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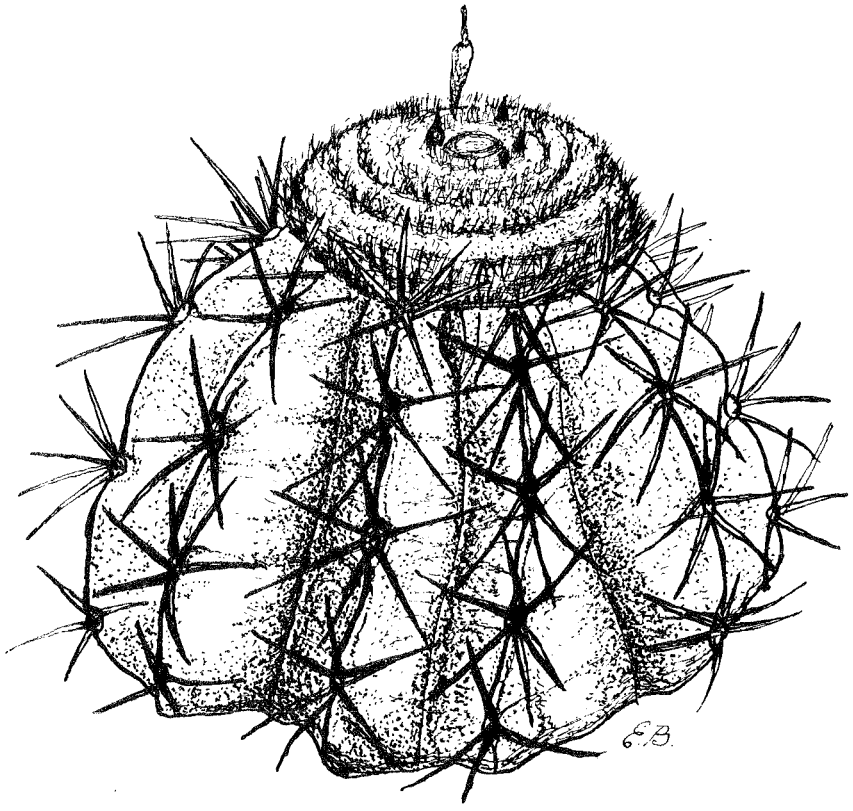
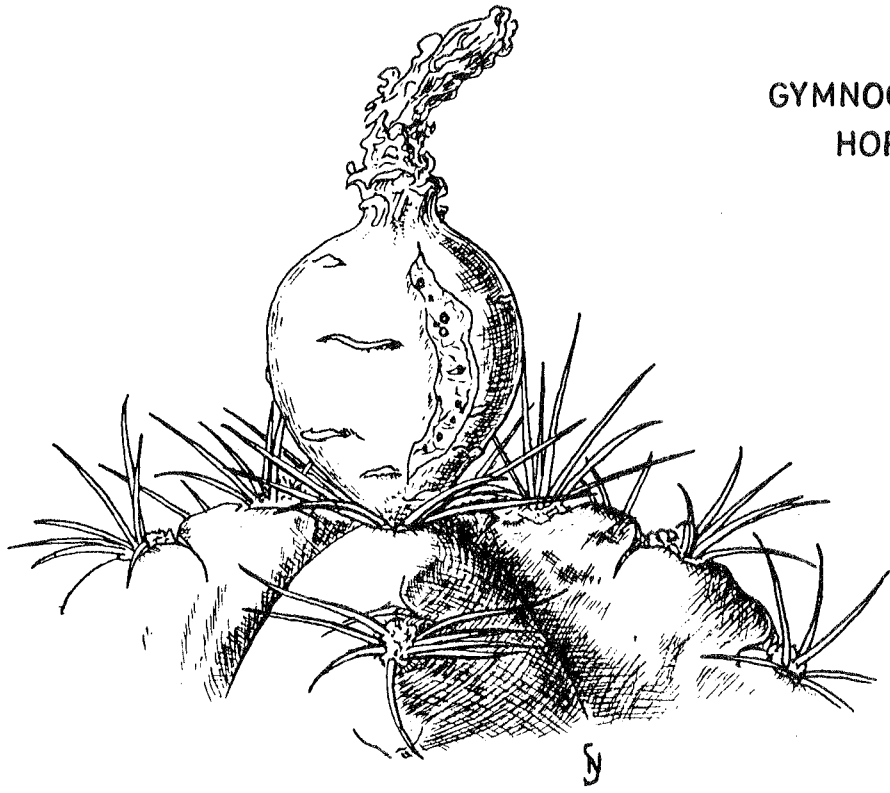


Melocactus melocactoides
HU 237

Actual size

GYMNOCALYCIUM
HORSTII



GYMNOCALYCIUM
BUENEKERI

Collection - G. HOLE

Full Size

GYMNOCALYCIUM BUENEKERI SETS FRUIT **From G. Hole**

Setting a fruit on G. horstii has been achieved each year now for several years, but only with the help of a brush, usually by using pollen from G. multiflorum or G. hybopleurum. Persuading seed to set on G. buenekeri is a totally different matter however. Since l980 I have tried to set seed on this plant, but until 1983 I had no luck. It took a lot of work with the brush and also pollen from about 30 different species that happened to be open at the time. I would agree that the stigma lobes on both of these species are longer than is usual on Gymnocalycium – they are about 10-12mm long – but then the flowers are larger too! Flowers on both of these species seem to possess very little pollen. The fruit on G. buenekeri started to swell about two weeks after the flower was pollinated; it then took about ten weeks for the fruit to grow up to the size it had reached when it was on display at the Chileans Autumn Weekend.

. . . from J. Lambert

Although I have tried to cross pollinate flowers on two different plants of G. horstii, so far I have not obtained any fruit. At first a suggestion of a fruit seems to shape up but then merely withers away. However, I noticed that the flowers of this species were of quite a large size – some 100mm in diameter, 75mm in height and with a pericarpellum of about 20mm. This latter would account for a fruit of nearly 30mm in height.

. . . from G. J. Charles

This year quite a number of Gymnocalycium have set fruit without any help at all from me. Included in this number is G. buenekeri, which has set a fruit which may be said in general terms to be large for a Gymnocalycium but bears no resemblance whatsoever to the fruit on G. Hole's plant.

. . . from G. J. Swales

Towards the end of September the fruit fell off the plant of G. buenekeri which was on loan from G. Hole. It split longitudinally, exposing the seed embedded in a white to colourless pulp. The fruit weighed 113.4gm (about four ounces) when ripe and smelt deliciously of ripe melon and strawberries, although still green in colour externally. All the seeds were separated from the pulp by smearing the mixture onto absorbent tissue and picking out the seed by hand. The seeds were then counted, the final total being 2479. Some twelve of these seeds had already germinated and were growing submerged in the pulp; I transfered these to a closed petri dish containing moist filter paper but unfortunately they all succumbed to a fungal attack. Has anyone been successful in raising seed that has germinated by endogenous vivapary? Although externally the seed looked normal enough, on crushing a random sample, very few indeed contained anything which might have been a viable embryo. If the seed is sown in Spring I would forecast a percentage germination rate in single figures!

Although I am never able to get round to hand pollinating my Gymnocalycium flowers, I do obtain an appreciable number of fruits, especially on plants in the G. gibbosum group. As there are very few insects on a roof top four storeys up in the centre of Sunderland, I suspect that quite a number of my fruits must have been set on self-fertile plants, just as G. Charles observes. Equally I would suggest that although G. Hole did apply a great deal of pollen to his G. buenekeri flower, this does not entirely rule out the possibility that it was self-fertile and set it own seed. Where cross-pollination is done by a brush, it is never impossible that a flower could already have set seed by selfing, or as a result of a visit from an insect, before manual intervention. The only certain way of controlling cross-pollination is by emasculation i.e. removal of the stamens before the anthers open to release the pollen. This usually means removal of the stamens just before the flower opens. This is a highly skilled operation which is commonly practised by plant breeders. If done too soon, it may kill the flower, or fail to achieve the intended objective if carried out too late. Immediately the manual cross-pollination has been done, the flower must be enclosed in a porous but insect-proof bag. Unless all this is done, one cannot be certain that the fruit was not set by self-pollination or by the agency of some stray insect.

I am very grateful to G. Hole for letting me have this plant on loan since it is the first time that I have been able to study a fruit of this species.

. . . from C. A. L. Bercht

I have been able to set fruit on G. buenekeri by transfering pollen on to the flower from an Echinofossulocactus. This was the first time that the plant had flowered for me and it set three fruits. These were indeed very large, about 6cm long and 2.5cm diameter. The fruit is still green when ripe and you can see the seeds through the pericarp. The fruit does not split but weakens and I think that in the wild it will break up. The pulp is very wet and thin. Two of the fruits fell off more or less at the same time and I sowed many of the seeds which germinated quite well. I did not count the seeds at the time, but now that you have asked I find that there are about 500 seeds remaining, so I suppose that the two fruits each contained about 350 seeds.

Cross-pollination between flowers of G. buenekeri and G. horstii failed to set fruit; perhaps the flowers were not ripe for pollination? Every time I have occasion to look at these two species it amazes me that two so similar looking plants produce such different seed.

. . . from H. Middleditch

Surely we should not expect seeds to be similar just because plant bodies are similar. A resident of Rio Grande do Sul may well consider as rather similar the overall habit of Beech, Sycamore and Oak in an English wood; it would be unwise to assume that the seed would also be somewhat similar. Speaking of the Tola bushes found on the high Puna, Fiebrig says of Fabiana densa, a Solanaceae, "it is physiognomically in growth, branch formation, leaf form and flower carriage so like the Compositae Tola bushes that only with difficulty can one get accustomed to placing them systematically elsewhere". Of the cushion plants found on the Puna, Fiebrig mentions a Verbena and also the "white flowering Pycnophyllum pilgerianum which is so similar in habit, leaf form, etc. to the verbena that it can scarcely be distinguished from observation of the surface features". The admirable illustrations of Opuntia subterraneana and Rebutia pygmaea which appear in Fries' account of the Puna Flora show two plants of remarkably similar appearance with very different seed forms. The body morphology represents a similar defence response to the hostile macro-environment, whereas the different seeds probably exploit alternative means of survival between plant generations.

In a similar way, G. horstii and G. buenekeri both grow in a macroclimate with a very similar temperature and rainfall regime: as far as it is possible to judge from the very limited information that is available, it seems that both plants may well grow in immediate surroundings which are not vastly dissimilar, possibly grassland with sparse bushes. Hence in a similar macroclimate and in similar immediate surroundings, the two species have evolved similar body morphology.

On the other hand if the nature of the bedrock and the surface soil derived from the bedrock is considered, it becomes clear that G. horstii grows near Cacapava on soil derived from ancient granitic rocks, whilst G. buenekeri from San Francisco de Assis grows on soil derived from younger sedimentary rock interbanded with deep cills of basalt lava. Gymnocalycium horstii comes from central Rio Grande do Sul where trees are sparse and grow only in more favourable spots, whilst G. buenekeri lies within a zone that originally supported dense and extensive tracts of woodlands. South America supports a vast and varied population of monkeys, of which almost all are tree dwellers. It is possible that monkeys may be found on the southern margins of the Brazilian forests, in Rio Grande do Sul, around the habitat of G. buenekeri. The fruit on G. buenekeri seems to me to be about the size and consistency that might attract a monkey. The environment of G. horstii seems to be unlikely to support any monkeys so it would be a waste of effort for the plant to produce a fruit that attracts a monkey. But I suspect that the different seeds are each in their own way eminently suitable for the quite different surface soils and ground conditions at each location.

. . . from Mrs. N. Swales

The fruit of G. buenekeri remained green when ripe and possessed a delicious aroma. It could hardly be directed towards bird dispersal, since birds have no sense of smell and are unlikely to be able to see the fruit easily in the surroundings of other green vegetation. On the other hand, many mammals do possess a well-developed sense of smell; so I would suspect that dispersal of the seeds of G. buenekeri would be done by mammals and certainly not by birds.

. . . from Librarian, Zoological Society, Regents Park, London

We would not appear to have any information which will throw any light on your query concerning the distribution of monkeys in southern Brazil.

. . . from K. H. Prestle

The surroundings of Quevados are not very well wooded, but they have become dreadfully deforested. Even the well-wooded areas are becoming quite rare. Around Santiago and Boquerao there are virtually no more trees at all now, whilst from there in the direction of Alegrete all the timber has been cut down and the land turned over to agricultural use, so that almost no cacti are to be found there any longer over some 200km.

I have found it difficult to be able to collect anything in the way of Gymnocalycium in Rio Grande do Sul; often I only met with little plants of 1 to 2cm across. However I do have a worthwhile collection and it does demonstrate that G. denudatum consists of a series of vary variable varieties and is not just "the" denudatum. In the border region with Uruguay there are quite naturally transitions to the species found in Uruguay. It is remarkable that in the area around Encruzhilda I have found large plants of Gymnocalycium that grow in crowds and bear very large flowers of white to pink blooms. The construction of the flower displays an undoubted similarity with G. horstii, but since up to the present time I have not been able to harvest a single seed from them, despite several pollination attempts, I am still uncertain about it. Of course I obtain fruit, but they are uniformly empty! But from many of my collected Gymnocalycium I now have small seedlings so that at least their propagation progresses slowly.

. . . further from H. Middleditch

At our Chileans Weekend where K. H. Prestle was our visiting speaker we saw slides of the huge flower on the Gymnocalycium denudatum from Encruzhilda; the flowers were about five inches tall and five inches in diameter. Very fortunately I also have a copy of a slide taken by Buining near to Lavras do Sul where he found Gymnocalycium denudatum. In an earlier Chileans it was suggested that the original G. denudatum originated from near Pelotas in the S.E. corner of Uruguay. All these places are shown on the map opposite p. 134 in Chileans No. 30. On this evidence it would appear that G. horstii occurs within the general distribution area of G. denudatum.

My attention has been drawn by G. Swales to an apparent anomaly between the description of G. horstii and G. buenekeri which was provided by Buining in K.u.a.S for 21.9.1970 (Chileans No. 30, p. 146), when compared with the currently accepted distinction between the two species. The most obvious basis for identification is the shiny green body for G. horstii and the dull green body of G. buenekeri, which is included in Buining's description. Experience of setting fruit on these two species in cultivation is suggesting that the fruit on G. buenekeri is markedly larger in size than that on G. horstii.

However, in Buining's original description we find that the fruit on G. horstii is also 50-60cm long, which is much larger than any grower has so far reported for this species. It is quite simple to check this size by means of the photograph in K.u.a.S for 21.9.1970 of a fruit of G. horstii which has been cut in half. Many seeds are thereby exposed on the cut surface and these seeds measure just over 1mm across on the photograph. A separate sketch is provided of the seed of this species, which gives a seed size of 1.2mm deep and 1.3mm wide. In this way we may deduce that the sliced fruit is shown at full size; it measures virtually 60mm high, which conforms with Buining's accompanying description for G. horstii.

It is rather difficult to believe that the fruit set on G. horstii in cultivation is consistently only round about half the size of that pictured by Buining. What is more, the fruit pictured by Buining as that of G. horstii seems to be closely approaching the size of that expected on G. buenekeri. What are we to make of this situation? Do we go so far as to suggest that the fruit which Buining described for G. horstii is not that at all, but in reality the fruit off G. buenekeri? But then how can we explain that the seed sketched by Buining is both the correct shape and the correct surface texture for G. horstii and would be quite incorrect for G. buenekeri seed? Are we obliged to conclude that the size of fruit set on G. horstii in cultivation simply does not measure up to that which is found in the wild? After all, fruit set on plants of G. pflanzii in cultivation rarely comes up to the habitat fruit of tomato size and colour. If that is the case, do we have to discard the idea that the fruit on G. buenekeri would normally be a great deal larger than that on G. horstii? So back to the basic question, what is the purpose of such a large fruit?

. . . from P. Allcock

Whilst I would not by any means claim that it is always the case, I get the feeling that it is easier to obtain a

large fruit (within certain genera) by cross-pollinating with a different species i.e. by producing hybrid seed. A few examples may illustrate this. On Cleistocactus vulpis-caudae a hand crossing to produce true seed yielded a fruit about 1cm long and wide; this is about the size of fruit that I would usually expect to see on Cleistocactus. By comparison a hybrid fruit on Cl. santacruzensis is 2cm long and 1.25cm wide; hybrid fruit on Cl. sp. from Sargant is 2cm long by 2.25cm wide. On Echinopsis, a hybrid fruit on E. pojoensis is 3cm diameter and 2.5cm high; another hybrid fruit on a KK sp. Echinopsis is of similar size; these are both larger than the normal size of fruit that I would expect to see on Echinopsis. Is the reason for the larger fruit reported by G. Hole on his G. buenekeri due to it being a hybrid?

In habitat, there may be hundreds or even thousands of the same species at a given site, so that multiple pollinations may occur as a flower is visited by several pollinators. Sufficient quantities of pollen could be deposited on the stigma to produce the maximum number of viable seeds and then large fruits will be produced. On the other hand in a greenhouse we are lucky to have two or three plants of the same species in flower at the same time and we cannot expect these to fertilise each other as effectively as the large populations in the wild. Hence the variation in seeds per fruit for a given species that have already been reported in the pages of the Chileans, and the smaller fruits in cultivation than in the wild. I only put this forward as one possible tentative explanation of why our fruits do not always match up to those in descriptions from habitat.

Of course I do not know what steps have been take by K.H.Prestle to obtain the fruit on his large flowered Gymnocalcium. It is possible that he may be using a brush, but I do not believe that brush pollination is any good at all, particularly where the stigma lobes are clasped together. I do try and pollinate a great many of my flowers, but never with a brush. I take a few complete anthers in a pair of tweezers, force the stigma lobes apart and introduce the anthers and leave them gripped between the stigma lobes. I can report that it works very well indeed.

PROBLEM BRASILIPARODIAS **From S. J. Theunissen**

The problem with Brasiliparodias is not a new one on the continent of Europe, although for a good ten years now groups in Eastern Europe have kept themselves occupied especially with Notocactus sensu Buxbaum. In correspondence the question turns up regularly how this group of plants really should be treated. Just because of these recurring questions about this subgenus of Notocactus, it is evident that we do not yet know the answer. Within the international Society of Internoto, established in 1980, one study group is even specially concerned with these plants, but up to now it has not been able to produce a specific answer as to how these plants need to be grown on their own roots.

Although I myself have no special experience with Brasiliparodias, I will nevertheless try to approach the problem at least theoretically. Further experiments will be necessary to show whether these thoughts about the problem are worthwhile or not. The first problem that we come up against is that of growing these plants from seed, for it is often easier to get seeds than plants. The common experience with sowing in the usual fashion is pretty negative. Through pure chance I discovered that seed falling alongside the plant from ripe fruit germinates there straight away and also very well. That means that the seed must preferably be fairly fresh and moreover must not be sown in too much warmth. In recent years, after this discovery, I have sown the seed of Brasiliparodia that was obtained via the seed distribution of Internoto, not before April or May in the greenhouse, without extra warmth. The results have been substantially better than previously, when they were sown under warmth in December or January. Indeed this applies to practically all Notocactus spp; too high a temperature is detrimental to germination.

In general one reads very little in plant descriptions about the conditions under which the plants grow in the wild. Because Internoto obtained as a gift from Mrs. Buining the custody of all the slides that her late husband had taken in the habitat locations visited by him, we acquired a treasurehouse of information about the conditions under which Brasiliparodia and Brasilicactus grow. It seems that these plants grow in very damp surroundings, high up in the hills up to 1500m altitude, in a wooded tract. The plants grow there in open spaces on the rocky ground or against steep slopes, where trees find no foothold. Without exception they are surrounded, indeed almost jacketed, by mosses and tiny ferns. Even when it is not raining it is always moist there on account of the mists drifting in from the ocean. You can find a splendid photograph by Buining on the title page of Succulenta for November 1973, showing how these plants grow in the wild. This picture shows what a thousand words cannot tell.

If we look at the plant itself and then in particular at the parts which we look at the least, namely the roots, then we see that there is a finely branched root system without so much as a fleshy main root. This is readily understandable on account of the permanently moist surroundings in which the plants grow; the plants need no drought reserve. This continuous humidity probably also explains the fact that the seeds only retain viability for a fairly short period. On account of the high altitude and the wooded surroundings it is also obvious that we are dealing with locally moderate temperature – thus explaining the low germination temperature.

Well then if take into consideration that in our greenhouses the summer temperatures are much higher than in the hilly parts of Rio Grande do Sul and that we certainly do not provide our plants with moisture daily, this in my view is the fundamental explanation for the poor performance of Brasiliparodias in our collections. That the solution is to be found in the soil mixture, I do not believe, although a sandy soil appears to be preferable. In summer we could probably cultivate the plants better in an open cold frame where extra moisture must be provided regularly. Possibly cultivation in rockwool would also help with these plants. In no event does it seem to me to be advisable to give these plants the warmest place in the greenhouse. As already suggested, much will be revealed after experiments.

If we cannot meet the requirements of these difficult plants, there only remains the possibility of grafting. It will often be evident that grafted plants quickly deform, losing their compactness as they grow. Choose for preference a slow growing stock such as Trichocereus pasacana. Brasiliparodias are also very sensitive to red spider, which is perhaps a result of the fact that the plants are not really healthy with us.

Out of the statistics that Brasiliparodia and Brasilicactus have a common distribution area, it might be deduced that Brasilicactus might also be problematical; but Brasilicactus occurs more on the open flat rocky places and

therefore these plants can tolerate somewhat more heat, but it is a fact that many cactophiles who do not have so much trouble with other Notocacti, still experience a fair amount of problems with this group. I should like to hear via The Chileans and Internoto from cactophiles who have no problems with Brasilicactus, and yet do have problems with Brasiliparodia. Possibly responses can also be published in English in Internoto, for we are trying to break down language barriers. Internoto, the Society and the Journal, are in no way meant to compete with existing groups or periodicals. We concern ourselves solely with Notocactus sensu Buxbaum.

. . . from H. Middleditch.

In the north of Rio Grande do Sul there is an upland called the Serra Geral which is generally rolling highland without prominent peaks. The highest part of the Serra Geral lies in the north-east of Rio Grande do Sul and here there are a range of prominent peaks, running more or less parallel with the coast, that do rise well over 1500m. This range is the Aparados da Sierra. This is the highest land in Rio Grande do Sul so the Brasiliparodia could well grow there at the 1500m altitude quoted by Theunissen. However, I feel that any mist in that locality will arise either orographically or from night-time condensation, and not by drifting in from the sea, as Theunissen observes. With the high average annual rainfall enjoyed in this region, the humidity of the air could often be high, but it would need a low night time temperature to drop absolute humidity below dew point. How low does the temperature fall in these parts? It is certainly valuable to hear that the immediate surroundings of these plants is a bed of moss; perhaps Buining's photograph is typical of the immediate surroundings in which these plants grow? Any more information about the environment in habitat would be equally valuable. In addition, any ideas on how to grow Brasiliparodias successfully would naturally be welcome.

. . . from P. Bint.

I have tried growing Notocactus buenekeri and find that I cannot keep it alive any longer than one season. On the other hand, Notocactus alacriportanus stays with me rather longer, but on its own roots it will persist in bending over; whatever I do in the way of support to try and keep it upright, within a few weeks it has devised some way of lying down again; it also seems to be susceptible to scorch.

. . . from R. Christian

I have one or two plants of this group and they are the same size and in the same condition as when I acquired them about three years ago. One has been put on a graft to get it to move. They are in a position on the staging which gets its full share of sun; they have certainly not been tried in a more shaded position. We must have a fair amount of lime in our tap water which can produce yellowing effects in the cacti, particularly in the lower parts of the plants. This may give me problems with plants like N. buenekeri which other people do not suffer.

. . . from P. Allcock

I too have quite a lot of experience in not growing Brasiliparodia. In my opinion they rank as one of the most difficult genera on their own roots – whilst they have still got any. I have grown B. buenekeri and B. brevihamata to flowering size but have never managed to keep one more than four years from seed. They seem to lose their roots at the slightest prompting and I have never managed to reroot one; they simply dehydrate and die. Nearly all my plants are grown in trays but this does not seem to help the Brasiliparodias. I have successfully rerooted habitat collected Discocactus, Uebelmannia, etc and many other so-called "difficult" plants, but the two most difficult genera for me are Brasiliparodia and Argentine Pyrrhocactus. Perhaps I should treat Brasiliparodia like the Uebelmannia and Discocactus – superb drainage and hot and wet all the year round; perhaps that would work. Germination of the seed is very poor – only three or four out of a hundred.

. . . from J. Forrest

Certainly the Brasilian Notocacti can be temperamental in my experience. They must not be allowed to go completely dry even in the coldest winters. These plants can also mark easily through a cold winter, especially a damp one, so some extra heat is required, either a shelf near the heater or on a heated sand bed but with no cover. I have also found them to be prone to attack by mealy bug so they get more than the normal treatment with insecticides. The foregoing also applies to some Wigginsias.

The Brasilian Notocacti tend to flower very early in the year, buds forming around February and opening early in April. If the plants dry out during this bud formation then the buds often abort. These plants also flower when they are very small. I had some N. buenekeri seedlings in bud early this year at under two years old from sowing; the flowers are miniatures of the adult, no more than one cm across.

. . . from G. Charles.

From the appearance of the plant and of the flower and especially from its cultivation likes and dislikes I am tempted to ask why my Notocactus rechensis is not called a Frailea. It does not like a lot of sun, it must be kept wet (or at least moist) all the time or else it will dry up. Once I let mine get too dry it is almost impossible to get it to pick up and start back into growth again. Even potting it up into a larger pot cause it to sulk. To me, it has to be grown like a Frailea, with the compost kept acid at all times. Although I have seen plants of this group with quite large bodies, it never seems possible to get them to grow to that size in cultivation. One plant which I tried was an offset from a plant at Hollygate that was 4 in. high and 1 in. plus in diameter, but my offset never managed to grow up to that size.

. . . from R. Rolfe.

Certainly plants of this group are not easy to raise from seed, but I must admit that my recent sowings of Notocactus seed have only resulted in a pretty poor germination. As an experiment I will be sowing my next batch in November. Now as to plants, I have grown both N. buenekeri and N. alacriportanus, but lost the latter. Some three years ago I decided to try a different system of cultivation for my Notocactus and Parodias, using one inch deep trays without any drainage. These are filled to the brim with a compost which comprises peat with an addition of about 25% each of John Innes No.3 and pearlite. A generous addition of Vitex Q4 and phostrogen is included. The plants grow with a free root run in this one inch deep layer of compost and they certainly seem to thrive on it. Some time ago there was an article in The Chileans about Parodias losing their roots in the middle of summer; it suggested that it would be better to water the plants early and late in the year, letting them go dry during the hottest part of the summer. I have followed this idea with both Notocacti and Parodias and

it certainly seems to work.

In spring the tray of plants is watered very liberally with a hose until the bed of peat gets so wet that it is almost a slurry. Despite this, during a hot sunny spell it will dry out in about two days. Now that I have added a covering of fine grit over the bed of peat it takes a little longer for the compost to dry out. During July and August I only spray these plants by using a fine rose on the end of the hose pipe . For about one month the compost will get no water at all and dry out completely. In September it is again generously watered, though not as liberally as in Spring. For five or six months over winter a sheet of bubble polythene is laid carefully over the plants and this will be lifted occasionally during the winter to give them a heavy spraying. This sort of treatment seems to me to produce leathery rather than soft roots and perhaps this is why they are not lost.

A plant labelled Notocactus buenekeri was one of those taken out of a pot and transferred to this form of cultivation. It seems to be satisfied as I have had it for four or five years now. It has grown to 3 plus inches across and is offsetting, but it has never flowered.

. . . from J. Arnold

It is rather surprising to hear of "Brasiliparodias" described as temperamental as I had not considered them to be to be desparately difficult. To me they are not as difficult as some Parodia. About seven or eight years ago I obtained a N. buenekeri from a friend who had grown it from seed; I have not found that this plant or the others exhibit the astonishingly quick growth often claimed for them. This plant is now 4 plus inches across without any offsets. I find that they make quite a lot of growth in the year and the previous years' growth disappears underneath, so that they increase in bulk quite slowly. The plant flowers well in the spring, often quite profusely and the flowers are fairly sweetly scented. It is certainly maturing now because the spines are gradually becoming longer and larger and appear to be nicely wrapping around the body.

In addition I have had a N. alacriportanus for about 3 or 4 years, also acquired as a seedling and now about 3 plus inches across. Yet another plant which looks like a short-spined version of N. buenekeri is of similar age and size. Neither of these last two plants have produced any offsets either. None of these plants is given any special treatment. They are grown just like all my other plants, in a soil-less compost, but some four or five years ago I had some bad experience with Levington compost – it would not wet very easily and when it did once get wet it stayed very soggy for far too long. Roots simply did not want to seem to grow in it and some plants even died off completely. After that experience I tried some J.I. compost which is made up locally, using four parts of that to one part each of sand and grit. The J.I. compost itself must be made with a fairly sandy loam as it wets well and drains well even on its own.

The first watering of the season is done with the addition of sequestrine to the water in order to counteract any possibility of the compost becoming alkaline. Almost every other watering I do feed with something like phostrogen, but only a weak solution. Although I do not water the plants every day, nevertheless I do water each plant more or less individually with a watering can. All the plants stand in large plastic trays so that any surplus water collects in those trays. Originally I had a shallow bed of sand in the base of the tray but I found that roots worked their way out of the bottom of the pots and into the sand, so now the pots are just stood straight on the trays.

My greenhouse stands with its length set north and south, and it lies between two houses, so that it does not get sun all day long, except perhaps in midsummer. There is a partition to divide the greenhouse into two sections, with the "hot" section at the north end. The Brasiliparodias are in the cool end of the greenhouse which is kept at just above freezing point during the winter, with the help of sheets of bubble polythene over the outside. The Brasiliparodia are located about fifteen feet from the south end of the greenhouse. The Brasiliparodias come into bud quite early in the season, about April time; they form a lot of buds in a ring round the crown which all come up at the same time and all come out together. There is just the one flush of flowers. I think that they have a slight scent which to me is rather like an indeterminate citrus smell.

Although I have been round the flowers trying to encourage fruit to set, none has ever formed for me, so I have no idea what the fruit is like. It also seems to me that these plants are no longer readily available and the seed is possibly not too easily obtained either. Certainly I would like to get hold of some more plants from this group.

. . . from M. Muse

I still have a Brasiliparodia which has been with me for quite a few years now and has survived a variety of cultivation regimes. It was originally acquired from Abbey Brook as a plant just over an inch in diameter, under the name of Notocactus buenekeri v. senescens. Initially it seemed reluctant to grow and turned purplish-black, probably through being exposed to too much sun, so it was moved to a more shaded position. At that time I had no greenhouse and my plants were grown in cold frames; they were taken indoors from October to April and they were not watered over that period. Then my collection was put into a greenhouse with the benefit of winter heating, but after three years I decided to go back to the cold, dry regime for the winter. The whole collection has certainly been down to -7°C on several occasions. By the end of February some species have an extremely shrunken aspect; if there is some sunny weather around about that time it will induce me to start a cautious watering perhaps around the early part of March; from that point onwards I put the paraffin heater on during most nights until April.

The Brasiliparodia endures these same winter conditions with the rest of my plants and like them is bone dry over that period. I do not rule out the likelihood that it may have lost its roots at an earlier period and my apparent good fortune may be accounted for by a good summer. Like a number of my plants, it has been potted up in what is a new medium for me; for grit I am using a granite grit composed of particles of up to 3-4mm in size and containing a lot of finer dusty material. It comes from a quarry about four miles from here on the Charnwood escarpment, a very ancient volcanic remainder of varied composition; other plants which I have observed more closely have certainly thrived on it.

After having the plant for about six years it decided to flower, in the month of June.

. . . from W. Christie

Because of their reputation I have always treated my Brasiliparodias as difficult plants, but I have kept B. brevihamatus for ten years from a small seedling and it has given no trouble. I have sown seed of HU186 B. myriacanthus and HU45 B. chrysocomus, obtained from Kohres and both flowered the following year. In 1978 I obtained a plant under the name of Notocactus rechensis from Hollygate as a cylindrical seedling about one inch across and two inches high. It flowered the

following year and then formed a clump of small heads around the base (as well as flowering again) in 1980. Later that year it lost its roots and I was only able to save one head, which took three years and survived a failed attempt at grafting before re-establishing itself. It has now formed a small clump again budding up in May as usual, with flowers in May/June time. This plant is now given similar conditions to my Parodias i.e. a shallow pot, well-drained compost, and a summer rest.
. . . from A. C. Hall

Yes, I have tried growing Brasiliparodias from seed and have successfully raised B. brevihamata, B. rechensis, and B. buenekeri from seed. I have found that germination is poor even from fresh seed gathered from my own plants. Once germinated they are very slow until they are pea size and very prone to losing their roots. For this reason, the mature plants of the above spp which were grown from seed were grafted at one month old on to Piereskiopsis or Selenicereus stock. I have found that B. brevihamata is a very variable plant – it can be either globular or columnar, it can have white or brown spines; and these are plants from the same parents (not hybrids). Is there any reason why this should happen?

My method of seed raising is to sow the seeds in a medium of half black peat and half sharp sand, both sterilised at 300° C for one hour. The soil is gently tapped into 2 in. square pots, the seeds are sprinkled on top and the pots are stood in a tray containing boiled water. When the surface of the compost is damp the pots are placed in pairs into small plastic bags which are closed at the top by short plastic coated wire seals. The bags are then placed into my homemade propagator at 18° C. The pots rarely need watering again for three months and then only with boiled water. Generally the pots and seedlings remain sealed up for 4 to 6 months from February/March to June/September.

On removal from their plastic bags each pot has a 5mm layer of 1.5 – 2mm size grit poured onto it to prevent the growth of algae and to prevent the pots drying out too fast. In addition a small fan of 4 in. diameter controlled by a time switch moves the air over the seedlings for five minutes each time, every hour during the day and every two hours at night. I used to have a set of strip lights over the seedlings, coupled to an optical sensor which supplemented the light if the natural level of daylight dropped below a certain level within a 16 hour growing day, but when I found that this provided no real advantage and that the seedlings grew just as well without the added pampering, I stopped using it.

Except for the sowing of the seed and covering with grit later on, it will be obvious that my aims have been to make seed raising as labour free as possible; maybe I have been rather sophisticated with the electronics (which are a little more complicated than the preceeding outline). The other thing which I have tried to do is to reduce the number of variables so that I can change my method of growing seedlings if something goes wrong with the previous year's crop.

My propagator is 5 ft. long by 1 ft. 9 in. wide and it can hold some 300-400 pots of seedlings. The heat is provided by twelve 60 watt light bulbs below the pots, controlled by a thermostat in the seedling section. If the box gets too hot, a thermolink raises the lid at 30° C and lowers it again at 25° C. The base and sides are lined with expanded polystyrene and inside that the base and sides are lined with bacofoil to reflect the light upwards. The top above the seed pots is a double layer of polythene mounted on a hinged frame. The whole arrangment cost about 75p per week to run in February, about 72p per week in March, and in April it cost just under 50p per week.

BRASILIPARODIA Ritter gen. nov.
Translated from Kakteen in Sudamerika Vol.I by H. Middleditch

(Latin diagnosis provided)

In regard to the name Brasiliparodia, I had already selected this name about 1965 for my own publication. By chance Josef Jelinek from Liberece in Czechoslovakia also arrived at the same name. He wrote to me on December 27th 1967 that it seemed to him justifiable to choose either Brasiliparodia or Notoparodia as an appropriate subgeneric name for the species involved, and that Michal Ondrej, Dr of Biology, had undertaken thorough seed studies of the group of genera around Notocactus. The outcome of these studies was then published with numerous seed sketches under the title of "Brasiliparodia" in the Czech Journal Kaktusy No.5 of 1968, under the authorship of Ondrej and Jelinek. The designation Brasiliparodia was proposed for the species previously published as Parodia from Rio Grande do Sul, without valid diagnosis and without establishing a systematic rank for this name. The seeds appear to be much more closely related to Brasilicactus than to Notocactus.

Brasiliparodia alacriportana. This species was the first of the false Parodias from southern Brazil to be discovered, by Helmut Berger in the mountains of Porto Alegre in 1939. Since it appears that it never reached Europe and as the Type is a designated specimen in the Botanical Garden in Rio Grande do Sul, which is no longer there, then when various species of this complex were discovered later in the same mountains, they were not taken from their appearance to be B. alacriportanus. Since I have traversed the area in question myself, in my understanding only the species that grows around Cazuza Ferreira can be regarded as Parodia alacriportana Backeberg and Voll.

Brasiliparodia buenekeri forma buenekeri. This species was found by Heinrich Bueneker in Corvo, among the steep cliffs of the Aparados da Serra, where they are found along the ridges of the border between Rio Grande do Sul and Santa Catarina. They grow in a thin layer of almost always saturated black humus soil, on flat rocks, between mosses, sometimes briefly covered with snow, except in summer. In cultivation they should be protected from strong sunlight and from warmer or dryer air; they will perish in a hotter climate.

Brasiliparodia buenekeri forma conjugens. From southeast of Cambara along the old road to Fortaleza. Distribution in a strip parallel to the narrow belt of distribution of the preceding type along the border, going off to the northwest, where the terrain is more or less sloping and the climate is milder. This name indicates that this form lies midway between the form buenekeri and its variety intermedia. The boundary with the form buenekeri is not distinct, so that transition occurs in the wild. FR 1284a, HU 44, HU 46, HU 69, HU 351.

Brasiliparodia buenekeri v. intermedia. Type locality not far N.E. of Cambara. This variety lies between the species buenekeri and brevihamata. FR 1284, HU 42.

Brasiliparodia brevihamata v. conjugens. Distributed between B. brevihamata and B. buenekeri v. intermedia. North-west of Cambara. FR 1277b, HU 71.

Brasiliparodia brevihamata v. mollispina. Type locality south of Cambara. FR 1277a, HU 43a.

Brasiliparodia catarinensis Ritter sp. nov. Type locality Bom Jardin da Serra, Santa Catarina. Like all Brasiliparodia, growing as a mountain rock plant. Discovered by Leopold Horst. FR 1401a, HU 40. Plants of Brasiliparodia found by Leopold Horst, growing between Bom Jesus and Rio Pelotas were considered to be a regional variety of B. catarinensis, possibly even of B. buenekeri. FR 1401, HU 45.

Brasiliparodia rechensis. Of the Brasiliparodia spp only the seed of B. rechensis varies somewhat. Here the hilum region has not yet undergone the evolution of both its parts (or at best it is quite minimal) and usually it remains somewhat rounder. Even here, as in the other species, that part of the scar outline opposite the micropyle lies fairly close to the dorsal end of the hilum. The humps on the testa are somewhat flatter and not (or faintly) arranged in lines, and the testa margin is curved outwards even less. Otherwise the seed is typical of Brasiliparodia. The plants, too, exhibit no significantly different features compared with the typical species of Brasiliparodia. According to Buining, the fruit is globular, red, splitting open horizontally in the middle on maturity. The type locality, the only place where it has been found so far, lies at elevated places close to other Brasiliparodia species.

. . . from H. Middleditch

This account locates the Brasiliparodia in a fairly restricted area in the north-east part of Rio Grande do Sul. Almost all the place names involved may be found on the accompanying map of Rio Grande do Sul. The border between Rio Grande do Sul and Santa Catarina follows the ridge of the Aparados da Serra and also constitutes the eastern boundary of this distribution area. This ridge is the highest part of Rio Grande do Sul and is evidently cut into pretty steep sided valleys by the rivers flowing from there towards the R.Jacuhy. We do not possess any information about temperatures here – we do not really know if this area is exposed to the same sort of chill winds that Ave-Lallemant records on the heights around Cacapava. But Ave-Lallemant does mention occasional night frosts and Ritter does mention the odd snow covering; this would suggest that there are somewhat similar minimum night time temperatures encountered in both areas in winter.

IN SEARCH OF CACTI IN RIO GRANDE DO SUL **By K. H. Prestle**

Translated from Succulenta 60.3.1981 and 60.4.1981 by H. Middleditch.

It is the 22nd October 1979. The sun has just about appeared on the horizon and I see lying below me the highlands of Peru. The picture of the strikingly eroded, treeless, high plateau is fascinating and makes a deep impression on me. The colours of the rock of the various mountain massifs change continuously from ochre yellow, brick red, to manganese brown. But for us, Europeans, the green to which we are so accustomed is absent here in the mountains, or is only to be seen as a narrow strip in the deep gorges and valleys. Now and then the prospect is interrupted by massive mountains clothed in white snow, whose peaks rise above the clouds; after that the weather is the same as before. Whether we are still flying over Peru or already over the mountains of Bolivia is uncertain from here. One must measure the world in flying hours, for roads in this land are but few, so that great areas must still be unexplored.

After some hours we finally reach the green belt of Brazil and know that we shall shortly land in Rio de Janeiro. The customs control does not take long, so that I can quickly start on the internal flight with the Brazilian company "Varig" towards Porto Alegre, the terminus of a journey of more than 36 hours. After three hours' flying we are there, and at midnight we land at Porto Alegre. An extraordinarily cordial welcome awaits me in the house of my friend and guide "Xico" and after an hour's chat in the cactus greenhouse, sleep can no longer be held at bay.

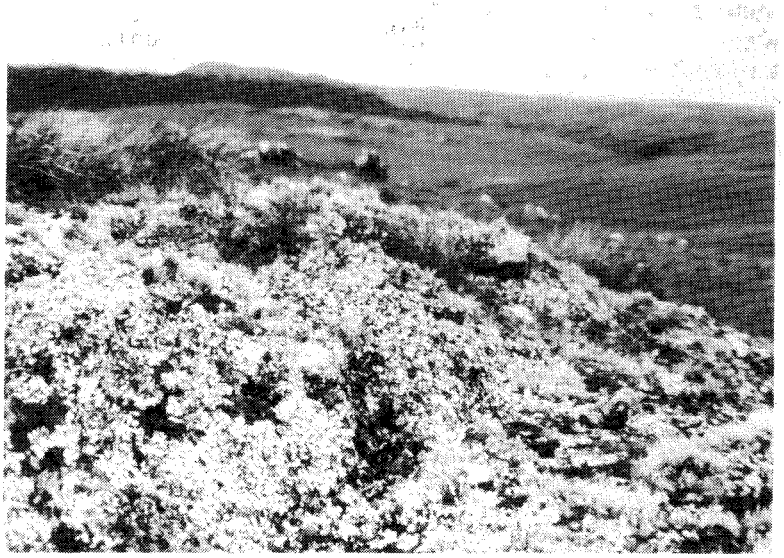
[The first trip is local to Porto Alegre]

25.10.79. The first longer expedition brings us to the territory of the Brasilicactus and Notoparodias. After 180km via Taquara and Francisco de Paola we reach the district round Tahinias, where we came across the first cacti on this expedition. Of interest here is a stand of Notocactus linkii var. PR212 which is apparently exposed to severe cold here in the hills, for all the plants which we saw had frost damaged ribs. There is also a cold wind today and showers of rain do not make it easy for us to search the territory intensively. We had dressed ourselves warmly but it is still no pleasure.

After 50km we came to a flat rocky plateau that is still completely untouched and thickly carpeted with mosses. There we found the first Notoparodia PR265. Besides the white and yellow glossy lichens, beautiful alpine flowers grow here. The whole district reminds me vividly of the Tyrolean alpine meadows. Of course we scan the rocks very intensively now for Notoparodias, but only after 30km did we see a population again. I take this find to be Notocactus hamatacanthus PR267, but it is very difficult to identify Notoparodias in situ, because these wild plants are much more compact than we are accustomed to with those plants in our greenhouses. The plants are almost invisible among the glossy mosses, because they are more than half buried in the moss. The long fibrous roots which can become more than 50cm long, grow in the thin layer of humus under the mosses. One can well imagine what happens when this protective layer of lichens becomes disturbed by burning. To our amazement the buds of these Notoparodias open in the midday sun, despite the cold and the wind. Consequently we could admire, study, and photograph the fine citron-yellow flowers. For both these locations it is characteristic that in addition to the Notoparodias, Notocactus linkii is always present. Both sorts seem happy to grow together at the self-same place. There is, however, no sign of any hybridisation.

Eventually we reach Cambara, a village with 300-400 inhabitants where we attempt to get something to eat in a restaurant, which is a cross between a bar and a provision shop. But apart from beer, small cold sausages and a roll and cheese, there is nothing to be had. Quickly we fill up with some more petrol at a hand-operated pump, because in the next two days we will not be able to get any more petrol. Then we set forth on the road to Fortaleza dos Aparados where we intend to camp for the night. Fortaleza dos Aparados which lies in the National Park of Aparados de Sierra, is an elevated district with a deeply entrenched canyon, running all the way to the ocean. The steep canyon walls are about 100m high. In this unique wild

Notocactus alacriportanus Photo - Buining Succulenta 52.11.1973



RIO GRANDE DO SUL

Brasiliparodia habitat

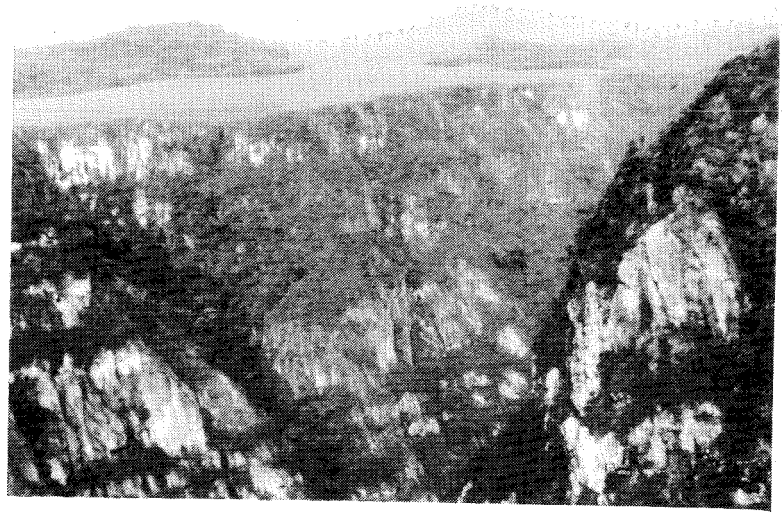
Photo - Prestle

Between Bom Jesus and Cambara

Fortaleza dos Aparados

Photo - Prestle

Brasilicactus graessneri on canyon walls



district lies the type locality for Brasilicactus graessneri var. albisetus forma fortalazensis PR269. This cactus grows here on narrow ledges on the very steep sides of the canyon, so that it is almost impossible to reach the plants. Apart from the Brasilicactus there also grows here Rechtsteineria purpurea, together with some Bromelias and Orchids. In the trees, thickly overgrown with long tails of bearded moss, we see among others the scarlet flowering Orchidea sophonitiens, which feels more at home here despite the cold – temperatures down to minus 5° C.

Suddenly and unexpectedly a thick mist forms which within half an hour filled the deep canyon up to the rim and after that spread over the surrounding region. Because there was absolutely nothing more to see, we retreated into our vehicle and passed the night sitting up wrapped in a sleeping bag. The following morning everything is as wet as after a heavy shower of rain; now we understand so much the better how the plants here obtain their moisture on the steep rocky walls. As soon as the sun is shining again, we set off along the road and search the rest of the surroundings, but except for the Brasilicactus already mentioned above, no more cacti are to be found here, nor any Notoparodia.

We drive back via Cambara to Bom Jesus, because Parodia chrysacanthion should grow there. We scour the whole surroundings up to the Rio Pelotas, but find nothing. On the way to Jaquirana, close to a waterfall, we find Brasilicactus graessneri v. longispina PR271, which also grows against the rocky walls here. This Brasilicactus has a very distinctive appearance, with its long yellow-green bristly hairs. Jaquirana is a village in which the old style of architecture still predominates; almost all the houses and also the church are of timber. This should be the home territory of Brasiliparodia buenekeri v. intermedia Ritter.

But however we may search in this cactus-poor stretch, nothing is to be found except for a splendid variety of Notocactus linkii PR 254. Thus we quickly leave Jaquirana behind, in the direction of Camela. Barely 90km beyond Jaquirana we again stumble across a Notoparodia, which could possibly be that named by Ritter as Brasiliparodia buenekeri v. intermedia PR 262. On the way we see, in addition, a group of Brasilicactus haselbergii; however the cliffs here are so steep and wet that it is quite perilous to scramble up there. Thus we go further without having attained our objective. In Camela we get the chance of a bed once again after a long spell. For once we sleep our fill and reach Porto Alegre again on the following day.

. . . from H. Middleditch

Now that does provide us with some better idea of the conditions in the area where Brasiliparodia grow. Was the temperature below freezing really measured and not just a natural reaction to the change from a pleasant daytime temperature? Even in winter the daytime temperature at this latitude could be around 25° C so that fall in the air temperature to freezing point will bring about an appreciable increase in relative humidity, evidently sufficient to generate a ground mist. In its turn, this mist would minimise radiation of heat from the ground during the night so that it could result in a morning dew without ground frost. The temperature in the body of the moss could remain decidedly above freezing point under such conditions. It really requires one thermometer in the moss and another in the air to check this theory. On the face of it, a soil heating cable set at about 7° C under the plants and spraying morning/evening would appear to approximate to their natural environment.

At the Chileans' Weekend where K. Prestle was the visiting speaker, we were shown a slide of one habitat location of Brasiliparodia, about half way between Bom Jesus and Cambara. The undulating ground was covered with grasses for nearly a mile from the viewpoint; trees spread over the hillside in the background. A rocky spot, only a few square meters in extent in the midst of the sea of grass, was home for a few Brasiliparodia. A patch of tall reed-like grass grew next to this rocky spot, which also supported a variety of dwarf herbs. Most of the rock was covered with moss and lichen, apart from one or two blocks up to grobag size. With such isolation it is hardly surprising that variation in habit occurs between individual populations.

NOTOCACTI OF THE APARADOS DA SIERRA

By D. J. van Vliet

Translated by H. Middleditch from Succulenta April 1986.

The Aparados da Sierra which translates from the portugese as the "abrupt end of the mountain chain", are the spurs of both the meridional planalto in Rio Grande do Sul and the basalt planalto in Santa Catarina. These high plateaux change into a more or less narrow coastal strip at the Atlantic ocean. From this coastal strip the Aparados da Sierra appear out of an enormous mountain range. Now one follows the few mountain roads aloft along the deep clefts, ravines, and individual mountain sides, then after some 1000m to 1500m climb – all according to which road one has chosen – one finds oneself all of a sudden on the aforementioned fairly level plateau. Now turning around, there opens out the splendid panorama of the Aparados da Sierra with the Atlantic ocean on the horizon, a truly unique spectacle.

These plateaux which lie between 1200 to 1500m above sea level have a quite peculiar climate, indeed I would say extremely tundra-like. Only about 300 years ago this area was covered with extensive forests of Araucaria angustifolia, whilst the rocky parts which remained free of this growth could support a cactus vegetation. Yes, could support, for in this enormous area of about 200 x 300kms there are to be found, so far as is known to me, only about fifteen locations of cacti with which this article is concerned.

On account of its altitude this area is fairly moist the whole year through. In summer it can be blood-heat during the day, whilst the mists which can drift inland during the night from the nearby ocean, result in the whole vegetation being soaking wet in the morning. The sun and the almost constantly present wind ensure that in all events the surface dries up again rapidly. In winter abundant rain and snow falls, whilst at night frosts of down to -10° C are not exceptional. Once in a while the daytime temperature even falls below zero, but then the sun also provides a drying effect again. Visitors from europe can scarcely believe their eyes when they see how damp and cold the conditions are in which the cacti survive in this area in the winter. This information causes me to put a query against the statement that succulent cacti are able to bridge over lengthy periods of drought.

Passing on to the plants which have our special interest, the Notocacti, then I have to say in all honesty that

the plants growing at this place have certainly got some most unfortunate names from Friedrich Ritter. He has given the plants occurring in this area the generic name Brasiliparodia, but if we examine the flower, fruit, and seed of these plants, we quickly see that it is not only a matter of a broad relationship with the genus Notocactus, but that they are indeed Notocactus!. They probably even belong to the older representatives of this genus. If it is indeed correct, that a greater quantity of seed per berry is an indication of greater age in the evolutionary scale, then I firmly suppose that the Eriocacti must already be very old, and on the same basis they would be followed by the Brasiliparodias. If on the other hand we look at the fruit of Wigginsias, then it is evident that they are still very young, with very few seed per fruit.

Possibly you would argue "but the appearance of these plants with their hooked spines surely makes one think straight away of the genus Parodia?" How so? Have all Parodias got hooked spines then? Have all Brasiliparodias hooked spines? Is Notocactus minimus with its hooked spines even a Parodia then? And what is one to think of Parodia comarapana in comparison with Notocactus horstii?

It will be clear that I am not happy with a name which refers to a genus with which the plants really have as little to do as with Astrophytum. Likewise I consider the name Notobrasilia proposed by Havlicek to be not very fortunate. It is true that it is pointed towards Notocactus, but by no means can all the Notocacti in Brazil be encompassed under this name. Personally I would have more sympathy with a name-attribution that refers to the origin of the plants. Whether one regards this group as a separate genus or as a subgenus is a question of sentiment, emotion, and personal preferences. In my following remarks about these plants I will make use of the name Aparadoa.

The Aparadoas grow under the selfsame conditions as Brasilicactus graessneri. At the growing places, one can often observe that trees growing between the rocky parts provide the plants with shade. In general terms it can be described as rocky ground on which lies locally some very good, porous, black, humus-like earth with an acidity of around pH5. This earth also forms a first class medium for various mosses, so that the Aparadoas grow scattered in the moss which keeps the sides of the plant as well as the roots continually moist. It is superfluous to say that these spots are superbly well drained.

In regards to the Brasilicactus it is of interest to be aware that there are yellow spines haselbergiis and whitespined figraessneris. Brasilicactus graessneri grows near to Brasiliparodia (Aparadoa) buenekeri, brevihamata and alacriportana and their varieties, whilst B. haselbergii grows more inland, beyond the line from Vacaria to Caxia do Sul, together with Eriocactus leninghausii. Still further inland grows E. magnificus and E. claviceps. Even then I still found B. graessneri close to Lajes.

In view of the environment at their growing places, Aparadoas endure the cold well. In addition we must not forget that the surrounding vegetation affords them a good shelter. Without it these plants would form no buds. Some years ago, after I had collected a number of plants from this place in the winter, back in Holambra I put them into black tins with very good results. They also flowered in the first year, but then the plants had all formed their buds at the natural growing place. Holambra lies round about 1000km to the north of this growing place and at a height of about 600m. Even in the depths of winter it is still comfortable in Holambra; the night-time temperature amounts to about 8° C whilst in daytime it quite quickly rises to 20° . The result of this considerable change was that my Aparadoas did not flower any more after the first year.

It is surprising how variable is the spine colour of these plants at their growing places. An exception to this variability is that made by Brasiliparodia rechensis. I collected this species at two places lying not far from each other and could discern no differences. Strangely enough this species flowers well for me, though not superabundantly. Their growing place is also very isolated from the other spp. and lies at an appreciable distance from them. Brasiliparodia brevihamata, buenekeri, and alacriportana grow more towards the coast, whilst B. rechensis grows close to Ana Rech not far away from Caxia do Sul.

As far as the cultivation of Aparadoas is concerned, one may say in general for europe that they can be grown better in a cold frame because the greenhouse is too warm then. Even in the winter the greenhouses are still on the warm side, but this applies equally well for other Notocacti. Stationary air is disastrous for these plants; it should quickly be pointed out that moulds may develop on the unripened fruits with all the consequences that involves. In the wild the plants stand all day long exposed to drying factors, sun and wind, and it must be provided in the greenhouse too. It seems that the best method is to cultivate in an off-house that can be closed down during protracted rainfall. In regard to the approximation of natural environment, the climate in europe lends itself better for the cultivation of Notocacti than here in my home [E Brazil – H.M.] for on account of the greater warmth here both in summer and winter, the spination as well as a the bud formation of very many Notocacti is adversely affected; in general a Notocactus will flower more abundantly in europe and be more handsomely spined than the selfsame sort in Holambra.

In regard to the accompanying cactus flora to the Aparadoas I found, starting at the coast, where the Aparadoas grow, only Brasilicactus graessneri in the immediate vicinity, as indicated above. Around 50 to 100km further inland we then find the first Notocactus linkii which in their turn are spread further, far inland. On the low coastal strip, sometimes only a few kms as the crow flies from the Aparadoas growing on the high plateau, are to be found Notocactus ottonis. Remarkably I found the last representatives of this species at about 50km to the north of Torres in a dune-like terrain.

When you come across other data from any other investigator in regard to the localities of these plants, do please bear in mind that I have not seen them all for a long time and also I am not aware of everything in this enormous land. Indeed it is true that I have visited these areas at all times of year, which I do find is essential for serious field research. Out of the many study trips which I have been able to undertake up to now I can certainly say this: nature here still has a great deal in store for us.

. . . from The Editor, Succulenta (following the foregoing)

However unhappy the author is with the generic name Brasiliparodia, in accordance with the usage of the Latin names for the plants he is not able to replace Brasiliparodia with his Aparadoa.

. . . from H. Middleditch

That really would seem to confirm that night-time temperatures do fall down to quite a low level in this part of Rio Grande do Sul. So now we have a photograph by Buining, an account by Prestle of his collecting trip, and a summary of

his observations by van Vliet, all of which tell us that Brasiliparodia grow in moss. Now the annual rainfall here is pretty evenly distributed throughout the year.

(Figures in inches for Porto Alegre averaged for 1909-1922):—

	J	F	M	A	M	J	J	A	S	O	N	D
ins.	4.3	3.7	3.6	4.8	4.1	5.0	4.3	5.1	4.6	3.1	3.3	4.1

To this can be added the moisture from what are seemingly frequent night mists and morning dew (all year round?) So presumably the Brasiliparodias grow in moss which never really dries out completely. Is this why these plants are so difficult to re-establish in cultivation once the roots have dried out completely?

The reference to numbers of seed in the fruit has me puzzled. My impression is that the fruit on Brasiliparodia are decidedly smaller in size than those on other Notocacti, so I find it difficult to understand how the fruit on the Brasiliparodia can contain more seed than most Notocacti fruits, which is what van Vliet seems to be saying. Do the flowers only open briefly around noon, as Prestle would appear to be indicating? In regard to the comments about Notocactus seed in relation to Parodia seed, Brandt has had something to say about that.

. . . from A. Johnston

My plant of Brasiliparodia rechensis flowers in midsummer and all the flowers are out more or less together. The fruit is about a quarter of an inch in diameter of a very dark plum colour with small areoles and spines. Longer bristles up to half an inch long cluster round the dried flower remains at the top of the fruit. It takes quite a long time for them to turn red and then they dry up and split.

. . . From H. Middleditch

The fruit which A. Johnston had taken off his B. rechensis was found to contain only eight seeds. The first reaction to this exceedingly small number was to suppose that incomplete fertilisation had taken place and that it would be usual to expect rather more seeds if thorough pollination takes place.

. . . from W. Christie

My plant of B. rechensis sets fruit with no assistance from myself. The fruit is fairly small, about half a cm in diameter, and remains turgid for quite some time – until early September; it then dries up quite rapidly and splits. In the process of removing the dried fruit from the plant (in late February) the brittle fruit wall broke up and the base of the fruit remained on the plant so that some seeds fell out and were lost. Those remaining were therefore only a part of the total.

. . . from H. Middleditch

The fruit taken off his B. rechensis by W. Christie was found to contain only one possible GPO-squashed seed plus two complete seeds. Although these seeds appeared to be rather under one mm in size, I cannot image that a vast number could have been left on the plant when the fruit was removed. Thus it may possibly be a case of round about a dozen seeds per fruit. However from the flower having set seed itself, I am still suspicious that a higher count might be possible with fully effective pollination.

. . . from S. Theunissen

Yes indeed van Vliet does say that the Eriocacti must be very old, because these plants have have the largest number of seeds of all Notocacti. Following in age, because they follow in seed number, is the subgenus Brasiliparodia. I must admit that I am not too happy with my own efforts at setting seed on Brasiliparodia; I intended to do this in 1986 but failed to achieve it. But after receiving your enquiry I had a look at my Brasiliparodias and found a lot of dried fruits, already open. So I removed one of them and counted 474 seeds in it. So you can conclude that fertilisation was very incomplete in the other examples you have had. Never before have I counted the seeds in a fruit, but I have included seeds of Brasiliparodia in the Internoto seed list and I do remember that in all cases the fruits had far more seeds than the dozen you are speaking of.

. . . from H. Middleditch

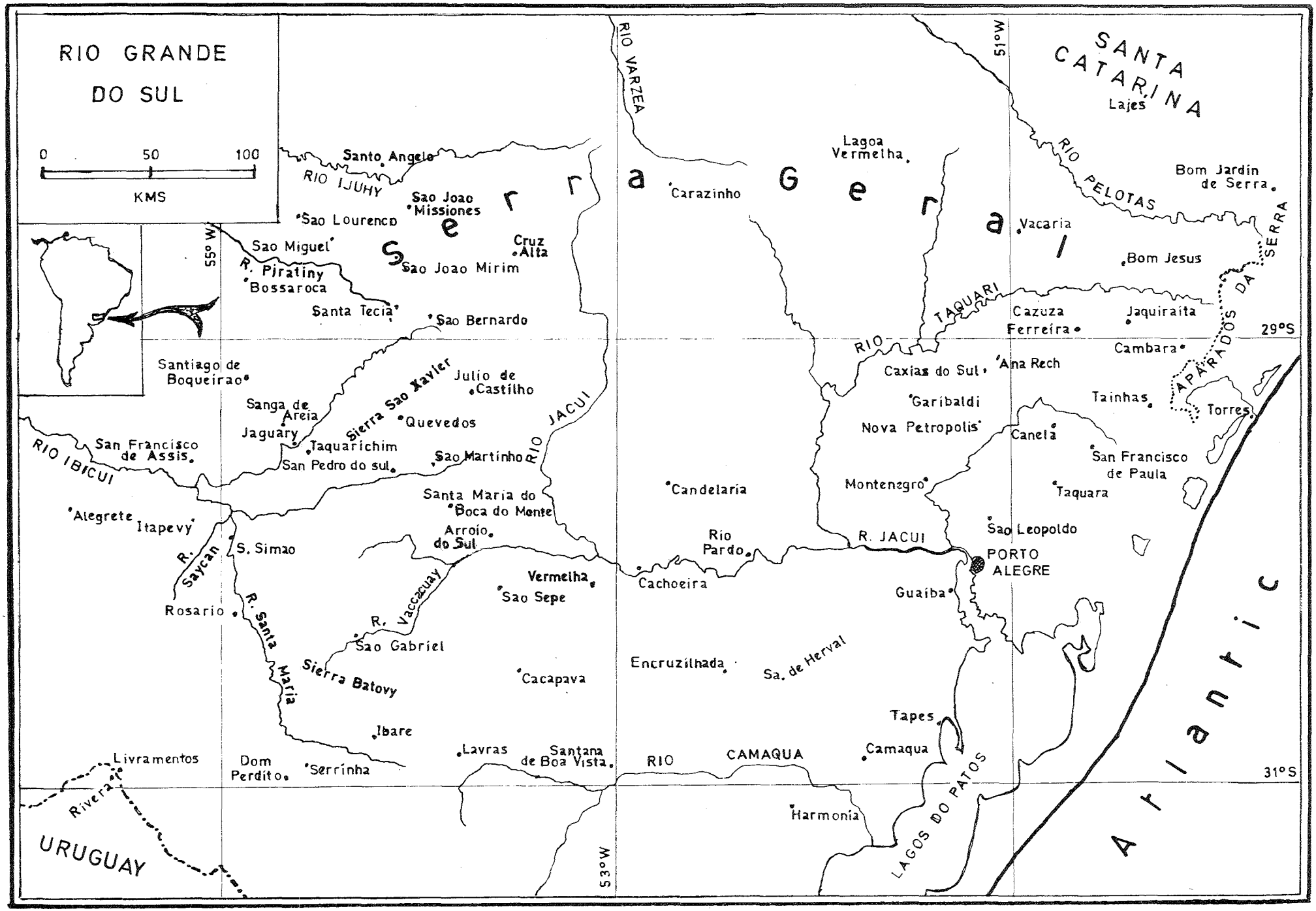
So how large were the fruits with that many seeds in them? The sort of size of fruits that I recollect seeing on Brasiliparodias – about 6mm tall and broad – would surely not hold that quantity of seeds. Do we have yet another example of fruit sizes we are used to seeing in cultivation and larger fruit sizes that are really typical of fully fertilised fruit?

. . . from S. Theunissen

I have had a look for some fruits on the Brasiliparodias in my collection and I have found 16 of them. The fruit was very dry and brittle so that when I removed them from the plants various amounts of seed spilled out of the fruit. All these fruits would be about 6mm in diameter and height, but of course they are not all exactly the same size. I hope that this will show you that these fruits are no larger than those which you are used to seeing on these plants. I did not take any steps to ensure pollination of the flowers; I think that Brasiliparodia are self-fertile but a better pollination would have taken place if there had been cross-pollination. It is not impossible that insects like bumble bees made some visits to the flowers. Apart from the fact that these plants flower early in the season, they have quite a strong sweet smell so that insects may be attracted to them in this way. I have about fifty flowering plants near to each other so that just one insect might pollinate all of them.

. . . from H. Middleditch

These Brasiliparodia fruits arrived from Holland in very good condition, each one packed in its own sealed expanded polythene capsule and all within another large capsule, inside a small but rigid cardboard box. The lowermost part of the fruit had presumably remained on the plants so that it was not possible to give a precise size for the fruit, but a reasonable approximation to the size could be made. The largest fruit, from Brasiliparodia aurisetus, was some 6 to 7mm in diameter and height, excluding floral remnants. This held 403 seeds. The smallest, from HU74, was tiny and contained three or four seeds. Other counts were: aurisetus v. longispinus 117; HU40 223; HU42 156; HU44 159; alacriportanus 72; alacriportanus v. parvisetus 197; brevihamatus 184 and 252; chrysocomus 159; hamatacanthus v. albispinus 118; sp. Cambara 149; sp. Pelotas 136; sp. Tainhas 205; No.25 260. All seeds were counted individually; anything which would roll on


RIO GRANDE DO SUL
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Sao Lourenco
Sao Miguel
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Bossaroca
Cruz Alta
Sao Joao Mirim
Santa Tecia
Sao Bernardo
55° W
Santiago de Boqueirao
Julio de Castilho
Sanga de Areia
Sierra Sao Xavier
Quevedos
Jaguary
Taquarichim
San Francisco de Assis
San Pedro do sul
Sao Martinho
RIO JACUI
RIO IBICUI
Santa Maria do
Boca do Monte
Alegrete
Itapevy
Arroio do Sul
R. Saycan
S. Simao
Vermelha
Sao Sepe
R. Vaccacuay
Rosario
R. Santa Maria
Sao Gabriel
Sierra Batovy
Cacapava
Ibare
Livramentos
Dom Perdito
Serrinha
Lavras
Santana de Boa Vista
Rivera
URUGUAY
53° W
RIO VARZEA
Lagoa Vermelha
Carazinho
Serra Geral
51° W
SANTA CATARINA
Lajes
RIO PELOTAS
Bom Jardin de Serra
Vacaria
Bom Jesus
SERRA DOS APARADOS
TAQUARI
Cazuza Ferreira
Jaquiraita
29° S
RIO
Cambara
Caxias do Sul
Ana Rech
Garibaldi
Tainhas
Torres
Nova Petropolis
Canela
San Francisco de Paula
Montenegro
Taquara
Candelaria
Rio Pardo
R. JACUI
Sao Leopoldo
PORTO ALEGRE
Cachoeira
Guaiba
Encruzilhada
Sa. de Herval
Tapes
Camaqua
RIO CAMAQUA
31° S
Harmonia
LAGOS DO PATOS
Atlantic

the sheet of white paper was counted as a seed.

. . . from R. Hollingsbee

On my plants of Notocactus alacriportana and N. buenekeri the buds can be seen as early as March. On N. buenekeri the buds were first spotted as yellowish swellings above the areoles and were without wool for some time, but on both plants the buds have a good covering of wool once they are well developed. The flower of N. alacriportanus had a tube and ovary about 17mm long with brown-tipped white bristles springing from scales beginning 13mm from the base of the ovary. The stigma had only four very short lobes. On both species the stamens were inserted in two series, one in a ring at the base of the petals, then a gap with a second ring of stamens 6mm below the throat circle.

. . . from H. Middleditch

Are Brasiliparodia really not self-fertile? Do all Brasiliparodia have stamens inserted in two series, in two separate rings? Do all Brasiliparodia have only four stigma lobes? Are the flowers really scented? Or only scented under certain conditions of warmth and humidity, and/or time of day (perhaps like Echinopsis?).

. . . from K. H. Prestle

On my second trip to Rio Grande do Sul I again paid a visit to the Aparados da Serra; this was in January of 1983. We had great difficulties because of the unusually wet weather. This not only presented problems for collecting but also for taking photographs. Up on the Aparados the black clouds stretched from one horizon to another and it was so dark that it was almost impossible to take any photographs. You will have seen on my slides the trees that occur there and look like cedars; these cedars are quite scarce further to the south. They are not Araucaria as we know them.

In the Aparados da Serra I have in addition made a very interesting find, when I came across a new variety of Rhipsalidopsis rosea there. Botanically this find amounts to a minor sensation, because nobody had expected this species so far south. Indeed it was in Santa Catarina that Epiphyllopsis gartneri Berg. was found and up to now this find was regarded as the most southerly! I am just waiting for this years flowers in order to make a flower section and hopefully to obtain a few seeds, so that a fairly good appreciation can be made of it.

A JOURNEY THROUGH SOUTHERN BRAZIL **By R. Ave-Lallemant 1858**

Translated by A. Wheatcroft and H. Middleditch.

[Riding from Porto Alegre, via Rio Pardo to Cachoeira; after leaving here...] On 21 March we were shown a mountain peak in the hazy distance, at the foot of which the newly founded german colony of San Angelo should lie. We rode on for hours in a sea of campos and forested undulating terrain with no houses, no people. The nearer we came to the mountains, the more the forest increased; when we could look over it from an eminence the green canopy of the broad forest seemed to me to get darker. Some Araucarias of unusual appearance projected above the deciduous forest; alongside them many palms swayed above the deciduous forest – a forest above a forest. We travelled 11 leagues before camping for the night and rode into San Angelo the next day.

On the following day we rode through swampy meadows and dark woods until we reached a lonely farm where there was a private crossing over the R. Jacuhy. We crossed one at a time in narrow canoes, the gunwales barely above the water of the broad, deep river, the animals swimmimg across. After a brief rest on the riverbank we rode through the gallery forest and then out on to the open campos. In places the pampas grass rose above steed and rider. From a hilltop we surveyed the view; not far away numerous cattle pastured, together with some ostriches. Beyond that, a grassy hill, and beyond that again grassy hill after grassy hill. Finally we reached an Estancia only to find that our Indian guide had lost his way and we were travelling towards the R. Vaccacuhy Mirim in a distant strip of wood.....the sun went down, thunderclouds blotted out the moon. As we reached the bridge over the Jacuhy a fearful thunderstorm broke.

The next day I was able to continue my journey through the campos, in 26° R at 11 o'clock... By evening we looked over woods and hills, but inhabitants were very scarce...we found a small house for our night's halt. On the 25th March I set off before dawn; the light mist which covered the ground was soon dispersed by the sun and a fresh northeast wind... The campos had really given way to a mountainous nature. The hills formed a tortuous but uninterrupted ridge, up which wound the cart road to Santa Maria do Boca do Monte. In many wooded vallies to left and to right there were purple acacias, bright yellow cassias, the canella tree, and small purple orchids on myrtles. At the edge of the forest, where there was more moisture, an iris occurred in abundance, together with a blue ionidium, a hyacinth-coloured Salvia, a small red Oxalis, lantanas, and blue commelynas.

From a roadside store I took a side track up a wooded valley and out again into the hilly campo of Rincon da Tronqueira. The estancia lay in a sea of hills and woods..... Scarcely had I retired to my room when the thunder rolled, the lightning flashed continually, then came torrential rain, lasting through the night. At about 8 a.m. next morning blue sky appeared, accompanied by a fresh wind... The ride over the Rincon back to the highway was fresh and cool. Some trees had been blown down, branches had been broken off, beds of earth swept away, stretches of sand gullied.... Much of the woodland was characterised by parasites; I do not mean parasitic plants rooted in the earth and growing up the trees, nor lianas putting aerial roots down to the ground, but individuals adhering to and rooting on to host branches, leafing and flowering in true epiphytic style. On stout half-dead trunks grew Usnea in vast quantities, together with mosses and ferns in a lovely green, which compete for their airy location with large and small bromeliads, especially Tillandsias. Everywhere, however, the orchid flora predominates. I saw only two orchids in flower as I rode by, one purple in colour and in such quantities that the tree trunks appeared to be covered in red butterflies. Scarcer were Loranthus growing as parasites on apparently dead trees.

Passing through the district brought to life by the overnight rain, the nearer we approached the mountains to the northwest, the more succulent was the plant growth of the campos and the leaves of the woods. A wide area, rather wet and partially submerged as a result of the rain, separated me from the Serra de San Martinho, which even from a distance displayed charming vallies, cliffs, and isolated foothills. From the cartroad a dwelling was visible here and there. Just at the entry to the mountains we rode into Santa Maria do Boca do Monte. In the afternoon I took a walk towards the mountains.

Here was tall forest, with the campos stretching away to the south. Some giant cacti stood hereabouts; the columnar stems rose up to 16 feet high, covered with hundreds of brilliant purple flowers and many ripe, pleasant-tasting fruits. Such sorts are well known in europe, but when they are seen in the wild in their huge size and abundance, even anyone familiar with them cannot wholly avoid a degree of amazement.

Near Santa Maria is a small german colony in a district called the Pinhal or pine mountains, after the many Araucarias or brazilian pines which form part of the forest here. On March 28th I rode out of Santa Maria with my two companions, up over the hills and soon into the mountains. Here ran the roads from the former Missions to Uruguay..... Initially our track goes through a really awful battlefield! The forest had suffered from iron and fire. To left and right, fire ravaged trunks, where agriculture was starting in the Brazilian forests.... We crossed and recrossed the upper course of the R. Vaccacuhy Mirim, glimpsing the mountain peaks through gaps in the forest.... From the ridge of the mountains there was a tremendous view over wooded vallies to the boundless plains with undulating woodland and grassland. The track continued along the heights with forest below us on both sides. Agriculture is starting on the higher lands too, where there is woodland and grassland just as at the lower levels. Here are eleven german families who have been granted land.

In the afternoon we made an expedition towards the forest. In half an hour's ride through the campos we noticed a bright red mimosa, glowing dark red verbenas, bi-coloured lantanas, some Labiatae and an iris. When the Araucarias towered over our heads we dismounted and walked into the forest. The Araucaria has stems 3 to 4 feet in diameter with not a branch for 50-70 feet up, and a height of 100 to 120 feet. Many of the largest had already been felled and used for housebuilding and boards. [Description of habit of Araucaria] The fruit is a roundish head-sized cone, carried on the ends of the branches; its outer covering is an arrangement of scales... between which lie the elongated nuts. One large fruit revealed 85 nuts. Slender palms stand between the Araucarias – I should say under them, as one looked in vain for a palm reaching the height of the Araucarias. The neighbouring trees attain barely half the height of the Araucaria.

As we glanced upwards a real spectacle was enacted before us. Ten to twelve monkeys slunk noiselessly through the forest. The long, horizontal, leafless branches of the Araucaria, whose edible fruits they pursue, serve as bridges for the agile animals. Each female had on her back a young monkey, which clung on with confidence. With my small telescope I could observe each movement, even the countenance of the animals. Now and then an individual stopped still on their aerial progress and stared down to where we were lurking. Evidently they believed themselves unseen. Not the least noise did they make, not even once cause a movement in the so-slender branches. Thus the silent band travelled on until completely lost in the darkness of the deep forest.

Returning home from the Araucaria forest we visited a charming spot. The sharpening-mill stream, just a trickle of water, lies in a rocky ravine which must be not less than 300ft deep. It is pretty inaccessible, as one may remain hanging out, suspended over it. Such deep fissures and rocky canyons are a reminder that we are in the mountains, although the whole appearance of the neighbourhood of the expanding german colony is of a somewhat undulating campos area.

When riding somewhat northwest from the lowlands of Santa Maria into the mountains, one can frequently not avoid astonishment at the way that the terrain, which must be described as uplands, corresponds in detail with the lowlands . . . first a wood; soon this almost completely disappears with grassy hillocks in its stead. Even the same birds are found, although in smaller numbers than the lowland. The partridges however are three times more numerous. In the monotonous landscape of the grass pampa I lost the track. We rode over streams, over hills, and over plains; finally we reached San Martinho. The area is noteworthy because of the altitude. Here is the watershed between the Jacuhy and the Uruguay. From any hill could be seen on all sides the boundless world of grassy hills, over which blew the perceptibly cold evening wind. With the rising moon a sharp S.E. wind came on to blow so that I was frozen in the middle of the house and I was grateful to our host not to be sleeping in the open air. At the first rays of dawn we saddled up . . . for mile after mile there were few features — a bush, a copse, some red earth, or a stream. About 11 o'clock we rode through the Guassupi, the first water that I had passed which flowed to the Uruguay. Beyond the Guassupi I lost the track again. Not a dwelling, not a man, not a tree, not a bush to be seen. A couple of large pampas deer, a number of cattle. Finally I saw a house in my telescope.

[The itinerary continued through the Missions of San Miguel, San Lourenco, San Luis-Gonzaga and San Nicolao then west to the R.Uruguay. Thence along the R. Uruguay, turning back to the east at Itaqui]

We were early into the saddle on 21 April and ere long reached the estancia of the Ribeiro brothers. What a magnificent place! We had hardly finished breakfast before we were in a fine sea of grass. We met occasional herds of cattle; numerous flocks of rheas appeared along our route. Just before the passage of the Ibiraucuhi our path led through a ravine with bush vegetation, which formed an attractive feature in the everlasting grassland. Just behind, the slope was covered with quartz crystals, many crushed by the wheels of the carts which go straight through here.

The Ibiraucuhi makes itself a welcoming place. Its valley bottom is thickly covered with vegetation, at least for the grass district. With its ravine, the area assumed a somewhat different character. The terrain became more rolling and broken up into steeper slopes, and resembled the start of a mountain range. In spite of the persistent drought, from which the whole district had been suffering for months, water usually occurred in the small depressions between the grassy hummocks. Growth of grass was richer and juicier round these accumulations of water. By evening we reached the bushes alongside the small Inhanduhy which flows into the Ibiraputim. On the morning of 22nd April we rode the last five leagues to Alegrete. Most of the settlers in Alegrete had come from Schleswig-Holstein.

We were off by dawn on the following day, passing the occasional hut and more than one rolling field of corn. There was no problem crossing the Ibiraputim river at low water, scarcely two feet deep at that time, but at high water the crossing is hazardous. Soon all traces of human habitation were left behind and the district, appearing so attractive with its rolling terrain and green carpet of grass, was bare and devoid of any human activity. We rode all the day without seeing any cultivated land, always the natural grassland covered the entire district with great monotony. Not a hut was to be seen, not even a distant estancia. However a great many carts cross the district; it indicates a diverse commerce since the route from Alegrete to San Gabriel is a main commercial route of the province.

The autumn heat in the open country was really unbearable, the temperature reaching 25° R, without any air movement. We made a halt under a tree close to an estancia and let the horses lose; they were soon grazing quietly

alongside more horses and seven ostriches. After our midday meal had been cooked and eaten in the open, we rode on. The landscape tended increasingly to become grassy mountains, some of them very rugged grass-covered hills between and over which the track wound. About here we met bad weather, which started with a light shower of hail and developed into a two-hour rainstorm, which in the open with no trace of a sheltering tree makes one as thoroughly wet in south america as in europe. The lightning struck on the green hills and the thunder rolled almost continuously for a whole hour. Darkness fell; no house, no quarters for the night to be seen. A dog howled not far away; we rode over a hump and beheld a large house occupied by a rich man. Despite my unenviable predicament, despite the damp and the darkness, despite the size of his house, the fellow declined us any night's quarters, the first time this had happened on the whole of my journey. So we had to ride on further . . . and were well received by a settler in a small house; the place was called Tapevi.

We set off again on the morning of 24 April; soon we met up with a herd of some 550 head of beasts, accompanied by about a dozen riders, which gave us a problem in getting past them as the hills rose steeply on either side. At last we got well under way and soon crossed a small tributary of the Ibicuy, the R. Isahicam or Sahicam. An hour later we were continuing on our way in spite of the heavy rain, accompanied by a strong south-west wind. However the further we rode southeastwards towards the passage of Rosario on the southern Ibicuhy, the more heavily the rain poured down. I always hoped at every turn of the road to reach San Gabriel, six leagues from Sahicam. After a ride of two leagues, we descended into a depression, which was totally flooded and offered little hope of passage. By the time the water was up to the horses' chests we decided it was prudent to return.

At Sahicam a rider was going to San Gabriel by a more northerly route and was prepared to accompany us for three leagues. The rain eased up, the weather showed signs of improvement. I shook as much rain as possible out of my cloak and coat, emptied the water out of my boots; we rode eastwards over wet cuchillos and dripping hollows towards the passage of San Simao on the R. de Santa Maria or Ibicum de Sol. The sun set and a cold wind blew so that I dried out somewhat although I was freezing.

The moon was but lightly covered and cast a hazy sheen on the wasteland. Suddenly all appeared white around us. One might have thought one was riding over snowfields. The pure white sand lay all around us with no vegetation — a real African-style desert, although of small extent. A small lake lay on our route; we had to ride in a wide curve to avoid it. All traces of life, all vegetation appeared to have died out. Finally we came to the R. Santa Maria, which rolled along in pure white sand, where we had a trouble free crossing. Further on we reached a building in the midst of this desert where we stopped for the night.

At five in the morning we were saddling the animals in order to reach San Gabriel by evening, thirteen leagues away, and set off at a sharp trot. It was two leagues before we came across the next house. Then under an overcast grey sky came a depression of three leagues in extent which appeared to be blackish-grey. The wind was bitingly cold and directly in our faces. The terrain was monotonous, no flowers were open, no rays of sunlight interrupted the colours of late autumn. At two leagues from San Gabriel my horse was incapable of going any further. Our companion from Alegrete who knew and was known throughout this countryside obtained a horse from a house half a league off the track. We were told to unsaddle it at San Gabriel, lead it outside the town, lash it with the whip and it would find its own way home — the usual proceedure throughout the province. This area, named the Serra Batovi, formed the watershed between the Ibicuy and Uruguay and the Vaccacuhy and Jacuhy rivers. The high altitude there made itself felt mainly by the unpleasant cold and humidity, the latter often changing into drizzle, especially cold for the face and ears. Dusk fell as we caught sight of San Gabriel.

The two evenings in San Gabriel were exceptionally cold; the temperature did not get above 8° R, which is certainly not cold, but appears to be very cold to those who 2 to 3 days previously had been travelling through the world of grass at 25° R with a total absence of wind and the grass fairly generally dried up. We should have been off sharp on 27th April but so many townspeople came to bid me farewell that it was 10.00 hours before we set off from San Gabriel for the Vaccacuhy. The river was very low in water but this summer and autumn of 1858 was unprecedentedly dry and many small streams had dried up entirely. Across the Vaccacuhy it was again up on to the heights and my travelling party jogged forward briskly over hill and dale. The six animals that were running free kept alongside us with no problem at all. The weather was marvellously clear and the sunshine was consistently pleasant although a cold south wind blew sharply, a light pampeiro or pampas wind; such a south wind in the autumn can bring unusually fresh temperatures.

The district here to the south of the Vaccacuhy rises to a significant height, so that we obtained an extraordinarily broad panorama. Although it certainly lacked the charm that agriculture, hamlets and villages impart to the landscape, yet a particular type of cultivation makes itself noticeable from San Gabriel eastwards, just as from there westwards. There again seems to be more thickets and here and there a parcel of woodland. Also unmistakable attention is paid to the roads, some of the roads and bridges being quite well maintained. In the midst of a district adorned with woods and bushes, on a green hill, there appeared the two-storied white house of estancia Cambay. The owner was away but nevertheless my caravan was made welcome and given quarters for the night. The estancia extended to twelve square leagues and supported twenty thousand head of cattle alone.

I trotted away from Cambay on a magnificent morning, just like a clear October morning in the north, just as cold, so that the increasing heat of the sun was steadily comfortable. Immediately after leaving Cambay we found ourselves in a completely different landscape from before. Real mountains rose around us; high and rugged grass covered mountains, forming many valleys and ravines between them. While it was pleasantly warm in the valleys, the wind blew with biting chill on the heights. The autumn seemed to have finished all the flowers, except for yellow, white and red Oxalis sorts. These flowered in really unbelievable numbers; some slopes were completely covered by them and so had a characteristic appearance which could be recognised from afar. In sheltered hollows I found a few groups of Buriti palms growing by streams. From the hilltops we had superb views; we could recognise the hill close by Santa Maria da Boca do Monte at least twelve leagues to the north of us. As we came to a high spot for a noon halt, Cacapava could be seen like an eagles' nest on a mountain top, six leagues away.

From there I took a direct route to Cacapava; we rode a really steep track and over hills from which we more than once gazed down into magnificent deep valleys. Finally the road, if such a barely visible animal track can be so called,

went down some 800 feet into a valley, so steeply that the animals skidded more than they walked. Then we crossed over a small river and stopped in front of an adobe house, although it was only three o'clock. The journey of three leagues as far as Cacapava did not appear to be advisable on account of the ruggedness of the terrain. The man of the house was away but his wife and child bid us welcome and gave us quarters for the night. From the verandah I estimated that the grassy hilltops at either side of the valley rose to at least 1500 feet in altitude. Cows grazed on the rugged slopes; only at a few spots some totally bare cliffs of sandstone blocks outcropped and imparted a somewhat desolate aspect.

On the 29th April we set out early in the morning; the valley steamed, the heights glowed! A bitingly cold wind drove colour-streaked shreds of cloud around the peaks in front of us. A white shimmer lay on the grass as if it was a hoar frost and the rising sun had difficulty bringing the half-frozen ground to life. We rode obliquely through the valley and then climbed steeply upwards. From a precipice, about 800 feet high, we looked back once more to the place where we had stopped for the night. Then the clouds came and enveloped us until the sun rose fully. It was a good morning and the air was of wonderful clarity....Above on some distant grassy meadows pastured more cattle and sheep. Thousands, yes, millions of Oxalis flowers drank in the morning rays of the sun; between them were occasional yellow irises and beautiful blue Salvias, and a few low Melastomes – an Alpine spring flowering on the autumn cordilleras of Cacapava.

Some thousand feet below us lay once more a broad valley. The slope into it appeared to me to be so rugged that for half an hour I led my horse by the reins since I felt dizzy in the saddle. At the foot of this mountain stretch the horses needed to recover, as the short steep ride was rather hard on animals used to more level terrain. Here dwelt an old portugese who plied us with coffee, milk, and roasted maize. A new mountain range lay in front of us. At some places on its rugged sides lay huge masses of sandstone, outcropping in deep beds, like huge columns propping up and supporting the whole mountain. One block of about two hundred feet tall and eighty feet thick stood completely bare and isolated, some smaller ones alongside; a peculiar small imitation of Saxony's Switzerland. A small river flowed through the thicket of bushes below the foot of the mountain ridge. We set into it and rode down a stretch where the water was about two feet deep, between banks formed of sandstone bulwarks. My travelling companion, who seemed to know every stick and stone on the way, jumped his horse out of the water on to a convenient step, but I only managed this manouevre after much tribulation. We rode away from the river bank, now and then with a trail under our horses, at times without a sign of a track for hours. After such a fairly desolate mountain ride we finally came to a road which already lay at quite an elevation and went still higher, along a mountain ridge. We came out of the thicket and Cacapava lay straight in front of us. This little town almost hangs in the clouds. From here are views of enormous extent on all sides. Presenting my letter of introduction, we were provided with elegant quarters.

After an hour's rest I rode out of the south end of the town to inspect a limestone quarry which supplies most of the province with limestone. The mountain ridge on which the town lies becomes broader and forms a level highland which is covered with vegetation and well cultivated in parts. After a ride of a good hour I came to the spot. I found a mountain, indeed a complete ridge of hills out of whose overgrown surface projected huge blocks of marble. The whole strata ran from SE to NW and consists, as far as one could see, of large blocks of coarsely shaped build ranged in a row one against another. The marble is not much use for sculpture but must be really excellent for architectural applications. Meanwhile limestone is burnt out of this fine material. The whole marble mountain near Cacapava is extraordinarily remarkable. I brought from there two or three sorts of marble, red granite, Syenite, red sandstone, and Greywack. There are also numerous clear lumps of quartz in the neighbourhood.

The climate of Cacapava is characteristic, similar to all places that come too close to the clouds. The temperature changes are very striking. If the sun shines, it is hot even in the winter; if a cloud comes over the sun, however, people shiver with cold and wrap themselves up in thick cloaks. Snowfalls occur in the winter, but the snow only lies for a few minutes; then, next moment, the sun can restore the temperature to 15° R. Really frosty weather lasting throughout the day does not occur in Cacapava, although sometimes a light frost occurs in the morning before sunrise. Cacapava lies really on the mountains, the highest place in the whole province; I would estimate perhaps at 2500 feet altitude. Sello, who lost his life in the Rio Doce, visited Cacapava for several years.

By 10.00 hours we left Cacapava as only a speck behind us. Eastwards from Cacapava the heights decrease more gently and offer the traveller less difficulty although a certain mountain character remains. Small woods occur around and upon occasional heights, along streams, along certain depressions, and here and there on flat areas. Around noon we took a short cut over a pretty steep mountain. Between patches of short grass lay bare stone outcrops whose characteristic colour attracted my attention. There were great masses of a very heavy ironstone; smaller pieces appeared to be almost completely pure iron.

More and more we came out of the mountainous terrain of Cacapava and hurried along the ridge of a long, high, cuchillo. Despite our sharp trotting I could not reach Barro-Vermelho as intended by evening, so we stopped at a small estancia. We saddled up on May 1 by moonlight. Without any stops at all we trotted unremittingly the seven leagues to the passage of San Lorenco, at the junction of the Jacuhy and Vaccacuhy Grand. After a further short ride of two leagues from the passage, I came into Cachoeira, this time from the west, which was just as welcome as when I first came into it from the east.

. . . from P. James "Latin America" 1959

In 1822 the new Brazilian emperor recognised the necessity of getting a stronger hold on the south to guard against the threatened northward expansion of the spaniards. In 1824, consequently, a group of german peasants, labourers, and craftsmen were brought over and settled in the new colony of Sao Leopoldo, located in the previously negelected forest lands, a little north of Porto Alegre. Between 1824 and 1859 more than 20,000 germans were brought to Brazil and placed on small farms, most along the terraces of the northern side of the Jacui valley. They all began as clearings in the semideciduous forest. Between 1870 and 1890 a new group of pioneers arrived in Rio Grande do Sul; these were italians. They settled on lands along the crest of the diabase, above the german settlements, but still in the belt of semideciduous forest. The houses of the european colonists are built of wood and made in the styles familiar in the homeland.

. . . from H. Middleditch

And in consequence of the forest clearance for farming, the Araucaria is now almost scarce in Rio Grande do

Sul; indeed in the Jacuhy valley and on the slopes to the north of it there are now only remnants of forest. The fauna dependant upon the forest environment have probably been exterminated by the progress of "civilisation". But from this account by Ave-Lallemant (and from nowhere else, to date) it is clear that this forest belt did originally support a monkey population. On indirect evidence, up to about a century ago this forest belt did extend to the vicinity of San Francisco de Assis. So it is within the bounds of possibility that the fruit of G. buenekeri is orientated towards monkeys. On the other hand there would not seem to be any environment suitable for these animals around Cacapava. But what could the columnar cactus with purple flowers be?

. . . from K. H. Prestle

In the area around Cacapava where cacti are found is mountainous; it is not easy to climb the high rounded basalt and lava rocks here because one must first pass through a wood of thorny bushes on the razor sharp spikes of which one can be badly cut. We were glad to have a long knife with us to ease the way and clear away the worst hindrances. There is indeed often a sharp and icy wind on the mountains. Mist naturally occurs there quite frequently but it does not put in a regular appearance. Here in the Piedra de Segredo we came across a series of old friends: Notocactus uebelmannianus FR238, Wigginsia prolifera PR281, Frailea horstii, Notocactus scopa PR228, and also an example of Notocactus ottonis v. segredoensis PR203 which is not identical with Notocactus ottonis v. cacapavensis HU11.

. . . from A. F. H. Buining Succulenta 19.9.68.

Notocactus uebelmannianus HU78. Found by L. Horst on the peaks of some fairly high mountains in the vicinity of Cacapava.

. . . from H. Middleditch

We now know, from Chabataroff and others, that the highest altitude of these mountains around Cacapava is some 1650 ft., rather than the 2000 odd estimated by Ave-Lallemant. But this hardly detracts from the admirable descriptions of the steep sided valleys cleft into the mountains. However, it is still quite unclear whether Gymnocalycium horstii came from the stony patches round the mountain tops, or from the steep valley sides; from grassy areas, or in the company of bushes.

Most of the place names noted by Ave-Lallemant will be found on the accompanying map of Rio Grande do Sul; a location for Segredo has not yet been established. A well-documented account by Auguste de St. Hilaire of his travels through this area appears in Chileans No. 30. The Serra Xavier, then the traditional boundary between Rio Grande do Sul and the Missions of Paraguay, runs southwest from Quevedos. For any readers wishing to correlate Notocactus species with basic environment, caution should be exercised if making reference to the map of locations in Bradleya 4/1986 p. 96.

NATURAL REGIONS of RIO GRANDE do SUL and URUGUAY **By J. Chabataroff**

Translated from Anais de Asociacao dos Geografos Brasilieros Vol 1 Book 1 1951/52 (1954) by H. Middleditch.

Within the immense arc of the Rio Uruguay, from its origins in the Rio Pelotas through a course of more than 1600kms to its confluence with the Plata, there is about 470,000km^2, bordered on the south by the Rio La Plata and to the west by the Atlantic. This is equal to the total area of the Scandinavian peninsular. Since the climate of Rio Grande do Sul does not vary sufficiently from one end of the country to the other to justify setting out distinctive climatic regions, the types of relief, vegetation, and soils must be utilised for establishing the natural regions. That there are indeed inequalities is clearly self-evident on a trip from Porto Alegro to Caxias do Sul, which are enough to substantiate that as a fact. In this extensive region, (more than ten times the size of Switzerland) it is possible in our opinion to recognise the following natural areas.

Southern Brazilian Planalto

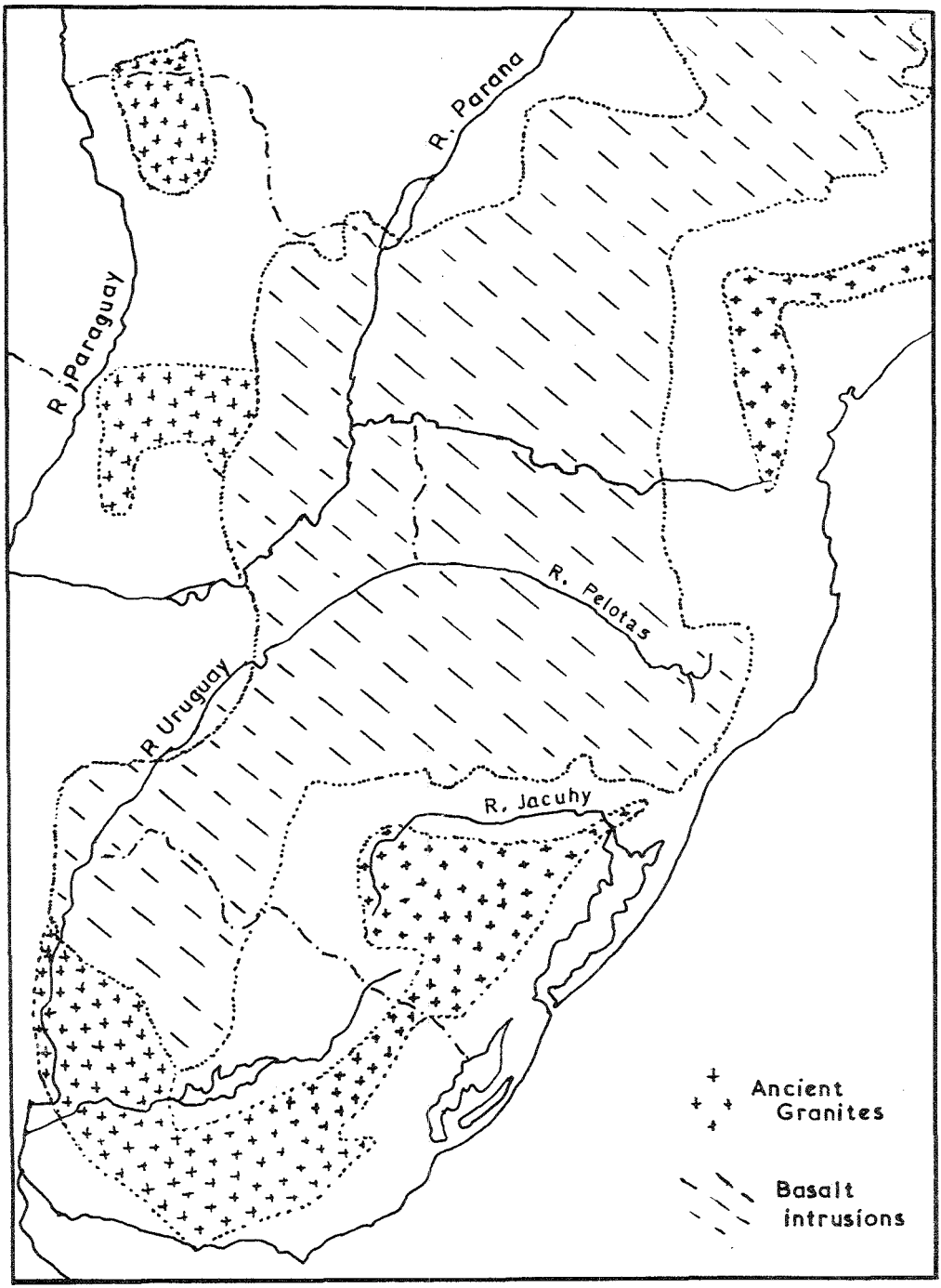
This corresponds to the more elevated part (more than 300m) of the geological formation consisting of the volcanic mantle (or better, succession of flows) of basalt. The greatest altitude is found towards the north-east, around the frontier with Santa Catalina, reaching up to about 1100m; places such as Vacaria, Bom Jesus and San Francisco de Paula, lie at more than 900m altitude above sea level. In this elevated area, the contrast between the obvious mass of the Planalto and the valleys of the quebradas cut by water, is very profound. This area forms the so-called Serra Geral, a name which is regularly used to designate all the basic outflows of the vast Parana tableland. The Serra Geral is not a mountain strictly speaking in the normal sense of the word. It is simply the erosion margin of the meseta cut by valleys with quite steep walls. The body of the basalt dips very slowly to the NW and is usually covered with Triassic sandstones, which outcrop at denuded areas and sometimes show up interposed between successive flows of volcanic lava.

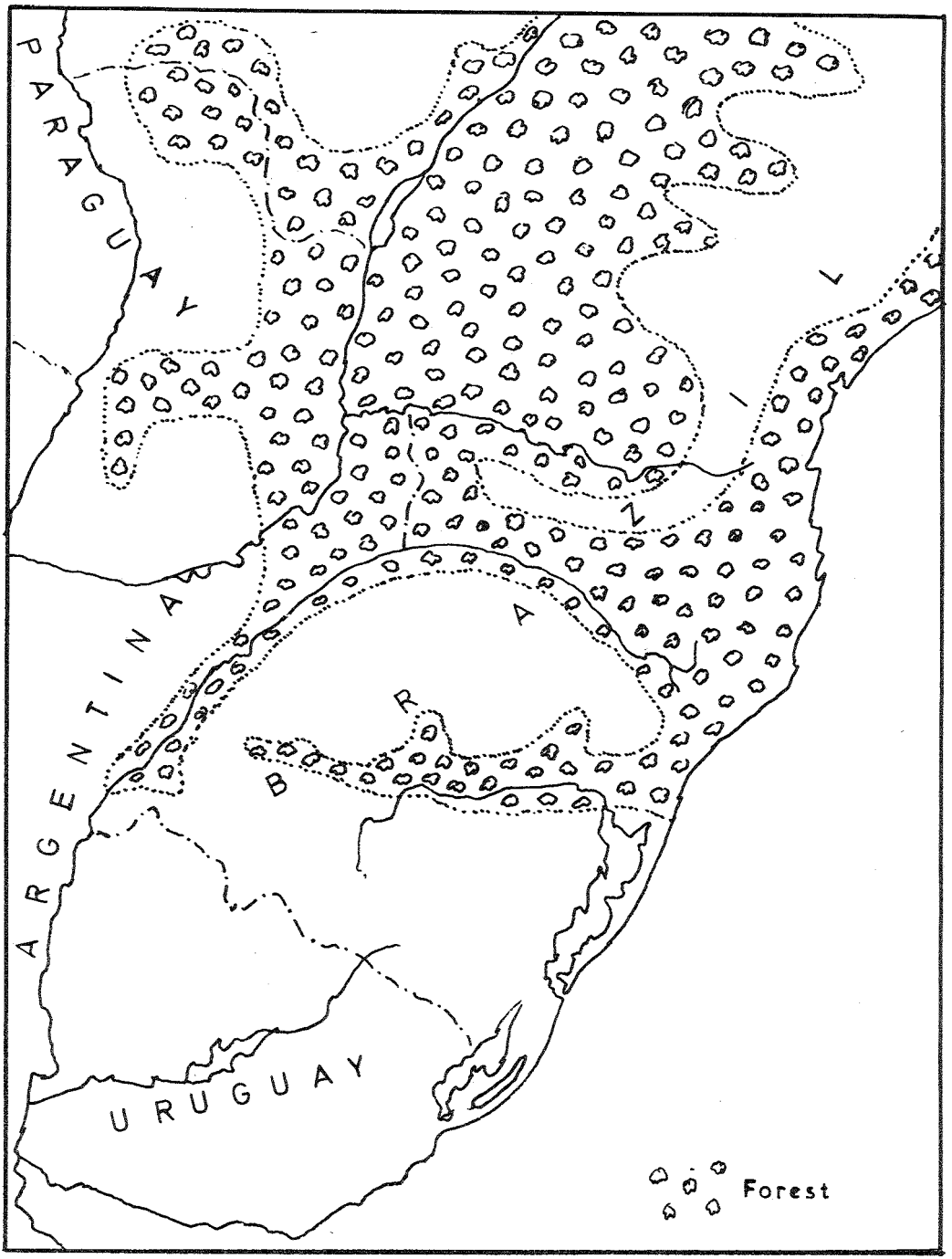
On account of its great extent, more than 100,000km^2, the Planalto presents certain variations of climate and phytogeography. Thus from our own observations on the slopes and scarps of the Rio Cai, the vegetation varies a great deal in accordance with the altitude. In addition, some elevated areas of the Planalto reach the condition of domination by the Araucaria formations, which (according to Rambo) sometimes descend as far as 500m altitude where they are mingled with the subtropical vegetation of the slopes. But this same formation is replaced in certain areas (for example at the Vacaria rapids) by low vegetation, shrubs, or herbs.

From a phytogeographic viewpoint, the Planalto certainly exhibits several formations – (a) Araucaria, (b) Subtropical wooded slopes with numerous aspects, and (c) Grassy or purely herbaceous campos with sparse copses. The rainfall of the Planalto varies between 1500-2500mm (more than the average for Uruguay) and is at a maximum in the so-called Serra of the North-east, which are more elevated and not so far removed from the sea. The average annual temperature is about 17° C. Coverings of snow do occur in the more elevated parts of the region; according to Peixoto Machado this occurs between the months of May and September; in July of 1942, snow fell on three consecutive days, and event which has happened there during previous years – 1912 and 1925.

Basalt Cuesta

(This occupies the SW corner of Rio Grande do Sul and the NW corner of Uruguay – H.M.) A tabular block which dips gently towards the west, where it is covered with Cretaceous and Tertiary deposits fairly equally composed of


R. Parana
R. Paraguay
R. Pelotas
R. Uruguay
R. Jacuhy
Ancient Granites
Basalt intrusions


PARAGUAY
BRAZIL
ARGENTINA
URUGUAY
Forest

various conformable superimposed beds and basaltic lava flows. To the east it exhibits a fairly pronounced scarp, shaped by obsequent streams. Nothing would be more inappropriate for this region than the name Planalto, since the average altitude is less than 200m, the maximum being barely 350m in the vicinity of Lunareyo of the Cuchilla Negra and the Cerro La Virgem in the Cuchilla Haedo. In addition the scarp on the west side is absent since the basalt disappears beneath the sedimentary covering. The surface of the cuesta, quite stony with isolated hollows of soil produced by localised weathering, pretty heavy but of fine fertility with much excellent pasture, is ideal above all for raising sheep. In the quebradas, e.g. Valle Eden in Uruguay, the arboreal vegetation becomes quite thick, but does not extend to the sort of woodland developed on the Planalto, including very few Palmars. Along the river courses the woods are pretty abundant. The climate is fairly mild although subject to sudden changes in a few hours, being moreover somewhat hot in summer and often dry. The average temperature of this region is 18.5° C; the rainfall ranges between 1100mm and 1500mm, this latter corresponding to the value in the interior of Rio Grande do Sul.

Crystalline peneplain

(This occupies the SE half of Uruguay and the SE quarter of Rio Grande do Sul – H.M.) This region consists of the areas where the basal crystalline rocks of Uruguay outcrop and the corresponding shield in Rio Grande do Sul. The average altitude of the region is less than 200m and this fact, as well as an intense and centuries-old erosion which levelled the whole region to a state of extreme maturity, obliges us to regard the whole region as a peneplain in the strict sense of the word. The subterrain of this peneplain includes an impressive variety of rocks: granites, sienites, granodorites, gneisses, micaschists, etc. which emerge as outcrops.

Within the whole there stands out fairly sharply the shapes of eruptive volcanic blocks and metamorphised rocks of the Uruguayan series of Minas and Aigua and the Rio Grande series of Marica; there are some low ranges made of more even, more recent, elements in the Sierra de los Animos and some granite blocks in the Rio Grande. The zone of hills, which are sometimes just groups of Monadnocks of little importance, in other instances occupy an extensive area – such as at Policia and at the Porto Alegro rapids. These amount to a geographic entity with the character of a sub-region — the Sierra del Este in Uruguay and the Sierras del Sudeste in Rio Grande do Sul. The maximum height of these latter — Encruzilhada, Tapes, Cangusu, etc., ranges around 500m and the average altitude of the strictly hilly area barely exceeds 300m. In Uruguay the Cerros de las Animas attains 501m but the average altitude of the whole of the hilly region generally does not attain 200m; thus in Uruguay the peneplain is more typical than in the state of Rio Grande do Sul.

The peneplain proper differs from the hilly subregion by the types of soil – less stony, and more clayey and deep, although sometimes less fertile and practically without copses and woods, except those which border the watercourses. It is dominated everywhere by meadow of graminoid vegetation, grasses, Cyperaceae and low-growing herbs, including some sub-shrubs and bushes such as Baccharis cordifolia, B. articulata, Eupatorium burnifolium and others. In the upper parts of the slopes of the hilly regions the copses are dominant, with Colletia paradoxa, Dondonaea viscosa, Schinus myrtifolius, S. lentixifolius, Heterothalamus alienus, Blepharocalyx angustifolius, and Berberis laurina, augmented in the lower parts with Rapanea laetivirens, R.ferruginea, Lithrea brasiliensis, Fagara rholfolia, Celtis iguanea, Scutia buxifolia and some palms. In the hollows there is usually to be found copses of Yerba Mate (Ilex paraguayensis) and many species of ferns.

In regard to the climate, being a pretty extensive region, it varies appreciably going from SW to NE. Thus for example while the average rainfall at Colonia, Uruguay, is barely in excess of 950mm, in the Sierras of Rio Grande it attains 1700mm. Certainly the average temperature is nearly the same in Colonia as it is in the Sierra Encruzilhada, around 16.5° C.

Sedimentary Peneplain

This comprises, in Uruguay, the territory between the eastern margin of the basalt cuesta and the outcrop of the basal crystalline i.e. where the rivers Tacuerambo and Negro run. This connects up with the area in Rio Grande do Sul comprising the valley of the R. Jacuay and the valley of the R. Ibicuy which cuts through the basalt. This peneplain, whose greatest altitude does not reach 300m, is distinguishable from the crystalline peneplain and offers a landscape of contrasts between lowlying areas and tabular blocks, the latter forming flattened hills (or merely buttes) or table topped ridges (or mesetas). In the hills and ridges the feature of the scarps is usually recognisable which particularly exhibit fairly eroded sandstones. The ridges of Taboleiro, Santa Anna, and Cunapira, and the southern part of the Cuaro mesa, belong to this type of feature. Since the rocks of the peneplain are usually sedimentary, they have less resistance to erosion than those of the basalt cuesta. The sandy soils are relatively poor and readily susceptible to aeolian erosion, but are sometimes fairly good, such as those which occur on the Palermo beds.

The dominant vegetation on this peneplain is grasses and various bushes of the genera Eupatorium and Vernonia, but in the hollows where springs and streams occur (places often called "grottos") groups of trees appear crowded together on the steep slopes, such as Schinus, Eugenia, Cupassia, Ficus, Cassearia, Lithraea, Sebastiana, Luehea, and Erythrina, with their trunks covered with epiphytes. In such hollows the ferns are numerous.

As to the climate, it is fairly uniform in the Uruguayan section, but even here an increase in rainfall is evident towards the Santa Anna ridge where 1300mm falls annually. The central Rio Grande do Sul depression is characterised by a fairly high average temperature of 19.4° C and the rainfall reaches as much as 1800mm annually in some places. At Tacuerambo the average annual temperature is somewhat over 18° C but the rainfall scarcely exceeds 1200mm annually.

As a result of the erosion of the flat topped ridges or the ancient scarps, lines of hills (buttes) have appeared, such as the Once Cerros and the Tres Cerros of Cunapiru in Uruguay, leaving others isolated as in the example of the Morro de Zapucaya, near to Porto Alegro, a spectacular remnant of a scarp, almost with the shape of a hogback.

Valley of the R. Uruguay

From Salta there begins the lower course of the river; in this section the river runs in a very broad valley seemingly bordered by steep banks on the Uruguayan side. On the low river plain are found various kinds of woodland and at some distance from the flowing water appear spiny copses of Prosopsis, Aspidosperma, Grabowskia, Castela, Acacia,

Berberis, etc., with some Trithinax (palms – H.M.) and Cactaceae.

(The relatively narrow coastal plains are also discussed).

. . . from H. Middleditch

The accompanying map of the basic geology and natural woodland of this area may identify some of the regions discussed in this article.

BRASILIPARODIA; NOTOCACTUS OR PARODIA? **By F.H. Brandt**

Translated from Succulenta 63.4:1984 by A. Wheatcroft

Both the Notocacti and the Parodia derive from the same stock of the subtribe Notocactinae. However, the question arises, from which of these lines are the Brasiliparodia derived? Their present habitat, the mountains of the Rio Grande do Sul, may be regarded as only their secondary zone of establishment [1]. In my opinion, the expansion of the Notocactinae took place as follows: I see the cradle of the subtribe as the Bolivian mountains of the Cordillera Real, and the ridge stretching east to Santa Cruz. Here the two branches of the subtribe definately diverge, the genus Parodia extended to the south and penetrated Argentina. Conversely the genus Notocactus moved further eastwards, towards Santa Cruz, and then much later also turned south and penetrated deeply into the country. Finally, in the mountains of Rio Grande do Sul, they met their relatives the Brasiliparodias [2].

Among the Parodias, after separation in a southerly direction over the Cordilleras, the subgenus Protoparodia was the first to develop. This subgenus divided in turn into three groups. One of these groups is characterised by the species P. mairanana Card. and P. prestoensis Brandt. These two Parodia spp let us still see today the line of development of Protoparodias from which, in my opinion, the Brasiliparodias later developed. These two species occur in the most easterly growth area of the subgenus Protoparodia. From here, they extended further east to Rio Grande do Sul, and became the present Brasiliparodias.

At the time of their discovery, all the Brasiliparodias were recognised [3] and described as Parodias. Recently, Prof. Buxbaum has separated the Brasiliparodias from Parodia and included them in the genus Notocactus, where they are placed in the subgenus Brasilicactus [4]. However, Buxbaum's new combinations are based on a mistake! He developed the new combination after evaluation of seed material of Parodias and Notocacti which he had available. However, this was not sufficient to show the whole range of differences in evolution of Notocactus and Parodia. Dr. Buxbaum took the seed of the two genera as the most obvious characteristic for differentiation of Notocactus from Parodia. According to Buxbaum it is an infallible and evolutionarily significant characteristic of Parodia seed that the funicle does not detach from the umbilicus of the seed [5]. In the description of the seed of Parodias in Krainz "Die Kakteen" 1,IX,1966 C VI it is stated that this never happens and this characteristic of the seed of Parodias was again repeated in further description of the genus Notocactus in Die Kakteen section 1,I,1967 C VIc. The characteristic was still stressed there and it was specially referred to as a peculiarity of the seed of Parodias. It was stated there that in Notocactus, as opposed to Parodia, the funicle always detaches from the umbilicus of the seed [6].

This phenomena of detachment of the funicle from the umbilicus was for Buxbaum also the basis for the new combination of the Brasiliparodias P. brevihamata W. Haage and P. alacriportana Bckbg & Voll into the genus Notocactus. For the same reason, P. buenekeri Buin. was later also included in Notocactus, all three being assigned to the subgenus Brasilicactus. The only reason [7] for the new combinations. also considered as a factor in evolution, was the detachment of the funicle from the umbilicus of the seed.

In his further considerations on the ecological significance of the strophiole tissue of the seed of Parodias, especially the small-seeded species, Buxbaum suggested that this tissue in Parodia seed might be considered a 'flotation apparatus'. As the seed, because of its small size, might be washed away by strong rainfall, this strophiole tissue might act as a lifebuoy. The large strophiole would keep the seed floating until the water level sank again. However, by tests and observations, I have established that the strophiole tissue of these seeds soon saturates with water, and the seeds then sink to the bottom; the tissue can therefore hardly be called an effective flotation apparatus. In my opinion the spongy tissue is of ecological importance, especially in the small-seeded species, as a moisture regulator. Growing conditions in the region where small-seeded Parodias occur, the Bolivian Chaco, are characterised by heat and drought. The seeds must germinate without the presence of water, and the small seeds could easily dry out. The strophiole tissue of Parodia seeds sucks up even the least traces of dew at night and is thus saturated as far as possible. The following day, the strophiole can give up this water to the seed itself, thereby fulfilling its needs. Thus the strophiole tissue protects the seed from excessive drying out during the day and controls germination via the supply of water. Finally, the redundant tissue serves as a nutrient source for the seedling and is fully consumed.

It appears that the strophiole tissue serves a double function; it gives the seed a controlled water supply and later serves as a nutrient source for the developing seed. The contention of Buxbaum that the strophiole is a flotation apparatus must be considered at best of secondary importance. From my interpretation of strophiole tissue of Parodias and its ecological function, I automatically came to a wholly different conclusion on the funicle and the whole strophiole tissue in development of the genera Notocactus and Parodia and their separation from each other. If the function of the strophiole tissue and the need of the seed for it are interpreted in my sense, then the strophiole of the seed is not a characteristic in evolution, but must merely be considered as part of the seed developed in relation to climatological conditions. In hot, dry, districts a spongy strophiole tissue is a necessity for the seed [8]; in wetter districts where the climate permits, a dense strophiole may remain. In districts such as the Brazilian mountains of the Rio Grande do Sul, where the climate is clearly wetter than the Brazilian Chaco, there is no danger that the seed will dry out and therefore a spongy strophiole is useless. Indeed, in conditions of persistent moisture, such a strophiole would increase the chance of rotting. In that way the seed would be at risk and it could also bring about an infection of the germinating seedling. Thus a spongy strophiole would be a risk factor for Parodias in the Rio Grande do Sul and consequently the seed must be adapted to the different climatological factors [9].

In relation to the detachment of the funicle from the umbilicus, Prof. Buxbaum writes that in the most primitive Parodias the funicle plays a major part in the formation of the hilum and the strophiole present there. The contribution of the funicle to the construction of the strophiole around the elevation of the micropyle is clear; only in the small-seeded Parodias does the strophiole tissue form a single common body around both parts, the funiculus and the micropyle. I am not in agreement with the conclusion of Buxbaum in relation to the detachment of the funicle from the umbilicus of the seed, and the composite formation of the strophiole body [10].

On the basis of some drawings of seeds of Notocacti and Parodias which I have specially prepared, I will try to explain my views. Some of the species are illustrated with the hilum visible and where possible several views are given. For the drawings I made use of the seed which I had available. From the drawings [11] we can see that the funicle is often more or less detached from from the umbilicus in the genus Parodia and its subgenera, as it is in Notocactus. Thus the characteristic for separation of Notocactus and Parodia proposed by Buxbaum falls out of consideration. After abandonment of this incorrect criterion for differentiation, all Brasiliparodias must again be considered as true Parodias and accordingly treated in the literature.

Fig 1a shows the seed of P. mairanana Card., in which the funicle may be considered not to be detached. It may clearly be seen that it is involved in the formation of the strophiole around the elevation of the micropyle. Fig 1b, again of P. mairanana, shows conversely that the funicle is not only detached but also that the umbilicus protrudes as a naked wedge, and not even a remnant of the detached funicle may be seen. The projection around the micropyle is densely covered with strophiole tissue without the funicular remnant having a part there. One may find all transitional stages between these two seed forms in P. mairanana. In this species, the periphery of the hilum bulges outwards and the maximum diameter of the seed occurs here around the margin of the testa, just as in Brasiliparodia. Also there is a great difference in the structure of the tubercles covering the testa. Fig 2a and 2b show the seed of P. buenekeri Buin. Here again the projection around the micropyle may be seen as in Fig. 16 and again the funicle is not involved. The umbilicus does not protrude like a wedge in P. buenekeri but it is surrounded by dense strophiole tissue in the middle of which an indented 'wart' may be recognised, which shows the detached funicle as in P. mairanana Fig 1b. The seed of P. brevihamata W. Haage is shown in Figs 3a and 3b and here again one sees the same situation in the structure of the testa and the formation of the strophiole. It agrees well with buenekeri and mairanana. This shows the close relationship between this species and the genus Parodia. The external appearance of the hilum also shows the same picture, except that here the umbilicus may be recognised only as the darker point in the flat strophiole tissue.

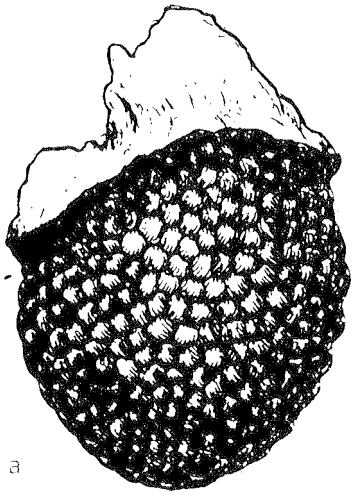
Figs 4 and 5 show the seeds of P. prestoensis Brandt, in which one drawing shows clearly that the umbilicus has no strophiole tissue, while the funicle is still present and appears to have grown together with the tissue of the micropyle projection and contributes to this. In Fig 5 the flat strophiole tissue around the umbilicus is not arched, but clearly shows the wart-like depression where the funicle detached from the umbilicus. On the other hand only the projection around the micropyle is covered with strophiole tissue, almost as in P. buenekeri, brevihamata and mairanana.

The periphery of the testa is bowed outwards in this species too and the greatest diameter of the seed is found at this point. Here I must also consider the seed of Brasilicactus graessneri Sch. as this has the same [12] shape and testa structure as those considered above, see Fig 6a and 6b, showing the close and unmistakable relationship to these species of the genus Parodia. The projection around the micropyle is flattened and the funicle is detached similar to the above Parodias and Brasiliparodias. Fig 7 shows the seed of P. borealis Ritt. and here again it may clearly be seen that the funicle is detached and that the projection around the micropyle is flat, just as in B. graessneri. Also the shape of the tubercles on the testa is almost identical in all these species; this again shows the close and unmistakable relationship of all these plants in a single genus[13].

Parodia ayopayana Card. seed is illustrated in Fig 8a and 8b. Here again the flat form of the micropyle projection may be recognised as in graessneri and haselbergii. It may be seen that in ayopayana the funicle is more or less detached, the tubercles of the testa are covered with aril tissue to a greater or lesser extent, which is a characteristic showing close relationship with Notocactus. Fig 9 shows seed of P. elata Brandt (raised from FR seed). Fig 10 shows seed of P. buxbaumiana Brandt derived from KK plants of elata. This species belongs to the form group of the subgenus Obtextosperma, but they have no covering of aril tissue and their tubercles are more oval. The funicle may always be clearly seen to be detached; the projection around the micropyle is sharp and stands out conically, in contrast to other members of the group around ayopayana/borealis.

Even on the basis of these few species from the form group of the most north-easterly Parodias, it may be concluded that the funicle may be considered to be detached from the umbilicus, to a greater or lesser extent. Again in Parodias this conclusion of mine forms a clear contrast to the view of Prof. Buxbaum that the funicle is never detached in Parodias. Fig 11a and 11b show the seed of P. maassii (Heese)Berg. I have taken the drawing of the exterior of the hilum from Krainz "Die Kakteen" 1.IX,1966. Here it may be seen that the micropyle and the umbilicus are separately surrounded by strophiole tissue. The wide site where the funicle detached may be observed on the umbilicus. It is incomprehensible to me how Prof. Buxbaum could say in relation to the seed of P. maassii that the funicle was not detached. For the seed of Notocactus corynoides, Fig 12a and 12b, showing the umbilicus covered with dense strophiole tissue, he held that the funicle is detached. How can the differences exist in the funicle for these two seed types? For comparison, Fig 13a and 13b show the seed of N. mammulosus [14]. The same may also be said concerning the seed of N. scopa Speg. Fig 14a and 14b. If one examines the seed of N. scopa and P. maassii in profile, the similarity is striking and the umbilicus is similarly covered with strophiole tissue; also the site of the funicle, detached or not, cannot be seen.

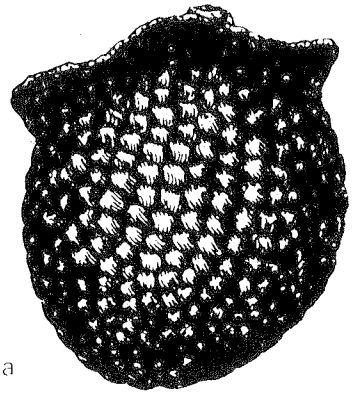
If we also examine the microspermae series of the genus Parodia we see that these seeds show the same structure. Parodia mutablis Bkbg, Fig 15a and 15b, has a large spongy strophiole but at the basal end of the hilum the place where the funicle was detached may be recognised as a wart-like scar in the strophiole. If this wart-like depression is not the place where the funicle detached, then at this point the funicle must merge without a seam into the strophiole tissue of the micropyle. Whether the funicle forms part of the micropylar projection is of no significance, as the principal fact to be considered is whether it is detached.



1a

1b

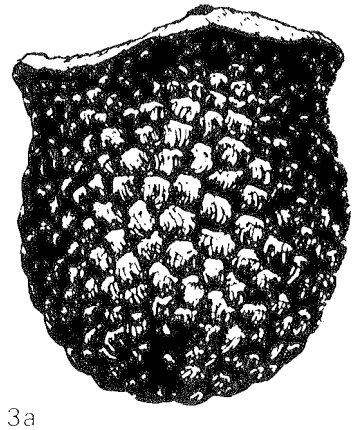
P. marianana Cara



2a

2b

P. buenekeri Buin.

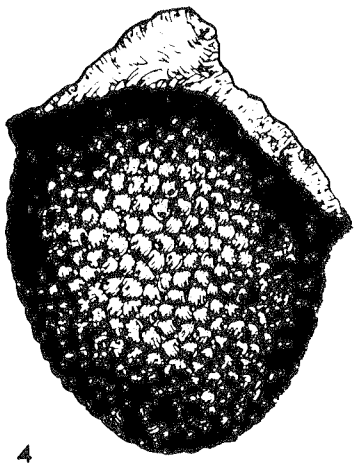


3a

3b

P. brevihamata Haage

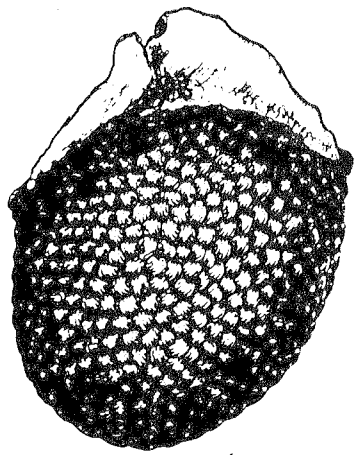
Sketches - F. Brandt



4

1 mm ø

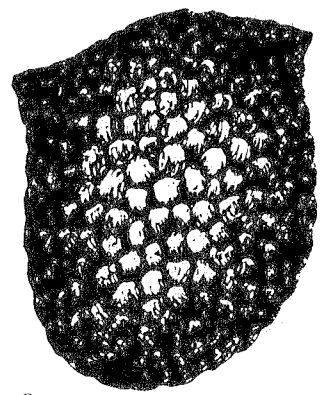
P. prestoensis Brandt



5

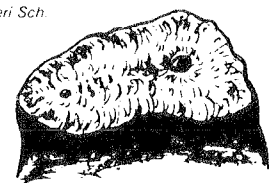
1 mm ø

P. prestoensis Brandt

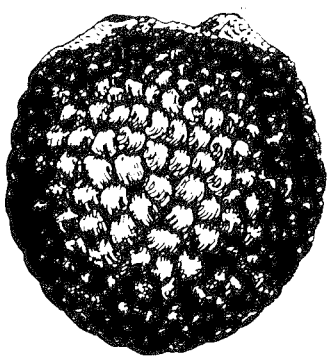


6a

B. graessneri Sch.



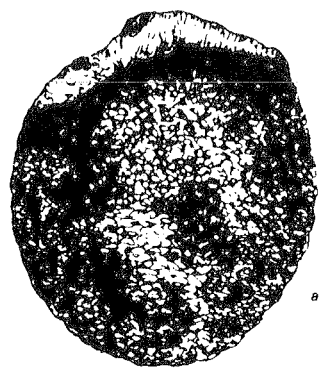
6b



7

0,7 mm ø

P. borealis Ritt

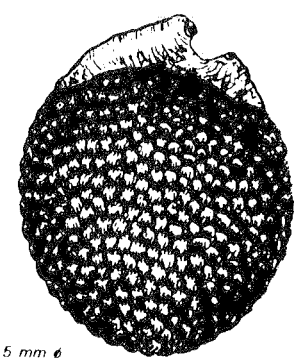


a

8

b

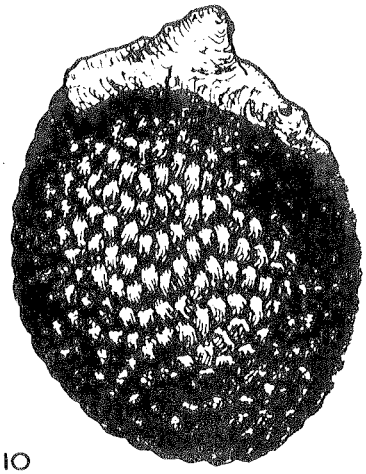
P. ayopayana



0,5 mm ø

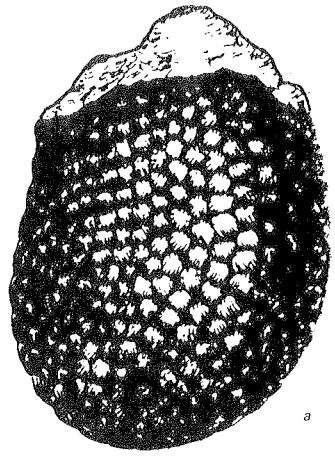
P. elata

9

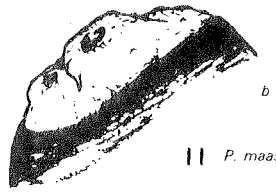


10

0,9 mm ø
P. buxbaumiana

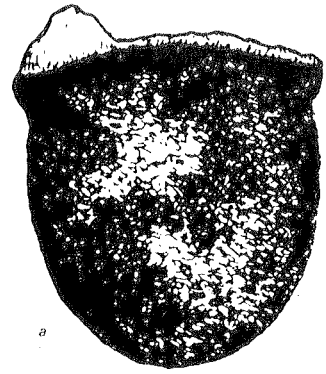


a



b

11 *P. maassii*



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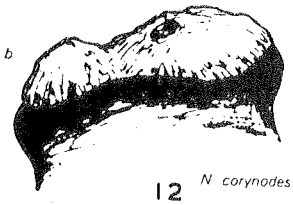
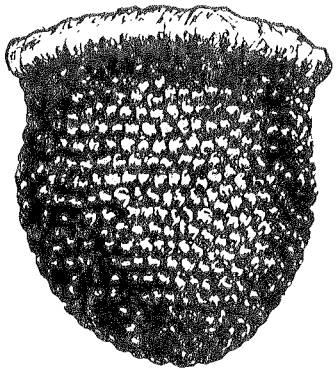


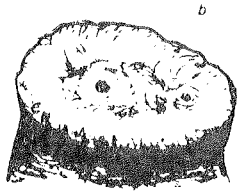
b

12 *N. corynodes*



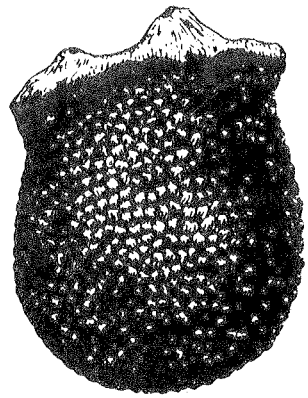
a

13



b

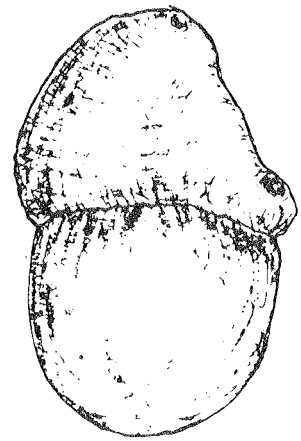
N. mammulosus



a

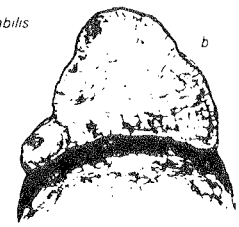
b

14 *N. scopa*



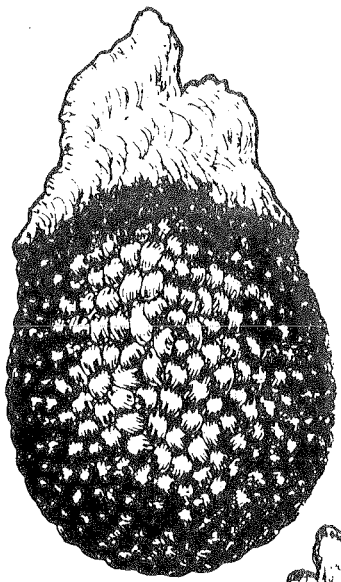
a

P. mutabilis



b

15

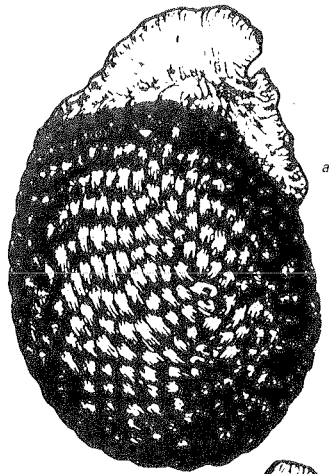


a

b

17

P. camblayana

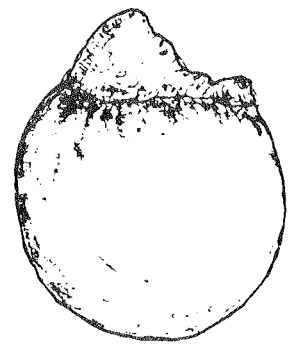


a

b

18

P. challamarcana



a

P. pluricentralis

b

16

A second microspermae species, P. pluricentralis Brandt, Fig 16a and 16b, shows clearly and without doubt that the umbilicus lies at the basal end of the hilum and that the site where the funicle detached is marked by a wart-like scar here. Furthermore, in this species we may establish that the micropylar projection is formed with no involvement of the funicle. This species of Microspermae therefore also shows a striking resemblance to the seed of Brasiliparodias, and also to the closely related members of the genus Parodia. In the case of seed of P. camblayana Ritt., Fig 17a and 17b, it may clearly be seen that the funicle is not detached and forms a composite body with the strophiole tissue of the micropyle. Here, at the basal end of the hilum, there is neither a trough-shaped wart to be seen in the tissue nor any other shape of cavity to show the place where the funicle might have detached; the funiculus rises up in the direction of the micropyle. In addition P. challamarca Brandt, Fig 18a and 18b is another species where the funicle remains behind at the basal end of the hilum.

The site where the funicle detaches from the umbilicus and the occurrence of this detachment can no longer be considered an individual characteristic of seed of Parodias. This characteristic may in no case be considered as a criterion for differentiation of genera; it may be considered a factor in the evolution of the genus Parodia. Thus Prof. Buxbaum's suggested combination of Brasiliparodia with Notocactus is derived from a mistake, as the sole characteristic on which this combination is based is the supposed fact that in Parodia the funicle does not detach from the umbilicus, whereas in contrast to Parodias this always occurs in Notocactus. The Brasiliparodias should also show this characteristic.

According to my approach to the characteristics of the funicle of Parodia and Notocactus, this differentiation characteristic should be scrapped as unusable; in this way the basis for Buxbaum's combination of Brazilian Parodias also collapses. Hence all Brasiliparodias should now be classified under Parodia and recognised as true Parodias [15].

In his new work, "Cacti in South America" Vol. 1, F. Ritter has established a new genus for these Brasilian Parodias, Brasiliparodia Ritt. genus novum. Concerning this new genus, he has unfortunately confined himself to a study on differences from the genus Notocactus without consideration of the genus Parodia. With this broad comparison, Ritter has succeeded in differentiating Brasiliparodias from Notocactus, something which I would not in the least dispute, as Brasiliparodia has nothing in common with Notocactus. However, Ritter has overlooked the fact that the diagnosis he gives for the new genus Brasiliparodia agrees with the diagnosis of the genus Parodia. Thus the genus Brasiliparodia may be considered synonymous with Parodia as there is no difference in diagnosis; they are identical. As the name Brasiliparodia has been reduced to synonymy with Parodia, all the other new names and new combinations of Ritter concerning Brasiliparodia are unfounded, and must be considered synonymous with the genus Parodia. The name Brasiliparodia cannot even be used as a subgenus, it can only have the status of a series within the subgenus Protoparodia.

. . . from S.J. Theunissen (Succulenta 63.4.1984)

[1] It would have given no doubts as to the reliability of the author if he had also given here the reason why the habitat of Brasiliparodia must be considered secondary.

[2] The previous comments indeed clarify how the Notocacti came to the Rio Grande do Sul, but not how the Parodia had already arrived.

[3] This comment is only partially correct. Indeed Haage, Backeberg, and Buining classified as Parodias the species which they described. It is advisable to consider the comments made by Spegazzini in 1923 on Parodia brasiliensis, which appears to have died out but certainly belongs in this group. Spegazzini says "an especially pleasing species which at first sight strongly reminds one of Malacocarpus (Notocactus) tabularis". Hence it appears that the author of the genus Parodia recognises a clear link with the genus Notocactus, at least for this species.

[4]This assertion is wholly incorrect. Buxbaum does indeed comment on the close relationship between Parodia and Brasilicactus. but he does not include this group of Parodias in Brasilicactus. Buxbaum, like Ritter, places the origin of the Notocactinae in the east of South America, in contrast to Brandt who places it in Bolivia. Furthermore, pure scientific justification for these theories are difficult to supply. It is commonly a question of "feelings", which can at best be supported by so-called primitive seed forms. It seems to me somewhat hazardous to base a theory mainly on seed characteristics, as in the article under consideration. Also, as far as I know, the origin theory of Buxbaum and Ritter is the older; if Brandt wishes to displace the origin of the Notocactinae to Bolivia, he must establish that his theory is better than that of Buxbaum and Ritter

[5] Buxbaum says (in translation): While in Notocactus the funicle is detached from the umbilicus, or at the most is recognisable as a dry residue, even in the most primitive Parodias the considerable participation of the funicle in the construction of the hilum is visible, while it always plays a prominent role in the formation of the strophiole; it is generally but not always clear that in the primitive forms the micropyle elevation is also taken up in the strophiole – but only in the fine-seed species is there a single body formed from both parts. This fact leads to the conclusion that the species P. brevihamata W.Haage ex Backeberg and P. alacriportanus Backeberg et Voll, hitherto described as "Brasilian Parodias", belong to Notocactus and not to Parodia. [This is a translation into English of Theunissen's translation into Dutch of a German original, so fine shades of meaning will almost certainly have been distorted -A.W.]

[6] As mentioned before, this view of the authors is based on a not wholly accurate interpretation of the text of Buxbaum, who nowhere asserts that in Notocactus the funiculus is always detached.

[7] Quite apart from the repetition of the same false interpretation, Buxbaum mentions in his description of the genus Notocactus the fact that the stamens are arranged more or less clearly in two rows, while in the genus Parodia he states that the stamens are distributed uniformly over the whole receptacle wall.

[8] It would be interesting to know whether other species occurring in the same region have the same seed type.

[9] From this it must be concluded that the seed type of the Brasiliparodias must be younger than that of the small-seeded types. Elsewhere, however (Succulenta 1980 p.54 et seq) the author states that the large-seeded species are the most primitive (oldest) from which the fine-seeded types slowly developed! On the basis of what Buxbaum and Ritter say about the 'cradle' of the Notocactinae, I am inclined at this time to accept their view.

[10] Unfortunately the expression 'detachment from the hilum' used by Buxbaum is not clear without further

amplification. Here also comment [5] must be taken into consideration in evaluation of what Brandt proposes. It would do no harm if we knew accurately what Buxbaum meant by 'detached'.

[11] For objectivity, scanning electron microscope pictures should have been used. Drawings can always be subjectively influenced. Also, the whole article shows that our hobby requires more scientific work. Without wishing to prejudice the value and reliability of Brandt's drawings, from which it must be concluded in every case that he is an outstanding observer, I would like to point out that he is now criticising the work of the highly experienced field collector Ritter and the purely scientific botanical and taxonomic work of Buxbaum. We have here to deal with three different people, each presenting his viewpoint. Would the work of these three not have been more useful if they had tried to combine their knowledge and to use it for the scientific side of our hobby. Although it may appear to be too idealistic, I would like to suggest that new descriptions should be made by a minimum of three people – a field worker, a scientist and a specialist. It would indeed take longer for a new species to be described, and also fewer might be described, but against this we could at least do something with the results! At present the position is that scientists who still have a little self-respect do not concern themselves with cacti, because laymen have made the situation wholly inextricable!

[12] Personally I find that the one labelled P. prestoensis rather shows differences!

[13] Concerning similarity of seeds, Ritter says in Kakteen in Sudamerika p.93: 'Neither does similarity of seeds mean anything; similar seeds, if not specialised, occur regularly in non-closely related species.' Also elsewhere in his book Ritter points out that seeds can hardly be used as the sole criterion determining species. Here he is supported by scientists such as W. Barthlott and L. Diers, who make use of such modern methods as the scanning electron microscope, and warn that the results should not be over-valued.

[14] Comparison of the sketches provided by the author with those of Buxbaum gives rise to doubts that both illustrate seed of the same species; for this reason, little sensible may be said further on the matter.

[15] On the basis of the fact that the author, in my opinion, presents Buxbaum's statements inaccurately and leaves his comments on stamens wholly out of consideration, I am of the opinion that this new combination should not be sustained in practice. Since neither field workers, scientifically trained taxonomists nor botanists deny the relationship between Notocactus and Parodia, and because the idea that the genus Parodia derives from Notocactus is the oldest and has not been contradicted, the Parodias should rather be included in the genus Notocactus. Dr. Barthlott says on this matter in a letter: 'I doubt whether Parodia is a good genus; the differences from Notocactus are too small'. He says further, that according to usual botanical criteria (not following criteria used in relation to cacti!) Eriocactus and Brasilicactus are clearly Notocacti!

. . . from H. Middleditch

Having encountered, in the past, so many authors' statements that were subsequently misquoted by later writers, my immediate reaction was: "did Buxbaum really say that?" Theunissen tells us what he considers Buxbaum said; but as far as I am concerned that still leaves unanswered the question as to what Buxbaum actually said.

It would certainly appear that Brandt does not concern himself either with flower sections, or with fruit, and so relies almost entirely on his careful seed studies as the basis of his statements. In doing so he attracts strong criticism, sometimes verging on contempt. It is most unfortunate that, in this way, he diminishes the great value of his seed sketches; it is equally unfortunate that the critics tend to play down the value of seed studies unduly in their otherwise commendable efforts to add some balance to the Brandt picture.

Brandt states pretty clearly that the 'small seeded Parodias occur....in the Bolivian Chaco'. I do not really understand how he can make such an error. It is now many years since we received from Brandt a valuable map on which was plotted reported locations for virtually all the then named Parodias: this same map has been used by several of our members to locate place names not provided on any other maps. There is not a single Parodia location plotted in the Chaco. Parodias are essentially creatures of the Andean mountainsides, not of the Chaco plains.

In regard to the strophiole it is stated by Brandt that 'this redundant tissue provides a source of nutrient for the seedling and is...fully consumed'. A source of what nutrient? The strophiole is apparently a residue of the funiculus which is a stalk supporting the seed off the wall of the ovary; the funicle has a function which does not differ basically from the function of a petiole, or of a tree limb, or of a flower stalk on a herb in an English meadow. It might be reasonable to suggest that it will be of a similar basic construction in each application i.e. a series of rectilinear cells filled with fluid to give the necessary structural strength, around a core of similar but more specialised cells forming the vascular bundle. A dry funicle may be expected to be similar to a dried flower stalk or a dried petiole in so far as it will consist almost entirely of ligniferous tissue. Without nutrient, surely?

In considering the seed of P. mairana Brandt observes that "the projection around the micropyle is densely covered with strophiole tissue without the funicular remnant having a part there". I take this statement to mean that the strophiole does not consist of or contain any remnant of the funicle. My impression is that the ovule (which matures into a seed) is connected to the wall of the ovary by the funicle; that in some species there is an outgrowth at the junction of funicle and ovule which is described as an arillus or caruncle. As far as I am aware these are the only two/three constituent components involved; so the strophiole must be part of one or other of these components. In Buxbaum's "Morphology of Cacti" Part 2 - Morphology of the seeds, section 8 "Hilum and Strophiole" the strophiole is described as a "corky or spongy mass over the hilum" (p.206) whilst the hilum is defined as "the scar or mark resulting from the attachment of the ovule to the funiculus" (p.197) This latter is not a good definition as it should have read "the scar or mark resulting from the detachment of the ovule from the funiculus" since no scar or mark exists whilst the two are attached. However, if we are prepared to accept the intent rather than the content of the definition, then it means that anything on the seed side of the hilum is part of the seed and anything on the funicle side of the hilum is part of the funicle. On this basis a strophiole which lies "over the hilum" can only be part of the funicle. If we are to accept Brandt's contention that the strophiole which he describes has no funicular content, then that hilum must be the external face of the strophiole, contrary to Buxbaum's definition of a strophiole as lying on the hilum.

Buxbaum is not the easiest author to read and I find that it is quite easy to misunderstand him – or even not understand him at all. However I am prepared to accept Buxbaum's definition of hilum and of strophiole and consequently I would regard the hilum projection on P. mairanana as a remnant of the funiculus. Since F. Fuschillo already knows how to cut a seed in half, he might feel inclined to photograph a seed section through a strophiole then we might all learn something new. Such a section would also show quite positively which opening was the micropyle and which was the funiculus; without such facility, how do authors who describe seeds decide which one is which? This is quite easy with seeds like Austrocactus and Neoporterianae where the micropyle is outside the hilum, in the orthodox textbook location – but how about all the others?

The term "Umbilicus" used by Brandt has me puzzled. What is it supposed to mean exactly? Is it the funicular opening in the hilum?

. . . from A. Wheatcroft

In Henderson's dictionary of botanical terms, a rather archaic source, the umbilicus is defined as the hilum. On the other hand, Chambers' dictionary of science and technology gives no botanical meaning of umbilicus but gives umbilical cord = funicle!

I would agree in questioning the nutrient content of the spongy strophiole – I would be very surprised to find that this contained much except cellulose, pectic substances and maybe lignin – not a lot of use as a nutrient source.

. . . from Buxbaum-Krainz, Die Kakteen C VIc 1967

Genus Parodia

. . . . Seeds of the subgenus Parodia are very small (ca. 0.2mm in diameter), spherical, with a smooth brown testa and spongy, corky strophiole usually exceeding the size of the seeds, in the formation of which not only the tissue covering the micropylar elevation but also the spongy tissue of the end of the funicle is included, a characteristic in which the genus differs considerably from Notocactus. Seeds of the subgenus Protoparodia are black or brown/black, tuberculate (only exceptionally mainly or wholly smooth – P. columnaris), elongated bonnet shaped and then slightly curved, or a truncated egg-shape to almost spherical. The strophiole is generally small; the funicle is always involved in its formation, either as a somewhat lower projection than the micropylar elevation, or as an independent part of the strophiole, which may be smaller than, the same size as, or larger than, the micropylar part. In no case is the funicle dried up or broken off. In the subgenus Obtextosperma the black, finely tuberculate testa is covered with a fine aril layer, which is tattered into small, star-shaped species on the points of the tubercles, so that the seeds have a frosted appearance. (Convergence with Notocactus subgenus Neonotocactus!) The strophiole is almost hemispherical, cushion-shaped.

Parodia, Subgenus Obtextosperma

. . . . The common original forms may be close to the Notocactus subgenus Brasilicactus, the seeds of which show considerable similarity to those of Protoparodia, which however shows itself to be highly derived in the degeneration characteristics of the flowers.

Considering the great variability of flowers in both Parodia and Notocactus, the separation of these two genera would in fact be difficult if Parodia did not show a most decidedly not very striking but quite specific development tendency. This is the inclusion of the funicle in the strophiole which is generally not very large in the Subgenus Protoparodia. While in Notocactus this funiculus stump always dries up and commonly breaks off, leaving a hole, in Parodia it is enlarged in a spongy manner and is included in the strophiole tissue covering the micropylar elevation or it forms a second projection of the strophiole. As this is a characteristic without any ecological significance, a quite precise form-rule applies, as Notocactus wholly lacks this characteristic even in the subgenus Brasilicactus which has similar seeds.

Genus Notocactus

. . . . The seed is straight or slightly obliquely bell-shaped to hemispherical, with a basal, flat to slightly angled hilum, generally slightly larger than the seed diameter, as the hilum margin curves outwards somewhat. In approximately the middle of the hilum is a more or less clear elevation, already preformed in development of the seed, and on the point of which is the micropylar aperture (micropylar elevation). The whole hilum is covered with a thin layer of loose tissue, which is often more or less worn away so that the testa cells lying beneath are revealed. The funicle is never thickened in a strophiole-like manner; generally its rudiment is hardly recognisable or broken off. Only in the subgenus Brasilicactus is the hilum somewhat smaller than the seed diameter below the part at which the funicle is attached, as a narrower part set at an angle. Seeds of the subgenus Neonotocactus have a thick, bulging, or cushion-like hilum margin, which may be termed the seed-appendage. The black (dark brown in the subgenus Eriocactus) testa belongs to the tuberculate type, and is always originally covered with aril tissue, which however generally separates as the seeds ripen. Only in the subgenus Malacocarpus does it remain as a uniform, often wrinkled, coat covering the seed and in the subgenus Neonotocactus it is torn into tiny, star-shaped jagged particles which remain on the tips of the tubercles. Seeds of the subgenus Eriocactus are, as a result of the great subdivision of the seed primordium into a multi-branched cluster of seeds, very small (convergence with Parodia) and pointed, hat-shaped; testa tubercles are flat.

. . . from H. Middleditch

The statement which was made by Buxbaum about the difference between the seeds of Parodia and of Notocactus occurred under the general heading of Parodia, but in a paragraph which started by reference to the seeds of the subgenus Parodia. Nevertheless, the statement is quite plain, that the genus Parodia differs from Notocactus by the characteristic of the Parodia seed which has a strophiole that includes not only the tissue covering the micropylar elevation but also the spongy tissue of the end of the funicle. In effect it is repeated under the heading of subgenus Obtextosperma: ". . . the genus Parodia shows a quite specific development . . . of the inclusion of the funicle in the strophiole". Only by looking up the reference to strophiole in Buxbaum's Morphology of Cacti can we find that "the true strophiole consists of a corky or spongy mass over the hilum". I take this to mean that if there is a strophiole present, then it is over the hilum, so that we cannot see the hilum; conversely if there is no strophiole present, then what we see is the hilum – as on Notocactus. By inference, there is no remnant of the funicle to be seen on the hilum of Notocactus.

On the other hand, botanical textbooks do not provide quite the same impression of seed terminology: Strasburger's Textbook of Botany, 1965 – "the hilum, or former place of attachment [of the seed] to the funicle": Priestly & Scott, An Introduction to Botany 1957 – "The hilum...represents the region where the seed has separated from the funicle": Weir, Stocking & Barbour, An introduction to Plant Biology 1970 – "The hilum is the large...scar... left where the seed broke from the stalk or funiculus". If such a definition is accepted literally, then there is no such thing as a funicular remnant forming part of the seed. The hilum divides the seed from the funicle, so if you have a seed you have no part of the funicle. Hence if you take a Parodia seed with a strophiole, then according to the textbook definition for hilum, the outer face of the strophiole which you can see is the hilum. On this basis you could possibly claim that Brandt is quite right is saying that there is no difference in the funicular remnant between Parodia and Notocactus, for the simple reason that there is no remnant of a funicle forming part of those seeds, or of any seed.

However, there appear to be several reasons for doubting this over-simplistic approach. Firstly, those textbooks which I have been able to consult always quote the definition of a hilum in relation to a specific seed – of rice, or corn, or wallflower, or whatever. No doubt in this way the relevant author covers himself for the exceptions. Nowhere in a botanical textbook have I come across a definition of hilum for a cactus seed. Secondly, the textbook definition appears to me to fall into the category of all basic definitions, being a starting point from which qualifications and amplifications follow. Without prejudice to the generality of the basic definition, almost all the funicle could separate from the seed, with a relatively tiny proportion of the funicle remaining as a remnant and forming a part of the seed. Thirdly, on a few seeds which I have examined it is possible to see the dark testa cells through an aperture in the hilum; I am suspicious that many more seeds will have a complete envelope of protective armour in the form of the testa of which a patch is usually obscured by the hilum. It is most interesting to note that Buxbaum also met with this feature. Hence I am suspicious that there is a remnant of the funicle on most (possibly every) seed. But up to now it tends to be accepted that only when there is a positive projection on the hilum does this become described as a funicular remnant. Thus I would feel that with the terminology of his time, Buxbaum was correct in accepting that some remnant of the funicle could be part of the seed, whilst Brandt worked too literally to the textbook definition of hilum.

The "aril layer forming star-like edifices on the testa cells" can be recognised as the crinkly cuticular layer that we are now accustomed to seeing on electron microscope photographs of seed. However the use of the term aril layer to describe this cuticle seems to be open to question.

. . . from G.J.Swales

I am not really too happy with the use of the term aril layer which appears to be used by Buxbaum to describe an additional and apparently thin layer of material which can be seen covering patches of the testa, or outer coat, of certain seeds. I am most familiar with this feature on Gymnocalycium seeds, where it is to be found on a variety of species, but I have certainly observed that it is present on some seeds from other genera.

Among the Gymnocalycium, some of the Macrosemineae have discreet patches of a brown layer over the black testa. They are not attached to, and apparently never were attached to, the funiculus, and therefore cannot be described as an arillus. They are not just a dried-up layer of mush as one can clean up the seed and these brown patches remain. From a white-flowered so-called G. baldianum ex Bill Putnam comes seed which looks rather scruffy as the skin is covered not in patches but all over with a brown layer; I have concluded that it is not just a dirty seed as I have tried to remove parts of this layer with a scalpel but when the seed is put under the scanning electron microscope it is clear that I had damaged the testa.

The pleated nature of the surface of the testa cell can only be viewed by means of the electron microscope; this sort of surface does occur generally on Gymnocalycium seed which gives a lustrous rather than a shiny appearance to the seed when viewed by means of an optical lens – or perhaps even with the naked eye. This pleated surface does not occur on the pflanzii group, nor on Trichomosemineae, nor on the hammerschmittii/chiquitanum group; it is not present on G. fleischerianum and G. paraguayense is fairly shiny. There is not much sign of it on seeds of the Microsemineae group (or groups). But it is very common in other groups.

On G. uebelmannianus the seed surface does look about half way between an arillus and a membraneous layer. Nevertheless I am still unhappy about the use of the term aril layer to describe this feature.

. . . from S. P. Bhatnagar & B. M. Johri, Development of Angiosperm seeds, in Seed Biology, Ed. T.T.Kozlowski Vol.1 1972

Ovules may be unitegmic or bitegmic. In the former there is a single integument, whereas in the latter there are two. The Sympetalae are characterised by unitegmic ovules; Polypetalae and monocotyledons generally possess bitegmic ovules. Exceptions to this generalisation are, of course, present in these groups.

Some other structures are associated with the ovules. The aril has been considered as a third integument. P.Maheshwari (An introduction to the embryology of angiosperms, 1950) stated that the aril is a new structure arising from the base of the ovule "forming a third integument". Eames (Morphology of the Angiosperms, 1961) considers the use of aril as a third integument "unfortunate", particularly in those ovules where the aril is an elaboration of either the whole or part of one integument.

SEED COAT MORPHOLOGY OF CACTACEAE, A SCANNING ELECTRON MICROSCOPE SURVEY

By W. Barthlott & G. Voit

Translated by H. Middleditch from Plant Systematics and Evolution No.132 1979.

This study was based upon seeds of about 900 species spread among 120 genera which were examined both by an optical microscope and by the scanning electron microscope. Seeds were obtained from the Botanic Garden at Heidelberg University, from Zurich City Succulent collection and from a large number of private collections.

Arillus and other adherent structures

The campylotropous ovules of the Cactaceae are often held aloft and half enwrapped by the funiculus. When the seed is ripe this usually perishes. There are exceptions to this state of affairs where the residual part of the funiculus forms an arillus.

In the Opuntioideae the funiculus wraps all the way round the ovule, widens out flattish, coalesces with and consequently surrounds the ovule with the exception of a tiny opening at the micropyle. The proportionately thick funicular mantle lignifies as the seed ripens and takes on a mechanical defence function as a stone-hard arillus. The Testa itself is small-celled and only slightly sclerified. This seed type which is characteristic for the group, is well investigated – Planchon 1895, Archibald 1939, Maheshwari & Chopra 1955. The external surface of the lignified arillus can be dry and smooth, such as in Tephrocactus floccosus (SD)Bkbg, or with hairlike extensions on the epidermis cells matted with watery fruit flesh, such as in Nopalea cochenillifera (L)SD.

If the customary definition of the "Arillus" as a persisting funicular membrane is utilised, then the funiculus which is extremely swollen immediately before its point of attachment to the seed on some globular south american cacti must also be referred to as an arillus. This usually remains preserved on the ripe seed as a whitish aerated tissue. In globular form this second arillus-type can attain almost the size of the real seed, such as in Blossfeldia liliputana Werd. More commonly it forms only a shallow cushion-tissue over the hilum-micropyle area, such as in Rebutia wessneriana Bew. Whilst a definite function can be ascribed to the Opuntioideae arillus, the ecological function of this second arillus type is not known. Perhaps it serves as a bouyancy jacket, or as an "Elaioson" for the distribution by ants; perhaps it even plays a role to quicken the water-intake for germination.

On the hilum-micropylar area of Rhipsalis and related genera is observed a water-soluble jelly-like body of mucus. With Epiphyllum and some other genera a mucus-layer envelopes the whole seed, reminiscent of frog spawn. The mucus adheres firmly to the outer surface of the seed, but its morphological nature (Arillus?) is not known. Functionally its formation can be interpreted as adaption to ornithological distribution. Perhaps the mucus eases the passage through the digestion tracts; with epiphytic Rhipsalis it serves together with the sticky pulp for the adhesion of viable seeds to the tree bark.

With many south american cacti such as Matucana and many Rebutia and Lobivia spp., the ripe seeds are coated in a certainly macroscopically visible wrinkled whitish "skin" that is generally designated as "Arillus", for example by Diers 1972 and by Leuenberger in 1974. This interpretation is false, as it is a matter of a greatly evolved overlying layer of partly peeled-off cuticle whose evolutionary history and ultrastructure was described in respect of Matucana and Neochilenia by Barthlott and Ehler in 1977.

In 1967 Buxbaum designated the cuticle very differently: in Rebutia as "third integument"; on the other hand as "Arillus skin" (Buxbaum 1958) in the closely related genus Lobivia (including Chamaecereus); the mucus layer of many Cerei were likewise called "Arillus", for example in Dendrocereus (Buxbaum 1969). Finally it was stated by Buxbaum in 1977 that the seeds of all Cactaceae were coated with a "third integument" that when the seed was ripe either vanished, or formed a thin "Arillus skin", or changed into the seed mantle in the Opuntioideae. All these interpretations were based upon faulty observations; in the Cactaceae there are neither an "Arillus skin" nor a "third integument": the real Arillus mantle of the Opuntioideae on the other hand originates by historical evolution from the funiculus tissue growing round the seeds.

Form of the Hilum-Micropylar area

On account of the campylotropous form of the ovule, the detachment place of the funiculus (hilum) and the micropyle lie close besides each other in the ripe seeds and often form a union which will henceforward be described as the "Hilum-Micropylar area". The disposition of the hilum-micropylar area is stated in the literature to be a taxonomically relevant feature. Its appearance is not uniform: the following types may be distinguished:

(a) Hilum and Micropyle separated by a narrow bridge of sclerified testa cells. This form is characteristic of the primitive Pereskioideae e.g. Pereskia, and also of a few highly-developed cacti such as Echinocactus.

(b) Hilum and micropyle are united into the Hilum-Micropylar area by an unsclerified testa region whose thin-walled cells are barely structured. In the literature this zone is usually simply called "Hilum"; Engelman (1960) used for this area the terminology "hilum cup".

. . . from G. J. Swales

The cross section of a cactus seed is poorly drawn by Barthlott and Voit in so far as it does not identify the hilum correctly. The line from the word hilum on their sketch ends on what I would suppose is the funicle, or perhaps a remnant of the funicle, rather than on the hilum.

. . . from H. Middleditch

It may have been the intention of Barthlott and Voit to indicate that the place where the funicle broke off the seed is the hilum. Alternatively they may have intended the slightly S shaped body of material closing the hilum-micropyle end of the seed to be identified as the hilum.

This article by Barthlott and Voit looks as though it may well contain some valuable information but the problem is that I do not understand quite a few parts of it. Indeed I am lost as early as the second word — what is "campylotropous" all about and what has it got to do with telling Brasiliparodia from Parodia, or from Notocactus?

. . . from Strasburger's Textbook of Botany 1970

The most important parts of the flower are the stamens with their pollen sacs and the carpels with their ovules.....the carpels bear ovules internally. The ovules are highly characteristic organs, roughly ovate and not more than a mm or so long, attached to the interior of the carpel by a short stalk or funicle and consisting of a compact mass of tissue, the nucellus, surrounded by one or two envelopes of integuments which arise from the base of the ovule (the chalaza) and leave a small passage to the nucellus at the other end.

If the nucellus is erect, continuing the line of the funicle, the ovule is termed orthotropous. If it is reversed, with the funicle bent through 1800 , it is anatropous. Or the nucellus itself may be curved in one of a number of ways and the ovule is said to be campylotropous.

. . . from H.Middleditch

Well that seems to explain what is meant by campylotropous – sketch appended. Of course it is quite

understandable that the micropyle opening must remain uncovered by the funicle because this is where the pollen tube gains access to the ovule in order to carry out fertilisation of the nucellus. But that immediately raises a problem, because then the micropyle is outside the area of attachment to the funicle; the hilum, in accordance with the textbook definitions quoted above, is the scar left at the former place of attachment to the funicle. So in the ovule, the micropylar opening is outside the hilum area, but in most cactus seeds the micropylar opening is within what we always call the hilum. It cannot very well get overgrown by an expanding funiculus during ripening of the seed can it? If it cannot and does not, how can what we call the hilum extend beyond the "place of attachment of funicle to seed"? But Barthlott and Voit state quite categorically that the "hilum and micropyle lie close besides each other in the ripe seeds", which is another way of saying that the micropyle does not lie within the hilum area.

If that is correct, then what we are used to calling the hilum is not the text-book hilum i.e the former place of attachment of the funicle, but something else. Unaware of that possibility, it was pointed out to me by G.J.Swales just before our 1986 Weekend when looking through the microscope at some Austrocactus seed, that the micropyle was quite clearly disposed outside the hilum i.e. in what subsequently transpired was the orthodox textbook disposition. By chance I discovered that all the RMF habitat collected seed of Neoporterianae put on slide by F. Fuschillo also exhibited the micropyle outside the hilum. It was pointed out by N.Taylor at our 1986 Weekend that this feature occurs in other genera, too. Then in making a search of suitable literature, I found quite a few seed sketches which showed the funicular remnant which was connected to only a small part of the area we call the hilum. So it really does appear that the textbook hilum is only a small part of what we call the hilum and the micropyle occurs outside the textbook hilum, presumably on all cactus seeds. In that case, what is the area we usually call the hilum?

Barthlott and Voit say that one form of this "hilum" consists of an "unsclerified testa region whose thin-walled cells are barely structured" (p.211). I suppose in plain English you would say that it was a part of the testa composed of cells that lacked strong, hard, walls so forming a more or less amorphous layer. Presumably the usual dark testa cells which I have seen below this "hilum" layer on a few seeds means that the normal testa coating does occur under this amorphous layer, but does this occur on only some seeds and not in others? Also I suppose that when this amorphous layer is quite thick it can then be described as a strophiole? But this is at variance with the other observation by Barthlott and Voit, who say that "using the customary definition of the Arillus as a persisting funiculus membrane...a second arillus type can attain almost the size of the real seed". So the part that we usually describe as the hilum, Barthlott and Voit say firstly is an 'unsclerified testa region' (p.211) and secondly that it is 'an arillus or persistent funicular membrane' (p.214). How can what we call the 'hilum' be a persistent funicular membrane and then two pages later become a part of the testa with unhardened amorphous cells? And which botanical textbook defines the arillus as a persistent funicular membrane?

Is the real reason for this apparent anomaly that in the cactus seed there is a growth at the junction of the funicle and testa for which there is as yet no generally accepted terminology? There are other types of seeds which have growths at the junction of the funicle and the seed, which are described and illustrated in the botanical textbooks; such growths as, for example, an arillus, a haustorium, a caruncle, or an eliasome. There does appear to be broad agreement about the specific seeds to which this terminology is applied. These specific growths are not identical, nor yet the same, hence their terminology differs. None of these growths appear to be strictly comparable with the amorphous tissue on the so-called hilum of a cactus seed, so that it may be inadvisable to use any of the existing terms for the cactus seed 'hilum' since they are intended to describe other sorts of growths.

This work by Barthlott & Voit was published in 1979 whilst the article by Brandt appeared in 1984. If Brandt was aware of the views expressed by Barthlott and Voit regarding the nature of what we normally term the "hilum", is that why he used the term umbilicus to refer to what we usually call the hilum? This term umbilicus does not really seem appropriate to describe the body of amorphous tissue to be seen at the "hilum" of many ripe cactus seeds. However, there is one term that has already been used for this purpose and that is "strophiole". This term could be applied to a thin, thick, sunken or projecting body of tissue; the existing definition of strophiole (such as it is) neither excludes nor implies any specific thickness or shape of tissue or growth. The use of the term strophiole would automatically accept that the micropyle must lie outside the text-book hilum, which is where it does lie on a cactus seed, contrary to almost all the cactus literature. If nothing else, it has at least the advantage of convenience in comparison with the (quite correct) term hilum-micropylar region as used by Barthlott and by Glaetzle.

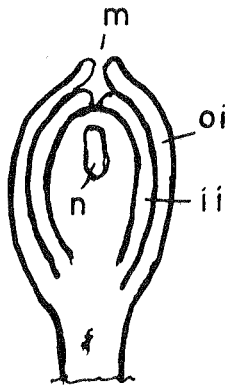
By far the most important value of using the term strophiole would be that Chileans' members would no longer be confused by un-necessary arguments by the so-called authorities. Instead of Brandt, Theunissen, and Buxbaum arguing at cross-purposes, the discussion would be based upon a strophiole, of which only the outer surface was immediately visible.It would then be necessary to identify the text-book hilum, the funicular remnant, and the micropyle, or explain why they could not be so identified. It would then be possible to make useful comparisons between the work of different authors. We would really know what the authors are talking about and be able to make our own comparisons and deductions. This is the basic objective of agreed botanical terminology. We might even be able to make a constructive appreciation of Brasiliparodia seed.

. . . from G.J. Swales

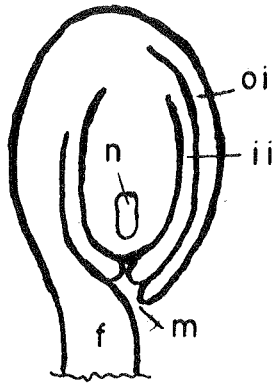
It has already been noted that on seeds of Ferocactus, Austrocactus, and Neoporterianae, the micropyle is separated from the hilum by a narrow band of testa. I believe that it is this narrow band to which Barthlott and Voit refer when they say that in some instances the hilum and micropyle are separated by a narrow bridge of sclerified testa cells. The "sclerified testa cells" are the normal external testa of the seed. I do not think that they are referring to the band across the "hilum" which can be seen on several of Brederoo's seed sketches, such as on Pilosocereus aureispinus.

A STROPHIOLE BY ANY OTHER NAME — By H. Middleditch

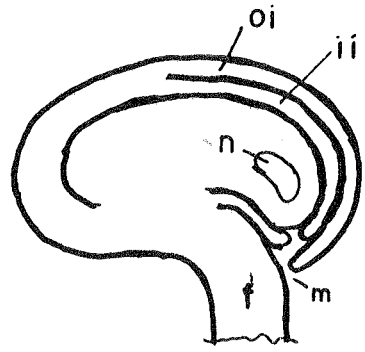
Among the botanical literature, there is a wide choice of reading, ranging from the introductory to the advanced. When it comes to diagrams and descriptions of ovules in the flowering plants, sketches and illustrations abound, together with explanatory text, in all classes of botanical books. Almost any of them will have sketches similar to those



ORTHOTROPOUS



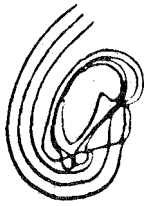
ANATROPOUS



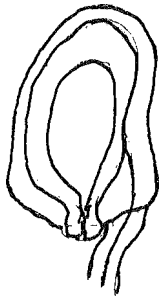
CAMPYLOTROPOUS

FORMS OF OVULE

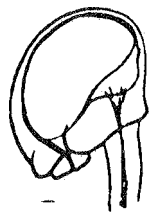
f funicle m micropyle n nucellus
ii inner integument oi outer integument



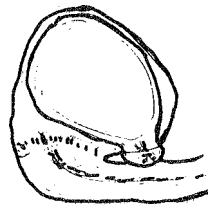
Pseudopilocereus arrabidae



Eriocactus schumannianus

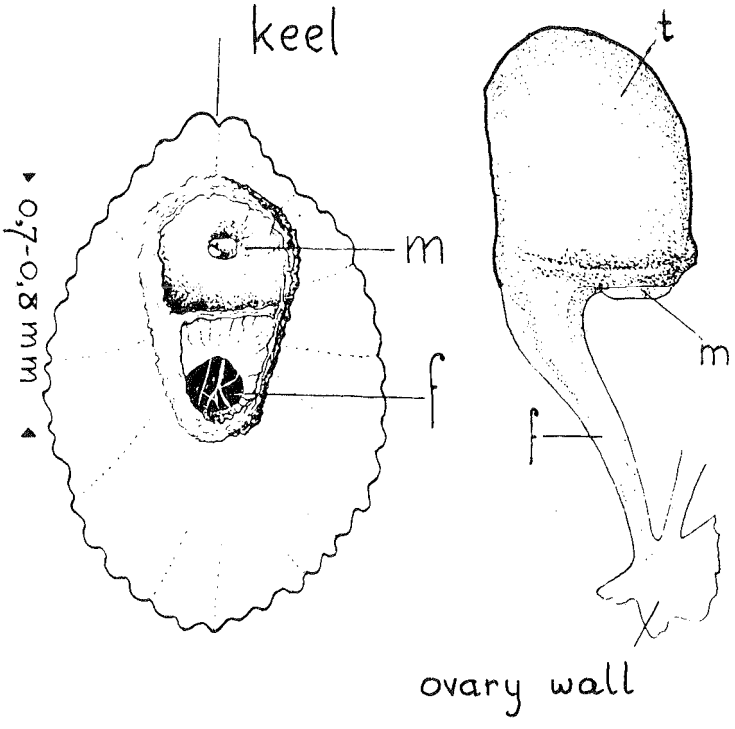


Pyrrhocactus bulbocalyx



Notocactus brevihamatus

OVULES Buxbaum-Krainz Die Kakteen



MELOCACTUS BREDEROOIANUS

Ovule and Seed

Succulenta, 51.2.1972

f funiculus
m micropyle
t testa

provided here in order to show the variations in form of ovule that may be found among the flowering plants – the orthotropous, the anatropous, and the campylotropous shape of ovules. As Barthlott and Voit observe, cacti generally exhibit the campylotropous shape of ovule. This means that the funicle is attached to the ovule and hence to the seed in close proximity to the micropyle.

Some specific examples of ovules from the Cactaceae may be found in overseas literature. A sample of those which appear in the Buxbaum-Krainz Die Kakteen are reproduced here. In each case the funicle is attached to the ovule at a point quite close to the micropyle, in a similar manner to the diagrammatic campylotropous ovule. A fine example is the sketch by Brederoo of the ovule and seed of Melocactus brederooianus; on the ovule the micropyle may be seen immediately adjacent to the funicle. When the funicle dries up and parts company from the seed, the scar at the previous place of attachment of the funicle is correctly called the hilum. On the sketch of the seed of M. brederooianus the area which is probably the hilum may be seen to be separated from the micropylar area by a narrow transverse band.

Most cactus seeds which lack a projecting strophiole also lack any funicular residue, but sometimes a seed may be found which has not parted completely from the dried up funiculus. Within the Buining book on Discocactus we can find illustrations of seed of D. horstii, D. magnimammus, and D. subviridigriseus where a remnant of the funiculus remains on the seed. The sketch of the seed of D. mamillosus not only shows the undetached funicular remnant in side view but when looking at the strophiole (the so-called hilum) we can also see the outline of the scar which has been left by the detached funicle – the text-book hilum. A remnant of the funicle may also be seen on the seed of Facheiroa cephaliomelana. It is always possible that this remnant may be only the vascular bundle of the funicle; similarly with the seed of Pilosocereus aureispinus and Pilosocereus azureus. In that event the detachment of this remnant of the vascular bundle may leave a tiny – possibly very slightly projecting – scar, whilst the detachment of the funiculus may leave a larger scar i.e. the hilum. On Pilosocereus aureispinus the hilum may extend up to the bridge across the strophiole shown by the illustrator - the "narrow bridge of unsclerified testa cells"?

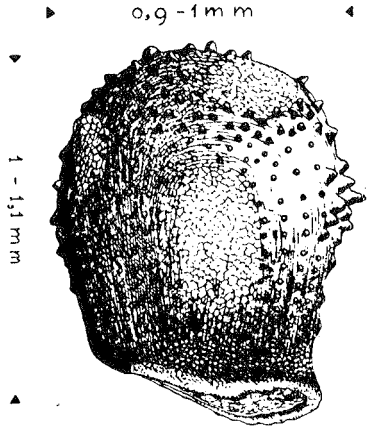
The space within the testa is partially occupied by the embryo; among the seeds of the flowering plants there is a huge variation in the relative proportions of the embryo and seed. In the cultivated grasses, like wheat and maize, the embryo is small in comparison with the volume of the seed. At the other extreme, in the cactaceae, the embryo is a large proportion of the volume of the seed. The section through a seed of Notocactus eremiticus is typical of the large proportion of the internal volume of the seed occupied by the embryo. The base of this seed is closed by a shallow strophiole (the so-called hilum). In the seed of Discocactus magnimammus v. bonitoensis the strophiole is somewhat thicker. The "hilum" may be intended to denote (correctly) the previous point of attachment of the funicle or it may be intended to refer to the dotted area within the testa. If the latter was the authors' intent, it would be incorrect, since the hilum is an abcission scar and not a body of tissue. However, this dotted area could be described as a strophiole, whether or not there was a layer of testa between the strophiole and the embryo. In the sketch of the seed of Arrojadoa aureispina it is not entirely clear if the dark patch is in cross section or not. No identification of this material is attempted by the authors, although it could be described as a strophiole without either misleading or causing confusion. Similarly the strophiole in the seed of Pilosocereus aureispinus and P. azureus is not identified in any way – perhaps to steer clear of contention?

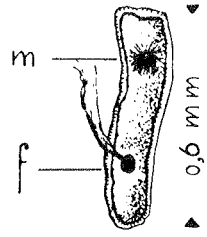
The ovule possesses an inner and an outer integument which are both present in the ripe seed. The outer integument is normally converted into the hard testa shell, whose outermost layer is called the cuticle; not all seeds of flowering plants possess a cuticle, but it is found on some seeds other than cacti e.g. on Phaseolus (bean) -illustrated by Esau, Anatomy of Seed plants Fig 23.10. If the cuticle is pretty flat, it is virtually transparent and the seed looks glossy. If the cuticle is not heavily wrinkled, the seed is dull. If the cuticle is deeply ridged and wrinkled, it may be seen with a hand lens looking like a brownish skin covering or partly covering each testa cell. Thus on sections of seed to the scale used here it is only the embryo, inner integument, testa, and strophiole that may be distinguished, as in the appended sketches of seed of Pilosocereus aureispinus, P. azureus, Arrojadoa aureispina, Coleocephalocereus geobelianus, Notocactus eremiticus, Discocactus magnimammus v. bonitoensis, and of a typical cactus seed after Barthlott and Voit. On the other hand in the sketch by Bregman et al. of a typical Matucana seed the embryo is surrounded by an innermost integument, an unidentified layer, an outermost integument, the testa outside the outermost integument and then a final layer of cuticle with an odd lump of arillus. This does not really seem to match the botanical literature to which I have been able to refer. In some seeds the outermost skin of embryo cells forms an aleurone layer, so it is possible that the layer entitled "inner integument" by Bregman et al. is really the aleurone layer.

Initially the funicle is attached to the ovule; strictly in accordance with the textbooks, the funicle is transformed into the ovule at the chalaza, from which the inner and outer integuments arise. Nowhere in a botanical textbook have I found the funicle attached directly to the embryo, although in Buxbaums sketches from Die Kakteen the vascular bundle at the core of the funicle of necessity runs to the embryo. It is puzzling to find a funicle i.e. more than just the vascular core, attached to the embryo as denoted on the typical Matucana seed sketch by Bregman et al. Also the "hilum-tissue" shown there surrounds not only the funicle but also the micropyle, which is virtually impossible. However if the dotted tissue is described as strophiole, no problems or confusion remain. In these Matucana seeds the strophiole is shown to be separated from the greater part of the rest of the seed by a layer of testa. A strophiole neither requires nor precludes the existence of such a layer of testa cells. The sketches comparing seeds of the four proposed Matucana groups depict an orthodox inner integument, an orthodox outer integument, an orthodox micropyle, an orthodox strophiole, and a questionable funicular remnant.

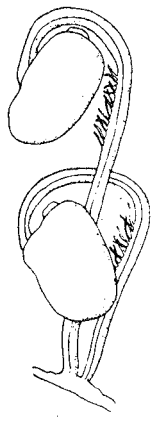
The strophiole seems to be associated with a testa cover formed of smaller cells than the general testa surface. On Pilosocereus aureispinus the deep strophiole is accompanied by a deep skirt of finely tuberculate testa cells. On Coleocephalocereus goebelianus, taking the exterior view as a mirror image of the section, the asymmetric strophiole is associated with an asymmetric skirt of fine testa cells. Thus we may perhaps gain a first impression of the extent of a hidden strophiole from this feature of the testa. On the Buxbaum-Krainz sketches of ovules, reproduced here, there is some material between the nucellus (potential embryo) and the junction of ovule and funicle; is this material the potential strophiole?

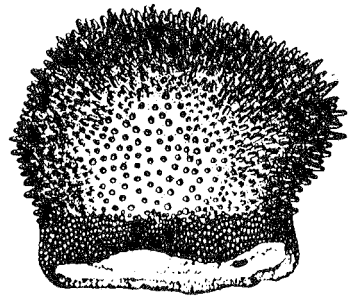
The diagram of the campylotropous ovule suggests that the funicle may lie on the side of the strophiole where the seed bulges outwards. On the seed sketch of Facheiroa cephaliomelana (and on other sketches by Brederoo) the

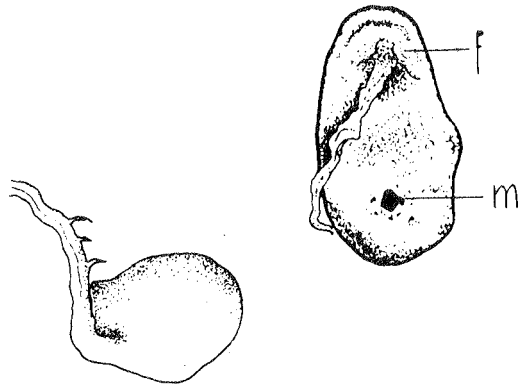




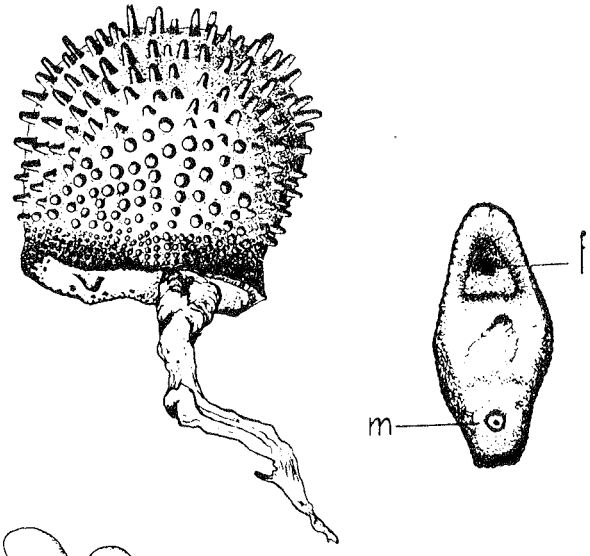
Discocactus horstii

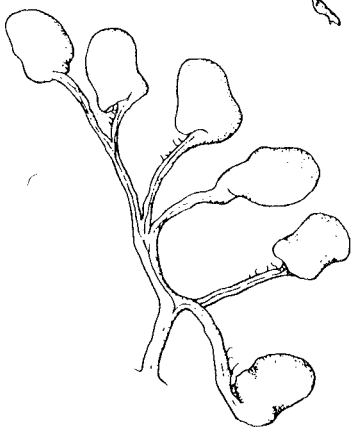




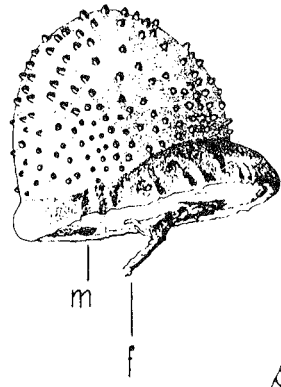


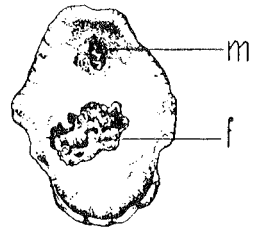
Discocactus magnimammus

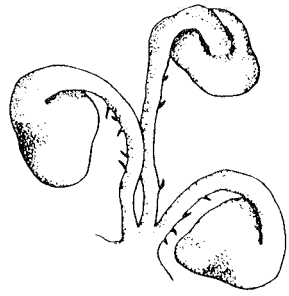


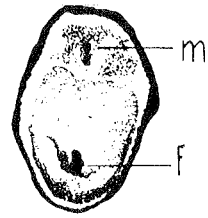


Discocactus mamillosus

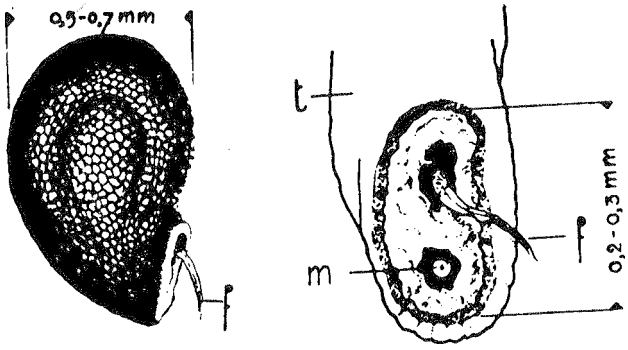




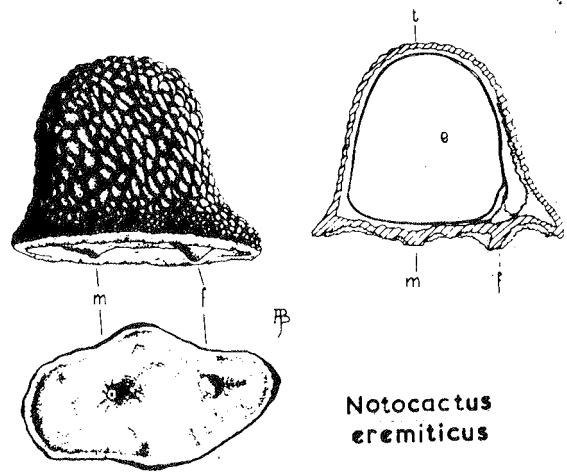




Discocactus subviridigriseus

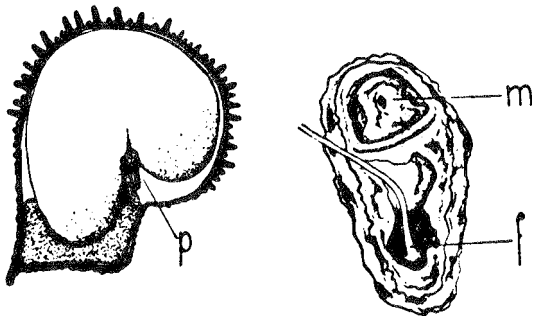


Facheiroa cephaliomelana
K.u.a.S. 26.6.1975

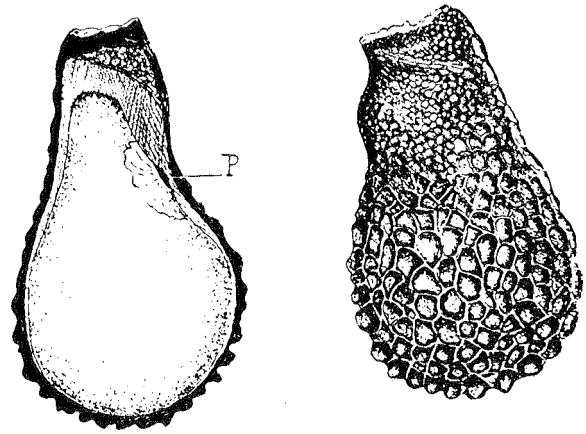


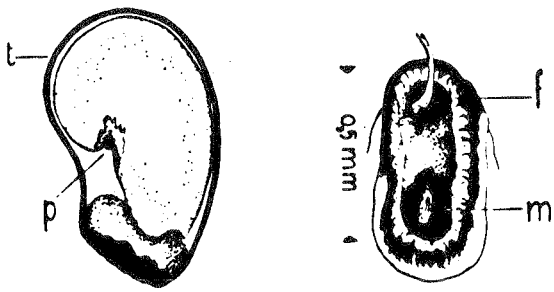
Notocactus
eremiticus

Succulenta
63.7.1984

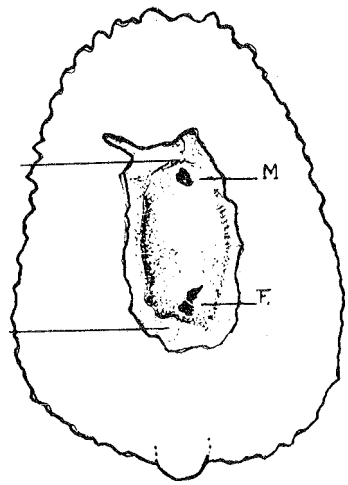


Pilosocereus aureispinus
K.u.a.S. 25.4.1974



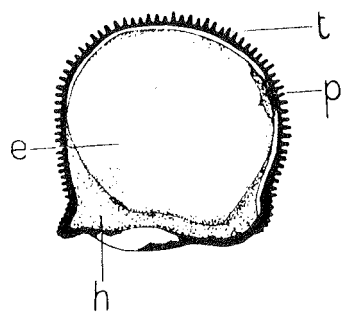


Pilosocereus Azureus
K.u.a.S 26.11.1975



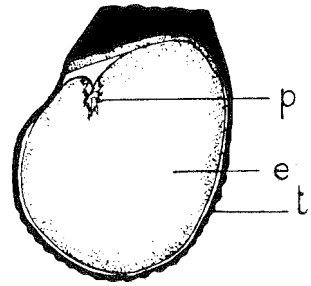
Coleocephalocereus
goebeljanus
K.u.a.S. 21.11.1970

Sketches - A.J. Brederoo



Discocactus
magnimammus
v. bonitoensis
'Discocactus'

e embryo
t testa
p perisperm
h hilum



Arrojadoa
aureispina

K.u.a.s 23.4:1972

remnant of the funiculus does indeed lie at the end of the strophiole which is under the bulging part of the seed. In the campylotropous ovule the funicle forms a sort of raphe where it wraps partially around the ovule as far as the chalaza. As the ovule expands into a seed, this raphe may remain as a slight projection and so it may constitute the origin of what is called a keel on a seed. On the "hilum" view of the seed of Coleocephalocereus goebelianus the illustrator seems to have shown a slight keel at the bottom of the sketch; this is at the funicular end of the strophiole, so matching the foregoing idea. But on the seed sketch of Melocactus brederooianus it is the other way round, and designated as such; similarly on other seed sketches by Brederoo. But how does the illustrator know which is the real hilum and which is the micropyle when he views the strophiole? How does anybody tell the difference?

. . . from G. J. Swales

In my own mind I had envisaged that the keel on a seed was indeed the raphe of the funiculus; in turn this would mean that the keel was located on the funiculus side of the seed. On the other hand I would now be inclined to accept that the funicular opening or funicular remnant on the "hilum" will be on the overhanging side of the seed, because this shape is an enlargement of the campylotropous ovule. On this account I must accept that the keel is correctly shown on the micropylar side of the seed in the various seed sketches by Brederoo in KuaS and Succulenta. In consequence it appears that the keel cannot be the funicular raphe after all.

I do suspect that the funiculus could swell out after fertilisation of the ovule and overgrow the micropyle, in which event it would be acceptable to continue to use the term hilum as we do today, for it would represent the text-book scar left by detachment of the funicle. The hilum is a two-dimensional area, so we still require a name for the three-dimensional material which provides depth to what we been in the habit of calling "hilum". I would consider that strophiole, or strophiolar material, is quite acceptable for this purpose. Certainly I would expect to find the external testa cells continuing to enclose the embryo, underneath this strophiolar material.

The terminology used by Bregman et al. on the sketch of Matucana seed does not altogether match my understanding of how features of a seed should be described. Bear in mind that the unshaded and unidentified layer between the inner and outer integuments may possibly be fresh air. When I have cut seeds in half the embryo usually falls out of its own accord so it does not seem to be a tight fit. On this sketch the inner integument is shown forming the micropylar opening; because an aleurone layer does not possess a micropylar opening, the thin layer drawn around the embryo on this sketch by Bregman et al.could not be considered as an aleurone layer.

. . . response from R. Bregman

I do not really see the problem in regard to the terminology of the structures in the hilar region. Most terms are being used by every botanist. The term funicular hump was introduced by Engleman (American Journal of Botany 1960) and the terms 'hilar ridge' and 'micropylar hump' were introduced by me. In regard to the layers around the embryo this conforms with the seed drawing published by myself in the Botanical Journal of the Linnean Society, 1983.

. . . from H. Middleditch

Both a vertical and horizontal cross section of a seed are depicted on p.359 of "Seed germination in Cactaceae" in the 1983 Linnean Journal. Unfortunately the horizontal cross section includes an unidentified layer (or fresh air) between the inner and outer integuments, which is virtually impossible. No such gap is shown on the orthodox vertical section. Consequently I continue to regard the typical Matucana seed section by Bregman et al, shown here, as well as the horizontal seed section in the Linnean Journal, as out of step with all other information that I have consulted.

. . . from G. J. Swales.

The article published by R. Bregman in the Linnean Journal does include a sketch of both longitudinal and transverse sections of a "typical cactus seed variant". It is not entirely clear to me whether this is intended to be a typical cactus seed, or a variant of a typical cactus seed i.e. an atypical seed. The transverse section identifies an inner integument and an outer integument and there is a relatively thick unidentified layer between the two integuments. If this gap is fresh air then I must admit that I am rather surprised as I would not expect to see a fresh air gap between the inner and outer integuments in any seed that I am familiar with. It is not clear from the sketch whether this unidentified layer is indeed fresh air. Unfortunately there are also quite a few phrases in the text that are not entirely clear to me, throughout the article. Has R. Bregman actually sectioned a number of cactus seeds himself?

. . . from N. Taylor

Although I would not claim to be that familiar with the finer details of seed structure, cactus or others, nor would I claim to have completely digested the article by R. Bregman in the Linnean Journal, yet I find that I have reservations about quite a number of aspects of the body of the article. In addition I am not really too happy with the sketches of the seed sections as the presence of an apparent gap between the inner and outer integument is not what I would have expected. In general I would have been inclined to treat this material with some degree of caution.

. . . from R. Bregman

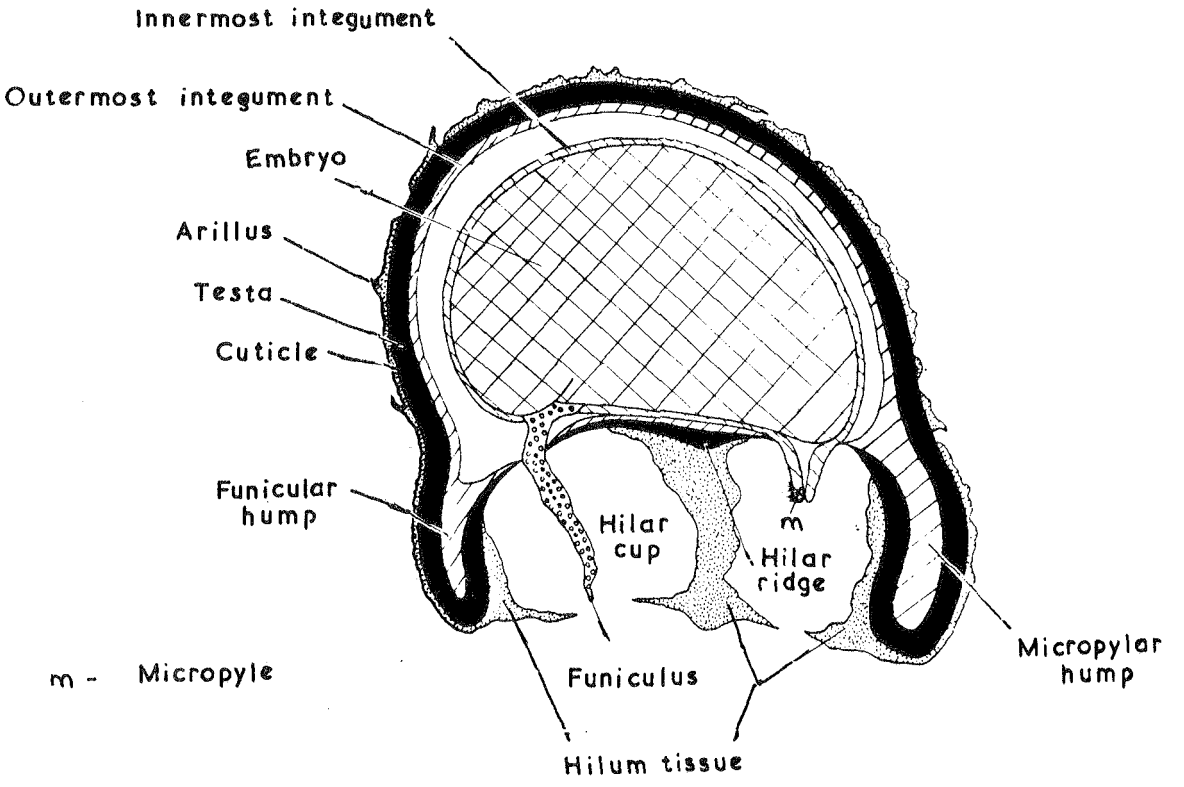
In the figure of the seed cross section on page 359 of my article in the Botanical Journal of the Linnean Society, I deliberately spaced the two integument layers for convenience. In the ripe seed these two layers are close but not fused. Both layers get separated when the seed dries.

. . . from F. Fuschillo

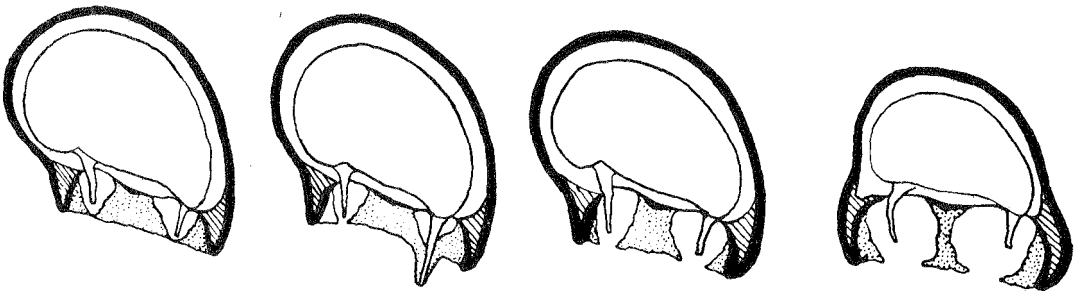
When I have been photographing seeds I find bits of tissue still sticking to those which are fresh and have been carefully handled and packed. This has to be cleaned off, without damaging the seed, before they are photographed. Many of these seeds have a string of funicular tissue still adhering to the hilum, rather similar to those drawn by Brederoo on the Discocactus seeds. Of all the Gymnocalcium seeds which I have cut open I find those of G. quehlianum have the embryo very loose inside the testa shell, so I expect that there will be a gap of fresh air between the embryo and the testa before I cut into these seeds.

AN ACQUAINTANCE WITH ECHINOPSIS — From M. Muse

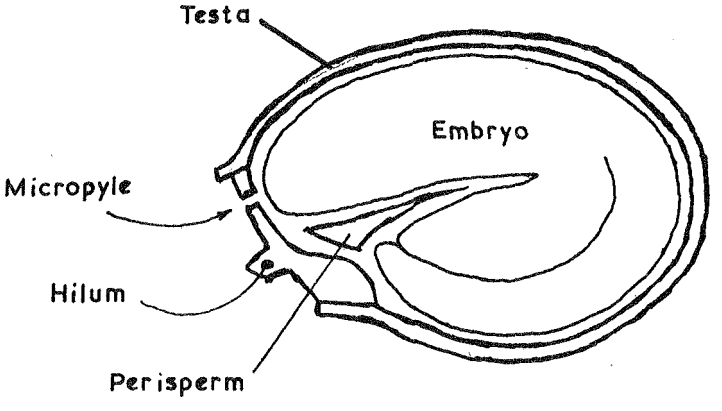
My own collection of cacti is not large, numbering some 600 or so species. However I have been able to



TYPICAL MATUCANA Bregman et al. Succulenta 65.8.1986



MATUCANA SEED GROUPS Bregman et al. Succulenta 65.11.1986



CROSS SECTION OF RIPE CACTUS SEED

After Barthlott & Voit

acquire a good range of Echinopsis (sensu Zucc) and some Pseudolobivia, but I do not have any interest in hybrids. During recent years I have been able to add to the numbers of these plants but due to limitations of space they have taken the places occupied previously by other sorts. Sixty to seventy of the Echinopsis will now be of flowering size and I have a further fifty or so species which are fairly small, most of which I have raised from seed, some of which bear numbers of Rausch, Ritter, Lau, and Horst-Uebelmann. For all my plants the first watering of the year is usually in March and the regime of low night and high day temperatures seems to be most beneficial to growth in spring.

My interest in these plants stemmed initially from the variety of body forms and spination they exhibit, rather than their flowers, fruit, or seed, although I acknowledged that the flowers could sometimes aid identification. This is frequently a major problem since reliable and comprehensive references to many species are very hard to find in the literature, especially those species named up to Spegazzini's time. Far from trying to evade the problems posed by some of the early names, I am anxious to unravel them and put them in their proper context. To this end I am in the process of consulting Pfeiffer's "Enumeratio Diagnostica Cactearum", Salm Dyck's "Cacteae in Horto..." and Link & Otto's "Ueber die Gattungen...". Unfortunately by quoting Brazil, or Argentina, they hardly convey much useful information on finding places.

Then there is the reference in Britton and Rose to Goias as the distribution area for E. calochlora, whereas it was suggested to me that the climatic regime prevailing in Goias would not support Echinopsis. I was browsing through Chileans 5:20:71 and came across the article by Hammerschmidt (pp43-46) which then cleared up any lingering doubts I may have had on the habitat of E. calochlora. Hammerschmidt was in the general area of San Jose de Chiquitos when he found E. calochlora, which is no vast distance from Corumba on the R. Paraguay which is quoted as finding place by Britton and Rose.

There is still no lack of problems with locations for more recent names and references. For example, a location for Echinopsis pereziensis Cardenas is supposed to be near Santa Cruz, but I was unable to find the place name Perez on any of the maps then available to me. Now in Backeberg's Lexikon I could find Corryocactus perezianus Cardenas from Province Loaza, Summitas Luribay, 2800m. If the specific epithet had any bearing on the locality, then Luribay is a long way from Santa Cruz and also the altitude for E. perezianus is 1900m – altogether somewhat confusing. But arising out of the discussions and many helpful comments at the Chileans' Weekend, I am now able to consult the ex-Brandt map of Bolivia. Now I can identify provincial boundaries and locate Perez in Santa Cruz province. Another problem that this map has solved is the location for E. mamillosa v. orozasana Ritter (also referred to as Pseudolobivia) whose locality is given as Orozas, Province Arce. Previously I was able to locate neither the province nor the place, but now I find that it is not too far distant from the type locality of E. mamillosa.

On first becoming acquainted with the name E. taperana KK1562 I felt that it was probably a typographical corruption of E. tapecuana FR777. I had assumed that E. taperana KK1562 came from Taperas near Robore along the Corumba-Santa Cruz route. As this plant appears to belong to the obrepanda complex such a location would represent an isolated population. I now see from the ex-Brandt map that there is a Taperas near Oconi S.E. of Pojo and W.S.W of Comarapa and yet another south of Santa Cruz near to Florida. These two localities are more probable as the habitat. All three plants of KK1562 and the plant of FR777 flowered at almost the same time last year. All four plants had a moderately stout floral tube some 16.5 to 18cm long by 0.9cm diameter which was vivid green and quite unlike any others in this respect, thereby adding to my suspicions that they may be the same species.

Until one becomes familiar with the peculiarities of place names in south america, it can be rather confusing. On first looking at Kiesling's compilation of Spegazzini's work I noticed that he quoted E. leucantha v. brasiliensis as coming from Puerto del Santos. I do not think that this is other than the coastal town near Sao Paulo. Spegazzini says that he discovered the plant near there. Although this location is way beyond the traditional distribution for Echinopsis, it may be as well to bear in mind that Braun has found similar plants in Mato Grosso, so we have to keep an open mind about where Echinopsis can grow.

Even in the restricted sense of Echinopsis (Zucc) the extent of distribution of Echinopsis is enormous from 16° to 39° S and 42° to 62° W, so far as is presently known, i.e from the R. Negro at the northern limit of Patagonia to the northern boundary of the Chaco, and from the foot of the Andes in Mendoza to the highlands of Rio Grande do Sul. This distribution area encompasses a variety of environments and it was suggested to me that this might be reflected in species from a similar environment displaying certain affinities of flower, fruit, or seed. Although I had not previously studied any cactus seed, I was fascinated by the discussion on seed at the first Chileans' weekend I attended; even then I was still not sure what sort of features to look for on seed and how important each feature was. Now I have had an opportunity to become more familiar with some Echinopsis seed I am beginning to see that this may be a help in arranging species into groups. Even now we are still short of provenanced seed from the obrepanda, ancistrophora, and bridgesii groups.

During 1984 I made a start noting variations in flower structure. Lacking any sort of botanical training, mine is probably something of an ad hoc approach. One feature which I quickly noticed was the insertion of the stamens in the flowers. In the group of species round E. leucantha which are distributed through the Chaco and the lowland plains nearly as far south as Patagonia, the flowers all have the stamens inserted in one series with no distinctive gap between the throat circle and the rest of the stamens. All other Echinopsis flowers have the stamens inserted in two series with a gap between. Another fairly obvious feature on the flowers of the oxygona/multiplex/eyriesii group was the presence of bristly spines from the axils of the scales, which did not appear to exist on flowers from any other group. However I later discovered that bristly spines existed on both the floral tube and fruits of E. klingeriana, E. leucantha, and E. minuana. I think the reason I missed this feature earlier was because the bristles lie flush with the surface of the tube and fruits. I only discovered those on the tubes after they had shrivelled and on the fruits at maturity; some swelling occurs at that point and causes the bristles to protrude at an angle.

Having had a request to keep an eye open for fruits during 1986, I took more specific note of these and also kept a photographic record of many of them, which I had not done systematically before. What was really remarkable was that any tentative grouping of species based upon the characteristics of the fruit showed a surprisingly good correlation with grouping based on flower features or on seed. However, my Echinopsis sp. ex Toba grown from seed obtained about four years ago from Lamb, has now flowered and set fruit; the flower has the two series of filament insertions which debars it from

the leucantha group, and the barely bristly fruit which I take as characteristic for the leucantha group. What particularly struck me about these plants was that the tepals are in two series, not three as in all other Echinopsis. I have spoken to Lamb who assures me that the seed was habitat collected and came from a collector in Paraguay who died in 1982. Toba was the locality. On the ex-Brandt map there are three such place names downstream of Puerto Irigoya on the lower Pilcomayo.

There are of course all the usual pitfalls in acquiring plants with correct identification. There is the confusion around E. ayopayana Lau 973 and E. sp. ex Independencia Lau 972. I have two versions of Lau 972 grown from seed ex Sargant – both different – and I have seen two more versions, making four in all, all of them different. A slide of the fruit was shown at our 1986 Weekend and one member there commented that it differed from the fruit on his plant of that name; he asked where I had got my plant – it was a cutting off his own! My plant of E. minuana which was carrying a huge bright red fruit was taken to that same Weekend and provoked quite a few dissenting voices as the fruit was considered highly atypical for Echinopsis.

Many of the early Echinopsis names seem to have disappeared from our collections, perhaps for ever. The early literature and first descriptions are extremely threadbare with regard to details, so much so that in many cases we can no longer be sure what sort of plants these actually were. Although by Schumann's time things had improved, it was not until Britton and Rose's Cactaceae was published that things really improved in this respect. Following the excellent work of Rausch we now recognise certain natural groupings within Echinopsis, though Britton and Rose recognised some affinities. More recently Ritter has made certain claims in this area, though his treatment has been inconsistent. I am familiar with Friedrich's work on seed studies, included in his efforts published in Bradleya No.1 but this does not provide me with a better understanding of the genus, and the question of Lobivia is ignored. The majority of my own tentative conclusions on grouping of species is in line with these works; but I disagree with Friedrich who does not include E. klingeriana in the group around E. leucantha, although both flowers and seed place it there.

Nowadays it has become fashionable to slight Backeberg's Lexikon, yet it remains for all its faults quite the most useful work on the Cactaceae in any language, and a good starting point for further investigation. To reject Pseudolobivia, as many authors have done recently, is to throw the baby out with the bathwater. Whilst Backeberg presented his ideas poorly, indeed they may need restructuring, there is a case for hiving off a number of "species" from the mainstream of Echinopsis although such a group might be called something other than Pseudolobivia. The article by Bryan Adamas dealing with Pseudolobivia which appeared in an earlier issue of The Chileans was surely a useful approach to this question – but how can we obtain sight of the slides shown at the Chileans' Weekend now the author is out of the country?

However there remains the task of collating and assessing the now considerable body of literature and presenting it in a coherent form. I cannot claim to have made a complete literature search: not only is the material hard to come by, but its sheer volume would tax even a full time professional. Information has come from various sources and I am grateful for all the help I have received. A request was sent to Myron Kimnach at Huntingdon Botanical Garden for information on E. robinsonia which Werdermann described from a single large specimen he saw there at 1.2m tall and 20cm in diameter. Marshall and Bock suggested that it was possibly E. turbinata, but from from the characteristics given this seemed doubtful. The information that came in reply was most valuable and informative.

When F. Vandenbroeck came to the Chileans' 1986 Weekend he showed us slides that he had taken in various parts of Argentina; naturally I was especially interested in those which showed Echinopsis in habitat. Perhaps the high point was when he put a slide on the screen of plants growing under fairly heavy shading in a woodland area and described them as E. silvestrii. To me this had for long been a name that I had found difficult to identify with certainty, although I do possess a plant with that label. It came to me as B36 supposedly from Salta at 1500m, which tied in with the location given by Vandenbroeck. On seeing the slide I commented that it deserved the name silvestrii being found in woodland, but before the evening was out I remembered that it was so named after Dr Silvestri. Several features of this species put it into close affinity with the group of Echinopses to be found in southern Brazil and Uruguay.

I am still in the process of acquiring both plants and information about them and would be pleased to hear from any member who has an interest in this genus. I would be particularly interested to learn of available seedlings of known origin or of larger or old plants that the owner wishes to dispose of. Should such an opportunity arise it would be my intention to propagate offsets from reliably named plants and make tham available to any interested members.

. . . from H. Middleditch

Echinopsis have long been regarded as a pretty reliable plant for anyone starting to grow cacti. Other globular plants produce a more showy display of day time flowers and so they tend to capture more interest. In consequence Echinopsis do not figure largely in most collections, or in the literature, apart from reams of print about why they should or should not still be called Echinopsis. But it only needs the gentlest of digging to find that the traditional Echinopsis are not all the same. The information on flowers, fruit, and seeds presented at the Chileans' Weekends has certainly put forward a measure of order and interest for these plants and it is the intention to include a resume of that data in a future issue of The Chileans.

It is pretty certain that the earliest collections of Echinopsis were made from southern Brazil and from what is now Uruguay. It is known that Sellow travelled through this territory on more than one occasion and that he did collect plants there and send them back to Europe, where they were described by other authors. Other Echinopsis which came to Europe in the 1830's from Mendoza were ascribed to Chile; so we have E. leucanthus Gillies.

Echinopsis leucantha v. brasiliensis poses rather a puzzle; from Spegazzini's description it is quite clear that the flower is of Echinopsis size. Spegazzini also describes a Parodia (P. brasiliensis) from this same area, as well as Leocereus paulensis. There is no indication that Spegazzini collected them himself. None of these plants appear to have been collected at this location at a subsequent date. Their validity must in consequence be open to question. In regard to Echinopsis sp. ex Tobas, it is most peculiar to find only one representative which combines floral features from two (so far) distinct groups of Echinopsis. It may be as well to bear in mind that Adolpho Friedrich grew various cacti at his residence in Asuncion and it would be a great deal easier to collect seed there than searching for it in the wild. I do not expect that the

insects are any more discriminating in their selection of flowers out there than they are over here.

The seed of E. silvestrii is very similar to that of eyriesii/oxygona/multiplex and differs from all other Echinopsis seed examined to date. In view of the suggested affinity of the Parodia from south Bolivia/north Argentina with the Brasiliparodia of Uruguay and Rio Grande do Sul, it is most interesting to find that a parallel affinity appears to occur in Echinopsis. A comparison of all the features of the species in this group would appear to be desirable in order to give more substance to this idea.

. . . from F. Vandenbroeck

I came across an Echinopsis which I feel could possibly be E. silvestrii at two locations; near Alemania, province Salta, and near Catamarca at the foot of the Cuesta Portezuelo. The plants are growing in favourable conditions, together with trees and bushes and with other cacti. At Alemania, E. silvestrii grows together with Gymnocalycium antherosacos, Parodia sp., Eriocereus sp., and Pfeiffera. Near Catamarca it is accompanied by Gymnocalycium nigriareolatum, Eriocereus sp, and Stetsonia coryne; it is typical of the Echinopsis near Catamarca that the plants had black areoles just like the Gymnocalycium.

. . . from J. Lambert

On my trip to Paraguay and northern Argentina, undertaken at the end of 1986, I did collect E. silvestrii in the lower part of the Quebrada del Toro at 1700m altitude. I was not able to observe the flowers on this species properly as the flowers at the site were faded when I was there. Some seed is being sent to F. Fuschillo for photographing.

. . . from R. Mottram

The disposition of the stamens in Echinopsis flowers is rather unusual because the majority of them are clustered to one side of the style. However I had flowers on two plants of the huascha complex last year, both of which exhibited a cluster of stamens in the lower part of the tube displaced to one side. I have only seen this character before on those Echinopsis which hold their flowers at an angle of some 30° to the vertical, and in Trichocereus where the flowers are held horizontally. It is most unusual to see the same thing in the huascha group where the flowers are held vertically and one might expect complete radial symmetry in consequence.

. . . from H. Middleditch

But are the stamens inserted uniformly in the flower tube and just lying clustered to one side, or are more of them inserted into one side of the tube? I would be surprised if the latter was the case. It appears that the vascular strands to each scale on the flower tube rise up in a spiral. The number of spiral starts can usually be conveniently assessed from the scales on the tube but there are the same number of starts to the spiral of petals/tepals. I also expect that the vascular strands to each filament will also be spirally arranged and hence I would expect those to be symmetrically arranged, too.

In regard to the size and shape of fruits, it may be as well to bear in mind the comments made by P. Allcock about the size of fruit (see under Gymnocalycium buenekeri, this issue). I can well recollect taking a look at Lobivia fruit at Whitestones and commenting on the divergence of shape, size, and colour that was to be seen. However, R. Mottram cautioned that the many of the fruits changed their size, shape, and even colour, quite quickly when they were close to maturity so that it was advisable to make sure that any notes about the fruit were carefully related to their degree of maturity.

. . . further from M. Muse

It would be hybrid seed on my E. minuana with the huge red fruit, which is at least in line with the comment from P. Allcock that hybrid fruits can be larger than a same-species cross. Clearly there is a case for close examination of the flowers of all groups. I can at least confirm that not all Echinopsis stamens are crowded to one side of the throat.

THE GENUS ECHINOPSIS **By J. G. Zuccarini**

Translated from Plantarum novarum vel minus cognitarum. Horto botanico herbarisque regio monacensi. Vol.3 Abh. Math-Phys Konig. Bayer. Akad. Wiss. 1837 By H.Middleditch.

Cereus —. Columnar cactus.

The genus stands in the closest relationship to the foregoing [Echinocactus] on account of the group of the so-called "Cerei globosi". Hence it enables us to speak firstly about these transition- or connecting-forms.

Immediately following the establishment of the genus Echinocactus, all cacti with shortened, more or less spherical stems, which did not distinguish themselves as Melocactus or Mammillarias, became included in that new genus. Later it was found that some of these forms with the habit of an Echinocactus, had to be placed with the Cerei on account of their very long tubed flower perianth and made for themselves the section Cerei Globosi. Recently Dr. Pfeiffer has increased the number of these to over 10, since he transferred over some Echinocacti which flower on the old trunk with tubular flowers. Up to now we have had no opportunity to examine the flowers of all types but this did occur with C. oxygonus, eyriesii and turbinatus and a characteristic found in each in the manner of attachment of the stamens, diverging from Echinocacti and Cerei alike. Specifically, these are attached partly crowded in the base of the flower tube, but partly they arise in a ring at the throat of the flower, whilst the portion of the tube lying between both insertion points remains free. The strong resemblance of these flowers to C. multiplex, leucanthus, and tubiflorus, permits anticipation of a similar stamen formation with these, too. If the latter is really the case, then we wish to establish the Cereus globosi as its own genus between Echinocactus and Cereus.

(From the Latin) Echinopsis Zuccar. Sepals and petals fused to a very long tube at least three times longer than the ovary. Stamens numerous, inserted in two series, one at the base and the other at the throat of the tube — Body globose to club shaped, with many ribs; flowers solidary from a mature part of the body, very long tube, with very numerous sepals and petals.

The species considered here would certainly all be indigenous to Brazil and Chile.

. . . from H. Middleditch

If Zuccarini considered all Echinopsis known at that time to be indigenous to Brazil or Chile, it seems to be most probable that the plants deemed to originate from Chile would have come from Gillies or from Miers and would have been collected in or about Mendoza. Those from Brazil would originate from Uruguay or Rio Grande do Sul.

ECHINOPSIS OXYGONA (Link)Zucc **By F. Ritter**

Syn:Cereus multiplex Pfeiff

Translated from Kakteen in Sudamerika Vol.1 1979 by H.Middleditch

Echinopsis oxygona is widely distributed in southern parts of the state of Rio Grande do Sul, growing on rocky localities. It appears in two forms which are quite different in spination, so that without more ado they could be taken for two different species, if field studies did not show otherwise. Generally the short-spined form has been taken for another species and and was established by R. Meyer as a variety of E. eyriesii. There can be no doubt about it that it is a case of dimorphic spination with one single species. Body and ribs are identical, likewise flower, fruit, and seed, whilst the latter are quite different from E. eyriesii, despite almost the same spination. In addition, E. oxygona f. brevispina grows alongside E. oxygona at numerous locations and flowers at the same time. Likewise forms with transitional spination are rarely encountered.

Whilst with E. eyriesii the areoles are generally prominent and the ribs between them somewhat inswept, with E. oxygona the areoles are generally sunken into the ribs and the stretch of rib between areoles is straight. In addition, E. eyriesii has round areoles whilst in E. oxygona these are often broader than long, at least in older specimens. Also E. eyriesii usually has a few more ribs and different seeds. The most outstanding difference is the fine purplish-pink flowers of E.oxygona compared with the whiter ones of E. eyriesii. The latter species is distributed from Uruguay as far as Quarai in the territory of Rio Grande do Sul, nevertheless without overlapping the distribution area of E.oxygona. My FR1404 is E.eyriesii from 30km north of Quarai in Rio Grande do Sul.

. . . from H. Middleditch

I take it that the place name of Quarai given by Ritter will be the Quarahy on my map which lies opposite Artigas on the border with Uruguay, N.W. of Rivera/Livramento. In that event, if I interpret Ritter correctly, E.eyriesii emanates from western Uruguay and therefore grows on the basalt-intruded upland which has a maximum elevation of slightly over 200m. Ritter states specifically that E. oxygona comes from southern Rio Grande do Sul, which could mean that this species extends over both the upland around Alegrete as well as the highland of and around the Serras Batovy and Herval. However in that case E. oxygona would be growing both on basalt intruded upland and on ancient crystalline baserock. Since E.eyriesii with the whitish flower grows on basalt intruded rock up to about 200m altitude, it may be that E.oxygona with a pink flower grows on crystalline baserock up to some 300m altitude.

What precisely is supposed to be the difference between the seeds of E. oxygona and E. eyriesii?

. . . from M. Muse

I have grown quite a few of these plants from different sources in order to eliminate my own doubts about identification of each species. I was looking at this contribution from Ritter in summer of last year and felt rather scornful of what I regarded as the superfluities it contained, since the position up to then was quite plain to me i.e. All the spines on E. eyriesii are no more than 5mm long, whereas E.oxygona/multiplex has 2 to 4 central spines from 2 to 4cm long like fine gold needles with blackish tips. Added to that the flower of eyriesii is always white and that of oxygona/multiplex is pink. It was only a couple of months later when I acquired two E. oxygona from Whitestones (plants imported from Schlosser in Uruguay), that Ritter's point about the ribs not being sunken between the areoles was seen to be quite correct. My own plant with this label has saddle-backed edges between the areoles, yet in other respects the plants are near enough identical. The engraving I have which accompanies the first description of E. multiplex also shows this clearly.

Having said that, none of the illustrations I have seen (apart from Ritter's) show plants which accord fully with the description in Britton & Rose. Whereas they quote the length and number of both radial and central spines, these are not quoted in the first descriptions, so that the Br & R account is an amplification of the original. Ritter on the other hand says of E.oxygona "central spine often missing, or mostly only one; like the radials". So what are the plants which Britton & Rose describe as E.multiplex – central spines 2 to 5, up to 4cm long, and E. oxygona – spines about 14, short and stout, 2 to 4 cm long? And what also is the plant I possess which clearly accords with their E. multiplex? Now that I have read all the accounts very carefully I am beginning to wonder if I have been wrong in assuming that the names oxygona and multiplex are indeed synonymous.

With the help of N. Taylor I was able to read various first descriptions of these early Echinopsis and it fast became clear that the picture I had of these plants could be in need of some revision. Not least among the problems arising is the fact that almost all species are reported as having tepals in two series. Only my sp. ex Tobas shows this feature. Either the earlier authors interpreted these structures in a different way to me or they were looking at different plants. Scent may yet prove decisive in establishing whether for example E.eyriesii and E. turbinata are one and the same species. I must confess that I have not so far taken much notice of scent among Echinopsis. I do not recall E. eyriesii as being perfumed, nor is there any record of this on my data cards, but this may be due to laxity on my part. Yet the authors describe it as narcotic whereas that of E. turbinata is described as jasmine scented. Spegazzini uses the terms 'lilii candidissimi vel cinnamoni' and 'jasmineum vel citrinum'. The vast majority of Echinopsis are unscented although certainly E. leucantha and E. sp. ex Toba are scented.

A further couple of plants were acquired from Whitestone which came from Schlosser as E. tubiflora, having been collected in Dept. Colonia, Uruguay. According to Schumann, E.tubiflora comes from "S. Brazil and adjacent Uruguay". By Spegazzini's time this somewhat vague locality has become "in dry stony meadows in the provinces of Tucuman, Catamarca and Salta". What the real facts are is anybody's guess.

. . . from H. Middleditch

In his Enumeratio Diagnostica Cactearum of 1837 Dr. L.Pfeiffer observes that E.eyriesii has a strong narcotic scent whilst Echinopsis oxygona has 'exterior petals deep pink, interior petals white tinged reddish' but there is no mention of scent. In the same publication Echinopsis multiplex is described as having pinkish petals; there is no mention of scent, but by 1839 in Abbildung & Beschreibung Cact., Pfeiffer & Otto give this species a strong scent. Had the scent been missed at first flowering of E. multiplex in 1834? Or perhaps the flower is not scented for the whole of the time it is open? In his

Gesamtbeschreibung K. Schumann states that E. multiplex has 'pinkish-red outer petals, inners reddish white, pinkish red at tip; jasmine scented'; whilst for E. oxygona 'outer petals brownish red, inners pink to carmine red externally, white with red centre stripe internally, flower almost scentless'. So that ostensively the literature tells us that E. oxygona and multiplex are pinkish flowered, E. eyriesii is white flowered, whereas E.oxygona is scentless whilst E.multiplex and E. eyriesii are scented. Is this really the situation? It is rather unfortunate that Ritter makes to reference to the question of scent with these three species; it might well upset his E. oxygona = E. multiplex.

. . . from Hosseus "Notas sobre Cactaceas Argentinas" 1939

The following two species, Echinopsis multiplex (Pfeiff)Zucc and Echinopsis oxygona (Link & Otto)Zucc without doubt have a close relationship between each other and both species are in cultivation, originating from Uruguay and the latter also from Entre Rios. In the year 1930 and especially in 1931 a number of those specimens bore flowers, but without forming fruit. In the literature particular significance is attached to the characteristic by which Echinopsis multiplex, unlike E. oxygona, displays prolific offsetting with little inclination to flower these being pink flowers with a jasmine scent. Echinopsis multiplex originates from the south of Brazil and the north of Uruguay; E. oxygona from an area more towards the south of Uruguay and from the Argentine province of Entre Rios. Often illustrations of these are to be found in the literature. My observations undoubtedly demonstrate that in cultivation in pots they offset prolifically in such a way that this difference can by no means be taken as a basic feature for separation, neither can the shape and the number of the spines; whereas the body of the latter species which usually has 14 ribs is a more light green colour and in the former it is a dark green.

An excellent photograph of E. eyriesii and E. oxygona, in which one stands besides the other, is to be found in the book of W. Kupper "Das Kakteenbuch", Berlin 1928. The work of Foerster (1846) which is quoted on few occasions, despite its importance, has rarely been taken into account. Some lines of this author refer to Echinopsis multiplex and the possibility of encouraging a better production of flowers. "Unfortunately this plant is only rarely to be seen in flower, irrespective whether its offsets are left on or not. Senke asserts that it is possible to ensure flowering every year, if a weak solution of nitric acid is added to the water. The first flowers were observed by Dr. Pfeiffer on E. multiplex in August of the year 1834 in the collection of Allardt in Berlin"

In regard to Echinopsis tubiflora (Pfeiff) Zucc. it is to be regretted that Britton & Rose did not reproduce any of the well known figures from older publications instead of that by Spegazzini, with the intention of mentioning a very dubious distribution (see Britton & Rose p.65 Fig 83); the precise distribution is not known up to the present time. It is true that over the dry hills of Tucuman, Catamarca and Salta there grows an Echinopsis with a white flower, but there is very little likelihood that it is the same Echinopsis tubiflora Zucc., especially from the note of Britton and Rose ('recorded from Brazil'). Rose, who had travelled in the abovementioned parts of the country, ought to know that it is only feasible to take one or the other into account. Attention is expressly drawn to this point as in the study we came across similar instances, with great frequency, which must generate confusion, in particular by those persons who did not know precisely the geography of South America and the edaphic possibilities for the distribution of the various species. I believe that the plants referred to by this name, from the three Argentinian provinces, are Echinopsis silvestri Speg. 1905, a species which is found in Salta but not in Tucuman. It grows on rocky terrain, together with Parodia microsperma and its varieties, at various places.

. . . from H. Middleditch

Since E. tubiflora was originally described in the early nineteenth century, it is most likely that it originated from Uruguay or southern Brazil. In Curtis' Botanical Magazine for 1839 there is a sketch of E. tubiflora in flower, from the Norwich nursery of Frederic Mackie (late Mr. Hitchin's collection). The habitat is erroneously quoted as Mexico – a common mistake at that time. In his Gesamtbeschreibung, Schumann gives southern Brazil or neighbouring Uruguay as origin for E.tubiflora. Spegazzini in his Cactacearum Platensium Tentamen 1905 refers this species to Schumann but gives 'arid hills in Tucuman, Catamarca and Salta' as habitat. This latter would appear to be in error. There is a great deal of most valuable material in Spegazzini's works and there are also a number of howlers. The real problem consists of separating the correct facts from the incorrect ones.

. . . from K. H. Prestle

Contrary to the general opinion, there are now only a few locations left in Rio Grande do Sul and Uruguay with small numbers of Echinopsis plants. This genus has become really quite uncommon there and almost exterminated. Thus I found one small specimen of E. multiplex near Francisco de Assis; there were no longer any more existing there. I have in my collection habitat specimens from four locations, but because I have always collected small specimens, it is only this year that they may perhaps flower for the first time, since in the meantime they have reached flowering size. All those that I have collected in Rio Grande do Sul up to now flower a pale lilac colour, but the flowers are variable from one location to another. In Uruguay I have collected only one pale lilac sort in the vicinity of Artigas; plants found further to the south (Carmelo, Dept. Colonia) belong to E. eyriesii and flower entirely white. Should I obtain any seeds this year then it will be possible to propagate these wild plants. It is most unfortunate that only rarely are there true wild plants of Echinopsis from this area because nobody makes the effort, but only assumes that "They are only Echinopsis!"

. . . from H. Middleditch

Well if the pink flowering Echinopsis occur round Artigas that is certainly in the area of the basalt intrusions, so that puts paid to the idea that the flower colour is related to the nature of the soil derived from the bedrock.

. . . from R. Mottram

My own experience of scent in Echinopsis flowers is of it being rather variable. Not only does it vary from species to species but my impression is that it can vary from one flower to another — according to my own nose, that is. Generally I find that Echinopsis are not self-fertile and also most of them do not seem to respond to self-pollination, so it is necessary to cross-pollinate in order to set fruit. On several occasions I have been keeping an eye on an Echinopsis fruit in order to photograph it when it is ripe and in this way I have found that the fruit starts to dry out before it splits. As an example, the fruit on E. eyriesii is rather elliptical in shape and about 25mm high and 20mm in diameter when it splits vertically. The fruit wall is then no longer turgid and I believe that the fruit wall shrinks as it dries until it splits. The fruit wall is quite thin and the seeds are held in place by a matrix of quite dry pulp. In the same way that there are no bristles or spines in the axiles of the

flower scales on any Echinopsis, there are no bristles or spines (only hairs) in the axils of the scales on the fruit, but the fruit of E. eyriesii can feel bristly on account of the spinescent tips to the scales. The fruit tends to stay on the plant for quite some time before it becomes detached; most of them do not fall off very readily after they split. I imagine that the seeds are most likely to be distributed by ants.

. . . from M. Muse

I have the distinct impression that there are sharp bristles or bristly spines on the fruit of E. eyriesii whilst the fruit on E. silvestrii B.36 ex Whitesthones displays the most pronounced bristly spine development so far observed.

There may well be variability in the flower scent. My impression of scent is that outside this group from S. Brazil and adjacent territory, only some of the obrepanda group seem to shell. I say smell because the odour of crushed parsley which excludes from E. roseolilacina is somewhat unpleasant.

. . . from H. Middleditch

But surely all Echinopsis flowers are scented in order to attract moth pollinators?

ECHINOCACTUS OXYGONA **By H. F. Link and F. Otto**

Translated from Verhandlungen Vereins zur Beforderung des Gartenbaues in der Koniglich Preussischen Staaten. Vol. 6 1830 by H. Middleditch.

E. glaucescens subglobosus 14 angularis, costis acutis repandis, spinis patulis inaequalibus, flore longissimo.

The stem is ten inches up to one foot high and in its upper part almost ten inches in diameter, of almost globular form, somewhat narrowed below. The colour is rather bluish, the 14 ribs or angles arise from a broad base up into an acute and somewhat scalloped margin; because of the broad base the furrows between are acutely notched; approximately 14 spines of varying size, the outer ones usually longer, those inside being smaller; these project nearly straight outwards, more or less diverging from each other; all brown, conical, not flat; surrounded by wool when young, which is more or less absent in older ones. Flowers arise from the groove roughly half way up the stem, nearly one foot long, inverted cone-shaped, the somewhat curved tube wholly coalescent with the ovary, furnished externally with scales, the lower ones small and red, becoming steadily larger above and finally passing into the flower petals, which are broad lanceolate and rose coloured. The stamens are present in great numbers and extend throughout the interior of the tube, shorter than the flower. The style is as long as the stamens, multilobed.

[Relationships with other then accepted genera discussed].

We received this plant from Sello out of Brazil without a specific note of the finding place. It flowered for the first time in July of last year in the Botanical Garden of Berlin and certainly 48 hours without closing. Earlier we had notified our correspondents about it under the name Echinocactus sulcatus. By chance we discovered that this species is easily multiplied. It so happened that the top of a plant had been damaged on the long journey but soon recovered and healed up. After a while new offsets grew out of the sides by means of which we propagate this tine species quite prolifically.

. . . from H. Middleditch

The A3 size illustration which accompanies this description shows the slightly inswept crown of the ribs between each pair of areoles, contrary to Ritter's observation above. On this sketch the aeroles are shown somewhat longer than broad, again contrary to Ritter's observation. A plant about a foot in height and not much less in diameter would appear to meet Ritter's criteria of being a fair age. The drawing of E. multiplex which appears in Abbildung und Beschreibung Cactaceae of Pfeiffer and Otto depicts a plant with ribs running straight from one aerole to the next. Whereas Ritter gives scalloped ribs to both E. oxygona and E. multiplex, the original descriptions do not.

There is a description in Latin which accords fairly well with that in German but also states that the outer spines are ten lines long (not quite one inch long). The brief Latin diagnosis which is reproduced above includes the word glaucescens; there is no body colour in the Latin description whilst the description in German gives a bluish body colour. This is roughly in accord with Hosseus who quotes a dark green for the body. But I still wonder what led the original author to describe the body as having a covering of rime.

If we add the information from this description to that deduced above, it appears from the literature that E. eyriesii has a pale green body with scalloped ribs and a scented white flower; E. oxygona has a bluish or darker green body with scalloped ribs and a scented pink flower; E. multiplex has a pale green body with straight ribs and a pink scentless flower. Does this match what imported specimens really look like?

The description of E. oxygona by Pfeiffer in Enum. Cacta. of 1837 is generally in accord with that by Link & Otto, but adds:- wool in young areoles pale yellowish, grey when older; flowers scentless; ovary and tube hairy; scales brownish on ovary, green on tube; stamens and anthers pale yellow. It does however state that the adult plant is 4 to 6 inches diameter and 5 to 6 inches high; it does seem quite probable that the plant described by Link and Otto was uncommonly large. It is quite understandable that the King of Prussia would expect to have the largest and best import in his own botanic garden so that Joe Bloggs would not go round boasting that he had a better specimen.

An account of the various itineraries followed by Sellow in the territory of Rio Grande do Sul may be found in Chileans No. 30.

. . . from M. Muse

My two plants of E. oxygona came from Schlosser via Whitestones and were collected from Gruta de Segredo; one plant is yellowish green but is darkening on the new growth and the other is darker green. The colour of the epidermis can change according to the amount of light and nutrient available and I have known changes of compost type to coincide with changes in body colour, not just in Echinopsis.

. . . from H. Middleditch

Which is precisely why I suspect that plants of different body colour have been growing above bedrock of differing type which yields soil of a different nature.

CEREUS OXYGONUS Link & Otto **By J. G. Zuccarini**

Translated from Plantarum novarum vel minis cognitarium. Horto botanico herbarisque regio monacensi. Vol. 3 Abh. Math-Phys Konig. Bayer. Akad. Wiss. 1837. By H. Middleditch.

With regard to the definition from Dr. Pfeiffer (above), we give here a detailed description of the flowers only for the purpose of the more precise establishment of the genus Echinopsis.

Flowers lateral, almost a foot long; tube cylindrical gradually enlarging in a funnel shape above, green at the base to pinkish green above. Scales on ovary minute, linear-subulate with a narrow point, on the corolla tube a greater distance apart nevertheless numerous, linear-lanceolate, with a narrow point, finally changing into sepals; bundles of hairs in the axils of the scales; hairs in the lowermost ones white and twisted, in the upper ones dark purple, straight and close together. Exterior sepals or uppermost scales four times shorter and narrower than inner ones, dingy pinkish-olive green on the outside, a beautiful pink on the inside, linear-lanceolate, smooth, entire; the rest of the sepals and petals in four series, 13 in each series, hence 52, oblong, running out into a short acute point, apex irregularly crenate, otherwise quite entire, a beautiful pink, more deeply coloured on the centre stripe, gradually becoming paler on the inside to the extent that finally the innermost are white. Stamens very many, in a double mode of insertion; about 80 attached at the throat of the corolla where they are formed into an annulus, unequal ones among them, thread-like, smooth, white; the remainder more than 150 inserted at the base of the tube, decidedly unequal, coming into contact at one side, ascending; anthers oblong-ovate, blunt, white. Ovary short, barely thicker than the tube. Style cylindrical, smooth, thick, white, rising above the stamens, below the height of the petals. Stigma 15 to 16 raylike white erect-connivent blunt cylindrical lobes, about four tenths of a inch long.

. . . from H. Middleditch

It is rather unexpected to find the stigma lobes described as erect and connivent as I was under the impression that in Echinopsis these were usually spread out in a radiating manner. If there are some slightly "unequal" stamens in the throat circle it surely hardly worthy of note; but if markedly unequal, is that not atypical? There is no mention of flower scent.

. . . from M. Muse

From memory I do recall having to separate the stigma lobes on a number of plants when pollinating them with a brush, but all the slides I have show the stigma lobes spread out in a stellate fashion as is common in all Echinopsis. Certainly at some point in the life of the flower, the lobes are clasped together and I suspect that it may be post-pollination. The number of stigma lobes is not a datum since this can vary from one flower to the next on the same plant in the same year.

I have examined yet again the early material I have — Pfeiffer's "Enumeratio" states "petal biseriala" which I see from Stearn's "Botanical Latin" should be rendered as "petals arranged in two rows". Taking this along with the four series from Zuccarini is at some variance with my own observations. The drawing from Pfeiffer & Otto's "Abb. Beschr." is not altogether reliable, for the style is not excerted — a constant feature of this group, the fruit is the wrong shape, the scales on the tube are too large, etc. Observations on this year's flowers may provide a more accurate appreciation of these features.

MAIHUENIOPSIS? WHAT'S THAT?

. . . From F. Vandenbroeck

If you have any information on the splitting up of the old genus Tephrocactus into Maihueniopsis, Cumulopuntia, Tephrocactus (sensu Ritter), and Austrocylindropuntia, in the form of text or drawings, it would be very welcome. To me these new genera are very blurred and vague. I remember that during your Weekend meeting at Nottingham you touched upon this problem.

. . . from C. Hall

Regarding the relationship between Maihuenia and Maihueniopsis, I consider their separation as un-necessary and a prime example of the difficulties that lie in trying to classify plants on anything but the broadest of lines. I would prefer to retain many of Backeberg's genera within the Opuntiae such as Opuntia, Tephrocactus, Maihuenia, Pterocactus, Austrocylindropuntia, Consolea, Peireskiopsis, Quiabentia, etc - firstly because I can readily see the characteristics that broadly govern their members, secondly they make geographical sense, and thirdly I lack the plant material and therefore the knowledge and experience to put forward a better system. When someone like Ritter comes along and proposes a totally different system of classification based upon his many years in the field, I begin to wonder why. He brings together into Maihueniopsis a number of species out of the articulatus complex, the glomeratus complex, and the ovata group. Which leads me to wonder whether Ritter went out of his way to think up a system of classification that would conflict as much as possible with Backeberg's already controversial system.

A quick glance through the names and the photographs that go with them in Ritter's four books, in Die Cactaceae, and in the book by Leighton-Boyce clearly shows that either the plants are very variable in habitat – in which case they should say so – or they are not talking about the same ones. By and large where the first two illustrate a plant of the same name the photos are different; almost without exception the only grouping all seem to be agreed on are the members of the articulatus (sensu Backeberg) group. The few habitat plants that I do possess are either sulking or growing untypically in comparison with the old growth. The more I see photographs and read about these plants in their habitat, the more I realise that drawing anything but vague conclusions from cultivated plants can and probably has led to what must be the best example of chaos within the cactaceae.

. . . from H. Middleditch

I have to admit that I have always found it difficult to tell most Tephrocactus apart. The articulatus and the floccosus groups I can recognise without any problem and I am tolerably sure I can identify plants of the sphaericus/kuenrichianus group. But when it comes to the closely-clumping hummocky sorts it really was a problem. It is rather less of a problem now it has been pointed out to me that the glomeratus group have subconical joints without prominent

tubercles and with glochids on roughly the lower half of the joint and spines on roughly the upper half of the joint. There was an opportunity to look at an excellent selection of Tephrocacti that were brought to our 1986 Weekend; most of the cushion type of plants could be separated into those with prominent tubercles and others without tubercles. With few exceptions, where the segments possessed fairly obvious tubercles then all (or nearly all) the areoles bore spines. On plants where the segments lacked tubercles there were spines at areoles on the top half of the segment and glochids at areoles on the lower half. Are these latter all Maihueniopsis then and do the Cumulopuntia all have segments with fairly obvious tubercles and spines at almost every areole?

ARGENTINIAN REPRESENTATIVES OF THE GENUS MAIHUENIOPSIS **By J. Lambert**
Translated by H. Middleditch from Succulenta 65.6/7.1986

The generic name Maihueniopsis was established as early as 1925 by Spegazzini, but the spp. which must be counted within this genus were until quite recently included under Tephrocactus by many authors, and naturally in the same manner by cactophiles in general.

The difference between the two genera is nevertheless very easily defined. First and foremost by the habit, which with Tephrocactus has the appearance of small "bushes", whilst with Maihueniopsis rather compact small cushions are met with. The latter evidently is not always the case with all spp. of Maihueniopsis. The absolute distinction resides in the fruit and seed. In Tephrocactus the ripe fruit are quite dry and split open; with Maihueniopsis the fruit remains juicy and fleshy and does not burst open. The seed of Tephrocactus bears a porous arillus skin, provided with strongly developed lateral wings, whilst with Maihueniopsis the arillus is compact, not porous and without wings.

[The definition of Maihueniopsis sensu Ritter is repeated from Kakteen in Sudamerika]

The distribution area of the genus is Andean-Patagonia, that is to say that it extends from the high mountains of Peru, Bolivia, Chile, and Argentina as far as the more southerly plains of Patagonia. The plants are adapted to a cold climate, with night-time temperatures below freezing point during the larger part of the year and with very intensive insolation by day. They are the cacti which are to be found at the greatest elevations.

In Argentina there are to be numbered seven spp:

Maihueniopsis darwinii. (Hensl) Ritter var. darwinii forms not very dense cushions with a diameter of 10cm whilst the var. hickenii reaches 1m in diameter. The var. darwinii comes from along the coast of Patagonia, from the southernmost part of Buenos Aires province to Santa Cruz. This is the form which remains small. (Segments of less than 3cm in length, plants of barely 10cm in diameter). Found at the time by Charles Darwin in the vicinity of Puerto Deseado, 47° S latitude. The variety hickenii (Britton & Rose) Kiesling, differs from the foregoing by their much stronger development. (Segments of more than 3cm; plants of up to 1m diameter and more). The distribution area embraces the whole of Patagonia i.e. southern parts of the provinces of Mendoza and La Pampa, and the Provinces Neuquen, Rio Negro, Chubut and Santa Cruz.

Maihueniopsis glomerata. (Haw) Kiesling forms cushions of up to about 1m high and about the same diameter. Egg-shaped segments with pointed apex of 0.8 to 1.3cm diameter and 2 to 4(5)cm tall. This species occupies a widespread area extending from south Bolivia into Chile along the Cordillera to the north of Santiago as well as in the Argentine provinces of Jujuy, Salta, Catamarca, La Rioja, San Juan and Mendoza. This plant was in earlier travellogues often described under the name Opuntia andicola.

More recent authors indeed still make a distinction between Tephrocactus andicolus and Tephrocactus glomeratus, based upon the number of main spines on each areole. Nevertheless it can be stated with certainty that the spination increases from north to south. Examples from Jujuy or Salta display only one main spine and no secondary spines, whilst the more southerly occurring plants carry 1 to 3 main spines and (0)2 to 5 additional spines. In the native tongue the plant is called 'leoncito' which gave rise to the synonymous name of Tephrocactus leoncito. Yet further synonyms are: Opuntia grata, O. hypogaea, O. tarapaca and Maihueniopsis molfinoi.

Maihueniopsis minuta. (Bkbg)Kiesling. A dwarf species as the name indicates, with cushions only 1 to 3cm high and 10cm in diameter. The short branches consist of 1 to4 round to egg-shaped segments. From the provinces of Jujuy and Salta at 2500 to 3000m altitude.

Maihueniopsis ovata. (Pfeiff) Ritter. Dense cushions of some ten cm high and 20cm diameter. Distribution extends over the south of province San Juan and into province Mendoza, along the pre-cordillera and in the vallies that run parallel to the Cordillera.

Maihueniopsis boliviana. (S.D.) Kiesling. Large thick cushions of about one metre high and somewhat more in diameter. Segments 3-4cm diameter and 4-7cm long. Distribution extends over the high mountains and the high plateaux of Bolivia and Argentina, in the latter from Jujuy in the north to as far as Mendoza. It is the highest growing cactus, being encountered between 3000and 4500m. Related to M. pentlandii.

Maihueniopsis nigrispina. (K.Schum) Kiesling. Low plants forming loose cushions. Roots only slightly thickened. Joints 1.2 to 1.8cm diameter and 3-4 cm long. Distribution stretches from the Argentine puna in Jujuy and Salta provinces into southern Bolivia at altitudes between 2700 and 3500m.

Maihueniopsis pentlandii. (S.D.) Kiesling. Forms more or less compact, half-round cushions of 10-30cm diameter and 5-15cm high. Segments 3-4(-7)cm long and around 2cm in diameter. Areoles with glochids inserted in an annulus.

. . . from H. Middleditch.

On reading the headings and subheadings of this article, together with that amount of text that I can understand without resorting to my dictionary, there did appear to be some positive data beyond repetition of the specific names under a new genus. But how does this fit – or not fit, as the case may be – with previous material? Further reference to the literature seemed to be advisable. In addition, I do have a Tephrocactus in my collection which, after much deliberation, I have for long felt inclined to identify as T. andicolus; perhaps I could find out something more about it?. Two points seemed to

offer somewhere to start tackling the subject – the first Maihueniopsis was apparently published by Spegazzini, and one of the plants now included in Maihueniopsis was Opuntia glomerata Haworth. Very fortunately I have a copy of Kiesling's compilation of Spegazzini's cactus writings, so that could be one thing to look at. Getting hold of Haworth's original description might be quite a different matter. In addition, there seems to be some confusion around Opuntia glomerata Haworth already, because it is treated in different ways by Britton & Rose and by Backeberg.

A comparison between the Argentinian species listed under Maihueniopsis by Lambert (following Kiesling) and by Ritter is very puzzling. Under the genus Maihueniopsis Ritter includes the species:- hypogaea (glomerata), leptoclada Ritt., ovata, albomarginata Ritt., darwinii, neuquensis, mandragora, and molinensis. There is no immediate explanation why Ritter's list of Maihueniopsis species should be so different to Kiesling's. Kiesling appears to have taken note of clump size and distribution altitude, but for practical purposes there is no reference to these points by Ritter.

MAIHUENIOPSIS Speg. Gen. Nov. **By Dr Carlos Spegazzini**
Translated from Anales de la Sociedad Cientifica Argentina Vol. XCIX 1925 by H. Middleditch

From the Latin – Habit cushion shaped dense caespitose Maihuenia-like bunch, areoles few buried all bearing hairs, nevertheless bearing glochids below, above bearing spines or lacking spines when bearing flowers; flowers solitary borne at apices, stalkless obconical rotate.

From the Spanish. This genus is intermediate between the genera Maihuenia, of which it has all the looks because of its segments united together and not detachable, and certain Opuntias of the section Tephrocactus with which it shares the possession of some areoles armed with brush-like bunches of glochids as in Opuntia glomerata and Opuntia molinensis.

Maihueniopsis molfinoi Speg. spec. nov.
Latin diagnosis provided.

Habitat. In the stony places of the Puna, around Santa Catalina at 3650m altitude, province of Jujuy, collected by F. flClaren 16.1.1901. F.Kurtz Herbarium argentinium No.11463

It is with great pleasure that I dedicate this interesting species to the young and industrious argentine botanist and friend, Jose F Molfino, who had the kindness to provide the specimen which has served me for this study. The segments, or more accurately speaking branches, are all continuous, without trace of joints and so not detachable or easily separated one from the other, just as in Maihuenia patagonica Phil.; thus they form quite an ill-defined outline, but it may be considered in the majority of cases as conoidal or oval, with tip more or less rounded (10-15mm long and diameter) with smooth surface, more or less wrinkled and of a bright green colour; each segment presents from 5 to 6 areoles over the exposed outward and convex section, fairly well separated from one another and formed of dimples, almost cylindrical (2-3mm deep) packed with a bundle of very slim tiny white hairs, 8-10 cells, only single; in the lowermost areoles in addition to this bundle of tiny hairs there projects a brush-like bunch of reddish glochids, which are absent in all the upper areoles; glochids are slender but hard, straight, cylindrical (3 to 3.5mm long by mm in diameter) bedecked with backward pointing barbs, with sharp point and with foot abruptly flattened and bi-toothed; each one of the two immediately uppermost areoles carry, in place of the glochids, one robust spine, straight or slightly bent outwards (15 to 25mm long by 1mm wide at the base mm wide at the tip) in the lower half flattened on the ventral side, convex on the dorsal side, the rest of it cylindrical, horny, sharp, of dull ashen brown colour with reddish tint, darker in the upper third.

The flowers are borne solitary in the apical areole, bigger than all the rest, imbutiform, accompanied by abundant white down, but without glochids, stalkless and average size (25 to 30mm total length), found accompanied on each side by a spiny areole; the ovary is continuous with the perianth tube (15mm long by 12mm diameter) partially embedded in the areole, conical-toplike, the exterior matt green, without areoles or scales, fairly turgid, terminating abruptly in the crown of about twelve petals distributed more or less in four rows; those of the two outermost rows or calical petals are green and fat, the most external ones small, oval and pointed (3 to 4mm long by 3mm broad), the following ones ellipsoidal (6mm long by 4mm broad) obtuse or slightly mucronate, somewhat paler; the internal leaves or petals in two alternating rows are tapered-ovate (12 to 16mm long by 10mm broad), of sulphur yellow colour, thin with silken sheen, the upper part rounded, obtuse, sometimes denticulate or slightly notched, in the lower part slightly narrowed; the numerous stamens are inserted over all the upper internal half of the perianth tube with yellow filaments (5 to 6mm long) and whitish linear anthers (1mm long); the lower internal half of the perianth tube is bare and smooth; the style is almost cylindrical and roughly tetragonal (8mm long by 2mm diameter) is a green, surmounted by an almost spherical head (2.5mm diameter) with 4 to 6 papilla or tiny lobes closely clasped together, of a pale violet colour. The ovary cavity is small hemispherical, protected by a stout wall. Fruit not known.

. . . from H. Middleditch

Well now, that is a bit peculiar because in this original description we are told the basis for establishing the genus is the coalescent mode of segment growth and no information is given about the fruit, whereas Lambert says that the genus is differentiated by the nature of the fruit and he says nothing about any coalescent mode of growth. However, this does seem to define Maihueniopsis as one of the hairless cushion or hummock shaped Tephrocacti that I associate with the high Andes. Indeed, Spegazzini say specifically that it comes from stony places on the Puna, which is just the sort of Puna environment where cacti are to be found according to the description by Fries (Chileans No.43).

Some of my Tephrocactus get wrinkled if I leave them dry for long enough and I suspect that the wrinkled surface on the specimen examined by Spegazzini would come about whilst it was in transit from site. To have only five to six areoles on one segment seems fewer than I would expect. Both the description and illustration by Spegazzini define the sunken areoles, which are placed at the base of a tiny cylindrical pocket, something I do not recollect having seen on any

Tephrocactus before; are they really like this? Also there is no reference here to irritable stamens, which I thought were universal in Tephrocactus – perhaps they are not? And now Lambert provides us with a third treatment for Opuntia glomerata Haworth which differs both from that by Britton & Rose and that by Backeberg – for what reason, I wonder? Because of the pulp-filled fruit? And where is that recorded? Does this mean that we have Tephrocacti growing in hairless hummocks in the high Andes, some of which have pulp filled fruit and are now called Maihueniopsis, and others which have dry fruit? . . . from C. Hall

On my own cultivated plants that fall within the group of Maihueniopsis sensu Ritter, the form and size of the joint connection varies. Species molinensis connects so thinly that joints will fall off if the plant is jolted. On the other hand certain clones within the glomerata group form very tight clusters and here the joint union grows to almost the same diameter as the joint. As to sunken areoles, I consider the term by its very nature misleading since areoles are by definition sunken. However if "sunken areoles" is accepted as a rough non-specific term, the plants within Ritter's grouping of Maihueniopsis do not conform to Spegazzini's diagnosis.

MAIHUENIOPSIS **By F. Ritter**
Translated from Kakteen in Sudamerika by H. Middleditch

Amended diagnosis – Ritter.

Plants in hummocks, with multiple offsets, somewhat sunken at centre, germinating sideways as well as apically; segments separate from adjacent parts, occasionally united together by growth, 1.5 to 9 cm long, 1 to 3cm thick, at first elongated barrel shaped, later becoming almost conical to semiconical, circular in section to barely tuberculate to somewhat pitted; areoles small, parts between nodes decreasing from lowermost part to the top, lowermost later carrying glochids; leaves small, subulate, deciduous; spines at first several, slender, small, later up to several times more robust, cylindrical to applanate, and in addition far less slender, downward adpressed, lacking spines at the bottom of the areole; flowers similar to most opuntiae sensu lato; insertions of funicles absent from base of arched ovary chamber; ovary not ribbed, carrying areoles all the way to the base, provided with triangular scales; stamens in highest and lowest parts slightly dissimilar; petals yellow; fruit obconical to ovate, with glochids and fairly often provided with very slender spines; filled with a somewhat acidic juicy pulp of a viscous phlegmatic consistency; seeds applanate, often some grains without arils among seeds provided with an aril; lateral parts of aril slender and somewhat soft, sometimes lacking, circumferential aril narrow to broad; seeds without hairy covering to woolly; habitat western Argentina, southwestern Bolivia, and central Chile in cold and temperate regions. Type species Maihueniopsis molfinoi Spegazzini 1925.

The genus Maihueniopsis was established in 1925 by Spegazzini for a single species of clumping Opuntia with divergent growth form (M. molfinoi Speg. 1925). The stems of this species are only jointed (separated into segments) in their upper halves; towards the bottom they coalesce together in growth. This species was found on the Puna of Santa Catalina, the northern most point of the province Jujuy close to the border with Bolivia, at around 22° latitude, at an altitude stated to be 3650m. The description set out by Spegazzini is reproduced in Backeberg's Kakteenlexikon p.605. If the coalescing growth habit of the stem is put to one side, the illustration and description provided is typical of a group of species of hummock opuntias which are to be found in the cooler or in cold regions from 49° S latitude in Argentina (sp. darwinii) to about 20° S latitude in Bolivia (species hypogaea); the larger number of spp already known are found to the west of the Andean watershed in Chile. The Maihueniopsis molfinoi is according to the description and illustration provided, obviously closely related to cacti published as Opuntia hypogaea which likewise is domiciled in the highlands of Jujuy; the essential difference is the coalescent form of stem growth in molfinoi. Such growth forms occur with many segments with other species of the designated group of spp only as an exception. This coalescing growth form can possibly be due to a single mutation, and establishment of an individual genus only on that account is not justifiable. Maihueniopsis molinensis frequently shows a slightly coalescent growth of the segments, too, according to the photograph of "Tephrocactus molinensis Backbg" in his handbook Vol I p.282. The whole known related group of spp appears however so very divergent from other Opuntia, that one must view them as an individual genus. Their connection evidently lies with Maihuenia, with which they have many similarities. Up to the present no spp have been found which fall between Maihueniopsis and any other genus of the Opuntioideae. It is obviously a matter of a fully independent evolutionary line, which arose directly out of the primitive origins of the Opuntioideae. In conformity with this, no hybrid between Maihueniopsis and any other known genus has been found at any time. Up to now, the spp. belonging here were under Tephrocactus sensu Backeberg and under Opuntia Britton & Rose. Since no-one had previously recognised the special taxonomic position, treatments up to now were based specifically on a lack of field experience and upon an over-emphasis upon the flowers. In my explanation of the Opuntioideae (in Brazil) I refer to this over-emphasis upon the flowers.

Maihueniopsis is a genus of the Opuntioideae which forms hummocks of smaller to larger offsets. Segments generally stout, from time to time loosely clustered, commonly grey-green; branching from the base, sideways or upwards; occasionally the segments are a coalescent growth in their lower half (sp. molfinoi). The body is pretty soft, somewhat jelly-like, similar to Maihuenia. Young segments grow at first elongated barrel shaped, later they become more or less conical because only in their lower portion does their growth thicken. Growing segments are according to species 1.5 to 9cm long and between 1 and 3cm thick. The segments are notably slightly tuberculate at first, later lacking tubercles and smooth (also agreeing with Maihuenia in this respect), or in place of the tubercle is found a tiny depression in the stem, in the middle of which the areole is located.

Areoles usually round or even elongated, pretty small, increasing in size from bottom to top of the segment; they extend to the lowermost end of the stem, in distinction from both Tephrocactus and Cumulopuntia; areoles often depressed with small, deciduous, pointed leaves; the lower areoles subsequently develop a growth of larger bunches of glochids.

Spines. On growing stems only some small fine ones developing, subsequently on outgrowing stems the typical spination, one or more stronger central spines, round to applanate, usually in addition to that one or more very fine, short, straight outward pointing spinelets under the central spine; the lower areoles are often spineless up to as far as the middle of the stem or even higher.

Flower on the whole exhibits the typical features of the Opuntia blooms, proof that the Opuntia flowers are of ancient lineage, which scarcely admits of any further differentiation among the Types within the genera (it is somewhat different when e.g. Nopalea or Tacinga undergo a flower modification as a result of a change in the mode of pollination). So the flower section which I cut of the Cumulopuntia pampana in comparison with that of Maihueniopsis hypogaea only exhibits slight further development e.g the insertion of the filaments in Cumulopuntia extends up to form the base of the receptacle; the pericarpel is fluted externally, the areoles sit on a small hump, the scales are sharp, not triangular, the stamens are clearly distinguishable between upper and lower. Petals yellow, just like in the well-known flowers. Fruit inverted cone shaped to egg-shaped, slightly tubercled, green to yellow, with white felted areoles, usually with glochids, frequently with fine spines; ovary with thick wall and filled up with a sour, jelly-like pulp, not dry, in distinction to Cumulopuntia and Tephrocactus, nor with glochids within.

The seeds are the most primitive among the Opuntioideae. The ends of the seed string (funiculus) encircles the ovule annularly before it runs into the seed at the basal side; when the seed is ripe, this lower coiled part hardens off and forms the hard seed mantle (arillus) which covers the whole of the exterior testa of the seed. With Maihueniopsis this formation is still not entirely completed, frequently seed grains are found amongst the hard seeds which bear only the original testa, or the seed mantle is pretty fragmentary on the flat sides of the fairly flattened seeds, for the mantle on these flanks is generally thin and sometimes pretty soft in comparison with the other genera of Opuntia. The hardened off annular coil of funiculus is still recognisable as a hoop that runs around the periphery of the flattened seeds. The most primitive version apparently seems to be the seeds of M. atacamensis and M. crassispina; in these two the hardened arillus coil – denoted by me as the arillus hoop or circular aril – is still very narrow (the thickness of the original funiculus) and forms no outwardly protruding expansion of the seed crust (arillus). The most derived species is M. archiconoidea in which the hardened funiculus (arillus hoop) is thick and is prominently swollen. On account of their flattened seed form the Maihueniopsis are clearly distinguishable from all species specifically of the genera Tephrocactus, Cumulopuntia, Austrocylindropuntia and Tacinga which have more or less spherical seeds. The seeds can carry hairy wool at their periphery, or be quite smooth.

At least 22 species are known up to the present; only one of them extends from Argentina into south Bolivia (hypogaea) and only one, for sure, from Argentina into Chile (ovata). In Chile more spp are known than in Argentina. The correlation of the species of this group were still not understood by Backeberg and he disposed them into different sections of his genus Tephrocactus, together with spp. with which they had no relationship. According to him only molfinoi belonged to the genus Maihueniopsis. He placed the other spp in the second section of his genus Tephrocactus and indeed in two different sections thereof. In each subsection he put them together with spp. belonging to Tephrocactus sensu Ritt and to Cumulopuntia, with which they have no relationship. Type species Maihueniopsis molfinoi Speg.

Maihueniopsis hypogaea (Werd) Ritt— comb. nov.

Synonym: Tephrocactus glomeratus sensu Backeberg 1933
non sensu Spegazzini 1926
non Opuntia glomerata Haworth 1830

Backeberg lists this species under the name Tephrocactus glomeratus (Haw) Bckbg 1953 with the basionym Opuntia glomerata Haworth 1830. As much as the description of Haworth appears to suit for that purpose, another species must have been put before this author, however. First of all then it should be pointed out that the cacti of the high areas of Salta and Jujuy and of southernmost Bolivia were not completely known at that time. Even the typically characteristic plant of those high Andes, Trichocereus pasacana, was first described in 1886, others from there such as Lobivia, Rebutia and Parodia were first known in this century. On the other hand however at that very time of 1830 northern Chile had already begun to be opened up for cacti. Secondly the description of Haworth is just as well or still better suited to the Opuntia camachoi espinosa from northern Chile. This species has similarly flattened spines and has just as often one central spine per areole. The spine length of 5cm stated by Haworth accords very well to the species camachoi, but poorly to hypogaea with its rather shorter spination, especially if one bears in mind that Haworth describes an english cultivated specimen, which would have had a more reduced spination than is to be met with in the wild. Flowers, fruit and seed were unknown to Haworth, but these very characteristics are essential for a positive designation of Maihueniopsis and Tephrocactus spp. Since the description of Opuntia glomerata Haworth is too inadequate to associate it with certainty to a definite species, and since the finding place is unknown, this name must be struck out as a nomen dubium delendum. Haworth gives Brazil as habitat which is impossible.

. . . from H. Middleditch

It is quite likely that Molfino would be tolerably familiar with the Tephrocactus from lower altitudes and their tendency to fall apart into individual segments at the slightest encouragement. Any botanist would surely be excused trying to avoid the unwelcome task of bringing back a string or spray of those sort of segments for a herbarium specimen. If Molfino came across a plant with a few segments having a coalescent growth, it is hardly surprising that he would select these for collection as he could reasonably expect them to travel much better. Now Ritter tells us that this particular form of growth is to be found, but only from time to time, in those species of plants which he includes within his genus Maihueniopsis. Ritter also says that from time to time the clumps are not tightly compact but are more loosely clustered – what he does not tell us is whether this occurs at ε location with some slight shelter from the harshness of the Puna climate.

When the hairless Tephrocactus growing in the high Andes appear in a photograph they always seem to be of

a cushion or hummock like form. It appears that Ritter has divided these hummock-forming Tephrocacti between Cumulopuntia and Maihueniopsis. Ritter states quite clearly that the difference between these two groups is in the nature of the fruit, dry in Cumulopuntia and filled with stiffish pulp in Maihueniopsis. Unfortunately few cactophiles seem to be blessed with flowering Tephrocacti and still fewer with fruiting Tephrocacti, so this seems to be one feature where we cannot very well do any checking for ourselves. However Ritter also tells us that in the genus Arequipa there are plants with dry hollow fruits and others with flesh-filled fruits; he also accepts within the one genus Oreocereus those plants growing on the Puna having dry hollow fruits and others growing in deep canyons which have flesh-filled fruits. He does not explain to us why he accepts two instances of both dry and pulp filled fruits within a single genera, but does not accept it in a third case.

From Ritter's descriptions of Maihueniopsis and of the hummock-forming Cumulopuntia, it seems that the segments are more generally of a smooth conical shape with depressed areoles in Maihueniopsis, whilst in Cumulopuntia the segments have more or less elongated tubercles with the areole at the top of the tubercle. Now I recollect a comment made by C. Hall that the glomerata group could be distinguished from other species of Tephrocacti by virtue of their conical segments. But when I have a look through Ritter's Kakteen in Sudamerika I do not seem to be able to find either Tephrocactus glomeratus, Cumulopuntia glomeratus, or Maihueniopsis glomeratus; now I see why – Ritter disposes of it as a nomen confusum. It is most interesting to see that Ritter does accept Opuntia ovata Pfeiffer 1837, Opuntia darwinii Henslow 1837, Opuntia ovallei Gay 1847, opuntia grata Philippi 1859, and Opuntia atacamensis Philippi 1860, each one now being under Maihueniopsis with the same epithet but with Ritter as author, yet he finds Opuntia glomerata Haworth 1830 a confused name. So it may be advisable to take a look at what Haworth did have to say about this plant

. . . from R. K. Hughes.

I am certainly interested in Ritter's treatment of Tephrocacti. His groupings may be good with Austrocylindropuntia for the floccosa group, Cumulopuntia for the pentlandii group, Tephrocactus for the diademata group, Globularies for the sphaericas and Maihueniopsis for the glomerata types. I have come across plants of the sphaerica, floccosa and pentlandii types during my trips to Peru. They all produce similar fruits with no room for pulp or liquid in the central ball of tightly packed seed. You will remember that I showed a slide at the Chileans' Weekend of one of these fruits that I had cut in half at the spot where I took it off the plant. The fruit sections of Tephrocactus in Rauh's Peru book are typical of what I found. The hollow floral scar is the usual recognition feature separating a fruit from a joint.

. . . from C. Hall

Does Ritter know something that I don't on the nature of plants such as Tephrocactus molinensis and T. mandragora? He splits up the genus Tephrocactus sensu Lemaire emend Backeberg and then unites these two very different species in another genus named Maihueniopsis. The first is plainly characterised by protruding, almost tuberculate areoles with prominent glochids, with (in my experience) a root not unlike a fibrous begonia; the glomeratus group have joints ending in a marked point, sunken areoles, young joints produce central spines and then glochids as the joint matures and most importantly the plants have distinct and well formed taproots.

The plants that I have in Maihueniopsis sensu Ritter are:- glomerata, russelii, darwinii, neuquensis, mandragora, molinensis, and ovata. Whether they exhibit close compact clumping is a matter for conjecture since the degree with which each species displays phenotypic plasticity is enormous – judged on the basis of habitat photographs and comparing these to cultivated plants. That they clump is not difficult to confirm, although whether the same plants would clump in habitat is another matter.

. . . further from H. Middleditch

It is interesting to see that the original description of Opuntia atacamensis by Philippi in Flora Atacamensis 1860 gives the joints as egg-shaped and the lower areoles only having wool and short bristle-like spines i.e. glochids. A later description of Opuntia tarapacana by Philippi also notes egg-shaped joints and spines at the upper end – by inference at the upper end only. Both these species are placed in Maihueniopsis by Ritter.

In addition to the foregoing, Ritter includes in the genus Maihueniopsis from Chile:- M. atacamensis, camachoi, conoidea, rahmeri, colorea, leoncito, ovallei, archiconoidea, grandiflora, wagenknechtii, domeykoensis, crassispina, and tarapacana. Of the last named species, Ritter says that "the finding place was given as Calalaste in Province Tarapaca; this place is not recorded on geographical maps". At the time it was described by Philippi in 1891 the high Andes between northern Chile and northwest Argentine were literally no-man's land, due largely to it having no value to either nation. On the journey on which he found this particular plant, Philippi started out from Copiapo, climbing into the high Andes and entering what is now (but was not then) Argentine territory; on page 140 of "Journey to province Tarapaca" by F. Philippi 1885 the party are at Calalaste. Unlike Ritter, I believe I know where Opuntia tarapacana was found.

OPUNTIA GLOMERATA **By A.H. Haworth**

From The Philosophical Magazine Vol.7 No.XXXVIII 1830

Opuntia (long flat spined) ramis caespitosa confertis, spinis centralibus solitariis, linearibus, acuminatis utraque planis longissimus. Habitat in Brazilia, et in nobili horto Hort. Soc. Londini nunc sine floribus viget.

Obs. Planta tota fere glomeratim hemispherica est. Ramuli sublanceolata-teretes, carne farctim crassi, subvirides, vix semunciam lati. Areolae ordinariae setis brevissimus densissimus uniformibus, unaque spina plus minus centrali cornea, corneoque colore biunciali, vix flaccida, neque rigida, sed in arcum flexibili.

Whole plant almost clustered closely together into a hemispherical clump. Branchlets tapering cylindrical (terete), broadest almost in the middle (lanceolate), thick wrinkled skin, almost green, barely half an inch thick. Areoles typically with very short identical bristles, very closely packed together, a single horny spine more or less central, horn colour and two inches long, barely able to hold up its own weight, also not rigid, but flexible in a bow.

. . . from H. Middleditch

Was this another Tephrocactus that had been travelling as luggage for quite some time and become wrinkled

in the process? The hemispherical clump form of the plant would almost certainly put it out of the running for being Opuntia articulata, which takes up a rather untidy looking cluster (or bush, as Lambert puts it) even though the description of the spines might be considered more appropriate for O. articulata than for O. glomerata. For the plant to be in Haworth's hands in 1830, it seems to be most probable that either Gillies or Miers would have collected it from the surroundings of Mendoza. It is unlikely that either Meyen or D'Orbigny could have sent a cushion type Tephrocactus back from Bolivia in time for it to be described in 1830 and it was after 1830 when Bridges and Cumming visited Bolivia. In addition it is far from clear who was "opening up northern Chile for cacti in 1830" as Ritter briefly states. Backeberg also locates Tephrocactus glomeratus (Haworth) Backeberg in the area of the Argentine-Bolivia border; as Ritter correctly observes, no cacti were brought to Europe from this area until a great many years later. As far as it can be judged, Mendoza is the only practical source of Opuntia glomerata Haworth.

Subsequently O. glomerata has had a chequered career. Britton & Rose put into one species the bushy Opuntia articulata found growing at low-altitude and the cushion-forming O, glomerata found at higher altitudes. Then Backeberg pointed this out and separated them again, but provided O. glomerata(Haw) with an impossible habitat for its discovery time. Ritter is evidently unhappy about the suitability of the spine description for Opuntia glomerata. and decides to dispense with this name. To judge by the designation of Maihueniopsis glomerata (Haw) Kiesling it looks as if a spot of spade work has now been done on the subject, especially when Lambert has a photograph of a plant taken in province Mendoza. Does it still grow there "clustered closely together in a hemispherical hump"?

It is interesting to see that in 1830 Haworth has already separated a section of Opuntia with sublanceolate-terete segments i.e. with cylindrical segments as opposed to flat segments. This section was subsequently converted into Tephrocactus by Lemaire in 1868. The distinction between the two basic forms of segment remains as clear today as it was then, so that any question of whether to treat Tephrocactus as a genus or as a section of Opuntia is only a matter of academic taxonomy.

. . . from C. Hall

Plants of the glomerata group are easy to distinguish. They have joints ending in a marked point, sunken areoles, young joints produce central spines and then glochids as the joint matures and most importantly the plants have distinct and well formed taproots. Secondary and tertiary spinal development is progressive and in plants of, say, glomeratus longispinus, the spines may continue to grow for at least 3 or four years.

. . . from J. Lambert

Maihueniopsis do indeed grow in quite compact clusters, a shape which, combined with the spination on top of the joints only, provides them with a very effecient protection against the cold in winter. The snow remains on the outside and thus forms a kind of protective blanket. Most Maihueniopsis are restricted to higher altitudes, where the conditions in winter may be quite severe. I collected Maihueniopsis glomerata at the Pampa Yalguarez, which is 2150m above sea level. However the plants grow at lesser altitudes in the south, where the climate becomes colder. They are never sympatric with Tephrocactus articulatus, which is always encountered in lower and hotter surroundings.

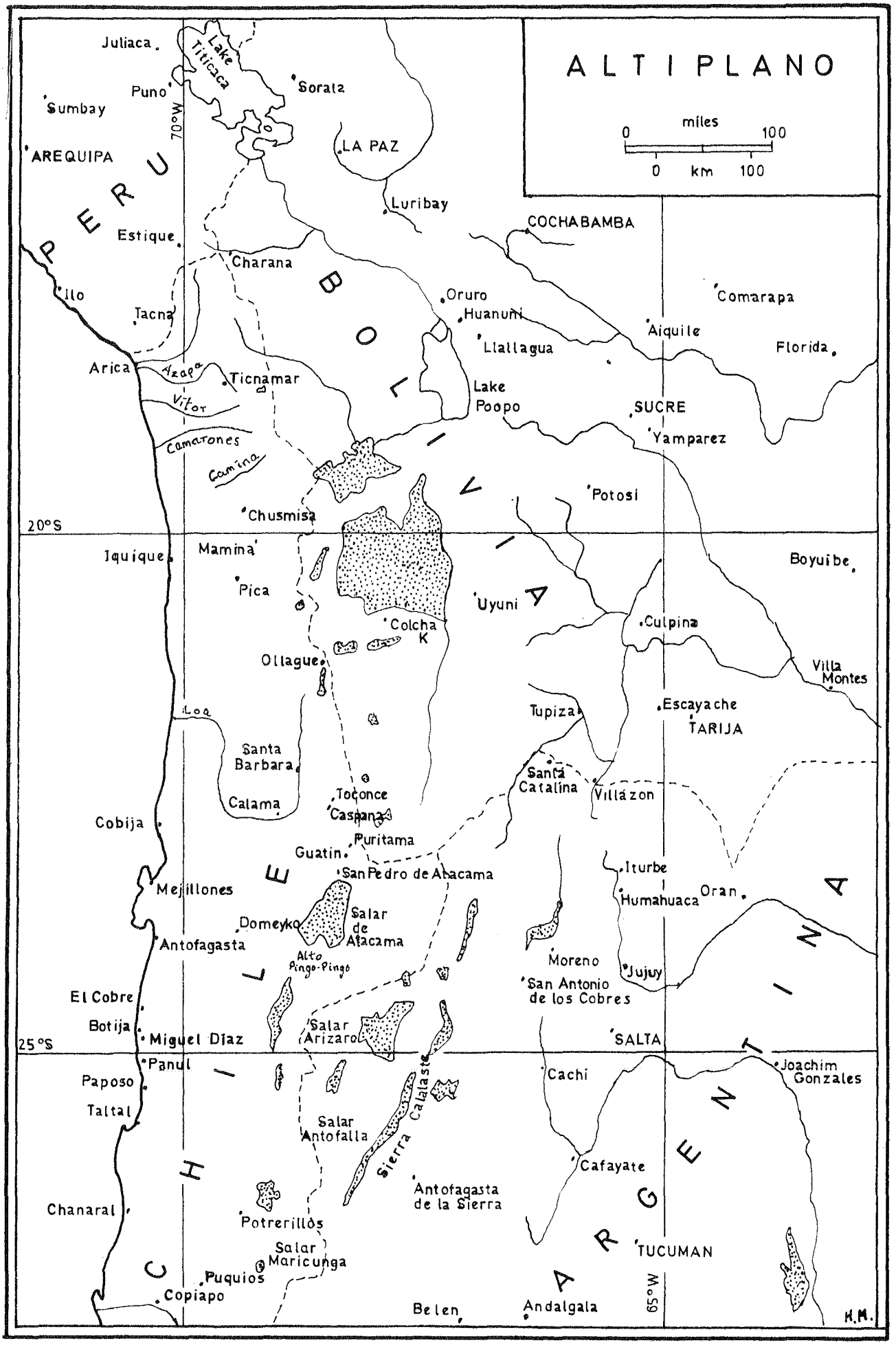
. . . from H. Middleditch

Immediately behind Mendoza lies a high ridge of mountains, the Sierra Paramillos. Most travellers going to Chile from Mendoza would cross the Cordillera by the Uspallata pass which lies almost due west of Mendoza, so that they first had to clear the Sierra Paramillos. The most convenient way of doing this was to travel north out of Mendoza and enter the Sierra as far as the warm springs of Villa Vicencia. From there it was a short climb to a pass over the Sierra then a descent to a broad plain which lay between the Sierra Paramillos and the main body of the Cordillera. Part of this broad plain and twenty miles or so to the north from Villa Vicencia lies Pampa Yalguarez. We do know from the locations recorded for his plants that Gillies did make collections along the route from Villa Vicencia via Paramillo to Uspallata. He had reached Mendoza in 1821 and in Hookers Botanical Miscellany for 1830 there were listed seventy one different species which had been collected by Gillies. Taking all factors into account it does seem to be very probable that the Opuntia glomerata described by Haworth in 1830 was collected by Gillies not too far from Mendoza.

WE FIND MAIHUENIOPSIS **From R. Ferryman**

On my fourth visit to Chile which took place early in 1987, I had two objectives in mind. One was to travel down a part of the coast of northern Chile at a pace which allowed for some detailed study of the flora. The other was to drive from Copiapo up into the high Andes and having reached a suitable altitude to travel southwards. This area has been little explored and so we hoped to be able to take note of both cacti and other flora. How much travelling we could do in the high Andes before we had to turn back towards the coast was likely to be determined by time, our supplies, and the conditions we encountered. We were able to undertake this latter trip. Soon after we left Copiapo, heading for the Cordillera, we turned up the Quebrada Paipote in the general direction of Salar Maricunga. The so-called road was the usual track over the ground made by the previous passage of vehicles. There was an odd drop of water in the riverbed so that here and there a bunch of pampas grass or a tuft of wiry grass appeared close the river course. But otherwise there was nothing else obvious in the way of vegetation.

I had received a request before departure to keep a lookout for fruit on any clumping Tephrocacti — or Maihueniopsis! On previous trips we had certainly seen fruit on cushion-forming Tephrocacti and had accepted that they were in accordance with the literature, having no call to make any study of them in the field. This time we intended to try and establish whether they were dry, or fleshy, internally. It was some distance beyond Puquios and about 40km out from Copiapo before we came across the first population of hummock forming Maihueniopsis on rocky terrain, and that consisted of only three or four plants. As we ascended further, the grass alongside the river course became more infrequent and eventually ceased altogether. By now we were probably at around 2500m altitude, with little sign of previous passage of vehicles. Every so often we came across a further population of Maihueniopsis; a population would consist of perhaps a dozen plants encountered over a walking distance of about one kilometer. Apart from a very occasional Eriosyce, there was just an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Llallagua
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Loa
Tupiza
Escayache
TARIJA
Santa Barbara
Santa Catalina
Villazon
Calama
Toconce
Caspana
Cobija
Puritama
Guatin
San Pedro de Atacama
Iturbe
Mejillones
Humahuaca
Oran
Domeyko
Salar de Atacama
Antofagasta
Alto Pingo-Pingo
Moreno
Jujuy
San Antonio de los Cobres
El Cobre
Botija
Salar Arizaro
Miguel Diaz
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Joachim Gonzales
Paposo
Taltal
Salar Antofalla
Sierra Calalaste
Cafayate
Antofagasta de la Sierra
Chanaral
Potrerillos
Salar Maricunga
TUCUMAN
Puquios
Copiapo
Belen
Andalgala
65°W
H.M.

occasional shrublike bush with small papery flowers rather like a daisy. These shrubs generally grew at the base of a clifflike rocky outcrop and reached a height of up to about half a meter. But the overall impression was of arid terrain with no other vegetation whatsoever. Between populations there was just bare mountain desert devoid of any life. The cacti did not occur on the more level ground which often had a typical desert pavement surface, but on the rocky outcrops, on faces so steep that it was not just a scramble to ascend but more of a handhold and foothold job. Very occasionally there would be a mound of Maihueniopsis on a ledge on one of these rock faces, where there was a spot of accumulated debris and the mass of rock afforded some small degree of shelter. This was nothing like the environment further north, to the north of San Pedro de Atacama, where we found hummocks of Tephrocacti scattered over the desert pavement, sometimes with gaps of only a meter or even less between plants and often with only a kilometre or two between population groups.

In the area above Purquios the Maihueniopsis grow so compactly that each segment is more or less touching the next one, separated only by their own spines. The spines exist on the lower areoles only during juvenile growth and these must become detached in some way, leaving only the top two-thirds of the segment with spines, the lower areoles carrying only glochids. The shape of the segments do vary, probably due to mutual pressure, but generally the top is pointed and the base is rounded. These cushion type plants grow into mounds and within the mound there are dry fruits that are obviously either the previous seasons' fruit or of even earlier setting. Removal of the fruits is difficult and some sort of implement has to be used to prize them out.

Having removed a fruit from near the top of one of the plants, I found it to be slightly squashy, not firm and hard. Externally it was not unlike Opuntia fruits as I know them. When cut open there was certainly a considerable quantity of pulp inside the fruit, probably a greater volume of fleshy pulp than of seeds. This flesh, although sticky and messy, was not the runny jelly that is found in one or two Gymnocalycium or classically in Eulychnia. After opening the fruit it needed a fair amount of time, four to five days if I remember correctly, before the fleshy pulp had dried sufficiently for the seeds to be removed — and these were Chilean days with heat, little humidity and no direct sun. Even now the seeds which I have back here at home ready for sending to F. Fuschillo for photographing, are still sticky to the touch.

We did not come across any ripe fruit on Tephrocactus on our trip, although one rooted cutting which I brought back is in the throes of setting a fruit, so I may yet have an opportunity of making a comparison.

. . . from H. Middleditch

The expression "fleshy fruit" may possibly not mean entirely the same thing to all our readers. For example, when a fruit splits on Cleistocactus it exposes the fleshy pulp filling the interior with the speckles of seed sprinkled in the flesh. On the other hand, I have had fruit on Gymnocalycium which have split and the seeds have stood there without falling out because they were retained by the fruit flesh — but you had to look fairly closely to be able to see the strands of flesh between the seed; the basic impression at first sight was a stack of seeds like a bunch of grapes. From this description by R. Ferryman I imagine that the amount of pulpy flesh in the fruit would be about half way between a typical Cleistocactus fruit and a typical Gymnocalycium fruit. If we compare this description of the fruit on a Maihueniopsis with the fruit of Tephrocactus from Peru as described by R. K. Hughes and shown on slide to our 1986 Chileans' Weekend, it looks as though Ritter may well have correctly reported the difference. It will be interesting to see the comparison of seed from the two groups in relation to Ritter's comments.

. . . from F. Vandenbroek

During my own visit to northern Chile, I also made a trip into the Andes near to San Pedro de Atacama. In general the area around Calama, Chuquicamata and San Pedro is devoid of any vegetation. The area is neither reached by the coastal mists nor by any precipitation coming from the Andes. Travelling eastwards from San Pedro de Atacama we came across big humps of Tephrocactus, possibly Ritter's Maihueniopsis atacamensis. The altitude was around 2600m. The plants reached a formidable size, some 2.5m in diameter (8ft); there was no accompanying vegetation. Only further east from San Pedro do cacti start appearing in greater numbers, amongst which are Trichocereus atacamensis, Tephrocactus, (smaller humps and darker spined) and Oreocereus. There is also an accompanying xerophytic vegetation; this would be at an altitude between 2800 and 3500m. Here there is an occasional rainfall, although it is very sparse in this region. Above a certain altitude, about 3700m, the cacti disappear and then the typical plants are ichu grasses and humps of Yareta (Llareta).

. . . further from R. Ferryman

In talking to F. Vandenbroeck at the 1986 Chileans' Weekends, I discovered that he had travelled into the Andes from San Pedro de Atacama along the same road that was used by our own party — understandably, since it is the only road there anyway. Just as when we travelled into the Andes from Copiapo, the Tephrocacti were the first plants to appear. My own impression was that the hummocks were generally no greater than a meter or so across, but that does not rule out the existence of a larger plant. There were some plants which looked as though they could previously have been larger, but had partially died off. What were conspicuously absent were small plants of a convenient transportable size. When we did at last find a smallish plant we set about digging it up and were amazed to find that it had a narrow neck just below ground level and then a large beetroot-like swollen root. Of course Ritter describes this very characteristic for a number of the Chilean Maihueniopsis.

It occurred to me that when Fred Katterman was in Argentina last year he may have come across some fruit on Tephrocactus and taken a closer look at it. I have been in touch with him but he was not able to contribute any observation on this point.

. . . from H. Middleditch

On the accompanying map of the Altiplano may be found the locations mentioned by R. Ferryman, both for Maihueniopsis and for Tephrocactus. This map also covers the area in which are found both Cumulopuntia sensu Ritter and Maihueniopsis sensu Ritter and it locates most of the place names recorded by Ritter in his Kakteen in Sudamerika for those species of these genera which occur in this area.

IN THE FOOTSTEPS OF MAN

In 1585, a missionary, describing Sao Vicente on the coast of Brazil near Santos, noted that "it used to be a seaport . . . but with the flow of waters and soil from the hills, the channel has been obstructed; boats are unable to approach . . . and because the lands are spent and because there is no port, it is becoming depopulated."

Voyage dans l'Interieur de Brazil by Auguste de Saint-Hilaire. 1830

With the exception of some elevated peaks, there is probably no corner of Germany, England, or France which has not been disturbed....Even our woods, cut at regular intervals, have turned into our workplace and our open spaces, continually turned over by the plough and re-seeded by the hand of man, are just as artificial as the meadows to which we are pleased to give that name. How many species have gone out of existence in all this artificial landscape! A great proportion of south america has already changed its face; forests have been replaced by cultivation, woodland by pasturage. Plants from Europe, Africa, and North America follow in the footsteps of man. To the extent that our race extends over the indian territory, the original vegetation disappears with them. It is important to confirm that it is this so splendid and so diverse vegetation that has been destroyed. Even if this is not without interest today, it must become of increasing interest as time goes by.

The differences in the original vegetation are so palpable in the province of the Mines, that they have been impressed upon the most rural inhabitant and they are identified by specific names. I have become familiar with a great many of these variations, to the extent that they have been displayed to me. The inhabitant of this province divide the whole of the country into woodland – matos, and open countryside – campos. Either the woodland consists of the original vegetation, or they are the result of the hand of man. The first are: the virgin forests or Mato virgem; the catingas, whose vegetation is less prolific than that of the foregoing and which lose their leaves every year; the carrascos, a sort of dwarf forest, composed of small trees three or four feet in height, and close to one another; and the carrasqueinos which form a sort of transition between the carrascos at lower altitude and the catingas. It is the original vegetation, too, which appears as capoes, woods which arise in a hollow like a sort of oasis, surrounded by campos on all sides. In regard to woods which are the work of man, there are the capoeiras which succeed the plantations made in the virgin forest.

The word campo signifies a terrain covered with herbs or, put another way, all that is neither virgin forest, nor capoeira, nor catinga, nor carrasco, nor carrasqueino. Often there are to be seen in the campos some twisted, stunted, trees scattered here and there; but this variation does not obstruct the terrain which continues to retain the name of campos. When a hill is topped by a small plain, it is called a taboleiro or chapada depending upon its extent and in accordance with the vegetation growing there it is covered – coberto – or open – descoberto.

It is understood that all these expressions do not reflect an exact demarcation, since the differences that they signify shade from one to the other by gradual transition. No one hesitates to describe a wood as a Mato virgem or as a catinga, but there is no place in the nature of a definate boundary between the virgin forests and the catinga, between that and the carrascos, and lastly between those and the true campos.

We only occupied two hours over the journey from Villa Rica (Ouro Preto – H.M.) to Marianna, whereas the first inhabitant needed five days, since at that time the countryside was covered with virgin forest down to the rivers' edge. The system of agriculture adopted by the Brazilians in general and by the Mineiros in particular has undoubtedly contributed most to the ruin of parts of the province. Having chosen a plot of land, the trees are cut down to waist height after the end of the rainy season and after giving them time to dry out they are put to the fire. Seed is sown in the midst of the stumps and the half-burned branches. After taking two harvests it is left alone; trees grow again, more slender than before and of an entirely different sort to the original ones. After a further five or six years it is again cut down and fired. After one harvest it is again left fallow; the trees grow once again and so on in the same fashion until the soil is quite exhausted. This part of the province of Minas Gerais, located to the immediate east of the Serra Mantequeira and the chain which continues from it to the north, is divided into mountains of greater and lesser height. Previously it was entirely covered with forest. Where gigantic trees interlaced with lianas rose up not so long ago, the traveller now finds immense tracts of capim gordura, a rank, greyish, viscous grass. It is impossible to imagine that in the course of such repeated firing of the forests, a multitude of species useful to medicine and science have not already disappeared and in not many years hence the Flora which I describe at this moment will only be a historic monument in certain regions.

An excursion to the mountains of Brazil **By Prof. E. Warming**
From La Belgique Horticole 1883

(At the peak of Sierra Piedade)... If one turns to look at the forests which cover the foot of the mountain and its immediate surroundings, only a trace is to be seen, for the quite simple reason that man has destroyed them. In the middle of the shadeless country to the east of the Sierra, called Mato dentro, stands the town of Caete, symbol of the splendour of times past, for in the indian tongue Caete means 'great forest'. The descriptions of early explorers speak enthusiastically of the vast forests in this region. What will befall the relatively insignificant forests of this sierra when man dreams of extracting in the rocks which form its carcass, is unfortunately too easy to foresee.

Man and Environmental change in South America **by H. O. Sternberg**

The use of vegetal fuel was to take on new dimensions after the Spanish conquest, when the removal of firewood and the manufacture of charcoal became a salient cause for degradation of the environment. The demand for firewood by the sugar factories of Pernambuco added to the clearing of land for cane, has left the "Forest Zone" only in name. Brazil also has an important charcoal-based iron and steel industry which now co-exists alongside coke-consuming and electric plants. The consumption of charcoal for smelting fuel in Minas Gerais was reported to be in the order of 900,000 tons in 1963. Wood-burning locomotives have been yet another cause for the large-scale destruction of the vegetation. In addition

to the major enterprises, there were still 280 charcoal retailers in Rio de Janeiro in 1961. Depletion of the woodlands has made vast areas inhospitable for some animals. The alien fauna that invades a man-altered environment may itself act as effective agent of further modification.

Melocactus in Brazil **By A. F. H. Buining**
From U.S C.& S.J XLVI 1974

At the habitat where Werdermann found his Melocactus macrodiscus grows another quite rare species, Melocactus amethystinus. In this region lying at about 1000m several M. amethystinus exist and the miners dig up the earth there. We were there in June 1968 and saw several plants of both species. In August 1972 we again visited this location and could not find a single plant.

Melocactus conoideus grows in the region of Vitoria de Conquista at about 1000m, under and between thick shrubs. In this region, much sand and gravel is mined for road building purposes and therefore the habitat is in imminent danger of being destroyed in the near future.

Impressions of a trip through Brazil
From K.u.a.S 35.7.1984

On 10.8.1981 our cactus expedition started off with the intention of visiting a number of cactus locations in the Brazilian States of Bahia and Minas Gerais. The party consisted of Heimen, Hovens, Paul, Strecker plus van Heek and his wife . . .

. . . from Xique-Xique we went southwards in the direction of Santa Inacio, where Melocactus giganteus should grow. We were fortunate and disappointed at the same time, as after 25km along the narrow, dusty road we caught sight of the first plants in an area of some sandstone rocks rising in stages. Happy because we had reached the habitat of Melocactus giganteus and disappointed because we could find scarcely a fine plant with a cephalium. The majority of cephalium bearing plants were dead or even badly damaged and the good specimens were young plants, not much larger than two clenched fists together. Heimen had already been to this location in 1979 and at that time he had found crowds of good cephalium bearing plants; we could only suppose that this location had been regularly stripped in the intervening period.

. . . near Itaobim we left the main road, turning off in the direction of Aracuai [=Arassuahy – H.M.]. After some kms along a very dusty and potholed road we found Melocactus multiceps on an extensive sloping plateau. The habitat was known to us from slides that friend Heimen had taken on his first visit two years before together with Pierre Braun. Whilst at that time there were still great numbers of many-headed Melocacti occupying the rocky plateau, now we were able to find only a few good plants entitled to the name "multiceps" despite thorough searching. There were mainly decayed or apparently wilfully destroyed 'corpses' of large plants, or seedlings up to fist size without cephalium. Real habitat destruction had obviously been carried out to excess here. Our disappointment was understandably great.

Impressions of Brazil **By P. Braun**
Mato Grosso — Succulenta 63.11.84

One of the most interesting Discocacti in Mato Grosso is (or rather was) Discocactus semicampaniflorus. This species was discovered by Horst and Uebelmann in the 1960's. Later on the habitat was visited by Buining in company with Horst in 1968, 1972, and 1974. Since this species is as good as unrepresented in Europe, at least certainly not by plants coming from the Type locality, we also visited this habitat on our trip through Mato Grosso. Today the whole area has been put into cultivation, the forests of yesterday have been completely eliminated. Although it was all of nine years since Leopold Horst was last here before, he found the small hill where a small boarding house stood at that time, right besides the road to Rondonopolis. The hut has now fallen into disrepair on account of the now asphalted road being diverted in the meantime, so that no travellers make a stop here any longer.

In whichever direction one looked, bare hills were to be seen everywhere, on which lay meadows or cultivated land. Of the Campo Cerrado, the original landscape, nothing more remains. Enormous areas are all ploughed up. There where nine years ago thousands of specimens of Discocactus semicampaniflorus stood, now all is black and burnt. Eventually after a lengthy search we still found some scorched specimens and about 10 undamaged plants, which by fortunate circumstances had not been damaged by the fire. After we had finished our searching around, the farmer started to plough up this last corner too. The day before he had burned of and ploughed up the adjoining parcel. The hills nearby had already been ploughed up in 1982 and already the first meadow grass grew there.

Alas we were not able to find these Discocacti in any other spot, so we must abandon a habitat location which we were still allowed and able to visit right before its final extermination. This experience is unfortunately symptomatic of our whole journey through Mato Grosso.

Southern Goias — Succulenta 65.1.1986 KuaS 36.9.1985

In the early morning we had a look at Goiana, the capital of Goias and market centre for cattle and agricultural produce. This city now has more than one million inhabitants and counts as a metropolis in Brazil. Where fifty years ago there still lay a lovely village in the Campo Cerrado, sky-scrapers stand today and a busy business life prevails in the streets. The process of urbanisation and industrialisation goes on at a savage tempo. In many respects Goiana would not be far behind Brasilia and already surpasses it in importance. From a high point one can look at the advancing city and everywhere is marked out with pegs for new housing estates.

Shortly after our departure on our next long stage,Eddie Esteves showed us the first growing place for

Discocactus. Eddie had found these plants years ago. Already almost all the plants have vanished. After a long and fruitless search we found just one spot of a few square metres on which there grew some plants. Even here stone quarrying had begun. Most of the plants had been burnt. The children take pleasure in pulling up, chopping up, trampling and crushing the plants, young and old. and throwing them into piles. The rotting, stinking heaps of plants lay everywhere. Here and there some dying plants push one last flower out of the cephalium.

Large areas of the states of Mato Grosso and Goias were originally occupied by the Campo Cerrado. This type of vegetation is atypical for cacti as the annual rainfall is about 1000mm and transpiration of the leafy plants is not reduced in the dry season, as recent ecological research has shown. This vegetation clearly differs from the east Brazilian caatinga and the xeromorphic bush of west Bahia. Consequently we find cacti and many of the xerophilic terrestrial bromeliads only in ecological niches. These are coarsely structured outcrops of Pedra-Canga crust, a limonite-coated haematite (e.g. Discocactus cangaensis), limestone rocks (mainly Austrocephalocereus and Pilosocereus), sandstone rocks (Pilosocereus and Discocactus), and exposed slopes with coarse soil texture in the upper layers due to aerial loss of the finer grains (Discocactus), all extremely hot and dry sites, often of limited extent, with coarse or extremely coarse soil texture.

We often come across the limestone formations concealed in the forest, with Pilosocereus, Opuntia, Cereus and Hylocereus. Not infrequently we also find beautiful rosettes of Bilbergia. Such locations were always small and the plants are threatened as soon as the rocks are discovered. It is then not long until the trees and cacti are cut and burnt down. The rocks are very popular for road construction and are generally systematically and completely removed. All too often we found these graveyards.

West Bahia — Succulenta 63.7.1984

We travelled from Goias into Bahia and approached the western side of the Rio Sao Francisco.... coming to the habitat location for Melocactus levitestatus. Not long ago some men from north Bahia decided that the edge of these rocks are to be excavated for the Sobradinho reservoir project. Their children, who are bored by the monotony of life here, alas get enjoyment in aimlessly chopping to pieces the columnar cacti. Here one can find whole graveyards of felled columns of Austrocephalocereus dolichospermaticus.

Before we crossed over the R. Sao Francisco we had a look at the habitat location of Melocactus warasii on flat rocks in the middle of a wood. Melocactus warasii is an intense blue colour and inclusive of cephalium grows more than a meter high. At the edge of these rocks we admired a huge bottle tree, probably one of the tallest and stoutest specimens that Leopold Horst and I had seen in the whole of the north-east of Bahia. Behind these rocks extended the terribly dense woodland. All alone there stood a tall, blue, Pilosocereus. In this woodland area too will settlements be founded before long for the Sobradinho farms. For this purpose a small parcel of wood will be dug up and a number of small, identical prefabs will be set down along a street. This setting down is the start of the still distant thoroughfare. It will not be long ere the disafforestation starts by setting it on fire. In this way great surface areas of woodland become systematically annihilated.

Discocactus **By A. F. H. Buining — (Undated)**

Buining and Horst found specimens of Discocactus subviridigriseus south of the R. Sao Francisco, close to Sobradinho and south of Santa Se, east of the same river. The total area south and partly east of the Rio Sao Francisco will soon be turned into an enormous reservoir. At Sobradinho south of the river a large flood control dam and a power station plant are being built. In all probability this species will, therefore, be lost, unless the fazenda Lago Seca, which means dry lake, will be spared, which is unfortunately very doubtful.

. . . from P. Braun

Glimpsing into the future, the survival of the cacti in Goias and Mato Grosso is not very promising. The answer lies with everyone who knows the beauty of these plants and wishes to save them for the future. A rational protection of these species does not depend only on controls of collecting activities as these are not the only threat to the natural plant population. An important task for us in Europe is the development of specific, successful cultivation methods, and establishment of official and private reserve collections. As these Brazilian plants are mostly very exacting and require cost- and labour- intensive care, a role of great responsibility falls especially upon the private enthusiast.

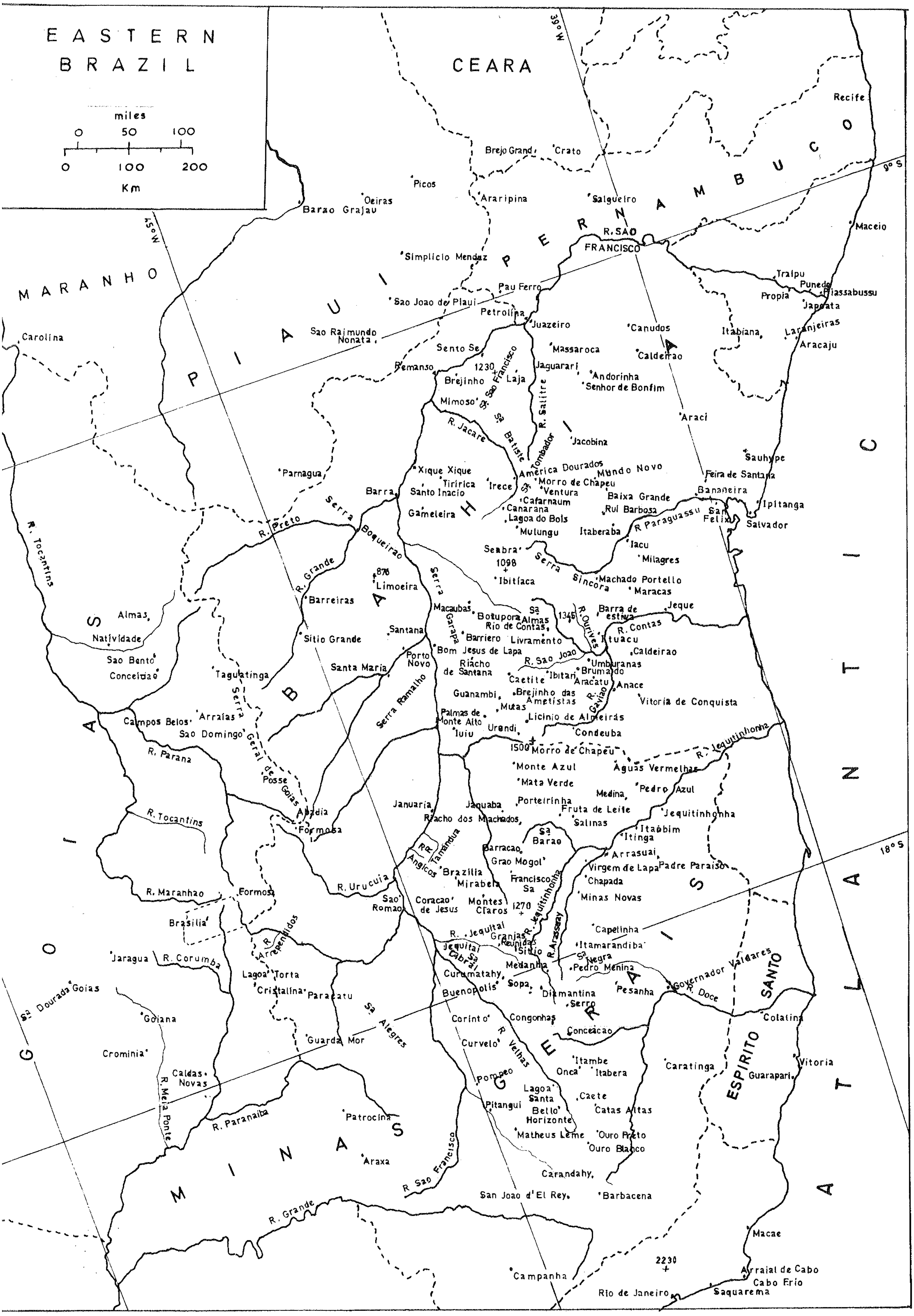
MELOCACTUS VIOLACEUS Pfeif. **By Dr. C. Pfeiffer**
Translated from Allgemeine Gartenzeitung 40. 1835

Somewhat pyramid shaped Melocactus, with 10-12 acute, crenate, vertical ribs, broad intercostal groove, areoles pretty well separated, with densely matted white felt when young, eventually bare, 6-8 stiff, long, straight, divergent spines, deep red when young, then with transverse violet striations, uppermost very short, no central. Habitat:Brazil.

This species is probably unknown in Germany,. at least it is undescribed; it was received by Master gardner Schelhaus here in the course of this summer from H. Parmentier in Engbien as sp. nov. in several larger and smaller specimens, which are quite identical in every characteristic feature. The largest is 3 inches tall and 4 inches broad and in habit has some similarity with Melocactus comm. Jordensii (amoenus) on account of which I must certainly take this species to be a genuine Melocactus, even though no specimen yet displays a cephalium. However the above description will suffice as a provisional one until it flowers, so that the species has a name for the time being.

. . . from G. C. Charles.

Many years ago I acquired a mature M. violaceus from Hollygate, which I managed to keep for several years before it passed away. Now I have a small, presumably seed-grown plant. Although I do have quite a few Melocacti, almost all



EASTERN BRAZIL
miles
0 50 100
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Km
CEARA
39°W
Recife
PERNAMBUCO
Brejo Grand
Crato
Picos
Oeiras
Barao Grajau
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Salgueiro
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Maceio
45°W
R. SAO FRANCISCO
Simplicio Mendez
PIAUI
MARANHAO
Pau Ferro
Tralpu
Penedo
Piassabussu
Propia
Japoata
Sao Joao de Piaui
Petrolina
Juazeiro
Canudos
Itabiana
Laranjeiras
Carolina
Sao Raimundo Nonata
Aracaju
Sento Se
Massaroca
Caldeirao
Remanso
1230
Sa Sao Francisco
Jaguarari
Andorinha
Senhor de Bonfim
Brejinho
Laja
Mimoso
R. Salitre
Araci
R. Jacare
Sa Batiste
Sa Tombador
Jacobina
Sauhype
Parnagua
Xique Xique
America Dourados
Mundo Novo
Feira de Santana
Tirirca
Irece
Morro de Chapeu
Barra
Santo Inacio
Ventura
Bananeira
Baixa Grande
Cafarnaum
Canarana
Rui Barbosa
Ipitanga
Gameleira
Lagoa do Bois
R. Paraguassu
San Felix
Salvador
R. Preto
Serra Boqueirao
Mulungu
Itaberaba
R. Tocantins
Seabra
1098
Iacu
Milagres
Serra Sincora
Ibitiaca
Machado Portello
Maracas
876
Limoeira
R. Grande
Serra
Barreiras
Macaubas
Botupora
Sa Almas
1345
R. Ourives
Barra de estiva
Jeque
Almas
Sa Garapa
Rio de Contas
Livramento
R. Contas
Santana
Barriero
Atuacu
Natividade
Sitio Grande
Bom Jesus de Lapa
Caldeirao
Sao Bento
Porto Novo
R. Sao Joao
Umburanas
Conceicao
Taguatinga
Santa Maria
Riacho de Santana
Ibitari
Brumado
Caetite
Aracatu
Anace
Guanambi
Brejinho das Ametistas
R. Gaviao
Vitoria de Conquista
Serra Ramalho
Mutas
Campos Belos
Arraias
Palmas de Monte Alto
Licinio de Almeiras
Sao Domingo
Serra Geral de Goias
Iuiu
Urandi
Condeuba
R. Parana
1500
Morro de Chapeu
R. Jequitinhonha
Monte Azul
Aguas Vermelhas
Mata Verde
Posse
Medina
Pedro Azul
Alvorada
Januaria
Porteirinha
Jaquaba
Fruta de Leite
Jequitinhonha
R. Tocantins
Salinas
Riacho dos Machados
Formosa
Itaobim
Sa Barao
Itinga
R. Tamandua
Barracao
Arrasuai
18° S
Grao Mogol
Angicos
Virgem de Lapa
Padre Paraiso
Brazilia
Francisco Sa
Mirabela
Chapada
R. Urucuia
R. Maranhao
Formosa
Sao Romao
Coracao de Jesus
Montes Claros
1270
Minas Novas
Brasilia
R. Arrependidos
R. Jequitai
Granjas Reunidas
Capelinha
R. Araçuai
Sitio
Itamarandiba
Jaragua
R. Corumba
Jequitai
Sa Cabral
Sa Negra
Medanha
Pedro Menina
Curumatahy
Lagoa Torta
Governador Valdares
Sa Dourada
Goias
Cristalina
Sopa
Diamantina
Pesanha
R. Doce
SANTO
Paracatu
Buenopolis
Serro
Goiana
Colatina
Corinto
Congonhas
Sa Alegres
Conceicao
Guarda Mor
Curvelo
R. Velhas
ESPIRITO
Crominia
Itambe
Vitoria
Caldas Novas
Onca
Itabera
Caratinga
Guarapari
R. Meia Ponte
Pompeo
Lagoa Santa
Caete
R. Paranaiba
Pitangui
Catas Altas
Patrocina
Bello Horizonte
Matheus Leme
Ouro Preto
Ouro Blanco
MINAS GERAIS
Araxa
R. Sao Francisco
Carandahy
San Joao d'El Rey
Barbacena
R. Grande
Macae
2230
Campanha
Arraial de Cabo
Cabo Frio
Rio de Janeiro
Saquarema
GOIAS
BAHIA
ATLANTIC

of which are easy to grow, I must say that this particular species really is a most difficult one to grow. It remains quite small, only being about four inches in diameter when it produces a cephalium. There are a lot of short red bristles to be seen in the cephalium. The fruit pods are a pale pink to violet colour.
. . . from J. Arnold.

Although I do not have a M. violaceus in my collection, I have tried on more than one occasion to raise it from seed. However I have had no success at all; germination is good but I cannot get them past the small seedling stage.
. . . from J. Forrest

Quite a few years ago I obtained an imported plant of Melocactus violaceus which I managed to keep for about five years. After adding one or two more Melocacti to my collection I found that these grew satisfactorily for a few years and then died off, although for no very obvious reason. This led me to start growing Melocacti from seed. My seed grown Melocacti certainly fared better than imported plants but I still suffered losses. At that time my Melocacti were grown in a small enclosed section within the greenhouse which produced a microclimate rather like a propagator. My Melocacti will put out fruit at almost any time of year, not just during the summer season, and there were times during the winter when the Melocacti would be carrying fruit; from time to time I found quite clear growth of fungus on the fruits and I attributed to this fungus the basic cause of my losses.

About five years ago I arranged my Melocacti on a heated sand bed with a thermostat control at 70/75° on the heating coil, and the plants themselves open to the general greenhouse. Since that time my problems have been insignificant and now I must have about a dozen different Melocacti grown from seed which carry a cephalium. Melocactus violaceus will start to produce a cephalium when it is about 3 to 4 inches across and some 5 to 6 years of age. There is no doubt in my mind that M. violaceus will start to produce a cephalium when it is a smaller size and of a younger age than any other species in my collection. Most of my Melocacti need to be 7 to 10 years of age before they produce a cephalium. Despite several statements which I have seen made to the contrary, I find that the body of the plant does continue to increase in size after it starts to grow a cephalium.

Cactus melocactoides **From Britton & Rose The Cactaceae Vol III**

Dr. Rose collected a plant along the coast of Bahia (No. 19691) which he would refer here. A somewhat similar plant, but smaller, was collected by him at Cabo Frio (No. 20698) which we have tentatively referred here. Schumann, however, kept the Bahia and Rio de Janeiro plants distinct, refering the plant from Bahia to Melocactus depressus and the one from Rio de Janeiro to M. violaceus.

Melocactus in Brazil **By A.F.H. Buining. from U.S. Cactus & Succulent Journal Vol XLVI, 1974**

One of my main purposes in undertaking three expeditions to Brazil was to try and find the formerly described Melocacti. The first one was Melocactus melocactoides published in 1826. The Type locality was Brazil without further indication. In a later publication, Cabo Frio was mentioned as Type locality. On May 30, 1968, we collected plants of this type in the dunes a little distance west of Cabo Frio and east of Rio de Janeiro, and also at Cabo Frio where it is very rare. My notes tell me of plants of 9cm diameter, with ten ribs, cephalium 4cm high and 5cm diameter, with white wool and red-brown bristles, radial spines only, and a rose-coloured flower. We collected more or less similar plants in the dunes north of Cabo Frio at Macae, then further north close to Guarapari, and in several other places in the dunes, always quite close to the Atlantic ocean. Later, on the 9th of June 1968, we found more or less the same plants north of the capital of Bahia, Salvador, formerly called Bahia, and at Ipitanga, also in the dunes. At Macae, I noted that once in a while the plants had a central spine; the spines at first red-brown, soon greyish-white with red-brown tips. At Guarapari the same species but with 12 ribs (a very old plant with 14 ribs and a diameter of 12 cm), often with a central spine, cephalium 3cm high and 7cm diameter. At Ipitanga we found similar plants. It is still a question as to how much further north this small Melocactus species occurs. Werdermann collected it north of Pernambuco. There are no indications at all that it grows north of the delta of the R. Amazonas. It would be very interesting to collect flowers, fruit, seeds and also pollen at the numerous habitats to see if there is any important difference. We shall see if this is possible. Anyhow, if the two described species, Melocactus melocactoides and M. violaceus are the same, the older name has priority and is then Melocactus melocactoides.
. . . from W. Strecker. Impressions of a journey through Brazil K.u.A.S 34.12.1983

In Salvador we needed to undertake repairs to the vehicle; to get this done, two members of the party drove about 40km out of Salvador to a firm with German connections. This drive went along high white sand dunes in which we supposed there would be Melocactus violaceus. We resolved to make a search there on the return trip. The German workshop manager told us that nearby on the firm's land he had earlier found a more or less fist-sized cactus with a red cephalium. Naturally we immediately assumed that this could only be a Melocactus violaceus. At our request he took us to the spot and we found numerous plants there, some of them with red spines projecting through the cephalium, some with a pure white cephalium. In other respects the habit displayed no different characteristics. By good fortune we had our photographic equipment to hand and were able to take some fine habitat shots.

Back at the hotel the other members of the party were very disappointed at missing this find, so we arranged to go back with them the following afternoon. For the rest of our group it was quite an experience to find and photograph the much sought-after Melocactus violaceus, in the white sand dunes, usually under small bushes. We discussed at great length the breadth of variation in the cephaliums for we had not been able to establish any other difference in the plants.
. . . from H. Middleditch

The place called Ipitanga where Buining found these plants is about 28km as the crow flies and hence probably some 40km by road from Salvador. Thus it seems probable that the location described here where Strecker et al found these plants could also be fairly close to Ipitanga. However there is no reference by Strecker to cephalium bearing plants being fairly small in size, although this appears to be the case in cultivation.

. . . from W. Strecker

The diameter of the Melocactus violaceus which we found in 1981 to the north of Salvador is between 80 and 100mm after getting a cephalium. The cephalium has a diameter of 40 to 50mm. Surely Melocactus violaceus are the smallest Melocacti from Brazil. In 1985 we have seen the same plants again at the same place with the same sort of diameter. But at about 1000km more to the south near the town of Macae we found another M. violaceus with the same measurements. The only difference is that the plants in the north have white fruits and the plants in the south have pink coloured fruits.

. . . from Notices of Brazil 1828 By R.Walsh

[After an Atlantic crossing] On the 15th October at 12 o'clock, Cape Frio burst upon our view. It presented to us the first view of the new world, the vast continent of America. The temperature of the air was delicious – the thermometer standing at 72° in the morning and 73° at noon. The coast was very bold, high, and varied, consisting of hills and headlands, clothed with wood to their summits.

Just after we passed Cape Frio, a strong breeze set in from the sea, which swept us along at the rate of 13 knots, so that from 2 p.m. to 6 we made 53 miles in 4 hours. During the continuance of this breeze, the thermometer fell to 61° and the sense of cold from the sudden transition of temperature was quite painful. After bearing it for some time, shivering on deck, it became intolerable, and we all went below, put on our warm clothing and again appeared with thick woollen jackets and trousers as if we were entering Baffin's bay and not a harbour under one of the tropics.

. . . from H. Middleditch

No doubt the reaction of the Melocacti to this climatic change would be equally unfavourable, which perhaps explains why the southern limit for Melocacti in Brazil approximates to Cape Frio. The place names which occur above may be found on the accompanying map of eastern Brazil. A general review of the variety of climate and rainfall in this region may be found in Chileans No. 22 and several articles concerning vegetation and other aspects of this region appear in Chileans No. 28.

TRAVELS IN THE INTERIOR OF BRAZIL **By G. Gardner. — 1846**

Being now desirous to explore the northern provinces, I took passage for Pernambuco in H.M. Packet Opposum. We sailed from Rio on the fifteenth of September and after a passage of thirteen days, during which we had much bad weather, reached the city of Bahia, sometimes called San Salvador.....On the thirty-first we set sail for Pernambuco...After a passage of nine days, land was decried from the masthead...On nearing the coast it presented a very flat and barren like aspect, the houses and the cocoa-nut trees appearing above the horizon. As Pernambuco is situated on the most eastern part of the American continent, it is fully exposed to the influence of the trade winds all year round, and hence enjoys a cool climate; it is considered more healthy than Rio or Bahia.

For the first few days, my walks did not extend much beyond the suburbs of the town. The country being quite flat, the soil sandy, and the dry season having commenced, the herbaceous vegetation in the more exposed situations was beginning to suffer for want of rain. For many miles around the town large palms grow in the greatest profusion. The Mimosa and other hedges are festooned with climbers. The sea-coast yielded many curious plants, particularly one part of it about eight miles to the southward of the town, where the soil for some distance inland is very sandy, and covered with shrubs. There I found, in great plenty, a new kind of those curious mossy cacti Melocactus depressus, Hook.; it was but a small one, being only about four inches high and eighteen in circumference.

About a fortnight after my arrival in Pernambuco I removed to a house situated on the banks of the Rio Capibaribe, about four miles west from Recife... Early one morning in the beginning of November, I started for a small German colony called Catuca, lying about twenty miles to the westward of Pernambuco. Our route for about two hours was through a flat and cultivated country, although a greater part of it was still uncleared. A few of the remaining large trees rose high above their fellows of the wood. After ascending a slight eminence we entered the virgin forest. Previously the road had been of a sandy nature, but now we found it to consist of hard red clay. Many of the trees were very lofty. Here everything betokened a drier atmosphere amd a more arid soil than at Rio. There were no ferns, Begonias, Pipers, or Orchidaceous plants. On the stems and branches of the larger trees a few Bromeliaceae and Aroideae were alone to be seen...Near the colony I found two beautiful trees, one of them a species of Vochysia covered with long spikes of bright yellow flowers, and the other the splendid Moronobea coccinea, literally covered with its globular crimson blossoms....Returning to Pernambuco, we had to hire a Jaganda, a raft boat common on this part of the coast, to visit a small island called Itamarica.

The great object of my visit to the north of Brazil was to make a journey from the coast to the highlands which lie on the eastern side of the Rio Tocantins. This part of the country, which I was strongly recommended to visit by von Martius and others, on account of its botanical riches, is distant from Pernambuco about 1200 miles and nearly direct west from it. Although I was desirous to begin the journey, I was advised by persons well acquainted with the interior of the country not to undertake it until towards the end of the rainy season, on account of the difficulty of finding grass and water for the horses after the period when everything has been scorched up by the burning sun of the dry season. Nor is the period of the rains less exceptional for the undertaking of a long journey since, during the four months which it generally lasts, there are scarcely two consecutive dry days. It was now about the end of January, and as the period of my entering upon my proposed expedition would not be sooner than the end of June or beginning of July, I determined to visit Maceio and from thence to make an excursion to the R. San Francisco.

On the thirtieth of January 1838 I embarked and...we got outside the reef and ran down before the north-east trade wind till seven p.m., when we came to anchor for the night in a small sandy bay. At dawn of day we again got under way...during the whole of the day we ran down between the shore and the reef. The country is of an undulating hilly nature, wooded with small verdant trees and shrubs, many of the latter covered with flowers. We came to anchor in the evening and landed...we remained here all the following day, which I did not regret as it rained heavily till night. On one short walk I found the whole herbaceous vegetation burnt up. The faces of several low hills here exhibit a kind of coarse grained sandstone rock, exactly of the same nature as the reef which runs for several hundred miles along the coast both to the north and south of

Pernambuco. Early in the morning of the following day we again pursued our voyage, keeping close to the shore and at about two p.m. we arrived at Barra de S. Antonio Grande. In the afternoon I took a walk a little way along the banks of the river; like all other sandy parts along coast, the vegetation here consists of low shrubs mixed with a few small trees, Schinus terebinthifolius being by far the most common.

Next day, Feb. 4th, we reached Maceio. The country around is not so monotonous and flat as that around Pernambuco; low undulating ridges of hills reaching close to the sea, covered with a vegetation of low trees and shrubs. During several walks which I took in the vicinity, I made many additions to my botanical collections, particularly on a flat sandy tract to the north-east of the town. Among these I may mention a fine Diospyros, a curious Eriocaulon, an Eschweilera and a Melocactus.

Having made the necessary preparations for the voyage, I engaged a jaganda to take me along the coast to the mouth of the river. Having at length embarked, we soon lost sight of Maceio under the influence of a strong north-east wind....at night the jaganda was brought close to the shore. The jaganda was floated on the morning tide...it was one p.m. when we reached a little village called Peba, about five leagues to the north of the mouth of the R. San Francisco. On the day following I made arrangements with the owner of an oxcart to take me and my luggage to Piassabassu, a little village situated on the north bank of the R. San Francisco and about two leagues from its mouth. On the morning after our arrival at this place I hired a canoe to convey me to the Villa Penedo, seven leagues further up the river. The river here is about two leagues broad. The country, for about three leagues, is flat on both sides, which the present flood had inundated to a considerable extent. Where trees existed, nothing but their upper branches were visible and almost every house that we passed had only its roof appearing above the water. The river begins to rise in the month of October, which is the commencement of the rainy season in the southern provinces, the sources of its origin, and continues to do so until the end of March.

After my arrival at Penedo, I engaged a passage in an empty canoe that was going upriver. In the evening we reached the village of Propia situated on the south side of the river. The most striking objects of vegetation which I observed on the banks of the river were many trees of considerable size, belonging to the order Leguminosiae, bearing large spikes of large purple flowers; abundance of a curious kind of cactus, reaching to the height of from twenty to thirty feet, the great arms of which stand out like branches of an enormous chandelier. A most striking difference was to be observed between the verdure of that part which had been under water for upwards of four months, and on the more elevated parts on which no rain had fallen for nearly six months. It was only here and there that a tree was to be seen covered with leaves, all the others having lost their foliage owing to the excessive and long continued drought. In sailing up the river the prospect would have been dreary had it not been for the broad belt of arboreous vegetation that clothed its margins.

On the morning after our arrival at Propia, I walked a little way into the country behind the town, but found the vegetation so completely scorched up that not a green thing was to be seen. I collected two species of Caesalpinia which were in flower. In the afternoon we left Propia and at eight we arrived at Traipu,. situated on the north bank of the river about seven leagues further up. The effects of the drought on the vegetation was still greater here than further down; as far as the eye could reach, nothing like a forest was to be seen, both the hills and valleys being thinly covered with small trees and shrubs and all, with few solitary exceptions, denuded of their foliage. On the surface of the ground itself there was no herbaceous vegetation, the red coloured soil alone being seen through the withered bushes. The only objects that relieved the eye in this desert-like region were the green bushes which grew along the inundated banks and the grotesque cacti abounding in dry rocky places. These latter are the most conspicuous objects that meet the eye of a voyager; some of their trunks are of immense thickness and their branching tops reach to a great height above the surrounding vegetation. On the rocky places where they grow, there are also many Bromeliaceous plants which, in spite of the want of rain, not only grow luxuriantly but produce their large red clusters of flowers in the greatest perfection. The rocks on which these plants vegetate are of gneiss, in thin layers of a dark colour, full of small garnets.

We resumed our voyage next morning, but as the wind was very high we could make no headway against the current. At about half a league from our place of departure we were obliged to halt for some hours on the north bank of the river. This afforded me an opportunity of landing and I made a few additions to my collections. Here I also met with some of the largest cacti I have ever seen; one in particular was of enormous size, the stem measuring upwards of three feet in circumference, and unbranched to a height of about ten feet. It entire height could not be less than thirty to forty feet. This and other large kinds of cactus are called by the inhabitants of this part of the country Sheeke-sheeke and their fleshy stems and branches, after being stripped of their back [sic!] and spines are roasted and eaten in times of scarcity. A little further up we were obliged to come to anchor for the night. On the following morning before breakfast, I took a walk to the high ridge of gneiss rocks which is at a little distance from the river and found a variety of different kinds of cacti. One of these was a great Melocactus much larger than the one which is so common near Pernambuco; it grows in fissures of the rock where scarcely any soil exists and its tough roots penetrate to such a depth that they can with difficulty be withdrawn. Living specimens of this Melocactus hookerianus Gardn. which I sent home, now exist in the collections at Kew and Glasgow.

We resumed our voyage in the morning and at once reached Lagoa Funda; we were obliged to remain, owing to the loss of wind, till five o'clock in the afternoon when the sea breeze reached us and we were enabled to reach another small village called San Pedro, situated on an island of the same name. Early in the morning I took a walk over the island and gathered a few plants. It was six o'clock in the evening before the sea breeze reached us. On the second morning I again took a walk over the island and found a large tract covered with a very prickly species of Opuntia, covered with Cochineal insect. I also collected several species of Viscum and Loranthus, growing on branches of Mimosa and Ziziphus trees. The day was calm and sultry, the thermometer standing at 96° in the shade. It was again six in the evening before the breeze set in, accompanied with a curious appearance in the atmosphere; the sun was setting in the west with a fiery redness, surrounded by a mass of red coloured clouds, while from the eastward was seen approaching an immense body of vapour. From the distance at which it was seen this had more the appearance of smoke issuing from some great conflagration. This body came slowly on before the wind till at last it reached us, and we could see the small vesicles of which it was composed rolling past. For about five minutes the wind was so hot that every one was glad to take shelter from it. but it soon acquired its usual refreshing coolness. The old captain told me that such a phenomena was of frequent occurrence at the beginning of the rainy

season and added that long experience had taught him that it was always the forerunner of a great storm.

On the following day we left the island in the evening and had not gone an hour before the sky towards the northeast became darkened with a mass of black clouds, the sure harbinger of a coming storm. We were then nearly in the middle of the river which was about a league broad. Before we had half reached the shore we were overtaken by a gust of wind which laid the canoe nearly on her broadside. A considerable quantity of water was shipped...the storm was setting in with all its fury.. the sails were stowed away and we steered before the wind. Before we reached the south side the wind, the rain, thunder and lightning were such as I had never before been exposed to....The canoe ran aground, the rain continued to fall in torrents for nearly two hours. When the storm had entirely exhausted itself, we found the wind had died away also...we returned with the current to San Pedro.

I found myself feverish and unwell...I was confined to my hammock for five days...in the course of these few days I was reduced to a mere shadow. On the twelfth of March, having gained sufficient strength to leave the island, I hired a canoe to take me down to Penedo. I landed several times on the passage, for the purpose of making collections of living plants of the different kinds of cacti, which grow in great abundance on the banks of the river wherever they are rocky. At Penedo I was enabled to make several excursions in the neighbourhood. On the afternoon of the 21st I embarked in a canoe which I hired to take me down to Piassabassu, which we reached after little more than four hours. Before the following evening I devoted this interval to a few botanical excursions in the neighbourhood.....On reaching Peba.. .the jaganda I engaged to take me to Maceio was a fine large one...during the succeeding day the winds were again light but we reached Maceio about eight p.m.

MELOCACTUS DEPRESSUS **From Curtis' Botanical Magazine 65.1830 No.3691**

Depresso-conicus basi multum latior profunde subdecem-angulatus, costis latis obtusiusculis, spinis 5-7 fasciculatis subulatis rectiusculis pallide fuscis basi lanuginosis, corona per-brevi lanuginosa, aculeis rubris.

This is one of the few cacti which have rewarded Mr. Gardner's researches in the vicinity of Pernambuco, and from whence a number of this species were sent to Woburn Abbey and to the Glasgow Botanic Garden. The flower is at present unknown, probably it is small and red, like what we know of other Melocacti: but they had blossomed freely previous to their having been embarked; and, after their arrival copious seed-vessels were produced, long, and of a delicate transparent rose-colour, which, rising in a circle considerably above the crown of red aculei, presented an appearance perhaps more striking than the flowers themselves.

Description. Our largest specimen scarcely measures more than six inches across near the base, below which the plant is suddenly contracted, and above which it gradually becomes smaller to the height of about four inches, whence the crown springs: so that the shape of this Melocactus is that of a depressed cone with rounded sides: and this is deeply cut into about ten broad furrows, forming as many prominent ribs, the ridges and bottoms of the interstices forming moderately acute angles: upon each of these ridges are about four or five clusters of spines, of from five to seven spines in a cluster, subulate, strong, spreading, straight, or but very slightly curved, of a pale brown, or ashen-green colour. At their base is a small, dense, woolly tuft or scar. From the summit of the short crown, scarcely three-fourths of an inch high, and about two inches and a half in diameter, of a woolly substance, filled with excerted, red aculei, very crowded. Fruit, an oblong or rather club-shaped berry, about an inch long, of a delicate rose colour tipped with the withered flower: containing within several nearly globose, shining black, reticulated seeds.

. . . from H. Middleditch

If the illustration alongside the above description is drawn at full size, then the plant concerned measures 140mm across at the bottom; allowing for perspective it could be some 60 to 70mm high. It has ten or eleven stout, deeply angled ribs. In KuaS for 31.11.1980, W. Strecker suggests that HU 482, collected by Horst and Uebelmann in spring of 1978 from the lower reaches of the R. San Francisco, could well be classed as M. depressus. For HU 482 Strecker gives a size of 130-150mm broad by 70-90mm high. Both the drawing in Curtis' Botanical magazine and the description by Strecker appear to be of plants larger than are usually associated with the name of M. violaceus. It may well be that these plants were collected by Gardner on the rocky places alongside the lower reaches of the R. Sao Francisco, further inland then those on the sandy ground not far from the beach.

MELOCACTUS DEPRESSUS **By F. H. Rodier Heath**

From Cactus & Succulent Journal of Great Britain 1938

Owing to a mishap to a steamer on which I was travelling from the upper reaches of the Amazon, I found myself in the little known town of Natal, situated on the Rio Grande do Norte on the east coast of south america, and about sixty miles north of Pernambuco. I rather thought from the look of the country that some cacti might be found, and from the scanty information afforded by the natives I decided to make a little excursion some miles inland in the hope of finding something of interest; and accordingly set out with a day's ration in the company of an old Englishman who had gone native, and a couple of boys.

A tramp across a rather arid stretch of country, mostly desert, with here and there delightful little oases where tropical trees and other forms of vegetation luxuriated, ended in a spot where amongst other forms of plant life was a species of wild india rubber tree which not only afforded a most welcome shade but bore a very pleasant edible fruit about the size of a golf ball. Passing on over large stretches of sand, the sharp eyes of the indian boys soon spotted some of the Melocacti, and sharp eyes are needed as, at this season, the plants were almost entirely buried in the sand which had drifted up (quite stiff breezes blow in from the sea at times) so that all that was visible was the woolly head, much the same colour as the sand around, and woe betide the unwary foot that trod on this, as the spines are sharp and strong.

Here and there I found plants of Melocactus, but they were not very abundant, never more than one or two together, and usually growing under the partial shade of shrubs. The soil was, as mentioned, a fine sand strongly impregnated

with sea salt carried by the prevailing wind (as the sea was only a few miles away as the crow flies) and the roots ran close to the surface to a distance of six or seven feet from the base of the plant among small pebbles, from which no doubt they obtained the condensed moisture from the heavy night dews, augmented by an occasional shower at this season.

I found some fully developed plants of the Melocactus, known locally as Cabeza de Fradi or preist's head owing to the fancied resemblance to the shaven head of a friar. I also found others which I thought at the time was another species, but I discovered later that these were immature plants of the same species which had not yet developed the cap that typifies the Melocactus. All sorts and sizes were growing round, from the fully developed plant with as good cap three inches across, to little ones no bigger than a shilling, but even these had roots extending for a very long way from the plant, pushing out no doubt even in their infancy in search of the vital moisture. I brought to England in all about sixty plants, from which I cut off the long roots. On the voyage home I struck them in moist sand so that on arrival most of them were rooting.

The plant is rather flattened out from above as its name implies and has about twelve to fourteen ridges which are divided into imperfect tubercles each carrying a tuft of spines, stellate in appearance, and about seven in number, with a central smaller one. The younger plants do not show these tubercles and have much the appearance of a small echinocactus. The cap or head of the mature plant is most interesting, consisting of wool studded with minute spines, and from this the little red flowers spring up, followed by the coral seed pods, in much the same way as some of the mammillarias.

On reaching home I potted the plants up in the usual porous cactus compound consisting of loam, brick rubble and some coarse sand and most of them rooted and began to grow. Specimens were sent to The Royal Gardens, Kew, and to Messers Cannell of Swanley, who at that time specialised in cacti, and others to some private collectors, but in no case did they thrive for very long and soon became sickly. The late Mr. W.Watson who was at that time curator at Kew, pointed out that these plants are always found in their native state near the sea and required some salt in the compost used, and when I later came to Weymouth I tried this but was not very successful.

During my rambles in Natal I found one other species of cactus of the tall-growing type, and from these I took several cuttings a foot or so in length, as I could not find any single plants small enough to dig up, the majority being about six or seven feet in height and branching about half up the stem. This plant rooted and ultimately flowered and proved to be a species of Pilocereus, very probably P. palmeri, but it was unknown at Kew at that time.

. . . from H. Middleditch

Would these plants found by Heath have been better described as M. violaceus, since they were growing in sand rather than on rocks? Did the plants of Melocactus violaceus found by W. Strecker and party also have long roots close to the surface of the ground, too? The distance from Recife (Pernambuco) to Natal is more like 120 miles according to my map, somewhat less than the distance from Recife to the mouth of the Sao Francisco river.

PILOCEREUS . . . PILOSOCEREUS . . . PSEUDOPILOCEREUS . . . ??? **By H. Middleditch**

Apart from checking that the greenhouse is kept at a reasonable temperature, there is not a lot that can be done with a collection during the depths of winter. This usually affords an opportunity to browse through some pieces of literature, perhaps to catch up with some of the information that has appeared in foreign language books or journals. Sometimes this may involve refreshing one's memory of flowers, fruits, seeds, distribution area, or some other aspect of the species or genus in question, which often requires a search to be made through further pieces of literature. Occasionally some question of nomenclature does arise, an aspect that would normally not have a great deal of appeal for me. However, if I disregarded the matter, that would leave me without any explanation of why we have to put up with what looks at first sight to be yet more "names for the sake of names"; it would also mean missing the useful and interesting information that can usually be sieved out of the articles which generate yet another name – or disagree with some other author's new name.

So that when I came across an article written by Pierre Braun about some of the plants he had found in Brazil, I was rather intrigued to see that there was an editorial rider concerning the names Pilosocereus and Pseudopilocereus. It was with no small amount of relief that I found the relevant literature dealing with these names was not only fairly brief, it was explicit and understandable. Even more to the point, it raised quite a number of questions about the plants themselves for which I was not able to find a ready answer.

Pilosocereus **By C.Backeberg — From Die Cactaceae Vol.IV**

The history of this names is complicated. It first appears as Pilocereus Lem in Cact. Gen. Nov. Spec.6 for 1839; the name was untenable since Pfeiffer had published the genus Cephalocereus Pfeiff. in the previous year with the same type species as Lemaire, which the latter had evidently overlooked. Later it became clear that a cohesive group of species with more or less abundant hair at the areoles of the flowering zone must form a genus of their own; so Schumann made use of Lemaire's name, gave it a new description with the Type species Pilocereus houlletii Lem. In Kakteenkunde 130.1937 Werdermann proposed this new genus Pilocereus K. Schum non sensu Lem as nomen conservandum prop. Likewise Croizat published in Caldasia 2(8):251.1943 a proposal for Pilocereus as nom. cons. to bring up to date the long standing proposal by Werdermann. A retention of the name Pilocereus K.Schum non Lem went against Article 18 of the International Code of Botanic Nomenclature: "The Name of a Taxon must be changed if the Type plant of the name is removed from it". This was one such instance and on that account the 1954 Paris Botanical Congress declined on principle to retain Pilocereus K.Schum non Lem. A new identification was taken in hand by Byles and Rowley in The Cact & S.J.Gr.Brit.19:3,66-67,1957, as Pilosocereus Byl & Rowl.

. . . from H. Middleditch

It is quite evident that the genus Pilocereus as originally established by Lemaire, constitutes a contravention of what later became a pretty straightforward requirement of the Botanical Code for Nomenclature, i.e. if the type plant is removed from a genus then the genus has to be given a new name. It must have been a pretty clear-cut case because

Backeberg accepted it. It appears that Britton and Rose were well aware that the name Pilocereus was not really tenable since they did not use it as a genus in their own work. Indeed, the change from Pilocereus to Pilosocereus seems to have been generally accepted throughout the cactus literature — except by Buxbaum.

. . . from G. Rowley

The Pilo- v. Piloso-cereus story is dead and buried now and I see no point in exhuming it — at least it could be dismissed in two or three lines.

. . . from H. Middleditch

For those like myself who have never previously understood whether Pilocereus and Pilosocereus were really two different genera, or two alternative names, or what, two or three lines would probably have left me just as much in the dark as before.

Is Pilocereus K.Sch (non Lem) of dual phyllogency? **By F. Buxbaum**
From Sukkulentenkunde VI 1957

I am now able to publish the results of an examination of the flowers of two Pilocereus spp., the brazilian P. catingicola and P. sartorianus from Vera Cruz.

The flower of P. sartorianus expands out of a conical basal part after only a slight constriction of the tube, in a symmetrical bell shape. The ovary is closed above by a thin disc. Above it is found a spacious nectar chamber which in turn is fully closed above by a thin diaphragm originating from the lowermost filaments. The run of the vascular tissue and the insertion of the lowermost filaments from the diaphragm demonstrate that here is an inward projection of the receptacle wall. The further stamens are distributed regularly up to the throat of the tube. The stigma projects above the uppermost anthers with its ca.10 lobes. The stigma lobes are narrow, with gradual transition from style to stigma, the papillae running down the corners from the top of the stigma. A quite similar flower section of Pilocereus lanuginosus is shown in Fig.334 of my Morphology of Cacti, again with the nectar chamber closed by a diaphragm.

Thus these flowers in internal construction are quite similar to that of Cephalocereus hoppenstedtii although they differ externally.

The flower of Pilocereus catingicola is considerably different from that of P. sartorianus, even externally. The shape is more or less cylindrical out of a broader base and then fairly sharply widening out in to a bell shape. In section however it exhibits an outstanding divergence in flower construction in comparison with that of P. sartorianus. Although here too there is only a short ovary, the dividing wall between it and the nectar chamber is relatively thick. The nectar chamber occupies the cylindrical part of the receptacle and in comparison with P. sartorianus is narrow and fairly tall. The essential difference however arises in that it is not closed by a diaphragm, but the wall of the receptacle is considerably thickened below the lowermost filaments and the tube in consequence is narrowed there. The stamens are disposed regularly from the lowermost up to the throat. In contrast with P. sartorianus the stigma is almost knoblike, consisting of only slightly thickened and clearly delineated stigma lobes, that do not run down into the style but have rounded lower ends.

[Further discussion of the phyllogeny of related genera] There is no definite conclusion possible at this stage, despite probable dual phyllogenetic origin of the present Pilocerei.

. . . from H. Middleditch

My first attempt to read this article merely left me in utter confusion, until I eventually found an errata in Sukkulentenkunde VII/VIII which made very significant revisions to the titles of the sketches. Without this errata the sketches together with the relevant text simply do not make sense.

Pseudopilocereus **Buxbaum-Krainz, Die Kakteen — 1968**

. . . Columnar cacti of very diverse stature, some forming trunks and becoming tree-like, others branching near the base, rarely growing as a solitary column; remaining quite low up to very high – 1m to 10m, with 4 to 12 ribs, often coated with rime. Spination also quite diverse. Areoles in the vicinity of the crown, but especially flower-bearing areoles, more or less abundantly woolly (with a few exceptions). Flowers originate from near the crown, or from older parts of stems, from individual areoles which in the aforementioned exceptions are only felted, otherwise are woolly-hairy, or with very long wool and bristles, or only with woolly pseudocephalia.

Flowers nocturnal with very uniform internal structure . . . the internal space in the receptacle narrows above the imposing nectar chamber due to a thickening of the receptacle wall and often from a constriction of the receptacle over a more or less lengthy section. This narrowing zone (axial projection) has adhering to it the descending filament bases of the lowermost stamens so forming a parallel-striped sculpturing ("fluted zone") which is an essential characteristic of the genus. Not till the narrowed zone broadens out into the nectar chamber do the filament bases recede into the wall of the receptacle. At this spot originates the nectar glands which generally extend somewhat between the flutes . . . at the upper margin of the thickened zone the lowermost stamens turn and project in a gentle curve against the style, without forming anything in the way of a diaphragm to close off the nectar chamber, however. The other ranks of filaments also turn inwards, the uppermost reaching up to the throat, are inserted tangentially, and lie against the wall of the receptacle. Towards the top the stamens become somewhat shorter . . . The numerous stigma lobes display a narrow backstripe; they project to unequal heights and are fistlike or pointed with an inclination to collect together like a paintbrush . . . The seeds vary in form from one and the same fruit.

After the proposal by Werdermann to conserve the generic names Cephalocereus Pfeiffer and Pilocereus K.Schumann non Lemaire was rejected by the I.N.C., Byles and Rowley (1957) set up the new name Pilosocereus Byles & Rowley for Pilocereus sensu Schumann, whereby Schumann's Type species Pilocereus leucocephalus Poselger was retained. At the same time (1957) Buxbaum pointed out that the "Brazilian Pilocerei" probably belonged not in the Tribe Pachycereae but in the Tribe Cereeae, which could be demonstrated by the subsequent treatment of the Tribe Pachycereae

(Buxbaum 1961) and Cereeae (Buxbaum 1968). Accordingly the new genus must be established for the "Brazilian Pilo(so)cerei".

When Ritter recently (KuaS 19:90,1985 [sic]) came out in favour of the retention of the genus Pilosocereus Byl & Rowl even for the brazilian spp (!), because in his view the Type species P. leucocephalus Poselg. was falsely interpreted by Britton & Rose, he thereby overlooked that in either case Poselger's species was a matter of a Mexican species, which on the basis of the inner construction of their flowers belongs in either case to the Tribe Pachycereae, whereas the internal construction of the flowers of the Brazilian "Pilosocerei" is fundamentally different in all essential features from the foregoing and they point to the Tribe Cereeae. On that account they can in no case be retained under Pilosocereus. . . . from H. Middleditch

The 1957 paper by Buxbaum states that he examined flowers from two sorts of Pilosocerei. His 1968 paper includes sketches of flowers from four other species of Pilosocerei, whose internal construction is along the same general lines as that indicated in 1957. His earlier paper drew a distinction between the stigma of the Brazilian and of the caribbean Pilosocereus whereas his 1968 paper includes both sorts of stigma lobes within Pseudopilocereus, no doubt as a result of his examination of further sorts of flowers. His 1968 sketch Abb.2 C is of a stigma with longish, slender, partially opened, lobes but without any identification for that particular sketch either in the title to that figure or elsewhere in the text. No doubt this was to ensure that the process which he initiated in his 1957 paper of confusing the issue by mismatching the titles to his sketches, was not allowed to fall into disuse.

A sketch which would appear to be identical to the unidentified stigma appears later as part of Fig.8 in a lengthy article by Buxbaum dealing with the subject of Pseudopilocereus, that appears in Beitrage zur Biologie der Pflanzen Vol.44 for 1968. This paper reports on the flower sections from eight different species, the flowers having been obtained from plants grown in the Jardin Exotique at Monaco, University of California Botanic Gardens, Zurich City Collection, Les Cedres, or from Gastaud at Roquebrun on the Riviera. The flower sections taken from each of these eight species display lowermost filaments adnate to the wall of the tube for a greater or lesser length.

COMPLICATIONS WITH THE TAXONOMY OF THE GENUS PILOSOCEREUS Byl & Row By P. N. Aarsen
Translated from Succulenta 60.11.1981 by H. Middleditch

The confusion over the systematic classification of the columnar cacti growing in the tropical and subtropical area of east Brazil, the east coast of Mexico, and Florida, can almost be described as Babylonian. Initially these wool-bearing columnar cacti with cephaloid flowering zones were placed in the genus Pilocereus (Lem) K.Schum. In 1905 Berger expressed the opinion that the name Pilocereus was established for somewhere to put any strange looking Cereus. Pilus is the Latin word for hair.

After the International Nomenclature commission had rejected the proposal of Werdermann for retaining the genus name Pilocereus, Byles and Rowley introduced the generic name Pilosocereus in 1957 with Pilosocereus leucocephalus (Pos) Byl & Rowl as the Type plant.

On the basis of detailed flower studies, Buxbaum stated in 1968 that the Brazilian Pilocerei should be closely allied to the short-flowered Monvilleas which latter he had earlier separated into the new genus Praecereus. He based this relationship upon the observations that the flowers of Pilocerei as well as those of the Praecereus spp. had a common characteristic, namely a fluted and somewhat projecting section between the nectar chamber and the insertion of the primary stamens. These so-called fluted sections were in fact formed by the lower parts of the primary stamens fusing with one another. For the Pilocerei with a fluted section in their flowers, Buxbaum also set up a new genus, namely that of Pseudopilocereus. This genus would, according to Buxbaum, have been able to develop out of the genus Praecereus over the course of time. The generic name Pilosocereus introduced by Byles and Rowley was not adopted by Buxbaum, because this was based on the type plant Pilosocereus leucocephalus (Pos) Byl & Rowl, which lacked the feature of the fluted section. The nectar chamber in the flowers of these plants is closed by a diaphragm which, before reaching right up to the style, changes into the primary stamens. On that basis Buxbaum classified the plant in with the genus Cephalocereus and accordingly declared the generic name Pilosocereus synonymous with Cephalocereus. He signified that all Pilosocereus spp which could not be classified in the new genus Pseudopilocereus should thenceforward be called Cephalocereus, for example Cephalocereus palmeri.

The abovementioned proposition by Buxbaum was strongly challenged by Ritter in his book "Kakteen in Sudamerika" Vol.1 1979. Ritter states there that as early as 1968 he had pointed out to Buxbaum that the Type plant Pilosocereus leucocephalus (Pos) Byl & Rowl. did not grow near to the Horcasitas in the Mexican state of Sonora, as incorrectly stated in the standard work of Britton & Rose "The Cactaceae" Vol.2 1937 p.52, but by Horcasitas in the Mexican state Tamalipas. This place lies in the warm Atlantic coastal zone of Mexico, whilst the first-named spot is situated in the Andean zone, where on account of its cool climate no Pilosocereus can thrive. Because Cephalocereus spp. are pre-eminently found in the cooler zones, it is according to Ritter unreal to bring into the genus Cephalocereus the spp Pilosocereus leucocephalus or Pilosocereus palmeri which grow in a subtropical climate. One other point of criticism expressed by Ritter concerns the fact that Buxbaum based the new genus Pseudopilocereus on one single flower feature, that is to say the fluted ringlike thickening in the flower tube. According to Ritter the variation in the flower structure within one genus can be very broad. For example in the flowers of the genus Cleistocactus and Matucana there are diaphragms which occur in all sorts of forms, from nearly absent to almost surrounding the style. Also within one species growing at the selfsame habitat location Ritter was able to observe wide differences in diaphragm formation, such as for example in the flowers of Loxanthocereus neglectus v. chimbotensis. Some flowers displayed scarcely any diaphragm, whilst another one possessed a diaphragm entirely enclosing the nectar chamber. Also with typical Brazilian Pilosocerei spp. diaphragms do occur in the flower tube, such as with the Pilosocereus aurilanatus described by Ritter. These diaphragms are also formed by the growing-together of the lower ends of the primary stamens. According to Ritter one must therefore guard against the taxonomic over-rating of one single flower feature, such as is done by Buxbaum.

Moreover Ritter reproaches Buxbaum for shortsightedness, because in his study of the wool-bearing columnar cacti he is very one-sided in paying attention to the wool-bearing without taking into consideration other taxonomic characteristics. Ritter writes that every one who has studied the plants which up to now fall within the genus Pilosocereus will have had regard to the form of the body, the ribs, the spination, the areoles, the wool zones, the flowers which are pollinated by bats, and not to overlook to soft fleshiness of the body. All these features are so typical that Pilosocereus spp are hardly capable of being mixed up with those of any other genus. According to Ritter there is none of the cactus genera so well founded and so well defined as that of Pilosocereus. He thus finds it inconceivable that on the basis of one single flower feature Buxbaum has brought together representatives of this genus with typical Cephalocereus spp., such as C. senilis and C. hoppenstedtii. Cephalocereus spp differ from those of the genus Pilosocereus by the presence of a true lateral cephalium. This is a cephalium that in origin is already present in the vegetative centre. No true cephalium occurs in Pilosocereus spp, the woolly flowering zone develops out of already existing areoles, usually facing towards the sunny side. One other essential difference between the two genera concerns the fruit; all Pilosocereus spp from south Brazil up to Mexico and Florida have more or less depressed spherical fruits, which are typical for the genus and are quite different from Cephalocereus fruits.

This criticism by Ritter was partially endorsed by Rauh. He stated in his book "Kakteen in their habitat" 1979 p.188 that the markedly woolly flowering zones of the Pilosocereus are no true cephalia, such as those described for Cephalocereus hoppenstedtii and Espostoa. On the basis of that, Rauh finds it not strictly correct to consider Pilosocereus Byl & Rowl. synonymous with Cephalocereus, in the manner Buxbaum had proposed. The genus Pseudopilocereus newly established by Buxbaum for some columnar cacti growing in east Brazil was however certainly adopted by Rauh. This means, according to Ritter, a taxonomically ill-founded splitting up of the genus Pilosocereus.

. . . from H. Middleditch

It was (if my memory serves me correctly) over twenty years ago that a photograph appeared in K.u.a.S of a Melocactus cut in half-section right down through the middle, to show that the vascular tissue continued to grow within the cephalium just as it did in the lower part of the body. This cross-section also demonstrated that there was a much less thickness of body tissue between the cepahlium and the vascular bundles than between the exterior of the rest of the body and the vascular tissue; this particular characteristic of a cephalium was depicted in Chileans No.10. A similar half section through the cephalium of a Discocactus is illustrated in Buining's book on the genus Discocactus, again showing the close proximity of the vascular bundle to the base of the cephalium. Thus it would appear that there is no great problem in deciding whether a cactus plant does indeed possess a cephalium or not. I am not aware of anything which shows clearly that Cephalocereus possess a true cephalium, merely that all the literature says they do, which is not the same thing. On the face of it, we have Cephalocereus sensu Buxbaum which contains both cephalium and non-cephalium bearing cacti; this is matched by the proposal of P. Braun to include Facheiroa and Zehntnerella in one genus.

Ritter's argument about the original location of Pilosocereus leucocephalus (Pos) Byl & Rowl. being in a different climate zone to that occupied by Cephalocereus may well be correct in fact. But it is not clear how it can influence the question at issue if one bears in mind that Trichocerei occur in the Argentine plains at about 400m altitude and up in the Andes at over 3000m altitude; in addition Haageocereus occur at one or two hundred metres above sea level near the Peruvian coast and are also found at altitudes as high as 3000m, away from that coast. This appears to be just as broad a spread of altitude as that between the locations in Mexico for Cephalocereus and for Pilocereus Lem., as quoted by Ritter.

. . . from A. W. Craig

You will find another photograph of a Melocactus with cephalium which has been cut into two halves, in the American Cactus & Succulent Journal for 1974. The close proximity of the vascular tissue to the root of the cephalium wool may also be seen here, quite clearly.

. . . further from H. Middleditch

The argument over Pseudopilocereus arises out of a very fundamental difference in approach to taxonomy by Ritter and by Buxbaum. The Buxbaum approach appears to utilise the characteristics of the flowers, fruit, and seed in order to divide a Family into Tribes and the Tribes into Genera. If one or more species are found to possess features which do not conform to those selected as characters for a tribe, then that group of species need to be moved into another, appropriate, tribe and of necessity into another genus. In Buxbaum's view, Cephalocereus have a diaphragm closing the nectary, whilst Pseudopilocereus have an open nectary with adnate filament bases. If no other genus of flowering plants includes both of these features, it would afford support for Buxbaum's move. If this difference does appear in any one genera of flowering plants, then Buxbaum's idea would probably need re-appraisal.

What I have been unable to establish is whether a division into genera of any group of flowering plants outside those of the cacti would normally be done using only those basic features of flower, fruit, and seed, that are utilised to establish a Family, or a Tribe. If this is indeed the case, then it will be difficult to accept the idea put forward by Ritter that other features e.g. of external body habit, should be taken into account when discussing the acceptability of the name Pseudopilocereus.

Methods of taxonomic research **From "Botany" Weier, Stocking & Barbour 1970**

A traditional taxonomist primarily examines plant morphology, searching for a few traits which enable him to separate plants into well-defined groups. Nowadays the choice of traits is limited to those which presumably are (1) genetically controlled (rather than environmentally controlled) and (2) conservative in the evolutionary sense. Flower and fruit morphology, for example, meet these criteria, but leaf size does not. It should not be supposed that the traditional taxonomist limits himself at the start of a study to the examination of only a few traits. He examines many characters, measures many plants, and keeps records of all of these. He eventually, however, subjectively selects only a few characters to serve in determining the number of taxa. The characters he selects are those which show discontinuities and are most helpful in separating related taxa.

. . . from H. Middleditch

Did Buxbaum examine many characters, did he eventually select only a few characters which showed discontinuities? Did Ritter examine many characters – seemingly he did; did he then select those which showed discontinuities? It does appear that the characteristic selected by Buxbaum does show a discontinuity; it also appears to be "most helpful in separating related taxa". So we come to the question of whether it is an acceptable discontinuity. And just what is an acceptable discontinuity for separating genera in other flowering plants? Is it an acceptable discontinuity for the separation of genera in flowering plants other than cacti that the lowermost stamen bases are adnate or form a diaphragm?

Seedcoat morphology and taxonomy of Cactaceae **By W. Barthlott & G. Voit**
From Plant Systematics and Evolution No. 132 1979

In regard to the phylogeny of the cactoideae it is certain that the family relationships of the globular genera are well researched. This is associated with the popularity of these mostly small plants for collection as ornamental plants. On the other hand the classification of the tree-formimg columnar cacti is treated very differently, as living research material for these genera is often lacking. Hunt (1967) placed all these genera in one subtribe Cereinae, whilst Buxbaum (in Endler & Buxbaum 1974) divided them into over twenty different subtribes.

. . . from Bergman, Hensel, Laney, Meerstadt, Melis, Pullen & van Tilborg "The genus Matucana" Succulenta 65. No.6/7 1986

. . . to a large extent Hunt (1974) follows Kimnach's ideas as published in "A revision of the Borzicactus" 1960. Hunt places in his subtribe Cereinae, group C, the following genera: Espostoa, Leocereus, Borzicactus, Cleistocactus, Denmoza, Zehntnerella, Oroya, Trichocereus, Echinopsis, Arthrocereus, Lobivia, Rebutia, and Mila . . . In our opinion the groups are too large in the system of Hunt. He puts into one group genera which are not directly related to each other, such as Borzicactus (including Matucana etc.) and Rebutia, something that only makes the classification more obscure.

. . . from H. Middleditch

So we have a choice of something like Hunt's system where the Pseudopilocereus and Cephalocereus are in one tribe, and on the other hand Buxbaum's system where they are in different tribes. In the latter system they cannot be included in one and the same genera; in the former, they can. If it is still a matter of opinion as to whether they are or are not in the same tribe, then the Tribe they belong to can hardly be an acceptable basis for the validity of Pseudopilocereus. This means we are left with the question of "acceptable discontinuity" posed above i.e. do adnate stamens/fused filament diaphragms constitute an acceptable discontinuity between genera, or not? Are there any parallels to this situation in the British Flora?

. . . from D. Aubrey-Jones.

As far as differences in flowers are concerned within one genera of the British Flora, I have come across one example in the genus Crocus. The flower of Crocus banaticus (also known as Crocus Byzantinus) is very different from any other member of that genus. Of the six petals, the three outer ones are far taller and larger than the inner ones. They are also reflexed when fully open. The inner ones are, by contrast, small, far paler, and remain erect. All the other species of Crocus have six equally sized and spaced ovate petals.

. . . from P. Collins.

In looking specifically at the feature of a diaphragm formed by growing together of the lowermost filaments, this is surely a characteristic found almost exclusively in the tropics where there are a wide diversity of pollinating agents such as bats, humming birds, and numerous sorts of much smaller insects. The diaphragm above the nectar chamber appears to be a device for restricting access by certain groups of this range of pollinating agents whilst permitting access to others. It seems to me that you are unlikely to find any parallel in the British Flora to the particular filament arrangement noted by Buxbaum, in view of the much narrower diversity of pollinating agents that are found in this country.

. . . from G. Rowley

There are indeed taxonomic issues of current interest relating to the status of Cephalocereus and Pilosocereus. Much of the argument laid out above has a nineteenth century ring to it. An awful lot has happened in taxonomy in recent years. It all boils down to saying that Buxbaum was a traditionalist, favouring genera founded on reproductive characters alone (as did Linnaeus); Ritter is closer to the modern phenetic/cladistic school in using all available characters, vegetative as well as reproductive. Modern taxonomists from Davis & Heywood onward overwhelmingly favour the latter approach. Hence Ritter is quite right to challenge the founding of a genus on the presence or absence of a roofed nectar chamber in the flower. This part of the floral syndrome has evolved independently in several unrelated groups of cacti (compare Borzicactus/Hildewinteria) and is obviously adaptive in preventing spillage of nectar and access of ants and small nectar robbers. Hence it rates low as a character, at least at the generic level.

No discussion of generic concepts in Cactaceae is complete without reference to the efforts of the I.O.S working party to arrive at some sort of international agreement on this. Their preliminary report (in Bradleya 4:1986) is essential reading if controversial and liable to modification: admirably conservative in some quarters, dottily perverse in others. Here we find Cephalocereus in Tribe Pachycereae limited to the type species alone (C. senilis), and Pilosocereus in the Tribe Cereus including also Pseudopilocereus and Cipocereus. If these decisions offend, now is the time to shout to the I.o.S. working party to mend their ways.

. . . from G. J. Swales.

The classification of plants into species, genera, and so on, is essentially a man-made conception. Much as it might suit us for the plants to fall neatly into these artificial compartments, they do not always do so. If we consider one of the very first divisions of the flowering plants, this is into monocotyledons and dicotyledons. In one division both the embryo in the seed and the germinating seedling have one cotyledon, in the other division they have two. But this is not the only feature

which separates plants into one or the other of these two divisions. The monocotyledons have leaves with parallel venation, the dicotyledons have leaves with reticulate venation. In general the monocotyledons store the intermediate products of metabolism as sugar, the dicotyledons store it as starch.

However, if we care to look at the ordinary english meadow plantain, here we have a flowering plant, a dicotyledon, which has leaves with parallel venation. So in theory we should have three initial divisions of the flowering plants, not two; monocotyledons, dicotyledons, and plantains. However, this is not done, because almost all the basic characteristics of the plantain place it into the dicotyledons. In just the same way, there are monocotyledons with leaves having reticulate venation, but this is one nonconformist feature, the overwhelming weight of evidence placing the plants concerned in the monocotyledons.

Similarly, limited nonconformity can be expected within families, or tribes, or genera. In the case of Pseudopilocereus, we are provided with two features, firstly the absence of a diaphragm formed by the lowermost stamens; secondly their occurrence in an area of east Brazil which is separated geographically from the rest of the Pilosocereus. But that is only two counts and a great many others should be taken into consideration – all vegetative characters, other flower features, whether the seed exhibits divergencies, etc. What do we know about these aspects?

. . . Buxbaum, Ibid, 1968

Even the seed morphology does not allow of any clear conclusion on account of the appreciable similarity of seed forms in many primitive genera (such as the columnar cacti) since even Monvillea, Cereus sensu stricta, Cereus repandus and Pilocereus catingicola undoubtedly possess very similar seeds, which could signify a close relationship. There is little diversity in the seed even in the Pachycereidineae tribe!

. . . from P. Braun KuaS 35.8.1984

Just as it has already been possible to establish with several other recently discovered Brazilian representatives of the genus Pilosocereus, so also does the species described here (P.rosae) lack the so-called 'canal zone' which according to Buxbaum should be typical for the genus Pseudopilocereus. Furthermore groups of species were found with transition-developments in different phases of evolution. Finally Gruber recently discovered in Venezuela too, species groups with distinctively formed 'canal zones'. Thus in accordance with the present day state of knowledge on the subject the genus Pseudopilocereus is not acceptable any longer.

. . . from H. Middleditch

Some examples of flower sections from more recently discovered Pilosocereus are shown here. In Pilosocereus azureus the tube wall is thickened internally in the immediate vicinity of the insertion of the lowermost stamens whilst below this point there are flutes down the thickened section of tube wall. Both these features were emphasised by Buxbaum as the basis for Pseudopilocereus; some of his flower sections were rather similar to that shown for P. azureus. (In other flower sections made by Buxbaum e.g. P. arrabidae, P. glaucochrous, the fluted section formed a parallel tube, widening abruptly below into the nectar chamber). In the flower section for P. aureispinus the thickening of the tube wall is less marked but a fluted zone still occurs below the insertion of the lowermost stamens. In P. rosae, there is a bulge at the base of the lowermost stamens, but no thickening of the tube wall and no fluted section of the tube. In Pilosocereus superfloccosus, P. supthutianus, and P. juaruensis there is no marked thickening of the tube wall at the point of insertion of the lowermost stamens and no fluting below this point. It would appear that the flowers of Pilosocereus range all the way from the type having the features emphasised by Buxbaum to those in which the features are entirely absent, with pretty well all shades between. Thus it would appear that for Pseudopilocereus we can now read Pilosocereus.

In the same way that there is a range of variation in the wall thickening and in the fluting above the nectar chamber, there does seem to be some minor and infrequent degree of variation in the nakedness of the exterior of the flower tube. It is normally regarded as totally hairless. However it will be evident from Braun's sketch that P. rosae has some short hairs in the axils of the lowermost scales. Even shorter hairs in the axils of the scales are noted by E.E. Pereira for P. vilaboensis.

. . . from J. Forrest

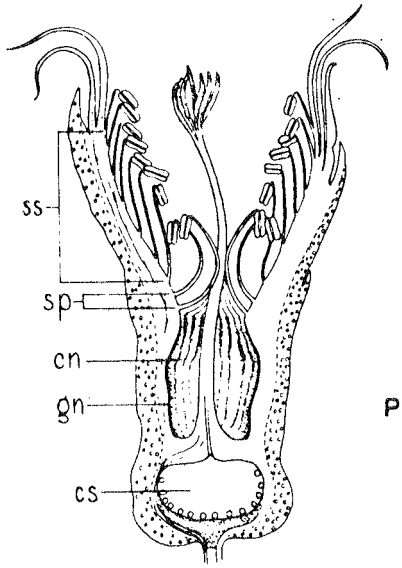
Although I do not have any of the Brazilian Pilosocerei, I have been growing Pilosocerei for several years. I have two P. palmeri bedded out and both are now about three feet high. The older plant flowered in a pot about three years ago and after being bedded out has flowered each year since. Last year it has put on some four inches of growth whilst the younger plant made about a foot of growth and both are now about the same height. The flowers are nocturnal and are very strongly scented, so much so that I would call them obnoxious. The flowers open in the early evening and are still open in the morning but soon wilt as the heat of the day increases. I have found that they have always gone by 10 a.m. even on a cool day. I have so far not set fruit on them, the flower remains going black and then falling from the plant within five days. I have not found any of these plants difficult to grow and they receive no extra heat or protection in the winter when temperatures often go down to below 5° and on some occasions down to as low as one degree above freezing.

. . . from I. le Page

It is many years since I added a Pilosocereus glaucescens to my collection; it grew on steadily until its growing point was getting close to the glass. We had a very severe cold spell in the winter of 1978/79 and as a result my P. glaucescens lost its growing point. However I was rather loth to dispose of the plant and subsequently it put out a flower from one of the older areoles. On an August evening I noticed that the bud had a small patch of white showing at the tip and I suspected that it would open that evening. As I do not have suitable photographic equipment suitable for use without daylight, I decided to put the plant in a cupboard until dawn so that I could get a slide under natural light. However, the flower was open at 10.0 p.m. but the petals had closed up again by six in the morning, so I did not get a slide of the open flower. When fully open the flower was 6cm long and 3cm over the fully reflexed petals; it had fifteen petals, a hairless tube with very few dull green brown-tipped scales, and a protruding stigma. But the most notable feature was the scent! It was of a most repulsive nature – the nearest thing I can liken it to would be decomposing onions! Now what could be attracted by this in nature – bats?

. . . from B. Chudleigh (N.Z.)

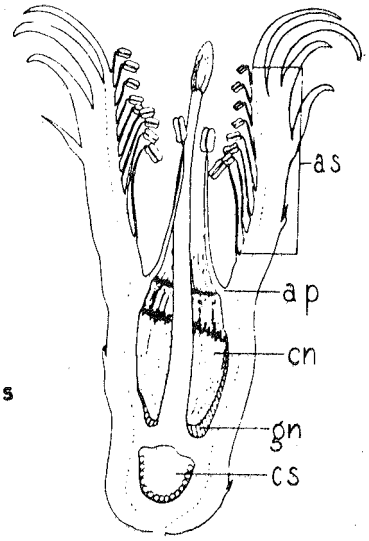
Pilosocereus are generally too large for me; at our last home P. palmeri grew over 2m high and did not flower



ap sp primary stamens
as ss secondary stamens
cn nectar chamber
gn nectar glands
cs ovary

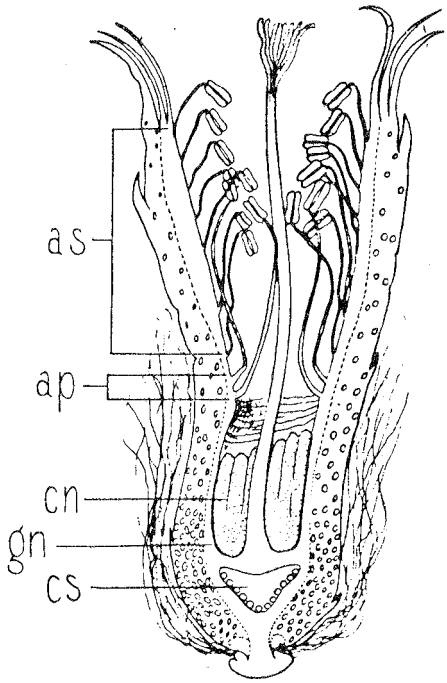
Pilosocereus
azureus

K.u.a.S.
26.11.1975



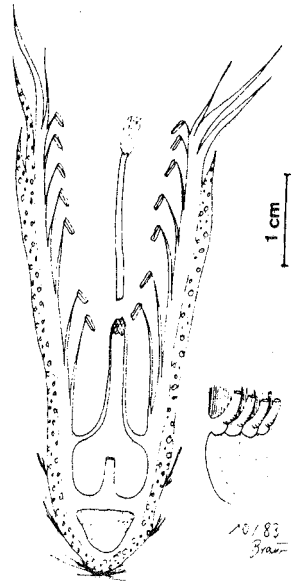
Pilosocereus
aureispinus

K.u.a.S.
25.4.1974



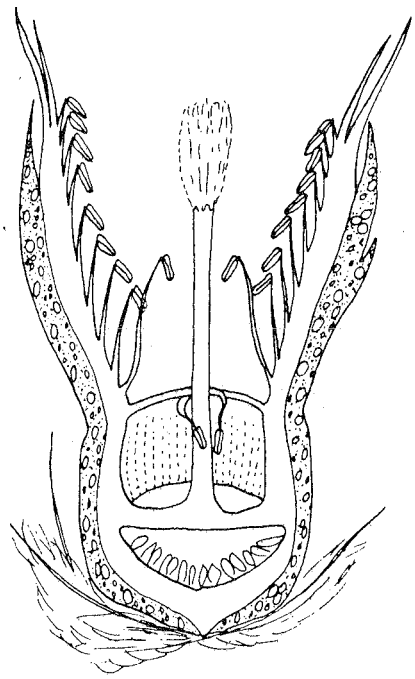
Pilosocereus
superfloccosus

C. & S.J.A.
XLVI 1974



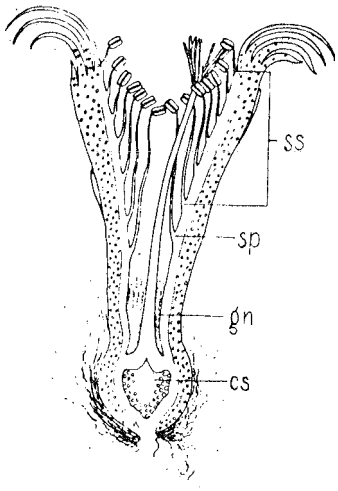
Pilosocereus
rosae

K.u.a.S.
35.8.1984



Pilosocereus
supthutianus

K.u.a.S.
36.5.1985.



Pilosocereus
juaruensis

K.u.a.S.
29.7.1978

PILOSOCEREUS

until I cut the head off because it touched the glass. It reached this height from 45cm in under three years, it was unbelievable. I cut it back to 30cm and the offsets reached the glass again in the same sort of time, and flowered well. It was just too big so it had to be disposed of. I now have P. glaucochrous with eleven branches up to 144cm tall. Woolly flowering areoles areoles radiate out through about 270° but not to the south. Flowers profusely for weeks on end with long rows of buds up the side of the stems.

From a small imported cutting, P. fulvilanatus is now 86cm long; it has five ribs and on the three which face N, E, and W there is dense brown wool, but little wool on the two south facing ribs. It has produced a number of flowers in ones and twos. Pilosocereus aurisetus came as cuttings from Uebelmann, now three plants up to 73cm long; these dwarf Pilosocerei would like more humid, shaded conditions than I give them. Woolly flowering areoles are on the north-east side of the stem over 16cm, some long hairs now developing over upper flowering areoles. Has produced odd flowers. Like most of the Pilosocerei the perfume is unpleasant, some of them are distinctly garlic like in scent.

COMPOST, FEED and FLOWERS **From N. Wilbraham**

It was rather a coincidence to read about both Tephrocactus subterraneanus and Oreocereus trollii in Chileans No.43 since my own plants of both species have flowered this year. They have really been growing quite well since I started changing my compost mix two or three years ago. (A comment that could possibly be applied to most of my plants). Previously I had used a compost that contained a fair proportion of peat and loam and a considerably smaller proportion of gritty material than my present mix. It is quite probable that this compost became almost solid fairly quickly, instead of remaining open and porous, a situation which may have been accelerated by my former practice of too frequent and too generous watering.

My present compost now excludes peat for most plants and is made up basically of four parts of gritty material to three parts of loam from which the dust has been sieved. The gritty material consists of one part each of medium Perlag (3-9mm nominal size), fine Perlag (1-4mm), ⅛ Alpine grit (may be crushed quartzite or granite) and coarse sand (up to 1/16 size and dust free if possible). There is also an 8-15mm nominal size of Perlag which is useful for crocking material and also as additional coarsening material where large pots are in use. Like Perlite, Perlag is derived from the thermal treatment of volcanic lava, but is heavier than perlite. It has a texture somewhat similar to broken brick but softer and lighter in weight. Because of its greater strength and weight compared with perlite it is, in conjunction with the other materials, quite capable of supporting columnar plants adequately.

Obviously there is little nutriment in this mixture, so I make use of a pelleted feed called Osmocote. This is available in various NPK ratios and various solvancy rates so that the total number of permutations are large. In this way it can match various commercial horticultural requirements but it is not readily available, if at all, via retail gardening outlets. A low nitrogen formulation (NPK 6:12:24, 3 to 4 month solvency rate) is made, but usually only to special order and that for a minimum quantity of several tons! As this is a formulation with limited uses in the horticultural trade I have not yet managed to locate a stockist, if one even exists. Consequently I have been having to use one with approximately equal proportions (NPK 15:11:13 plus 2MgO plus trace elements). This is rather higher in nitrogen than I would like but perhaps because of the rather coarse soil mix seems not to induce excessive lush growth as might be expected. Or maybe my occasional feeds of potash help to mitigate the worst effects.

In comparison with growth rates before I changed to my present compost mix, the growth rate is now generally better, in many cases much better, and in a few cases it is little short of astonishing. Needless to say I am delighted with the results. However, please do not change your present practice if it produces what you want. My way may not do so, because of other differences!

It would probably be some time in the mid 1950's when I bought a couple of Oreocereus which were then round about six inches in height, from Kenneth Harle – one of them Oreocereus trollii, the other O. celsianus. By the time I changed my compost mix, both of them had grown to around 18 ins. in height, occupied 9 ins. pots, and carried robust spination and plenty of long hair. The body would be about four or five inches in diameter and whilst this may not be quite as stout as the habitat examples seen north of Salta earlier this year, it is what we might expect in cultivation. In the last two years they have both put on about four inches of new and slightly stouter growth but retained at least the same length and robustness of spination, of areole spacing, and perhaps have produced even greater hairiness. Not only that, but this year, Oreocereus trollii put out six flowers for the very first time of flowering. Maybe O. celsianus will also oblige before long.

It was possibly in the early 1970's when I obtained a plant of Opuntia variiflora from a local collection which was being dispersed. At that time the plant would be fairly small, compact, with few heads making a low clump. Up until the time I changed my compost it had not put on much in the way of new growth, but over the last couple of years it has done remarkably well. About half a dozen extra heads have appeared and in addition the existing heads have made more growth. On all this fresh growth the more or less diamond shaped outline of each tubercle can be seen but the tubercles scarcely project beyond the well rounded outline of each joint. On all new growth, whether from the extension of the existing heads or on newly formed heads, the spination is of the somewhat gingery-coloured "spider-like" type, with twisting spines. The lower parts of all but the new heads carry not these spines, but the shaving brush type – possibly they are a tuft of glochids, not spines? Since the areoles carrying these latter tufts presumably had the spidery type of spines when young, the spidery ones must have fallen away. Obviously further observation is needed here.

When one of this year's offsets was removed from this plant it became clear that the cut surface right at the junction of the segments was about half the thickness of the segment, which may be proportionately more than other Tephrocacti which often have a connecting area between segments barely larger than the size of an areole. This plant flowered both in 1985 and in 1986, in the latter year with half a dozen flowers of a magnificent shell pink colour. Now the corollas have withered and fallen off, the long bristle-like spines around the upper margin of the ovary are very obvious. I shall be surprised if the fruits ripen however because they are now quite soft and deformable and almost certainly have no seed inside them to develope into a fully mature fruit.

. . . from H. Middleditch

A catalogue of Winter's seed, published in 1952, together with another published in 1953, was received from one of our New Zealand members; these are just roneoed sheets, not like the 1954 and subsequent catalogues. On 22nd February 1953 Ritter crossed into Bolivia at Villazon on his first seed collecting trip and the 1953 Winter catalogue offers several sorts of Oreocereus which almost certainly were collected earlier that year. It is quite possible that the two plants grown by N.E. Wilbraham were raised from this seed, which would make it some 23 years from sowing to flowering.

CHILEANS' 1987 WEEKEND

In previous years we have been able to listen to valuable accounts of visits to various parts of South America, but for the very first time we expect to hear from P. Braun about his trips to Brazil. Our visiting speaker has selected the date of July 10/12th for the Weekend and once again we shall be at Nottingham University, this time at Hugh Stuart Hall. The Event will commence with an evening meal at 7.00 p.m. on the Friday and close with a buffet tea at 4.00 p.m. on the Sunday. We hear that R, Ferryman will be able to provide an account of his latest visit to Chile which took place at the start of the current year; we also anticipate hearing from R.K. Hughes about another section of his 1986 trip to Peru. The cost for all meals and accommodation will be £46.50 per head, payable before June 15th to Mrs. M. Collins.

We understand from P. Braun that he will first introduce us to the nature of the countryside and flora of those parts of Brazil which he has visited, followed by separate talks on Melocactus, Discocactus, Cephalocereus and Pilosocereus. Plants of any of these genera will be welcome for discussion. Reference files will be available for virtually all new species of these genera which have been described in the last ten to fifteen years. We also hear from R. Feryman that he will be able to give us an account of his 1987 visit to Chile, covering the coast from Tocopilla to El Cobre and (separately) the Copiapo and Paipote valleys. There will be an account by R. K. Hughes of his 1986 visit to Yura and the Calca canyon near Arequipa. We anticipate some further comments on Ritter herbarium specimens from R. Mottram and some further comments on Echinopsis from M. Muse; plants of Lobivia aurea, fallax, quinensis, leucomella, cylindrica, shaferi and luteiflora will be welcome for discussion, also plants of Lau 972 and 973, Lobivia tirquipaya and independencia, R244, E megacarpa and E. ayopayana. A brief account of Oroya fruit will be presented by P. Allcock. Plants of Submatucana will be welcome for locating on a floor map together with a more detailed review led off by G. Charles of madisoniorum (also its vvs), paucicostata, and especially pujapatii. Connectives on anthers will be illustrated by slides from F. Fuschillo. Any other plants slides, or queries of interest will be welcome.

In addition we hear that J. Piltz will be visiting the U.K. and will be able to join Chilean members for an informal discussion on August 2nd, for which arrangements will be finalised at the Nottingham Weekend.

Some soil certainty? From A. Wheatcroft

An aspect which I feel has long been neglected in the cactus literature in general is detailed information about the nature of the soil at any cactus habitat. Information on such important aspects as porosity and particle size distribution, humus content, pH and so on, are almost unobtainable. What I was wondering is whether the Chileans could persuade any members fortunate enough to be able to visit habitat locations to record selected information. For example, pH can be easily measured with sufficient accuracy by means of a horticultural test kit, the light intensity which may be measured by the camera light meter. A rough particle size distribution in the soil can be established by the old fashioned system of shaking up a sample with water in a test tube and allowing it to settle. A relatively small amount of effort could thus slowly build up a compilation of data of considerable value for optimum cultivation of our plants.

The desirability of having pretty accurate ecological data is a bit of hobby horse of mine — it has always struck me as a bit odd to grow exotic specimens, often expensive and/or rare, with very little understanding of their actual requirements.

. . . from H. Middleditch

I would suggest our member participates in our Annual Weekends when he may have an opportunity both to find out at first hand how much of a problem it could be to try and undertake such observations in addition to navigating, camping, photographing, and collection, as well as trying to persuade those concerned to consider tackling this sort of thing as well.

Slides from our Slide Library

At one of our previous Weekends a box of slides was collected on loan from our slide library by a member, whose name was (by mischance) not recorded. Would anyone who believes that they may be holding these slides please get in touch with our slide librarian, A. W. Craig.

Chileans Stand at 1987 BCSS Show

We have been offered space for a Chileans stand at the 1987 BCSS Convention & Show. A compact stand will be erected and kitted out by G. Charles, where members and potential members may meet and discuss matters of mutual interest. Would anyone attending this event who would be able to assist at The Chileans stand for (say) half an hour, please contact G. Charles directly.

CONTENTS

THE CHILEANS

Organiser	H. Middleditch, 5, Lyons Avenue, Hetton-le-Hole, Co. Durham, DH5 0HS.
Treasurer	R. L. Purves, 19, Brocks Drive, Fairlands, Guildford, GU3 3ND.
Membership Sec. & Back Numbers	Mrs. G. Craig, 32, Forest Lane, Kirklevington, Yarm, TS15 9LY.
Slide Librarian	A. Craig, 32, Forest Lane, Kirklevington, Yarm, TS15 9LY.
Weekend Events	Mrs. M. Collins, 11, Tudor Gardens, Upminster, RM14 3DE.

STUDY GROUPS/REFERENCE COLLECTIONS

Cleistocacti	T. Lavender, Kalanchoe, Market Place, Tetney, DN36 5NN.
Copiapoa	A. W. Craig, 32, Forest Lane, Kirklevington, Yarm, TS15 9LY.
Echinopsis	M. Muse, 32, Fielding Road, Birstall, Leicester, LE4 3AJ.
Frailea	J. Forrest, Spring Garden, 2, Darngaber Road, Quarter, Hamilton, Scotland.
Gymnocalycium	F. Fuschillo, 55, Emberton Court, Torpion Street, London, EC1V 0EP.
Matucana/Borzicactinae	P. Allcock, Springhill Farmhouse, Plum Lane, Shipton-under-Wychwood, OX7 6DZ.
Melocactus/Discocactus	J. Arnold, Suffolk House, 2, Oak Hill, Washingborough, LN4 1BA.
Neoporterianae	R. Ferryman, Nichelia, The Street, Stonham Aspal, IP14 6AH.
Notocactinae	G. J. Charles, Briarsbank, Fosterbridge, Ketton, Stamford, PE9 3UU.