2 cm thick, faintly furrowed lengthwise, deeply umbilicate at the tip, bare. Seeds fairly numerous, obovate, with a pointed base, 4 mm long, 3 mm across, yellow-brown, hardshelled, covered with short felt. Flower yellow, often suffused reddish.

"S. Peru: Azarango (Dep. Puno), on stony patches at 3600m; Weberbauer, no. 1357, Aug. 1902. . . . Close to *O. pyrhracantha*."

Illus.: Vaupel in Monat. f. Kakt., 24:175 (1914) drawing, reproduced in Die Cact., 1:328; Backeberg, Die Cact., 1:329, fig. 322 (1958), photograph.

Syn. *Tephrocactus dactyliferus* (Vaup.) Backeb., Die Cact., 1:320 (1958).

Britton and Rose refer *O. dactylifera* to their inclusive *O. pentlandii*. We have seen a small cultivated piece of material received from the University of California as "pentlandii" (U.C.37.1052; J. West, 8228) which distinctly resembles Backeberg's fig. 322 ut sup. The tubercles, which have an imbricate tendency, are somewhat decurrent and tapering below, but their apices crowd together a little towards the (somewhat sharpish) top. Thus from one aspect the stem-segment may appear slightly obovoid and from another slightly pointed. This might explain the paradoxical combination of these terms in the description of their *pentlandii* by Britton and Rose. So far this material is almost spineless. The glochids initially are sunken and a curious greenish-gold; and the stem-segments, once mature, are distinctly glaucous. We have also had material from Richardson of Ipswich, which we understand came from Cardenas, which appears to be good *dactylifera*; and we have sometimes seen plants elsewhere in collections which would seem to be *dactylifera* if our interpretation is correct.

Backeberg (l.c.) places *T. dactyliferus* in his sub-series *Pentlandiani* next to *T. bolivianus*. He describes the colour as "a peculiar pale grey-green" and notes that the fruit is edible. In Die Cact., 6:3598 he says that the flower-colour is reddish-orange yellow, and the stamens, style and stigma-lobes creamy white. He relegates his own *T. duvalioides* of 1953 (Cactus (Paris), 8:250) to synonymy under *T. dactyliferus*. *O. duvalioides* (Backeb.) Rowl. and its var. *albispina* (Backeb.) Rowl. (the latter based upon a variety published by Backeberg at the same time) appear in Reun.: 5. Backeberg did not maintain the distinction of his own variety in 1958 or later.



**O. ignescens** Vaupel in Botanische Jahrbücher, 50 (1914), Beiblatt 111:30-1 (1913).

Planta humilis, articulata, ramosa. Articuli ovati apice angustati, dimidio superiora leviter imbricatum sulcati. Areolae sparsae, in parte inferiore articulorum valde remotae, orbiculares, pro rata magnae, tomento glochidiisque numerosis erectis obtectae. Aculei in areolis senioribus 0, in areolis junioribus ad 15 vel plures, erecti, alteri tenuiores breviores flexiles, alteri validi, longiores, articulis subaequilongi. Flores plerumque singuli ex dimidio superiore articulorum erumpentes, magnitudine mediocres; ovarium atque tubus extrinsecus late infundibuliformia, imbricatum sulcata, margine superiore squamis parvis lanceolatis obsita, caeterum nuda; squamae glochidia atque aculeos numerosiores erectos perigonii phylla superantes gerentes. Perigonium ovario cum tubo paulum brevius, phylla exteriora parva, squamiformia, interiora late cuneiformia vel obovata, obtusa; stamina numerosissima inclusa e toto pariete tubi oriunda, subaequilonga; filamenta filiformia, antherae parvae; stylus crassus, sub stigmatibus 7 erectis paululum angustatus, stamina vix superans. Fructus apice umbilicatus, imbricatum sulcatus, aculeis longis numerosis superatus.

“A low, articulate, ramose plant. Stem-segments narrowed at the tip, with slightly overlapping furrows in the upper half. Areoles sparse, exceedingly distant in the lower part of the segments, round, large in proportion, covered with woolly felt and numerous erect glochids. Spines on the older areoles 0, on the younger areoles up to 15 or more, erect, some more slender, shorter, supple, others sturdy, longer, almost as long as the segments. Flowers for the most part solitary, bursting from the upper half of the segments, moderate in size; the ovary and the tube broadly funnel-shaped on the outside, with overlapping furrows, covered on the upper rim with small lanceolate scales, the rest bare; the scales bearing glochids and rather numerous spines topping the perianth-segments. Perianth a little shorter than the ovary with the tube, the outer segments small, scale-shaped, the inner broadly wedge-shaped or obovate, obtuse; the stamens very numerous, included, springing from all the wall of the tube, almost of equal length; the filaments thread-like, the anthers small; the style thick, very slightly narrowed beneath the 7 erect stigma-lobes and scarcely outreaching the stamens. Fruit umbilicate at the tip, with overlapping furrows, topped by numerous long spines.

“A densely ramifying hemispherical to globe-shaped plant forming cushions up to  $\frac{1}{2}$  m high. Stem-segments fairly hefty, generally a pointed ovoid shape up to 8 cm long and 5 cm in greatest diameter, the upper part with overlapping furrows. Areoles, particularly on the lower part of the segment, not numerous, round, fairly large, up to 5 mm across, provided with a certain amount of wool and numerous erect glochids. Spines only on the younger areoles but here very numerous, up to 15 or more, erect, far outreaching the top of the stem-segment, unequal, some thinner, flexible, shorter and yellowish, the greater number stiff, sturdy, red-brown, up to 8 cm long. Flowers for the most part solitary on the upper half of the segments,  $3\frac{1}{2}$  cm in overall length; ovary and tube broadly funnel-shaped, nearly 2 cm long, with faint overlapping furrows, beset about the upper rim

with very small scales in the axils of which there are tufts of erect short glochids and up to 10 yellow-to reddish-brown flexible spines, up to 2 cm long, which outreach the perianth-segments. Perianth-segments not so very numerous, up to  $1\frac{1}{2}$  cm long, the outer small, scale-like, the inner broadly spatulate to obovate, rounded above; stamens very numerous, springing from the entire wall of the tube, filaments thin, thread-like, the uppermost 6 mm long, the lower shorter, thus outreached by the perianth-segments; anthers small; style sturdy, but slightly narrowed above,  $1\frac{1}{2}$  cm long, stigma-lobes 7, erect, 3 mm long, very slightly outreaching the stamens. Fruit umbilicate at the tip, with overlapping furrows, beset with numerous long flexible erect spines at the rim. Flower colour fiery red. S. Peru, near Sumbay, by the Arequipa-Puno railway, 3830 m., Weberbauer, no. 1370, Aug. 1902.”

Illus.: Britton and Rose, The Cact., 1:98 (1919), drawing and photograph; Backeberg, Die Cact., 1:336-7 (1958), photographs.

Syn. *Tephrocactus ignescens* (Vaup.) Backeb., Kaktus-ABC: 108 (1935).

The “older” and “younger” areoles are of course the lower and upper ones respectively. The lower areoles of the stem-segment develop first, and it is thus the upper areoles which bear the spines. Indeed the stem-segment illustrated by Britton and Rose (l.c.) could be the archetype of that kind of tephrocactus which has no spines whatever over the greater part of the stem-segment but a thick brush of strictly erect spines from the very top. The photograph in Die Cact., (fig. 338) confirms this habit of growth. This kind of disposition of the spines is apparently characteristic of several species near here, but it is seldom seen in collections and presumably needs more light than can be obtained in this country for its development.

According to Vaupel (l.c.) Schumann believed *O. ignescens* to be referable to *O. pentlandii*; Vaupel himself, however, finds the proposal unacceptable and advances Salm-Dyck's description of *O. pentlandii* as evidence of the difference between them, though he also considers the possibility that this difference might be due to cultivation. In the light of Backeberg's rehabilitation of *O. pentlandii* S.-D. one can now understand that the two species are widely distinct. Britton and Rose treat *O. ignescens* as a separate species which they place next to their *O. pentlandii*, and Backeberg places it in his sub-series *Pentlandiani* though at some distance from *T. pentlandii* itself.

A particularly well arranged and well preserved specimen in the Botanical Department Herbarium, British Museum (Natural History) (Brooke no. 6391 (1950), S.E. shore L. Titicaca, Bolivia, 12,800 ft.) agrees in many respects with *O. ignescens* except that it lies well inside the dimensions of the description (stem-segment ca. 4 x 3 cm). It seems originally to have been unnamed, and is included under *O. pentlandii*.

The more recent names which appear to belong to this group are listed here under year of original description but it is possible that a few more among those listed under “Unassigned Plants” may also be relevant.

- 1935 *O. flexuosa* (Backeb.) Rowl., Reun.: 5  
*O. mistiense* (Backeb.) Rowl., Reun.: 6  
*O. rarissima* (Backeb.) Rowl., Reun.: 6  
*O. subinermis* Backeb., Bl. f. Kakt.: 8  
*O. wilkeana* (Backeb.) Rowl., Reun.: 6
- 1952 *O. chichensis* (Card.) Rowl., Reun.: 5  
ditto var. *colchana* (Card.) Rowl., Reun.: 5  
*O. cylindrarticulata* (Card.) Rowl., Reun.: 5
- 1953 *O. backebergii* Rowl., Reun.: 5 = *T. minor* Backeb.  
*O. ferocior* (Backeb.) Rowl., Reun.: 5  
*O. pentlandii* S.-D. var. *fuauixiana* (Backeb.) Rowl., Reun.: 6  
ditto var. *rossiana* (Heinrich et Backeb.) Rowl., Reun.: 6 (where Heinrich's name is omitted)
- 1956 *O. asplundii* (Backeb.) Rowl., Reun.: 5  
*O. fulvicoma* (Rauh et Backeb.) Rowl., Reun.: 5  
ditto var. *bicolor* (Rauh et Backeb.) Rowl., Reun.: 5 (= *T. bicolor* Rauh)
- O. ignescens* Vaup. var. *steiniana* (Backeb.) Rowl., Reun.: 5 (where it is misprinted *steinianus*) (= *T. flaviscoparius* Ritt. see Backeb., Die Cact., 1:335).
- O. noodtia* (Backeb. et Jacobs) Rowl., Reun.: 6  
*O. pyrrhacantha* K. Sch. var. *leucoleuca* (Backeb.) Rowl., Reun.: 6  
*O. zehnderi* (Rauh et Backeb.) Rowl., Reun.: 6
- 1962 *T. albiscoparius* Backeb., Die Cact., 6:3599.
- 1963 *T. flexispinus* Backeb., Descr. Cact. Nov., 3:14.  
*T. longiarticulatus* Backeb., Descr. Cact. Nov., 3:15.
- 1964 *T. multiareolatus* Ritt., Taxon 13:144.  
*T. echinaceus* Ritt., Taxon 13:145.
- 1966 *T. pentlandii* (S.-D.) Backeb. var. *adpressus* Backeb., Das Kakteenlexikon: 427.

### CULTIVATION.

There should be no difficulty about the cultivation of *pentlandii* and its near relatives, which seem to accept a temperate climate very well, as one would expect, but they do not flower for us. We attribute this to the failure to provide sufficient insolation, although the explanation may be a little more sophisticated than that and relate to the establishment of an appropriate cycle of "short" days and "long" days, as demonstrated successfully by several flowerers of the Cerei. As good as the *O. corrugata* group for outdoors in the summer; we would recommend this

course, indeed, if it can be arranged, in view of the tendency to elongation under glass. Salm-Dyck's experience with the type material of *O. pentlandii* is perhaps relevant here; according to the plan of the garden of Schloss Dyck in Hort. Dyck, oder V. it would appear that the Cactaceae were all housed. The late J. T. Bates used to recommend outdoor summer growth for *Maihuenia poeppigii*, which has the same tendency. In the winter it is our experience that *O. pentlandii* is not reliably frost-resistant out of doors in our damp climate.

## *O. glomerata* group

- O. glomerata* Haw.  
*O. andicola* Pfeiff.  
.....(var.) *elongata* Lem.  
.....(var.) *fulvispina* Lem.  
.....(var.) *major* Lem.  
*O. darwinii* Hensl.  
*O. russellii* Br. et R.  
*O. platyacantha* Pfeiff.  
.....(var.) *monvillii* S.-D.  
.....(var.) *gracilior* S.-D.  
.....(var.) *deflexispina* S.-D.  
.....var. *neoplatyacantha* (Backeb.) Rowl.  
(*O. platyacantha* sensu K. Sch.)

*O. glomerata* Haw. is the first tephrocactus to have been described which we can recognise with reasonable certainty. The various close forms centred about *O. glomerata* and *O. andicola* are in fact probably the next-best known tephrocacti to the average collector after *O. diademata*, though they may not appear under these names. At the same time some readers to whom the name "*O. glomerata*" has suggested a somewhat *diademata*-like plant may be puzzled to find it heading the tough, dense, clumpy plants which belong here, and a general word may be helpful.

doubt, has completely changed its connotation in this century with its revision in "The Cactaceae". *O. glomerata* Haw. is mentioned regularly in the Salm-Dyck-Lemaire era, almost always in close association with *O. andicola*; but later the references dwindle and reappears in "The Cactaceae" only after a period of obscurity. Britton and Rose revive *O. glomerata* on account of its priority and further propose that shall include almost all of the early flat-spined tephrocacti, both in this and in our succeeding *O. diademata* group, under the one species. This is an unrealistic suggestion as interpreted strictly: when all allowance is made for complexity and disconcerting

approximations in the field, one must still see within their synonymy the existence of at least two series of plants, roughly but fairly distinguishable as *andicola*-like and *diademata*-like, which differ in spine-formation and in other obvious and consistent characters and which have been recognised as distinct, in one way or another, by all previous authorities. In fact, however, we question whether a strict interpretation need be considered. The revision has a strong bias towards the *diademata* side; and, even if *O. glomerata* itself is left out of account to allow for possible lack of acquaintance at the time, one must still feel doubt as to how far Britton and Rose actually recognised the plants concerned in the case of the better known *andicola* and *platyacantha* material on the other side of the synonymy. We are inclined to believe that they misread *O. glomerata* Haw., *O. andicola* Pfeiff. and *O. platyacantha* Pfeiff. together and took all these descriptions to indicate variants within an entirely *diademata*-like group of forms. Their revised description agrees with this view, and their own illustration strongly endorses it. A single illustration cannot sit on the fence; and this is plainly one of the close variants of *O. diademata*.

Their widely inclusive synonymy in its full aspect never seems in fact to have attracted much support, at least in Europe, and it is noteworthy that Spegazzini, undoubtedly the foremost Argentinian botanist in this field at the time, adopted a quite different approach. But though *O. andicola* and *O. platyacantha* maintained or resumed their former places, *O. glomerata* itself was left in need of explanation, since in the experience of most collectors it had no former place other than as a distant name. It was natural to accept its revival in the form given in such an authoritative source as "The Cactaceae", and it thus took a new identity from the *diademata*-like bias of the revision. It remained in this position until Backeberg directed people's attention once again to Haworth's text, which we quote below. We find nothing in this to encourage, and much to prevent, the reading of a *diademata*-like form; on the contrary we find it readily recognisable as an *andicola*-like form and we know some specimens of this kind which agree with it in almost every respect. Indeed reasonably similar material is probably not uncommon, and has doubtless persisted throughout, though assimilated under other names.

**O. glomerata** Haworth, "Twelfth Decade of New Succulent Plants", in *Philosophical Magazine*, ser. 3, 7: 111 (1830).

Ramis caespitose confertis: spinis centralibus solitariis linearibus acuminatis utraque planis longissimis. Habitat in Brazilia, et in nobili horto Hort. Soc. Londini nunc sine floribus viget. St. h. Obs. Planta tota fere glomeratim hemisphaerica est. Ramuli sublaevolato-teretes carne farctim crassi, subvirides, vix semunciam lati. Areolae ordinariae setis brevissimis densissimis uniformibus, unaque spina plus minus centrali cornea, corneoque colore biunciali, vix flaccida, neque rigida, sed in arcum flexibili.

"With branches packed together in a clump; the central spines single, straight, tapering to a fine point, flat on both sides, very long. It is found in Brazil, and thrives in the celebrated collection of the London Horticultural Society, as yet without flowering. A

woody form. Observations. The whole plant is a rounded, almost hemispherical mass. Individual stem-segments somewhat pointed-terete, tightly filled out with flesh, greenish, hardly 1¼ cm thick. Areoles normally with very short dense uniform bristles and 1 horny spine more or less central, and of a horny colour, 5 cm long, hardly weak, yet not rigid, but capable of being bent into a curve."

"St." denotes "status, rank", while "h" ("woody") is one of a range of several such symbols indicating similar general categories which were in common use at the time (Stearn, *Bot. Lat.*: 365, 372).

Pfeiffer (Enum.: 145) observes that the stem-segments of *O. glomerata* are hardly 2½ cm long (vix pollicares) and gives Mendoza, a much more probable locality, as the source of his material. Haworth's reference to Brazil is almost certainly an error, though this may have been the country from which the species reached Europe. *O. glomerata* is also recorded from Chile (*Fl. Chil.*, 3:28), while *O. hypogaea* Werd., regarded as synonymous by Backeberg, was based upon material collected several hundred miles to the north of Mendoza in the high Andes of Argentina: Prov. Los Andes, at 4000 m.

Illus.: Cardenas in Backeberg, *Die Cact.*, 1:287 (1958); Werdermann in Backeberg, op.c.: 288 (as *O. hypogaea*); Backeberg, *Das Kakteenlexikon*: 718-19 (1966); all photographs.

Syn ? *O. andicola* (var.) *fulvispina* Lem., *Cact. Gen. Nov.*: 72 (1839); q.v. as to *O. glomerata* (var.) *fulvispina* S.-D. nom. dub.

*O. glomerata* (vars.) *albispina*, *flavispina*, Hort. Berol. ex S.-D., *Cact. Hort. Dyck*, ed. 1:40 (1841) nom. nud.

*O. glomerata* (var.) *minor* Hort. Berol. ex S.-D., *Cact. Hort. Dyck*, ed. 2:71 (1850), nom. nud. (*O. andicola* Hort. non Hort. Angl., Pfeiff. pro syn. sec. S.-D., *ibid.*)

*O. hypogaea* Werd. in Backeb., *Neue Kakt.*: 64 (1931) et in Fedde, *Repert. Sp. Nov.*, 30:59 (1932), sec. Backeb., *Die Cact.*, 1:276.

(Type specimen: a living plant sent to the Berlin Bot. Gard. by E. Stümer, from Argentina, Prov. Los Andes, ca. 4000 m alt. Backeberg, l.c., gives a slightly later reference for this name).

*Tephrocactus glomeratus* (Haw.) Backeb. in *Cactus (Paris)* 8:249 (1953) sec. Backeb., *Die Cact. ut sup.*

*Non O. glomerata gracilescens* Hort. Pan. ex Terraciano in *Contrib. Biol. Veg. (Palermo)*, 3:t. 4 fig. 3 (1902) nom. nud.; *non O. glomerata* sensu Br. et R., *The Cact.*, 1:89 (1919); *non T. glomeratus* sensu Speg. in *Revista Arg. Bot.*, 1:200 (1926) = *O. diademata* Lem.

As we have indicated in the introductory note to this group, *O. glomerata* has a complicated background owing to its revision in "The Cactaceae". Britton and Rose there treat *O. glomerata*, *O. andicola* and *O. platyacantha* together with the greater part of the *O. diademata* group as one single species, where *O. glomerata* itself has priority as the specific name. Their wide synonymy, based apparently on the mere possession of flat spines, stands as an attempt to unite two very different classes of plant, but in practice their species would seem to be indistinguish-

able from *O. diademata*. This treatment, as Backeberg has also argued (e.g. *Die Cact.*, 1: 216-17, 279), is clearly unacceptable. It is evident from the habit, tiny terete sublanceolate (more or less pointed) stem-segments and straight, centrally placed spines of Haworth's plant that this cannot have belonged to the *O. diademata* group; while the early records give repeated testimony that *O. glomerata* Haw. was at that time recognised as having a close affinity with *O. andicola* where these same characters would well correspond. The inclusive synonymy of "The Cactaceae" has very understandably been widely ignored so far as *O. andicola* and *O. platyacantha* are concerned, but the association of the name *O. glomerata* with diademata-like plants has unfortunately persisted and caused much confusion: on the one hand illogical attempts are sometimes made to find an independent place for an "*O. glomerata*" within the *O. diademata* group; while on the other hand material which could be *O. glomerata* Haw. is liable to be wrongly identified because the name is believed to apply elsewhere. Some "*russellii*" may in fact belong here; see *O. russellii* below.

Specimens may be met today which show exactly the small terete stem-segments and the high ratio between the length of spines and size of stem-segment of the original description, and we see no reason to doubt, even considering the plasticity of these plants and the long interval involved, that these are representative of *O. glomerata* Haw. We have not seen any authenticated *hypogaea*, but Werdermann's description, which is quoted by Backeberg (*Die Cact.*, 1: 279), appears to agree with that of Haworth except that it mentions slightly shorter spines. The variants distinguished by Salm-Dyck on spine-colour (see synonymy) may perhaps be paralleled today, and several other varieties of *glomerata* have been catalogued in recent years. *O. glomerata* and *O. andicola* would seem to approach one another in their respective ranges of variation. Lemaire describes varieties of the latter (q.v.) with stem-segments less elongated than those of the species; while some present-day *glomerata*-like material has the additional small weak subsidiary spines characteristic of *andicola*, as against the single spines described by both Haworth and Werdermann. (Haworth's "dense bristles" are clearly glochids). These additional spines, however, may at least on some occasions arise as a cultivated character. Single-spined plants may indeed be found; yet the small additional spines may develop on the growth of cuttings taken from them. Thus, while it may be that *O. glomerata* is distinguished by absence of subsidiary spines in habitat or in old age, the distinction might be difficult to maintain under cultivated conditions. Förster seems to have experienced this and noted that on his plants 4-5 shorter spines was the rule although they otherwise agreed fairly with Haworth's description. (*Handb.* ed. 1: 472 (1846)).

Backeberg treats *O. andicola* and its varieties within two varieties (var. *andicola* and var. *fulvispinus*) under his *T. glomeratus*. Without prejudging the details, this general conception of the *glomerata/andicola* series of forms may well prove to be the most acceptable as this group of plants becomes better understood. Backeberg also has a third variety under his *T. glomeratus* (var. *gracilior*, transferred from under *O. platyacantha*, q.v.) which is incorrectly founded and obscure in treatment.

Another plant which may well belong near here is

*O. leoncito* Werd. (Chile: Copiapó, ca. 3800 m, "hard on the limit of vegetation", in *Notizbl. Bot. Gart. u. Mus. Berlin*, 10: 752-4, (1929)). This gives much the impression of a larger-growing *O. glomerata* with a different spine—to—stem-segment ratio (both 4 cm long), the flat main spines usually single, but "often with 1-2 small appressed subsidiary spines." The flower is described as yellow. A good piece of authenticated leoncito (Werdermann no. 944 (1926)) is preserved in the Kew Herbarium in a cover endorsed "Chile" placed after the numbered specimens in the "Opuntia, Temperate S. America" series. For reference to *O. leoncito* in a Key by Werdermann see under *O. atacamensis* below.

We would also note the recent circulation of a hardy, thin yellow spined plant evidently very near *glomerata* labelled "*O. gracilis*", a name which is badly astray here. *O. gracilis* Pfeiff. was a *Cylindropuntia* described in *Enum.*: 172. It is treated by Schumann and by Britton and Rose as a synonym of *O. leptocaulis*.

*O. glomerata* is placed next to *O. andicola* in classified lists and/or associated with it by direct reference in *Allg. Gartenz.*, 1: 367 (1833); *Enum.*: 145 (1837); *Cact. Gen. Nov.*: 72 (1839); *Cact. Hort. Dyck*, ed. 1: 39-40 (1841) and ed. 2: 70-71 (1850); *Mon. Fam. Cact.*: 482 (1858); Rümpler in *Först.*, *Handb.*, ed. 2: 915 (1885); and *Bois, Dict. Hort.*, 2: 896 (1893-9), where Weber concludes the *andicola* entry by recording that *O. glomerata* Haw. and *O. tuberosa* Pfeiff. were "neighbouring species" cultivated at that time. Towards the end of the 19th century however the references generally speaking become sparse and unreliable. The Rümpler treatment departs far from the original. Schumann, in 1899, records the name only, with a query whether it might be associated with *O. corrugata* (*Gesamt. Kakt.*, ed. 1: 696). We think this may have occurred to him because of Haworth's grouping of *glomerata* and *longispina* together under a heading evidently designed to cover the possibility of further narrow-segmented material in general. The *O. glomerata gracilescens* Hort. Pan. ex Terraciano of 1902 (see synonymy) would seem from its illustration to be close to *corrugata*. Spegazzini omits *O. glomerata* altogether from his "Cactearum Platensium Tentamen" of 1905, though, as against the synonymy of *O. glomerata* sensu Br. et R., it is noteworthy that he treats *O. andicola* and *platyacantha* there as closely allied with *O. darwinii* but quite distinct from *O. diademata*. The two latest references to an *O. glomerata* from the pre-Britton and Rose era which we have traced are in catalogues of famous collections: that of the City of Manchester Alexandra Park (Darrah) Collection of 1908, and that of the Hanbury Gardens, La Mortola, compiled by Berger in 1912. The latter lists *O. glomerata* Haw. and *O. diademata* Lem. as different species but appends the above reference in *Gesamt. Kakt.* to its *O. glomerata*, with a note of June as the flowering season, which presumably reflects Schumann's suggestion of a *corrugata*-like plant. The former notes with care that its *O. diademata* Lem. is the same species as *O. papyracantha* Phil. and *O. plumosa nivea* Hort., but lists its *O. glomerata* as a different plant. This might indicate the original view of *glomerata* or again might be guided by Schumann.

Following upon the publication of "The Cactaceae", Spegazzini accepted *O. glomerata* sensu Br. et R. as a prior synonym for *O. diademata* (*Anal.*

Soc. cient. Arg., 99:99 (1925)). *Tephrocactus glomeratus* sensu Speg., a transfer of this reading of *O. glomerata* sensu Br. et R. published, towards the end of his life, in 1926 (Revist. Arg. Bot. ut sup.), has no connection with *T. glomeratus* (Haw.) Backeb.

If part of the type specimen ever was preserved amongst Haworth's herbarium material this is likely to have been lost at an early date (Staffeu, Tax. Lit.: 194). For details see Clokie, "An Account of the Herbaria of the Department of Botany in the University of Oxford": 180 (1964). A specimen preserved in the Kew Herbarium (Shafer no. 11) under *O. glomerata* is in fact *O. diademata*.

***O. andicola*** Pfeiffer, Enumeratio Diagnostica Cactearum: 145 (1837).

*Opuntia prostrata ramosissima*: articulis cucumeriformibus elongatis, apice attenuatis, brunneo-ventibus nitidis, tandem lignosis; areolis subconferitis setosis; aculeis 3-4 gracilibus albis subrigidis, 1-2 longioribus, albis, basi applanatis. Articuli 4-6 lin. dia. Aculei infimi 1½-2 pollicares. Foliola minuta brunnea.

"A prostrate, densely ramose opuntia; with elongated cucumber-shaped stem-segments tapering at the tip, glossy brownish green, eventually woody; areoles bristly, rather close-set, with 3-4 thin white hardly stiff spines, and 1-2 longer spines, white, flattened towards the base. Stem-segments 8-12 mm thick. The lowest spines 3¼-5 cm long. Leaflets minute, brown."

Pfeiffer gives the source as Mendoza. Spegazzini says "not uncommon in the mountains about Mendoza", and records the flower as rotate, pale golden or lemon yellow (Cact. Plat. Tent.: 512). Hauman (op.c.: 291) records *andicola* in the Tupungato valley, the flower 5 cm long overall, 3¼ cm across, the robust style 16 mm long with longitudinal furrows.

Illus.: Hauman in Anal. Soc. cient. Arg., 86:t. 16 (1918), a habitat photograph showing the dense mound-like formation of the plant; Dodds in Jour. Cact. Succ. Soc. Amer. 6: 104 (1935), habitat again, Mendoza (with a note that the flowers are a delicate lemon and the spines flattened and twisted: "At the tip they grade through a beautiful gray into black...grows in decomposed granite... the spaces between the joints are filled with fine sand, leaf mould, and constitute a favorite place for ants." To us this plant appears very like some forms of *O. glomerata* Haw.); Backeberg, Die Cact., 1:289, 290, fig. 252 (left) (1958); all photographs.

Syn. *O. andicola* Hort. Angl. sec. Pfeiff., l.c.

*O. horizontalis* Gill., sec. Pfeiff. ibid., nom. nud.

*O. andicola* Hort. Angl. (var.) *crassior* S.-D., Cact. Hort. Dyck, ed. 1:39 (1841) nom. nud.

*Tephrocactus andicolus* Lem., Les Cactées: 88 (1868). (Schumann notes that since "andicola"—"Andes dweller"—is a substantive "Tephrocactus andicola" would be correct.)

*T. glomeratus* (Haw.) Backeb. var. *andicola* (Pfeiff.) Backeb. in Cactus (Paris), 8:249 (1953) sec. Backeb., Die Cact., 1:282. Vars. *elongata* Lem. and *major* Lem. (q.v.) are also referred here in Die Cact., ut sup.

*O. wetmorei* Br. et R. The Cact., 4:255 (1923) sec. Backeb., Die Cact., ut sup.

Lemaire describes the following three varieties under *O. andicola* Hort. Angl. We accept Pfeiffer's indication that this was the same as his species.

***O. andicola*** (var.) ***elongata*** Lemaire, Cactearum Genera Nova: 72 (1839).

Articulis elongatioribus (aliquando 5 poll, longi); aculeis minoribus, minusque albis et nitidis.

"Stem-segments more elongated, sometimes (ca.) 12 cm long, spines smaller, less white and less shiny."

***O. andicola*** (var.) ***fulvispina*** Lemaire, ibid.

Articulis brevioribus, subovatis; aculeis subpollicaribus, rigidioribus, pallide fulvis: planta distincta; an species propria? an *O. glomerata* Haw.?

"Stem-segments shorter, subovoid, spines hardly 2½ cm long, stiffer, pale tawny yellow; a distinct plant; a separate species? or *O. glomerata* Haw.?"

Syn. *T. glomeratus* (Haw.) Backeb. var. *fulvispinus* (Lem.) Backeb., Die Cact., 1:283 (1958).

(*O. glomerata* (var.) *fulvispina* S.-D., Cact. Hort. Dyck, ed. 1:40 (1841) nom. nud. is doubtful because the author, after equating this here with Lemaire's *andicola* (var.) *fulvispina*, subsequently treated the latter as = *O. longispina* Haw. in Cact. Hort. Dyck, ed. 1 Add.: 43 (1845)).

***O. andicola*** (var.) ***major*** Lemaire, ibid.

Articulis duplo crassioribus; aculeis longioribus, robustioribus, colore corneo.

"Stem-segments twice as thick; spines longer, stronger, horn-coloured."

The main features of Pfeiffer's description are readily recognisable; and *andicola*-like material seems to be comparatively well represented in collections, with many small variations in size and in spine colour, section, length and angle. Because of this close variability the significance of Pfeiffer's bare reference to the "lowest" spines cannot be determined, but neither can it be of such great importance: evidently some comparison amongst the principal spines is intended, and the observation gives a general estimate of their length. The subsidiary spines, in our experience, are seldom more than 1 cm long and usually less. Though often irregularly situated they tend to arise from the lower margin of the areole and may be appressed, especially on weak growth. It may be noted that "cucumber-shaped" elsewhere, as applied to stem-segments of a plant which is compared with *andicola* (*O. monticola* q.v.—cf. also *O. retrospinosa* and *O. parmentieri*), is connected with a length-to-breadth ratio of 4:1; and the same comparison suggests that habitat *andicola* might exceed what we usually know in size of stem-segment. The elongated stem-segments described of the species are perhaps less common than forms such as those indicated by Lemaire in his two latter varieties. As Lemaire recognised, such forms approach *O. glomerata* Haw.; and we have already noted Backeberg's treatment of *andicola* within his *T. glomeratus*. Hauman's illustration suggests that the principal spines are seldom developed to their full breadth in cultivation and poor weakly specimens may be quite unrecognisable owing to excessive development of the subsidiary spines and complete

lack of principal spines. Indeed, Lemaire's description of the smaller and duller spined var. *elongata* might be taken to be simply a record of poor growth; but we have material which suggests that there is in fact a strain which will elongate to a grotesque degree in cultivation. It has a soft decumbent habit (*O. horizontalis*?) and a rapid growth.

Collected material recently reaching this country as Backeberg's variety *fulvispinus* has the rather dumpy stem-segments envisaged by Lemaire and the 2-3 main spines at the upper areoles are stiff, swept well back, rounded in section though a little flattened near the areole, bright red-brown at the tip, shading off gradually to horn-yellow near the areole and up to 6 cm long. This spine-length might suggest Lemaire's variety major but the diameter of the stem-segments is only 2½ cm at most. Lower, older spines have no colour left.

Schumann refers in passing to an *O. andicola* Pfeiff. var. *minor* Hort. (Monat. f. Kakt., 10:48). There is also a reference in Berger, Kakteen: 54 and in Borg, Cacti, ed. 2: 119, to an *O. andicola minor* Hildm. of which we have not seen the original description. The specimen referred to in more detail by Leighton-Boyce in 1965 under this name (Cact. & Succ. Jour. Gr. Br., 27:72) does not correspond with any of Lemaire's varieties and is distinctly smaller growing than the species. The particular specimen came from G. G. Fuge of Bristol, and the plant is widely grown in collections in this country. Backeberg equates *andicola minor* Hildm. with his unsatisfactory *T. glomeratus* var. *gracilior* (cf. *O. platycantha* var. *gracilior* below).

Another very similar miniature version has circulated in this country to our knowledge from around 1951 (and probably much earlier) which differs in that, viewed from above, the thin flat main spines (white again with a reddish tinge) instead of springing straight out from the stem show a persistent anticlockwise bend. This also seems to belong here, although commonly labelled "russellii".

Backeberg's identification of *O. wetmorei* Br. et R. with *O. andicola* would seem possibly an oversimplification, since Britton and Rose (l.c.) describe *O. wetmorei* as having a more complex spine-formation with 3-4 larger flattened spines. However, the two would seem to be close, and it may be that *wetmorei* is only a more heavily spined variety of *andicola*.

A misleading synonym (*O. papyracantha* Hort. non Phil., Gesamt. Kakt., ed. 1:694) may account for an engraving of an "O. andicola" in Schelle, Handb.: 45 (1907) which shows a diademata-like plant irreconcilable with Pfeiffer. This might perhaps have influenced Britton and Rose in their relegation of *andicola* to synonymy under their *glomerata*. Britton and Rose accept another misnamed illustration of "andicola" (Cact. Jour., 1:100) in The Cact., 1:90; this in fact represents *O. phyllacantha* (q.v.).

The herbarium and type specimens from Pfeiffer mentioned by Stafleu, Tax. Lit.: 356, appear to be confined to a collection of mosses relating to Pfeiffer's "Flora von Niederhessen und Münden" (1847-55). A classified list of the contents of this collection is given by Laubinger in Abhandl. u. Ber. Ver. Naturk. zu Cassel, 49:81-102 (1905).

**O. darwinii** Henslow in Magazine of Zoology and Botany, 1:466 (1836-7).

Prostrata, articulis globoso-ovatis, aculearum validioribus elongatis, tricuspidatis (sic), floribus magnis solitariis.

"Prostrate, with globose-ovoid stem-segments, the stouter spines elongate, tricuspidate, flowers large, solitary.

"The terminal articulation (the only one seen) globoso-ovate, with distant areolae beset with short tomentum, and those towards the anterior extremity with 4 to 6 stiff spines of various lengths, of which the stoutest are 1½ in (3¾) long, evidently formed out of 3 combined, and whose points are free, so that the compound spine appears compressed and tricuspidate. They mostly point forward, but some spread in all directions. Flowers solitary, larger than the articulations which they terminate, yellow. Perianth of 6 whorls, each of 5 parts, gradually passing from the form of small fleshy bracteal scales to membranous petaloid segments; spirally arranged at somewhat more than the fifth of a circle asunder, so as to form 5 distinct secondary spirals, corresponding to as many, formed by the areolae on the fleshy tube investing and surmounting the ovarium. These areolae are placed upon slight tubercular elevations, each bearing a small fleshy bracteal scale, in whose axil is a tuft of yellow tomentum, and those on the upper extremity are also furnished with about half a dozen stiff acicular spines. The segments of the perianth pass gradually from the ovate-apiculate bracteal form of those in the outermost whorl to the cuneato-obcordate, and slightly mucronate petaloid form of those in the innermost. Stamens numerous, covering the inner parties of the fleshy tube. Style remarkably stout, cylindrical, with 9 thick radiating stigmata reaching above the fleshy tube, and a little beyond the uppermost stamens. Ovarium, a small cell, the width of the style, surrounded by the very thick fleshy walls of the lower part of (the) tube or floral receptacle.

"The specimen figured was gathered at Port Desire. lat. 47° S . . . (Darwin) recollects also to have seen the same plant . . . as far south as Port St. Julian in lat. 49° S. It is a small species growing close to the ground on arid gravelly plains . . . The climate is remarkably dry and clear, hot in summer, but with sharp frosts during the winter nights."

Illus.: Henslow, op.c.: t. 14, an engraving, said to be life-size (op.c.: 468), from a drawing of the type specimen. It shows a stem-segment with rather large close areoles and spines up to 7 (4 main spines and 3 reflexed bristles). The most remarkable feature of the description—the tricuspidate spines—can just be confirmed from the engraving: the larger spines taper rather suddenly and divide at this stage into 3 separate fine points. The feature does not appear in herbarium material seen or in the further illustrations: Britton and Rose, The Cact., 1:94 (1919), drawing; Hosseus, Not. sobre Cact. Arg.: t. 6, 7 (1939), the former poorly reproduced in Die Cact. 1:282; Backeberg in Des. Pl. Life 22:19 (1950) poorly reproduced in Die Cact. 1:283, photographs.

Syn. *Tephrocactus darwinii* (Hensl.) Backeb., Kaktus-ABC: 113 (1935).

Spegazzini notes: "Young spines are all undivided: only in age do they become more or less (and not always) trifid" (Revista Fac. Agron. Un. nac. La Plata, 3: 604). The species, he says, is "common between R. Sta. Cruz and R. Negro" (Cact. Plat, Tent.: 512).

Schumann (Gesamt. Kakt., ed. 1: 695) evidently saw larger material and quotes stem-segments up to 4 cm thick with spines  $4\frac{1}{2}$ —5 cm long. The spine/stem-segment proportion is preserved. His description agrees generally with that of Henslow, and he adds that the stem-segments are "hardly tuberculate", olive-green; the areole-wool is yellow; and the flower 5-5 $\frac{1}{2}$  cm long with "dentate" mucronate perianth-segments 3 cm long. However, he describes the spines as "acicular". In his own separate English "Keys of the Monograph of Cactaceae" (1903) he qualifies this as follows: "Spines very stout, 4-5 cm long, somewhat compressed, yellow—58. *O. darwinii* Hensl." He concludes the entry in Gesamt. Kakt. with a note: "Spegazzini has recently confirmed my opinion, that the triple-pointedness of the spines is not an essential character. It only arises through the spines unravelling out in old age." This suggests something like the tatty effect of broken sheaths on some North American cylindrical opuntias which can splinter when old. It must be remembered, however, that the segment seen by Henslow was a terminal one, not necessarily so very old.

Britton and Rose find occasional smaller growth. The spine/stem-segment proportion is still preserved, but they find fewer spines than in the previous descriptions and for the first time these are explicitly stated to be flat. They describe *darwinii* as "much branched . . . from a more or less woody root . . . globular, ca. 3 cm thick, or often nearly cylindrical, frequently numerous and small . . . then only 5-10 mm thick . . . spines 1-3 . . . the largest 3-3 $\frac{1}{2}$  cm, yellow or reddish-yellow, decidedly flattened. Flowers . . . said to be as large as the joints, but often much smaller." Of Henslow's drawing they say, "The illustration of the flower seems too large, but otherwise represents fairly well the plant as we know it." (The Cact., 1: 93). They consider the nearest species to be *O. wetmorei*; and place *O. darwinii* among their Pentlandianae. Backeberg (whose description in "Die Cactaceae" is practically the same as that of Britton and Rose) places it in his sub-series Platyacanthi.

In view of the remarkable description of the spines we were anxious to consult the type specimen, but this has not been possible. It is neither at the Kew Herbarium nor the herbarium of the Botany Department, British Museum (Natural History); nor were we able to find it at Cambridge, though the type specimen of *O. galapageia* Hensl. is in the keeping of the Botany School. There are two pieces of *darwinii* of more recent collection in the Kew Herbarium which may be of distinct variants. One (Donat no. 129 (1928)) is very similar to that illustrated in The Cact. ut sup. It has 2-5 spines, slightly flattened or almost rhomboid in section, with 1-2 additional bristles, and the flower is 4 cm long, quite comparable with the stem-segment in size. The other (Un. Calif., no. 23808) is altogether slightly larger, and lacks the "stiff acicular spines" on the areoles of the flower tube, having merely fine bristles. We are indebted to Mr. D. Hunt for this observation. Yet another piece, again of Donat 129, in the Botany Department, British Museum (Natural History), has

up to 7 main spines several of them decidedly flattened, in addition to the bristles, and the flower is 4 $\frac{1}{2}$  cm long. None of this material has tricuspidate spines or sudden tapering of the spines as seen in Henslow's drawing; nor the miniature growth described by Britton and Rose.

It was, of course, the same Rev. John Stephen Henslow of Cambridge who influenced Darwin's career in many ways besides suggesting him for the post on H.M.S. Beagle, which took him to Patagonia and later to the Galapagos Islands to make the observations which had so profound an effect on his subsequent work. But he did not overlook his own contribution in this minor field in his later writing. "I found here a species of cactus, described by Professor Henslow, under the name of *Opuntia Darwinii* . . . which was remarkable by the irritability of the stamens, when I inserted either a piece of stick or the end of my finger in the flower. The segments of the perianth also closed on the pistil, but more slowly than the stamens. Plants of this family, generally considered as tropical, occur in North America . . . in the same high latitude as here, namely, in both cases, in 47°—Charles Darwin on the coast of Patagonia (in "The Voyage of the Beagle").

The same irritability of stamens had, however, been described earlier on *O. tuna* by Dr. J. E. Smith, President of the Linnaean Society, in 1798.

Professor R. Good ("The Geography of the Flowering Plants", ed. 2, (1953)), who mentions "*Opuntia* (from 50° North)" as one of "about 80" genera found throughout America from North to South (p. 88), takes the trouble to name *O. darwinii* as among the outstanding species of the Patagonian region (p. 203).

We have had three different forms of plant under this name, and both Innes and Lamb have experience of more than one version from different sources. None of our material is sufficiently long established to essay a positive identification, though most of it is plausible. Some *andicola*-like material also circulates under the name.

***O. russellii*** Britton et Rose, The Cactaceae, 1: 94-5 (1919).

We include this species here, although it is of relatively recent description, because its identity is closely involved with *O. glomerata* Haw. and *O. andicola* Pfeiff. and because we have come across many cactus enthusiasts to whom it seems the most familiar name of all the Tephrocacti, although clearly it is misapplied in many cases.

"Forming small, compact clumps 1-2 dm in diameter; joints small, globular to obovoid, dull green to more or less purplish, 2-4 cm long, very spiny near the top" (—not "at the top" as Borg says—); "leaves minute, acute, soon falling; prominent spines 3-6, yellow, 2-3 cm long, slightly flattened, accessory spines 1-several, 1 cm long or less; glochids at first inconspicuous but in time very abundant, sometimes 2 cm (sic) long, somewhat persistent; flowers not known; fruit globular, 2-2 $\frac{1}{2}$  cm in diameter, spineless; seeds pale, 4 mm broad."

Collected by Rose and Russell, dry hills, Potrerillos, Mendoza, no. 21002 (1915).

“Obovoid” stem-segments are unexpected here. The accompanying illustration shows ellipsoid segments; possibly “ovoid” is intended. Backeberg reads “2mm” for “2cm” in the description of the glochids.

Illus.: Britton and Rose, l.c., drawing, reproduced enlarged to life-size in *Die Cact.*, 1: 291; ? Backeberg, *Die Cact.*, 1: 290 and 292, figs. 252 (right) and 256 (1958), photographs.

Syn. *Tephrocactus russellii* (Br. et R.) Backeb. in *Cactus* (Paris) 8: 249 (1953) sec. Backeb., *Die Cact.*, 1: 286.

The material commonly listed in this country as “russellii” includes many slight variants, but conforms fairly closely to a characteristic fades with longish conical-ovoid stem-segments, 1-3 or 4 hair-like subsidiary spines, often bent or appressed, and 1-2 (occasionally 3) narrow, flat, usually whitish principal spines (see e.g. Neale’s Photo. Ref. Pl. (1949), no. 71a; though here the principal spines are rather few). This material agrees broadly with *O. russellii* Br. et R. in having stem-segments of the right size and colouring with diverse spines. However, when the details of spine number and colour are considered together with the shape of the stem-segments, it is found, on the whole, to approach more closely to *O. andicola* Pfeiff.; while specimens with particularly small stem-segments and proportionally long single spines agree best with *O. glomerata* Haw. Variants with yellowish-tinted spines could be met by *O. andicola* var. *fulvispina*. The discrepancies with *O. russellii* as described are too constant, and found upon too many apparently well-grown plants, to be fortuitous or due simply to loss of character under cultivation; and it must be remembered that *O. andicola* and *O. glomerata* were both obliterated under synonymy by Britton and Rose at the same time as the appearance of *O. russellii*, so that neither would be available as an alternative to anyone who followed the classification of “The Cactaceae” at this point. As much of the material in this country has been grown on by cuttings from cuttings from imports long before 1919 it would seem likely to be within *andicola*, which was widely grown in collections at the turn of the century.

A small amount of listed “russellii” (which appears to be the same as what B. Fearn of Sheffield more cautiously let us have as “spec. nov.” some years ago) is almost certainly distinct from the above *andicola*-like material. The (usually 2-4) divergent spines appear to be all alike strictly straight and porrect but irregularly unequal in size: the smallest may be mere bristles, while the larger are stoutish, flattened and decidedly yellow to the base. This material would seem to approach more closely than the former to *O. russellii* Br. et R. and in some ways it recalls Backeberg’s fig. 256 ut sup., but specimens have not yet been found well enough developed to afford good comparison. At present the low number of spines presents the same difficulty as before. Thus, surprisingly, it would seem that *O. russellii* is still doubtfully represented in cultivation.

Like other forms near here, *O. russellii* is probably variable; and indeed the extent to which any of the various entities in the *glomerata-andicola-russellii-wetmorei* area are truly distinct is still far from clear. It seems that only further field work can settle the question. As to another view, that *russellii* may lie nearer *ovata*, see thereunder.

According to the statement by Britton and Rose in their Introduction (*The Cact.*, 1: 7) the type specimen of *O. russellii* should be found either in the herbarium of the New York Botanical Garden or in that of the United States National Museum.

**O. platyacantha** Pfeiffer in *Allgemeine Gartenzeitung*, 5: 371 (1837).

As the name “*O. platyacantha*” appears so frequently, it may be helpful if we note that three references given here seem to us to be more likely than the others to relate to currently available material: *O. platyacantha* Pfeiff.; *O. platyacantha* var. *deflexispina* S.-D.; and *O. platyacantha* sensu K. Sch. There seems no reason to doubt that the first of these gives the correct citation of authority for the specific name; but Schumann published his revision of the species under the citation “*O. platyacantha* Salm-Dyck”, and this additional, incorrect version of the specific name has gained wide currency (cf. Spegazzini and Sanzin below) accompanied by varying degrees of agreement with the particular features of Schumann’s revised description. The three forms can indeed be distinguished, and if this course is adopted then Schumann’s plant according to its recent classification (Rowley, 1958) should be called *O. platyacantha* var. *neoplatyacantha*. It seems to us however that the possibility should be considered that the three represent only fairly well-marked stages in the development to maturity in cultivation of a variable species, var. *deflexispina* being accounted the most juvenile in this view. We also know some *platyacantha* material, apparently less commonly found, which does not altogether correspond with any of these three forms as we understand them. We refer to this later.

The original diagnosis of the species from Pfeiffer is as follows:

*Opuntia humilis ramosa, ramis divaricatis cylindricis, parum tuberculatis, nitide brunneis, areolis magnis immersis, tomento setaceo fulvescente aculeisque diversiformibus instructis; aculeis infimis 3-4 gracilibus albis adpressis, superioribus 2-3 longioribus arundinaceis griseis.*

“A low ramose opuntia, the branches divergent, cylindrical, hardly tuberculate, glossy brown, with large sunken areoles equipped with bristly tawny wool and diversely formed spines; the lowest spines 3-4, thin, white, appressed, the upper 2-3 longer, reed-like, greyish.”

The phrase “diversely formed spines” refers to true spines exclusive of glochids. In his discussion Pfeiffer describes the stem-segments as  $2\frac{1}{2}$ - $7\frac{1}{2}$  cm long and 16-20 mm thick (1-3 Zoll., 8-10 lin.), the thin spines as 6-8 mm long (3-4 lin.), and the reed-like spines as  $1\frac{1}{2}$ - $2\frac{1}{2}$  cm long ( $\frac{1}{2}$ -1 Zoll.). Salm-Dyck later adds: “The species itself is very strong, and the reed-like spines are very thick and of a greyish straw-colour” (*Cact. Hort. Dyck.*, ed. 2: 245).

Pfeiffer gives the source as Chile, and *O. platyacantha* Pfeiff. is also recorded there in *Fl. Chil.*, 3: 30. Sanzin (in *Revista Chil. Hist. nat.*, 25: 116 (1921/1923)), referring to *O. platyacantha* S.-D., gives the distribution as Chile and Patagonia, and Spegazzini



reports *O. platyacantha* S.-D. as common between the rivers Chubut and Colorado (Cact. Plat. Tent.: 511).

Illus.: Sanzin, l.c., a drawing, to which we refer later; Backeberg, *Die Cact.*, 1:285, fig. 244 (1958), photograph; Rowley in *Nat. Cact. & Succ. Jour.*, 13:6 (1958), photograph. (Not Lamb, Pocket Encyclopaedia of Cacti: t. 141 (1969)—see under *O. diademata*).

Syn. *O. platyacantha* Hort. Dyck ex Pfeiff., l.c.

*O. platyacantha* Pfeiff., Lem. (sic) (var.) *albispina* S.-D., Cact. Hort. Dyck., ed. 1:40 (1841), nom. nud.

? *O. platyacantha* Pfeiff. (var.) *deflexispina* S.-D., Cact. Hort. Dyck., ed. 2:245 (1850).

*O. platyacantha* Nichols., Illus. Dict. Gard., 2:503 (1885-6) quoad descr. tant. excl. tab. (= *O. phyllacantha* Hge. et Schm. ex Regel.).

? *O. platyacantha* S.-D. ex K. Sch., Gesamt. Kakt., ed. 1:693 (1899). (*O. platyacantha* sensu K. Sch.)

? *O. hickenii* sensu Speg. in *Anal. Soc. cient. Arg.*, 99:101 (1925).

? *Tephrocactus hickenii* sensu Speg. in *Revista Arg. Bot.*, 1:216 (1926).

*T. platyacanthus* sensu Backeb., *Die Cact.*, 1:270 (1958).

Non *O. platyacantha* Hort. Angl. sensu Pfeiff. = (q.v.) *Cereus syringacanthus* Pfeiff., Enum.: 103, et (q.v.) *O. tuberosa* (var.) *spinosa* Pfeiff., Enum.: 146 (1837) sec. Pfeiff. in *Allg. Gartenz.* ut sup.

Britton and Rose relegate *O. platyacantha* to synonymy under their composite *O. glomerata*, l.c.

***O. platyacantha*** sensu Lemaire, *Cactearum Genera Nova*: 63, 72 (1839).

Syn. *O. platyacantha* Hort. Angl. sensu Lem., op.c.: 72.

= *O. platyacantha* Pfeiff. (var.) *monvillii* S.-D. sec. S.-D., Cact. Hort. Dyck., ed. 2:71, 245 (1850).

*Tephrocactus platyacanthus* sensu Lem., *Les Cactées*: 88 (1868).

This variant, published two years after Pfeiffer's description of the species, is said to be strongly tuberculate and darker-spined. It evidently belongs within *platyacantha* but we cannot place it exactly, and we postpone the quotation of Lemaire's description until the end. If the form is to be recognised as distinct there is at present no valid alternative under *Opuntia* to Salm-Dyck's synonym of 1850 above. Backeberg has a photograph in *Die Cact.*, 1:287 which is said to represent Salm-Dyck's plant.

Salm-Dyck describes three varieties under *O. platyacantha* Pfeiff.

***O. platyacantha*** (var.) *monvillii* Salm-Dyck, *Cactae in Horto Dyckensi*, ed. 2:245 (1850). (The varietal epithet is often misquoted as "monvillei").

Paulum *gracilior*, aculeisque arundinaceis angustioribus, brunneis.

"A little thinner, and with the reed-like spines narrower, brown."

Syn. *O. platyacantha* sensu Lem., Cact. Gen. Nov. ut sup., sec. S.-D., l.c.

***O. platyacantha*** (var.) *gracilior* Salm-Dyck, *ibid.*, nom. illegit.

Articulis angustioribus magis extensis, aculeisque arundinaceis *gracilioribus*, albis.

"With narrower, more extended stem-segments, and with the reed-like spines thinner, white."

Syn. *O. tuberosa* Pfeiff. (var.) *spiniosior* (sic) Pfeiff., Enum.: 146 (1837) sec. S.-D., Cact. Hort. Dyck., ed. 1 Adds.: 43 (1845) et op.c.: 71.

Backeberg's *T. glomeratus* var. *gracilior*, which is based here, (and which is in itself subject to contradictory treatment: cf. *Die Cact.*, 1:273, text, and 283, synonymy) must be regarded as incorrectly founded in view of the illegitimacy of the above name. The identity of Salm-Dyck's plant is obscure; it may have belonged in the *andicola/glomerata* relationship as Backeberg thought.

***O. platyacantha*** (var.) *deflexispina* Salm-Dyck, *ibid.*

Minor, aculeisque arundinaceis *deflexis*, caule adpressis, spurco-albidis.

"Smaller, and with the reed-like spines deflexed, appressed to the stem, dirty whitish."

Syn. *O. pelaguensis* Hort. Angl. sec. S.-D., op. c.: 71, 245, nom, nud.

A report by M. E. Shields on the flowering of a plant stated to be *O. platyacantha* var. *deflexispina* in a small glasshouse in Christchurch, New Zealand has the photograph of the event unfortunately reproduced too small for confident identification. The vivid description is "The yellow blossom shades to gold at the tip, while each petal ends with a little twist where the gold deepens in colour. Pale yellow stamens graduate down the throat leaving a clear passage for the thick cream style, which breaks into seven pale green stigma lobes, all standing erect like little fat fingers pointing upwards. When fully expanded the flower measures 3 inches across. The ovary or seed pod is decorated with many fine ribbons, quite soft, though needle sharp." (*Cactus and Succulent Journal of America*, 32:104-8 (1960)). The plant is said to have large, plump, shiny green tubercles and broad, flat, cream spines "all 'bent down', so it is quite true to its name . . . spines . . . beautiful, shining like polished bone . . . with deeper coloured wavy transverse corrugations." This sounds rather more like Schumann's description, which we give next.

***O. platyacantha*** Salm-Dyck ex K. Schumann. Gesamtbeschreibung der Kakteen, ed. 1:693 (1899). (*O. platyacantha* sensu K. Schumann.)

Schumann's citation of Salm-Dyck as his authority might give the impression that he is referring here to an early alternative version of the species but this is in fact a revision based upon the publication by Pfeiffer which we have already considered. At the

same time Schumann evidently saw larger and stronger material than that available to Pfeiffer, and in Backeberg's view the new description defines a distinct variety (see synonymy below). So far as we can establish, the only reason for considering the possibility of Salm-Dyck's authority lies in the presence of Pfeiffer's synonym *O. platyacantha* Hort. Dyck. in the original publication. This however can indicate no more than the immediate provenance of the type material. Salm-Dyck himself is clear throughout that Pfeiffer is to be considered the author of the species. Schumann's description is quoted at length in *Die Cact.*, 1: 275; the salient points are as follows:

"Shrubby, densely ramifying . . . Stem-segments ellipsoid, somewhat club-shaped or globular, 4-5 cm in greatest diameter, leaf-green . . . often red-coloured below the areoles, tuberculate . . . Areoles up to 6 mm across, with yellowish wool . . . Glochids at first hidden . . . later up to 5 mm long, dirty yellow. Spines 2-4, the laterals very flat . . . roe-brown . . . diagonally striped, up to 6 cm long; the middle spine sharply 3-edged, somewhat shorter, yet stiffer and often strongly twisted; sometimes 1-2 reflexed subsidiary spines."

Schumann qualifies the colour in his Key (op.c.: 690), placing *platyacantha* and *andicola* together under "stem-segments brownish green to brown, particularly at the top". Spegazzini (*Cact. Plat. Tent.*: ut sup.) describes *O. platyacantha* S.-D. as forming dense caespitose cushions; the spines are said to be often only 3, "2 lateral, another below", and the flower "golden yellow". He later supplements this reference by more speculative treatment to which we will return.

Illus.: Ginns, "Cacti and other Succulents": 72 (1963), photograph.

Syn. *O. platyacantha* S.-D. in Pfeiff., *Allg. Gartenz.* ut sup., sec. K. Sch. l.c.

*Tephrocactus platyacanthus* (S.-D.) Lem. var. *neoplatyacanthus* Backeb., *Descr. Cact. Nov.*: 8 (1956).

*O. platyacantha* Pfeiff. var. *neoplatyacantha* (Backeb.) Rowl., *Reun.*: 6 (1958).

Backeberg distinguishes yet another variety, *angustispinus* Backeb., under his *T. platyacanthus* (*Die Cact.*, 1: 271) which, from the photograph, op.c.: 286, gives much the impression of a narrow-spined version of Schumann's plant.

Spegazzini returns to the subject of *O. platyacantha* in *Anal. Soc. cient. Arg.*, 99: 101 (1925) and again in *Revista Arg. Bot.*, 1: 216 (1926) in both cases with reference to *O. hickenii* Br. et R. (1919). In the first he identifies his *O. platyacantha* of *Cact. Plat. Tent.* with *O. hickenii*, accepting the synonym *O. platyacantha* sensu Speg. (nom. subnud.) non S.-D. which W. B. Alexander had already suggested as a synonym of *O. hickenii* in *The Cact.*, 4: 255 and which Backeberg quotes in *Die Cact.*, 1: 270. In the second he modifies his position, describing in great detail, under the heading of *Tephrocactus hickenii*. "beautiful specimens" of material "frequent in the ravines of the plateau of Talagapa" (Patagonia) which, he says, make him suspect that *O. hickenii* is not a new species, as Rose claimed, but that Rose there "treats of the genuine *O. platyacantha*

S.-D. (*non* Auct!) as I designated this in 'Cactearum Platensium Tentamen' in accordance with the indications of Dr. Weber". It would seem in fact quite possible that Spegazzini is here considering a form within or at least very near *platyacantha*, though we would not suggest that this accounts for the whole of *hickenii* which, on the basis of material which we possess from two sources, we incline to believe exists in its own right. It is evident that at this date Spegazzini has doubts over the status of the name *O. platyacantha* following upon the synonymy of Britton and Rose, and his decision to place the present material with *hickenii* may be understood as an attempt to hold it within the framework of their classification. At the same time his reference to "genuine" *platyacantha* which for Britton and Rose would not be separable, foreshadows problems of priority in his reading of *hickenii* which he left unresolved. It would be rash to attempt a more positive identification of the present material, but we give an abstract of the description, with particular reference to the detailed and interesting account of the fruit, as a pointer to further enquiry on the *platyacantha* borders. (See "Postscript", p. 98).

As in *Cact. Plat. Tent.*, the spines are noted as generally three, of which the upper is here the larger. They are mostly on the upper areoles, about the same length as the stem-segments, and rather rigid: "well flattened but not papery". Schumann's description of the spines of *platyacantha* is commended as particularly applicable in the matter of the "many faint transverse lines" which occupy intermediate bands alternating with a faint central groove and marginal borders "rather more clearly of a uniform tint". The 5-6 cm long cylindrical-elliptic stem-segments are "bright leaf-green . . . with 12-16 teeth or decurrent protuberances each crowned by a more or less horizontal areole"—clearly a case where the tubercles are strongly up-tilted; more strongly it would seem than is usual, in our experience, upon those forms of *platyacantha* where tubercles are well in evidence. Spegazzini regrets that he received no flowers, only fruits. These are described as cylindrical-elliptic, obscurely 5- or 6-sided, slightly wedge-shaped below and truncate-concave above, with 10-15 small spineless areoles bearing yellowish glochids, the thick walls at first green, fleshy but firm, in maturity yellowish and cardboard-like, the obovate internal cavity "crammed" with 15-25 seeds between which there is "very scanty colourless gum derived from alteration of the funiculi"; the seeds "in general very deformed by mutual pressure, typically lenticular (5-6 mm in diam., 1½-2 mm thick), rounded but rather sharp at the edges, without any vestige of a wing, white, glabrous, smooth, hard, almost bony, with a relatively thin testa."

The drawing of an evidently different plant reproduced in *Die Cact.*, 1: 284 as *T. hickenii* (Br. et R.) Speg. is the one made by Vaupel to illustrate *O. hickenii* in 1925 (*Zeitschr. f. SukkKde.*, 2: 143) and we do not know what Spegazzini may have thought of it.

The general picture of *O. platyacantha* as a tough, smooth to glossy brown or green form, often more straggly and decumbent and larger-segmented than *O. andicola* but with the same tendency to woody growth in age, is well established; but it seems less clear that there is a sufficient basis for the distinction of the varieties described above. Among various approximations we have had material corresponding

well to the Pfeiffer and Schumann descriptions from several sources (of which the strongest growing came from R. Ginns of Desborough) and we have been impressed by the extent to which one form will grow into another. The characteristic growth of the "small" brown material which we take to represent *O. platyacantha* sensu Pfeiff. may develop only when the plant has reached a certain size, and we connect this with Pfeiffer's own remark on "full development" mentioned later. On a small specimen the areoles may be abnormally close, and the spines narrow and closely appressed to the stem, and we have known the onset of the more mature growth on specimens of this kind to alter the plant's appearance radically in a surprisingly short time. This suggests the possibility that var. *deflexispina*—which Borg mentions as "the form commonly grown"—is only a juvenile form of *O. platyacantha* sensu Pfeiff., and we are rather inclined to think this may be so. The further relation between *O. platyacantha* sensu Pfeiff. and the "big" green material (some of which agrees very closely with Schumann) may perhaps be analogous. So far as we know the species has not been described as brown in habitat, and Sanzin (l.c.) in fact says "green" in a brief key. Thus although it is possible that Pfeiffer's "glossy brown" colouring—which indeed can be widely confirmed in collections—is a character which has so far passed unreported in the field, it is more likely that this is an instance of the tendency widespread among plants of the *O. glomerata* group for their common traces of reddish, purplish or brownish tinting to become intensified in cultivation. We have found elsewhere in the group that this intensified colouring tends to be associated with underdeveloped growth, and we think the association is borne out here; for the brown *platyacantha*, though a tolerant plant which can easily be cultivated without obvious signs of arrested development once it is well established, is nevertheless consistently smaller than the green form in our experience. From the opposite angle, we have found that under exposed conditions, or on growth from cuttings, the green form may darken considerably even becoming brown; and the new growth can assume a character much the same as that of *O. platyacantha* sensu Pfeiff. The circumstances are not conclusive, but they suggest (as indeed does Schumann's inclusive treatment) that there is a closer connection between the two main sorts of *platyacantha* than might at first be supposed; and the question arises whether *O. platyacantha* sensu K. Sch. might be one form of the mature plant, of which Pfeiffer's description represents either an interim "adolescent" stage or perhaps an essentially cultivated form. The green material differs from the brown in being characteristically more strongly tuberculate, as Schumann describes. However, it would be too hasty to assume that prominence of tubercles as such is the habitat character. Sanzin shows a practically smooth stem-segment which incidentally, though the spines are shown at right angles to the stem giving the plant an unusual appearance for the species, is very like some we have seen in cultivation. It would be useful to have further observations from the field, both upon the development of the tubercles and the question of colour, (p. 98).

We have noted a stem-segment 5 cm long with a diameter of 2½ cm as fairly common on the "big" green sort, about half those dimensions on the "small" brown, and even less on var. *deflexispina*, but apart from these three forms, as we said earlier,

there is another form to be accounted for here. This is a race with hardly tuberculate, rounded segments above 2 cm thick, just about as long as they are thick, and is perhaps more particularly what Backeberg considered to be his var. *neoplatyacanthus*. It is very closely caespitose in growth-habit. These measurements are taken from non-grafted plants—see note on cultivation.

We now come to Lemaire's *O. platyacantha*, mentioned earlier in brief, which we think must be quoted for completeness of the record.

Diagn. Articulato-caespitosa, intense nitideque violascenti-virens; articulis ovatis, apice attenuatis, crasse tuberculatis; areolis rotundatis; tomento brevissimo, fulvo; aculeis biformibus; aliis penicillatim collectis, parum perspicuis, brevissimis, aliis multo longioribus, divaricantibus, applanato-foliaceis, dejectis; superis duobus quatuorve latioribus, quorum tribus saepe in tridentem dispositis.

Articuli elongato-ovati, ad apicem attenuati, crasse tuberculati, sesquipollicares (ferem pollice uno lati in diamet.); tuberculi prominentes, crassi et latissimi; foliolae minutissimae, fere imperspicuae, sub articulorum gemmantium areolis sitae, crassiores, applanatae, caducae, aliquando desiccato-persistentes (in junioribus ramis!); areolae distantes, rotundatae, tomento brevissimo, parco, fulvo, persistentique minutae; aculei bifformes; alii penicillati, rari, in tomento dispersi, vix perspicui, in senectute numerosiores et longiores, gracillimi, fulvicantes; alii omnes multo validiores quamvis adhuc graciles, divaricati, applanati, ad imum dejecti; inter quos duo, tres aut quatuor, pollice uno aut uno cum medio longi, sensim acuati, ad basim fere una linea lati, violaceofuscescentes, nitidi, foliacei, saepe in tridentem elongatum dispositi (et tunc eorum supero et imo sicut in longitudinem coalitis); caeteri graciliores, pallidiores, ad tres, quinque et sex lineas longi.

"Diagnosis. Segmented, caespitose, deep and glossy violet-tinted green; stem-segments ovoid, tapering at the tip, stoutly tuberculate, areoles round, with very short tawny wool:—"(glochids)"—collected together in a tuft, hardly noticeable, very short;—"(spines"—divergent, flattened, leaf-like, directed downwards: 2-4 of the upper spines broader, of which 3 are often set in a trident.

"Stem-segments elongated ovoid, tapering at the tip, stoutly tuberculate, 3¾ cm long (usually 2½ cm thick); tubercles prominent, stout and very broad; leaflets very insignificant, almost unnoticeable, those situated below the areoles of the budding segments thicker, flattened, caducous, sometimes persisting when shrivelled (on the younger branches!); areoles distant, round, covered over with very short, meagre, tawny persistent wool:—"(glochids)"—brush-like, scanty, dispersed in the wool, hardly noticeable, in age more numerous and longer, very thin, of a tawny hue;—"(spines)"—all much stronger though still thin; divergent, flattened, directed downwards toward the base of the segment, among which 2-3-4 are 2½-3¾ cm long, gradually narrowing to a point, almost 2 mm wide at the base, of a dusky violet colour, shiny, leaf-like, often set in an elongated trident (and then the uppermost and lowest of them as it were joined into one length); the rest thinner, paler, up to 6-10-12 mm long."

This plant certainly seems to lie within the terms of the previous main descriptions. (The suggestion that the glochids develop slowly is characteristic.) However we would hesitate to comment on the possible relevance of the description to such living *platyacantha* as we have seen so far. Some of the characters suggest a choice, distinctive plant, yet Salm-Dyck, according to his 1841 synonym (see under *O. platyacantha* Pfeiff.) seems at first to have thought that *platyacantha* Pfeiff. and *platyacantha* Lem. were the same, and it may be rather that the form gives a measure of the range of variability within the species as a whole. Lemaire himself gives no clear indication as to how the plant should relate to the rest of *platyacantha*. He treats *O. platyacantha* Hort. Angl. as a synonym, but dissociates his plant from both the elements of *O. platyacantha* Hort. Angl. distinguished by Pfeiffer, and ignores *O. platyacantha* Pfeiff. itself altogether.

The homonym *O. platyacantha* Hort. Angl. has caused much trouble. Pfeiffer treated it as a synonym of *Cereus syringacanthus* Pfeiff. and again of *O. tuberosa* var. *spinosa* Pfeiff. in his "Enumeratio". Lemaire (l.c.) called the latter reference "a slip of the pen", but it is evident from Pfeiffer's discussion mentioned below that this was not the case, and there seems no reason to doubt Pfeiffer's conclusion that *O. platyacantha* Hort. Angl. was a name which had reference to more than one plant. *O. platyacantha* Pfeiff. itself received no mention in the "Enumeratio" but was published separately later in the same year. On these grounds Backeberg (l.c.) dismisses Pfeiffer as confused and his title to authorship of the specific name as unsatisfactory, preferring, like Schumann, to take the authority of Salm-Dyck. In fact the criticism is ill-founded, both in matter of dates and of treatment. Nearly a year supervened between the two publications, the "Enumeratio" appearing in Jan.-Feb. 1837 (Stafleu, Tax. Lit.: 357) and *O. platyacantha* Pfeiff. in the "Allgemeine Gartenzeitung" of the November following; and in the latter publication Pfeiffer made it clear that he regarded *C. syringacanthus* and *O. tuberosa* var. *spinosa* as distinct both from his own *platyacantha* and from one another, emphasizing that the distinction of his own *platyacantha* became apparent upon its

"full development". From our own experience the last statement is quite understandable. The obscure *O. tuberosa* var. *spinosa* might possibly belong near here, but *C. syringacanthus* would seem to belong with the plants of the *O. diademata* group.

The chief beauty of all the *platyacantha* varieties lies in the coloration of the spines, particularly as seen under a lens. The generally creamy brown effect on a clean, not too old spine is seen to consist of an elaborate pattern of wavy markings on both sides, on some plants running lengthways and on others more or less across the spine or in a sequence of V shapes. Only very young spines are whitish, though the coloration fades again in decay on a very old stem. The spines frequently change direction on the same plant during growth, sometimes performing a U turn and sometimes rotating about their axis in the existing direction of growth, so that a carefully nurtured plant may often appear to have been roughly handled. The movement of plants as they grow is very characteristic, but difficult to describe, which is perhaps why other authors have ignored it!

Of the more recent names appropriate to the Group we have already discussed *O. russellii* Br. et R.: accepting that *O. hypogaea* Werd. may be relegated to synonymy under *O. glomerata* Haw. and that *O. wetmorei* Br. et R. lies somewhere within *O. andicola* Pfeiff., the newer names which fall to be listed here are as follows, under year of original description. Some of these have a brief mention in the text.

- 1919. *O. hickenii* Br. et R., The Cact., 1: 93.
- 1929. *O. leoncito* Werd., Notizbl. Bot. Gart. u. Mus., 10: 752-4.
- 1937. *O. neuquensis* Borg, Cacti ed. 1: 67-8.
- 1940. *O. reicheana* Espinosa, Bol. Mus. nac. Chile ser. 2, 33: 31-6 (perhaps only a form of *leoncito*)
- 1956. *O. platyacantha* Pfeiff. var. *angustispina* (Backeb.) Row., Reun.: 6
- 1963. *T. glomeratus* (Haw.) Backeb. var. *atrato-spinus* Backeb., Descr. Cact. Nov. 3: 14.  
*T. glomeratus* (Haw.) Backeb. var. *longispinus* Backeb., Descr. Cact. Nov. 3: 14.

## CULTIVATION.

The ease of cultivation of these plants varies in our experience principally upon the nature of their root system. In the *glomerata/andicola* range this is extremely strong and thrusting and should be encouraged to spread. If the plants cannot be bedded out, at least let the pans stand on a substrate of sand or vermiculite into which the younger roots will soon find their way. On an old imported *glomerata* attributed to one of the newer varieties (*longispina*) we found that the main tuberous structure from which the roots spread was over 1.25 times as deep as the clump growing above the surface was wide. This suggests that if confinement to pots is essential there may be virtue in not having them too shallow, but these plants are so vigorous that we doubt if it matters much. They are very happy in a temperate summer and like their winter quarters cold and dry. As old stems shrivel, they are pressed together by the new, so on mature clumps the spination appears far

more dense than on cuttings. As has been noted with other plants well equipped to spread vegetatively, they are reluctant to flower in cultivation, particularly in the far from ideal conditions available in this country. But they are easy to grow, form quaint clumps looking from the side sometimes rather like a hedgehog, and are deservedly popular.

The *platyacantha* plants have a looser method of growth, and some of them are much slower. The root system may not be so vigorous, and overwatering is a possibility, even in mid-summer. Many European and Japanese growers graft these plants for reasons which we have failed to understand, because it would seem less trouble to make up a reasonably porous disease-free soil and let the plants establish themselves, as they generally do. They are not rare and not really difficult, provided that one is not in a hurry.

Of the plants in the group we have not discussed fully we particularly like *O. hickenii* Br. & R. (1919), of which we have had for some years a small cutting from Lamb. It has prettily marked spines and forms something of a bridge between the platyacantha and the glomerata/andicola range. We have another version reputedly from Hutchison via Bates. The species comes from S. Argentina.

*Darwinii* was first described from further south still, near the Straits of Magellan, but was rediscovered by Hosseus in the same general territory as *hickenii*. In cultivation, it would seem to require similar conditions to *andicola*, but it responds much more slowly.

Without offering any guarantee we can say that we have found the plants in the glomerata/andicola and platyacantha ranges to be untouched by at least a degree or two of frost in this climate even out of doors, provided they are dry; but the same is not true of the "spec. nov." material discussed under *russellii*. This will survive frost, but it suffers splitting of the stems and seems to remain permanently stunted as a result. (The experimental specimen was not one of those from which our descriptive notes were taken!)

It is possible to grow the plants from seed, but some process of vernalization appears necessary. One of us has tried freezing followed by sanding and then by nicking (as is often done with lupin seeds). There is an outer layer of the seed case which must, it seems, first be dissolved. But the percentage of germination remains extremely low compared with that of most cacti. However, we have a few interesting seedlings and, as we are a little suspicious of the age of some of the seed used, it may be that we should be content.

For those who care to concentrate on the growth of a few really excellent plants, we commend particularly in relation to this group (though it has some application to others) the advice of Buxbaum on root care (Cact. Cult.: 81 et seq. etc.). The roots and base of the plant should be clean and sound on planting. Any decaying roots should be cut back until absolutely no yellow or reddish spots show in the vascular tissue. Established plants may well need attention to the subterranean parts when re-potting. With a thick, woody tap-root there forms with age a horny outer layer between which and the inner, live epidermis spots of rot can form. These are potentially dangerous. If the plant seems not to have done as well as in previous seasons it is well worth attempting some minor surgery. The outer layer can be removed after gentle soaking, and the reddish or brownish spots of infection thus exposed on the inner

surface gently scraped away under running water until entirely clean tissue is seen. Exposure of this clean tissue is tolerable with sensible hygienic care if it does not extend too far round the circumference at any one level. If the rot goes through to the core, the whole branch of the root should be cut off, and the stump cut back until the central vascular tissue is seen to be sound. After any considerable disturbance of the roots the plant must of course be laid aside to heal. In such cases, we consider it sound practice to trim off all the finer rootlets to guard against their dying back and inducing further rot. New rootlets will soon form on replanting a mature plant after this treatment, which often seems to act as a stimulus to fresh growth.

Buxbaum's advice to disinfect the knife with methylated spirit should be followed for each major cut, but for routine cleaning and trimming this is painfully slow. For this we find a pair of scissors used under a running tap good enough. It may seem a rather painstaking operation and is certainly time-consuming, but we judge it well worth while for any particularly cherished plant. This sort of root rot is of course a different problem from that of root mealy bug, though it is possible that damage by the bug could initiate it. We have found that as a precaution against mealy bug the use of chemicals, such as malathion mixtures, is very successful. We use commercially available hormone-with-fungicide rooting powder as a coating on the still wet rootstock when laid aside to heal, and are satisfied with its fungicidal action. We have no clear evidence that it stimulates root production in the case of these plants: we have not the facilities for a large controlled experiment, which would be necessary.

We suspect that Buxbaum's advice on the treatment of the base segment of a plant from which the rootstock has been removed may lead the inexperienced to be too severe and to lose the plant. The green flesh of a stem-segment is much less tolerant of exposure than root flesh, and if much of the epidermis is broken the segment can collapse catastrophically from water-loss in a matter of twenty-four hours. If the base segment is very woody or corky it is safer, rather than to remove the entire corky layer after soaking, to remove that segment and commence rooting the one above. The roots appear through an areole, often just above the level of the rooting medium on which the segment rests, and pull the stem-segment down firm as they have become established. This is the nearest to the natural process by which a desiccated plant, or one whose root system has been attacked, collapses sideways and what were the upper stem-segments send down roots from their underside and recommence growth from a new centre of operation.

## O. diademata group

- O. diademata* Lem.
  - .....var. *oligacantha* Speg.
  - .....var. *polyacantha* Speg.
  - .....(var.) *calva* Web.
- O. turpinii* Lem.
- O. diademata* var. *inermis* Speg.
- O. aoracantha* Lem.
- O. paediophila* Cast.

We have studied more material of this group than any other and have found it intensely interesting. The core of the attraction of *Tephrocacti* lies here, among plants more highly differentiated from the generality of *Opuntia* than any others with which we deal. It is generally agreed that the forms within the group are all very closely related, and that the group as a whole is very distinct and coherent. There is however a polymorphic area within the group which has been the source of much classification difficulty. At one time, we were inclined to accept that a single species and some eight varieties on the lines advocated by Backeberg (though not proposed by him in a technically satisfactory form) was reasonable. But increasing experience suggests that this ninefold division is either too few or too many according to which mix of variable characteristics one brings under critical consideration. It is possible from our small collection to put up to a dozen plants of the group on a table and persuade experienced growers of other genera of cacti that they ought all to have separate names. There is a stronger case for recognizing four entities only, to which we shall allude later. All the known plants in cultivation can properly be placed within the area covered by a reasonable interpretation of the eight descriptions referred to in the heading to this discussion of the group, but many other names have been widely used and will be dealt with in the detailed examination which follows. Our assessment of the merits of these different possibilities and of the level at which the distinctions can satisfactorily be maintained is placed at the end of the discussion, before the note on cultivation.

The plants were immediately seized upon by nineteenth century collectors as attractive curiosities, but imports to this country and to Germany (distributed from both to other parts of Europe) remained rare for many years and much of the small quantity of material available was probably lost by faulty cultivation. A clear photograph of one, with other *Opuntias* in the bowl garden, appeared in the first issue of *Cact. Jour.* 1898. "Its spines (if they may be called spines) are long, broad, thin and flexuose like a piece of paper. When they are young they are brown, but become white as they grow older". It should be noted straight away that the famous paper shavings are spines. Poindexter (l.c.) disposed of the suggestion in Borg (*Cacti*, ed. 2: 26) that they were not real spines but single rows of long hairs knitted together into a flat ribbon-like production. He found them to be derived from the same primordia as other *Opuntia* spines.

The earliest recorded names appear to be four listed without any description by Otto in 1833: *O. ovata* Hort. Angl. (not to be confused with *O. ovata* Pfeiff.), *O. platyacantha* Hort. Angl. (a loose obscure name not to be confused with the *O. platyacantha* which we now know), *O. articulata* Hort. Berol. and *O. polymorpha* Hort. Angl. (Allg. Gartenz. 1: 367 non 116 auct.). The first attempt to give them validity was by Pfeiffer in 1837 (Enum.: 102-3). Unfortunately he chose to produce three descriptions not four, and not only separated them from *Opuntia* and placed them in an enlarged genus *Cereus*, but confused his description of *Cereus articulatus* by insisting in the same place that he gave it that *O. polymorpha* Hort. Angl. was a synonym, which it manifestly could not be as his description was in terms restricted to a spineless plant. It is probable that Pfeiffer, who was no doubt familiar with the Berlin *articulata*, never saw what was known as *polymorpha* in this country at that time and was misled. This was the opportunity for Lemaire, with access to both, to come forward egregiously in 1838 with four names of his own under *Opuntia*. He had no difficulty in voiding *Cereus articulatus* Pfeiff. for self-contradictory uncertainty and also managed to trounce *Cereus syringacanthus* Pfeiff. (identified by Pfeiffer with part of the *O. platyacantha* Hort. Angl. material) as too vague and confused. This left *Cereus ovatus* Pfeiff., for which he wanted in any case to find a fresh name (*O. aoracantha* Lem.) because of the existence of the entirely different and valid *O. ovata* Pfeiff. He appears to have taken a certain delight in this operation but whatever one may suspect of his motives, his suppression of these rare errors of Pfeiffer has been upheld, and our researches have not discovered any validation of *O. articulata* to this day (we shall mention some use of varietal names on the assumption of its validity in our Summary at the end of this group). *O. syringacantha* has had only an abortive and mistakenly identified revival in Schumann's early work. Salm-Dyck attempted unnecessarily and unsuccessfully to revive *polymorpha* at varietal level, as will be seen. It is sad to see so apt a name disappear, especially as there is a tradition that it is even older than *articulata*. Ironically, although three of Lemaire's descriptions were valid (*diademata*, *turpinii* and *aoracantha*), he in his turn seems to have failed to establish his fourth name (*calva*) properly; this was treated subsequently by Weber as a variety of one of the others (*O. diademata calva*). Even Salm-Dyck as well as Labouret blundered in this area (see e.g. the absurd muddle over *turpinii* in *Mon. Fam. Cact.*: 484) and

compared with them the other early authors emerge with a certain amount of credit, laying amid their squabbles foundations upon which Schumann (in his later work) and Spegazzini were able to construct most of what we now see as a complete and correct account of the group.

**O. diademata** Lemaire, *Cactearum Aliquot Novarum*: 36 (1838).

Articulato-suberecta, dumosa, tuberculata, cinereo-purpurascens, albido densissime punctata (plus quam in affinibus).

Articulis subglobosis, tuberculatis (praecipue per juventutem) uno pollice altis, decemque lineis latis in diametrum; veteribus crassioribus, ex magnitudine et forma palumbini ovi, lineae atro-virenti circumductis; tuberculis ad areolarum basim, quando juniores, foliola minutissima, erecta, acuta, rubescenti, statim decidua, munitis, mammularum leviter depressarum formam satis bene praebentibus et circa areolas purpurascens; eis minimis, subrotundis, lana brevi, grisea, diuturna, munitis; aculeis biforibus; aliis numerosis, penicillatim collectis aut lana immersis, atro-violaceis, lineam dimidiam aut vix unam in longum assequentibus; aliis (in fasciculo unoquoque, uno solo aut duobus, priori majore, pollicare aut ultra, posteriori dimidio minore) ad summum articulum dispositis, illumque circinata ordinatione, quasi diademate quodam cingentibus, demum deflexis et deinceps deciduis; foliaceis, colliquiformibus, albidis, brunneo fasciatim maculatis, flexuosis et mollibus, ad apicem utrisque nigricantibus.

“Nearly erect articulate, bushy, tuberculate, ashy purplish green, thickly covered with minute whitish spots—more so than its relatives.

“Stem-segments nearly globose, tuberculate (especially when young), 2½ cm long, 2 cm thick; when older thicker, of the size and shape of a pigeon’s egg, the boundaries—”(of the tubercles)—marked by a dark-greenish line; the tubercles when young furnished with a very minute erect sharp reddish leaflet, immediately deciduous, at the base of the areole, and exhibiting fairly well the shape of slightly low mammulae and tending to purplish around the areoles; these very small, not quite round, furnished with short grey persistent woolly felt:—”(glochids)—numerous, gathered into a tuft like a brush or immersed in the wool, blackish-violet, attaining 1-2 mm in length; —”(spines)—(1 or 2 in each bundle of glochids, the higher longer, 2½ cm or more, the lower half as long) arranged at the top of the segment in an order surrounding it, as it were encircling it with a crown (diadem), at a later stage deflexed and eventually deciduous; they are leaf-like, channelled like a gutter, whitish, marked with brown stripes, flexuous and pliant, becoming dark on both sides towards the tip.”

Here as elsewhere Lemaire distinguishes glochids from spines proper by referring to biform spines (spines of two sorts).

The plant which is popularly known as *O. diademata* (though also found labelled “papyracantha” or “glomerata”) is easy to recognise here, and is clearly placed correctly under this name. Specimens with up to 3 or even 4 spines may be met with, and the spines may sometimes be longer

than what is suggested by the description. It would seem from their illustration (*The Cact.*, 1:89) that this is the plant Britton and Rose had foremost in mind as representative of their composite *O. glomerata*. Backeberg treated it in his later years as the variety *diadematus* of his *T. articulatus*.

A rival description of what was evidently much the same plant, under the name *O. papyracantha*, came from R. A. Philippi in 1872 (*Gartenflora*, 21:129). Though the name, we feel, must yield priority, we quote the description for comparison and because it adds detail to the picture and indicates by its differences from the way Lemaire described his material the particulars in which the plant tends to vary during its life (which we are satisfied it does even without the stimulus of major environmental upheavals).

*O. articulatus* subglobosis, loco spinae laminas foliaceas, papyraceas, majores diametrum articulorum bis aequantes gerentibus. Hab. prope Mendoza et Catamarca.

Speciminibus e regione Mendocina allatis articuli subglobosi, diametri 15 lin. (33mm). Verrucae ca. 8 lin. (17mm) inter se distantes, pulvinorumque diameter 3 lin. (6½mm). Pulvini centro pilis albis brevissimis confertis tuti, ambitu setis seu spinulis 1 lin. (2mm) longis, erectis, e purpureo rufis cincti, ex epidermide rupta emergunt, quae marginem distinctum subelevatum ostendit. E parte inferiore pulvinorum spinae seu potius laminae foliaceae 2 vel 3 nascuntur, 3 poll. (fere 80mm) longae, basi usque ad 2½ lin. (6mm) latae, sensim acuminatae, basi paullulum concavae, albae, in purpureum et cinereum vergentes, superiores patentes, inferiores deflexae, quibus planta ad aspectum valde singularem debet. Fructuum e centro pulvinorum ortorum vestigia adsunt.

“An *Opuntia* with nearly globose stem-segments, bearing leaf-like papery blades instead of a spine, the longest twice the diameter of the segment. Grows near Mendoza and Catamarca. On specimens brought from the Mendoza region the subglobose segments have a diameter of 33 mm. The tubercles are 17 mm apart and the diameter of the areoles is 6½ mm. The areoles emerge from the torn epidermis, which shows a distinct almost raised margin, and are covered in the centre with white very short close-packed hairs, surrounded on the circumference by erect bristles or spinelets 2 mm long, reddish-purple. From the lower part of the areoles 2 or 3 spines or rather leaf-like blades arise almost 80 mm long, up to 6 mm broad at the base, gradually acuminate, slightly concave at the base, whitish turning to purple and grey, the upper ones porrect, the lower deflexed, to which the plant owes its singular appearance. Traces of fruits sprung from the centre of the areoles are present.”

A further note by Philippi (l.c.) gives an account of a small yellow flower, which we consider under “The Flower of *O. diademata*” below, and quotes a report that the plant is found in two forms, “one with these leaf-like spines, the other quite bald.” We shall consider the spineless forms of *O. diademata* under *O. diademata* var. *calva* below; this report accords with our view that lack of spines in this group is not in itself necessarily a decisively distinguishing character.

There is no basis whatever in Philippi’s original

description for the distinctions on which Backeberg suggested a *T. articulatus* (Pfeiff. ex Otto) Backeb. var. *papyracanthus* (Phil.) Backeb.—“grey-brown joints” and “pure white spines” (Die Cact., 1:258). This was not his only venture in unnecessary distinctions based on the transient state of a particular plant or plants. In 1932 (Cact. Succ. Jour. Gr. Br. 1:7) he described and illustrated a new *O. papyracantha* var. *formosissima* as having “joints up to 8 cm with dark red glochids as much as 1 cm long in the areoles, and papery spines 15 cm long and almost 1 cm broad, which give the whole plant a grotesque beauty, especially when they stand out after watering.” A charming description not, as far as we can trace, maintained by its author in his later work but very useful as a practical example of the variability of these plants. (At this enthusiastic early stage of his studies he was even, despite its flattened stem-segments, treating *O. microdisca* Web. as a Tephrocactus, which he then accepted as a subgenus. He later retracted this, but not, alas, before it had got into dealers’ catalogues where it still occasionally occurs as *T. microdiscus*). His footnote to Die Cact., 1:256 that of all his *T. articulatus* varieties “only var. *diadematus* flowers yellow” reflects his own wide experience of white (sometimes rose-tinted) flowers on most of them. He does not specifically record a flower colour for var. *papyracanthus*, and under var. *diadematus* expressly attributes the yellow flower to a 1905 note by Spegazzini. He appears to have overlooked the retraction of that flower colour by its author some years later, which we shall be quoting in order to get the record straight, and gives pale yellow in “Das Kakteenlexikon” (1966).

An earlier name which is given by Salm-Dyck (Cact. Hort. Dyck., ed. 1:39) as a synonym of *O. diademata* is *Cereus syringacanthus* Pfeiff. (1837). Pfeiffer’s description (Enum.: 103) is as follows:

“A nearly erect and articulate cereus with a globose trunk; with thick almost globose green tuberculate stem-segments from the top of the trunk; the big areoles equipped with a bundle of brown bristles and 1-2 broad flexible reed-like dark spines. Stem-segments  $3\frac{3}{4}$ -5 cm diam. Spines 5 cm long and more, 2-3 mm wide at the base.—Mendoza.”

Lemaire (who treats the names in this area as quite distinct) surmises, in Cact. Gen. Nov.: 73, that *Cereus syringacanthus* might be identified either with his *O. diademata* or with his *O. turpinii*. He is slightly inclined to favour the latter (possibly because he is insistent that *diademata* has small areoles) but complains that Pfeiffer’s description is too vague to lead to a conclusion. Backeberg identifies *Cereus syringacanthus* particularly with *O. turpinii* (Die Cact., 1:257) but his grounds are insubstantial. We feel that *Cereus syringacanthus* is best regarded as a *nomen dubium* on account of the synonym *O. platyacantha* Hort. Angl. given by Pfeiffer, l.c. We have already noted that Pfeiffer treats this as a synonym which is applicable to two distinct forms: *Cereus syringacanthus* and the obscure *O. tuberosa spinosa* (q.v.). Fortunately—thanks to Pfeiffer’s valuable note in Allg. Gartenz., 5:371 referred to under *O. platyacantha* above—we do at least know what *O. platyacantha* Hort. Angl. is not: it is not *O. platyacantha* Pfeiff. which we know today. So far as any positive conclusions are concerned, however, the name remains exceedingly confused. It must be assumed to

have provided cover for a wider variety of forms than Pfeiffer’s two, for Lemaire extended it to his own *platyacantha* (q.v.); and from Pfeiffer’s manner of reference in Allg. Gartenz. one may suspect that the loose coverage at the time was wider still. We have no record of whether Salm-Dyck accepted *O. platyacantha* Hort. Angl. at Pfeiffer’s estimation, if indeed he noticed any *platyacantha* Hort. Angl. at all in his identification of Pfeiffer’s species with *diademata*, and the presence of this synonym casts an uncertainty over *Cereus syringacanthus* which weighs against any thought of the transfer of the latter. Schumann did in fact publish an *O. syringacantha* (Pfeiff.) K. Sch. in Monat. f. Kakt., 6:156 (1896) as a name only. This he later withdrew (Gesamt. Kakt., ed. 1:693), and it could have had no application here since he had associated it with *O. platyacantha* Pfeiff.

“Platyacantha” of course simply means “flat-spined”, and it is understandable that in the earliest days when flat-spined specimens first became known they should not have been particularised further. Unfortunately, confusion between various flat-spined forms still occurs. It is hard to believe, for example, that *O. diademata* could be mistaken for *O. platyacantha*. Yet we have met with this mistake and it may be well to enter a warning against confusion between these two species and to list some of their differences, particularly as both are variable. Apart from the gross vegetative differences in habit and colouring (and, it might be added, in season, since *platyacantha* like other plants of the *O. glomerata* group may show the first signs of growth in February whereas the plants of the *O. diademata* group wait for much greater warmth) we would note the characteristic reddish colouring (often verging on brown, purple or black) of the glochids and the distinct boundary markings to the tubercles left by the initial sharp furrows in the *O. diademata* group; and the complete absence of any wiry, acicular subsidiary spines in *diademata*. We would also add that the leaves of *platyacantha* may be  $1\frac{1}{2}$ -2 mm long and may last individually perhaps a month or even more from the bud while those of the *O. diademata* group generally are of the order of  $\frac{1}{2}$  mm in length, hard to see, and very short-lived. Finally there is the point that the joints between *platyacantha* segments are flexible and strong compared with those of *diademata*.

H. Blossfeld, when suggesting that cristation in habitat is generally caused by attack by insects, but is very rare in “spherical *Opuntias*” says, “We only found two crested plants of *Opuntia diademata* in the Province of La Rioja, the two plants being 2 m apart” (Cact. Succ. Jour. Gr. Br., 4:33 (1935)).

It is not known what became of Lemaire’s type specimens according to Stafleu, Tax. Lit.: 264. For a general reference to botanical material from Philippi see under *O. grata*. We have no record of the survival of the type specimen of *O. papyracantha*.

***O. diademata* var. *oligacantha*** Spegazzini. Cactearum Platensium Tentamen: 511 (1905).

Spegazzini provides valuable information on *O. diademata* in this publication; his account, like that of Philippi in the case of *O. papyracantha*, is based upon habitat observations, but takes a wider view. He refers to the species in general as very common “in the most arid places” in the triangle outlined by Mendoza, Jujuy and Santiago del Estero, a very large area of Northern Argentina, and observes that growth is “exceedingly deceptive” due to polymorphism “in



size, colour, form of stem-segments, spines, etc.” Apart from a detailed account of the flower his descriptive text is confined to three forms, var. *oligacantha*, var. *polyacantha* and var. *inermis*; these, he says, “seem to me the more easily recognisable varieties.” We shall consider his description of the flower, and the very distinct var. *inermis*, later. Var. *oligacantha* is as follows:

Articulis cinereis subglobosis, (20-50 mm long., 20-30 mm diam.), sublaevibus, areolis prominulis, aculeis tenuiter papyraceis latiusculis patulis 1-2 armatis.

“With ashy, subglobose stem-segments, 20-50 mm long, 20-30 mm thick, nearly smooth, areoles rather prominent, armed with 1-2 spreading rather broad thinly papery spines.”

Spegazzini’s subsequent life-size photograph of *oligacantha* in *Revista Arg. Bot.*, 1:204 (1926) shows that the spines may be up to 4½ cm long from the upper areoles only and not more than two from each, none from the lower areoles. On a lower stem-segment the spines appear to be single and more deflexed and somewhat shorter, and again none from the lower areoles. There is no suggestion of short or weak spines in his description, only, as the name implies, that there are few of them: his photograph shows a plant which is generally consistent with Lemaire’s diagnosis for *diademata*.

The plant which Backeberg calls *T. articulatus* var. *oligacanthus* is said to have “...only 1-2 spines from the upper areoles . . . sometimes absent or very short.” (*Die Cact.*, 1:265). The illustration so named (*Die Cact.*, 1:280) shows a large quantity of virtually spineless material, mostly 0-2 short spines per stem-segment not per areole (exceptionally up to 6 per segment), and closely approximates to material which belongs under *diademata* var. *calva* Web. The only other particularization offered is dark to blackish-grey spine colour, which has no warrant from Spegazzini here and occurs often enough elsewhere in the group. The concept is confused, but worth noting as a further demonstration of variability and intergrading among these plants.

Britton and Rose also remark under their *glomerata* upon the variability in spination and in stem-segment size observed by Dr Rose in the field. Their reference there to a light yellow flower and the flower of Spegazzini’s plant above (generally agreed to be white with a rose tinge) are discussed later under “The Flower of *O. diademata*.”

***O. diademata* var. *polyacantha*** Spegazzini, *Cactearum Platensium Tentamen*: 511 (1905).

Articulis cinereis, cylindraceis, subglobosis vel obovatis (25-70 mm long., 20-25 mm diam.), transverse leniter corrugatis, areolis parum prominulis, aculeis papyraceis latiusculis rigidulis erectis 3-5 armatis.

“Stem-segments ash-coloured, cylindrical, subglobose or obovoid, 25-70 mm long, 20-25 mm thick, with moderate transverse wrinkling, areoles only slightly prominent, armed with 3-5 papery rather broad rather rigid erect spines.”

The previous identity of this plant was suggested by Berger immediately in 1905. He said (*Bot. Jahrb.*, 36:450-1) that it “very probably corresponds with *O. diademata* Lem. (syn. *O. papyracantha* Phil.)”.

More abundantly spined specimens of *diademata*, such as the above diagnosis suggests, are indeed sometimes to be met with which do not otherwise show any significant difference from the plant as described by Lemaire. We cannot find that Spegazzini provided any illustration of this variety which would make his intentions more clear, as he did subsequently in the case of the companion vars. *oligacantha* and *inermis*; in fact so far as we know he never referred to var. *polyacantha* again.

Backeberg’s explanation of his identification of his *T. articulatus* var. *polyacanthus* (Castellanos’ *O. paediophila*) with Spegazzini’s var. *polyacantha* is unconvincing. He says “There is no other variety with up to 5 somewhat stiff spines”. As the next variety he deals with, his var. *ovatus*, has up to 6 very stiff spines, this places a good deal of weight on “somewhat”. The difficulty could be eased if we were able to construe “papyraceis” here in Spegazzini not as “papery in texture” but as “like a (papyrus) reed”. He modestly referred to his Latin as “macaronic” in *Not. Teph.*, but even so the same adjective occurs clearly meaning “papery” in his description of var. *oligacantha* in the same place. And the spines of *paediophila* Cast. cannot possibly be called “rather broad”.

It may be appropriate to note here that Borg also, who made a useful observation (*Cacti*, ed. 2:115) of a 3-4 cm broad, funnel-shaped white flower “often with a pale violet band on the back of the petals” for *O. diademata*, seems to have misunderstood its varieties, at least so far as authorship goes. Moreover, his “var. *molinensis* (Speg.) Hoss.” is a mystery. *O. diademata molinensis* (Speg.) Hoss. is given by Backeberg as a synonym of *O. molinensis* Speg. which Borg deals with elsewhere under its synonym *O. guerkei* Schelle. A form with a comparatively large number of spines and a pointed stem-segment is unknown to us either in the *diademata* or the *molinensis* direction.

The literature is of course replete with illustrations of the *diademata* material so far discussed. We cannot quote much less comment on all those we have examined but would mention the following on grounds either of historical importance or of accessibility (all photographs except the first): —

Philippi, as *O. papyracantha*, in *Gartenf.*, 21:t. 721 (1872), a rather crude but nevertheless informative coloured lithograph reproduced, engraved, in *Först. Handb.*, ed. 2:914 and photographically in *Die Cact.*, 1:272.

Walton, as *O. papyracantha*, in *Cact. Jour.* 1:8/9 (1898).

Watson, *Cactus Culture for Amateurs*, ed. 2:257 (1903).

Spegazzini, as *T. glomeratus* var. *oligacanthus*, in *Revista Arg. Bot.*, 1:204 (1926).

Lamb, as *O. glomerata*, in Neale’s *Photo. Ref. Pl.*, no. 65 (1949), re-issued in *Illus. Ref.*, 1:30, t. 8.

Borg, *Cacti*, ed. 2:t. 4(b) (1951).

Buxbaum, *Cact. Cult.*: t. 84 (1958).

Lamb, as *O. platyacantha*, *Pocket Encyclopaedia of Cacti*, t. 141 (1969).

We collect the synonyms which belong to *O. diademata* as represented by the material so far discussed for reference at this point. We include var. *polyacantha* provisionally, as it carries little evidence of acquaintanceship.

*Cereus syringacanthus* Pfeiff., Enum.: 103 (1837) sec. S.-D., Cact. Hort. Dyck., ed. 1:39 (*O. platyacantha* Hort. Angl. non Pfeiff. pro syn., Enum., ut sup., non *O. platyacantha* Hort. Angl. = *O. tuberosa spinosa* Pfeiff., Enum.: 146 sec. Pfeiff. in Allg. Gartenz., 5:371) nom. dub.

*Tephrocactus diadematus* Lem., Les Cactées: 88 (1868).

*O. papyracantha* R. A. Phil. in Gartenf., 21:129 (1872).

*O. diademata* Lem. var. *oligacantha* Speg., Cact. Plat. Tent.: 511 (1905).

? *O. diademata* Lem. var. *polyacantha* Speg., ibid.

*O. glomerata* sensu Br. et R. pro parte, The Cact., 1:89 (1919).

*T. articulatus* (Pfeiff. ex Otto) Backeb. var. *diadematus* (Lem.) Backeb. in Cactus (Paris), 8:249 (1953) sec. Backeb., Die Cact., 1:264.

*T. articulatus* (Pfeiff. ex Otto) Backeb. var. *papyracanthus* (Phil.) Backeb., in Cactus (Paris), 8:249 (1953) sec. Backeb., Die Cact., 1:258.

The following other synonyms (less widely circulated in our experience) will also belong here:

*O. plumosa nivea* Walton in Cact. Jour., 1:105 (1898) sec. Watson, Cact. Cult. Amat., ed. 2:256, nom. nud.; *T. glomeratus* sensu Speg. var. *oligacanthus* Speg., Not. Teph., in Revista Arg. Bot., 1:200 (1926); *O. papyracantha* Phil. var. *formosissima* Backeb. in Cact. & Succ. Jour. Gr. Br., 1:7 (1932); *O. glomerata* (sensu Br. et R.) f. *papyracantha* (Phil.) Cast. in Lilloa, 23:11-13 (1950); *O. glomerata* (sensu Br. et R.) f. *oligacantha* (Speg.) Cast., ibid.; *O. diademata* Lem. var. *chionacantha* Hoss.? ex Borg, Cacti, ed. 2:115 (1951) (= snowy spined).

Two further doubtful synonyms are *O. diademata stipulata* Walton, "Amateur's Guide and Price List" (undated, late 19th cent.) nom. nud. and *O. glomerata* var. *stenacantha* Morelli, Memoria del Jardin Zoológico, 1926-7: 50, La Plata (1930) nom. nud.

We consider the wider interpretation of *O. diademata* proposed by Schumann after we have examined *O. turpinii*. The lavish photographs of diademata forms in "Die Cactaceae" under *T. articulatus* and its varieties *diadematus*, *syringacanthus*, *calvus* and *oligacanthus* may be examined in this light.

***O. diademata*** (var.) ***calva*** Weber in Bois. Dictionnaire d'Horticulture, 2:896 (1893-9).

"*O. calva* Lem. is a form in which the leaf-like spines are partially or totally lacking."

This (the conclusion of Weber's dictionary entry upon *O. diademata*), although cursory, is in our view the first admissible publication in this group under the epithet *calva*. This epithet had previously been used by Lemaire in the specific name *O. calva* which he proposed in the preface to his publication of *O. turpinii* (Cact. Aliq. Nov.: 36-7) in 1838 but which he never, so far as we can trace, effectively described himself. It brings us to consider a difficult historical situation, which also has a bearing on Backeberg's treatment in "Die Cactaceae".

We regard the still earlier name which belongs near here (the *Cereus articulatus* Pfeiff. of 1837 mentioned in our introductory note to the group) as a *nomen dubium*. So far as we know it has not received valid transfer to *Opuntia*, and since Pfeiffer des-

cribes it as spineless but confuses it by quoting the reputedly spiny *O. polymorpha* Hort. Angl. as a synonym it seems to us too uncertain in its scope to make such a transfer seem feasible. This is unfortunate in that Pfeiffer's description, taken by itself,—

"A cereus with oblong-globose stem-segments, of a glaucous tendency, somewhat tuberculate, with spineless areoles set in almost vertical rows equipped with very short white wool and brown bristles scarcely longer. Stem-segments 3 $\frac{3}{4}$ -5 cm long, 2 $\frac{1}{2}$ -5 cm thick" (Enum.: 103)

—gives a fair account of one particular, quite recognisable form of our species. From our experience, however, it gives a rather misleading impression of sharpness of definition. The information furnished by Lemaire upon the synonym suggests that Pfeiffer may have mistaken the extent or the variability of his material and failed to convey its range in his description. It seems to us that Backeberg misinterpreted the taxonomic history in choosing on grounds of priority to base his specific name *Tephrocactus articulatus* (Pfeiff. ex Otto) Backeb. upon this uncertain foundation. Pfeiffer's description corresponds well with one of Backeberg's illustrations (Die Cact., 1:268). According to Pfeiffer the material came from Mendoza.

Lemaire (l.c.) made his intentions perfectly clear. These were to provide valid descriptions under *Opuntia* for *O. polymorpha* Hort. Angl. and *O. articulata* Hort. Berol. He drew up the following explanatory synonymy giving his view of the small group of plants immediately concerned:

*O. diademata* Lem.  
*O. turpinii* Lem.—*polymorphus* (sic) Hort.  
*O. calva* Lem.—*articulata* Hort.—*Cereus articulatus* Pfeiff.  
*O. aoracantha* Lem.

and described his *O. polymorpha* then and there under the new name *O. turpinii*. In his view *O. polymorpha* and *O. articulata* were quite distinct; and he argued that *Cereus articulatus* was incompetent as a validation of the latter because Pfeiffer treated it as the same as *polymorpha*. "There are two unlike enough plants before my eyes" says Lemaire, and goes on with much sarcasm at the learned author who placed the plants among the *Cerei* to culminate in a denunciation of the two garden names as "totally void and in no way compatible". From the midst of this rhetoric one can retrieve some fragments of comparative description. *O. articulata* (which Lemaire promises to describe under the name *O. calva* in a future work) "always has slightly elongated stem-segments and never the long broad spines of a straw-like nature such as *O. polymorpha* exhibits, and at the base of *polymorpha* the segments are distinctly globose and thicker." And after the detailed diagnosis of *O. turpinii* which we shall quote later Lemaire continues

Satis diversa ab *O. calva* articulis minus elongatis crassioribus et globosis, aculeis grandifoliaceis semper adstantibus, in altera semper absentibus, aculeorum piliformium numerosiorum dispositione, tuberculis magis mammillatis, tomento magis denso et longa, etc.  
(*O. turpinii* is) "Sufficiently distinguished from

*O. calva* by thicker and globose, less elongated stem-segments, by the large leaf-like spines always present, and always absent in the other, by the disposition of the more numerous hair-like spines"—(glochids)—"the more mammillate tubercles, the denser longer wool, etc."

From what we know of the material these sharp distinctions now seem a little over-confident; and Lemaire may perhaps have hesitated to commit himself further. He continued to maintain the distinction of *O. calva* as a name, but, so far as we can trace, the promised description did not appear. The subsequent reference in *Cact. Gen. Nov.*: 73 (1839) which is customarily quoted as the source for the name is a mere synonymy. This is possibly corrupt, for, confusingly enough in view of Lemaire's declared standpoint, it takes the following form:

*Calva* Lem. *Cereus articulatus* Pfeiff. *Op. articulata* Hort. Berol. Otto GZ. 1833; *Opuntia polymorpha* Hort. Angl.

Whether the inclusion of *O. polymorpha* in this case represents printer's error (a dropped 'non'?), reference to Pfeiffer's treatment, or mere acknowledgement of current garden usage, it is impossible to say; but it is hardly surprising that, in spite of Lemaire's vehement assertions that they are distinct (reinforced by a footnote to *O. turpinii* on this same page), the coverage of *O. calva* and *O. polymorpha* has remained confused and the effective result has been to perpetuate the very association which he so evidently wished to avoid.

In practical terms, we feel that the maintenance of var. *calva* Web. as a separate entity is dubious (cf. Philippi, under *O. papyracantha*, l.c.), though the name has a function in distinguishing the limiting case in the reduction of the spines. The two positions which Lemaire sought to differentiate as *O. calva* and *O. turpinii* are quite recognisable, but they are linked by intermediates; and intermediates from the *calva* position also occur towards *O. diademata* var. *inermis* and towards *O. diademata* Lem. sensu stricto. Salm-Dyck was among the first to appreciate this dilemma when he tried to treat *O. calva* as what he called *O. turpinii* (var.) *polymorpha*: "differs—" (i.e. from *O. turpinii*)—"by its slightly thinner stem and a reed-like spine which is sometimes absent. This spine however is often present and the characteristic is assumed from its absence to be variable." It is indeed, and it is a common experience in cultivation to find originally spineless specimens which could be taken as var. *calva* in its most extreme interpretation producing some, and then more spination. It should be added that Salm-Dyck persistently identifies *Cereus articulatus* with *O. turpinii* without explanation in all editions of *Cact. Hort. Dyck.*, in flat contradiction to Lemaire's purpose in establishing *O. turpinii*. It is thus impossible to decide the exact bearing of Salm-Dyck's comparison with *O. turpinii* in the case of the above variety.

Backeberg records the flower of his *T. articulatus* as white. We find no consistent basis for his distinction of "var. *calvus*" from "articulatus". He says that "var. *calvus*" has particularly squat stem-segments and prominent tubercles (*Die Cact.*, 1:257). We find that individual plants vary considerably in these respects during their life.

Illus.: Marshall, as *O. glomerata*, in flower, in *Jour. Cact. Succ. Soc. Amer.*, 5:412 (1933). The plates of short-segmented spineless or near-spineless diademata forms in "Die Cactaceae" will also be particularly applicable here.

Other names for the reputedly spineless or near-spineless form are collected here for convenience:—

- O. articulata* Hort. Berol. ex Otto in *Allg. Gartenz.*, 1:367 (1833) nom. nud.
- Cereus articulatus* Pfeiff., *Enum.*: 103 (1837), nom. dub.
- O. calva* Lem., *Cact. Aliq. Nov.*: 36-7 (1838), nom. subnud.
- O. polymorpha* sensu Först., *Handb.*, ed. 1:472 (1846).
- O. turpinii* Lem. (var.) *polymorpha* S.-D., *Cact. Hort. Dyck.*, ed. 2:71, 245 (1850) (*O. calva* Lem. pro syn. *ibid.*), nom. dub.
- Tephrocactus calvus* Lem., *Les Cactées*: 88 (1868), nom. nud.
- O. glomerata* sensu Br. et R. pro parte, l.c. (1919).
- O. turpinii* Lem. f. *tonsa* Borg, *Cact.*, ed. 2:114 (1951), nom. subnud.
- T. articulatus* (Pfeiff. ex Otto) Backeb. in *Cactus* (Paris), 8:249 (1953) sec. Backeb., *Die Cact.*, 1:256.
- T. articulatus* (Pfeiff. ex Otto) Backeb. var. *calvus* (Lem.) Backeb. in *Cactus* (Paris), 8:249 (1953) sec. Backeb., *Die Cact.*, 1:257.
- T. articulatus* (Pfeiff. ex Otto) Backeb. var. *oligacanthus* (Speg.) Backeb., in *Cactus* (Paris), 8:249 (1953) sec. Backeb., *Die Cact.*, 1:265.
- O. haageana* Hort. sec. Backeb., *Die Cact.*, 1:256 (1958).

**O. turpinii** Lemaire, *Cactearum Aliquot Novarum*: 38 (1838).

Articulato-erecta, dumosa, mammilliarie tuberculata, cinereo-virens.

Articulis globoso-ovatis, confertis; junioribus fere bipollicaribus, parum elongatis, subpollicaribusque in dia., veteribus ferme ex magnitudine et forma gallinae ovi, recentibus tuberculis mamillariaeformibus, demum obtusis, ad basim late subpentaedris, linea perviridi circumductis, ad areolas obsolete purpurascentibus; areolis rotundis, tomento albedo necnon parco, persistenti, sed tunc griseo, instructis, tribus quatuorve lineas distantibus; aculeis biformibus: aliis atroviolaceis, piliformibus, ad summam partem areolae in ordinem semi-orbicularem dispositis, lanam aequantibus, vix linea altis; uno ex eis aliquando validiore, erecto, tribus quatuorve lineas longo, in parte libera ad imam areolam uno elongato, valde applanato, foliaceo, contorto et colliquiformi, decem lineis et ultra longo, ad basim una lato, brunneo fasciatim maculato, ad apicem nigricanti, defixo et denique deciduo.

(We omit the passage already reproduced under *O. diademata calva*).—Mendoza? Excellentissimo doctissimoque vir . . . Dom. Turpinio dicavi.

"Articulate-erect, bushy, with mamilliform tubercles, ashy-green.

"With globose-ovoid, close-packed stem-segments, the younger nearly 5cm, not much elongated and

nearly 2½ cm in diam., the older almost the size and shape of a hen's egg, young tubercles mamilliform, later blunt, towards the base broadly and roughly 5-sided, surrounded by a greenish line, in age tending to purple towards the areoles; with round areoles, equipped with whitish and not sparse wool which persists, turning grey, and 6 to 8 mm apart; — (glochids)—purple-black, hair-like, arranged towards the top part of the areole in a semi-circular order, of equal height to the wool, scarcely 2 mm long, one of them somewhat sturdier, erect, 6 to 8 mm long; with one spine on the clear part towards the bottom of the areole, elongate, exceedingly flat, leaf-like, twisted and channelled, 2 cm or more long, 2 mm wide at the base, marked with a series of brown stripes, blackening at the tip, fastened down and finally deciduous.

“—Mendoza? I have named it after that most excellent and learned man . . . Dr. Turpin.” (François J. P. Turpin, botanist and botanical draughtsman, ob. 1840).

Syn. *O. polymorpha* Hort. Angl. ex Otto in Allg. Gartenz., 1:367 (1833) nom. nud. sec. Lem., Cact. Aliq. Nov.: 36-7.

*Tephrocactus turpinii* Lem., Les Cactées: 88 (1868).

*O. glomerata* sensu Br. et R. pro parte, l.c. (1919).

Backeberg gives *O. turpinii* as a synonym under his *T. articulatus* var. *syringacanthus* in Die Cact., 1:257 (1958).

The main difference between this description and that of *O. diademata* lies in the spines here being “fastened down”, a point often overlooked in references to *O. turpinii*. We take “fastened down” to mean that the spines look as if they were stuck on to the stem-segment, in other words hardly springing out from it at all. We have found spines sharply bent at the areole and appressed on plants which agree well with Lemaire in other respects. The description is taken by Backeberg to cover the same material as Pfeiffer's *Cereus syringacanthus*, but Pfeiffer gives no indication that his plant had a reflexed spine, and the features of size and spine-length noted by Backeberg are just those which show great variability in this area. Nor, indeed, does Backeberg offer any very clear or reliable connection between his own var. *syringacanthus* (which does include an occasional reflexed spine in its constitution) and the description from Pfeiffer upon which it is supposed to be based. Backeberg records a white flower “later rose-tinted” for his variety, which coincides with Berger's note upon the flowers of *O. turpinii* (see “The Flower of *O. diademata*” below).

#### Schumann's final position on *O. diademata*.

In view of the polymorphism which is evident to a greater or lesser degree throughout all the above material in this group we are entirely in sympathy with the direction of the broader interpretation of *diademata* Lem. finally adopted by Schumann which encompassed within that species all the turpinii material and, with some hesitation, all the earlier calva material which we have discussed under *O. diademata* calva Web. Schumann redefined the diagnosis for this purpose in Gesamt. Kakt. ed. 1:692 (1899) as follows.

Fruticosa ramosa humilis caespitosa pallide viridis mox cinerea; articulis globosis vel oviformibus; aculeis 1-2 papyraceis.

“Bushy, ramose, low, caespitose, palely green soon ash-coloured; with globose or egg-shaped stem-segments; 1-2 papery spines.”

His German commencement inserts an extra adjective into the latin text and the description continues with more detail: —

“Shrubby, branched, erect, low, clump-forming, up to 12 cm high seldom higher. Stem-segments often placed upright one upon another, globular or club-shaped; in a new segment light green, soon ash-grey, 2.5 to 3.5 cm long, 2.5 to 3 cm in diameter, strongly tuberculate. Leaves very small, three sided, pointed, brownish, soon falling off. Areoles clothed with plentiful white somewhat flaky woolly felt. Glochids dark brown, prominent, up to 3 mm long. Spines mostly singular, seldom 2, from the lower part of the areole, papery, supple, white and brownish, gleaming silver; points dark, up to 5 mm (? = cm) long and 3 mm wide. Flowers pale yellow. Seeds corky, roughened.”

This is in many ways a disappointing redefinition, notably in the reference to flower colour (see “The Flower of *O. diademata*” below) and in the matter of spination. But the idea of combination behind it is sound. The extent of the combination is expressed by Schumann in the following synonymy:

*O. diademata* Lem., Cact. Aliq. Nov.: 36.

*T. diadematus* Lem., Les Cactées: 88.

*O. turpinii* Lem., l.c.: 38.

*O. papyracantha* Phil, in Gartenf. (1872): 129.

*O. calva* Lem., Cact. Gen. Nov.: 73.

? *Cereus articulatus* Pfeiff., Enum.: 103.

? *O. articulata* Lk. et Otto in Allg. Gartenz., 1 (no.) 46.

? *O. polymorpha* Hort. in Pfeiff. l.c.

Weber's brief description of var. *calva* is quoted separately. The list of synonyms omits *Cereus syringacanthus* (evidently regarded by Schumann as obscure, cf. our discussion under *O. diademata* Lem. above and his note in Gesamt. Kakt.: 693, under *O. platyacantha*) and also of course the varieties from Spegazzini which postdate Schumann's publication. Apart from these, all the original publications and their leading synonyms which we have considered above are included. We have already given reasons for thinking that var. *oligacantha* Speg. is hardly to be distinguished from *O. diademata* Lem. sensu stricto and that var. *calva* is in fact not very easily separable from the adjacent forms. As regards var. *polyacantha* Speg., we think there can be little doubt that this should be taken to belong at least within the wider interpretation of *O. diademata* which Schumann proposes, though at present its identity remains unconfirmed.

The outsize glochid or bristle found by Lemaire upon his *O. turpinii* is not easy to explain. The upper part of the areole is not where one would usually expect to find an incipient second spine among the plants so far considered in this group. Moreover one might suppose that this would have revealed its

nature within reasonable time. The location of the spines within the areole is however somewhat variable, and we note as a possible subject for further detailed enquiry the question whether there is some increased tendency to displacement among the turpinii material.

As Backeberg rightly points out, there is a sad history of confusion over *turpinii* from Salm-Dyck to Borg which we find so self-contradictory as not to be worth putting before the reader. We have already noted that Lemaire, while he considered the possibility that *Cereus syringacanthus* might belong here, complained that Pfeiffer's account was too vague to be conclusive. However this may be, Lemaire himself fell into the opposite trap of describing too precisely one particular state of a very variable plant—a state which we have ourselves seen in imported plants, but which is not reliably maintained and cannot warrant taxonomic separation from *diademata*. Forms with three heavily reflexed flabby spines are met with, as well as those with two or one. And this characteristic appearance is combined in our experience on the same plant with segments with splendidly curling or unstanding stiff whitish papery spines, these being at a different stage in the life-cycle, and occasionally elongated more or less spineless segments as well.

It would seem from the figures which Lemaire quotes for his *turpinii* that the areoles on this plant were particularly close-set. This is suggested by a necessarily rough comparison (noting that Lemaire's measurements can hardly have been from centre to centre but must surely have been taken from right hand edge of one areole to left hand edge of the next) with the wide spacing indicated by the figures given by Philippi for his *papyracantha*. The areoles also vary considerably in size throughout *O. diademata* as interpreted in the wider sense by Schumann (cf. Lemaire's repeated remark that the areoles of his *diademata* were small); indeed it can easily be confirmed that both areole size and spacing vary, not only proportionally (i.e. independently of absolute size of growth) but also independently of each other. This variability is doubtless another aspect of the polymorphism to which Spegazzini and others refer.

***O. diademata* var. *inermis*** Spegazzini, Cactearum Platensium Tentamen: 511 (1905).

Articulis viridibus cylindraceis (50-100 mm long., 20-35 mm dia.) rectis vel incurvo-subbotuliformibus, transverse corrugatis, areolis infossis parum manifestis semper inermibus.

“With green cylindrical stem-segments, 50-100 mm long, 20-35 mm broad, straight or with a curved almost sausage-like shape, transversely wrinkled, with sunken hardly apparent areoles always spineless”.

Syn. *O. strobiliformis* Berg. Kakteen: 53-4 (1929).  
*T. articulatus* (Pfeiff. ex Otto) Backeb. var. *inermis* (Speg.) Backeb., in Cactus (Paris), 8: 249 (1953) sec. Backeb. Die Cact., 1: 257.

Here, by contrast with what has gone before, seems to be a distinctly different and reliable entity. Some shrewd observers have regarded it as a separate species, as which it was described by Berger. A comparison of Spegazzini's photograph (Revista Arg.

Bot., 1: 200) with Berger's (l.c.) leaves absolutely no room for doubt that they are both specimens of the same plant. It is difficult in retrospect to understand why Berger should have embarked on this unnecessary exercise. There were enough genuine novelties in his “Kakteen” to impress anyone. His description is nevertheless, we think, an improvement on Spegazzini's and may be rendered as “Stem-segments longish, matt grey-green, 7-8 cm long and 3½ cm thick; lightly tuberculate; the tubercles defined into roundish-rhombic areas by transverse curved lines fading off crosswise. Areoles small, scarcely felted. Glochids not numerous, grey; spines lacking (invariably?). Younger segments with conical wart-like tubercles six-sided at the base, brownish at the point. Areoles small, with white flaky woolly felt hanging out and light to dark brown glochids”. (Kakteen: 53-4). He may have been influenced in his decision to treat this as a new plant by his view over twenty years earlier that Spegazzini's var. *inermis* “perhaps would correspond with the *O. calva* Lem.” He obtained his plant from Fr. Ad. Haage Junior.

It is fairly clear that the capacity for spine production is present throughout the group and is characteristically undeveloped in the case of both var. *calva* and var. *inermis* but not always completely. The elongation of var. *inermis* segments is characteristically considerable but Lemaire stressed that a certain amount of elongation was characteristic of some of his *calva* material (Cact. Aliq. Nov.: 37). Plants may be seen which seem to stand mid-way between the two, and we have seen too many different inter-forms for separation at specific level to remain convincing.

#### **The Flower of *O. diademata* (after Philippi, Spegazzini, etc.)**

The flower, in the *diademata* material discussed up to this point (and indeed, so it would appear, throughout the *O. diademata* group), is generally found to be white or whitish or faintly rosy, and comparatively large. There are many absolutely reliable reports to this effect, including Spegazzini's final (1926) very clear and authoritative description. However, it happens that the two earliest references to the flower (Philippi, 1872, and Spegazzini, 1905) record it as small and yellow. Each of these two reports is for one reason or another attended by some uncertainty, and we quote them with this proviso. There may thus perhaps be a part of the *diademata* population which bears yellow flowers, but we feel that on the existing evidence this should be regarded as an open question which needs further investigation. The light yellow flower given by Britton and Rose for their *glomerata* affords no further evidence, for it is not particularised to any plant in the wide range which they treat together, and may well have relevance to *platyacantha*.

Philippi, in a note accompanying the description of *O. papyracantha* given above, quotes a report (but only at second-hand) that its flowers are “brilliant yellow, quite of the form of an opuntia flower, but very pale and rather small.” As some of the material is said to be “bald” there can hardly be confusion with *platyacantha* here. Philippi's colour (altered by Schumann in his description of *O. diademata* to “pale yellow”) was questioned by Berger (Bot. Jahrb., 36: 450-1, (1905)) on the basis of the specimens

actually flowering at La Mortola, Italy, in 1904 "magnificent pure white, only in fading faintly rose-coloured." As he said, the La Mortola plants agreed accurately with *O. turpinii* Lem. and had been so labelled for years. This doubt as to flower colour was the only reason why he did not at that time accept the view advanced by Schumann (with apparently Weber's support) that *turpinii* itself as well as *papyracantha* were really combinable under *diademata*.

Spegazzini provides three descriptions of the flower of *diademata*: in Cact. Plat. Tent.: 510 (19051; in Anal. Soc. cient. Arg., 99:101 (1925); and in Revista Arg. Bot., 1:200 (1926). The first is the other doubtful source to which we refer above. It is unparticularised as regards any one of the three varieties of *diademata* described at the same time, and the colour is given as yellow. In the second, a description of the flower of "*O. glomerata* Haw." (i.e., *O. glomerata* sensu Br. et R., the plant being expressly identified as *O. diademata*), the colour is again given as yellow: but this is stated to have been a mistaken inference from preserved material in the preface to the third description of the following year. This last is taken from living specimens of "*O. glomerata*" vars. *oligacantha* and *inermis*, and gives the colour as white. We quote from the first and third of these descriptions. The 1905 description, which Backeberg relied upon for the ascription of a yellow flower to his *T. articulatus* var. *diadematus* (cf. Die Cact., 1:256) and which seems to agree with Philippi's *papyracantha* in its specification of a small sized perianth and a yellow tint, is as follows:

Flores parvi subapicales, ovario glabro cinereo obovato turbinato (10 mm alt. et dia.) minute 20-24 subtuberculato-areolato, areolis infossis lanatulis et aculeolis brevissimis (0.5-1 mm long.) rubicundis adpressis armatis, corollis rotatis (20-25 mm dia.), phyllis flavis. Fructus sicci obovati (15-20 mm long., 10-12 mm dia.) sordide cinerei, pericarpio papyraceo-coriaceo frustulatum deciduo, intus grosse penicillato-glochidiato, glochidiis rubellis vel lividulis, semina (5-6 mm dia.) densissime constipata irreguliter orbiculari-polygona, scrupuloso-undulata, lignicoloria.

"Flowers small, almost at the tip of the segment, with a smooth ashen obovoid top-shaped ovary, 10 mm high and wide, minutely covered with 20-24 almost tuberculate areoles, the areoles sunken and rather woolly and armed with very short 0.5-1 mm reddish appressed bristles, with rotate corollae 20-25 mm in diam., and yellow phylla. Fruits dry, obovoid, 15-20 mm in length, 10-12 mm in diam., dirty ash-coloured, with a papery-leathery pericarp bit by bit deciduous, thickly equipped inside with glochids like a painter's brush, the glochids reddish or somewhat leaden, and seeds 5-6 mm in diam., very densely packed together, irregularly orbicular-polygonal, sharply wavy, wood-coloured."

It is difficult to know whether or not Spegazzini's final disavowal of the yellow-coloured flower (which expressly refers to the 1925 description) was meant to extend to this description as well. One would not have supposed the reference to preserved material to apply here, where the description suggests observations from the field, particularly in the details of the fruits. Yet the later statement that the flower is "never yellow" is categorical. A remark in the 1925 source that Spegazzini saw flowers "only . . . on one single occasion" is also puzzling, for it could suggest that he collected the material described above and the preserved material of the 1925 description at the

same time. This seems unlikely; but if it was the case then the two collections evidently differed, for the 1925 description quotes not only larger dimensions but a quite differently proportioned ovary.

At all events the 1926 description (Revista Arg. Bot., 1:200-4) is free of obscurity. Apart from the matter of flower colour this deals with larger flowers, even larger, indeed, than those of the 1925 note. Spegazzini explains that the description of the flowers of the "*Opuntia* (tephrocactus) *glomerata* Haw." in the previous (1925) note had been taken from "old specimens preserved in formol and which had been collected many years ago one afternoon in the neighbourhood of San Juan. The said specimens were not in very well preserved condition. I always cherished the desire to ratify my observations on new and, if ever possible, fresh material, which continued to present a serious problem for me, since my work did not permit me to visit Mendoza at an opportune season; fortunately in recent times, thanks to the kindness of Dr. Carette, I was able to build up a friendship with the Macola brothers . . . whose pleasure it was to . . . send me recently collected material about to flower; this material arrived opportunely to open its flowers in my own house, thus offering me the occasion not only to follow the evolution of the flowers but to verify biological particulars of great interest, and to be able through the medium of my friend Dr. Bruch to get good photographs. Before reverting to give a new detailed description of the said flowers I have the duty to correct a mistaken statement which slipped into the description and concerned the colour of the phylla or interior petals, which are tinted pink, more or less bright, but *never* yellow." The material which caused this gallant recantation was apparently confined to var. *inermis* and var. *oligacantha*, because apart from a description of new varieties of "*Opuntia* (tephrocactus) Bruchi Speg." the article concentrates on these two in great floral detail. He found little to distinguish them florally. The *oligacantha* flowers had "petaloid phylla somewhat more rounded at the apex and with generally little or no cleavage, showing a more homogeneous pinkish coloration without the longitudinal transparent streaks one usually notices on *inermis*, the stamens exhibit paler filaments, almost entirely white, the style is more swollen in its lower half and yellowish, thinner in the upper half and white like the stigma. The fruit is somewhat less globose and its seeds less numerous and more irregular." On var. *inermis*, in the course of a very detailed description, he noted that "the flowers appear in its native territory during the month of December and their duration of anthesis varies between 48 and 64 hours, they arise nearly always interspersed between two cormus segments, alone or on two opposite apices. The total length of each flower at the moment of anthesis is from 35 to 45 mm, thus equalling the diameter of the perianth when open. The almost cylindrical ovary (12 mm long by 10 mm diam.) is green on the outside, a little grey-green . . . the floral phylla are constituted in 6 to 8 series overlapping each other and increasing gradually in size from the bottom; those of the lower 3 or 4 series are fleshy green, oval and strongly mucronate, the upper or inside ones are more or less obovate or spatulate, hardly mucronate, and petaloid (30 mm long by 18-20 mm wide) of a beautiful white-pink colour, slightly yellowish in the throat . . . anthers pale yellow with plenty of pulverulent orange pollen. The

style (15-16 mm long without stigma) is . . . white-pink with an almost globose stigma (3-4 mm long and diam.) formed of 4-6 obtuse pink lobes."

**O. aoracantha** Lemaire, *Cactearum Aliquot Novarum*: 34 (1838).

Robustissima, suberecta, a basi jam ramosa, dumosa, cinereo-virens.

Articulis subconfertis, prorsus ovoideis, tuberculatis, juvenibus olivaceo-virentibus, deinde cinerascens, e rimis quae areolas arctiores bipartiantur et dilacerant oriundis, duos tresve pollices longis, duosque circiter in diametrum metientibus; tuberculis ad basim late subpentaedris, fere lineas duas altis, in mammulas leviter prominentibus, quorum et juniores hasce omnino simulant; areolis minimis, recentibus, tomento griseo parco, sicut et ad basim foliola minutissima, acuto-lanceolata, deplanata, munitis; biformibus aculeis; aliis circinatis, brevissimis, setaceis, rufo-griseis; aliis validissimis, rectis, divergentibus, inaequalibus, subspiraliter tortis, parumque applanatis, valde rugosis (operientibus densissimis, minutissimisque pilis, rigidis et subulatis, oculo nudo imperspicuis) in longitudinem a tribus aut octo lineis usque ad viginti et quatuor, etiamque multo amplius, assequentibus, griseis, fasciatim aliquando brunneonotatis.

"Very robust, nearly erect, already ramose at the base, bushy, ashy-green.

"With rather close-packed, absolutely ovoid, tuberculate stem-segments, olive-green when young later tending to ash-coloured, arising from Assures which bisect and tear asunder the narrower areoles, 5-7½ cm long, and measuring about 5 cm in diameter; with tubercles roughly 5 sided towards the base, almost 4 mm high, in the form of slightly prominent mammulae, and similar in all respects when young; areoles very small, when young, furnished with sparse grey woolly felt, as also with a very small sharply pointed flattened little leaf towards the base; —" (glochids) "—set in a circle, very short, hair-like, reddish-grey; —" (spines) "— very sturdy, straight, divergent, unequal, somewhat spirally twisted, and a little flattened, sharply roughened on the surface (with very dense very minute hairs, stiff and subulate, imperceptible to the naked eye) extending in length from 6-16 mm up to 5 cm and even much more, grey, sometimes marked with brownish stripes."

Salm-Dyck indicates (*Cact. Hort. Dyck*, ed. 2:71) that this is the same plant as *Cereus ovatus* Pfeiff. which is what Lemaire intended, to avoid a homonym. It has no connection whatever with *Opuntia ovata* Pfeiff.

Pfeiffer's version (quoted in *Die Cact.*, 1:261) offers glaucous instead of ashy-green as the main colour, remarks that the areoles are distant and says that there are 2-6 strong spines, sometimes blackish. Britton and Rose add (*The Cact.*, 1:91-2) that the segments are fragile and reach 8 cm in diameter. Both they and Backeberg record white flowers. Spegazzini gives a detailed account of the fruit in *Cact. Plat.* Tent.: 510. He observes that the species—which is described as "very distinct, though quite variable in colour, height, and number and length of spines"—is very common "in very dry slightly salty regions in Mendoza, San Juan, Catamarca, La Rioja and Jujuy."

"The corolla is rotate, large, white; the fruit dry, irregularly dehiscent bit by bit, nearly globose (25-30 mm high and wide) almost truncate above and indeed rather deeply umbilicate, and at this point often armed about the rim with 1-5 spines (5-25 mm long); the rather leathery pericarp covering (in place of flesh) thick little clumps of stiff bristles (or better, glochids?) within, of a reddish-white hue; seeds white, quite large, almost lentil-shaped (7-8 mm across), silky-glossy, often armed with tufts of glochids on one side or another, surrounded by a very thick corky unbroken obtuse wing."

Later, *Anal. Soc. cient. Arg.* 99:89 (1925), Spegazzini gives details of the flower, which we summarise as follows: —

Ovary top-shaped, 2½ cm long and thick, the external surface covered with prominences "like fish-scales" in 8-10 series sloping to the left; corolla consisting of ca. 6 series of segments, the outermost reniform or semidiscoidal (about 6 mm long and 10 mm wide), green and fleshy, the inner decidedly petaloid, broadly obovate, (23 mm long, 20 mm wide), white, rounded at the upper edge, faintly pointed; style cylindrical-fusiform (spindle-shaped) (25 mm long, 5½ mm thick) with 5 lanceolate, obtuse emerald-green lobes 5 mm long.

Syn. *O. ovata* Hort. *Angl. ex Otto* in *Allg. Gartenz.*, 1:367 (1833) nom. nud. (*O. gilliesi* Otto pro syn. nom. nud.) non *O. ovata* Pfeiff., *Enum.*: 144. *Cereus ovatus* Pfeiff., *Enum.*: 102 (1837) (*O. ovata* Hort. *Angl. non Pfeiff. pro syn.*) sec. S.-D., *Cact. Hort. Dyck.*, ed. 2:71. *Tephrocactus aoracanthus* Lem., *Les Cactées*: 89 (1868). *O. formidabilis* Walton, *Cact. Jour.*, 1:105 (1898). *T. articulatus* (Pfeiff. ex Otto) Backeb. var. *ovatus* (Pfeiff.) Backeb. in *Cactus* (Paris) 8:249 (1953) sec. Backeb., *Die Cact.*, 1:261.

Schumann considered but rejected the possibility that *Cereus ovatus* might be transferred as *O. ovata* K. Sch. non Pfeiff., and upheld Lemaire's name, *O. aoracantha* (*Gesamt. Kakt.*, ed. 1:691). He gave a photograph of the specimen in the Manchester (Darrah) collection in *Monat. f. Kakt.*, 12:172 (1902) reproduced in *Gard. Chron.*, ser. 3, 34:92. This photograph agrees well enough with the earlier one used by Walton (l.c.) and seems to have been accepted by Berger as a fair example of Lemaire's species. In the Darrah catalogue *aoracantha* is called "the Needle-spined cactus" but the shape of the spines on inspection of the Schumann photograph is not truly acicular. There is a variable amount of flattening and (more noticeably from the upper areoles) some twisting, as one would expect from Lemaire's description.

Britton and Rose separated this species from all others in our group and placed it in their series *Pentlandianae* next to *O. rauppiana*. They said it was "practically unknown in collections" and "very poorly described". They established a spine length of 13 cm in their text and altered this to a maximum of 20 cm in their key. This extension of Lemaire's "5 cm and even much more" disregarded the shorter spination on some specimens (e.g. that illustrated by Borg). Britton and Rose seem to have discounted all the morphological similarities to the other diademata material which they threw into their omnium gather-

um version of *glomerata*. The growth pattern is often identical. The segment size is no larger than the 8 cm observed by Backeberg in 1932 on a variety of what he then called *papyracantha*, and the spine length of the Rose material is not out of line with the 15 cm recorded by Backeberg there. Presumably it was the sheer solidity and thickness of the spines which led Britton and Rose to take up their attitude. If they had not been working on a single gathering of material from one particular site only in 1915 their conclusions might have been different. They evidently had detailed knowledge of one version only of what is now known to be a rather variable plant. The angularity of the spines varies and so does their straightness. The single segment illustrated by Britton and Rose is as strongly tuberculate as what has become increasingly accepted as *O. paediophila* since 1950 and has much the same disposition of spines (though they seem to be of a different cross-section).

Berger (Kakteen: 56) accepted Britton and Rose as to height of clump (up to 20 cm) and breadth (50 cm) and as to brown and black spines up to 13 cm long but described them as "angular, upright or bent", whereas Britton and Rose had "straight, a little flattened, roughish to the touch". Borg raised the height to 30 cm and commented on the iron hardness of the spines (the name means sword-spined).

Backeberg who borrowed many excellent illustrations for "Die Cactaceae" from Walter Kupper's "Das Kakteenbuch" (1929) for some reason did not use the superb photograph of *aoracantha* on p. 42. He may have thought it confusing because the spines in some cases are more flattened than one would expect, and would only need a slight curling upward along each edge for them to look positively concave above or somewhat keeled below. Admittedly one should use photographic evidence with caution but this illustration is exceptionally clear. Backeberg insisted that the plant with flattened awl-shaped spines (= *aoracantha*) should be treated as separate from the plant with "somewhat keeled" spines (= *paediophila*). He was undoubtedly right to suggest that they should be reduced to varietal status like *O. diademata* var. *inermis*, but unhappily his proposal of *T. articulatus* (Pfeiff. ex Otto) Backeb. as the typical form of his species is technically faulty and so automatically fails his varietal development of it. So at present Lemaire's name *aoracantha* stands, at specific level.

A striking specimen, with plentiful flower material, named *Cactus ovatus* and endorsed "Gillies" (ex Herb. Hook., 1867) is preserved under *O. aoracantha* in the Kew Herbarium.

It is perhaps worth noting that the very strong and densely criss-crossed spination of *O. alexanderi* var. *bruchii* is also rough under the lens like *aoracantha*. It should not be confused because *bruchii* spines are generally much shorter and of a blue or purple tint and the glochids are lightish rather than darkish as with *aoracantha*.

We now give *O. paediophila*, which although it is outside our period must be considered fully for a proper understanding of the group.

**O. paediophila** Castellanos in Lilloa, 23: 7-10 (1950).

Tephrocactus, Pentlandianae, pro subgenere magnus, 30 cm altior, articulatus, simplex, interdum 2-3-ramificatus. Articuli viridi-grisei, doliiformes ( $\pm 10$  cm longi x 7 cm lati), regulariter tuberculati; tuberculi

conici ( $\pm 15$  mm in basi x 8 mm alti) in apice areola instructi; areolae magnae, circulares, adultae  $\pm 4$  mm diam., iuveniles majores (5-10 mm diam.) fortique lanositate avellanea et floccis glochidiorum ( $\pm 5$  mm longorum) castaneorum lanositatum superantibus munitae. Spinae gladiatae, 4-7 (generaliter 5) ad fasciculos irregulares dispositae, flexibiles, haud pungentes ( $\pm 6$ -13 cm longae x 2-3 mm latae in basi), muricatae, pruinosa supra parum canaliculatae, infra naviculatae in statio humido zebrinae.

(This admirable description continues with full detail of the white (fading rose-coloured) flower, and the fruit and seeds).

"A Tephrocactus of the Pentlandianae, large for the subgenus, higher than 30 cm, articulate, single-stemmed, sometimes 2-3 branched. Stem-segments greenish grey, jar-shaped (more or less 10 cm long by 7 cm broad), regularly tuberculate; the tubercles conical (more or less 15 mm at the base by 8 mm high) equipped with an areole at the tip; the areoles large, circular, fully mature more or less 4 mm diam., the young ones larger (5-10 mm diam.) and furnished with strong woolly felt as on the husk of a nut and with hairs rising above the fleece of chestnut glochids (more or less 5 mm long). Spines sword-shaped, 4-7 (generally 5) arranged in irregular bundles, flexible, not at all sharp at the point (more or less 6-13 cm long by 2-3 mm wide at the base), but muricate. pruinose, on the upper side slightly canaliculate, on the lower side keeled and striped like a zebra when damp."

The author observes: "It has been seen by us in March of the year 1950 in San Juan between Marayes and Mascasin. This species has the appearance of *O. aoracantha* Lem. so far as concerns the dimensions of the stem-segments and the distant similarity of the spines, but it is different because the spines are not solid and not black but more of the nature of a shaving or splinter. Its habitat is the brackish ground of the plains; the specific name alludes to this last point."

The location among the Pentlandianae will refer to the series so named by Britton and Rose which according to them would include *O. aoracantha*. The present plants are very unlike *O. pentlandii*.

As to the name, there is a good Greek adjective for one who dwells in a plain or flat place (pedion—short e): pedionoma. If the plants like it there, *paediophila* would of course be etymologically acceptable; but the spelling with a diphthong in the first syllable is confusing and may even start some readers looking towards an entirely different and unlikely meaning.

Illus.: Castellanos, l.c. (drawing, type specimen, reproduced in Die Cact., 1: 274).

Krainz et Gräser (see below).

Backeberg, Die Cact., 1: 269 et seq. (1958).

Lamb, Pocket Encyclopaedia of Cacti in Colour t. 140 (1969); photographs.

Syn. *Tephrocactus hosseii* Krainz et Gräs. Sukkulenkunde, 4: 29-30 (1951).

*T. articulatus* (Pfeiff. ex Otto) Backeb. var. *polyacanthus* (Speg.) Backeb., in Cactus (Paris), 8: 249 (1953) sec. Backeb. Die Cact., 1: 258.



It is rather ironical that Castellanos should have, as he certainly has, the credit for naming the plant because Hosseus (who died in 1950) knew it well and earlier Spegazzini may have had it in mind when commenting wryly on Dr. Rose's "rediscovery" of *aoracantha*. According to Krainz and Gräser, the latter and Andreae and the Botanic Garden Berlin-Dahlem and the State Succulent Nursery Zurich had it in 1941 from Kesselring of Darmstadt as "Tephro. from Prof. Dr. Hosseus in Cordoba". Krainz and Gräser named it *Tephrocactus hosseii* but their name must under the rules of nomenclature yield priority because Castellanos published first. The authors of *hosseii* note that the Zurich plants "rooted and grafted on *O. imbricata* grew close and are luxuriantly spined but have so far not flowered. The plants with Herr Gräser in Nürnberg, grafted on *O. robusta*, on the other hand produced in the summer of 1951 some well developed flowers." It was no doubt for this event that they had very properly waited before publication. These authors give a height up to 60 cm, smaller segments (4-6 cm long by 2-4 cm diam.), fewer spines (2-4 or 5), but longer (up to 16 cm) and a larger flower (7 instead of 5-6 cm long) with a brown tint on the exterior petals. They say the spines are "flattened, more or less strongly twisted, erect or crooked, elastic and sharp, yellow brown, thereafter ashen."

E. and B. M. Lamb record a spine length of up to 23 cm for *paediophila* (Illus. Ref. 3 : 605) which seems to break the record set by *O. quimilo* K. Sch. which we have heard referred to by some lecturers as the longest spined *Opuntia*. As *quimilo* has so much more body it certainly does not give as effective an impression of spine length as a well grown example of the much smaller plant we are considering.

We do not doubt that the Swiss-German plants (described with grafted material under observation) are the same as that described by Castellanos. The conflict over the sharpness of the spines is probably not important: we have sharp *hosseii* of good provenance, and sharp *paediophila*. The more difficult question in our view is the fundamental one, which is whether the plant is properly separable from *O. aoracantha* Lem. On this, Castellanos rightly infers that at a distance the one can be mistaken for the other; and this would account very well for the curiously long delay in *paediophila* reaching botanic notice after all the other plants in the group. The 8 pale stigma-lobes and the scarcely umbilicate, apparently spineless fruits described by Castellanos suggest some distinction. We think from ungrafted specimens of both that we have examined that a differentiation is valid. We are impressed by the consistently more pronounced tubercles of *paediophila* (sometimes twice as high as those of *aoracantha*), the larger areoles of *paediophila*, and the fact that it retains spines on most of its areoles whereas *aoracantha*'s superb spination towards the top of its stem-segments, criss-crossing impregnably between areoles, actually tends to fall off and disappear as the segment grows from what become its lower areoles. Apart from this there is perhaps sometimes a nearly circular cross-section in spines on plants which otherwise correspond with the original *aoracantha*, as against the  $\square$  or sometimes flatter cross-section seen on *paediophila*: the detailed shape of spines is a surprisingly weak guide on its own in this particular area, as is their length, although for many *Opuntia* borderlines it is one of the more practical.

Our conclusion is that *paediophila* is an entity which we would accept with reservations as separable, but we would consider that there is a strong case for treating it only as a variety, not a species. In Backeberg's view, it is the variety *polyacanthus* of his *T. articulatus*. This, as we have explained, rests on a misreading of Spegazzini's *O. diademata* var. *polyacantha* and is also unacceptable on other grounds we have mentioned elsewhere. At present, the plant is validly described as a separate species, although the differentiation from *O. aoracantha* Lem. is weakened by what we have observed of the spination of examples from several sources.

## SUMMARY

The whole group can be reduced in practical terms to four firm entities.

- (1) *O. diademata* Lem. interpreted on the lines put forward by Schumann to contain a substantial polymorphic range within which no firm distinction can very usefully be drawn.
- (2) *O. diademata* var. *inermis* Speg. which can reliably be segregated as a variety of (1).
- (3) *O. aoracantha* Lem. which is another reliable segregate which we would prefer to see at varietal level parallel in the hierarchy with (2), and
- (4) *O. paediophila* Cast, which we would also prefer to see at varietal level and which does not appear quite as clear from (3) as was at one time generally accepted.

The above leaves an undifferentiated range within (1) displaying far wider but mainly transient differences than the narrow but persistent differences between them and (3) and (4). This is not tidy but they are not tidy plants, and the arbitrary imposition of a neatly balanced categorised system is not likely to contribute to their better understanding; indeed, in our view it may well mislead the inexperienced.

Within *diademata* itself there are intricate cross-combinations of minor characters suggestive of strains in a hybrid population. So far as we know, neither this nor the possibility of geographical races have been seriously explored. H. Blossfeld, describing a collecting expedition, used a phrase suggestive of the latter which we think worth quoting in its context. "Along the road leading westward, we then went into the province of La Rioja. Taken all in all, it is an unutterably barren and desolate region. Here we found a terrible landscape completely dried up, with only a few ruined houses of long forgotten human settlements . . . On the plains the vegetation was miserable. Stretches were overgrown with *Opuntia diademata*, which is here almost spineless, and with *Opuntia strobiliformis*." (Cact. Succ. Jour. Gr. Br., 4:28 (1935)).

Even in the case of (2) we have seen far too many interforms between it and the calva end of the range within (1) for separation at specific level to remain convincing, in our view. Marshall and Bock (Cactaceae: 64 (1941)) referred to the contradictions of interpretation in the thirties between Backeberg and Knuth on the one hand and Borg on the other over

*turpinii* etc. and leapt from this to

“Convenience is best served by accepting the oldest name *O. glomerata* for all the numerous variations of this very diverse plant and assigning varietal trinomials if a more critical division seems desirable.”

We have demonstrated in considerable detail why *O. glomerata* is not the oldest name for these plants and applies properly to others of a very different structure and growth habit, but the sentiment of the quotation seems eminently sensible to us if applied in a less sweeping manner to *O. diademata*. It then accords admirably with what we apprehend to have been Spegazzini's intention many years earlier, but which he unfortunately did not completely carry out. The weight of informed opinion of those most interested in these particular plants (and therefore most likely to advance their status in the hierarchy) is in our judgement in favour of regarding them as one species. It might be thought a superficially attractive

solution to propose that the entire coverage of *T. articulatus* sensu Backeberg, which covers the same total range as the present group, be reconstituted properly under *Opuntia*, thus validating the already spreading garden use of his varietal names (e.g. one of our own plants is referred to as *O. articulata papyracantha* in the R.H.S. Journal 91:324 (1966). and Krainz used *O. articulata oligacantha* and *syri-gacantha* in the 1967 catalogue of the Zurich Städtische Sukkulentensammlung), but the number and in some cases the definition of his names is, as we have regretfully indicated, unsatisfactory. We consider that further work may well confirm that a smaller number of infra-specific divisions is likely best to accord with the levels of distinction generally accepted elsewhere in the genus—possibly just the four indicated at the start of this summary.

There is no list of newer names here because we have already dealt with those which clearly belong to this group.

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## CULTIVATION.

In contrast to the *O. glomerata* group, the *O. diademata* group consists of plants with a relatively poor root system. They tend only to grow after a period of really hot weather and in this country the sort of dry heat required can normally only be achieved under glass for a few months because it must, for a mature plant, be combined with bright sunlight. The possibilities of extending the favourable period by artificial illumination combined with artificial heat have not, as far as we know, yet been systematically explored with these plants but might prove rewarding. Watering should if possible be from below. The use of an automatic or semi-automatic system will save moving plants about, but must be controlled separately from a general collection of cacti and with great care. A sand tray holding all one's plants of this group, with an inch or so of porous material below the pots, may be watered conveniently from one place in it provided that it is absolutely level: the state of the substrate can then be checked at one place with confidence that it is no damper anywhere else. The intake is very small compared with the *O. glomerata* group, but several segments can be grown in a season without much difficulty and the gradual development and change of colour and direction of the superb spines on some varieties is very rewarding to the patient observer. There is little doubt that this is the group of plants that attracts most people to Tephrocacti, and the fact that it is not the easiest should not deter the novice because several varieties are in fairly generous supply. Wintering should be very dry indeed and if such conditions can be provided they can safely be combined with temperatures not much above freezing. We have one or two mature plants which have survived several freezings of a few hours duration without any sign of damage. It is, however, possible to induce a state of brittleness in which whole sections of the plant may become disjointed, in the same way that has been noted by a number of writers in the case of the group of thin jointed S. American cylindrical *Opuntias* around *salmiana* (*salmiana spegazzinii*, *colubrina*,

*ipatiana* and so on). This is not necessarily evidence of bad cultivation, and may be equivalent to the way in which some of the creeping dwarf *Opuntias* spread themselves by shrivelling, detachment and re-rooting of the healthier younger segments. It seems likely to be a natural process, and results conveniently in fresh new plants. In the conditions of our own collection, which we would not claim to vary beyond the barely acceptable from the frankly bad, we have grown one *diademata* up to eight segments on two out of three branches, so the fragility aspect need not be taken too seriously.

It should be noted that any of the plants may from time to time produce fairly low down on the stem an isolated aberrant red-brown segment about 1 cm in diameter which does not seem to grow on as it should. Such segments are probably an indication of malfunction of the growth system like the fasciation or monstrose formations common among other *Opuntias*. The segments may be, and often are, easily detached and can with some difficulty be persuaded to root, when instead of increasing to normal size they will produce another miniature version like themselves. Some of these little runts have been passed around and tempted some collectors to imagine they are a different species. Others sold under the name of the parent plant have given that plant a rather undeserved reputation as a “bad doer”. We have not so far managed to nurse one back to normal sized growth but it should be possible, as we have found with other stunted plants.

It is commonly assumed that the plants are very difficult to flower. This has not often been achieved in this country. Apart from isolated cases of which we have heard which seem to have involved imported specimens where the buds are already formed hidden within the areole in more favourable climates, we can vouch for one recent case. R. F. S. Dale of Broxbourne, an experienced grower of all sorts of succulent plants, had a plant labelled *T. articulatus oligacanthus* which he grew from a rooted one-segment cutting obtained about 1961-2 from Brooks of

Crowborough, who had the plant from the Uhlig nursery in Germany. By 1968 this was an 18-segment plant, and produced 5 buds, 3 of which developed into flowers. The flowers (opening in mid-August) were from 2½ to 3 inches across and pale pink or pinkish white. Cultural treatment is summarised by Dale as, 4-inch plastic pot, winter temperature down to 34 °F (1°C), full sun position, maximum ventilation in glasshouse, and the compost a mixture of John Innes No. 2 with extra peat, some bonfire ash, added hoof and horn and Perlite. The plant put on 5 new segments during the growing season in which it

flowered. This is an impressive example of what can be achieved with reasonable conditions (and green fingers). One of us has had what appears to be a clone plant of the same Brooks-Uhlig provenance and grown it for several years in poorer compost with, we suspect, much less water and less ventilation but nearly as much sun. This has produced no flowers and few new segments but a remarkable strengthening of the spination, some of which is almost glossy black rather than brownish in the growing season.

## O. sphaerica group

*O. ovata* Pfeiff. non Hort. Angl.  
*O. sphaerica* Först.  
*O. dimorpha* Först.  
*O. rauppiana* K. Sch.  
*O. corotilla* K. Sch.

The plants we deal with here are not quite so highly differentiated from the generality of *Opuntiae* as those in the *O. diademata* group, but are equally essential to the *Tephrocactus* concept. They come from Peru as well as from Chile and Argentina. They have been known since the eighteen thirties and were at one time much prized by European plantsmen. Their popularity waned with the increasing distribution of quantities of doubtful or worse material (some of it not South American at all), as a result of which some of these interesting old species got an entirely undeserved reputation as dreary little weeds. This provided in its turn an unscientific incentive to devise different names for more recent consignments from the countries of origin, to get collectors to take a renewed interest. We say more on the doubtful material in the note on cultivation at the end of the group.

**O. ovata** Pfeiffer, Enumeratio Diagnostica Cactearum: 144 (1837) non *Cereus ovatus* Pfeiff., Enum.: 102.

*Opuntia articulata viridibus glabris ovatis; areolis approximatis, magnis, pulvinatis, densissime fuscolanuginosis; aculeis 7-8 inaequalibus rigidis rectis, junioribus fusciscentibus, tandem albis. Articuli oviformes, 1¼-1½ poll, longi, 8-10 lin. diam. Areolae 4 lin. distantes. Aculei 2-5 lin. longi. Foliola 1 lin. longa, viridia, subconica. Mendoza.*

“An *Opuntia* with green smooth ovoid stem-segments; areoles close, large, cushion-like, covered very densely with dark wool; spines 7-8, unequal, stiff, straight, darkening when young, finally white. Segments oviform, 3-4 cm long and 1½-2 cm thick, areoles 8 mm apart, spines 4-10 mm long and leaves 2 mm long, green, nearly conical. Mendoza.”

Illus. Sanzin in *Revista Chil. Hist. nat.*, 25: 117 (1921/1923), drawing; Lamb, *Illus. Ref.*, 3: 604 (1963), photograph.

Syn. *O. ovoides* Lem., *Cact. Gen. Nov.*: 73 (1839) (“*O. ovoidea*” in Bois, *Dict. Hort.*: 896).  
*Cactus ovoides* Lem. *Les Cactées*: 88 (1868).  
*Tephrocactus ovatus* (Pfeiff.) Backeb., *Kaktus-ABC*: 113 (1935).  
Non *O. ovata* Hort. Angl. ex Otto in *Allg. Gartenz.*, 1: 367 (1833) nom. nud. = *Cereus ovatus* Pfeiff., *Enum.*: 102 = *O. aoracantha* Lem. (1838) q.v.

Schumann fills in further detail: “Bushy, forming a hummock from plentiful branching. Hummocks loose. Branches upright, up to 12 cm high. Stem-segments set one above another, ellipsoid or cylindrical, up to 2.5 cm in largest diameter; bright green, dull, later yellowish, eventually grey, not tubercled. Leaves conical, 2 mm long, moderately long-lasting. Areoles circular, up to 2 mm diameter, clad with yellowish woolly felt. Glochids at first more buried, emerging to a length of 3 mm. Spines 5-9, up to 1.5 cm long, light yellow brown and curled on a new shoot, but soon white, subulate, erect. Fruit half-ellipsoid, deeply umbilicate, 1.5 cm diameter, spiny, leathery yellow . . . Seeds 3.5-4 mm thick, obovoid, almost spherical, yellow, dull, with a slight rim, others not encased, chestnut brown, glossy, somewhat smaller. The circumstance of the seeds having either harder less coloured or thinner more coloured coverings is very remarkable. As only one fruit was submitted to me it remains to be decided whether this condition is normal.” (*Gesamt. Kakt.*: 696-7). He added later: “Upon habitat specimens the areoles are much larger with abundant woolly felt and 2-6 large sturdy sharp reddish-yellow spines, which later become grey and fibrous; the glochids are dark yellow. In cultivation they change strikingly. The segments become slimmer, the large coloured spines vanish and small glassy thin spines appear, so that the plant is hardly recognisable.” (*Gesamt. Kakt. Nachtr.*: 153).

Britton and Rose (*The Cact.*, 1: 95) confirm much of Pfeiffer’s description on material collected at Potrerillos, Argentina but show the name in their key

under "Spines white, at least when young" in straight contradiction of their textual description "when young brownish, in age white". Borg has the spines "yellowish passing to grey". He notes "low, broad warts", although the Britton and Rose key has "joints not tuberculate". They note that these may sometimes be deep purple when young—a common characteristic in our experience of several green Tephrocacti and some Airampoae for that matter. They give the fruit as "ovoid (with) umbilicus curved outward"—a point on which Borg preferred to follow Schumann (Cacti, ed. 2:120). Neither he nor Britton and Rose mention Schumann's seed problem.

At least the flower seems to have escaped controversy. Spegazzini records it as like that of *O. darwinii*, with a rotate corolla, 2½-3 cm across, pale golden. "(Found) once only in the Cerro de los Cordobeses mountains near Mendoza". (Cact. Plat. Tent.: 512).

Backeberg, who places *T. ovatus* in his sub-series Sphaeric between *dimorphus* and *tarapacanus*, illustrates a West Argentinian collected plant with small almost globular stem-segments and a compact, not greatly superimposed method of growth, making a low hummock of the usual glomerata/andicola pattern. He notes that Hosseus thought *russellii* Br. et R. to be the same species, but disagrees because Rose observed both near Mendoza and *russellii* has flattened spines. The illustration is rather difficult to reconcile with either the Schumann or the Britton and Rose description, and Backeberg's other illustration of an unidentified plant which he calls similar is far closer to the Britton and Rose sketch he also reproduces. It has spination to the bottom of the stem-segments, of irregular length. On the collected plant spination is rather restricted to the upper areoles as usually happens in a tight clump in the case of many Tephrocacti.

Hosseus himself makes no mention of *russellii* in his discussion of *O. ovata* in Not. sobre Cact. Arg.: 45 (1939). He notes *ovata* as a small species which grows amongst shrubs at lower altitudes than *O. grata* and confirms Schumann's statement that the plant does not do well in cultivation.

Britton and Rose note that *sphaerica* often passes for *ovata* (The Cact., 1:96). The reference in their key to "Joints oblong" may have contributed to the widespread misconception that the stem-segments of *ovata* should be flattened. This is quite unwarranted. In theory 'ovate' is a term appropriate to a flattened shape while the corresponding terete shape should be called 'ovoid' but, with the exception of Lemaire, the early authors with whom we are concerned did not observe the distinction. Pfeiffer himself uses the same word 'ovatus' to describe both *Cereus ovatus* (*O. aoracantha*) and the present species. There is nothing in his description to support any suggestion of a flattened stem-segment. The fact that Lemaire places *O. ovata* Pfeiff. under the heading "Articulis ovato-teretibus; rameaux ovoïdes", and the fact that he, Schumann and Backeberg are at least agreed on a terete form seem totally convincing. The elongation in cultivation mentioned by Britton and Rose is not the same thing as flattening. The plant in several collections labelled "O. ovata leoni" (a corruption of *O. ovata leonina*) does not belong here, being a form of *O. longispina* Haw. very near to the species itself. Backeberg at one time thought that there was some *ovata leonina* Hort. which might be relevant here but this must have been some other nurseryman's use

of the name with which we are not familiar. The plant to which we allude is closely related to the one labelled "O. leonina", as to which see under *leonina*.

We have seen most diverse forms claimed as *ovata*. One of these is apparently a form of the North American *O. fragilis*, while another is a strongly tuberculate plant near *subinermis* but with white spines and bright green stem-segments. It is undoubtedly an elusive plant to identify, remarkably so in view of its recognition by most of the main authorities. The plant whose photograph we cite from Illus. Ref. is one which the Lambs had had many years and, though difficult to reconcile with some of the other illustrations mentioned, appears to agree with Sanzin's and is as near to what we infer to be the original entity as any we have seen.

Material endorsed "Mendoza, D. Gillies" and in another hand "Opuntia ovata Pfeiffer" is preserved in the herbarium at Kew (ex Herb. Hook., 1867). The sheet also has a label bearing in a third old hand another name which we take to be "Cactus Sidrianus". We have not found this elsewhere in the literature.

We do not accept Britton and Rose's relegation to synonymy here of *O. monticola* R.A. Phil., *O. ovalle* Gay and *O. grata* R. A. Phil, because it appears to involve rejection of significant parts of the descriptions and we do not know on what basis, if any, this may be justified. We deal with these under "Unassigned Plants".

**O. sphaerica** Förster in Hamburger Gartenzeitung. 17: 167 (1861).

"Type specimen 10 cm (4 Zoll.) high. Branches fairly erect. The greenish-brown stem-segment of the type plant is absolutely spherical and 5 cm (2 Zoll.) thick: the new segments immediately arising from it, on the contrary, have a lively bright green colour and an almost ovoid shape since their growth is not yet complete. Areoles large, thickly beset with bristles which are blackish-grey on the main segment but a dirty golden colour on the young growth. Leaves small and very short-lived. Spines stiffly erect, subulate, spreading, unequal; on the main segment 12-22, blackish-grey, up to 2½ cm (12 lin.) long, on the young segment 10-12, whitish, shorter.—Prov. Arequipa, Peru."

Illus.: Britton and Rose, The Cact., 1:96 (1919); Backeberg, Die Cact., 1:302 et seq. (1958); photographs.

Syn. *Tephrocactus sphaericus* (Först.) Backeb., Kaktus-ABC: 111-12 (1935).

? *O. staffordae* Bullock, Cact. Succ. Jour. Gr. Br., 8:15 (1939).

Schumann said he did not know this plant (Gesamt. Kakt.: 749) but he described what was at least a very close relative as a separate species *rauppiana* q.v.

Britton and Rose (The Cact., 1:96) contribute helpful detail. The areoles "sometimes nearly (hide) the surface of the joint with brown wool". "Spines variable as to number . . . brown at first . . . 1-4 cm long, usually stiff; flowers 4 cm long, deep orange; petals obtuse; fruit globular, often very spiny, seeds globular, white, 4 mm thick, surrounded by a thin broad band . . . Common about Arequipa, where it

is called 'corotilla' . . . also in Chile." They relegated to synonymy under it *O. dimorpha* Först., *O. leonina* Haage et Schmidt ex Regel, *O. leucophaea* R. A., Phil., *O. corotilla* K. Sch. and *O. phyllacantha* Haage et Schmidt ex Regel, but there are difficulties about all these which appear to have distinctive characters not only in the eyes of their authors but in several cases of later workers as well.

Backeberg established a sub-series Sphaerici in "Die Cactaceae" which includes the five species we deal with here (one, *rauppiana*, reduced to varietal status as *T. sphaericus* var. *rauppianus*) and one (*T. tarapacanus*) from our Unassigned Plants, together with a number of newer names both at specific and varietal level. He made further modifications in his last book, "Das Kakteenlexikon" (1966) e.g. ". . . *rauppianus* . . . I take today only for a somewhat weaker spined form of *T. sphaericus*; the young shoots resemble each other so much". His relegation of *O. staffordae* to synonymy under *sphaericus* (Die Cact. 1:296) is one we have to take on trust. He never explained it fully and we have seen no authentic specimen. It obviously belongs in this group but we would not care on a single photograph and the short description to say which of the predescribed taxa it might belong to, if any. It is of interest to note that Miss D. Stafford found it in 1937 at three different places, Cachendo in Arequipa, Yura and San Antonio de Esquilache, at altitudes varying from 1000 to 4200 m which suggests a fairly well established form.

The name *O. sphaerica* is of course widely misused in much the same way as *O. ovata* but with less reason, because reasonably reliable material is available from time to time. The plant grows rather slowly so clumps are often small, less than twenty segments for a good many years. The spines can be more or less porrect (photo in The Cact. ut sup.) or more deflexed (photo in Die Cact., 1:303) but they are so dense and untidy and cover the segments so thoroughly that one knows fairly easily when one is in the presence of either *sphaerica* itself or a very close relative. Borg tried dividing the spines into radials and centrals (Cacti, ed. 2:118) but this is not in our experience helpful here. The plant illustrated by the Lambs (Illus. Ref., 3:608) has been much propagated by cuttings and is probably the indirect source of most of the correctly named plants in this country. We have compared it carefully with material of other provenance (Innes, the German nurseries etc.) which we accept as reasonably authentic even if modestly described as "sphaerica (form)" or "sphaerica var." and with what is generally passed as the *O. kuehnrchiana* Werd. et Backeb. of 1931, of which a variety *applanata* was sketchily described at the same time. One of us has also examined a plant from France which corresponds closely with the illustration of *applanata* in Die Cact., 1:300. It seems likely to us that the specific status of *kuehnrchiana* is open to question. We note this here as a promising field for further study, to establish just how far *sphaerica* could usefully be extended to embrace some of the newer names based on minor and possibly unreliable distinctions. Ritter in 1955 took a different approach calling *kuehnrchianus* a variety of his *T. campestris* of which we have not seen any publication but which we think may be *O. dimorpha*, q.v. In 1957 he called both *kuehnrchianus* and *sphaericus* varieties of an unknown to us *T. berteri*. (For references see Backeb., Die Cact., 1:294, footnote, and 6:3601). The name

*berteri* comes from an 1833 description by Colla of a Chilean plant which Britton and Rose treated as a synonym of *Neoporteria subgibbosa* (Haw.) Br. et R.

***O. dimorpha*** Förster in Hamburger Gartenzeitung, 17:167 (1861).

"The 3 type specimens are 15-20 cm (6-8 Zoll.) high. Main stem-segment roughly ovoid, brown-green, 3½ cm (18 lin.) thick; branch segments ovoid, cylindrical or cucumber-shaped, somewhat tapered at each end, a lively bright green, rather upstanding, at least 10 cm (4 Zoll.) long by 2½ cm (12 lin.) thick. Areoles rather large, rather close, not elevated, thickly beset with sulphur-yellow bristles. Leaves small and very short-lived. Spines 6-8, unequal, widely spreading, usually 2-3 longer, the short ones whitish, the longer brownish. On the old stem-segment however 6-12 subulate spines are found, of a pearl-grey colour with dark tips, the longest reaching to 4 cm (20 lin.)—Peru."

Illus.: Backeberg, Die Cact., 1:312-4 (1958); photographs.

Syn. ? *O. campestris* Br. et R., The Cact., 1:99 (1919). *Tephrocactus dimorphus* (Först.) Backeb. in Repert. Sp. Nov., 51:65 (1942).

? *T. campestris* Ritt. nom. nud. FR 242 (1955) ex Backeb., Die Cact., 6:3601 (1962).

It is obvious that this plant described by Förster at the same time and place as *sphaerica* was not just bigger. It lacked the absolutely spherical segment of mature *sphaerica* material and was differently and less heavily spined. But the eponymous "two forms" are rather suspect. Backeberg in a footnote (Die Cact., 1:299) suggested that the cucumber-shape mentioned was probably due to unfavourable cultural conditions, and we would say the same of Förster's reference to cylindrical growth. As already noted, Britton and Rose thought this was just *sphaerica* again, but Backeberg's photographs support some distinction as does our material. The plant as we know it has close-packed, regularly elliptic segments, close woolly areoles with about six spreading spines each, the outer whitish the inner darkish (but not always). This seems reconcilable with Förster. Backeberg also makes the interesting suggestion that *O. campestris* Br. et R. is a mere redescription of it: ". . . joints globular or a little longer than thick, 3-5 cm long, with numerous prominent areoles, tubercles conspicuous when young; . . . glochids conspicuous, numerous, yellow; spines usually wanting at the lower areoles, present above, very unequal, 5-10, acicular, the longest 3½ cm. Flowers rosy white to light yellow . . . ovary naked or spiny; fruit thicker than long . . . with deep umbilicus . . . Pampa de Arrieros, Peru." (The Cact., 1:99). We are not entirely sure of this because we have only heard of yellow flowers on *dimorpha* and as far as we know it is smooth rather than tuberculate and spined low down on the segments.

Two specimens in the Kew Herbarium ("Opuntia. W. Tropical S. America" series) should be mentioned here. One (Paul C. Hutchison no. 1230, Peru, above Nasca, Prov. Lucanas, Dept. Ayacucho, at 1730 m (1957)) was named *O. dimorpha* Först. by its collector but is preserved as *O. sphaerica*. It comprises two smallish globose pieces with large close woolly areoles. The stout, close-set, erect spines, though

numerous, are generally fewer and relatively larger than on the usual *sphaerica*. Hutchison notes that this plant is known locally as "choclo". The other (Stafford no. 954, La Raya, Peru, at 14,500 ft. (1937)) is preserved as *O. campestris*. It is certainly different from Hutchison's plant, having distant areoles and far fewer, smaller spines. The flower is noted as yellow.

We have a theory that both *dimorpha* and its more recently described variety *pseudorauppiana* might better be viewed as two positions on the perimeter of a wide *sphaerica* complex, but as we are not yet ready to map out the rest of it we can say no more here. They are both attractive plants, more often obtainable in this country than the earlier members of the group, probably because cuttings root and grow on a little less slowly.

**O. rauppiana** K. Schumann in Monatschrift für Kakteenkunde, 9: 118 (1899).

"Stem-segments ellipsoid, somewhat narrowed at both sides" (? or at both ends—"an den beiden Seiten verjüngt"), "leaf-green, later grey-green, grey below, like a potato, up to 7 cm long and 4 cm in greatest diameter. Areoles set in 5 and 8 intersecting spirals, round, up to 5 mm across, beset with yellowish wool which later becomes grey; glochids bright yellow, up to 5 mm long, not very sharp. Spines at first about 12-14, later up to more than 20, white, bent round, up to 2 cm long, not sharp, especially when older. Originates at all events from the Andes."

In Gesamt. Kakt. Nachtr.: 153 (1903) the author adds the following brief diagnosis: —

Articulis ellipsoideis apice rotundatis viridibus dein cinerascensibus; aculeis initio 12-14 dein ad 20 albis flexuosis haud pungentibus.

"With ellipsoid stem-segments rounded at the top, green later becoming ash-grey; spines at first 12 to 14 later up to 20, white, twisting, not sharp."

Illus.: Schumann, l.c. engraving (1899); Kupper, Das Kakteenbuch: 144 (1929); Backeberg, Die Cact., 1: 308 (1958), photographs.

Syn. *Tephrocactus rauppianus* (K. Sch.) Backeb., Kaktus-ABC: 109 (1935).

*T. sphaericus* (Först.) Backeb. var. *rauppianus* (K. Sch.) Backeb. Die Cact., 1: 298 (1958).

*O. sphaerica* Först. var. *rauppiana* (K. Sch.) Rowl., Reun.: 25 (1958).

Britton and Rose (The Cact., 1: 92) accept this as a separate species but have little light to throw upon it. Their only illustration is a simplified drawing from Schumann. Kupper (op.c.: 147), although his striking illustration of part of a plant looks very healthy, comments that he only knows the species from "miserably grown cultivated specimens."

Borg (Cacti ed. 2: 117) notes the spines as soft as well as curly and hardly prickly. He gives La Rioja (Argentina) as origin, as did Knuth and Backeberg in 1935.

Backeberg evidently knew the plant better at least in cultivation. He notes that most of the spines are appressed but a few spread out and on young shoots they are moderately short and white, upright or 80

spreading sideways. He changed his mind several times about its status in the hierarchy, from species to variety and ultimately, as noted under *sphaerica*, to a mere form.

With our limited experience, we can only add that the spines on young growth of *sphaerica* are sometimes quite white and soft, and variable in disposition. There is room for doubt over the need to maintain *rauppiana* as a separate entity. A clue to its creation may be that Schumann failed to identify anything to his high standards as *sphaerica*. It may be that *sphaerica* goes through different phases as we have suggested to be the case with *platyacantha*.

A renewed suggestion of Argentinian habitat was made by Castellanos (Lilloa 23: 13 (1950)) but rejected by Backeberg (Die Cact., 1: 217). Apparently, he thought (1958) it would come from Peru.

**O. corotilla** K. Schumann in Botanische Jahrbücher, 50 (1914) Beiblatt 111: 28-9 (1913).

Caulis humilis, articulatus, laxe ramosus. Articuli globosi vel ovato-oblongi. Areolae remotae parvae, tomentis, glochidiis permultis erectis, aculeis 0-7 inaequalibus obsitae. Flores singuli in articulis; ovarium late infundibuliforme, tuberculis decurrentibus glochidia erecta aculeosque 1-2 minores gerentibus obsitum. Perigonii phylla pro rata pauca, exteriora parva squamosa, interiora ca. 12 cuneata, obtusa, apice emarginata; stamina quam petala multo breviora, numerosissima, toti parieti tubi densissime insidentia; filamenta brevia, sursum gradatim paullum longiora atque validiora; antherae parvae; stylus crassissimus, sub stigmatibus multis brevibus paullum angustatus. Fructus anguste umbilicatus, ceterum ab ovario non distinctum.

"Stem low, segmented, loosely ramose. Segments globose or ovoid-oblong. Areoles distant, small, filled with wool and very many erect glochids, and with 0-7 unequal spines. Flowers solitary upon the stem-segments; ovary broadly funnel-shaped, covered with decurrent tubercles bearing erect glochids and 1-2 smaller spines. Perianth segments few in proportion, the outer small, scale-like, the inner ca. 12 wedge-shaped, obtuse, with emarginate tip; stamens much shorter than the petals, very numerous, very densely distributed over the entire wall of the tube; filaments short, gradually a little longer and thicker higher up; anthers small; style very thick, slightly narrowed beneath the many short stigma-lobes. Fruit narrowly umbilicate, in other respects not different from the ovary.

"A small, loosely branched plant up to 15 cm high. Stem-segments globular to longish-ovoid, the longest, lowest, 6 cm long, the remainder up to 2 cm thick. Areoles, especially on the lower part of the stem-segments, fairly distant, round, up to 3 mm across, somewhat woolly, with numerous erect glochids up to 3 mm long, and 0-7 spines of which the longest is sometimes rather over 3 cm. Flowers always solitary near the top of the stem-segment; 3½ cm long overall. Ovary and tube together 2 cm long, broadly funnel-shaped, covered from the base to the upper rim with decurrent imbricate tubercles bearing a bundle of short erect glochids, up to 4 (sic) fairly weak spines up to 3½ cm long and a small lanceolate scale at the tip. Perianth segments few, the outer small, scale-like, up to 5 mm long, the inner 12 about 1½ cm long.

broadly spatulate, rounded above and with a heart-shaped depression in the centre; stamens very numerous, outreached at a distance by the perianth-segments, arising in a thick mass from the entire wall of the 1 cm high tube; filaments increasing somewhat in thickness and length from lower to higher, the uppermost up to 6 mm long; anthers small; style 14 mm long, very stout, almost 5 mm thick near the base, somewhat thinner beneath the short, closely-inclined stigma-lobes. Fruit deeply umbilicate 2 cm long. Seeds not very numerous, obovate, nearly 4 mm long, thin-walled. Flower colour at first cream, later rose.

"S. Peru, between Airampal and Pampa on the Arequipa-Puno road near a dried water-course, 3200-3400m; Weberbauer, no. 1412."

Illus.: Backeberg in Die Cact., 1: 308 et seq. (1958); photographs.

Syn. *Tephrocactus corotilla* (K. Sch.) Backeb. in Cactus (Paris) 8: 250 (1953) sec. Backeb., Die Cact., 1: 298.

Schumann (l.c.) notes that "corotilla" is the local name. Britton and Rose (The Cact., 1: 96) say that "corotilla" is applied in S. Peru to *O. sphaerica*, and refer this species there. According to Backeberg the local people use "corotilla" indiscriminately for several kinds of globular plants.

Backeberg (Die Cact. ut sup) includes *T. corotilla* in his sub-series *Sphaerica*. He observes that there is in S. Peru no other tephrocactus which has flowers at first creamy-white and later fading rose like these; and distinguishes a variety, *aurantiaciflorus* Rauh et Backeb., Descr. Cact. Nov.: 8 (1956) and Die Cact., 1: 299 (with flowers of a reddish-orange tint). He finds that the stem-segments of *T. corotilla* "are always purple-tinted, as Britton and Rose gave for their *ignota*", and refers *O. ignota* here. Britton and Rose, however (The Cact., 1: 99), describe *O. ignota* as being "much branched" with "small narrow" stem-segments "2-3 cm long, more or less purplish . . . spines 2-7 . . . the longest 4-5 cm . . . areoles large . . ." The flowers and fruit were not seen. The locality is given as Pampa de Arrieros, Peru, together with *O. campestris* (l.c.; see also under *O. dimorpha* above). From the descriptions, the habit and proportions would appear to differ in the two cases, and Backeberg's treatment would seem open to question.

Material endorsed Stafford nos. 856, 866, 942 and 1030, all from Peru (1937), is preserved in the Botany Department Herbarium, British Museum (Natural History) under *corotilla*. The flower is said to have been orange in three of these collections.

Varieties of *sphaerica* and *corotilla* more recently described are listed with other newer names after the discussion of Unassigned Plants.

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## CULTIVATION.

True *sphaerica* likes a dry, hot environment similar to the *O. diademata* group.

A great deal of the available experience of growing the present group of plants in this country relates not to the species described directly but either to more modern taxa closely related to them (and perhaps, on a conservative view, unnecessarily differentiated from them at specific level) or to the depressingly large quantity of unidentifiable material which may be accounted for in two ways: some of it derives in our opinion from the importation over more than a century of the products of natural hybridisation over a much longer period than that, and some of it from the persistent spread by vegetative reproduction of stunted results of what may indeed have been in the first place, for one reason or another, malformed growth. The former is, of course, of considerable interest in its own right but cannot conveniently be discussed here for reasons of space, because of the difficulty of establishing which material is meant without an elaborate series of diagrams, measurements and photographs, as well as full written descriptions, which would give it an altogether disproportionate importance. The latter is for those who like to care for the sick and needy, and do not expect quick results. We write with feeling, as one of us spent several years nursing a curiously contorted little object which turned out eventually, when it began to respond, to be one of the most rampant of the commoner *Cylindropuntiae*.

A private grower not mentioned earlier in the text, who has established his status as a grower of

the smaller and more difficult *Opuntiae* by succeeding in flowering *O. invicta*, is Dr. W. S. Merrett of Cheltenham. His methods with the *Tephrocacti* appear to have been promising with several in this group and near it, and are noted here because they differ from our own. He has used a fully glazed cold frame, with the plants in individual plastic pots standing on bare black polythene sheeting over a solid foundation. He only soaks the pots (removing them for the purpose) two or three times in the growing season, but is fortunate enough to be able to give them almost daily attention as to their cleanliness, and whenever weather conditions permit is apt to use a fine spray for overhead watering. We seem to recall that it was rainwater, and have the impression that repotting was a pretty regular annual event. Apart from exposure to all available sun, this has little in common with what we have generally found associated with success with the group, notably watering from below, free root run by bedding out or associating very small plants together in large pans (with of course the risk that any trouble will spread more quickly through the lot). We think that the moral to be drawn is that whatever techniques are employed there is no substitute for watching one's plants grow and getting to recognise the early signs of distress or trouble and being able to take the usually fairly obvious line of remedy right away. The astonishing way in which many *Tephrocacti* will stand long periods of neglect and abuse tempts many of us, no doubt, into too casual an attitude.

## O. corrugata group

*O. corrugata* S.-D.  
.....(var.) *monvillii* S.-D.  
*O. eburnea* Lem.  
*O. retrospinosa* Lem.  
*O. parmentieri* Pfeiff.

It now seems most likely that *O. corrugata* and (its synonym? or variety?) *O. eburnea* belong to the Airampo series of *Opuntia*, from S. Peru and N.W. Argentina and should not be considered as *Tephrocacti* at all. The Airampoae seem to belong to an altogether different line of descent; in the (at least partial) flattening of the segment and also in tubercle and spine formation they are far more akin to *Platyopuntia*. They may be closely parallel to the North American *O. fragilis* and *O. rhodantha*. However, all dwarf *Opuntias* were grouped together in the earlier sources, and Schumann's treatment of *Tephrocactus* as a subgenus still left this corner obscure; indeed, *O. corrugata* was included in *Tephrocactus* by so recent an author as Borg. *O. retrospinosa* and *O. parmentieri* still seem of doubtful affinity. We consider these five names together partly because they are intertwined by synonymy and partly because of the possibility of confusion between some of the plants and others which are indubitably on the *Tephrocactus* side of the boundary.

**O. corrugata** Salm-Dyck. Hortus Dyckensis oder Verzeichniss . . . zu Dyck wachsenden Pflanzen: 360 (1834).

*Opuntia articulata* erectis cylindraceis utrinque attenuatis laeteviridibus; areolis confertis, aculeis biformibus, subradiantibus e tomento pallido, superioribus setaceis minutissimis fulvicantibus, inferioribus 6-8 elongatis acicularibus albis.

Hoc nomine, omnino improbio, ex Anglia haec species pulchra advecta est. Articuli sesquipollicem longi, et diam. 4-6 lineari, erecti, nitentes ac laetissime virides, valde aculeati; areolae confertae foliolo minuto suffultae; aculei numerosi, 4-6 lin. longi. Accedit ad *O. sulphuream* sed longe diversa. Flores et patria ignota.

"An *Opuntia* with erect cylindrical stem-segments, narrowing at each end, bright green; areoles close-set; spines of two sorts, emerging more or less radially from the pale wool: those above, very tiny rather tawny bristles; those below, 6-8, elongated, acicular. white.

"Under this wholly inappropriate name, this beautiful species has been imported from England. Stem-segments  $3\frac{3}{4}$  cm long 8-10 mm in diameter, erect, glossy, and very bright green, very spiny; areoles close-set, supported by a minute leaflet; spines numerous, 8-12 mm long. Resembles *O. sulphurea*, but is very remote from it. Flowers and native country unknown."

Pfeiffer observes that the segments easily break off,

and that the leaves are rose-red . . . "differs from *O. sulphurea* in its thinner, more oblong stem-segments, close-set areoles and finer, shorter spines" (Enum.: 144). According to Weber the flowers are "reddish", the fruit red, and the seeds "corky" (Bois, Dict. Hort. 2: 896). Spigazzini records the species as common on the tablelands near the Calchaqui valley, Argentina: Prov. Salta and Jujuy (Anal. Soc. cient. Arg., 99:97).

Illus.: M. J. Martin in Cact. Succ. Jour. Gr. Br. 28: 30 (1966); photograph.

Syn. *O. corrugata* Hort. Angl. ex Otto in Allg. Gartenz., 1: 367 (1833) sec. S.-D., op.c.: 184.

*O. corrugata* (var.) *major* S.-D. (*O. eburnea* Lem. pro syn.), Cact. Hort. Dyck., ed. 1: 39 (1841), nom. nud.

*O. eburnea* Lem., Cact. Aliq. Now.: 35 (1838), sec. S.-D., Cact. Hort. Dyck., ed. 1 Adds.: 43 (1845) et ed. 2: 71 (1850).

*Cactus corrugatus* Lem., Les Cactées: 88 (1868). *Tephrocactus corrugatus* (S.-D.) Backeb., Kak-tus-ABC: 113 (1935).

*O. longispina* Haw. var. *corrugata* (Pfeiff.) (sic) Backeb., Die Cact., 1: 423-4 (1958).

*O. microdisca* Web. in Bois, Dict. Hort., 2: 896 (1893-99) sec. Backeb. *ibid.*

**O. corrugata** (var.) **monvillii** Salm-Dyck. Cactae in Horto Dyckensi, ed. 2: 246 (1850). (The varietal epithet is often misquoted as "monvillei").

Varietas  $\beta$ . in horto Monvilliano culta a specie differt articulis dimidio minoribus, confertioribus aculeisque spurco-stramineis basi fuscis.

"The variety grown in the Monville collection differs from the species in the stem-segments smaller by half and the closer-set spines a dirty straw-colour, dark at the base."

Syn. *O. monvillii* S.-D. (*O. corrugata* sensu Lem. ex S.-D. nom. nud. pro syn.), Index Pl. Succ. Hort. Dyck.: 52 (1843), nom. nud.

*O. corrugata* Hort. Monv. = *O. parmentieri* Pfeiff. (1838) (q.v.) sec. S.-D., Cact. Hort. Dyck., ed. 1 Adds.: 43 (1845), *non* ed. 2 (1850).

*O. corrugata* is listed between *O. ovata* and *O. longispina* in Cact. Hort. Dyck., ed. 2: 71-2; Mon. Fam. Cact.: 486-7, and Först., Handb., ed. 2: 909-10. The position is ambiguous, since *O. ovata* is undoubtedly a *Tephrocactus* while *O. longispina* appears to belong to the Airampo group. The stem-segments of



*O. corrugata* are originally described in such a way as to recall the description of *O. pentlandii*: but the term “cylindrical” is probably used rather broadly (cf. its qualification in the case of *O. pusilla* S.-D.) and the comparison with *O. sulphurea* suggests some flattening. This is confirmed in the description of *O. eburnea* (if we accept Salm-Dyck’s identification of the two) and in revised descriptions from Schumann (Gesamt. Kakt., ed. 1:696) and Britton and Rose (The Cact., 1:95). Both these sources, nevertheless, still retain the species under the subgenus *Tephrocactus*. The comparison with *O. sulphurea* appears to us rather unhelpful because even in its smaller forms it is so very much larger than *O. corrugata* and has such very stout spines. Backeberg (l.c.)—after some hesitation, according to his synonymy—finally refers *O. corrugata* to *O. longispina* as a variety. He doubtfully regards *O. corrugata* var. *monvillei* (sic) as another variety of *longispina* but is uncertain which. (Backeberg’s ascription of the authorship of *O. corrugata* to Pfeiffer is unconvincing. He observes, justly, that Salm-Dyck is usually meticulous in noting his own publications; and it is true that in this case Salm-Dyck refers to the species throughout as “*O. corrugata* Hort. Angl.,” finally qualifying this in the second edition of Cact. Hort. Dyck. by adding “Pfr., Enum.” This reference, however, only quotes the description from Hort. Dyck. oder V. given above, and we can find no other evidence that Pfeiffer contributed the latter).

The plant very commonly available in this country as *corrugata* has little obvious affinity to the established *microdisca* material (which belongs clearly within Backeberg’s reinterpretation of *longispina* in several varieties) and is a bright green plant so far as its newer stem-segments are concerned, with numerous clear white acicular main spines showing off very attractively the diminutive bright red leaves on the latest growth. Most of its stem-segments are nearer globose than cylindrical and the definitely flattened appearance of the segments of all other identified *longispina*-*microdisca* variants is missing. The segments wrinkle somewhat when the plant is resting, a characteristic of many flat-pad *opuntias* here recognised in the specific name, although many other species (e.g. *juniperina* from New Mexico) show it more markedly. We see no reason why it should not be retained as a species. Its identity has been somewhat obscured in recent years by some dealers selling it labelled “sphaerica” or “boliviensis”, or even “ovata”, all names which properly belong elsewhere.

The flower only of “*Cactus corrugatus*”, dated 1824 and endorsed “Gillies” (ex Herb. Hook. 1867), is preserved at the Kew Herbarium.

We give Haworth’s brief diagnosis of *O. longispina* for reference:

*O. articulis compresso-teretiusculis; spinis purpurascens, allisque minoribus fulvis, inaequalibus tereti, antiquissima triunciali* (Phil. Mag., ser. 3, 7: 111 (1830)).

“An *opuntia* with stem-segments flattened yet approaching a terete form; spines tending to purplish; some, smaller, tawny, and 1, thin, cylindrical, at its most mature (ca.) 7½ cm long.”

***O. eburnea*** Lemaire, *Cactearum Aliquot Novarum*: 35 (1838).

Ramosissima, prostrata, caespitosa, laetissime virens. Articulis ovatis, elliptico-compressiusculis, 1-2 poll. altis, 8 lin.—ca. 1 poll. et aliquando plus eo in diam. latis, imperspicue tuberculatis; areolis rotundis, 4-5 lin. distantibus inter se, tomento fusco, parco, brevissimoque munitis; aculeis biformibus; aliis piliformibus, lutescentibus, curtissimis, supra areolas penicillatim collectis; aliis divaricantibus, inaequalibus, nitide translucideque albis 8-12 in numero; inter quos 6-8 fere semipollicares, aut vix amplius, 3-4 poll, et ultra.

“Densely ramifying, prostrate, caespitose, very bright green. Stem-segments ovoid, somewhat elliptically flattened, 2½-5 cm high, ca. 1½-2½ cm and sometimes wider than that in diameter, imperceptibly tuberculate; areoles round, 8-10 mm apart, covered with sparse very short dark wool;” —(glochids)—“hair-like, yellowish, very short, gathered in a tuft above the areole,” —(spines)—“divergent, unequal, shiny translucent white, 8-12 in number, among which 6-8 are scarcely Hem or only just longer, 3-4 are 2½ cm long or more.  
“Origin unknown”.

Syn. = *O. corrugata* S.-D., Cact. Hort. Dyck., ed. 1 Adds.: 43 (1845) et ed. 2: 71 (1850).

*Cactus eburneus* Lem., Les Cactées: 88 (1868).

*O. corrugata* S.-D. var. *eburnea* (Lem.) Borg. Cacti, ed. 2: 120 (1951).

Lemaire considers this a distinct species from *O. corrugata* because of its larger size and longer, very shiny spines, and maintains the distinction between *Cactus corrugatus* and *C. eburneus* in Les Cactées. Apart from Borg’s treatment of *O. eburnea* as a larger, quicker growing variety of *O. corrugata*, all authorities regard the two as synonymous. Borg gives the origin as northwestern Argentina.

***O. retrospinosa*** Lemaire, *Cactearum Aliquot Novarum*: 35 (1838).

Caespitosa, ramosissima, humilis, saturate virens, ad areolas brunneo-purpurascens. Articulis numerosis, ad areolas paululum inflatis, cucumeriformibus, cylindraceis, divaricatis, brevibus, 12-16 lin. altis, 4-5 lin. in diam. latis, confertis, utrinque attenuatis (minus ad basim quam ad apicem); areolis minimis, tomento albido, vix prae tenuitate perspicendo, instructis, necnon remotiusculis; aculeis biformibus; aliis numerosis, setiformibus, 2 lin. aut 2½ longis, lutescentibus, penicillatim ad basim collectis atque ad extremum divaricatis, aliis 2 (rarius 3-4), eburneis, rigidiusculis. ab unoquoque areolae latere retro deflexis, aliquandoque subtus transversim altero super alterum superpositis, 2-3 lin. longis.

“Caespitose, densely ramifying, low, full green, becoming brownish-purple towards the areoles. Stem-segments numerous, very slightly swollen towards the areoles, cucumber-shaped, cylindrical, divergent, short, (ca.) 2½-3 cm high, 8-10 mm thick, crowded together, tapering at each end (less at the base than the tip); areoles very small, equipped with whitish wool scarcely noticeable for its sparseness, and also rather

distant;" —(glochids)— "numerous, bristly, 4-5 mm long, yellowish, in a tuft drawn together at the base and divergent at the extremity," —(spines)—"2 (more rarely 3-4), ivory-white, rather stiff, deflected backwards from each side of the areole, one sometimes transversely overlapping the other below the areole, 4-6 mm long.

"Origin unknown. Slightly approaches *O. pusilla* D.C." (sic).

Syn. = *O. parmentieri* Pfeiff. in Allg. Gartenz., 6:276 (1838) sec. S.-D., Cact. Hort. Dyck., ed.: 72 (1850).  
*Tephrocactus retrospinus* Lem., Les Cactées: 88 (1868).

This description suggests a plant somewhat distinct from *O. corrugata* but its identity became lost. Schumann did not know it (Gesamt. Kakt., ed. 1:696), and its more recent association with *O. corrugata* (Britton and Rose, The Cact., 1:95; Borg, Cacti. ed. 2:120) may have arisen through Salm-Dyck's alteration in the synonymy of *O. parmentieri* between the 1845 and 1850 editions of Cact. Hort. Dyck. The plants illustrated by Backeberg as *retrospinosa* in Die Cact., 1:431-2-3 look closely similar to others to which he attributed different identities. An incorrect spelling *retrospina* occurs in various earlier sources.

"*O. pusilla* D.C." may perhaps indicate *O. pusilla* S.-D. (q.v.) as quoted by Aug. de Candolle, Prodr. Syst. Nat., 3:472 (1828).

Lemaire's publication preceded that of *O. parmentieri* which now follows.

***O. parmentieri*** Pfeiffer in Allgemeine Gartenzeitung, 6:276 (1838).

*O. articulata* cucumeriformibus, pallide viridibus; areolis spiraliter dispositis, convexis, tomentosus, rubello-fuscis, inferne setis 2-3 stramineo-albis brevibus instructis; foliolis gracilibus atrovibris.

"An opuntia with pale green cucumber-shaped stem-segments; areoles spirally arranged, gibbous, woolly, dusky-reddish, equipped with 2-3 short straw-tinted white bristles below; leaflets thin, blackish-red.

"The initially somewhat tuberculate but soon quite smooth segments are 2½-5 cm long, 12-16 mm thick; the bristles 4-6 mm, and the leaves 2 mm long. Paraguay." (Details in the German text).

Syn. *O. corrugata* Hort. Monv. sec. S.-D., Cact. Hort. Dyck., ed. 1 adds.: 43 (1845) non ed. 2 (1850).  
*O. retrospinosa* Lem. sec. S.-D., Cact. Hort. Dyck., ed. 2:72 (1850).

? *O. longispina* Haw. var. *brevispina* Backeb., Die Cact., 1:426 (1958).

This plant again has long remained obscure and is perhaps past recognition now. It is not even listed in either of Lemaire's new genera in Les Cactées. From their respective descriptions it is not possible to be satisfied with Salm-Dyck's identification of *O. retrospinosa* with it, though presumably he was able to compare authenticated contemporary material.

We do not list any of the newer names which we consider closely related to the plants discussed in this group because they all appear to have been generally, and we think rightly, accepted as belonging to the Airampoae (see Backeberg, Die Cact., 1:418 et seq. and 6:3609 et seq), as has the obscure *O. aulacothele* Web. (1904).

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## CULTIVATION

The cultivation of *corrugata* and plants like it is extremely easy and should be out-of-doors in this country throughout the summer on a well drained site. There are two drawbacks to this. One is that a heavy downpour of rain when the plant is desiccated may, if followed by bright sun, cause browning and shrivelling of a number of stem-segments to the detriment of the general appearance. The other is that

slugs are very fond of eating right through the newer stem-segments. Both these natural hazards are repaired in time by new growth as the clump thickens and spreads. Some protection from cats and birds in the immediate vicinity is worth arranging. We have not established whether the plants are winter-hardy, but if very dry they do withstand slight frost inside a glasshouse or shed.

# Unassigned plants

- O. pusilla* S.-D. non Haw.
- O. tuberosa* Pfeiff.
- .....(var.) *spinosa* Pfeiff.
- O. ovallei* Gay
- O. grata* R. A. Phil.
- O. atacamensis* R. A. Phil.
- O. monticola* R. A. Phil.
- O. bicolor* R. A. Phil.
- O. leonina* Hge. et Schm. ex Regel
- O. phyllacantha* Hge. et Schm. ex Regel
- O. tarapacana* R. A. Phil.
- O. leucophaea* R. A. Phil.
- O. rahmeri* R. A. Phil.
- O. tuberiformis* R. A. Phil.
- O. australis* Web.
- O. nigrispina* K. Sch.
- O. purpurea* R. E. Fries
- O. subterranea* R. E. Fries
- O. weberi* Speg.
- O. molinensis* Speg.

We place here chronologically those species which seem to us to be isolated or anomalous forms together with those of which we have too little experience to be able to suggest or endorse a relationship. We omit *O. poeppigii* Otto Mss. ex Pfeiff., Enum.: 174 (1837), *O. maihuen* Gay, Fl. Chil. 3: 29 (1847) and *O. patagonica* R. A. Phil. in Linnaea, 33: 82 (1864-5) as belonging to *Maihuenia*; and also *O. heteromorpha* R. A. Phil. in An. Mus. nac. Chile, 1: 28 (1891) and *O. hypsophila* Speg., Cact. Plat. Tent: 509-10 (1905), which would seem to be within the *Cylindropuntia* range. We include, however, for completeness of the record, some comment on various names of the period which we have felt unable properly to associate with any living material examined by us, such as *pusilla* S.-D., *ovallei*, *monticola*, *leonina*, *phyllacantha* and *leucophaea*. Our position is almost the same on some names still in popular use, such as *grata*, where the difficulty of identity is closely involved with the difficulty of relationship. We have not felt it fitting in most cases to go so far as to recommend the discounting of these names as irretrievably lost because at any time fresh material may require their rehabilitation or at least suggest the possibility.

**O. pusilla** Salm Dyck non Haworth, Observaciones Botanicae, 3: 10 (1822) nom illegit.

*Opuntia* prostrata, divaricata, sordide virens; articulis cylindraceis cucumeriformibus, fasciculis spinarum approximatis; spinus setaceis albis, quibusdam elongatis erectis.

Obs. Locum inter *Op. curassavicum* et *fragilem* tribuendum, primae humilior, secundae major. Articuli sesquipollicares, omnino cylindracei nec compressi, utrinque attenuati, divaricati; fasciculi approximati; spinae inermes in apice articulorum elongatae, numerosae; tomentum albidum.

“A prostrate opuntia, branching, dirty green; stem-segments cylindrical, cucumber-shaped, with close-set bundles of spines, bristle-like, white, some lengthy, erect.

“Observations. Deserving a place between *O. curassavica* and *fragilis*; of a lower habit than the first, larger than the second. Stem-segments  $3\frac{3}{4}$  cm long, completely cylindrical and not flattened, narrowed at each end, branching; bundles close-set; spines not pungent, lengthy and numerous at the top of the stem-segments; wool whitish.”

Syn. *Tephrocactus pusillus* Lem., Les Cactées: 88 (1868).

Non *O. pusilla* Haw., Syn. Pl. Succ.: 195 (1812).

This seems to be the earliest *Tephrocactus* to have been described. We have not found any record of its more recent recognition, but it is clearly quite different from its homonym, a small platyopuntia, upon which see, e.g., Britton and Rose, The Cact., 1: 105. Pfeiffer (Enum.: 145) adds that the stem-segments of *O. pusilla* S.-D. are 10-12 mm thick and the leaves “short, broad, reddish”. Förster (Handb. ed. 1: 467) notes numerous “bristle spines” and single “spines”, the latter erect, rather stiff, white, brown-tipped, 4-8 mm long, rather longer at the top. Backeberg (Die Cact., 1: 252) considers the possibility that the plant might have some connection with his *T. weberi* var. *setiger*.

Salm-Dyck gives no source. De Candolle (Prodr. Syst. Nat., 3: 472) gives “Tropical America”, a very doubtful indication of locality for such a seemingly tephrocactus-like plant, but perhaps one suggested by association with the homonym. Haworth (l.c.) writes “America meridionali?” (sic) for the latter, which is usually quoted as from the West Indies.

If the form should be recognised afresh it will need another name, as Salm-Dyck’s homonym must yield priority to that of Haworth.

**O. tuberosa** Pfeiffer, Enumeratio Diagnostica Cactearum: 146 (1837).

*Opuntia articulata* cylindraceis, divaricatis, brunneis, imbricato-tuberosis; areolis minutis albis in tubercolorum vertice; aculeis 7-8 brevibus setaceis albidis. Articuli 2-3 poll. longi, 4 lin. diam. Foliola minuta brunnea. Mendoza.

“An opuntia with cylindrical divergent brown stem-segments, the tubercles overlapping; areoles insignificant, white, on the summit of the tubercles; spines 7-8, short, bristle-like, whitish. Stem-segments 5-7½ cm long, 8 mm thick. Leaflets tiny, brown. Mendoza.”

Förster (Handb., ed. 1:467 (1846)) describes the tubercles as “regular” and mentions a variety, *albispina* S.-D., said to have “very white spines”, for which we can find no reference in Salm-Dyck.

Syn. *O. tuberosa* Hort. Angl. sec. Pfeiff., l.c.  
*O. alpina* Gill, ex Pfeiff., l.c., nom. nud. (? *O. alpina* Hort. Angl. ex S.-D., Hort. Dyck, oder V.: 184 (1834), nom. nud.)  
? *Pterocactus tuberosus* (Pfeiff.) Br. et R., The Cact., 1:32 (1919).

Gillies is known as a collector and according to the Index Kewensis his *O. alpina* is only noted as a synonym.

*O. tuberosa* and its variety below are both hard to understand, and might have found a very doubtful place in the *O. glomerata* group through synonymy. Britton and Rose (l.c.) identify *O. tuberosa* with *Pterocactus kuntzei* K. Sch. On this interpretation, however, the above description, if it is the same plant, is somewhat puzzling. The specific epithet might be supposed to refer to the well-known tuberous root of the pterocactus, but the “tuberosis” of Pfeiffer’s description has reference to the tubercles of the stem; and the stems of the pterocactus are not strongly tuberculate, nor do the tubercles, such as they are have a noticeably overlapping appearance. It may perhaps be felt that the balance of the evidence is with Britton and Rose, rather for want of an alternative, but the species is evidently obscure, and there would seem to be a case for continuing to use Schumann’s name for the pterocactus as many growers have done. If however *O. tuberosa* is not the pterocactus we have no first hand knowledge of it.

**O. tuberosa** (var.) **spinosa** Pfeiffer, *ibid.*

Aculeis pluribus et longioribus, nonnullis applanatis.

“With spines in greater number, longer, several of them flattened.”

Syn. *O. platyacantha* Hort. Angl., Enum. ut sup. non *O. platyacantha* Hort. Angl. = *Cereus syringanthus* Pfeiff., Enum.: 103 sec. Pfeiff. in Allg. Gartenz., 5:371.  
= *O. platyacantha* Pfeiff. (var.) *gracilior* S.-D., Cact. Hort. Dyck., ed. 1 Add.: 43 (1845) nom illegit.

The indications are that this variety was in fact a very distinct plant. Förster (Handb. ed. 1:473) treats it under its synonym *O. platyacantha* var. *gracilior*

which as we note elsewhere is itself obscure.

Pfeiffer’s description could be taken to suggest the intriguing possibility that this was an early discovery of *O. australis* but is too brief for serious consideration from this point of view. Salm-Dyck’s description (q.v.) is likewise inconclusive. Lemaire observes “possibly another variety of *andicola*?” (Cact. Gen. Nov.: 72). We feel with reluctance that the variety is perhaps most safely regarded as beyond recognition.

**O. ovallei** Gay, Flora Chilena, 3:29-30 (1847).

*Opuntia dense caespitosus* (sic) trunco prostrato, ramoso, articulata ovatis; areolis minutis, albis; aculeis 4-6, complanatis, fulvo-purpurascens, infimis setaceis, quandoque penicillatis, superioribus elongatis, centrali longiori, 1 poll, plus minusve longi.

“A densely caespitose opuntia with a prostrate, ramose stem, the segments ovoid; areoles small, white; spines 4-6, flattened, tawny purplish, the lower ones bristle-like, at times in tufts, the upper more lengthy, the central one the longer, 2½ cm long, more or less.

“This species forms a tuberculate clump upon the ground, of a bulky outline, and has ovalloid stem-segments 16-20 mm long and half as wide. The areoles are small, covered with white fleecy hairs; in the centre there are 4-6 sharp flattened spines of a purplish brownish-red, very unequal: those about the circumference smaller, sometimes the thickness of a hair, at other times almost as long as the central spine, which is the longest and is 2½ cm long, a little more or less. The flowers are yellow, ca. 2½ cm across. Fruit truncate, somewhat cupuliform, 16 mm long and 12 mm in greatest width.” A final note states that the species flourishes at the height of the perpetual snows, from 12,819 ft. down to 6339 ft. (sic.) “In the latter case it forms a layer several inches thick and rather convex, but at higher altitudes the (?) tubercles disappear and the mass appears almost unbroken” (los tuberculos desaparecen y la masa se presenta casi unida). The flowers are said to open in November.

The references to a “tuberculate” mass and to the disappearance of the “tubercles” probably apply to the appearance of the plant as a whole. At higher altitudes the branches might well be seen to shrink closer together forming a less knobbly and superficially smoother clump.

This is the plant given by several authors as *O. ovallei* Remy. Remy was responsible for some other families in Flora Chilena, but so far as we know he left the Cactaceae to Gay.

Apart from a comparison by Philippi with *O. grata* (q.v.), in which the spines of the two species are expressly said to agree in being flattened, we have not found any record of subsequent recognition of this plant. The name is listed by Schumann as among those “insufficiently known” to him in Gesamt. Kakt., ed. 1:749. Britton and Rose refer *O. ovallei* to *O. ovata* (The Cact., 1:95) but in view of the apparent large size of the plant, its high station and the character of the spines this suggestion seems doubtful, and *ovallei* is perhaps best regarded, like *grata*, as still awaiting recognition. The plant illustrated by Backeberg (Die Cact., 1:316) cultivated with an *ovallei* label cannot, we agree, be rightly named.

**O. grata** R. A. Philippi in *Linnaea*, 30: 211 (1859-60).

*Opuntia articulata ovatis*, 18 lin. longis. 13 lin. crassis, pilis albis areolas 4-5 lin. inter se distantes vestientibus; aculeis 3-4 aequalibus, complanatis, fulvis, 10 lin. longis; floribus omnino luteis, pollicem longis, aculeis setiformibus 6-9 lin. longis, tubercula ovarii superiora tegentibus, squama ovata foliacea  $1\frac{1}{2}$  lin. longa fultis; foliolis calycinis ovatis obtusis, 3 lin. longis; stigmatibus erectis 3 lin. longis.

In Andibus Prov. Santiago prope argentifodinam las Arañas dictam inveni. Fructus edulis, sapidus. Ab *O. ovallei*, quacum aculeis complanatis, fulvo-purpurascens convenit, aculeis 3-4, omnibus subaequalibus, setaceis nullis, articulisque 18 lin. nec modo 8-10 lin. longis differt.

"An opuntia with ovoid stem-segments  $3\frac{1}{2}$  cm long,  $2\frac{1}{2}$  cm thick; with white hairs clothing the areoles, which are 8-10 mm apart from one another; spines 3-4, equal, flattened, tawny, 2 cm long; flowers entirely saffron-yellow,  $2\frac{1}{2}$  cm long, with bristle-like spines, 12-18 mm long, covering the upper tubercles of the ovary, supported by an ovate leafy scale 3 mm long; calyx-leaflets ovate, obtuse, 6 mm long; stigma-lobes erect, 6 mm long.

"I found it in the Andes. Province of Santiago, near the silvermine called las Arañas. Fruit edible, tasty. The plant differs from *O. ovallei*—with which it agrees in the flattened, tawny tendency to purplish spines—in having 3-4 spines, all nearly equal, no bristles, and stem-segments  $3\frac{1}{2}$  cm long, not just  $1\frac{1}{2}$  cm."

The accounts of *O. grata* currently available in Borg, *Cacti*, ed. 2: 119 and in Backeberg, *Die Cact.*, 1: 319 derive almost entirely from Schumann's revision of the species (*Gesamt. Kakt.*, ed. 1: 697-8) and after comparing Schumann's description with the above from Philippi, brief and lacking certain details though this is, one cannot avoid the suspicion that two different plants are indicated. We can do no more here than note the discrepancies and add that so far as we know *O. grata* still awaits recognition in a form which will take into account the three most striking characters given by Philippi: the flat spines, (small?) yellow flowers and edible fruit. This can only be hoped for from the field; and here the fruit should be strongly indicative, since according to Backeberg (*Die Cact.*, 1: 320) the only other tephrocacti for which edible fruits have so far been recorded are *dactylifera* and *ferocior*. Unfortunately none of these three characters are noticed in the most recent reference we have seen to *O. grata* in habitat, a brief mention in Hosseus, *Not. sobre Cact. Arg.*: 45 (1939). To make the position more uncertain, Hosseus commends Schumann's illustration. The material to which he refers is said to be typical of the High Cordilleras above 4000 m in the frontier regions of La Rioja and S. Juan.

A small piece of *grata* (ex Herb. Hook., 1867) in the herbarium at Kew is at present included under *O. ovata*. It is endorsed "Opuntia grata Ph. Cordillera de Santiago" and in pencil "1861 Philippi", this being the year after the species was published. Philippi is recorded as having distributed botanical material to many European herbaria (Stafleu, *Tax. Lit.*: 358) and we suppose that this piece originated from him. It includes an incomplete stem-segment

and a flower, which is 5 cm long including the ovary but only  $2\frac{1}{2}$  cm wide. The spines appear stout, but they are distinctly flattened, and in all respects as described. They stand close-set and erect from the top of the stem-segment. It appears that the "white hairs" are in no sense floccosa-like processes but merely normal areole-wool. A note upon the same sheet by an observer in 1887 which refers primarily to another unidentified specimen there may include this together with the *grata* in a reference to "purplish-red fruit of a sweetish taste . . . most refreshing and nutritious."

Schumann (l.c.) describes the spines of his plant as "spreading . . . 0-5, subulate, straight or slightly bent, yellowish, later greying, up to 3 cm long" and an engraved illustration (reproduced in *Die Cact.*, 1: 328) shows them as thin, acicular, spreading, and unequal. The stem-segments are said to be grey-green, ellipsoid or ovoid,  $1-4\frac{1}{2}$  cm long, and are shown as smooth. The flower, which seems to be shown in the engraving on a smaller scale than the rest, is described as ". . . 5-5 $\frac{1}{2}$  cm long overall. Ovary broadly top-shaped, weakly tuberculate. Areoles without large spines, supported by reddish 3-sided sharp leaflets. Perianth short and broadly funnel-shaped,  $6-6\frac{1}{2}$  cm in greatest diameter. Outer segments, fleshy, red-brown, scale-like, the next obovate, red-brown, reddish-yellow at the edge, the innermost truncate, more yellow, only reddish outside on the upper part. Stamens half the length of the perianth. The stout style overtops them with 13 spreading lobes." Acknowledgement to Philippi is confined to a footnote giving his description of the fruit and the type locality, and there is no allusion to the spines being flattened. By itself this might be considered a comparatively unimportant detail; but the terms in which the spines are described, their illustration, and the account of the very broad-proportioned somewhat reddish flower, taken together, suggest that this plant differs from that described by Philippi. Backeberg (l.c.) believes *O. grata* (sensu K. Sch.) to be very near his *T. bolivianus* (as finally treated in "Die Cactaceae"). From the character and disposition of the spines and the smooth stem-segments this would seem to be possible; and the flower certainly agrees better with Backeberg's than with Philippi's description. There is room for the identification since *O. boliviano* was not a name admitted by Schumann into his classification.

Backeberg notes the original place of publication of *O. grata* in *Linnaea*, but he quotes only from Schumann, and one must wonder to what extent he was guided by Philippi's description. Had he noted the discrepancy between the two accounts, one might have expected, from his reaction in such circumstances elsewhere (cf., e.g., *O. tarapacana*, where again there are conflicting reports on the character of the spines) to find emphatic comment upon it. As it is, he remains in some doubt about the relationship of Schumann's plant only because in the case of *T. bolivianus* he can find no edible fruit. See also under *O. boliviano* above.

F. Philippi, in "Catalogus Plantarum Vascularium Chilensium": 93 (1881), considered *andicola* Hort. Angl. to be synonymous with *O. grata*.

Britton and Rose refer *O. grata* to *O. ovata* (*The Cact.*, 1: 95). Hosseus (l.c.) states that the two are quite distinct. An *O. grata* is briefly mentioned by Fries (*Nov. Act. Reg. Soc. Sci. Upsal.*, ser. 4, 1: 124)

as found (much further north again than Hosseus' locality) at Moreno, Jujuy, in 1905. The spines are said to be longer than those mentioned either in the description or in *Gesamt. Kakt.* Again the possibility might be considered that this was a form of *O. boliviano*. Two habitat photographs are unfortunately too distant to show detail. The same is true to an even greater degree of Hosseus, op.c.: t. 4, fig. 1.

The only "grata" we have seen has been within the cultivated material already referred to under the quite different *O. pentlandii* and almost certainly belonging there. For the present it would seem unwise to identify any specimen as *O. grata* in this country, particularly if this should be of cultivated growth.

***O. atacamensis*** R. A. Philippi. *Florula Atacamensis*: 24 (1860).

*Opuntia ramis ovatis, ca. pollicem longis, 9 lin. latis, in glomus diametri interdum bipedalis et pedem altum contextis; verrucis a basi ad apicem ca. 5-7 seriatis, inferioribus unice lana et aculeis setiformibus brevissimis tectis; superioribus spinam erectam, 9-12 lin. longam, flavam vel rufam, et 2-4-radiantes dense adpressas, modo 1 lin. longas exhibentibus; flore luteo.*

Unice in locis elevatis centralibus deserti crescit. Primum eam ad aquam Profetas dictam (24° 45' lat. m. et 9000 p.s.m.) et quidem rarem, deinde in montibus Pingo-pingo (23° 40' lat. m. et 10,800 p.s.m.) vidi, sed satis frequens ad fontem Puquios (23° 50' lat. m. et 10,800 p.s.m.) occurit.

"An opuntia with ovoid branches, ca. 2½ cm long, 18 mm thick, interwoven in rounded masses sometimes 60 cm across and 30 cm high; areoles ca. 5-7 in a row from base to tip, the lower ones especially covered with wool and very short bristle-like spines, the upper ones producing an erect spine 18-24 mm long, golden yellow or ruddy, and 2-4 radiating spines, closely appressed, only 2 mm long; flower saffron yellow.

"It grows especially in the high central parts of the desert. I saw it first, and indeed infrequently, near the water called Profetas (lat. 24° 45', alt. 9000 ft.), and then in the Pingo-pingo mountains (lat. 23° 40', alt. 10,800 ft.) but it occurs fairly plentifully near the source of the Puquios (lat. 23° 50', alt. 10,800 ft.)."

Elsewhere (under *O. papyracantha*) Philippi distinguishes "verruca" (tubercle) from "pulvinus" (aerole), but here it seems more accurate to translate "verrucis" as "areoles". The "very short bristle-like spines" are surely only glochids, a term which, although *Mammillaria glochidiata* had been published in 1832, was not in general use for our purposes until many years later. Philippi gives a map which shows that the Pingo-pingo mountains are immediately south of the Salar de Atacama, and that the Puquios of the description is just to the east of them and is not that other Puquios near Copiapó some 200 miles to the south; though in fact the plant is later reported from the Copiapó region (Johnston, see below). The specimen illustrated by Backeberg is from Santiago, some 400 miles further south again.

Illus.: Britton and Rose in *The Cact.*, 1:94 (1919), drawing, reproduced in *Die Cact.*, 1:340 (see below); Backeberg in *Die Cact.*, 1:339 (1958), photograph.

Syn. *Tephrocactus atacamensis* (Phil.) Backeb., *Kaktus-ABC*: 108 (1935).

Important supplementary information upon three species, *O. atacamensis*, *tarapacana* and *rahmeri*, is contained in an article by Werdermann, "Über einige chilenische Polsterkakteen", in *Notizbl. Bot. Gart. u. Mus. Berlin*, 10:752-8 (1929). The article also contains the original description of *O. leoncito* Werd., which we cannot treat here: a flat- (predominantly single-) spined plant which suggests a larger-growing version of *O. glomerata* Haw.

Werdermann's key gives a useful general view of these species. In the original the names "atacamensis" and "tarapacana" are reversed with respect to their characters in this key, as can easily be seen by comparison with the text. We restore these two names to their obviously intended positions.

I Spines very flat, almost papery, thin (in the text said to be 4 cm long and 2 mm wide)

.....*O. leoncito*

II Spines more or less cylindrical, subulate,  
(a) Upper rim of ovary thick with spine-bearing areoles. Spines up to 7 cm long.

.....*O. rahmeri*

(b) Only isolated, spineless areoles on upper rim of ovary. Spines significantly shorter.

1. Areoles on stem-segments few, with little wool. Ovary naked, or nearly naked. Scales on rim of ovary few

.....*O. tarapacana*

2. Stem-segments (especially when young) with numerous thick woolly areoles, similarly the outer wall of the ovary. Scales on rim of ovary numerous, gradually merging into the perianth-segments

.....*O. atacamensis*

With regard to *O. atacamensis* (op. c.: 756) Werdermann observes that the specimens collected by Johnston and himself undoubtedly belong to the same species and agree with Philippi. He regards *atacamensis* as distinguishable "from other similar forms" by the numerous areoles with short but thick wool "particularly on the young stem-segments". His description may be summarised as follows:

Glochids yellowish or brownish, at first undeveloped, later sometimes caducous; spines ca. 2 cm long, subulate, horny yellow to blackish, dark-tipped, often somewhat frosted, up to 5, unequal, sometimes all erect but more often 1-2 erect "as originally stated", the remainder more or less appressed. "Flower of Johnston's plant 4 cm long. Outer wall of ovary and axis with dirty yellowish woolly areoles, lacking spines but bearing glochids. Upper rim of ovary not furnished, as in *O. rahmeri*, with spine-bearing areoles. Scales on upper rim of ovary 2-4 mm long, lanceolate, fleshy, 'gradually merging into the perianth segments'" (—footnote, p. 757, cf. key). "Inner segments yellow, 16 mm long, up to 10 mm wide, with broadly truncate-rounded tips, only slightly expanded. The floor of the perianth—" (Blütenboden) "—funnel-shaped, sunken, almost 1 cm across at the throat. Stamens numerous, up to 8 mm long. Ovary spherical or slightly elongated. Style thick, columnar, 2 cm long without the lobes; lobes ca. 9, erect, felted, green-brown, 3 mm long, 1 mm thick. Fruit fleshy, greenish.

ca. 1½-2 cm long, 1½ cm thick, with sparse white woolly glochid-bearing areoles. Seeds whitish-yellow, flat, somewhat kidney-shaped, 3½ mm long, 3 mm wide.

“Chile: Prov. Atacama. Dept. Copiapó, Sierra S. Miguel, alt. ca. 3500m, 5th Nov., 1925. Portezuelo S. Pedrito, south side just below summit on gravelly hill-sides and benches; corolla yellow, lobes ascending. ‘Chuchampi’. Ivan M. Johnston no. 4869. Prov. Antofagasta, Dept. Taltal, Sierra de Varas, Aguada Varas, alt. ca. 3500m, Feb. 1926. In flat cushions ca. 30-60cm across, splendidly flowering. Fruit green, fleshy. Found as scattered individual plants, yet not rare. Werdermann no. 1050.”

A portion of Werdermann’s no. 1050 is in the herbarium at Kew. Small appressed spines can be seen, and the areoles are indeed very crowded, a feature which might also be inferred from Philippi’s description. The specimen is somewhat similar in appearance to Backeberg’s illustration (l.c.) which shows the larger spines very erect from the top of the stem-segment. It is unlike the illustration by Britton and Rose, which is a more gross-looking fragment, said to be from a cultivated specimen in the Santiago Botanic Garden, with a more spreading spine-formation. Borg, incidentally, describes the radial spines misleadingly as “flat” (Cacti, ed. 2:121).

Werdermann regards *O. atacamensis* and *O. tarapacana* as very closely related (op.c.: 758), as against Backeberg, who places the former in his sub-series *Pentlandiani* and the latter in his sub-series *Sphaerici*. Backeberg describes the stem-segments of *atacamensis* as pale green, and distinguishes a variety, *chilensis* (Backeb.) Backeb., Die Cact., 1:340 (*T. chilensis* Backeb. in Cactus (Paris), 8:250 (1953)), said to have two central spines, more flexible and white at the base. In view of Werdermann’s remarks on the variability of the spines of the species this variety may not be easy to identify.

*O. atacamensis* was not known to Schumann (Gesamt. Kakt., ed. 1:689-90) who notes that the plant which he encountered under this name was confused with *O. hempeliana*, later referred to *O. floccosa*. Britton and Rose (l.c.) include *atacamensis* in their *Pentlandianae*, and consider *Pereskia glomerata* Pfeiff. non Haw. (Enum.: 179) to be a possible synonym. This plant certainly can hardly have been a *Pereskia*, but it is too briefly described to afford useful comparison. Backeberg (l.c.) gives as a further synonym *Pseudotephrocactus atacamensis* Krzgr. (1935).

***O. monticola*** R. A. Philippi in *Linnaea*, 33:82 (1864-5).

Opuntia prostrata, caespitosa; articulis cucumeriformibus, areolis per series 6-8 longitudinales dispositis, albo-tomentosis; spinis ca. 8, inaequalibus; vel quatuor centralibus majoribus, griseis vel fuscis, apice albis, cylindricis; floribus 18-20 lin. longis, incluso ovario 11 lin. longo; setis albis e squamis ovarii enatis versus petala longioribus.

In Andibus Prov. Santiago prope argentifodinam las Arañas Nov. 1861 inveni. Articuli 4 poll, longi, medio pollicem crassi, utrinque attenuati; areolae valde distantes ca. 6 in quavis serie longitudinali, dia. 1½-1¾ lin. Spinae inferiorum minutae, unica major et vix 5-linearis, in areolis superioribus vero spinae

minores jam 5 lin. longae, majores 11 lin. Squamae ovarii per sex series transversas dispositae, in axilla pulvisculum albo-lanatum et setas seu aculeos albos ca. 6 gerentes, supremorum areolarum majores 4 lin. longae. Flores lutei, extus si bene memini fulvi. Ab *O. andicola* Hort. Angl. Gay III. 30. aculeis basi haud complanatis magis numerosis satis differre videtur.

“A prostrate, caespitose opuntia; stem-segments cucumber-shaped; areoles arranged in 6-8 longitudinal series, with white flock; spines ca. 8, unequal; or rather the 4 central spines the larger, greyish or darkish, white-tipped, acicular; flowers 3½-4 cm long including the ovary which is 22 mm long, with white bristles arising from the scales of the ovary, longer towards the petals.

“I found it in the Andes, Prov. Santiago, near the las Arañas silver-mine in Nov. 1861. Stem-segments 10 cm long, 2½ cm thick at the centre, narrowed at each end; areoles extremely far apart, ca. 6 in each longitudinal series, 3-3½ mm across. The spines of the lower areoles insignificant, 1 only larger, and this hardly 1 cm long; on the upper areoles however the smaller spines are already 1 cm long, the larger 22 mm. Scales of the ovary arranged in 6 transverse series, bearing a tiny white cushion of wool and ca. 6 white bristles or spines in the axil, the larger spines of the uppermost areoles 8 mm long. Flowers saffron yellow, the outside, if I remember rightly, tawny. Seems to differ sufficiently from *O. andicola* Hort. Angl.—” (= *O. andicola* Pfeiff.) “—in the more numerous spines not flattened at the base.”

We can find no record of subsequent recognition of this plant. It was not known to Schumann (Gesamt. Kakt., ed. 1:748). Britton and Rose (The Cact., 1:95) and Backeberg (Die Cact., 1:303) refer the name to *O. ovata* without discussion. However, the elongated stem-segments and very distant areoles make the reference seem doubtful; moreover the locality is the same as that of *O. grata*, while according to Hosseus (Not. sobre Cact. Arg.: 45) *O. grata* and *O. ovata* occupy different stations. It would seem best to defer an opinion on this form until it can be clarified by further field observation, and to assume that it will not be found in cultivation.

***O. bicolor*** R. A. Philippi in *Linnaea*, 33:83 (1864-5).

*O. caespitosa*, humilis; articulis ovatis, parvis; areolis per 6 series longitudinales dispositis, ca. 4 in quavis serie, subglabris; aculeis inaequalibus, cylindricis, supremo 1-2 majoribus, reliquis minutis, albis; ovario spinis setiformibus 3 lin. longis armato; corolla lutea, extus purpurea.

Cum priore inveni. —Articuli poll, longi, 7 lin. crassi. Diam. areolarum vix ultra 1 lin., aculei inferiores ca. 9, albi, setacei; superiores 8-9 lin. longi, albi aut purpurei, apice albi. Ovarium, 9 lin. longum, squamorum series 6 transversas ostendit, quae omnes, etiam infimae, in axilla pulvisculum albo-tomentosum et spinas setiformes ca. 7, 3 lin. longas gerunt. Corolla 7 lin. longa.

“A caespitose low opuntia with small ovoid stem-segments; areoles arranged in 6 longitudinal series, about 4 in each series, nearly hairless; spines unequal, cylindric, the uppermost 1-2 bigger, the rest minute, white; ovary armed with bristly spines 6 mm long, corolla saffron yellow, purple outside.

"I found it with the previous plant (*O. monticola*). Stem segments 2½ cm long. 14 mm thick. Diameter of the areoles scarcely more than 2mm. About 9 lower spines, white, bristly, the upper ones 16-18 mm long, white or purple, white at the tip. Ovary 18 mm long, exhibiting 6 transverse series of scales which all, even the lowest, bear in the axil a white woolly little areole and about 7 bristly spines 6 mm long. Corolla 14 mm long."

Listed as unknown to Schumann, Britton and Rose and Backeberg, and evidently not the same as *O. fulvicoma* var. *bicolor* from South Peru.

We have no record of subsequent recognition, but believe the name has occasionally been attributed in this country to a rather clavate opuntia with dark main spines and some weaker white ones. We do not know the authority for this or the provenance of the plant in question.

**O. leonina** Haage et Schmidt ex Regel in *Gartenflora*, 30:413 (1881).

The original description of this plant forms part of an article in which Regel deals with some forthcoming novelties of a well-known firm of nurserymen. *Leonina* is described as "imported from Chile", but much of the description refers to growth which we would suppose cultivated and unrepresentative. The relevant details may be abstracted as follows:

"... with almost cylindrical, sometimes almost spherical, or long-oval stem-segments . . . spines very unequal . . . On old segments . . . spines up to 1½ cm long, stalk-like, 1-3 in the centre, the others about the edge . . . with extraordinarily abundant short bristles. Slightly less old segments have . . . 6-12 thinner spines, hardly 1 cm long, in irregular array, and the youngest segments have very short wool and irregular, almost bristle-like spines hardly 2-3 mm long . . . The older segments more globular, the younger more elongated."

An engraved illustration, reproduced, reduced, in *Cact. Jour.*, 1:100 and by Rümpler in *Först. Handb.*, ed. 2:974 (1885), and as *O. grata* in Schelle *Handb.*: 46 (1907) shows that the upper growth of the specimen is elongated probably to an unnatural degree. The segments appear to be smooth. Many areoles are practically spineless, but this may be due to loss of character.

Rümpler (l.c.) gives an abstract very similar to that above. Schumann (*Gesamt. Kakt.*, ed. 1:698-9) has little to add to the original; and he subsequently dismisses *leonina* as "only an unimportant form of *O. grata*" (*Gesamt. Kakt. Nachtr.*: 153) which in fact may indicate *boliviana* (see *O. grata* sensu K. Sch. under *O. grata* Phil, above). Later authors refer *leonina* in other directions: Britton and Rose to *sphaerica* (*The Cact.*, 1:96) and Backeberg (1958) doubtfully to *dimorpha* (*Die Cact.*, 1:299) though he also considers the possibility that it belongs to *ovata* (op.c.: 297). Borg follows Schumann (*Cacti*, ed. 2:119). Finally (1962) Backeberg claims to have found material in the Pinya de Rosa collection which agrees with Rümpler's (sic) description (*Die Cact.*, 6:3596-8; it should be noted that Backeberg still indicates the Haage and Schmidt plant despite his unwarranted 90

ascription of authorship now to Rümpler). This claim to typify the name seems in fact a little uncertain, for Backeberg himself notes the unsatisfactory nature of the description and he now finds that, as against his earlier suggestions of relationship, the Pinya de Rosa material inclines in the direction of his *Pentlandiani*. From the accompanying photograph (fig. 3269) it would appear that the spines are more regularly distributed and the stems more tuberculate upon this material than upon the Haage and Schmidt plant. Backeberg describes the flower as light yellow, 4 cm long and wide.

We cannot help feeling that the original description is so insubstantial and occupied to such an extent with unnatural character that no secure recognition will ever really be possible. The most that can be safely said is that it indicates a probably smooth, possibly globular, densely glochidiate tephrocactus sometimes with numerous unequal spines which may, nevertheless, perhaps be absent. It is symptomatic that the name has been referred sometimes in the boliviana, sometimes in the *sphaerica* direction. In the circumstances it would seem best to avoid it altogether. Attempts to identify it are likely only to cause confusion; in particular, Backeberg's identification of it with the Pinya de Rosa material seems rather doubtful, and it may well be that the latter would merit full description.

Britton and Rose say that "leon" or "leoncito" is the local name for *sphaerica* in Chile; while according to Backeberg any Chilean hummock-forming tephrocactus may be called "leoncito" from its similarity at a distance to a puma. Schelle (l.c.) gave a var. *leonina* Hort. under *O. grata* but Backeberg doubts its identity. Phil, in *Gartenfl.*, 32:260 (*Gesamt. Kakt.*: 699) appears to be a false reference; this article is concerned with *Maihueina*.

The small padded creeping plant with dark red spines labelled "O. leonina" in several collections is clearly within Backeberg's interpretation of *O. longispina* Haw.

**O. phyllacantha** Haage et Schmidt ex Regel *non* Salm-Dyck, in *Gartenflora*, 30:414 (1881).

The description of this plant is a little more precise than that of *O. leonina* but also puzzling. The plant is said to come from Chile and yet to "belong near *brachyartha*", and to have "longish-elliptic terete stem-segments and scattered bundles of spines, with 1-3 flat spines up to 2 cm long directed downwards, sometimes 1-2 almost erect, not broadened central spines, and, in addition, smaller bristle-like spines about the rim". An engraved illustration shows a smallish plant with featureless elliptic stem-segments covered evenly with porrect spines like a bottle-brush. It is perhaps rather suggestive of a weakly *sphaerica*, which may be why Britton and Rose doubtfully refer the name there (*The Cact.*, 1:96).

Britton and Rose betray some confusion over this illustration. It is reproduced, reduced and reversed, in *Cact. Jour.*, 1:100 as "andicola". The name is clearly wrong; but the reproduction is accepted by them (*The Cact.*, 1:90) for an illustration of their *glomerata* "as *andicola*". They have evidently not noticed its origin; nor, when they observe (again below *O. glomerata* sensu Br. et R., op.c.: 89) that "the plant figured by Nicholson . . . as *platyacantha* hardly belongs here", have they noticed that this



illustration (Nichols. Illus. Dict. Gard., 2: 503) is only the same engraving not reversed doing duty yet again.

Backeberg (Die Cact., 1: 283) considers the possibility that *O. phyllacantha* may be the same as *O. leoncito* Werd., but a comparison of the above with Werdermann's description makes this suggestion seem unlikely. See notes under *O. glomerata* and *O. atacamensis* above.

*O. phyllacantha* S.-D. is quoted as a name only in Mittler, "Taschenbuch für Cactusliebhaber", 1: 41 (1841) and in Först. Handb., ed. 1: 508 (1846), both without reference.

**O. tarapacana** R. A. Philippi in Anales del Museo nacional de Chile, 1: 27 (1891).

*Opuntia subcaespitosa*; articulis ovatis, parvis. apice aculeis ternis, albis, rectis armatis; flore aureo, ovario elongate

Ad Calalaste crescit. Articuli modo 20 mm longi, 10 mm crassi; aculei 12-15 mm longi, apice fulvescentes, basi lana alba cincti. Ovarium 20 mm longum, pulvilli squama brevi (folio) tecti, summi setis candidis 5-6 mm longis armati; petala 21 mm longa.

"A somewhat caespitose opuntia; stem-segments ovoid, small, armed at the tip with straight white spines 3 to an areole; flower golden-coloured, with an elongated ovary.

"Grows near Calalaste. Stem-segments only 2 cm long, 1 cm thick; spines 12-15 mm long, passing to brownish-yellow at the tip, surrounded with white wool at the base. Ovary 2 cm long, the areoles covered by a short scale (or leaf), the uppermost armed with white bristles 5-6 mm long; the petals 21 mm long."

Syn. *Tephrocactus tarapacanus* (Phil.) Backeb., Kaktus-ABC: 114 (1935).

Werdermann, in "Über einige chilenische Polsterkakteen" (l.c.), adds further details on *O. tarapacana* as follows:

"Areoles only spiny at the tip of the stem-segments. Glochids brownish, 1 mm long. Spines 1-3, of which only 1-2 are strong, up to 2 cm long, erect, brown, horny-yellowish at the base, acicular. Flowers 3½ cm long overall. Ovary almost naked below, with isolated areoles above and with a few more about the rim of the axis bearing dirty whitish-yellow wool, spineless, or sometimes with 1-3 1 mm long spinelets. Inner perianth-segments 18 mm long, 6-7 mm wide, not truncate, with a hardly perceptible point. The floor of the perianth—" (Blütenboden) "—funnel-shaped, sunken to a depth of about 7 mm, ca. 1 cm across at the throat. Style 12 mm long, up to 1½ mm thick. Lobes ca. 9, papillose, dark brown, up to 1½ mm long, ½ mm thick, with a lengthwise furrow on the back. Fruit and seeds unknown."

Werdermann states that a small portion of the type-specimen was (1929) preserved in the Dahlem Herbarium at Berlin, while Britton and Rose, who quote Philippi almost verbatim (The Cact., 1: 94), record having seen type material in the Santiago Museum. A flower only of *O. tarapacana* endorsed "*O tarapacana* Ph. Chili, com. R. A. Philippi 2/1888" is preserved in the Kew Herbarium.

The small piece of *tarapacana* which Schumann mentions as having been submitted to him (Gesamt. Kakt., ed. 1: 694) may have been from rather different material. Schumann describes the spines as "1-2, stiff, subulate, somewhat compressed, reddish-yellow, 1½-2 cm long", and records their forms as "complanatis", a term which normally means "flattened" and which understandably perplexes Backeberg in this context (Die Cact., 1: 305). The ovary on Schumann's plant is said to be "clad to the base with areoles which bear white wool; beset with yellow glochids at the top, otherwise unarmed." The plant is listed (l.c.) next to his *O. pyrrhacantha*.

Britton and Rose place *O. tarapacana* next to *O. atacamensis* in their Pentlandianae; Backeberg places it in his sub-series Sphaerici.

**O. leucophaea** R. A. Philippi in Anales del Museo nacional de Chile, 1: 27 (1891).

*Opuntia articulis globosis, diametri 25 mm, albidis; aculeis in quovis pulvillo quinis, albidis; floribus croceis, ovario brevissimo.*

Prope Usmagama in provincia Tarapaca lecta. Ramosa, humifusa, ramis articulos paucos gerentibus (Rahmer).

"An opuntia with globose stem-segments 2½ cm thick, whitish; spines 5 to each areole, whitish; flowers saffron yellow, with a very short ovary.

Collected near Usmagama, Prov. Tarapaca. Ramose, spread close to the ground, the branches bearing few segments (Rahmer)."

We have found no record of subsequent recognition of this plant. It is referred to *O. sphaerica* by Britton and Rose (The Cact., 1: 96), but Backeberg is doubtful (Die Cact., 1: 297, 302).

**O. rahmeri** R. A. Philippi in Anales del Museo nacional de Chile, 1: 27-8 (1891).

*Opuntia articulis ovato-cylindraceutis, acutiusculis, ca. 35 mm longis, viridibus, glabris; areolis satis approximatis, diametri 4 mm albo-lanuginosis; aculeis binis e flavo albidis, omnibus erectis, tenuibus, 4½-5½ cm longis; floribus aurantiacis; ovario glaberrimo, areolis albo-lanatis, versus apicem una alterave seta alba, usque ad 13 mm longa instructis; corolla 24 mm longa, petalis retusis mucronatisque; staminibus vix dimidiam petalorum longitudinem aequantibus; stylo staminali parum superante, crasso, viridulo.*

Sicut prior prope Usmagama reperta.

"An opuntia with ovoid-cylindric stem-segments, somewhat pointed, ca. 3½ cm long, green, smooth; areoles fairly close-set, 4 mm in diameter, with white down; spines 2, of a yellowish-white, all erect, thin, 4½-5½ cm long; flowers golden-coloured; ovary very smooth, the areoles bearing white wool, one or two towards the top equipped with a white bristle up to 13 mm long; corolla 24 mm long, the petals retuse, mucronate; stamens hardly half the length of the petals; style slightly outreaching the stamens, thick, greenish.

"Found, as in the case of the previous species, near to Usmagama."

Britton and Rose (The Cact., 1: 94) and Backeberg with some hesitation (Die Cact., 1: 302, 304, 306)

treat this as a synonym of *O. tarapacana*; but from Werdermann's detailed description in "Über einige chilenische Polsterkakteen" (l.c.) it would seem to be distinct: —

In compact masses ca. 30 cm high, 1 m across . . . Stem-segments ovoid to elongated, 4-5 cm long, 1½-2½ cm thick, yellowish-green above, whitish in the middle, brownish below. Areoles densely glochidiate, spineless, below; with numerous spines above; round to elongated, 2 mm across, with dirty pale yellow wool. Glochids whitish-yellow to brownish, unbarbed, 4-7 mm long. Spines 1-7, usually 2-4, unequal, up to 7 cm long, aligned with the long axis of the stem-segment, generally acicular, only occasionally slightly flat, often with a multiple twist below the point, horny-yellow to brownish, dark-tipped, mostly straight, occasionally slightly curved. Flower 4-4½ cm long overall; perianth 1½-2 cm across. Ovary fleshy, bright green, glossy, naked or with isolated spineless areoles only; the upper rim, however, where the perianth is inserted, thick with woolly areoles, lacking glochids, but with subulate bristly spines 2½ cm long, whitish-yellow or brown, often outreaching the perianth-segments, mostly erect, often also twisted in a multiple spiral. Each areole has a lengthy 3-sided fleshy scale up to 5 mm long. Outer perianth-segments ½-1 cm long, yellow, somewhat greenish or brownish in the midrib, 5-7 mm wide, truncate, with a distinct brownish spikelet. Inner segments yellow, almost 2 cm long, up to 1 cm wide, somewhat narrowed at the base, truncate, with a distinct spikelet. The floor of the perianth (Blütenboden) a shallow top-shape, sunk to a depth of about 1 cm, the walls evenly clad with numerous stamens ca. 6 mm long. Style out-reaching the stamens, ca. 18 mm long, stoutly columnar, 3-4 mm thick at the base, thinner above; lobes ca. 11, erect, papillose, 3 mm long, grooved lengthwise on the outer side, dark brown. Fruit a fleshy-leathery berry retaining the dried remnant of the flower, with spiny areoles on the rim of the flower-axis, yellowish-green, 3½ cm long, Hem thick, tapering below.

"Chile: Prov. Atacama, Dept. Chañaral, near Potrerillos, ca. lat. 26° 7' S. long. 69° 31' W., ca. 3100 m alt., Oct. 1925. Cajoncito: common, rocky hillsides, petals yellow, scarcely spreading. Ivan M. Johnston no. 4724.—Near Potrerillos, ca. 2400 m alt., Oct. 23rd 1925; Cerro de las Vegas along trail Quebr. Cortadera. Rocky places, pulvinate masses 3-10 dcm across, 1½-3 dcm tall. 'Espina', Ivan M. Johnston no. 4709." (l.c.).

These sources lie some hundreds of miles to the south of the type locality, and the material seems stronger- and darker-spined (particularly about the ovary) and generally larger than that seen by Philippi; but the spine-to-stem-segment proportions are closely preserved, and the two accounts would seem to agree to a large extent. The parti-coloured stem-segments perhaps result from the shading of a particularly elongated form within dense growth. Analogous shading effects may sometimes be met with in cultivation.

**O. tuberiformis** R. A. Philippi in Anales del Museo nacional de Chile, 1:28 (1891).

*Opuntia articulata* ovatis haud compressis, ca. 9½ cm longis, 5 mm (sic) crassis (vetustioribus rimosis, cinereo-fuscis, tuberi Solani simillimis), basi nudi laevibus, 92

supra medium areoliferis, areolis distantibus, diametri 6 mm, setulis rigidis nec lana molli vestitis, supremis tantum aculeiferis; aculeis pallidis, plerumque 2-3, 7-8½ mm longis, tenuibus, et praeterea ca. 5-6 setiformibus, 2½ mm longis armatis; flore . . . (sic).  
Prov. Tarapaca, ad radicem Andium.

"An opuntia with ovoid stem-segments, not flattened, ca. 9½ cm long, 5 cm thick" (mm in the original) "(the older stem-segments fissured, of a dark ashy colour, very like a potato tuber), bare and smooth at the base, bearing areoles above the middle, the areoles distant, 6 mm in diameter, covered with stiff glochids and not soft wool, the uppermost alone bearing spines; these armed with pale thin spines, for the most part 2-3, 7-8½ mm long, and, in addition, with about 5-6 bristle-like spines 2½ mm long; flower . . . (sic).

"Prov. Tarapaca, at the foot of the Andes."

Schumann thought that this extraordinary plant was possibly *O. aoracantha* (Gesamt. Kakt., ed. 1:692). Britton and Rose (The Cact., 1:92) cannot have fully noted the description, for they accept the evident misprint and take the plant for a *platyopuntia* 5 millimetres thick. Backeberg (Die Cact., 1:264) thinks that centimetres could have been intended. He also wonders whether it might have been an alien. One cannot help wondering whether centimetres should also be read in the case of the spines: half-millimetres would normally have little significance in this context.

**O. australis** Weber in Bois, Dictionnaire d'Horticulture, 2:896 (1893-99).

"Patagonia, from the 40th to the 50th degree of latitude S., in the Magellanic region, as far as to the south of the River S. Cruz.

"Stem low, proliferous, soft; segments cucumber-shaped, 6-8 cm long, 1-2 cm thick, of a dark or violet green, tuberculate; tubercles rounded-ovoid; outer spines 10-15, radiating, thin, white; 2 central spines, longer, flexuous or recurved upwards, flat, reed-like, blackish or brown, later ashy-coloured, analogous to those of *O. diademata* but narrower. Flower straw-yellow, 3 cm across. Seeds rugose."

Illus.: Britton and Rose in The Cact., 1:88 (1919), photograph (herbarium material collected by Skottsberg in 1908).

Syn. *Pterocactus valentinii* Speg. in Anal. Soc. cient. Arg., 48:51 (1899) sec. Br. et R., The Cact., ut sup.

*P. australis* (Web.) Backeb. in Des. Pl. Life, 22:17 (1950).

Britton and Rose (l.c.) state that this species extends "farther South than any other cactus known to us" and confirm Weber's description "in the main" upon three lots of Skottsberg material. They add that this is the same as *P. valentinii*, which they say they have also seen (without indicating where). They note that *australis* has a yellow flower 2 to 3 cm broad and a root "often larger than the parts above ground" and describe the radial spines as 3-4 mm long ("cm" is an evident misprint) and the "much longer" central spines as 2 cm long. They remark that though the stem-

segments are described as 6-8 cm long they are "apparently often much smaller"; and indeed such smaller, globose stem-segments can be seen in the *O. australis* material preserved in the herbarium at Kew (M. E. Blake no. 30 (1926); Mrs. A. L. Blake no. 184 (1931)). Both these collections are from S. Julian, about 100 miles north of the R.S. Cruz. The flowers are recorded as pale pink and yellow respectively.

Spegazzini, on the other hand, mentions some *O. australis* in Cact. Plat. Tent.: 511 which would seem to be larger than that described by Weber; he remarks, surprisingly, that this is hardly distinct from *O. darwinii*, "easily making just a variety of the same with sturdier stem-segments and some broader central spines". It is said to be common between the rivers Gallegos and S. Cruz. Britton and Rose think that this must have been something else.

Backeberg (Des. Pl. Life, ut sup.) finds the flowers of *australis* to be terminal, i.e., arising from the apex of the stem-segment which encloses the sunken ovary. This is the first character used by Schumann to distinguish the genus *Pterocactus* K. Sch. (Gesamt. Kakt., ed. 1: 753). On account of this character, and the swollen root (which Schumann does not mention), Backeberg transfers *O. australis* to *Pterocactus*. Buxbaum, however, finds terminal flowers upon primitive *Cylindropuntia* such as *O. subulata* (Morph. Cact., 2: 112), so that this character would seem to be less decisive than has been supposed. Swollen roots are known upon other *Opuntias*; while the second main character used by Schumann to distinguish *Pterocactus*, the winged seeds, seems from the description to be in evidence here only to a very rudimentary degree if at all. Thus even if *Pterocactus* is accepted as a separate genus it is not clear that the present species should be included in it. Britton and Rose, who did accept the genus *Pterocactus*, did not consider this plant belonged there and classified it as an *Opuntia*. They place it, presumably on account of the flattened spines, in their *Glomeratae*, next to their *O. glomerata* (*O. diademata*); but it would seem very unlikely that the partial resemblance between the spines of the two species indicates any close relationship.

***O. nigrispina*** K. Schumann, Gesamtbeschreibung der Kakteen, ed. 1: 695 (1899).

Fruticosa humilis ramosa flavido-viridis; articulis breviter cylindricis; aculeis 2-5, majoribus violaceo-nigris.

"Shrubby, low, ramose, yellow-green; with short-cylindrical stem-segments; spines 2-5, the larger violet-black.

"Shrubby, ramifying, low-growing, hummocky, hardly 10 cm high, bristling with spines. Stem-segments cylindrical or ellipsoid, 2-3½ cm long, 1-1½ cm thick; yellow-green, strongly tuberculate when young. Areoles round, 2-3 mm across, clad with white or brown somewhat flock-like wool. Glochids brown. Spines 2-5; 1-2 of these strong, up to 2½ cm long, acicular, violet-black, rough under the lens; several smaller, lighter-coloured.

"Bolivia, on the Puna of Humahuaca—Lorentz." (The town of Humahuaca is now south of the Bolivian border, in Argentina, Prov. Jujuy).

According to Spegazzini (Cact. Plat. Tent.: 512) *O. nigrispina* is common in Salta and Jujuy (the Calchaqui valley). Spegazzini broadly confirms Schumann, describing the stem-segments as "of a pleasant green" (*jucunde virides*) "rather glossy", and adding the details, "spines 1-3 more rarely 5, erect, stiff . . . at first a dirty part-translucent reddish-yellow, blackening thereafter from base to tip, in age an opaque black. Flowers average, the petals lemon-yellow."

Illus.: ?Britton and Rose in The Cact., 1: 97 (1919), drawing: ?Backeberg in Die Cact., 1: 261, photograph reproduced from his Bulletin of Cactus Research (1935). (See below, and under *O. purpurea*).

Syn. *Tephrocactus nigrispinus* (K. Sch.) Backeb., Kaktus-ABC: 109 (1935).

Britton and Rose (l.c.) and Backeberg (Die Cact., 1: 245) give *O. purpurea* R. E. Fries as a synonym. On the basis of the descriptions this reference is rather puzzling. We quote the original publication of *O. purpurea* below, and consider the two names together.

*O. purpurea* R. E. Fries in Nova Acta Regiae Societatis Scientiarum Upsaliensis, ser. 4, 1: 123 (1905).

Fruticosa, humilis, ramosa, erecta; articulis obscure viridibus vel rubro-violaceis, oblongo-ellipticis, teretibus, junioribus tubercula decurrentia spiraler disposita gerentibus; aculeis 3-5, longis, rectis, subtretibus, albido-roseis; floribus parvis, purpureis.

"Shrubby, low, ramose, erect; stem-segments dark greenish or reddish-violet, oblong-elliptic, terete, the younger segments bearing decurrent spirally arranged tubercles; spines 3-5, long, straight, subterete, whitish-rose; flowers small, purple-coloured.

"Densely ramifying, 1-2 dcm high, the branches erect. Stem-segments 2-4 cm long, 1-2 cm thick. Areoles seated on the upper part of the tubercles, round, 2-3 mm across, furnished with wool and exceedingly abundant yellow glochids up to 2 mm long. Spines only on the upper areoles, 3-5 on each, 2½-3 cm long; as a rule 1-2 in the areole are shorter; all porrect, acicular, or the stoutest has an insignificant flattening on the upperside at the base; rather weak, smooth, whitish-rose. Flowers 1 or 2 to each stem-segment, lateral, 22-25 mm long. Ovary 1 cm long, inverse-conical, nearly smooth, furnished above only, at the top and about the upper rim, with nearly terete pointed leaves, 1½-2 mm long, having a certain amount of wool and 2 weak spines ca. 5 mm long in their axils. Outer perianth-segments elongated, pointed, the inner spatulate, pointed, 1½ cm long, 6 mm broad, purple-red. Stamens ca. 6 mm long. Style 7 mm long, thick-set; lobes 5, porrect, 2 mm long.

"Prov. Jujuy, Moreno, rare in stony mountains at 3500m."

*O. nigrispina* and *O. purpurea* are evidently similar in several respects, and Britton and Rose (l.c.) unite them: their description of *O. nigrispina* consists entirely of a shortened version of Fries' *purpurea* with the insertion of "purplish-black" in place of "whitish-rose" spines. They refer to material collected at La Quiaca, on the Argentina (Jujuy)-Bolivia border,

which is represented in the herbarium at Kew (Shafer no. 79, La Quiaca (1917)). This would seem likely to present somewhat the same general appearance as the plant shown in Backeberg's photograph (l.c.). In so far as its (ca. 4 porrect) spines are blackish and minutely striated (cf. Schumann) but sometimes with a slight flat (cf. Fries) it does indeed link the two descriptions; and from Spegazzini's observation quoted above it could be supposed that Fries' pale spines and Schumann's black spines represent successive stages of development in the one species. Nevertheless, Schumann's explicit statement that *nigrispina* is yellow-green is opposed to the common belief (cf. Borg, Cacti, ed. 2: 117) that it is purple, a character indicative of *purpurea*; while the conflicting accounts of the two flowers from Spegazzini and Fries are hard to reconcile. Thus two forms might be involved. There is some dark greenish-crimson-violet material with a cylindrical habit currently available as "*nigrispina*" which seems, if a choice is to be made, more likely to be *purpurea*. There have been some imports of mature heavily spined clumps which seem more convincing *nigrispina*, but we feel that no identification can be regarded with confidence until the relation between these two names has been further elucidated.

Backeberg lists *T. nigrispinus* in his sub-series *Oblongi*, a rather incoherent group which is presumably conceived as a first stage within *Tephrocactus* upon the *Cylindropuntia* side and which includes short-cylindric forms of indeterminate growth such as *T. (Opuntia) heteromorphus*. From its description, *O. nigrispina* would seem rather out of place here. Britton and Rose include it in their *Pentlandianae*, near to their *O. pentlandii* and to *O. ignescens*.

**O. subterranea** R. E. Fries in *Nova Acta Regiae Societatis Scientiarum Upsaliensis*, ser. 4, 1: 122 (1905).

*Cylindropuntia pygmaea, simplex vel parcellis ramosa; articulis 1-2, breviter cylindricis, teretibus et magna ex parte subterraneis; costis in tubercula humilia, spiraliter disposita solutis; aculeis marginalibus 6-7, brevibus, recurvatis, adpressis, centralibus nullis; floribus lateralibus, fuscis; ovario extus glabro, in axillis solum squamorum setifero et parum hirsuto; bacca pyriformi, glabra.*

"A pygmy *Cylindropuntia*, simple or very little branched; stem-segments 1-2, short-cylindric, terete and for a large part below ground; with ribs divided into low, spirally arranged tubercles; marginal spines 6-7, short, recurved, appressed, central spines 0; flowers lateral, darkish; ovary with smooth exterior, bearing only bristles and a little hair in the axils of the scales; fruit pear-shaped, smooth.

"The greater part of the plant is buried in the sand; only the tip with the flowers and fruits projects 1 cm above it. Stem-segments 1-2, green, 2-4 cm long, ca. 1½ cm thick, short-cylindric, fleshy, the lowermost gradually arising out of the very thick root, which gradually tapers below, simply, or with 2 thick branches. Tubercles rounded-4-cornered, ca. 3 mm across, distinct at the tip, more distant further down on the older part of the stem. Areoles elongated, 1-1½ mm long, clad with very scanty wool. Glochids ca. 1 mm long, in a bundle in the upper part of the areole, with deflexed barbs near the tip. Marginal spines 6-7, 1-2 mm long, recurved upon the side of the tubercle, red-brown, weakening and falling from the

older parts. Flowers 1-2, situated ca. 1 cm from the top, 2½-3 cm long overall, funnel-shaped. Ovary conical, smooth, with subulate, somewhat flattened scales, the lower 1 mm long, the upper increasing to 4 mm, the axils with scanty hair and 2 weak porrect spines. Outer perianth-segments tapering, pointed, the inner spatulate, pointed, 15 mm long, 5 mm wide, brown. The stamens extend about a third of the length of the perianth. Style 18 mm long, rigid; lobes 7, 1 mm long. Fruit pear-shaped, smooth, 12-15 mm long, 8-11 mm thick, flat above. Seeds 3 mm across. Shell thick, the exterior uneven.

"Jujuy, Moreno, towards Nevado de Chañi, in a sandy plain at 3500m."

Illus.: R. E. Fries, l.c. t. 8 (1905), drawing (type specimen), reproduced with some loss of detail in *The Cact.*, 1: 92, and in *Die Cact.*, 1: 348.

Syn. *Tephrocactus subterraneus* (R. E. Fries) Backeb., *Kaktus-ABC*: 110 (1935).

Fries calls this anomalous plant a *Cylindropuntia*; we include it on the authority of Britton and Rose (l.c.), who place it in their *Pentlandianae*, and of Backeberg (l.c.), who places it in his sub-series *Macrorrhizi*. Backeberg (*Die Cact.*, 6: 3594-5) describes and illustrates as a distinct species, *T. varii-florus*, the FR 91 of Ritter's material, which was taken by several workers to be a rediscovery of *O. subterranea* R. E. Fries. It has probably the finest flower of all the smaller *Opuntiae*, varying from carmine to a delicate rose-pink, a far cry from Fries' brown. There are other distinctions which may be valid, and as our subterranea material has not flowered we cannot at present properly express any view on this interesting controversy.

Two pieces of *subterranea* in the Kew Herbarium (Shafer no. 85, Villazon, Bolivia (1917)) show that the rootstock may extend some 5-6 cm before tapering.

**O. weberi** Spegazzini, *Cactearum Plantensium Tentamen*: 509 (1905).

Diag. *Tephrocactus*; caespitosus, longe intricateque subsetuloso-aculeatus; articulis flavescenti-viridibus cylindraceis erectis, dense loricate-subtuberculiferis; aculeis 5-7 quorum 3-5 inferis breviusculis subsetaceis retrorse-adpressis, 2-3 superis erectis pallide ex albido roseo-rufis longissimis crassioribusque sed vix pungentibus; floribus subapicalibus parvis, ovario ovato superne breviter aculeifero, corolla rotata flava; fructu sicco, intus glochidiifero, seminibus constipatis contorto-gibbulosis glabris.

Hab. Sat rara in montibus Sierra Pié de Palo, Prov. San Juan, et prope Molinos, Prov. Salta.

Obs. Caespites plus minusve densi (20-30 cm diam. — 10-18 cm alt.); articuli foliis omino destituti apice obtusiusculi (2-6 cm long. — 1½-2 cm diam.) tuberculis dense constipatis spiraliter dispositis obtusis subteragonis parum prominulis (5-6 mm lat. et long.) tecti; areolae impressae parvae; aculei minores pallidi (3-10 mm long.), validiores subpellucidi recti v. leniter flexuosi (30-50 mm long.); flores solitarii inter aculeos subsconditi ovario dimidio infero lanatulo; fructus siccus albescens (10 mm alt. et diam.); pericarpium membranaceo-subcrustaceum, frustulatim deciduum, intus penicillis roseis glochidiorum armatum; semina lignicoloria nodulo centrali ala crassa obtusissima concolore cincto.

“Diagnosis. A tephrocactus; caespitose, with long, entangled, somewhat bristle-like spines; stem-segments yellowish-green, cylindrical, erect, with breastplate-like low tubercles densely borne; spines 5-7, of which the lower 3-5 are rather shorter, somewhat bristle-like, appressed backwards, the upper 2-3 erect, of a pale whitish rosy-red, very long, and thicker, but scarcely pungent; flowers subapical, small, with an ovoid ovary which in the upper part bears short spines, corolla rotate, golden yellow; fruit dry, bearing glochids within, seeds crowded together, with contorted humps, smooth.

“Habitat. Fairly infrequent in the Sierra Pié de Palo mountains, Prov. San Juan, and near Molinos, Prov. Salta.

“Observations. Clumps more or less dense (20-30 cm in diameter, 10-18 cm high); stem-segments entirely destitute of leaves, rather obtuse at the tip (2-6 cm long, 1½-2 cm thick), covered with densely crowded, spirally distributed, obtuse, roughly 4-cornered tubercles, projecting hardly at all (5-6 mm broad and long); areoles impressed, small; the smaller spines pale (3-10 mm long), the stronger spines somewhat translucent, straight or gently curving (30-50 mm long); flowers solitary, almost concealed among the spines, the lower half of the ovary woolly; fruit dry, whitish (10 mm long and thick); pericarp somewhat like a membranous shell, bit by bit deciduous, armed with rosy tufts of glochids within; wood-coloured seeds, with the central nodule surrounded by a very blunt thick wing of the same colour”.

Illus.: Britton and Rose in *The Cact.*, 1: 84 (habitat) and 85 (type specimen, preserved); both photographs (1919). The former is reproduced in *Die Cact.*, 1: 264.

Syn. *Tephrocactus weberi* (Speg.) Backeb., *Kaktus-ABC*: 106 (1935).

According to Britton and Rose (l.c.) the type specimen was at that time in the collection of Dr. Spegazzini. They note that complete absence of leaves would be unusual upon an opuntia. We have not found this point mentioned in two more recent discussions of *O. weberi* (in Hosseus, “Notas sobre Cactaceas Argentinas” and in “Die Cactaceae”) and it may be that leaves were absent at the time of description. There is a note in *Kaktus-ABC* that Castellanos claimed the alleged absence to be a mistake. *T. setiger*, later referred here by Backeberg as a variety, was described by him as possessing short, acute leaves (*Kaktus-ABC*: 106, 410).

Dry fruits containing red glochids within are recorded for *O. diademata*; but in all other respects *O. weberi* would seem to be very distinct indeed from the plants of the *O. diademata* group and to have no obvious affinities. Britton and Rose, and Backeberg mark its singularity by establishing a separate series and sub-series respectively for it: *Weberiana* Br. et R., l.c.; and *Weberiani* (Br. et R.) Backeb., *Die Cact.* ut sup. Backeberg (l.c.) quotes a further synonym, *Weberiopuntia weberi* Krzgr. nom. nud. (1932), without reference. He recognises two varieties under his *Tephrocactus dispar* (Cast. et Lelg.) Backeb. in *Cactus* (Paris) 8: 249 (1953) and *Die Cact.* ut sup.; and *setiger* (Backeb.) Backeb., *Die Cact.*

ut sup. (*T. setiger* Backeb., *Kaktus-ABC* ut sup.). The latter, he suggests, may possibly be the same as *O. pusilla* S.-D. (q.v.).

Buining recently observed some large clumps near the road between Cachi and Molinas (sic)—see *Nat. Cact. Succ. Jour.*, 24: 14 (1969), but the species has remained rather uncommon in cultivation. The Lamb collection contains a good example, and we have had it and lost it twice before now.

**O. molinensis** Spegazzini. First described under the homonym *O. schumanni* Spegazzini non Weber, *Cactearum Platensium Tentamen*: 511 (1905):

Diag. *Tephrocactus*, exaculeatus, caespites pulvini-formes efficiens; articulis dense constipatis ellipticis vel subovatis, obscure griseo-virescentibus, obtuse tuberculatis; tuberculis areola dense breviterque glochidiato-penicillata valide prominula donatis; aculeis semper et plane nullis; floribus adhuc ignotis.

Hab. Semel abunde prope Molinos, Prov. Salta.

Obs. Articuli polystiche dense glomerati pulvinulos subhemisphaericos (15-25 cm diam.—5-10 cm crass.) compactiusculos constituentes. Articuli botryose superpositi (30-40 mm long.—18-24 mm diam.) subnitiduli, areolis circiter 24 ornati; areolae e penicillis cylindraceutis (3-4 mm diam.) cinereis glochidiorum efformatae sat prominulae. Species pulcherrima, *O. diademata* Lem. cognata sed certe distinctissima.

“Diagnosis. A tephrocactus, spineless, producing cushion-like clumps; stem-segments densely crowded together, elliptic or subovoid, dark greyish-greenish, obtusely tuberculate; tubercles provided with a strongly projecting areole densely and stubbly tufted with glochids; spines always and completely non-existent; flowers so far unknown.

“Habitat. Found in abundance on one occasion near Molinos, Prov. Salta.

“Observations. Stem-segments densely massed in many ranks, forming nearly hemispherical quite compact little cushions 15-25 cm in diameter and 5-10 cm thick. The segments are set one above another as in a cluster of grapes (30-40 mm long, 18-24 mm thick), somewhat glossy, beset with about 24 areoles; areoles formed out of ashy cylindrical tufts of glochids, 3-4 mm in diameter, markedly projecting. A very beautiful species, akin to *O. diademata* Lem. but certainly very distinct.”

Illus.: Spegazzini in *Anal. Soc. cient. Arg.*, 99: 102 (1925); Backeberg in *Die Cact.*, 1: 282 (1958); Lamb in *Nat. Cact. Succ. Jour.*, 15: 43 (1960) and 21: 62 (1966) and in *Pocket Encyc. Cact. in Colour* t. 139 (1969); all photographs.

Syn. *O. molinensis* Speg., *Brev. Not. Cact.*, in *Anal. Soc. cient. Arg.*, 96: 63 (1923) nom. nov., non *Nuev. Not. Cact. in Anal. Soc. cient. Arg.*, 99: 101 (1925) as in *Die Cact.*, 1: 267.

*Tephrocactus molinensis* (Speg.) Backeb. in *Cactus* (Paris) 8: 249 (1953) sec. Backeb., *Die Cact.* ut sup.

*O. gürkei* Schelle, *Kakteen*: 58 (1926).

Non *O. schumanni* Web. ex A. Berger in *Gard. Chron.*, ser. 3, 35: 34 (1904), (a large *Platyopuntia*).

The above cited photograph from Spegazzini con-

firms that the material generally known as *O. molinensis* in cultivation is correctly named. So far as we know at present it shows little, if any variability. Schelle (l.c.) closely confirms Spegazzini's observations but gives a measurement (about 3mm) for the distance between the areoles, which seems in our experience a little on the low side. It should be added that the young areoles have a prominent white collar of hair which gives them a conspicuous eye-like appearance and which may account for Spegazzini's reference to "ashy cylindrical tufts". This hair is much reduced after a few months and ultimately disappears. The glochids tend to darken with age, but in our experience they are for the most part a striking rusty red. This is the only firm character to suggest a kinship with *O. diademata*; in other respects *O. molinensis* would seem to be very distinct from *O. diademata* and indeed to have no obvious affinity in any direction. In particular, in the ovoid, glossy tendencies of the segments, the comparatively indistinct furrows and the large areoles, it is very distinct from the short-segmented spineless form of *O. diademata* with which it might at a distance be confused. It is not altogether clear that *O. molinensis* should strictly be called spineless: the outermost bristles (perhaps half a dozen or so), though similar to the rest in size and colour, differ in being radially directed and quite firmly anchored. Buxbaum regards both spines and glochids as modified leaves (Morph. Cact., 1: 11, 18); and possibly *O. molinensis* bears processes which could be said to be intermediate between the two. The leaves are minute, very slender, and deeply buried in the wool. We can confirm the "dark greyish-greenish" stem-segments. It seems that a brighter green may be a sign of poor health.

*O. molinensis* is reputedly difficult. It differs in our experience from plants of the *O. diademata* group in forming a genuine, if small tap-root, and this seems prone to the formation of a dark encrustation which inhibits the growth of side rootlets. We do not yet know the nature of this dark matter, but have found empirically that if the roots are gently freed of it with a fine knife or tweezers, washed and set to heal with fungicidal rooting hormone powder before potting, the plant will later respond with good growth.

Britton and Rose note under their *glomerata* that *O. schumanni* was a homonym and that the plant needed a new name but hesitated to give it one (The Cact., 1: 90). Borg incorrectly upheld Schelle's name, apparently not appreciating that Spegazzini had already, before Schelle, rectified the mistake in his first choice of name. Backeberg lists *T. molinensis* as the next species in his sub-series *Platyacanthi* after his *T. articulatus* and varieties (l.c.). He gives *O. diademata molinensis* Hoss. as an additional synonym without reference. As to Borg's account of a strange different plant under this name, see under *O. diademata*. B. M. Lamb calls *molinensis* "a wonderful species and probably my favourite" when discussing the *Tephrocacti* in Nat. Cact. Succ. Jour, ut sup. (1966).

We give Spegazzini's spelling of the specific epithet. Many sources give "schumannii".

The more recent names not listed under any of our groups but deserving of attention are recorded here under the year of original description.

1919. Not *O. skottsbergii* Br. et R.— it belongs to *Pterocactus* if this is accepted as distinct.
1923. *O. alexanderi* Br. et R., The Cact., 4: 256 (= *O. halophila* Speg. 1925).
1925. *O. alexanderi* Br. et R. var. *bruchii* (Speg.) Rowl., Reun.: 5.  
*O. molfinoi* (Speg.) Werd., Neue Kakteen: 65-6 (first treated by S. as type of new genus *Maihueniopsis* and remains obscure).
1926. *O. bruchii* var. *brachyacantha* Speg., Revista Arg. Bot. 1: 200-4.  
ditto var. *macracantha* Speg., l.c. (both accepted by Backeb. as subvars. of *alexanderi bruchii*).
1929. *O. riojana* Hoss. ex Berger, Kakteen: 55 (? = *alexanderi* Br. et R.).
1931. *O. kuehnrhichiana* Werd. et Backeb., Neue Kakteen: 64.  
ditto var. *applanata* Werd. et Backeb., l.c.
1933. *O. camachoi* Espinosa, Revista Chil. Hist. Nat.: 126-30.
1934. *O. geometrica* Cast., Kakteenkunde: 172.
1935. *O. alexanderi* Br. et R. var. *subsphaerica* (Backeb.) Rowl., Reun.: 5.  
*O. dimorpha* Först. var. *pseudorauppiana* (Backeb.) Rowl., Reun.: 25.  
*O. minuscula* (Backeb.) Rowl., Reun.: 6.  
? ditto var. *silvestris* (Backeb.) Krainz, Städtische Sukkulentsammlung Zurich 1967 Katalog: 95 (? also = *O. silvestris* Backeb. mentioned by him in Cact. Succ. Jour. Gr. Br., 1: 7).  
*O. minuta* (Backeb.) Cast, Lilloa 23: 12.  
*O. weberi* Speg. var. *setiger* (Backeb.) Rowl., Reun. 25 (= *O. setigera* (Backeb.) Cast.).
- 1935-6. *O. weberi* Speg. var. *dispar* Cast, et Lelg., Jahrb. d. D. Kakteengesellschaft: 51.
1937. *O. sphaerica* Först. var. *unguispina* (Backeb.) Rowl., Reun.: 25.
1953. *O. chilensis* (Backeb.) Rowl., Reun.: 5 (later reduced by Backeb. to a var. of *T. atacamensis*).  
*O. mandragora* (Backeb.) Rowl., Reun.: 6.
1956. *O. corotilla* K. Sch. var. *aurantiaciflora* (Rauh et Backeb.) Rowl., Reun.: 5.  
*O. mira* (Rauh et Backeb.) Rowl., Reun.: 6.  
*O. muelleriana* (Rauh et Backeb.) Rowl., Reun.: 6.
1958. ? *O. conoidea* (Ritter) Rowl., Reun.: 25 (author of *T. conoideus* later changed to Backeb. in Die Cact., 6: 3593-4—confusion with *T. schaeferi* Ritt. nom. nud.)
1962. *T. atroglobosus* Backeb., Die Cact., 6: 3905.  
*T. microclados* Backeb., Die Cact., 6: 3599-3600.  
*T. variiflorus* Backeb., Die Cact., 6: 3594-5.

1963. *T. alboareolatus* Ritt., Descr. Cact. Nov., 3: 14.  
*T. catacanthus* Backeb., Descr. Cact. Nov., 3: 14.  
*T. coloreus* Ritt., Descr. Cact. Nov., 3: 14.  
*T. curvispinus* Backeb., Descr. Cact. Nov., 3: 14.  
*T. hegenbartianus* Backeb., Descr. Cact. Nov., 3: 15.  
*T. melanacanthus* Backeb., Descr. Cact. Nov., 3: 15.

- T. parvisetus* Backeb., Descr. Cact. Nov., 3: 15  
(? close to *conoidea*).  
*T. sphaericus* (Först.) Backeb., var. *glaucinus* Backeb., Descr. Cact. Nov., 3: 15.

1966. *T. microsphaericus* Backeb., Das Kakteenlexikon: 426.  
*T. virgultus* Backeb., Das Kakteenlexikon: 430.

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## CULTIVATION

We have already indicated that some of these plants, including what is perhaps the most individual, *molinensis*, are apt to be temperamental. The rest seem to respond reasonably well to a cautious version of *O. glomerata* group treatment: indeed, the Robert Blossfeld (Potsdam) trade catalogue K320E (undated, 1933?) notes *atacamensis* as winter hardy in their conditions, along with “Davini” (no doubt a typing error for *darwinii*), *floccosa* and *ignescens*. This is qualified in its English text by a salutary “more or less”. For those anxious not to lose a cutting obtained with some difficulty, we would say that Tephrocacti can of course be grafted. Our attitude on this is broadly the same as that succinctly expressed by Rowley (Flowering Succulents, 39-41, 66-7, Farnham, 1959), in the wider context. Sensationally atypical growth can result for one or two

stem-segments, but we have noted that subsequent segments further from the stock revert satisfactorily in most cases to something superficially indistinguishable from type, and that a successful union with a different genus can be satisfactory in this technical sense. For example, we know a good *molinensis* living on *Trichocereus pachanoi*. The use of the older Echinopsis hybrids is also practical, and may prove more convenient than the more often recommended large pad Opuntias, which take up so much space to produce for the purpose. We would add that bloated and unnatural Tephrocacti such as appear from time to time on the show bench in this country (and win prizes under succulent plant judges who ought to know better) are more often not the result of years spent on a graft but of a season or two of intensive feeding.

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## Envoi

Lemaire chose characteristically as the motto for one of his works “E controversis fiat lux”. We have certainly shed a little more light on our subject in the course of this book by including historical matter not otherwise accessible to most of our readers and by (in some cases) for the first time translating it into English and (in others) making the Latin available for the benefit of a wider public. Our intention has been to provide as dispassionately as we can a firm foundation from which further and fuller research can proceed into the study of the whole of this long neglected subgenus, in the course of which the many

recent and fascinating discoveries can, we hope, be reappraised in a more reasonable perspective. There is ample material available in a number of distinguished collections in various parts of Europe, notably Spain, France, Germany and Switzerland, but we are (with all respect to the curators there) firmly of the opinion that considerable further field work in the countries of origin will be needed before the full tale can be told and certain outstanding problems resolved. The Succulent Plant Institute would be pleased to co-operate in the collation and dissemination of further information on the plants.

## Postscript

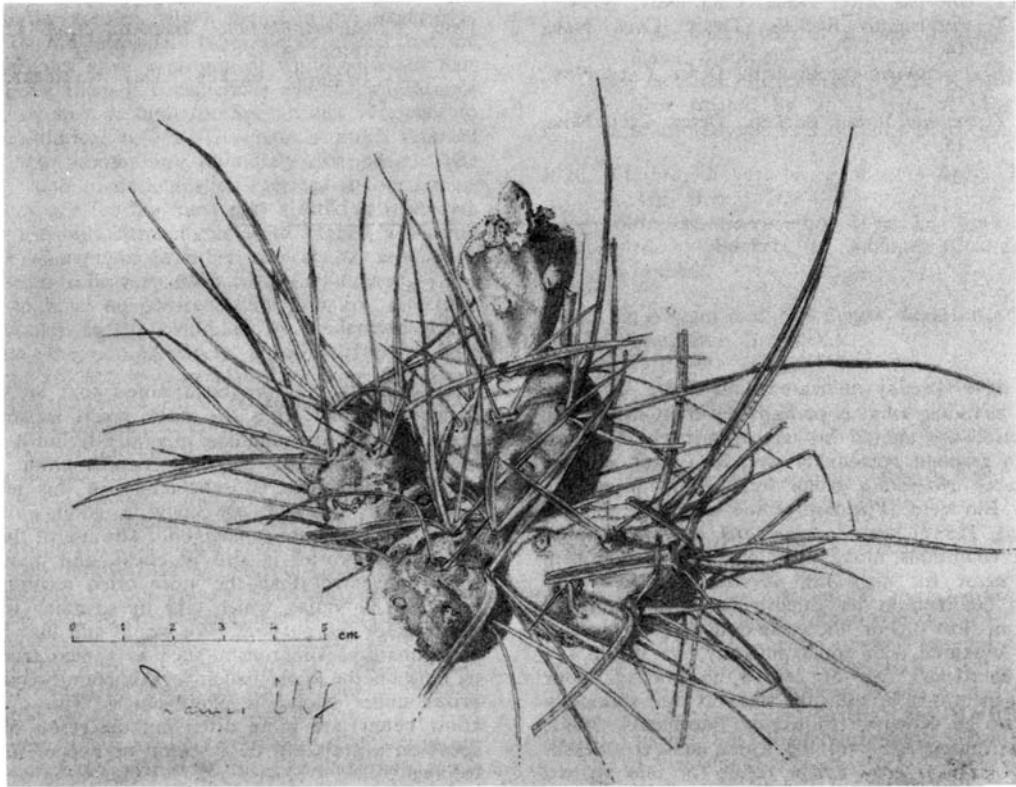


Fig. 77.

### **O. platyacantha** from Neuquén

We are greatly indebted to Mr Colin Makinson for sending us in November 1972, after we had completed our text, this cutting with particulars of its habitat: "just one isolated clump which had formed its own mound of wind-blown sand" outside Neuquén on the edge of the flood-plain of the River Limay, below a cliff of interbedded sandstones, limestones and clay shales some four kilometres north of the river. The plant seems now to be scarcer in the area which is being transformed by the El Chocon-Cerros Colorados hydro-electric scheme. Surface soil by the plant from which the cutting came was mostly small, rounded fairly uniform sand grains, a few small iron-bearing nodules and some clay with plant detritus. It was alkaline (pH 8.90). No examination was made of the underlying soil.

The spines of the specimen point clearly to *O. platyacantha*. The fruit, which bears a dried remnant of flower, is bright green while the newer stem segments are paler green, having already faded from a pure uniform, olive-green since arrival: the older segments are dull brown. They are just under 40 mm long and nearly 30 mm in diameter, indicating a plant midway between what we call "big green" *platyacantha* and the small, cobby plant we refer to as probably Backeberg's var. *neoplatyacanthus*, i.e. about the size of Lemaire's plant, but that was "stoutly tuberculate" and had shorter spines. All the stem segments of the specimen, regardless of age, are not strongly tuberculate, but of course even the newer ones are not young.

The spines are various shades of brown, thus clearly distinct from *O. hickenii* Br. & R. The fruit agrees externally very closely with the 1926 Spegazzini description of *T. hickenii*. Many other similarities with the description tend to confirm our view that he had some *platyacantha* material before him at the time. A difference is that the Makinson plant has at least four, not three, spines per areole, including one or more of the thinner 3-edged sort noted by Schumann as centrals in his version of *O. platyacantha*. These are longer than he noted, being up to more than 80 mm, only slightly twisted and 1 mm wide. Most of the spines are up to 3 mm wide and not more than 50 mm long, flattened and with the familiar pale stripe along each edge and splendid transverse patterning. The spines are very pungent, tangled and, on the whole, spring out further from the segments than on most cultivated plants we have seen within the species. They are also of course relatively longer.



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## THE SUCCULENT PLANT INSTITUTE AND TRUST

The Succulent Plant Institute was founded in 1962 by a group of amateur collectors and students with the object of promoting the study of succulents and the founding of a National Collection of these plants. Concern was felt at the loss of scientifically valuable plant collections on the death or incapacity of their owners, so one of the declared aims was the preservation wherever possible of such collections. The well-known collection of Aloineae and related genera of the late J. T. Bates was the first such collection to be taken into the Institute's care. This is now housed in South London and can be visited by patrons of the Institute by arrangement with the Curator.

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In 1970 the Institute set up and registered a charitable educational Trust, known as the Succulent Plant Trust. The Trust endeavours to promote the Institute's aims and to build a strong financial base for them. Publications of the Institute are handled by the Trust, which is responsible for fund-raising and investment. The Secretary of the Succulent Plant Institute will be pleased to supply full details of membership and of the ways in which the Trust can be helped to carry out its programme.

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| † Gymnocalyciums: some observations on the genus by a study group. Edited by R. Ginns.           | 1967 |
| † A Synonymy of the Genus Gymnocalycium, 1845-1967. E. W. Putnam.                                | 1969 |
| The First Fifty Haworthias. John W. Pilbeam.   | 1970 |
| Sedums: some observations on the genus by a study group. Edited by J. A. Hart and T. C. Wrigley. | 1971 |

† *Out of print.*





