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The Cactus and Succulent Journal of Great Britain



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Cover design: *Agave americana* 'Marginata'
Drawing by Darwin Schutzer-Weissmann

The Cactus and Succulent Journal of Great Britain

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Those Remarkable Cactus People

Many members will know that our indomitable President, Mrs. Dora Shurly, who will be 88 next birthday, has been seriously ill. Complications have hampered her recovery, but I am glad to say she is very much better, cheerful as ever, and living with her elder daughter and son-in-law at Dunstable. (Her address is c/o Mr. & Mrs. Scanlan, 1 Hawthorn Close, Dunstable, Bedfordshire.)

I visited Mrs. Shurly on the morning of New Year's Day, when she was staying with her other daughter and son-in-law near Watford. She was in very good form (even after a late night toasting the New Year in with champagne!) and she asked me to convey her best wishes for a happy and successful year to you all.

Also on the sick-list last Autumn was our Secretary, Bob Read. He timed things very well, making all the arrangements for the Society's Annual Dinner before going into hospital for a hip operation, and getting back on his feet again just in time to attend the Dinner himself! Well done, Bob!

The festive evening was very successful and enjoyable. We were proud to welcome Dieter Supthut, Director of the City Succulent Collection at Zurich, as Guest of Honour, and to have John Donald, President of I.O.S., and Will Tjaden among those who made speeches. To round off the evening, Dieter showed a superb series of slides of the Zurich collection. Proposing a vote of thanks, Mr. Ronnie Dale said what

several of us, I suspect, were thinking; 'After seeing some of the continental collections for the first time I felt like throwing all my plants away—after seeing Mr. Supthut's slides I feel like throwing my slides away too!'

They say that dog-owners grow to look like their pets. Not only dog-owners, perhaps? Just before the Dinner, someone peering into the room was heard to remark: 'Yes, these are the Cactus People all right ...'.

Autumn Show Award-Winners

At the Society's Autumn Show, held at Westminster on 11-12 October 1977, the award-winners were as follows:

Best Cactus: Mr. & Mrs. Maddams
Best Succulent: Mr. & Mrs. Maddams
Sir William Lawrence Cup: Dr. & Mrs. Rolfe
Evelyn Theobald Cup: Mr. & Mrs. Maddams
Collings Cup: Mr. A. Byles
Pryke-Howard Cup: Mr. & Mrs. Maddams
Pullen Cup: Dr. & Mrs. Randall
Hedges Cup: Mrs. R. Edmonds
Farrow Cup: Mr. G. Cryer
Junior Shield: Mr. N. Randall
Denton Medal: Mr. & Mrs. Maddams
Banksian Medal: Mr. & Mrs. Maddams

Correction to Pimlico Show Awards: The *Cutler Cup* was won by Mr. & Mrs. Maddams, not Dr. & Mrs. Rolfe as reported in the previous Journal.

Slide Competition Winners, 14 December 1977

Class A: 1st P. Whicher 2nd I. Le Page
 3rd J. Meldrum
Class B: 1st & 2nd I. Le Page
 3rd Mrs. M. Stillwell
Class C: 1st Mrs. M. Stillwell 2nd Mrs. P. Jones
 3rd I. Le Page
Class D: 1st I. Le Page 2nd P. Whicher
 3rd Mrs. P. Jones

Owing to the indisposition of Mr. Miller, the competition was judged by Peter Chapman and Margaret Martin. They commented that the standard was higher than in past years, but that some of the plant portraits would have been better if more care had been taken with the choice of background and the label had been removed. Composition and general effect could also have been improved in some cases by masking.

New-style Annual General Meeting

Try to attend the A.G.M. at Kew on Saturday 18 March if you can—details on p. 26. Besides the business meeting itself, when you have the opportunity to meet and appoint the Society's officers and discuss the Society's performance in 1977 and plans for the future, there will be a tour of the new nursery area behind the scenes (described on p. 43 of last year's May journal) and a talk on *Dolichothele* by Nigel Taylor.

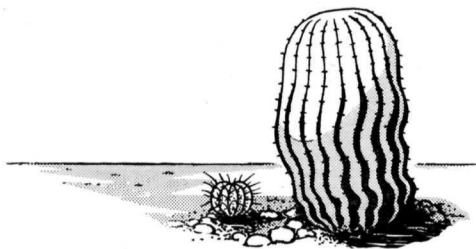
Import and Export Statistics

Late last year the Department of the Environment published statistics on licences issued in Britain during 1976 under the Endangered Species legislation. The figures seem to suggest that our cactus growers are doing more for the balance of payments—and the balance of nature—than their counterparts in the orchid trade:

No. of plants licensed	Cacti	Other succs.*	Orchids
Import	29311	2226	24806
Export	14960	2961	760

*Genera covered: *Euphorbia*, *Aloe*, *Pachyodum*, *Anacampteros*

These figures should not be taken too literally. For one thing, licences are requested by importers in anticipation of the plants being supplied, so that the number of plants actually imported may be appreciably less than the total allowed for. Moreover, the lists do not distinguish between plants which have been nursery-grown abroad and those which have been obtained directly from the wild.



'Some day, son, all this will be yours'

Second Cousins to the Boojum?

Traditionally, the Ocotillo and Boojum Family *Fouquieriaceae* has been thought to be related to the tamarisks (*Tamaricaceae*), though I confess I could never see much resemblance myself. More recently, some authors have suggested the Potato and Bindweed Families (Order *Solanales*) as more plausible allies. New support for the latter viewpoint comes from recent work on the anthocyanin pigments of *Fouquieria* flowers. Ron Scogin of Rancho Santa Ana Botanic Garden reports the presence of pelargonidin glucosides and hyacinthin in *Fouquieria* flowers, and this is consistent with a relationship with the *Solanales* (R. Scogin in *Biochem. Syst. Ecol.* 5: 265-7 1977).

Rebutia types

from Thalia Bence

Twenty-seven new *Rebutia* names, including no less than twenty-three new species, were proposed by F. Ritter in the German journal *Kakteen und andere Sukkulanten* 28 (4): 76-78 (1977). The text was not altogether explicit about the nature of the type material. An enquiry to the Utrecht herbarium has confirmed that herbarium material does exist, but—like Ritter's descriptions and locality data—it is, apparently, minimal.

BOOK REVIEW

Margaret J. Martin & Peter R. Chapman. *Succulents and their cultivation*. 300 pp. (9" x 5½"), c. 50 illustrations, some in colour. Faber & Faber, London, 1977. Price £9.50.

The companion volume to the popular 'Cacti and their cultivation' by Martin, Chapman & Auger has now appeared, and is similar in style and layout. The introductory chapter contains a clear and concise account of cultivation techniques for the beginner and is followed by a more comprehensive treatment of each of the major succulent plant families (excluding Cactaceae, of course) in turn. Two chapters dealing with some of the more unusual succulents, such as 'caudiciforms' round off the book, and one is left wondering how one is to accommodate all the plants one is encouraged to grow!

The text is most readable and the advice given has the great virtue of being drawn from personal experience. What a pity the publishers have not taken full advantage of the authors' other well-known skill, as photographers. Only about 50 illustrations, some in colour, are included, despite the book's high price of £9.50 (only £1 less than Jacobsen's *Lexicon of Succulent Plants*).

NIGEL TAYLOR

Phytogeography and the study of Succulents

G. D. Rowley

Plant Sciences, University of Reading

Phytogeography or Geobotany, as it is variously called, deals with plants and their distribution throughout the world. More than most subjects it overlaps many others. How plants change as they migrate into new terrains is the concern of the ecologist and evolutionist. How they travel requires a knowledge of pollination and dispersal mechanisms. To explain the movement of whole continents we must call in the help of physicists and geologists. And since present-day distribution is the outcome of millennia of to-ing and fro-ing, we need all the help the palaeobotanist can give to examine the fossil record of past floras.

In this brief account I shall be limited more to the questions that can be asked than to the answers; to an outline of the subject rather than to summing up past achievements.

Patterns of distribution

The distribution of any taxon, be it species, genus or higher category, fits one of three patterns: widespread, endemic or disjunct (discontinuous). The terms are relative, not absolute. 'Widespread' means wider in range than is average for the group; 'endemic' means confined to narrower than normal limits. Succulents are no different from other flowering plants in providing abundant examples of all three types. Thus the family Crassulaceae is widespread, occurring on all five continents; so is the genus *Peperomia* (pan-tropical) and the species *Cissus quadrangularis*, reported from the Transvaal up to Somalia, Arabia and part of India. Examples of endemics are the family Didiereaceae, limited to SW Madagascar, the genus *Greenovia* from the Canary Isles, and the species *Aloe mendesii* from a few unscaleable cliffs in southern Angola. Endemics can be further subdivided according to whether they are new (*neo-endemic*): a species at the start of its career, or old (*palaeo-endemic*): a relict of former widespread days now reduced by competition to a single last stand.

Disjunct or discontinuous distribution is the occurrence of the same taxon in two or more areas farther apart than is normal for the free interchange of genes. Here much of our interest arises from our basic belief in monophyly; that is, that species evolve once only, and where the same species is found in areas far apart, it has somehow migrated from a common ancestor. In absence of exact phylogenies and evidence to the contrary, this is the simplest and most logical interpretation. Hence discontinuity presents a problem: how did *Anacampseros* and *Bulbine*, for instance, with over fifty

species each in Africa, also come to have representatives in Australia, or *Kalanchoe*, predominantly a genus of Africa and the Old World tropics, reach Brazil?

Barriers to migration

First, we may consider the barriers to free migration of plants. The sea is one obvious block, and the analysis of island floras has fascinated botanists since it first attracted the attention of Darwin and Wallace. Islands, because of their isolation, can be active centres of evolution. One has only to think of the wealth of Crassulaceae found on the Canary Isles and nowhere else; the riches of Socotra, and the isolated caudiciform curios such as *Pelargonium cotyledonis* on St. Helena, *Impatiens mirabilis* on a small island near Sumatra and *Brighamia* on Hawaii.

Mountain ranges are another barrier to the spread of plants, the environment often being very different on the two sides: rain or cloud forest on one, desert on the other. The differentiation of *Neoporteria* into two groups, recognised as separate subgenera, on either side of the Andes provides a good example of long isolation and independent evolution. Latitude is another barrier to the spread of species. Because each is more or less adapted to its own particular range of temperature and day length, movement East or West is easier than North or South, where climate and day length would differ. On a map of the world one finds most of the wide distributions extend horizontally; very few taxa have been able to cross the Equator and colonise both hemispheres. Of course, in all these considerations we must remember that the climate of different countries has changed a lot in the past; tropical palms once grew wild in Great Britain as the fossil record shows.

Means of transport

Many questions are asked regarding the means whereby plants can travel long distances and surmount these barriers. Can seeds or scraps of live plant be transported by sea? Could the fine dust-like seeds of a genus like *Kalanchoe* be carried by the wind across the Atlantic? Or do migratory birds act as vectors for seeds or bits of vegetation? The evidence is rather scrappy, but more and more is gradually coming to light as we learn more of the habits of birds, their migration routes, and the directions of winds and ocean currents. It has been calculated that the present extraordinary flora of Hawaii, with nearly 90% endemics, could have come into being

if one genus were introduced every 20,000 years—ample time to allow for freak storms, hurricanes, tidal waves and other natural disturbances to bring off the lucky once-in-a-million accident. The most recent, but also by far the most effective, disperser of plants is man himself. But he has been active long enough for the natural distribution of many species to have become already blurred so that we no longer know for sure where they originated—if indeed they are not ancient hybrids. Plants considered of use to man are especially prone to removal, as for instance *Aloe barbadensis*, *Portulaca oleracea* and the sand-binding *Carpobrotus*.

A cautionary note in interpreting distributions comes when faced with possible convergent evolution. As many European growers are now aware, South Africa is not the only home of the extraordinary 'Elephant's Foot' plant (*Dioscorea* Section *Testudinaria*), with its unique, more or less overground, tessellated caudex. An almost identical species is to be found in Mexico. At first sight this tempts one to consider them close allies. However, we must always view such situations in the context of their allies; the genus *Dioscorea* has some 600 species spread all over the tropics and subtropics, and this is far more likely to be a case of convergent evolution from different ancestors in response to selection for adaptation to life in similar dry environments.

Continental drift

A tremendous stimulus to plant geographers in recent years has been the emergence of the theory of continental drift from fantasy to established fact. Thanks to much work by physicists and geologists we are now confident that the continents were once united as a single large land mass which split up and gradually drifted apart, the drifting continuing even today. Those in search of further enlightenment are referred to the admirable little book of Tarling (1971). Difficulties arose regarding timing; the break-up of the land mass was dated from Upper Carboniferous to Eocene (300 to 80 million years ago) and if continental drift alone was responsible for the present disjunct distributions of so many land plants, their ancestors must be presumed to be present on the primordial land mass prior to the separation. Now, it is noticeable that many of the disjuncts are genera considered to be among the most advanced structurally (and hence, most recent): in succulents, *Senecio*, *Euphorbia*, *Sarcostemma*, *Ceropegia* and so on. Absence of fossils had led us to think that these differentiated far too late for this convenient explanation to apply. However, this is negative evidence and in any case we know that xerophytes grow in places where fossil formation does not take place, because of lack of water, so one would not expect to find fossils of the above. A result of all this is a shift of belief: the ancestors of today's flowering plants are considered to have been in existence at a much earlier age, and before the break-up of the great land mass. However,

this does not discount the chance long-distance dispersal of some species by other means, and certainly man has been responsible for some, such as the occurrence of the South African annual *Mesembryanthemum* in California.

Linking up the evidence: *Caralluma*

Plotting our favoured plants on a map, whether as individuals, species, genera or families, gives a new dimension to thoughts on their classification and evolution. Often a pattern emerges—a gradient of characters from one area to another, and taxonomic problems of where to draw the line between species may be resolved in a flash. Most modern workers hence pay due regard to distributions, a good example being Clausen (1959, 1975), whose survey of American stonecrops involved systematically sampling populations from all the main areas of North America where *Sedum* was known to occur.

Often the inclusion of additional data such as chromosome numbers on the map adds much to the interpretation. Thus Albers (1976) mapped the widespread genus *Caralluma*, which extends over much of Africa, Southern Arabia and peninsular India. Primitive characters in the genus are expanded leaves (the Indian *C. frerei*) and tapered, non-succulent inflorescences, which link the highly succulent species of Southern Africa with their mesophytic ancestors in the tropics. These grow today in tropical West and East Africa. Looked at on the map, we get the impression of a possible migration route for *Caralluma*, starting in Southern Asia, home of many mesophytic Asclepiadaceae, and moving into Africa westwards with two separate branches, one going south and south-west into the Cape area, the other to north-west Africa and the Canaries. But further interest arises when Albers adds the chromosome numbers. In addition to the general mass of diploids, polyploidy is found in three areas at the extremes of the present-day range; tetraploids in India and the eastern Cape, and some very high polyploids in north-west Africa and the Canaries. Diploids are always ancestral and polyploids derived; polyploids produce finer shades of variation which could predispose them to a closer fit to ecological niches than is possible for diploids. The tetraploid in India is *C. frerei*, which is presumed to be a relict but could not be in direct line of ancestry to the rest of the genus which is largely diploid.

Rhipsalis

Of particular interest in Cactaceae is the occurrence of representatives apparently wild outside of the Americas. These are all closely allied members of the epiphytic genus *Rhipsalis*, of which as many as a dozen 'species' were reviewed by Roland-Gosselin in 1947 and reduced to four. I will refer to them here as the *R. baccifera* complex (*Rhipsalis baccifera* (J. Mill) Stearn, sens. lat., syn. *R. cassutha*). It might be appropriate to quote the wise words of Camp (1948) who noted that the wider

the distribution of any taxon, the greater was the tendency of taxonomists to split it up, if only from ignorance of each other's work. There is the feeling that a species that grows in, say, Ceylon cannot possibly be the same as one growing in Mexico, and when looked at closely enough some features will surely be found to separate it. Backeberg was a great exponent of this doctrine, making separate genera for cacti North and South of the Equator. But there is nothing whatever in the facts revealed so far to justify this attitude—indeed, there is a lot to be said against it. Certainly it is true that the longer two populations have been separated from one another the greater is the likelihood that each has evolved distinctive features and that they may even lose the ability to interbreed if brought together again: we must weigh each case separately and not make *a priori* judgments.

Roland-Gosselin rather too blandly accepted birds as the agency responsible for the long-distance transport of *Rhipsalis*, whose small white berries are very attractive to birds. Others blame man as the vector, either intentionally or unintentionally; I have heard one ingenious theory that in the absence of genuine mistletoe, sailors making the Atlantic crossing around Christmas time may have decorated their ships with sprigs of *Rhipsalis* from South America and subsequently discarded them in Africa. It is perhaps worth noting that of the more than sixty species of the genus, the only one to venture so far from home is the one that looks most like mistletoe. Camp favours continental drift as explaining *Rhipsalis* distribution. He was an early champion of Wegener's theory and cites in support examples of other genera of plants and animals common to South America and Africa.

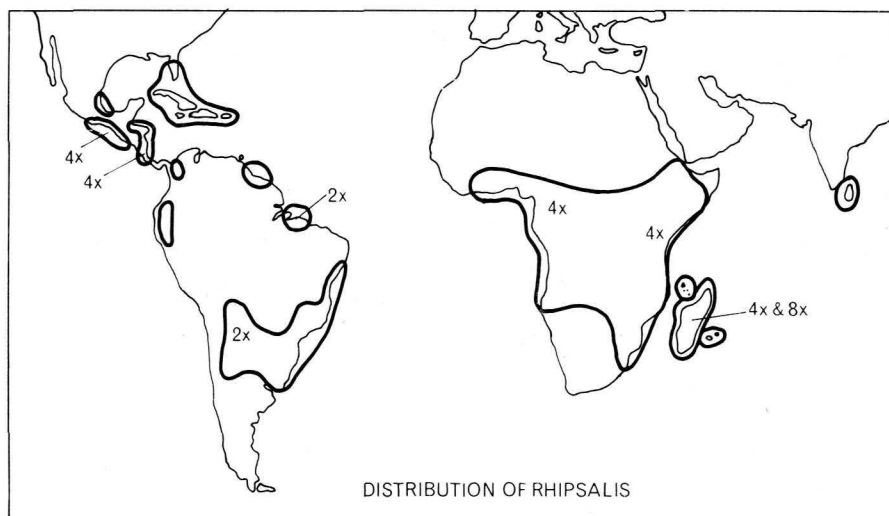
The map presented here shows the wide but disjunct spread of the *Rhipsalis baccifera* complex today. There

may be yet more areas that I have missed. Recent work by Barthlott and others has added to our store of knowledge, notably in showing that we are dealing with plants of three different chromosome levels: diploid, tetraploid and octoploid. A polyploid is more or less completely cut off from its diploid ancestors, with which it forms no or sterile hybrids, so is commonly the first step to originating a new species. Madagascar, it will be noted, boasts tetraploid and octoploid *Rhipsalis*, where Guillaumet in 1972 recognised three species: the widespread *R. baccifera*, *R. horrida* and *R. suareziana*. These examples show how phytogeography interacts with morphology, cytology and other disciplines to give an added dimension to systematic studies of plants, to the delight—or embarrassment—of the taxonomist and evolutionist.

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Distribution of the genus Rhipsalis. R. baccifera is the most widespread species. Its ploidy level, where known, is indicated by the symbols 2x, 4x, 8x.



Three spiny Euphorbias from Kenya

by Susan Carter

Royal Botanic Gardens, Kew

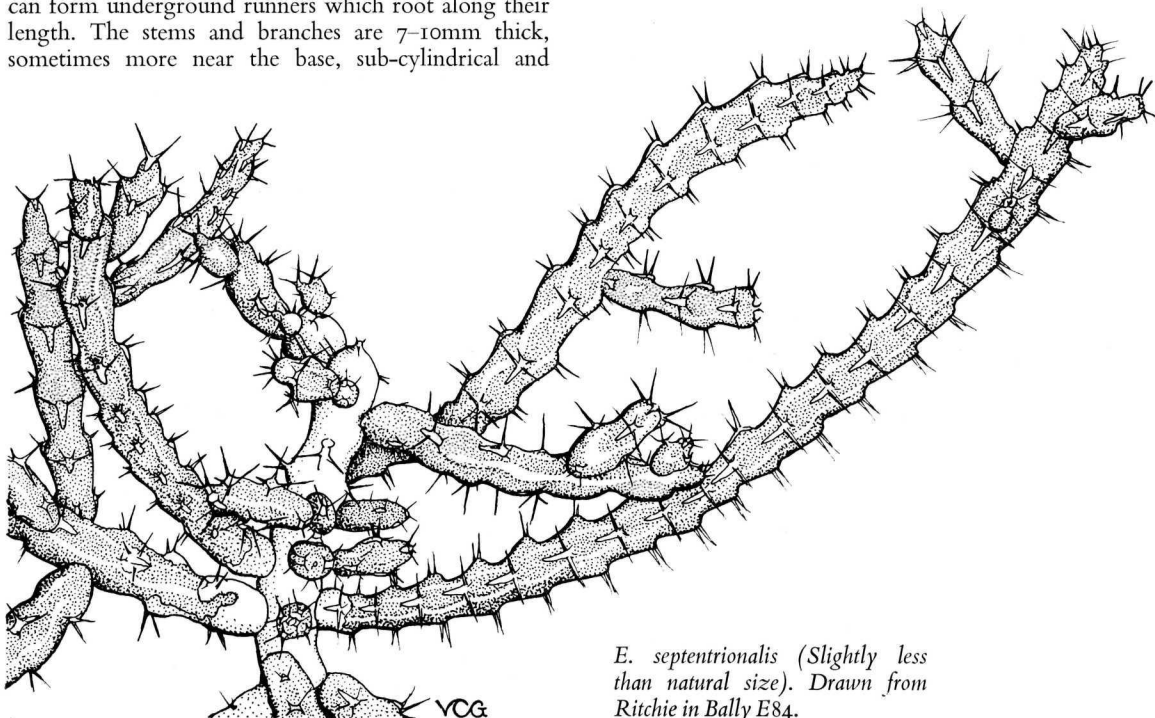
Three recently described species of spiny succulent *Euphorbia* from Kenya are now becoming more widely distributed in cultivation. They are *E. septentrionalis*, *E. saxorum* and *E. classenii*, all described by Bally & Carter in the Kew Bulletin 29: 507 (1974).

Of the three, *E. septentrionalis* is the commonest and most widely distributed in East Africa. It has been collected many times as an herbarium specimen since the mid 1930's, its distribution ranging from southern Ethiopia and from the mountainous regions along the border between Kenya and Uganda, to the eastern side of the Rift Valley in central Kenya. It grows in seemingly inhospitable conditions, usually on a windswept plain or gentle slope of rocky, sandy soil with only light scrub as covering vegetation.

A mature plant has a thick tap-root with its secondary roots fibrous and spreading. The sparsely-branched stems are very numerous and of varying length, erect when fairly short to form a dense tuft up to 15cm in height. They sometimes grow much longer, occasionally as much as 1m, when they become decumbent and can form underground runners which root along their length. The stems and branches are 7-10mm thick, sometimes more near the base, sub-cylindrical and

slightly toothed with the teeth in four series. They are a light glaucous green in colour with the angles a darker green. Under the scorching African sun these colours turn to greyish-green with a purple stripe. When the plants are found in more sheltered conditions, growing amongst the grass at the base of bushes, the long stems become semi-scandent, remaining turgid and attaining a diameter of more than 1cm. In such situations the variegated coloration disappears, as it usually does in cultivation here, where it is difficult to reproduce the conditions of heat and drought found in the species' natural habitat.

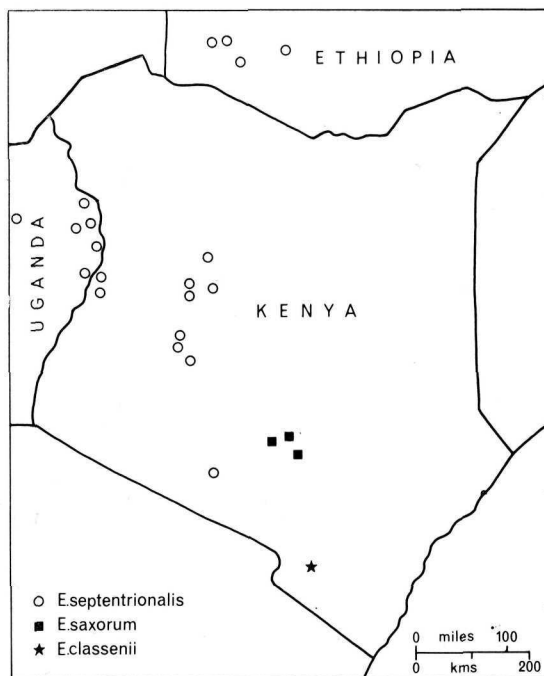
The light-grey spine-shields are widely spaced, crowning the small teeth. They are triangular in shape, bearing a pair of needle-like spines. Very small prickles (secondary spines) are usually present at the upper corners of the shields. The solitary, once-forked cymes arise at the apices of the branches immediately above the spine-shields. The peduncles and cyme-branches are



E. septentrionalis (Slightly less than natural size). Drawn from Ritchie in Bally E84.

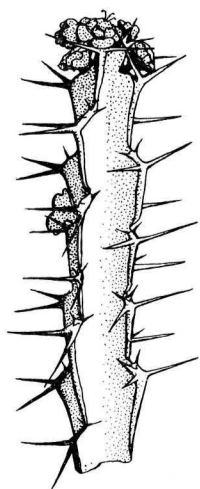
fairly long, to 5mm, terminating in broadly funnel-shaped involucre with yellow glands. The central involucre is deciduous after producing only male flowers. The lateral involucre develop later, the styles protruding first, followed by more stamens. The capsule, when mature, is not exerted from the involucre, being borne upon a pedicel only 1–2mm long. It is ovoid in shape, 4 x 3mm, obtusely 3-lobed, and green with pronounced purplish stripes along the sutures.

Euphorbia saxorum is much less common, and has so far been found only in a limited area to the east of Nairobi where it was discovered by Peter Bally and R. O. Hennings in 1952. (Collections cited from near the northern borders of Kenya are most probably of an undescribed species). It has thinly fibrous roots which anchor the plant in rocky crevices, usually shaded by trees and shrubs. Its numerous stems are 4-angled, dark green, and even in cultivation attractively mottled with a darker purplish-green. They are seldom branched, trailing over the rocks to a length of 30–40cm, with only the short young stems remaining erect. The spine-shields are a dark grey, slender, and almost contiguous along the barely toothed angles. The needle-like spines are reddish when young and can be almost 1cm in length. Prickles are also present, varying in length from 0.25–2.5mm. The cymes are produced immediately above the spine-shields and, an unusual feature with these small spiny *Euphorbia* species, generally consist of only a single sub-sessile involucre. This is fairly large, 6mm in diameter including the spreading glands, and a deep crimson in all its parts. The styles emerge first, followed by the stamens which have yellow anthers in contrast to the deep colour of the surrounding glands. The capsule is sub-globose and 3-lobed, and it

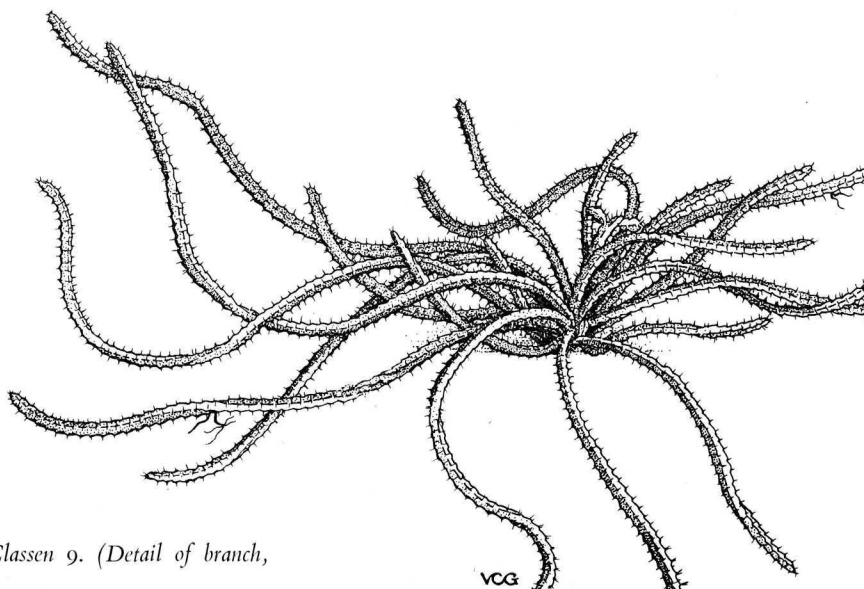


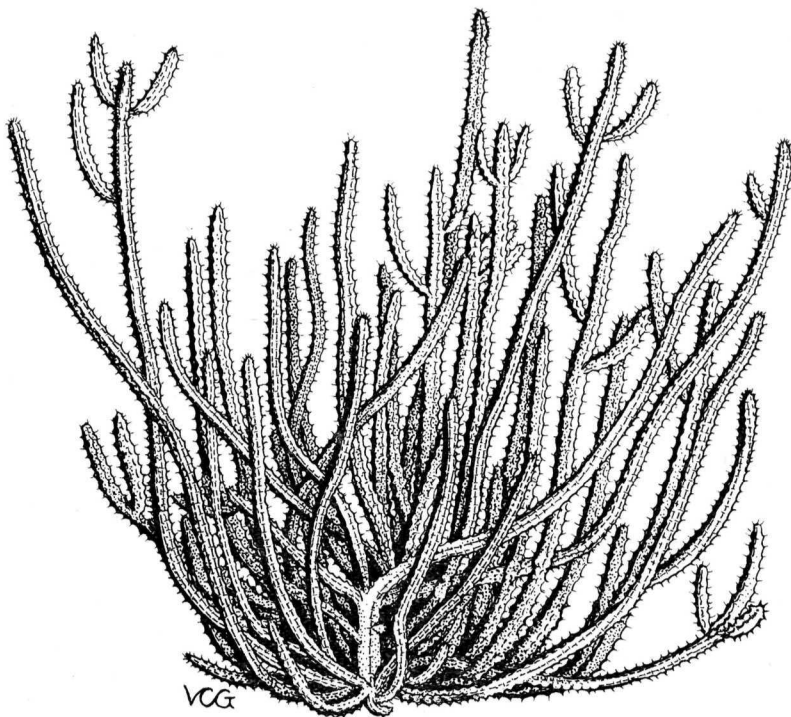
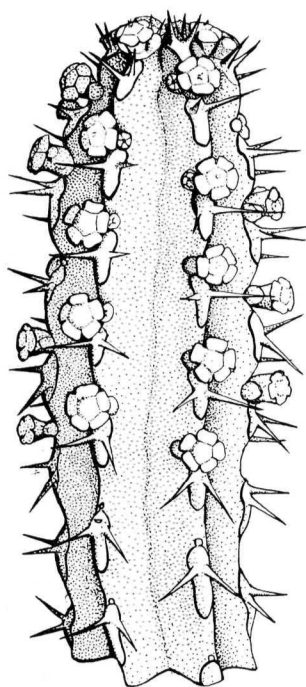
Distribution in East Africa of *Euphorbia septentrionalis*, *E. saxorum* and *E. classenii*.

too, is a deep crimson becoming almost black with age. As with *E. septentrionalis*, it is included within the involucre, being borne upon a very short pedicel. The grey ovoid seeds have a wrinkled surface.



E. saxorum. Drawn from Classen 9. (Detail of branch, x1; habit, x $\frac{1}{4}$)





E. classenii. Drawn from Classen 70 in Bally 12285.
(Detail of branch, $\times 1$; habit, $\times \frac{1}{9}$)

Euphorbia classenii is apparently even further limited in its distribution, for it has so far been found in only one locality, on Mount Kasigau to the east of Kilimanjaro. Mr. George Classen, after whom it is named, found it in 1960 growing on the lower rock-strewn slopes of the mountain and took it home for cultivation in his own garden whence he has generously distributed many cuttings.

It is a very sturdy species with many densely clustered stems bearing a few short branches and reaching a height of 1 metre. They are a bright green, 6-8-angled, with the slightly toothed ridges bearing evenly spaced, obtusely triangular, pale grey spine-shields. The spines are not large for such a robust species, being slender and not more than 6mm in length, and the prickles, if present at all, are only rudimentary. The solitary, once-forked cymes are sub-sessile and borne at the apices of the branches. The cup-shaped involucre are small, only 4mm in diameter including the bright yellow, spreading glands. The central involucre produces male flowers only and is deciduous. The styles emerge first from the lateral involucre, followed by long red filaments bearing red anthers which nevertheless produce yellow pollen. The green capsule is, in this species, exserted from the involucre on a reflexed pedicel about 5mm long. It is sub-globose and 3-lobed, over 5mm in diameter. The seeds are ovoid and smooth.

This species is extremely vigorous in cultivation, forming large plants in just a few years. Bearing this in mind, its apparently very limited distribution in the wild remains something of a mystery. But Kenya is a large country, with countless rocky outcrops, hill ranges, plains and thickets which have yet to be explored for botanical treasures, such as the three *Euphorbia* species described here.

The original descriptions of the three Euphorbias which are the subject of the above article appeared in Kew Bulletin 29 (3): 507-516 (1974), published by Her Majesty's Stationery Office. The illustrations are by Victoria Gordon.

Kew Safari to Kenya

Susan Carter (Mrs. Holmes) has recently returned to England after an expedition to Kenya with Dr. Peter Brandham and Mr. Brian Stannard. Numerous living and herbarium specimens were collected, principally of *Aloe* and *Euphorbia*. After the main safari, Susan made further field-trips in company with Dr. Peter Bally.

Diploid Cytotypes in *Mammillaria prolifera* and three other *Mammillaria* species

by Margaret A. T. Johnson

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Introduction

Little has been published to date on the chromosomes of Cactaceae, perhaps because it is not easy to obtain suitable material and the chromosomes are relatively small. The most extensive survey has been that of *Mammillaria* chromosome numbers by Remksi (1954) which also covered allied genera. She listed 110 counts of *Mammillaria* species and varieties, plus 12 counts in 8 other genera. All the *Mammillaria* species studied had a basic number of $x=11$ chromosomes, 12 counts being polyploid, the remainder diploid ($2n=22$). Polyploidy was recorded in *M. compressa* ($4x$), *M. capensis* ($24x$!) and *M. dioica* ($4x$), *M. morganiana* ($4x$), *M. parkinsonii*

($4x$, $8x$) and *M. pseudocrucigera* ($4x$), *M. prolifera* ($4x$, $6x$) and *M. multiceps* (= *M. prolifera* var. *texana*) ($4x$), and *M. ruestii* ($4x$).

The present report records the results of recent cytological studies at Kew of *Mammillaria* species, including further topotypes of *M. prolifera*.

Materials and methods

Plants of *M. prolifera* from seven different sources were studied, together with individuals of several other species. The provenance of the material is detailed in the table below.

Identification	Provenance	Collector/Donor	Kew cytology no.	Chromosome no.	Ploidy level
<i>M. prolifera</i> var. <i>prolifera</i>	Cuba	F. Otero	77.947	$n=c.33$	$6x$
<i>M. prolifera</i> var. <i>haitiensis</i>	Santo Domingo: near Guayubin	J. Jimenez	76.636	$n=c.33$	$6x$
<i>M. prolifera</i> var. <i>texana</i>	U.S.A.: Texas (?)	Cult. stock	77.944	$n=22$	$4x$
<i>M. prolifera</i> var. <i>texana</i>	Mexico: Nuevo Leon, between Linares and San Roberto, 850 m.	Hunt 8584A	77.917	$n=22$	$4x$
<i>M. prolifera</i> var. <i>arachnoidea</i>	Mexico: Tamaulipas, 8 km. from Antiguo Morelos on road to San Luis Potosi	Hunt 8057	77.945	$n=11$	$2x$
<i>M. prolifera</i> var. <i>arachnoidea</i>	As H. 8057	Hunt 8598	77.419 76.419	$n=11$ $2n=22$	$2x$
<i>M. prolifera</i> var. <i>arachnoidea</i>	Mexico: Hidalgo, E. of Jacala, barranca of Rio Moctezuma	F. Otero	76.420	$n=11$	$2x$
<i>M. pygmaea</i>	Mexico: Querétaro, between San Juan del Rio and Tequisquiapan, 1900 m.	Hunt 8547	76.424	$2n=22$	$2x$
<i>M. polythele</i>	Mexico: Hidalgo, near Zimapan, Sierra de Juarez, 2600 m.	Hunt 8537	76.483	$2n=22$	$2x$
<i>M. varieaculeata</i>	Mexico: Puebla, 'S. of Chilac' (Buchenau)	K. Schreier	76.639	$2n=22$	$2x$

Details of the material studied and results obtained. The original source of the widely cultivated form of *M. prolifera* var. *texana* (*M. multiceps*) with brown-tipped central spines is not known, but is here assumed to be Texas.

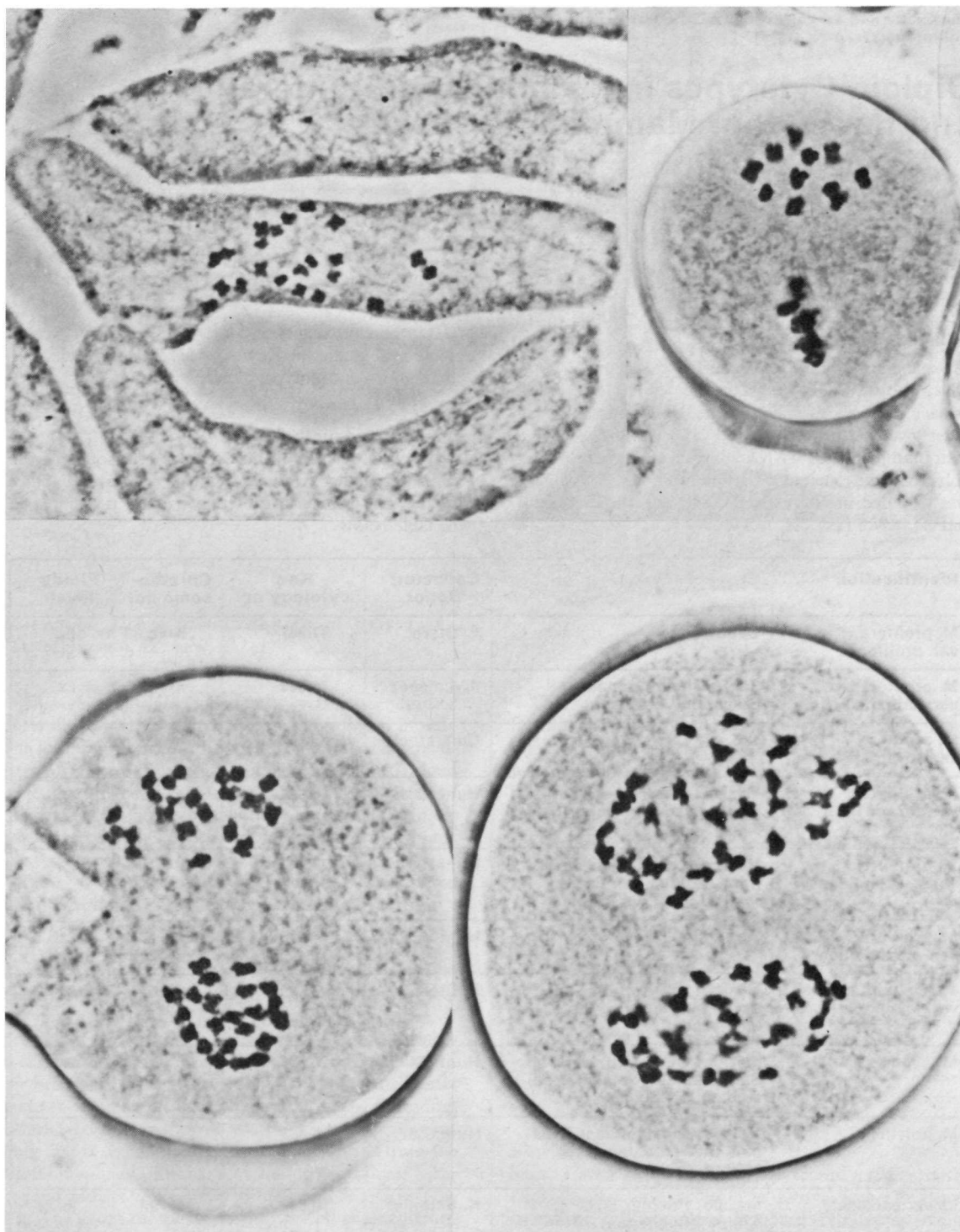
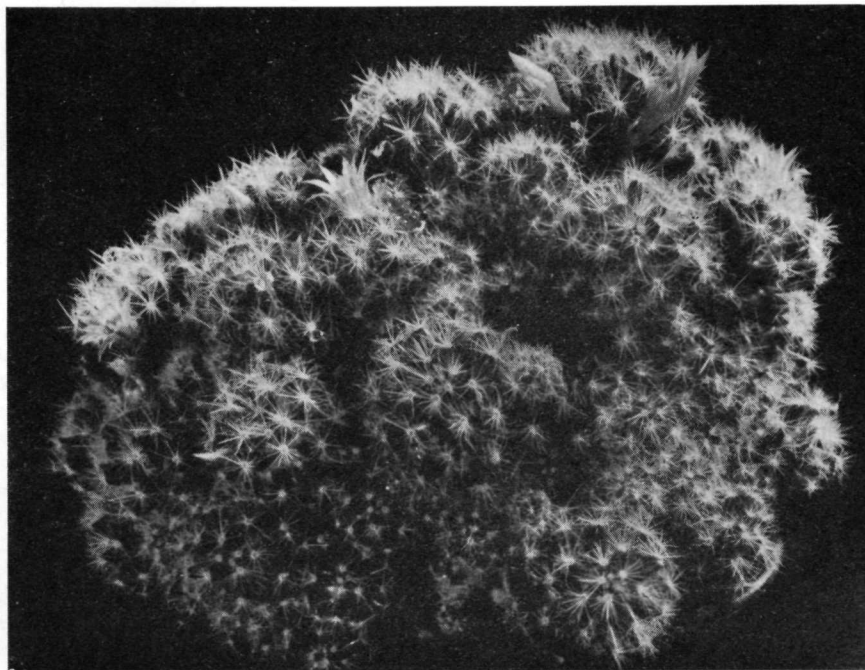


PLATE I. *Mammillaria prolifera* **Top left:** Somatic chromosomes of diploid ($2n=22$). **Top right:** Diploid ($2n=22$), pollen mother-cell at metaphase II of meiosis showing the gametic number of 11 chromosomes in the upper group. **Bottom left:** Tetraploid ($2n=44$), metaphase II showing 22 chromosomes in each group. **Bottom right:** Hexaploid ($2n=66$), showing approximately 33 chromosomes in each group. Magnification $\times 1470$.

M. prolifera
var. *arachnoidea*
(Hunt 8057)
(photo: T. Harwood)



Difficulty was experienced in obtaining suitable fast growing root-tips, and many of those selected were apparently not growing sufficiently well for there to be any cell-divisions. Remski also noted the same difficulty in her paper. Her method involved removing all of the roots from healthy plants, leaving the plants to dry out for two weeks and then placing them on moist sphagnum to encourage rooting. As soon as new roots developed they were removed and used for chromosome analysis. The incidence of polyploidy in roots is known to be high where new roots develop from callus tissue (Lindstrom & Koos, 1931), and for this reason Remski's method was not used for this study. All the root-tips were selected from normal healthily growing plants, and some of the roots, notably those without any root hairs around the growing tip, had some dividing cells. After experimenting with OQ (oxyquinoline) and ABN (alphanaphthalene) as pre-treating agents for varying lengths of time at different temperatures prior to fixation and staining, a saturated solution of ABN for 24 hrs. at 4° C was found to give optimal contraction and separation of chromosomes. Standard cytological squash techniques were employed, with feulgen being used to stain the root-tips.

As most of the *M. prolifera* plants had numerous young buds developing, meiosis was examined to determine the ploidy level, by squashing the anthers in 2% aceto-orcein. The meiotic buds were very small and hardly visible between the spines, but they contained a large number of anthers. In order to obtain a sufficient number of cells for analysis, several anthers were used

for each preparation. All the somatic and meiotic chromosomes stained faintly, but phase-contrast optics improved definition and the photographs reproduced here as Plate I were taken using this system on a Zeiss photomicroscope. All slides were made permanent using the standard liquid CO₂ method.

Results

(i) Mitosis

Somatic chromosome counts of $2n=22$ were obtained in *M. prolifera*, *M. pygmaea*, *M. variegata* and *M. polythale*. This is the first record of a diploid cytotype of *M. prolifera*, and the count for *M. variegata* is also new. The diploid plants of *M. prolifera* are morphologically distinctive in the very thin central spines and smaller differently shaped flowers, are here recognised as a new variety, *M. prolifera* var. *arachnoidea*.*

(ii) Meiosis

Examination of meiosis in *M. prolifera* showed the Cuban and Hispaniolan individuals to be hexaploid (6x). Remski's meiotic and somatic counts showed her Cuban material to be hexaploid also, but the two or more plants which she examined from Haiti were tetraploid

**Mammillaria prolifera* (Mill.) Haw. var. *arachnoidea* D. R. Hunt, var. nov.; ab aliis varietatibus differt spinis centralibus subtilibus, floribus anguste infundibuliformibus, 14 mm. longis, tubo fauce 5 mm. diametro, segmentis interioribus c. 6 mm. longis, 1.7 mm. latis, mucronatis. Typus: Mexico, Tamaulipas, 8 km. W. of Antigua Morelos, on rocks beside highway 80, alt. 300 m., 20 Nov. 1973, Hunt 8598 (K).

—D. R. HUNT.

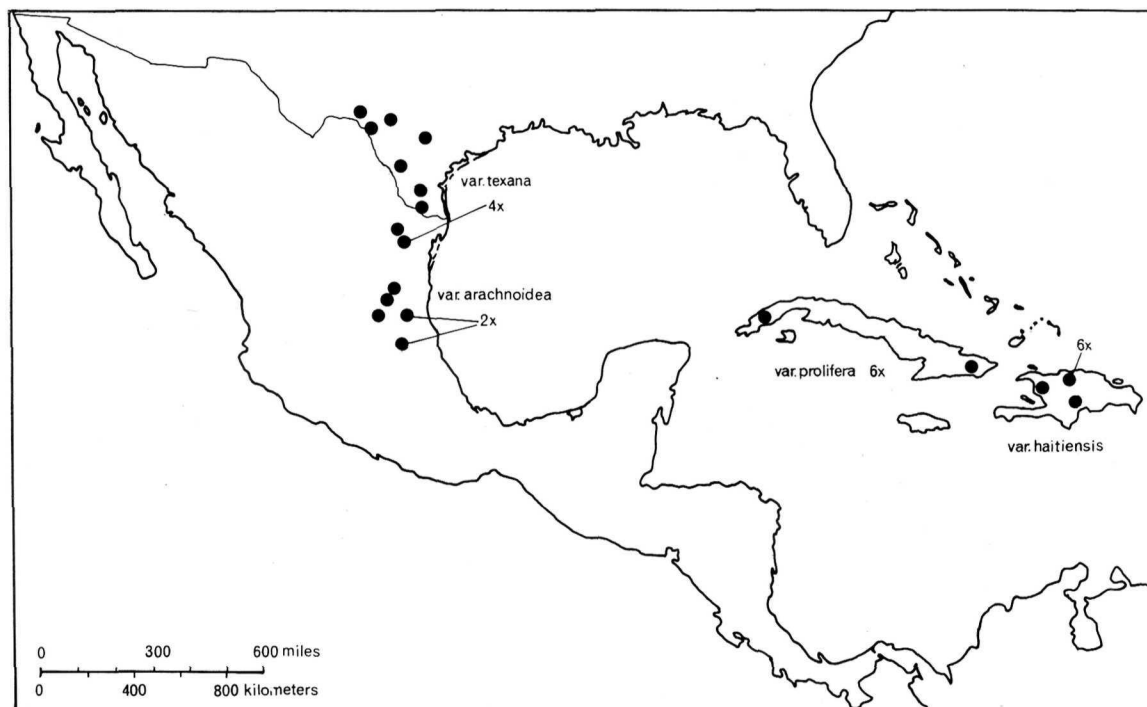
(4x). It is not unlikely that both tetraploid and hexaploid races of *M. prolifera* grow on Hispaniola and possibly Cuba also, although the possibility of confusion of localities cannot be ruled out especially as the varieties are morphologically very similar. (The importance of accurate labelling and adequate locality data cannot be stressed too highly where material is to be of any scientific use). The plants identified as *M. prolifera* var. *texana* were tetraploid and the remainder, from further south in Mexico were all diploid (2x) (*M. prolifera* var. *arachnoidea*).

Plate I shows diploid, tetraploid and hexaploid meiosis in *M. prolifera* at metaphase II. The difference in cell-size can also be seen, cell-size increasing with ploidy level, as also does the anther-size.

Although somatic chromosomes in all the species were very small, differences in centromere position could be seen and with improved techniques this may merit further investigation. It is hoped to continue this work to obtain chromosome counts of other *Mammillaria* species which have not yet been examined cytologically.

References

- HUNT, D. R. (1973). In J. Mamm. Soc. 13: 64.
 LINDSTROM, E. W. & KOOS, K. (1931). Cyto-genetic investigations of a haploid tomato and its diploid and tetraploid progeny. In Amer. J. Bot. 18: 398-410.
 REMSKI, M. F. (1954). Cytological investigations in *Mammillaria* and some associated genera. In Bot. Gaz. 116: 163-171.



Distribution of *Mammillaria prolifera*. The provenance of plants examined cytologically is indicated by a line and the appropriate ploidy level (it is not known which of the Cuban populations was the source of the material used). Other distribution records are taken from Benson, in Lundell, *Flora of Texas* 2(2): 277 (1969) (for Texas) and from published and unpublished data supplied by D. R. Hunt (see Hunt, 1973). Map drawn by Christabel King.

Amplification of the genus *Escobaria*

by D. R. Hunt

Royal Botanic Gardens, Kew

In my enumeration of the *Cactaceae* for Hutchinson's 'The Genera of Flowering Plants' Vol. 2 (1967), I treated *Neobesseyia* B. & R. and *Escobesseyia* Hester as synonyms of *Escobaria* B. & R., but necessary transfers from *Neobesseyia* were not made.

The justification for combining *Escobaria* and *Neobesseyia* was (i) that the two genera possess, in common, grooved tubercles and pitted seeds; and (ii) the existence of the intermediate species such as *Escobaria duncanii*, for which Hester proposed the genus *Escobesseyia*. A further species, recently described, which also appears to be intermediate is *Cochiseia robbinsorum* Earle. I can find nothing in the description of *Cochiseia* which distinguishes it generically and propose to treat it as a synonym also.

Though my generic concept is broader than that of Britton & Rose and many subsequent students of the *Cactaceae*, it is not as broad, in this instance, as that of Professor Lyman Benson, who includes *Escobaria* and *Neobesseyia* in *Coryphantha* (Engelm.) Lem. My view accords with the belief, earlier expressed by Buxbaum, that *Escobaria* (with *Neobesseyia*) represent an evolutionary lineage independent of *Coryphantha*, that is to say that they are distinct phyletic groups at an approximately analogous stage. The divergence of seed structure, begun in genera exhibiting a more primitive stage in areole morphology (species of *Thelocactus*, *Hamatocactus* and *Ferocactus*), is here complete and seems to me to confirm that the other differences between *Coryphantha* and *Escobaria* (stem morphology, flower, fruit) are of generic significance.

At one time Benson proposed *Escobaria vivipara* (Nutt.) F. Buxb. as the lectotype species of *Coryphantha* in preference to *C. sulcolanata* Lem., the choice of Britton & Rose (Benson in Lundell, Fl. Texas 2(2): 300. 1969). The choice of *E. vivipara* was unsatisfactory and could not be allowed to stand. *C. sulcata* (Engelm.) B. & R. has now been chosen instead (Hunt & Benson in Cact. Succ. J. Amer. 48: 72. 1976).

Under the circumscriptions of *Mammillaria* and *Escobaria* adopted by me, the isolated species *Ortegocactus macdougalii* Alexander falls between the two, since the flowering tubercles are usually grooved but not always so. (Even this character, it seems, is not infallible as a generic criterion!) *Ortegocactus* should probably be merged either with *Mammillaria* or with *Escobaria*, but no decision on this will be taken here.

A synopsis of *Escobaria* in its amplified sense is planned for a future issue of this journal. The following new combinations are needed:

- Escobaria asperispina*** (Boed.) D. R. Hunt, comb. nov.
Coryphantha asperispina Boed. in Monatsschr. Deutsch. Kakt. Ges. 1: 192 (1929).
Neobesseyia asperispina (Boed.) Boed., Mamm. Vergl.-Schlüssel, 14 (1933).
- Escobaria cubensis*** (B. & R.) D. R. Hunt, comb. nov.
Coryphantha cubensis B. & R. in Torreyia 12: 15 (1912).
Neobesseyia cubensis (B. & R.) Hester in Des. Pl. Life 13: 192 (1941).
- Escobaria dasyacantha*** (Engelm.) B. & R. var. ***varicolor*** (Tiegel) D. R. Hunt, comb. nov.
Coryphantha varicolor (Tiegel) Monatsschr. f. Kakt. 3: 278 (1932).
Coryphantha dasyacantha (Engelm.) Orcutt var. *varicolor* (Tiegel) L. Benson in Cact. Succ. J. Amer. 41: 189 (1969).
- Escobaria missouriensis*** (Sweet) D. R. Hunt, comb. nov.
Mammillaria missouriensis Sweet, Hort. Brit. 171 (1826).
Neobesseyia missouriensis (Sweet) B. & R., The Cact. 4: 53 (1923).
- Escobaria missouriensis* var. *caespitosa*** (Engelm.) D. R. Hunt, comb. nov.
Mammillaria similis Engelm. var. *caespitosa* Engelm. in Boston J. Nat. Hist. 6: 200 (1850).
Neobesseyia similis (Engelm.) B. & R., The Cact. 4: 52 (1923).
- Escobaria missouriensis* var. *marstonii*** (Clover) D. R. Hunt, comb. nov.
Coryphantha marstonii Clover in Bull. Torr. Bot. Club 65: 412, t. 17 fig. 6 (1938).
- C. missouriensis* var. *marstonii*** (Clover) L. Benson, Cacti of Arizona ed. 3, 26 (1969).
- Escobaria missouriensis* var. *robustior*** (Engelm.) D. R. Hunt, comb. nov.
Mammillaria similis Engelm. var. *robustior* Engelm. in Boston J. Nat. Hist. 6: 200 (1850).
Neobesseyia wislmannii (Hort. ex K. Schum.) B. & R., The Cact. 4: 52 (1923).
- Escobaria robbinsorum*** (Earle) D. R. Hunt, comb. nov.
Cochiseia robbinsorum Earle in Saguaro Land Bull. 30: 65 (1976).
- Escobaria vivipara*** (Nutt.) F. Buxb. var. ***alversonii*** (Coulter) D. R. Hunt, comb. nov.
Cactus radius [var.] *alversonii* Coulter in Contr. U.S. Nat. Herb. 3: 122 (1894).
- Escobaria vivipara* var. *arizonica*** (Engelm.) D. R. Hunt, comb. nov.
Mammillaria arizonica Engelm., Bot. Calif. 1: 124 (1876).
Cactus radius [var.] *arizonicus* (Engelm.) Coulter in Contr. U.S. Nat. Herb. 3: 121 (1894).
- Escobaria vivipara* var. *bisbeeana*** (Orcutt) D. R. Hunt, comb. nov.
Coryphantha bisbeeana Orcutt. Cactography, 3 (1926).
C. aggregata B. & R., The Cact. 4: 47, t. 4, fig. 47 (1923), not *Mammillaria aggregata* Engelm. (= *Echinocereus* sp.)
- Escobaria vivipara* var. *deserti*** (Engelm.) D. R. Hunt, comb. nov.
Mammillaria deserti Engelm., Bot. Calif. 2: 449 (1880).
Cactus radius [var.] *deserti* (Engelm.) Coulter in Contr. U.S. Nat. Herb. 3: 122 (1894).
- Escobaria vivipara* var. *radiosa*** (Engelm.) D. R. Hunt, comb. nov.
Mammillaria radiosa Engelm. in Boston J. Nat. Hist. 6: 196 (1850).
M. vivipara Nutt. var. *radiosa* Engelm. in Proc. Amer. Acad. 3: 269 (1856).
- Escobaria vivipara* var. *rosea*** (Clove) D. R. Hunt, comb. nov.
Coryphantha rosea Clokey in Madroño 7: 75 (1943).
C. vivipara var. *rosea* (Clove) L. Benson, Cacti of Arizona, ed. 3, 26 (1969).

Forum: Frailea

Compiled by Ray Pearce

with contributions from Brian Davis, David Hunt,
Barry Phipps, Bill Putnam and Nigel Taylor

Judging from the letters received, *Frailea* is not one of the more popular genera; contributors to previous 'Forum' discussions have mentioned that *Frailea* is a genus about which they have little knowledge. It is not too hard to find a reason for this lack of popularity—these cacti only rarely open their flowers. It is characteristic of *Frailea* that the flowers are *cleistogamous* (i.e. they set viable seed without the bud itself ever opening), although occasionally, and for no apparent reason, a bud will open to produce a normal flower.

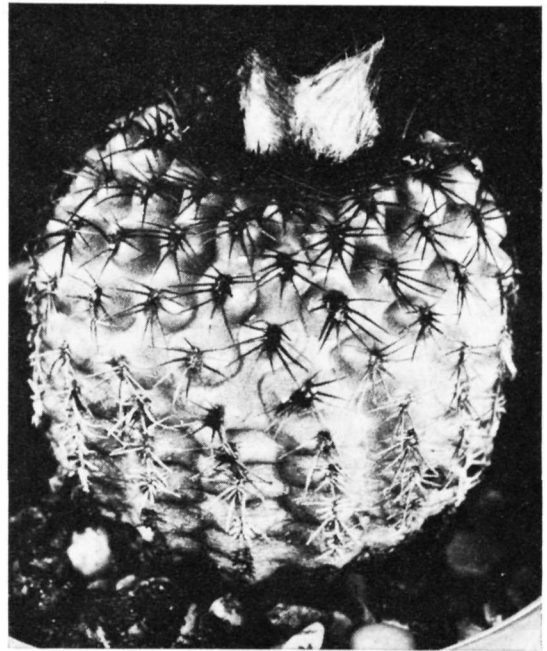
Apart from this disappointing characteristic, *Fraileas* have much to commend them. Even if the flowers themselves are rare, buds are freely produced, and the plant bodies are often of unusual and attractive form. Perhaps their greatest merit is that they are the miniatures of the cactus family. Most of the species will grow to maturity in a three-inch (or smaller!) pot, and will never require anything bigger. A genus one can collect and grow without a dread of repotting time every year! A complete collection of mature *Fraileas* could be housed in a very small greenhouse, with never a fear of the plants outgrowing their accommodation.

The genus *Frailea* was set up by Britton & Rose in 1922, and was named in honour of Manuel Fraile, a curator of cacti in the U.S. Department of Agriculture, in Washington D.C. Originally there were nine species, formerly included in Schumann's all-embracing genus *Echinocactus*. Since then the number of known species has increased. Borg listed 15, and now many more species have been described. During the past few years, this genus has provided a steady stream of novelties, though, looking at many of the so-called new species one is forced to wonder just how many of these names are really justified.

DAVID HUNT has provided the following geographical run-down. The numbers in brackets refer to the dot map on the following page.

Brief geographical run-down

The *Frailea* group is concentrated in SE. Paraguay, southernmost Brazil (Rio Grande do Sul) and Uruguay. Taking the northern outliers first, however, *F. colombiana* (1) described by Werdermann (under *Echinocactus*) in 1934 and transferred to *Frailea* by Backeberg, is the most notoriously disjunct. That a *Frailea* should occur in Colombia is by no means impossible, particularly if there is a real relationship, as sometimes argued, between *Frailea* and *Astrophytum*, and plant geography is full of surprises. But the species has never been found at the type locality again, and some doubt attaches to the veracity of the original data. The late



Frailea pullispina (photo: Margaret Martin)

Professor Cardenas commented on this when describing the first *Frailea* from Bolivia, *F. chiquitana* (2), in 1951. Other putative species from Bolivia, all described by Backeberg, are *F. cataphractoides*, from the same general area as *F. chiquitana*, and *F. pullispina* and *F. uhligiana*, from a little further east (3).

Buining holds the record for the number of species described in this genus to date, with 14 names under joint authorship with Brederoo or Moser. Two from the south of the Brazilian state of Mato Grosso are *F. matoana* (4) and *F. melitae* (5).

Ten species have been described from Paraguay. The most northerly is *F. conceptionensis* Buin. & Moser (6). The next six are all from the neighbourhood of Asuncion and Paraguari (7). They include *F. grahliana* (Haage f.) B. & R., *F. knippeliana* (Quehl) B. & R., *F. moserana* Buin. & Bred., *F. schilinzkyana* (Haage f.) B. & R., and *F. ybatensis* Buin. & Moser. The type species of the genus *F. cataphracta* (Dams) B. & R. had no type locality, but the var. *uyensis* Buin. & Moser is from the Paraguari area. Finally in Paraguay there are *F. ignacionensis* Buin. & Moser (8) and *F. friedrichii* (9), the latter commemorating A. M. Friedrich, the discoverer of several of the recently described forms.

The southernmost state of Brazil, Rio Grande do Sul, currently has the largest total of putative species, with 13. Nearly all of these have been described in the present decade. Prior to this, there was only *F. asterioides* Werdermann (12), now usually treated as synonymous with *F. castanea* (Uruguay), and *F. alacriportana* Backeb. & Voll, for which the precise locality is not recorded.



Distribution of *Frailea*. **Columbia:** *F. colombiana* (1). **Bolivia:** *F. chiquitana* and *F. cataphractoides* (2); *F. pullispina* and *F. uhligiana* (3). **Brazil, Mato Grosso:** *F. matoana* (4); *F. melitae* (5). **Paraguay:** *F. conceptionensis* (6); *F. grahlana*, *F. knippeliana*, *F. moserana*, *F. schilinzkyana* and *F. ybatensis* (7); *F. cataphracta* var. *tuyensis*, *F. ignacionensis* (8); *F. friedrichii* (9). **Brazil, Rio Grande do Sul:** *F. curvispina* (10); *F. asperispina* (11); *F. asterioides* (12); *F. fulviseta* (13); *F. aureispina* (14); *F. albicolumnaris*, *F. diminuta* and *F. perumbilicata* (15); *F. mammiifera* (16); *F. horstii* (17); *F. aureinitens* and *F. lepida* (18). **Uruguay:** *F. albifusca* (19); *F. phaeodisca* (20); *F. albiareolata* (21); *F. pulcherrima* (22); *F. pygmaea* (23). **Argentina:** *F. pumila* (24). (Map drawn by Christabel King).

The newer species from Rio Grande do Sul are as follows:

- F. albicolumnaris* Ritter (15)
- F. asperispina* Ritter (11)
- F. aureinitens* Buin. & Bred. (18)
- F. aureispina* Ritter (14)
- F. curvispina* Buin. & Bred. (10)
- F. diminuta* Buin. & Bred. (15)
- F. fulviseta* Buin. & Bred. (13)
- F. horstii* Ritter (17)
- F. lepida* Buin. & Bred. (18)
- F. mammiifera* Buin. & Bred. (16)
- F. perumbilicata* Ritter (15)

Several of these novelties are from near the border town of Livramento (15). Across the line in Uruguay is Rivera, and *F. albufusca* Ritter (19) came from near there. Further south in Uruguay are *F. phaeodisca* (Speg.) Backeb. (20) (often treated as a variety of *F. pygmaea*), *F. albiareolata* Buin. & Bred. (21) and *F. pulcherrima* Speg. (22). *F. pygmaea* (Speg.) B. & R., its var *aurea* (Backeb.) Backeb. were from the mountains near Montevideo (23).

There are a few rather vague records of *Frailea* occurring in Argentina (provinces of Misiones and Entre Rios). Of these, one that should be mentioned is for *F. pumila* (Lem.) B. & R. Britton & Rose interpreted *Shafer* 125 from Concordia (24) as this species, together with a cultivated plant from the botanical garden at Asuncion, Paraguay.

Cultivation

BILL PUTNAM is, in his own words, 'a great fan of the Fraileas' and has written in on their cultivation. By way of introduction to this he says:

'My cultivation methods fail or barely succeed with certain species (as mentioned in my notes), in spite of a lot of experimentation with composts. And there are tantalizing questions I should like to see answered, such as—Do Fraileas ever cross-pollinate? Is it true that seeds formed after the opening of flowers always have very low viability, compared with those formed cleistogamously? (I have read this, but I doubt it myself, at least for *F. castanea*).' Any further comments on these questions will be welcome.

BILL PUTNAM continues: 'I do not know how many Fraileas I have at present because seedlings grow so quickly to maturity, and I have seedlings scattered here and there among other plants in several dozen sizable seedpans, as well as the clumps of older plants which have been with me for years. At a guess I have over a hundred of these plants today. I have been interested in them for a good many years, but it is only fairly recently that there has been a sudden increase in the number of species, or alleged species, available, and my collection has expanded accordingly.

'I grow them under much the same conditions as the rest of my cacti, and by and large they thrive. The

globular species of the *F. pygmaea* sort, with green bodies and fine yellowish spines seem to be almost indestructible and give me no trouble at all. Given time and the encouragement of ample growing space, this sort of *Frailea* can form attractive many-headed clumps fairly quickly. Other globular Fraileas, such as *F. asperispina*, also seem to be very robust plants, except for the very attractive and distinctive *F. castanea* (= *F. asterioides*). This is definitely a tricky creature. I had a fine large grafted one for a good many years that provided unending quantities of seed, and I have kept a population of *F. castanea* going ever since by collecting seed and sowing it regularly. But as yet no self-rooted seedling has lasted for more than three or four years. As they produce a lot of seed in that time, I have no fears of losing the species in my collection, but it is frustrating that they should succumb so readily to fungus infections.

'The various columnar species I find less easy than most of the globular ones, although HU 83 (which probably has a valid name by now though I haven't seen it*) seems easy enough to keep in good condition. *F. gracillima* on the other hand loses its roots far too easily under my cultivation conditions. *F. horstii* grows quite vigorously and has an interestingly large flower, but my plants invariably bend over and grow into grotesque contortions after a year or two. Possibly this is their natural habit, but I find it very unattractive!

'Flowering comes and goes among my Fraileas. Last year I did not see one single flower in spite of the months of hot bright weather, yet in very ordinary and typically English summers of overcast skies I have sometimes had quite impressive displays of flowers.

'Referring back to the ease or difficulty of growing Fraileas, I should have mentioned *F. cataphracta*. This species, of which I have had a good many specimens, has always defeated me. I cannot get it to grow on its own roots at all and if I have it grafted it invariably goes into decline after a year or two, developing a strange red-brown discoloration before becoming moribund. I look forward to reading some other enthusiast's recipe for success with this species!

'Among the more striking of the newer species are *F. mammiifera* and *F. magnifica*. The former I have only as small seedlings but they are very distinctive and show their characteristic tubercles plainly. *F. magnifica* is a delightful oddity that always reminds me of *Noto-cactus leninghausii* in miniature.

'The question of shading always arises in discussions on Fraileas. I never deliberately shade any of mine, though in a well-crowded greenhouse they tend to be at the back of the bench and do get a little shade from taller plants in front of them in many cases. I have never yet seen a sunburnt *Frailea*, incidentally. I give the

*Yes, it does. HU 83 is the type no. of *F. lepida* Buin. & Bred.—Ed.

plants a lot of water in season and wherever possible give them all the root room they want by planting them in wide pans rather than in individual pots.

'This is a fascinating genus upon which a great deal could be written. I have lost count now of the number of named species: I made an up-to-date list a year or two ago but more names have been published since then. My own collection is not complete at all but is quite representative of the different types.

'One last word, for newcomers to *Frailea* growing: collect seed as it ripens and sow it at once. You will get good crops before winter sets in which are quite easily brought through the cold weather. Never keep *Frailea* seed longer than necessary as its viability diminishes rather quickly.'

Flowers, seeds and seed-raising

NIGEL TAYLOR echoes Bill Putnam's comment on the speed with which *Fraileas* reach maturity: 'My only experience of the genus is with *F. pumila*, *F. cataphracta* var. *tuyensis*, *F. pygmaea* var. *phaeodisca* and *F. castanea*. With the exception of the last-named, I have grown these to maturity from seed, and have found that the seedlings first show signs of cleistogamous seed-production at about 18 months old. Thus it is possible to raise three generations of *F. pygmaea* var. *phaeodisca* in under five years. In general, the cultivation of these diminutive plants is easy. I grow mine in John Innes no. 2, watering freely between March and November. During the winter months a minimum temperature of 5°C suits the plants fine, and I suspect that when really dry they would withstand colder conditions.'

Another contributor to this discussion is BARRY PHIPPS, who says:— 'I have found this singular genus curiously interesting. When the genus was smaller I had intended to build a comprehensive collection. But now that so many new discoveries are coming onto the market I have decided not to acquire any further plants as they hold little aesthetic interest.'

On the unusual flowering behaviour of these plants he writes:— 'Practically all of my adult plants display many flower buds during the summer months, yet few flowers open. (Buds which have opened during my absence have left behind visible proof of having done so, i.e. the buds have failed to fully close.) Only *Frailea phaeodisca*, *F. pulcherrima* and *F. algretae** have flowered. My notes say: "*F. algretae* and *F. phaeodisca* appear to be my only *Fraileas* which readily flower. My other species (fifteen different adult species) seem resolved not to flower." Further notes say "August: *F. pulcherrima* is now my third *Frailea* to flower." The previous year only one of twelve plants had flowered.

'The pods produced from cleistogamous flowers are normally loaded with brown seeds, and are non-

dehiscent. Typical of most of my species is *Frailea* HU12B. My notes say:— "Flowers are self-compatible. Fruits are red-brown, up to 12mm diameter, with dirty white wool and red-brown spines culminating to a point. Seeds are 1–1.5mm diameter, chocolate coloured, globular, with large oval concave hilums." All my *Fraileas* are cleistogamous. The pericarps dry to tissue-like thinness, crumbling at a touch, enabling the seeds to spill out. Seeds which I collected from *F. phaeodisca* were brown and appeared to have no living contents, but they germinated when sown.

'An extract from my notes on flowers says:— "*Frailea algretae*; 20mm diameter. Petals darkish medium yellow, acute: sepals yellow-pink and green, hairy. Style pale yellow with slightly paler stigma lobes. Filaments white-yellow with paler anthers."

'The genus has various forms: spherical, globular, squat cylindrical (barrel-shaped), and elongated types. I have not possessed my plants long enough to make much comment on branching, but most of my species have branched from the upper areoles. On one species, *F. schilinzkyana*, flower buds which had not opened changed into offsets. This does not seem feasible, but I have noticed *Mammillaria wildii* fruits change into offsets. Maybe other people have comments on this phenomenon.'

On seed raising Barry Phipps has added:— 'Twenty-seven out of forty-four packets of normal *Frailea* seeds, purchased from several sources, over several years, have proved viable. The species that germinated usually did so abundantly. My notes say "These seeds usually germinate well and make steady growth. But for all this, given a long, cool, dry winter, they soon shrivel, and many are lost before the spring." All my seedlings, during their first and consequent years, experience a six-and-a-half months cold dry winter in an unheated greenhouse. They receive additional protection, but no applied heat.'

As a postscript to his letter to the *Ariocarpus* 'Forum', BRIAN DAVIS added the following: '*Frailea* is a genus with which I have little joy. For the past three years I have persisted with shade and never a bud opened. I've now lifted them to full sun; they either bloom or get fried and ditched! Other than that very important shortcoming, they've given me no problems at all. The seed I've taken from closed buds has never yet proved viable. I've germinated enough other seeds to be confident it's not just me.'

Perhaps this was an effect of keeping the seed too long. I too have noticed the rapid loss of viability of *Frailea* seed. These plants do not come from areas of extreme aridity, so, in nature, there is presumably no need for a protracted period of seed dormancy. Alternatively, it is possible that the seeds may fail to mature (after all, the buds fail to reach the opening stage), or perhaps there is partial self-incompatibility. NIGEL TAYLOR has some further observations here: 'The flower-

*I have not met this name before. Any more details, please? The name suggests it may be from Alegrete (Brazil), the type locality of *F. asterioides*—Ed.

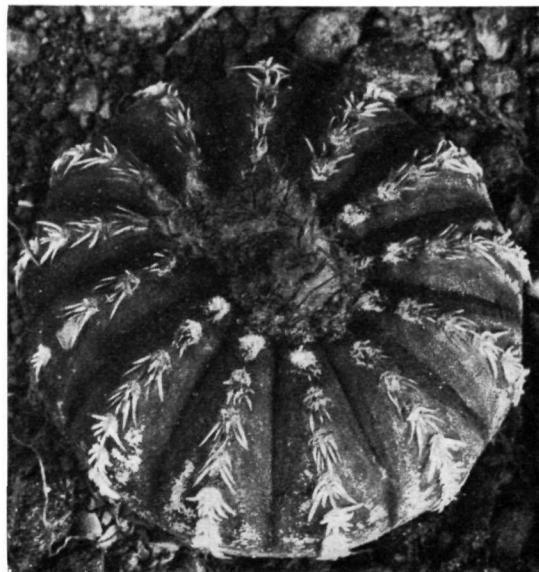
ing of my *Fraileas* has been a sore point, with only *F. castanea* obliging regularly to date. It would seem that with the other species I grow no amount of good weather will encourage normal perianth-development and flower-opening, but instead there is just repeated production of seed cleistogamously. One observation I have made concerns the quantity of seed per fruit in *F. castanea*. The flowers that fail to develop properly and set seed cleistogamously produce only half the number of seeds compared with those where normal flower-opening takes place, though self-pollination is the rule in both instances.'

On the subject of flower-opening, I have not yet seen any convincing argument correlating it satisfactorily with any set of climatic conditions. One wonders if perhaps, the trigger for flower-opening (if, indeed, there is such a trigger) may act some time before the actual opening of the flower and hence is not recognized. Another factor that could perhaps be involved is atmospheric humidity, but I have yet to see any comments on this. It would be interesting to have your views, and also to have notes of species which *do* open their flowers, if only occasionally. For my part, I have seen evidence of flowers on *F. alacriportana*, *F. pumila*, *F. phaeodisca* and *F. colombiana*. (I would add *F. horstii*, of which I had several seedlings simultaneously flowering last summer—Ed.)

Relationships

So far, our contributors have mainly discussed the cultivation and flowering of *Fraileas*, but there is clearly much more to be said about the plants. What are their taxonomic affinities—are they really close to *Notocactus*? How closely related is *Blossfeldia*, another genus of dwarf cacti with cleistogamous flowers? And what about *Astrophytum*, which Buxbaum classified alongside *Frailea* in the *Notocactaceae* despite its occurrence in Mexico and Texas? Your letters on topics like these will be welcome for inclusion in a sequel to the present discussion. Meanwhile, I will leave you with some comments in a taxonomic vein by NIGEL TAYLOR:

'Turning to a more scientific approach, I will not be the first to point out the remarkable similarity between the seeds of *Frailea* and *Astrophytum*. In taxonomic terms this can be explained in two ways. First, the resemblance could be the result of convergent evolution of the two genera without there being any initial close connection between them; alternatively, the similarity may indeed be due to their possession of common ancestral stock. However, in other respects the two genera differ markedly, some of the less conspicuous character differences for example, are the modes of dehiscence of their fruits, and their breeding systems. The fruit of *Astrophytum* dehisces by means of apical reflexing of the fruit wall segments to give a star-like formation, while *Frailea* as far as I know has no obvious dehiscence mechanism. Their breeding systems differ in that



Frailea castanea: a South American *Astrophytum*?
(photo: Margaret Martin)

Frailea appears to be largely self-compatible, while *Astrophytum* has almost certainly evolved a self-incompatibility mechanism. Incidentally, *Frailea* and *Astrophytum* seeds will germinate very rapidly, in as little as 48 hours in fact. Could this seed form which is common to the two genera be an adaptation facilitating rapid germination?

Please send your comments on *Frailea* to Ray Pearce, noting his new address, as follows:

Dr. R. B. Pearce
Department of Forestry
Commonwealth Forestry Institute
University of Oxford
South Parks Road
OXFORD OX1 3RB.

Ray will also welcome contributions on *Echinofossulocactus* (*Stenocactus*), which he hopes to deal with in a future issue.

No one has yet come forward with any views or comments on *Mila* (pp. 89-91 of last November's issue). Is Terry Smale our only reader who grows this genus? Comments should be sent to the Editor!

Back numbers of the Journal

Volumes 23-37 (1961-75) are still available at the bargain price of £1.20 per volume (inland postage paid; overseas extra), from Mr. A. W. Heathcote, Southwold, Station Road, Bishopstone, Seaford, Sussex BN25 2RB. For Volume 38 (price £2.50) and Volume 39 (price £3.50), contact the Editor.

Notes on the 1978 Seed Distribution

By Terry Smale

Please note:

- (i) The order form accompanying the Journal is valid to 1 September 1978 only.
- (ii) Members may order up to 10 packets of seed free of charge, but stamps or a postal order must be enclosed to cover postage (inland 7p; abroad 2 international postal coupons).
- (iii) Additional packets (one only of any kind) may be ordered at 5p (U.S.A. and Canada: 10 cents) each.
- (iv) If remitting in a currency other than sterling, members must add the equivalent of 70p (U.S.A. and Canada \$1.25) to cover the exchange transaction.
- (v) Where postage or the exchange fee is underpaid, part of the money sent for seeds will be used to meet these expenses, and fewer packets of seed supplied.
- (vi) The names in this list are as received from the wholesalers and given on the packets. Species offered under unpublished or incorrect names are indicated by *italics* after the order number.
- (vii) The seeds under KK numbers originate from Karel Knize of Lima, Peru. Each number refers to an individual wild population but it is not known whether the seeds were harvested in the wild or in cultivation in Peru.

091. *Arequipa leucotricha* KK535. This member of the *Borzicactinae* is the type species of the genus. A short columnar plant with white spines, which after a good summer will produce zygomorphic red flowers. Although the type locality is N. Chile, this collection was made in southern Peru.

092. *Ariocarpus fissuratus*. Very slow-growing spineless plant with a thick trunk and flattened top which is divided into furrowed triangular tubercles. The bright pink flowers are produced in the autumn from the elongated woolly areoles. Try grafting the seedlings to hasten the growth rate. SW. Texas and N. Mexico (Coahuila).

093. *Ariocarpus trigonus*. Another slow-growing spineless plant, but not as slow as the one above. The largest species in the genus with a crown of long grey-green tubercles which taper to a point. The axils are filled with wool and the cream flowers appear from this wool, usually in October. Central Mexico.

094. *Astrophytum myriostigma* var. *strongylogonum*. An unusual globular form of this species with five very flattened ribs which give it a resemblance to a large *A. asterias*. Covered with white scales and producing the usual yellow flowers. Central Mexico.

095. *Azureocereus hertlingianus* f. *monstruosus* KK 1063. The typical form is a large growing single-stemmed cactus with strong spines and an almost blue epidermis. The seed is from monstrous plants but it is not known what proportion of the seedlings will be monstrous. Central Peru.

096. *Cleistocactus smaragdiformis*. One of the smaller-growing members of the genus, which flowers easily. Thin cylindrical stems with many brown spines. The flowers are about 4 cm. long, cylindrical, barely opening at the top, red with a green tip. Paraguay and N. Argentina.

097. *Coryphantha werdermannii*. Rare species growing to about 6 cm. diameter and having no wool. Globular when young, covered with white pectinate spines. Mature plants more elongated with longer tubercles and also central spines. The large flowers open yellow with a red centre but become pink with age. Mexico (Coahuila).

098. *Echinocereus websterianus*. Fairly small clustering plant

with elongated stems. Areoles are close together and carry many short yellow spines. The beautiful large lilac-coloured flowers are freely produced, even on young plants. Mexico (Baja California).

099. *Echinopsis calorubra* Rausch 181. Seed harvested from cultivated plants. This was the name originally applied to R.181 but in Rausch's book "Lobivia", R.181 is said to be *E. rojasii*. Both names apply to forms in the *Obrepanda* group, with solitary flattened bodies and ribs divided into humps with the spines in the depressions. Flowers are long-tubed and red in colour. Bolivia (Nr. Totora).

100. *Escobaria chaffeyi*. Small plant to 5 cm. diameter, somewhat cylindric. It has short tubercles and numerous white spines which completely cover the body. The small cream or pink flowers are produced at the apex. Mexico (Zacatecas).

101. *Espostoa churinensis* KK 303. An undescribed form from Churin in central Peru. Columnar plant covered with snow-white hair.

102. *Ferocactus macrodiscus*. One of the few cacti to have received an Award of Merit from the RHS! Outstanding in being a 'Fero' which will produce its purplish flowers on plants only 10cm. diameter. The plant body is flattened and has strong spines. Central Mexico.

103. *Frailea castanea*. Small globular plant with a bronze coloured body which is divided into flat ribs. The black spines are very small and unlike many members of the genus, the yellow flowers frequently open fully. S. Brazil and N. Uruguay.

104. *Glandulicactus uncinatus*. Distinctive plant which is best known under this name but has also been placed in *Ferocactus*, *Hamatocactus* and *Ancistrocactus*. Plant is somewhat elongated, about 5 cm. diameter with pronounced tubercles. The yellow and red spines are very long; one hooked central being up to 10 cm. Flowers are brown to purplish in colour. W. Texas to Cent. Mexico.

105. *Gymnocalycium megatae*. Member of a complex group of species, including *G. tudae* which inhabit the Gran Chaco of Paraguay and neighbouring areas. Large flattened body with acute ribs and 5 thin spines. Freely-produced white flowers.

106. *Islaya longicarpa* KK 1080. As yet undescribed species which belongs to the *Neoporteriinae*. Collected from the dry coastal plain of S. Peru. Most *Islayas* are fairly slow-growing, well-spined plants with a woolly crown and yellow flowers.

107. *Lobivia intermedia* KK 784. First described by Rausch in 1972. Clustering plant with elongated stems which are armed with long thin yellowish spines. The red flower is only about 3½ cm. across but has a tube almost 6 cm. long. It comes from Central Peru (Challuanca) and is related to *L. westii* and *L. maximiliana*.

108. *Mammillaria leona*. A distinctive species which is correctly known as *M. pottsii*. Slowly clumping thin cylindrical stems which are completely covered with short white spines, the straight central having a dark tip. Small pink flowers. S. Texas south to Zacatecas (Mexico).

109. *Mammillaria wilcoxii*. This choice member of the *M. wrightii* complex will present a challenge to the grower. A smallish globular plant with white radials and brown hooked central spines. The flowers are large 4 cm. in diameter, cream to mauve in colour. USA (Arizona and New Mexico).

110. *Melocactus pygmaeus* KK 447. An unpublished species from N. Peru, unusual among the *Melocacti* from that area in producing the cephalium on relatively small plants. May be a dwarf form of *M. bellavistensis*.

111. *Mila churinensis* KK 767. Another undescribed species from the same area of Peru as the *Espostoa* above. White-spined caespitose plant which will occasionally produce small yellow flowers.

112. *Neolloydia conoidea*. Small elongated plant, usually offsetting. The straight central spines are black and contrast well with the many white radials. The large purple flowers are produced in the crown. A member of the *Coryphanthinae* from Texas and N. Mexico.

113. Neoporteria laniceps. Small plant with a brownish-green body; this is surrounded by long thin straw-coloured to brown spines which are twisted and interwoven, producing a bird's nest effect. The freely-produced tubular deep pink flowers are not very large and have inner petals which remain upright around the style. N. Chile.

114. Neoraimondia roseiflora KK 240. The smallest member of this distinctive genus, which is rare in cultivation. However, it is still a thick-stemmed cereus up to 2 m. in height with a grey-green epidermis. The five pronounced ribs produce very long spines from large areoles. In habitat, pink flowers are produced over many years from the same areole resulting in the areole extending many cm. from the stem. From the valleys of central Peru.

115. Neowerdermannia vorwerkii. A small genus related to *Gymnocalycium* and *Weingartia*. Plants are flattened globular with a thickened root. Ribs are divided into very pronounced tubercles with the spines in the depressions between them. The smallish flowers are white with a lilac mid-stripe. From high altitudes in Bolivia and N. Argentina.

116. Obregonia denegrii. Related to *Ariocarpus* and similarly slow of growth, however the tubercles do have a few spines at the tip. Freely-produced white flowers. Mexico (Tamaulipas).

117. Parodia lecoriensis KK 1409. Another plant that has not yet been described. One of the larger seeded types and it gets its name from its habitat: Lecori in central Bolivia.

118. Parodia salmonea FR 733. Seed from cultivated plants. Grows to 11 cm. diameter with about 20 ribs. The areoles are close together and the dense hair provides a complete edging to the ribs and almost hides the short brown spines. Small salmon-coloured flowers are produced in the woolly crown. This name was published by Brandt in 1973. Prior to this it was known under the unpublished name *P. multicostata*. Bolivia (Chuquisaca).

119. Rebutia albiareolata FR 761. Seed from cultivated plants of the type collection. One of Ritter's discoveries in the *Aylostera* group formally published last year. Probably a form of *R. pseudodominata* with fairly large bodies and short spines produced from prominent white areoles. Flowers are large and bright red. Bolivia (Tarija, Padcaya).

120. Rebutia aureicentra. An unpublished name, for which no information is available. The seed is from G. Kohres.

121. Stenocactus pentacanthus. (Echinofossulocactus pentacanthus). Globular plant with up to 40 thin wavy ribs. Each areole carries five curved brown spines and the violet flowers are produced in the centre of the plant. Central Mexico.

122. Sulcorebutia sp. Lau 337. A small strongly-spined form with purple flowers. Seed obtained in cultivation but original collection made in Bolivia (Cruce, Mizque).

123. Thelocactus lloydii. Solitary blue-green plant to 12 cm. diameter with body formed into low broad tubercles. About eight stout recurved spines which are bright crimson on the new growth and up to 6 cm. long. Large white or lilac flowers. Mexico (Zacatecas).

124. Thelocactus lophothele. Grows to twice the size of the above species, with longer tubercles. These bear 3-5 thick curving spines. Flowers are large and yellow in colour. Mexico (Chihuahua). *Thelocacti* are attractive and fairly easy plants, but they are not very fast growers.

125. Turbinicarpus lophophoroides. Choice slow-growing dwarf plant, which however will produce its white flowers at about four years from seed. The plant has a thick root and globular body divided into low warts. Each of these carries a few short white spines. Mexico (San Luis Potosi).

951. Cerochlamys pachyphylla. *Mesembryanthemaceae*. A monotypic genus of stemless mesem, which usually has two pairs of thick waxy brownish-green leaves, about 5 cm. long. These are flat on the upper surface and rounded underneath. Violet flowers are produced from the centre of the rosette on 3 cm. long stems in the new year. South Africa, Cape Province (Little Karroo).

952. Cheiridopsis candidissima. *Mesembryanthemaceae*. Collected from two sites in Namaqualand (South Africa). Forms low mats of shoots which each consist of one or two pairs of thick leaves. These are greyish-white in colour, united for two-fifths of their length, about 10 cm. long and 1 cm. thick. An attractive plant which unfortunately rarely flowers in cultivation.

953. Cheiridopsis meyeri var. *minor*. *Mesembryanthemaceae*. Collected in Namaqualand (South Africa). A small growing short-stemmed plant which produces two different types of greenish-grey leaves. The resting pair are united, forming a *Conophytum*-like body and the pair produced in the growing season are separated, 15 mm. long and 5 mm. across.

954. Cotyledon paniculata. *Crassulaceae*. A slow-growing plant which eventually forms a small shrub with a very thick stem. The stem is covered with a papery yellow bark. Leaves are only produced at the tips of the stems during the growing season which is in the winter. Widespread in South Africa.

955. Crassula columnaris. *Crassulaceae*. A dwarf plant composed of 4 rows of tightly packed rounded green leaves about a central stem. The plant is spherical when young and up to 5 cm. tall when mature. The small scented white flowers are produced in a terminal cluster. South Africa.

956. Dinteranthus vanzijlii. *Mesembryanthemaceae*. This species superficially resembles a *Lithops*. The bodies are about 5 cm. across, greyish-green with a few darker markings on the flat upper surface. The flowers are 15 mm. across, orange-yellow. South Africa (Cape Province).

957. Dracophilus proximus. *Mesembryanthemaceae*. This has a short, 4 cm. long stem with about six smooth blue-green leaves which are roundish in cross-section, 4 cm. long and 14 mm. across. Flowers are pink. South Africa (Little Namaqualand) and SW. Africa.

958. Frithia pulchra. *Mesembryanthemaceae*. A stemless plant forming a small cushion composed of almost cylindrical grey-green leaves, which have a window in the rounded tip. The attractive stemless purple flowers, with a white centre, are produced all over the cushion for a long period in late summer. South Africa (Transvaal).

959. Gasteria armstrongii. *Liliaceae*. A choice slow-growing member of the genus in which each rosette is composed of a few flat thick leaves which are twice as long as broad. These are arranged in two rows, have a rough surface, and are dark green in colour. South Africa (Cape Province, near Port Elizabeth).

Autumn Retrospect

by Jackie Panter

SEPTEMBER

This month sees the beginning of preparations for the long winter, time to decrease the watering and put the plants to bed. The weather was variable again but mainly dry with a few showers and quite mild, which made the drying-out process easier. I gave one good last watering to everything and that will have to last until March except for the 'other succulents' which will receive small amounts at about six-week intervals if the winter is not too severe.

The big task this month was removing the shading and washing down the greenhouses and it's at times like this that I wonder how our collection got so big as to take up three greenhouses. I found myself inspecting every plant most critically and thinking dark thoughts

about getting rid of some of them, but memories of past flowerings intruded and try as I might to harden my heart somehow I haven't got around to getting rid of anything! Actually, the operation wasn't that gruelling this year, although I did it on my own, firstly rubbing off the shading with a dry cloth then washing the glass with a contraption made of a sponge and some cloths tied to a pole, lastly (the fun bit) rinsing down with the hose-pipe. Suddenly all is bright and light again. I wish shading wasn't necessary but after the summer's disaster (see last journal) I don't think I would take any chances even if I increased the ventilation and had electric fans to move the air around; once bitten—in my case several times—twice shy!

This month I also brought in several large plants which stay outside during the summer: *Schlumbergera truncata*, a very large *Crassula portulaca* and several bromeliads one of which, *Fascicularia pitcairniifolia*, has turned brilliant red in the centre of each rosette and is about to flower.

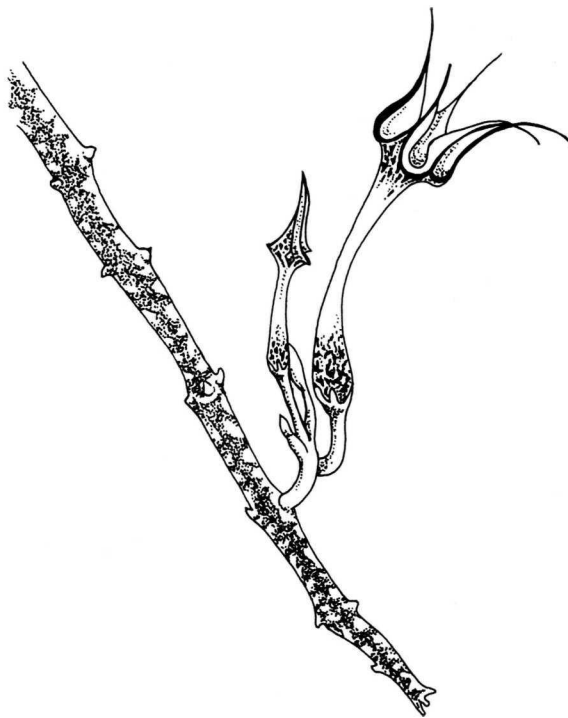
It was nice to see some of the 'other succulents' sprouting again, such as *Cotyledon reticulata*, several Pelargoniums and Sarcocaulons also growing new leaves; it compensated somewhat for the death of *Adenia spirosa* (I find these plants very touchy). Still plenty of flowers, again mainly on the 'other succulents'; *Euphorbia globosa*, *E. valida*, *E. splendens*, *Senecio stapeliiformis*, *Aloe jucunda*—flowers pink with white edges, *A. jacksonii*—red with bright orange inside, rather unusual. Ceropegias were also in bloom and I think these are particularly fascinating, especially *C. sandersonii* which has flowers like fringed green parachutes and *C. stapeliiformis*. Who would think that a few feet of thick stem could produce such beautifully shaped flowers? September is also the flowering time for the majority of stemless mesems, *Lithops*, *Conophytum*, *Conophyllum*, *Cheridopsis*, *Pleiospilos*, and *Gibbaeum*, and among the *Conophytums* in flower were *C. pearsonii*—mauve, and *C. frutescens*—orange-yellow, a change from the usual yellow. Time also for *Crassulas*, *C. corymbulosa*, *C. columella* and *C. falcata*, an unattractive plant, I think, but worth keeping for the large red inflorescence it produces. A scattering of cacti still in flower too, *Mammillaria schiedeana*, *Parodia multicostata*, *Neoporteria subgibbosa* and *Rebutia muscula*. The last of summer still lingers on but there is a decidedly cold feel to the night air which reminded me to see about getting out the heaters next month.

OCTOBER

Autumn is traditionally a nostalgic melancholy time of the year and nowhere more melancholy than in the cactophile's greenhouse where we are faced with at least five months enforced dormancy of our plants in order to keep them alive. The weather turned cold with some moderate night-frosts but the days were fine which meant I could continue to ventilate the greenhouses all month and this, coupled with not putting up the poly-

thene double-glazing (unless we have a severe winter), is part of my new toughen-'em-up programme. I decided that in previous winters I have mollycoddled our plants far too much, so this year it's 'survival of the fittest', starting with lots of fresh air no matter how cold it is outside. Even so, I must admit to lighting the heaters every night, the plants look so cold, poor things (really it's me that's cold).

Disasters again. This time it was to do with the heaters; not only has the maxi-unit (an automatic tank-filling system) packed up (this is the second one to go wrong and I've also removed the automatic vents as they don't work any more either—so much for labour-saving gadgets) but on arising one morning I noticed the small greenhouse appeared to be foggy inside. Foggy? That's smoke! Aaagghhh! I knew it wasn't on fire as all the benches are metal and asbestos, but I fully expected to see layers of soot all over the plants as other people have reported happening when their heaters flared up. But no, I was lucky; no soot just an awful smell which lingers on and on. The moral of this is keep your wicks trimmed and make sure there is a nice steady blue flame showing before leaving the greenhouse. This episode has finally made up my mind to reduce the collection next year, till it fits in the big greenhouse only and to perhaps have gas heating if the cost of running a pipe to the bottom of the garden is not too great. There I go again about getting rid of some of the plants, but after eight



Ceropegia stapeliiformis (drawn by Jackie Panter)

years of serious growing one might say the first flush is over and when I think of all the evenings, weekends and holidays spent potting, tidying, shading, washing pots and greenhouses, opening windows, closing them, mixing soil, filling heaters, putting up polythene, removing trapped birds, chasing the cat out, watering, feeding the plants, de-bugging, stopping leaks, fitting useless contraptions which break down after a few years and sweeping the floor, I feel exhausted just sitting writing this. Still, it's a long time till next April and I must see the plants in flower before I finally decide on what's going, and anything might happen until then.

A few late flowerers still lingering on: *Borzacactus madisoniorum*, *Copiapoa tenuissima*, *Parodia mairiana*, *Neoporteria wagenknechtii* and a first flowering for me of *Ariocarpus agavoides*. Amongst the 'other succulents' *Haemanthus albiglossus* is flowering rather early compared to last year (Dec.-Jan.); *Aloe haworthioides* x *albiflora*; all *Echeveria gibbiflora* types and hybrids; *E. paniculata* and *E. fulgens*, rather early again. The clocks have been altered and winter is almost here; I hope it will be dry and mild but that's every cactophile's dream.

NOVEMBER

The mild weather continued with sunshine but it soon changed; a severe rainstorm, cold winds and one night of gales which blew part of our fence across to the other side of the road! It then got much colder, so I left the heaters alight during the day as well as at night. This precaution was certainly necessary by the end of the month which brought heavy frosts; are we in for a hard winter? I hope not. Besides losing a bit of the fence no other disasters occurred in spite of several bitterly cold nights when the temperature in the greenhouses dropped to 5°C (40°F), only to be expected without the polythene double-glazing. The other drawback to not putting up the polythene is the increased amount of condensation which could cause problems, although I hope that the damper air will keep red spider out (we had heavy infestations last winter).

All flowering has finished on the cacti except for *Schlumbergera truncata*. My plant is large and rather woody and I thought it had no more life left in it, certainly not to flower, but after spending the summer in the garden it perked up no end. There are still plenty of blooms on the 'other succulents'. The *Echeveria* house is a riot of colour, for besides flowers the plants have developed deep shades of red and purple in the leaves which makes them a beautiful sight in the dark days of winter. A few *Crassulas* are just coming into bloom, notably *C. lactea* with masses of snowy white flowers it makes an attractive decoration at Christmas.

Thinking of Christmas reminds me that as I write the year is almost ended and although there is December yet to come this seems an appropriate point to conclude these articles. My main impression of 1977 has been of cold, wet weather which I think will be reflected in a reduced amount of flowers next spring, but I may be

wrong, cacti have a way of surprising us. I don't think that anyone can say they know the correct way to grow these plants, there just isn't one; so much depends on soil, environment, watering requirements, etc. that all one can do is to try something different if things go wrong. You may think after reading my account of one year in our greenhouses that things go wrong quite frequently; they do! Even so, none of the occurrences were unusual, indeed some were expected, for pitting your wits and skill against the weather, bugs and so-called greenhouse aids is all part of the fun (?). So if you are a beginner, don't despair over failures—we all have them, and if you are an "old hand" may all your troubles be trivial ones.

Growing Cacti in Natal

by J. T. Schouwerwou*

It will be obvious to all that seed-raising and growing in South Africa is not as difficult as in Great Britain or the Netherlands, my original homeland. The climate and larger gardens enable us to cultivate almost any species, while our white or brown fingers grow green and are stung in the process.

When I arrived here, in Durban, in 1951, one of the first things that came to my mind was that I should revive my hobby as soon as possible—the hobby I started in 1920 and had to abandon when we were forced to go underground, the time when the old country was invaded. I received seeds here from Holland and Germany and sowed them in wooden boxes, divided in compartments by laying copper brazing rods on the surface of the carefully gathered and sieved soil. The boxes, eight of them, 12in x 12in x 3in deep, were placed in a larger box 12in deep, standing on 36in legs. A 5in nail was driven into the bottom of the legs with the head protruding 2in and the whole contraption stood on four one lb jam tins filled with paraffin to prevent ants, etc. climbing up and carrying the seeds away or consuming the emerging seedlings. The bottom of the box was slotted and the top covered with whitewashed glass.

Germination was and still is practically the same as in the Netherlands, depending mostly on the age and quality of the seeds sown. Growing on the plantlets is easier here, of course, as day and night temperatures vary not more than 15°C with a minimum winter temperature of about 10°C.

At first I used tins of every description. That lasted for about two years, but as soon as they were available again I transplanted into clay pots—now all broken up and replaced by plastic pots!

Also, I used to graft at least one or two of the seedlings

*J. T. Schouwerwou 21 Morrison Road, Escombe, Queensburgh, Natal 4093, Republic of South Africa.



Cacti in Mr. Schouwerwou's garden in Natal, South Africa.

of globular or *Pilocereus* and *Cephalocereus* species on stock sent to me by Mr. Hans Herre, in those days Curator of Stellenbosch University. Many of the Pilo- and Cephalocerei are now growing in friends' gardens, reaching well above the single storey homes and flowering profusely.

By the way, I have about ten different species of *Cereus*, e.g. *peruvianus*, *jamacaru*, *dayamii*, *forbesii*, *hexagonus*, etc., using them as an appropriate background for other and lower-growing or straggling species, because the flowers are so alike. A point of interest might be that the above-mentioned flower here in November and December and set *no* seeds, then again in February to March and this time fruits as big as ducks' eggs appear, although during both seasons plenty of the same bee species visit the flowers.

At first I used to plant all cacti, as soon as they had outgrown a 4in pot, in an open bed or ground, but after one year Mammillarias, Notocacti, Gymnocalycium, Parodias and Lobivias looked very much the same. The spines all just grey, the epidermis greyish green and the hairy and woolly ones practically bald. So I built a greenhouse and the plants were then almost completely under my control. They were given water when needed, and the right amount, shade when necessary,

no dust settled on them, and air-flow and temperature could be regulated—more or less. Now I have clean plants with well-coloured spines and skin; plants that flower very well and can be pollinated with a mink brush when I require some seeds. Some people prefer a plant to show the struggle for existence by having scars, broken and discoloured spines as many imported plants do. I will not judge anybody's taste, but I consider myself more a grower and nurseryman than a collector. I try to let plants grow in the most favourable conditions for them.

A friend of mine, secretary of our Natal Cacti & Succulent Club, lives on The Bluff, which is a peninsula between the Indian Ocean and a large bay, the Durban harbour. Humidity there is very high of course, and mist from the sea frequently covers the land. This gentleman grows the most difficult species of *Lithops*, *Conophytum*, etc. and also Cacti, Anthuriums and Orchids there, but his highly succulent mesems show the same faces as the ones collected in Cape or South West Africa. That is what I would call knowing what to do and when.

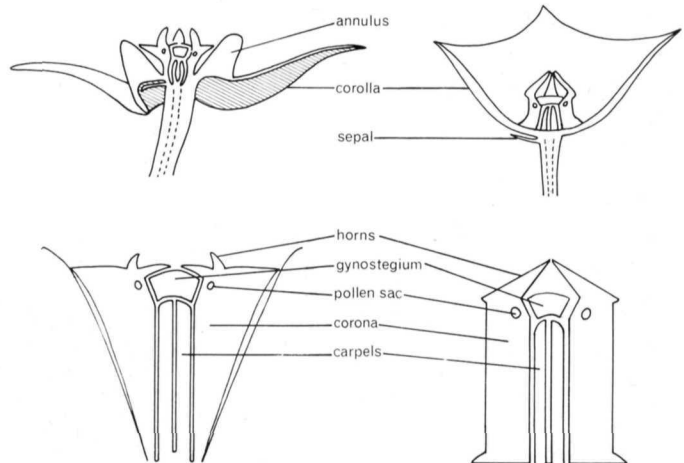
I would like to end this scribble with the thought that men can grow any plant almost anywhere, but we have to *love* them and not only love to *have* them!

Stapeliad flowers

by Harry Mays

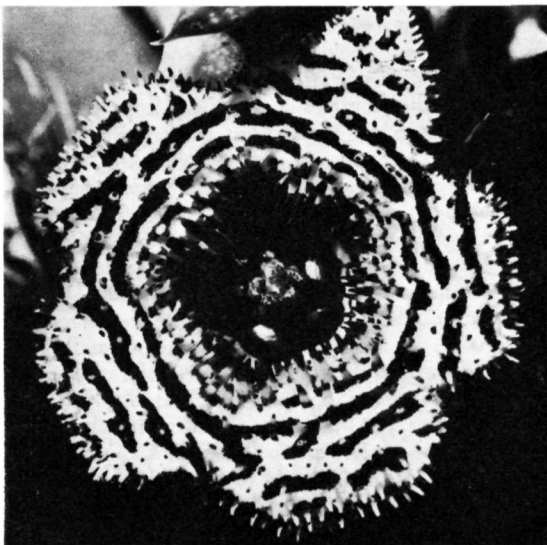
DUVALIA CAESPITOSA

HUERNIA OCULATA



The flowers of stapeliads are visually, though not necessarily olfactorily, attractive. They are generally highly coloured, have unusual shapes and have interesting and complicated structures. One looks in vain for what are considered to be the normal parts of a flower. There are for example no visible filaments and anthers and if one does discern any stigma-lobes one has in fact misidentified the horns.

The various parts of the flowers of *Duvalia caespitosa* and *Huernia oculata* are shown in the accompanying drawings of the sectioned flowers and their reproductive parts are shown enlarged in the diagrams. The flowers have five sepals which protected the buds and which alternate with the five corolla lobes. They are separated in *Duvalia caespitosa* and united in *Huernia oculata*. A



Huernia stapelioides

further example of a corolla is shown in the photograph of *Huernia stapelioides*. The basis of the lobes is swollen into an annulus in *Duvalia caespitosa* but not in *Huernia oculata*. There are no styles and stigma lobes. The two superior ovaries take the form of separate elongated carpels which contain the ovules. The carpels are surmounted by a cover known as the gynostegium and are surrounded by a corona which differs in shape in each species. The horns also have different shapes. The pollen sacs are located in the corona near the top on the inner surface which lies upon the gynostegium. Thus both the pollen sacs and the carpels are totally enclosed. With the development of the flowers the pollen becomes accessible through grooves which form at the top of the corona and guide the proboscis, feeler or leg of an insect to the pollen. The grooves in *Huernia oculata* became visible with age but it is difficult to distinguish the grooves in *Duvalia caespitosa* even with a magnifying glass. Once transferred to another flower, pollen is deposited through the grooves and grows through to the carpels where the ovules are fertilised. The exact path the pollen-tubes take has been and still is the subject of debate and will not be pursued here. Eventually the two carpels develop into two V-shaped follicles which are the distinctive fruits of these plants.

Stapeliads produce relatively little pollen and the structure of the flowers appears to make pollination difficult. Nevertheless these highly specialised flowers are highly successful at producing seed. They are adapted to pollination mainly by carrion insects. Colour and shape of flower play a part in attracting them but the main attraction is the smell of carrion the flowers produce which is much more intense in some than in others. I find it difficult to detect in *Huernia oculata* but it is quite strong in *Duvalia caespitosa*.

The size and shape of stapeliad flowers is very varied, but the basic parts are essentially those shown in the diagrams and drawings.

Succulent Snippets

Packing plants for a Show is quite an art (or a science?) in itself. Dr. Rolfe not only won most of the prizes at last year's Pimlico Show but performed miracles to get all those big specimens in his car without damage. At the Autumn Show at Westminster—probably the last we shall hold at the R.H.S. Hall—Mr. Byles's large *Cleistocactus* was a plant of particular interest and many wondered how it has been transported. Those who were packing their own plants at the end of the Show found out! Each stem was carefully wrapped in stiff paper tied round with sticks and string, the pot top carefully sealed and the interesting elongate parcel carried off at the slant!

While we're on the subject of Shows, let me ask you to make a note of the dates of our Shows this year, both one-day events, on 17 June and 7 October.

Transporting show plants is one matter, moving your whole collection quite another (I feel faint at the thought). Adele Whicher (our Meetings Secretary) and husband Paul faced the problem late last year when they moved to Sussex, and David Hunt will be doing so about now. The Whichers have taken their greenhouses with them and their plants are now safely rehoused, none the worse for a sojourn in the garage while their accommodation was dismantled, moved and re-erected. The Editor, on the other hand, tells me he's sold his two greenhouses with his house and is keeping his fingers crossed for prompt delivery of a new one (larger, of course!) at the new address. All his plants stand in rigid (empty) gravel trays for ease of watering and so are more or less pre-packed for removal.

Seed-raisers ahoy!

Our 'Seed Organizer', Terry Smale, has got together an interesting-looking seedlist for us again, and provided helpful notes which are printed elsewhere in this issue. It's 'first come, first served', so send your order in to Mrs. Boote as soon as you can!

You will not find *Myristica fragrans*, *Fortunella marharita* or *Persea gratissima* on the seedlist, but if you are a compulsive pip-planter (or just thrifty or curious) you will enjoy reading 'The Pip Book', a new Penguin paperback by Keith Mossman* which was among my Christmas stocking-fillers. There is sound and well-written advice on 'turning pips into plants', on rescuing carrot-tops and pineapple-polls from the rubbish-bin, and even an initiation in the cruel sport of bonsai.

What bothers the humane streak in me is the fate of these pip-pets, many of them tropical and arborescent, and mostly unbeautiful and very morose, when they

*Keith Mossman. *The Pip Book*. viii+118pp., with line-drawings by Marion Bagshawe. Penguin Books, Harmondsworth, Middlesex, England. 1977. Price 70p (Canada \$1.95).

begin to take over the greenhouse or living-room. Some friends of mine, for instance, have an avocado pear-tree whose leafy boughs are raised on high, cutting out nearly all the light and threatening to raise their living-room ceiling. As winter approached in 1976, they put it out in the garden to die of hypothermia, the heartless creatures, but it refused to cooperate, survived, and shamed them into allowing it indoors again, where they now have an even more umbrageous problem than before. Anyone know of a house for sale with a large conservatory?

Sally Cornioides

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Kew Gardens is always getting offers of plants which have outgrown their accommodation (the answer is usually a polite 'no thank-you'). One recent letter began: 'Dear Sir, I have been advised to get in touch with you to see if you are interested in a plant I have. It was given me by a friend three inches tall . . . '—Ed.

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Forthcoming Events

ANNUAL GENERAL MEETING

to be held on Saturday 18 March at the Royal Botanic Gardens, Kew, Richmond, Surrey, by kind permission of the Director.

The meeting will be at the **Lower Nursery**, which is in a part of the Gardens not open to the public. Members may reach the nursery area *either* via the entrance in Ferry Lane adjacent to the Queen Elizabeth's Lawn Car Park (this is a private entrance at the northern end of the car park, *not* the Brentford Gate public entrance); *or* via one of the public entrances to the Gardens and thence on foot to 'Kew Palace' where (as you face the Palace) there is an entrance to the Lower Nursery on your left.

N.B.

- (i) Admission will be to members and associate members only.
- (ii) Members wishing to visit the Succulent Houses in the main part of the Gardens should do so prior to the meeting. There will not be an opportunity during or after the meeting.
- (iii) The Restaurant in Kew Gardens will not be open. Snacks at the bar are obtainable at the 'Rose and Crown' Public House on Kew Green, but the other hostelties in the vicinity do not serve meals on Saturdays.

PROGRAMME

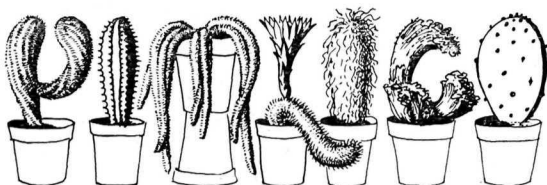
- 1.45–2.00 p.m. Members meet at entrance to Lower Nursery.
2.00 p.m. Tour of nursery glasshouses
3.30 p.m. Annual General Meeting
4.15 p.m. (approx.) Tea and biscuits
5.00 p.m. Illustrated talk on *Dolichothele* by Mr. Nigel Taylor, followed by discussion.

Bring and Buy, 10 May

This popular meeting will be held as usual at the Royal Horticultural Society's New Hall, Greycoat Street, Westminster, S.W.1. on Wednesday 10 May 1978 at 6 for 6.30 p.m.

Summer Show, Pimlico, 17 June

It is not too early to think about the Show—details of classes will be published in the next issue. If you can supply an item for a Draw prize or help sell tickets for the Draw, please contact Mrs. Maddams as soon as possible.



Branch Activities

Essex

Secretary: F. Braun, 63 Heighams Road, East Ham, E6 2JJ.
Meeting Place: Room A3 (film room), Little Ilford Comprehensive School, Church Road, Manor Park, London, E.12. 1st Saturday in month, 7.30 p.m.

North London

Secretary: Mrs. B. Massey, 86 Auckland Road, Potters Bar, Herts.
Meeting Place: Capel Manor Primary School, Bullsmoor Lane, Enfield, 3rd Friday in month, 7.30 p.m.

Our Autumn mini-Show last September was a great success. Competition was very keen and the standard was higher than the year before.

At our November meeting, John Pilbeam spoke with as much authority on Mammillarias as he does on his speciality, Haworthias.

Forthcoming meetings:

- 17 February Opuntias (G. Leighton-Boyce)
17 March Two of a kind (John Heywood)
14 April Echeveria (Les Carruthers)

As Mr. Carruthers has not visited the south of England for a number of years, visitors will be very welcome to attend this lecture.

North Surrey

Secretary: W. F. Maddams, 26 Glenfield Road, Banstead, Surrey, SM7 2DG.
Meeting Place: Adult School, Benhill Avenue, Sutton. 1st Tuesday in month, 7.45 p.m.

The Members' Slide evening at the end of 1977 proved to be rather more than a large selection of cactus transparencies, in fact they were in the minority. The range varied from Mexico to Orchids and a merry interlude by Paul Whicher on the advantages of moving to the south coast.

The first visiting speaker of the year will be Susan Holmes on 7 March talking on the latest Kew-sponsored African Safari under Dr. Brandham's leadership; 4 April sees a welcome return of Yvonne and Bill Tree talking on 'Cacti in Europe', and in May there is a grafting study evening.

Any members outside the Branch who would like to join in the activities from time to time should apply to Mr. Maddams for a Branch Fixture Card.

East Surrey

Secretary: Mrs. C. Walton, 15 Ownstead Gardens, Sanderstead.
Meeting Place: Community Centre, High Street, Caterham. 3rd Tuesday in month, 7.45 p.m.

Hatfield and District

Secretary: Mrs. P. Jenkins, 33 Bridge Road, Welwyn Garden City.
Meeting Place: Hatfield Congregational Church Hall, St. Albans Road East, Hatfield. 4th Monday in month, 7.30 p.m.

Northern Counties

Contact: Dr. M. J. Watson, 87 Queens Road, Whitley Bay, Tyne & Wear.

North Staffs

Contact: J. Wilson, 5 Monkton Close, Dresden, Longton, Stoke-on-Trent, ST3 4BG.

Wirral

Secretary: Mrs. I. Boote, 110 Mount Pleasant Road, Wallasey, Cheshire, L45 6HU.
Meeting Place: The Grange, Grove Road, Wallasey. 3rd Thursday in month, 8 p.m.

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Cover design: *Selenicereus grandiflorus*, the Queen of the Night, taken from an engraving on the cover of F. A. Haage Jr.'s 'Catalogue of Choice Cacti, Succulent Plants, Seeds, etc.' for 1909.

BACK VOLUMES

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All applications for membership, advertising and back volumes should now be made to the following address:

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67 Gloucester Court
Kew Road
RICHMOND
Surrey TW9 3EA
England

Cheques, etc., should be made payable to the Society and not to individual officers. When remitting in a currency other than sterling, please add the equivalent of £0.70p to cover currency negotiation charges.

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The Cactus and Succulent Journal of Great Britain

Volume 40 Number 2 May 1978

DORA SHURLY

With the death of Mrs. Dora Shurly on 7th March at the age of 87, the Society has lost not only its President but also someone who has been very much associated with the growth of our activities since their inception in 1931. Her late husband, Ernest Shurly, was one of the pillars of the Society until his passing in 1963 and for a period of more than thirty years Mrs. Shurly gave him tremendous support and encouragement. She also had a deep love and knowledge of succulent plants and the fact that her name is engraved on some of the Society trophies is a testimony to her skill in this direction.

Then, in 1964, at an age when most of us are looking for retirement and relaxation she accepted the invitation to become President. To her the position was no sinecure and she put her beliefs into practice. Despite being considerably afflicted with arthritis she attended Society functions, encouraged the Officers and generally radiated infectious enthusiasm that quite belied her rather frail figure. During the past fourteen years she has been an example to us all and she will be missed greatly.

W. F. MADDAMS

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Change of address

As noted on the inside cover, the Society's editorial address is now 67 Gloucester Court, Kew Road, Richmond, Surrey TW9 3EA. Most of the Society's business will be conducted from this address, including membership enquiries and renewals, and the despatch of journals, back numbers and other publications.

We hope that this reorganization will simplify the work of the Editor/Treasurer and Membership Secretary. Meanwhile, we apologize for delays in dealing with your letters due to *disorganization* during a period in limbo between addresses more protracted than we bargained for!

Annual General Meeting

Though we mourned the death of our President a few days before, the Annual General Meeting at Kew on 18 March was not a sad occasion, nor, I am sure, would Mrs. Shurly have wished it to be so. The attendance was very good, with doubts expressed early on as to whether everyone could be squeezed into the Lower Nursery staff room where the formal part of the meeting was held. More by luck than judgement, however, exactly the right number of chairs and tea-cups had been asked for, and the ladies of North Surrey Branch brought such a feast of home-made cakes that the Editor's biscuits were not needed! (Oh, the monotony of my diet ever since!). The actual attendance, for the record, was 60.

Before the meeting, members were shown the new nursery and micropropagation facilities by David Shaw, the specialist gardener responsible for the succulents, and after tea Nigel Taylor gave an illustrated talk on *Dolichothele* which was followed by discussion on both botanical and cultural aspects.

Council's Report and the year's accounts are printed on pp. 56-7 of this issue. Miss Jackie Panter, author of last year's popular 'Retrospect' feature, succeeds Mrs. Dennard as Hon. Membership Secretary and will also be acting as Assistant Treasurer.

1978 ISI Plant List

Once again the non-profit organization International Succulent Institute Inc. has a choice selection of documented material of rare cacti and other succulents on offer. The 1978 list, with a total of 60 species, includes *Mammillaria Lau* 777, *Morangaya pensilis* and *Sulcorebutia rauschii* amongst the cacti and a wide variety of 'other succulents' of which three new Mexican *Crassulaceae* look particularly appealing: *Graptopetalum saxifragoides*, *Sedum suaveolens* ('the most beautiful of all Sedums') and *Tactus bellus*. Prices are around \$4.00 U.S.

For the fully annotated list and further details write to the British representative, N. E. Wilbraham, 7 Marlborough Drive, Macclesfield, Cheshire SK10 2JX, or direct to Jay Dodson, 10 Corte Sombrita, Orinda, Calif. 94563, U.S.A.

SPI and SPT merge

As in other spheres, acronyms and abbreviated titles have been proliferating in our hobby in recent years: IOS, ISI, SPI, ASPS, etc., all very confusing. No sooner had ASPS closed down, than up sprang AFAPS. The initials SPI used to mean Succulent Plant Institute or Südpflanzen Importe, according to context, until fairly recently when the German firm tactfully dropped the 'I'. Now the 'other' SPI has also made a change. Rather than become the Succulent Plant Institute and Trust, the Institute has been merged with the Trust as from 1 January this year. Apart from its occasional publications over the past ten years, the organization issues a bulletin three times yearly, now known as The Succulent Plant Trust Newsletter, and edited by Bill Putnam. SPT's address is 72 Church Lane Avenue, Hooley Coulsdon, Surrey CR3 3RT, and the minimum subscription 75p per year.

By the way, SPT is nothing to do with SPC. The latter initials stand for the Succulent Plant Club, founded last year (subscription £2, to be sent to Victor Graham, Barleyfield, Southburgh, Thetford, Norfolk), and planning to publish a quarterly journal entitled 'The Xerophyte'.

Nation of shopkeepers

The number and variety of societies and journals we have is surely the most remarkable thing about the succulent plant hobby in Britain. Maybe it reflects our proverbial temperament, and certainly there's nothing to be said against choice, free enterprise and healthy competition. But when you look more closely, you find the same few faces behind more than one, sometimes several, counters. And small is not always beautiful, if it means too few contributors to provide copy for your publication, or too few subscribers to pay for printing it!

At the instigation of IOS British Section, a meeting of editors was held last November under the chairmanship of Gordon Rowley to consider the future of British

journals. What hopes for a pooling of resources, or a *de luxe* production full of coloured illustrations and well-arranged text? Not much, it seems, at present. The specialist groups, not unnaturally, prefer to remain independent, at least for the time being, and there are no plans for a merger of the two major societies.

Glass's Guide to the Cactaceae

Just as I was typing the items for this page, what should arrive (with a heavy thud) but a review copy of Blandford's translated edition of Backeberg's 'Kakteenlexikon', prepared by the supremely fluent and indefatigably trans-linguistic Lois Glass*. The vocabulary needed to use the descriptive sections of the German original is small, but for those who already have the German version and might grudge £25 for the translation it does have the advantage of interpolating Walther Haage's very good additional material for the 3rd edition (1976) in the appropriate systematic and alphabetical order. Despite Backeberg's quirky taxonomy, the 'Lexicon' is currently on its own as an annotated checklist and is the most useful single-volume reference on the Cactaceae. Blandford have produced the book to a high standard and, along with Mrs. Glass, deserve all our congratulations.

More on Escobaria

Taking each species in rather more detail than Backeberg did, Nigel Taylor has prepared his own checklist of one genus of the Cactaceae, *Escobaria*, and this is printed on the next few pages. Only another 1,000 pages and he'll have covered the entire family . . .

Various new names for use in Nigel's article were provided in our February issue, but two were omitted. They are:

Escobaria minima (Baird) D. R. Hunt, comb. nov.

Coryphantha minima Baird in Amer. Bot. 37: 150 (1931).

Escobaria sneedii B. & R. var. **leei** (Rose ex Boed.) D. R. Hunt, comb. nov.

E. leei Rose ex Boed., Mamm. Vergl. Schluss. 17 (1933).

Coryphantha sneedii (B. & R.) A. Berger var. *leei* (Rose ex Boed.) L. Benson in Cact. Succ. J. Amer. 41: 189 (1969).

Two corrections to the list (p. 13) concern the basionym citation for *E. dasyacantha* var. *varicolor*, which should read *Coryphantha varicolor* Tiegel in Monatsschr. Deutsch. Kakt. Ges. 4: 278 (1932); and that for *E. vivipara* var. *arizonica*, which should read *Mammillaria arizonica* Engelm., Bot. Calif. 1: 244 (1876).

Non Gibbaeum sed Cheiridopsis

As Harry Hall of South Africa has pointed out, the cover of last August's issue depicted, not *Gibbaeum album* (or any other *Gibbaeum*, for that matter), but a *Cheiridopsis*. The editor wishes he could say the mistake was deliberate, but, alas, it was not!

*C. Backeberg (transl. Lois Glass). *Cactus Lexicon*. 828 pp., 535 illustrations, mostly in colour, and 18 maps, 9½ x 6¾ ins. Blandford Press, Poole, Dorset. Price £25.

Review of the genus *Escobaria* B. & R.

by N. P. Taylor
Royal Botanic Gardens, Kew

Introduction

The notes which follow attempt to list in alphabetical order all names published in the genus *Escobaria* B. & R. with their authorities, place of publication, synonymy, nomenclatural type, type locality and distribution, brief description and annotations. A formal taxonomic revision is not intended, but rather a compilation from the literature which will serve as a checklist and to indicate gaps in our knowledge. Herbarium material, other than that at Kew, has not been studied.

D. R. Hunt's circumscription of the genus (Hunt, 1967, 1978) is adopted here and also L. Benson's treatment of the *missouriensis* and *vivipara* complexes (Benson, 1969, under *Coryphantha*). A key to groups and principal species within the genus will be given in a future article.

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WENIGER, D. (1969). Cacti of the Southwest.

List of Species

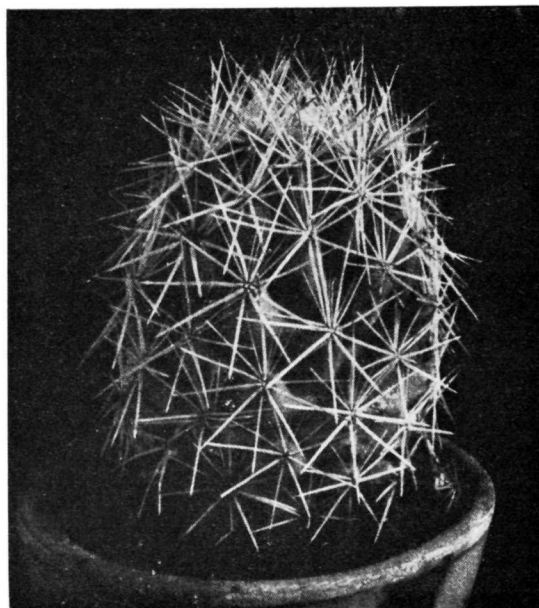
- E. aggregata* F. Buxb. (1951). See *E. vivipara*.
E. albicolumnaria Hester (1941). See *E. orcuttii*.
E. arizonica (Engelm.) F. Buxb. (1951). See *E. vivipara*.
E. arizonica Hester in Desert Pl. Life, 13: 192 (1941), a *nom. nud.* applied to *E. strobiliformis* (fide Benson, 1969).
E. asperispina (Boed.) D. R. Hunt in CSJGB 40: 13 (1978); *Coryphantha asperispina* Boedeker in MDKG 1: 192 (1929), with fig.; *Neobesseyia asperispina* (Boed.) Boed. (1933). Type: Mexico, Coahuila, S. of Saltillo, 1928, Ritter, not known to have been preserved.

Plant solitary, globose; tub. 18mm long, dark blue-green; ar. elliptic, nearly 2mm long, at first woolly, later bare; ax. glabrous; rad. sp. 9-10, 8-10mm long, grey-whitish; cent. sp. 0 (-1). Fl. funnel-shaped, 28mm long; inner per. segs. linear to narrowly-elliptic, pale greenish-yellow; style greenish-white, stigmas 5, bright green. Fr. ?; seed short-ovoid, 2 mm long [pitted?], shiny, black. Range: Mexico, Coahuila and Nuevo Leon.

To be considered here is *E. zilziana* (Boed.) Backeb., Die Cact. 5: 2957 (1961); *Coryphantha zilziana* Boedeker in MDKG 2: 233 (1930), with fig.; *Neobesseyia zilziana* (Boed.) Boed. (1933). Type: Mexico, Coahuila, Mountains N. of Paila, 1928, Ritter, not known to have been preserved. Differs from the above: Plant sparingly caespitose, short-cylindric; tub. 10mm long; ar. round, glabrous; rad. sp. 12-15, 10-15mm long, plus 4-7 smaller, slender; all sp. yellowish-grey. [Fl. very similar to the above]. Fr. clavate, 20mm long, red; seed 1mm, pitted, not shiny. A close ally of the above, but how close cannot be determined until authentic seed of both taxa is available for comparison.

E. bella B. & R., The Cact. 4: 56, t. 7, figs. 4, 4a (1923); *Coryphantha bella* (B. & R.) Fosberg in Bull. S. Calif. Acad. Sci. 30: 58 (1931). Type: Texas, hills of the Devil's River, 1914, Rose & Fitch 17991 (US).

Stems caespitose, cylindric, 6-8cm long; tub. 15-20mm long, groove white-hairy, with a narrow brownish gland [!]; rad. sp. 10mm long, whitish; cent. sp. 3-5, to 20mm long, brown. Fl.



E. zilziana. Boedeker's original illustration (1930).

N.B. Data are taken from the first description unless otherwise stated. Additional observations are enclosed in square brackets.

nearly 20mm broad; per. segs. linear-oblong, acute; stigmas green. [Fr.; seed ?].

Apparently not recollected since 1914, and referred by Benson (1969) to 'plants of uncertain status'. The glandular tubercular groove suggests this may have been a *Coryphantha*.

E. bisbeeana (Orcutt) Borg (1937). See *E. vivipara*.

E. boregui Schmoll ex Shurly in CSJGB 4: 11 (1935). Probably a catalogue name of no standing.

E. chaffeyi B. & R., The Cact. 4: 56 (1923); *Coryphantha chaffeyi* (B. & R.) Fosberg in Bull. S. Calif. Acad. Sci. 30: 58 (1931). Type: Mexico, Zacatecas, Cedros, 1910, Chaffey 5 (US).

Stems short-cylindric, 6-12cm long, 5-6cm across; tub. short, light green; [ax. ?]; rad. sp. numerous, bristly, $\pm$ covering the stem; cent. sp. several, shorter than rad. sp., brown to black tipped. Fl. 15mm long, cream-purplish; inner per. segs. oblong, obtuse; style white, stigmas yellowish-green. Fr. 20mm long, red; [seeds ?].

To be considered here is **E. lloydii** B. & R., The Cact. 4: 57 (1923); *Coryphantha lloydii* (B. & R.) Fosberg in Bull. S. Calif. Acad. Sci. 30: 58 (1931). Type: Mexico, Zacatecas, foothills of Sierra Zuluaga, 1908, Lloyd 5 (US).

Plants caespitose, bearing naked corky tub. when old; [ax. ?]; rad. sp. c. 20, slender, white; cent. sp. several, 20mm long, brown or black tipped. Fl. 25mm long, greenish; filaments, style and stigmas green. Fr. globose to short-oblong, 6-12mm long, seed globose, 1mm diam. pitted.

Two poorly known taxa growing in close proximity in Zacatecas. The black seed of *E. lloydii* suggests relationship with *E. dasyacantha*, but that species is usually solitary.

E. chihuahuensis B. & R., The Cact. 4: 55 (1923); *Coryphantha chihuahuensis* (B. & R.) A. Berger (1929). Type: Mexico, Chihuahua, in the mts. near the city of Chihuahua, 1908, Palmer 72 (US, K!). Santa Eulalia Mts., 1885, Pringle 250 (US, K!).

Plants solitary [or caespitose], globose to short cylindric; tub. short, [5-9mm long]; [ax. ?]; rad. sp. numerous [c. 20, 4-8mm long, dull-whitish]; cent. sp. several [4-7, 5-10mm long, stouter than rad. sp.], brown to black towards the tip. Fl. 10-15mm long, purple; outer per. segs. broad, apex often rounded, inner per. segs. pointed. [Fr.; seed ?]. Range: Cent. and S. Chihuahua, Mexico. The affinities of this plant will remain uncertain until seeds are available for examination. Illustrations in Backeberg (1961), p. 2961, resemble the type.

E. chlorantha (Engelm.) F. Buxb. (1951). See *E. vivipara*.

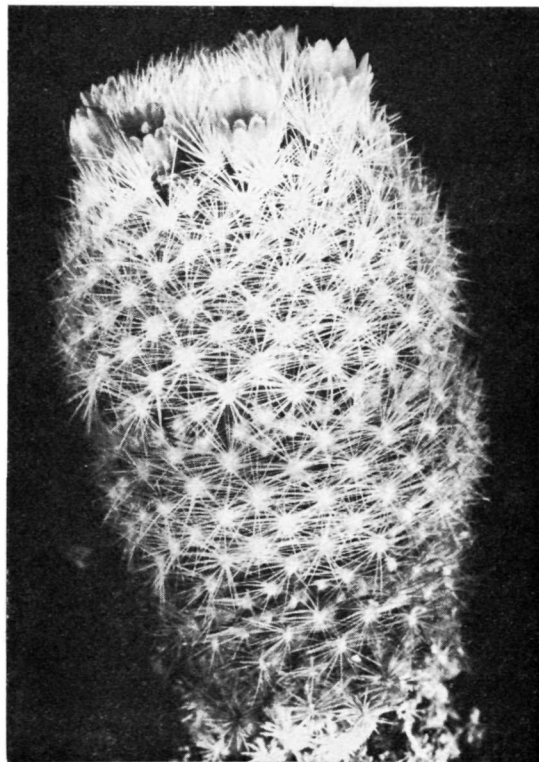
E. cubensis (B. & R.) D. R. Hunt in CSJGB 40: 13 (1978); *Coryphantha cubensis* B. & R. in Torreya 12: 15 (1912); *Neobesseyia cubensis* (B. & R.) Hester (1941); *Neolloydia cubensis* (B. & R.) Backeb. (1942). Type: Cuba, Oriente, SE. of Holguin, Shafer 2946 (US). Illustration: Riha, J., Ashingtonia 2: facing p. 19 (1975).

Plants depressed-globose, 2-3cm across, pale green; tub. 6-7mm long; [ax. ?]; young ar. woolly; rad. sp. c. 10 [-15], 3-4mm long, whitish. Fl. pale yellowish-green, 16mm long; per. segs. acute; filaments, style and stigmas yellowish. Fr. less than 10mm long, red; seeds black, [pitted?].

E. dasyacantha (Engelm.) B. & R., The Cact. 4: 55, fig. 52 & t. 7 fig. 1 (1923); *Mammillaria dasyacantha* Engelm. in Proc. Amer. Acad. 3: 268 (1856), and Cact. Mex. Bound. 15, t. 12, figs. 17-22 (1859); *Coryphantha dasyacantha* (Engelm.) A. Berger (1929); *Escobesseyia dasyacantha* (Engelm.) Hester (1945). Type: Texas, El Paso and Eagle Springs, Wright (US).

var. dasyacantha

Stem solitary, subglobose to 4-6.5cm high [to 20cm long and



E. chaffeyi (photo: Margaret Martin).

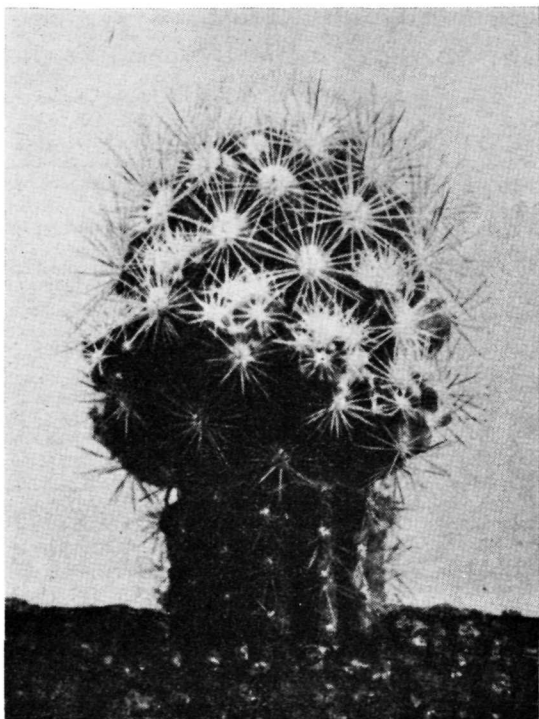
4-7cm diam.]; tub. 8-10mm long; ax. somewhat woolly; rad. sp. of outer series 25-35, 6-19mm long, white, inner series 7-13, 12-25mm long, [reddish or brownish]; cent. sp. 0-1 [1-5, to 12mm long]. Fl. not described [pinkish, 20-25mm long, inner per. segs. narrowly lanceolate; stigmas 5-6, green]. Fr. 9mm long [10-20mm long, cylindroid to narrowly ellipsoid, red]; seeds c. 1mm long, almost black. Range: SW. Texas and Mexico, N. Chihuahua.

var. **varicolor** (Tieg.) D. R. Hunt in CSJGB 40: 13 (1978); *Coryphantha varicolor* Tiegel in MDKG 4: 278 (1932); *Coryphantha dasyacantha* (Engelm.) Orcutt var. *varicolor* (Tieg.) L. Benson in CSJA 41: 189 (1969). Type: Not stated. Illustrations: Weniger (1969), plates 34, 35 & 37. [Rad. sp. 16-18, to 6mm long, straw-coloured or some white.] Range: SW. Texas at 500-1400m.

E. deserti (Engelm.) F. Buxb. (1951). See *E. vivipara*.

E. duncanii (Hester) Backeb., Die Cact. 5: 2966 (1961); *Escobesseyia duncanii* Hester in Desert Pl. Life 13: 192 (1941), name only; *ibid.*, 17: 24 (1945), descr. with figs. *Coryphantha duncanii* (Hester) L. Benson (1969). Type: Texas, Brewster Co., few miles NW. of Terlingua at c. 1000m, 1940, Hester (DS).

Mature plant solitary or caespitose, subglobose, 1.2-3.4cm diam.; tub. small, axillary groove white-woolly when young; rad. sp. 24-36, 5-10mm long, bristle-like, white tipped brown; cent. sp. 3-8 (-16), to 12mm long, white tipped brown [Rad. and cent. sp. intergrading, 30-75 per ar.]. Fl. 15mm long; inner per. segs. linear-oblancoate, pink; style greenish-yellow, stigmas 4 [-5], yellow. Fr. 20mm long, 5mm wide, red; seeds globose, 1mm diam., black, punctate.



E. emskoetterana. Quehl's original illustration (1910).

One of the *E. dasyacantha* Group, ranging from S. New Mexico and Texas, W. Brewster Co. at 1000–1650m.

E. emskoetterana (Quehl) Borg, *Cacti*, 304 (1937); *Mammillaria emskoetteriana* Quehl in *MfK* 20: 139 (1910), with fig.; *Coryphantha emskoetteriana* (Quehl) A. Berger (1929). Described from plants grown from seed originating in Mexico, type locality unknown.

Plant caespitose, globose to short-cylindric, 5cm high, 4cm diam.; tub. 10mm long, ax. naked; ar. round, 4mm across; rad. sp. 20–25 to 20mm long, white and sometimes darker tipped; cent. sp. 6–8, similar to rad. Fl. funnel-shaped, c. 30mm long; inner per. segs. dirty white with brownish midstripes; filaments bright pink. [Fr.; seed?].

This may be the earliest name and description for the plants known as *E. runyonii* and *E. muehlbauerana*. Quehl's comment that ungrafted plants of *M. emskoetteriana* superficially resembled *M. pusilla* var. *multiceps* (*M. prolifera*), further suggests that *E. runyonii* may be synonymous, since it too resembles *M. prolifera* when not in flower.

E. filziane Borg (1937). A misspelling of *E. zilziana*.

E. fobei Fric ex Berger, *Kakteen*, 280 (1929). *Fobia viridiflora* Fric ex A. Berger, l.c. An obscure name treated as a synonym of *E. dasyacantha* by Backeberg & Knuth, *Cactus-ABC*, 380 (1935).

E. henricksonii Glass & Foster in *CSJA* 49: 195 (1977), with figs. Type: Mexico, Chihuahua, c. 16 miles E. of Escalon at c. 1000m, 1972, *Henrickson* 7744 (POM). Also found near Ceballos, Durango, *Lau*.

Plant with long, slender, branched, tuberous roots; stems caespitose, few, 3cm diam. to 8cm long; tub. c. 6mm long,

pale green, with a naked groove extending to the ax.; rad. sp. c. 32, 4–4.5mm long, dirty, glassy white, adpressed; cent. sp. 10, 3–4mm long, 1 of these porrect and only 1.5mm long. Fl. c. 25mm in diameter, cerise to pinkish-lavender; style and filaments yellowish-white or tinged lavender, stigmas 4–5, cream-coloured. Fr. 8mm long, 3mm wide, reddish; seed light brown, c. 1.4mm long, with a thin testa.

An interesting discovery which appears to be not unlike the type material of *E. chihuahuensis* B. & R. The seed illustrated by Glass & Foster, l.c., does not appear to be pitted in the normal way, if indeed it is pitted at all. Further investigation is required to see whether this plant really belongs in *Escobaria*.

E. hesteri (Y. Wright) F. Buxb. in *Oesterr. Bot. Zeitschr.* 98: 78 (1951); *Coryphantha hesteri* Y. Wright in *CSJA* 4: 274 (1932), with fig.; D. A. Zimmerman in *CSJA* 44: 85 (1972). Type: Texas, Brewster Co., about 10 miles SE. of Alpine, 1930, *Hester*, not known to have been preserved. Another illustration: Weniger (1969), t. 37.

Plant solitary or caespitose to 30cm diam. stems globose, 2.5–4cm high; tub. 7–12mm long, with a groove extending to within 1–2mm of the naked ax.; ar. circular, 2–4mm across, slightly white-felted when young; rad. sp. 14–16, 7–15mm long, white with slightly darkened tips, plus 4–6 weaker spines in the upper part of the ar.; cent. sp. 0 [1–4, similar to rad. sp.]. Fl. rotate-campanulate, 23mm long; inner per. segs. slender-oblong to linear, light purple; filaments white; style yellowish, stigmas 4, whitish. [Fr. green to yellowish green, subglobose to globose, 5–8mm long, 3–6mm in diameter; seed 0.75–1mm long, brown, pitted].

E. intermedia Fric. in *Ceskoslov. Zahrádnických Listu*: 121 (1924), *nom. nud.*

E. leei Rose ex Boedeker (1933). See *E. sneedii*.

E. lloydii B. & R. (1923). See *E. chaffeyi*.

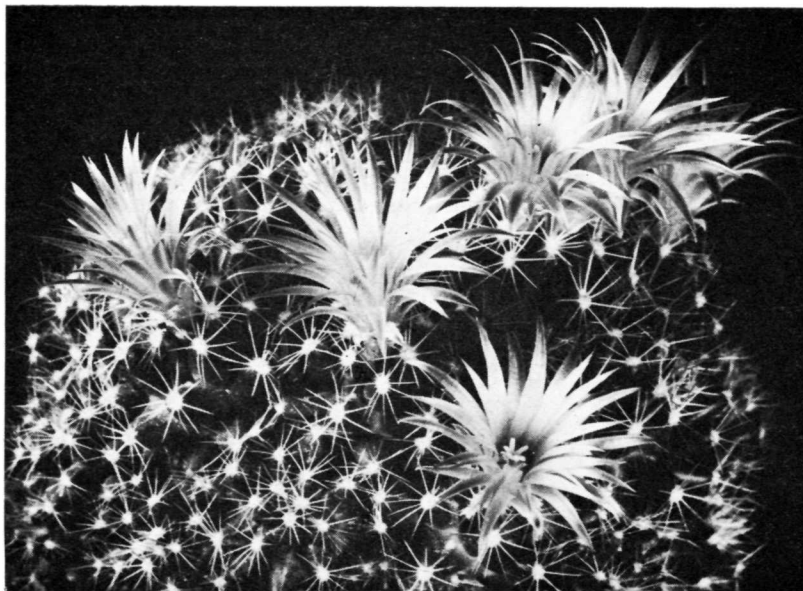
E. minima (Baird) D. R. Hunt in *CSJGB* 40: 30 (1978); *Coryphantha minima* Baird in *Amer. Bot.* 37: 150 (1931). *C. nellieae* Croizat in *Torreya* 34: 15 (1934); *E. nellieae* (Croizat) Backeb., *Die Cact.* 5: 2967 (1961). Type: Texas, near Marathon, 1931, *Davis*; not known to have been preserved. Range: NE. Brewster Co., Texas. Illustration: Weniger (1969), t. 37.

Plant simple or caespitose, short-cylindric, 3–4cm long, 1–2cm diam.; tub. 2–3mm long, grooved along its entire length; [ax. ?]; ar. somewhat woolly; rad. sp. 18, 3–4mm long; cent. sp. 3, erect, stouter than rad., to 8mm long. Fl. from base of groove, 15–20mm across; per. segs. lanceolate [to spatulate], rose-pink, with a pale margin. Fr. ovate, 3–5mm long, 1.5–3mm wide, green when ripe, with persistent per.; seed less than 0.5mm, very dark brown or black, not striated [pitted].

E. minima with its close ally *E. hesteri* constitute an isolated group within *Escobaria*, whose interrelationships with the remainder of the genus require further investigation.

E. missouriensis (Sweet) D. R. Hunt in *CSJGB* 40: 13 (1978); *Mammillaria missouriensis* Sweet, *Hort. Brit.*: 171 (1826); *Cactus mammillaris* Nuttall, *Gen. Pl.* 1: 295 (1818), not of Linnaeus (1753); *Neobesseya missouriensis* (Sweet) B. & R. (1923). For further synonymy see Benson (1969). Type and its locality unknown; description largely from Britton & Rose (1923) and Benson (1969), whose treatment of the varieties is accepted here. Overall range: N. America, from Texas and Arizona to Montana and N. Dakota.

Stems solitary or caespitose, hemispheroidal to depressed-globose, 2.5–5cm high, 4–10cm wide; tub. 10–15mm long, with a woolly groove; rad. sp. 8–20 to 10–20mm long, pubescent, grey; cent. sp. 0 (–2). Fl. 25–60mm diam., greenish-yellow, yellow or sometimes pink; inner per. segs. linear-lanceolate, acute, acuminate or attenuate; filaments yellow or



E. missouriensis
var. robustior

(photo Margaret Martin)

green; style green, stigmas 3-6, greenish. Fr. ellipsoid to globose, 10-25mm long, red; seed 1-2.5mm long, black, pitted.

var. **missouriensis** Range: Montana and N. Dakota south to Kansas and ? Oklahoma.

var. **caespitosa** (Engelm.) D. R. Hunt in CSJGB 40: 13 (1978); *Mammillaria similis* Engelm. var. *caespitosa* Engelmann in Boston J. Nat. Hist. 6: 200 (1850); *Neobesseyia similis* B. & R., The Cact. 4: 52 (1923); *Neobesseyia rosiflora* Lahman ex Turner in CSJGB 6: 2 (1937), and in CSJA 11: 72 (1939), *nom. nud.*

Rad. sp. c. 12-15. Fl. 50-60mm diam., outer per. segs. fimbriate. Fr. globose to ellipsoid, 15-20mm long; seed 2-2.5mm long. Range: Texas, E. Oklahoma, Arkansas, Louisiana and SE. Kansas. Grassland at low elevations.

var. **marstonii** (Clover) D. R. Hunt in CSJGB 40: 13 (1978); *Coryphantha marstonii* Clover in Bull. Torr. Bot. Club 65: 412 (1938).

Rad. sp. 10-19; cent. sp. always 0. Fl. 38-50mm diam., outer per. segs. fimbriate. [Fr. ?]; seed 2mm long. Range: Utah and Arizona.

var. **robustior** (Engelm.) D. R. Hunt in CSJGB 40: 13 (1978); *Mammillaria similis* Engelm. var. *robustior* Engelm. in Boston J. Nat. Hist. 6: 200 (1850); *Neobesseyia wislmannii* B. & R., The Cact. 4: 52 (1923).

Rad. sp. c. 12-15. Fl. 45-50mm diam., outer per. segs. not fimbriate. Fr. globose, c. 10mm diam.; seed ? Range: Texas. Prairies and woodlands at 300-600m.

Also to be considered here is *Mammillaria notesteinii* Britton in Bull. Torr. Bot. Club 18: 367 (1891); *Neobesseyia notesteinii* (Britton) B. & R., The Cact. 4: 53 (1923). Type: Montana, near Deer Lodge, 1891, *Notesteinii* (US?).

Stem solitary or caespitose, oval, c. 3cm diam.; tub. c. 6mm high [long?]; rad. sp. 12-18, 8-12mm long, white then grey, pubescent; cent. sp. usually 1. Fl. 15-25mm diam., ash-grey tinged pink, per. segs. broadly linear-oblong, mucronate. Fr. ovoid [colour ?]; seed globose, black, pitted. This plant may well be another form of the widespread *E. missouriensis*.

E. muehlbauerana (Boed.) Knuth (1935). See *E. ruyonii*.

E. nelliae (Croizat) Backeb. (1961). See *E. minima*.

E. neomexicana (Engelm.) F. Buxb. (1951). See *E. vivipara*.

E. oklahomensis (Lahman) F. Buxb. (1951). See *E. vivipara*.

E. orcuttii Boedeker, Mamm. Vergl.-Schlüssel, 17 (1933); *Neolloydia orcuttii* Rose ex Orcutt, Cactography: 5 (1926), *nom. nud.*; *Coryphantha orcuttii* (Boed.) D. Zimmerman in CSJA 44: 156 (1972), with figs.; *Coryphantha strobiliformis* (Poselger) Orcutt var. *orcuttii* (Boed.) L. Benson (1969). Lectotype: New Mexico, near Granite Pass, 1926, *Orcutt* (DS 307 and 410). Description from Zimmerman, l.c.

var. **orcuttii**

Stems solitary or commonly caespitose, cylindrical, to c. 15cm high and 6cm wide; tub. 4-8mm long, grooves woolly when young; rad. sp. 30-41, to 8mm long, white; cent. sp. (9-) 15-18, 9-11mm long, white, purplish or brownish tipped. Fl. 8-12mm diam. (not opening widely); inner per. segs. pale pinkish-white or occasionally deep rose, with pink midstripes; style white or very pale pink, stigmas 5-7, yellowish-white. Fr. cylindrical, green or greenish-yellow, 8-19mm long, nearly 6mm in width; seeds reniform, 1mm long, reddish-brown, finely pitted. Range: W. New Mexico and SE. Arizona.

var. **koenigii** Castetter, Pierce & Schwerin in CSJA 47: 68 (1975). Type: New Mexico, Luna Co., Florida Mts., Koenig Ranch, 1520m, 1962, *Castetter 961* (UNM).

Tub. 6-12mm long; rad. sp. 30-57; cent. sp. 9-22, 5-22mm long. Fl. 22-24mm long, 10-20 mm diam. Fr. 8-12mm long, to 10mm diam.; seeds 1-1.25mm long. Recorded from type locality only.

var. **macraxina** Castetter, Pierce & Schwerin in CSJA 47: 66 (1975). Type: New Mexico, SE. Hidalgo Co., Big Hatchet Mts., 2260m., 1973, *Heil 4287* (UNM).

Stems to 9cm diam.; rad. sp. 30-52, to 25mm long; cent. sp. 11-22, 4-12mm long. Seeds 1.25-1.6mm long. Recorded from type locality only.

To be considered here is *E. albicolumnaria* Hester in Desert Pl. Life 13: 129 (1941), with figs.; *Coryphantha albicolumnaria* (Hester) D. Zimmerman in CSJA 44: 157 (1972), invalid, exact basionym page not cited; *Escobeseya albicolumnaria* Hester ex L. Benson in Lundell, Fl. Texas 2: 311 (1969), *nom. nud.* Type: Texas, S. Brewster Co., WNW. of Terlingua and NE. of Lajitas, 1940, Hester (DS 271 & 855). Differs from the above: Plants usually solitary or sometimes with 2-3 stems; rad. sp. 25-30; cent. sp. 11-15, 12-18mm long. Fl. 20mm long, 15-18mm diam.; stigmas (3-) 5-6 (-7), white or pale pink. [Fr.; seed, very similar to the above]. Range: Texas, S. Brewster Co., 1000-1300m.

Zimmerman, l.c. suggests that these two species may represent the extremes of a cline in which spine and stem size, and perianth pigmentation increase from west to east. These taxa evidently belong to the *E. strobiliformis* Group, though specifically distinct according to Zimmerman.

E. organensis (D. Zimmerman) Castetter, Pierce & Schwerin in CSJA 47: 60 (1975); *Coryphantha organensis* D. Zimmerman in CSJA 44: 114 (1972), with figs. Type: New Mexico, Dona Ana Co., Organ Mts., c. 15 miles E. of Las Cruces, c. 2300m., D. A. & A. D. Zimmerman 1535 (SNM).

Stem caespitose, cylindric, somewhat soft, dark or yellowish-green, to 12cm high and 3cm diam. stem base neither naked nor corky; tub. 7-10mm long, groove extending halfway to the ax., bearing some wool; ar. circular, c. 3mm across; rad. sp. 33-35, 6-11mm long, white; cent. sp. 9-12, 9-19mm long, straw-coloured or yellow, with reddish-brown tips. Fl. 15-16mm across; per. segs. 34-36, acute, inner segs. pink with paler or white margins; filaments purplish-pink; stigmas 5-6, pale yellow. Fr. cylindric to slightly ovoid, 6-14mm long, 3-5mm wide, yellowish-green at maturity; seed 1-1.25mm long, reddish-brown, kidney-shaped, distinctly pitted.

The seed, fruit and habit of this plant ally it to the *E. strobiliformis* Group.

E. radiosa Frank (1960). See *E. vivipara*.

E. rigida Backeberg, Die Cact. 5: 2969, figs. (1961). As yet this name has not been validated by a latin diagnosis, but Glass & Foster (ined.) make mention of having collected this plant in (?) S. Coahuila, Mexico in 1972. They describe the plant as having small globular stems, glassy white spines and deep purplish-red flowers.

E. robbinsorum (Earle) D. R. Hunt in CSJGB 40: 13 (1978); *Cochisea robbinsorum* Earle in Saguaroand Bull. 30: 65 (1976), with figs. Type: Arizona, SE. Cochise Co., 1300m., Robbins (ARIZ).

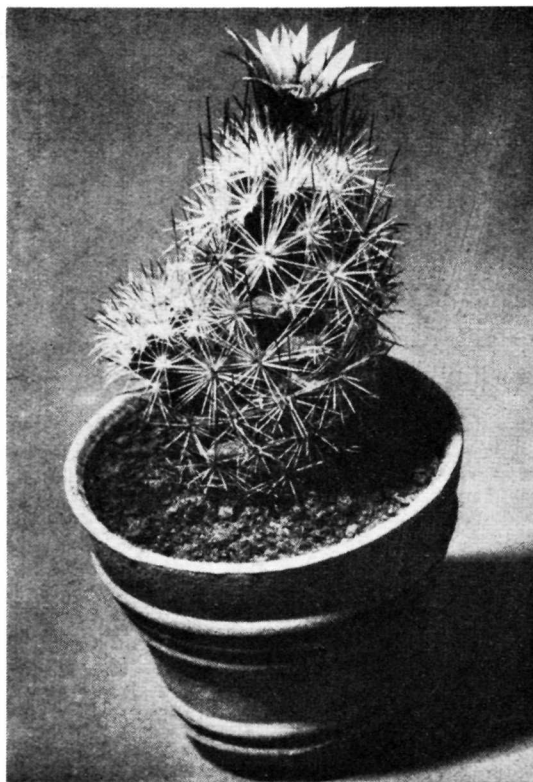
Plant solitary, up to 5cm diam. and high; tub. 8mm long, later devoid of spines; ax. [the groove?] with few white hairs; ar. round to oval, with copious wool; rad. sp. outer series 12, 6mm long, inner series 3-4, 10mm long; cent. sp. 0 (-1), 10-15mm long, all spines alike, white, brown-tipped. Fl. pink to olive [c. 22mm long]; per. segs. lanceolate, with light brown midstripe; style and stigmas light green. Fr. slender, 10mm long, red; seed 1mm in diameter, black, pitted.

Another member of the *E. dasycantha* Group.

E. roseana (Boed.) F. Buxb. (1951); *Echinocactus roseanus* Boed. in ZfS: 363 (1928); Glass & Foster, in CSJA 42: 234 (1970), state that this plant cannot be an *Escobaria* since, they say, it does not possess the tubercular groove characteristic of the genus.

E. runyonii B. & R., The Cact. 4: 55, t. 6 and fig. 53 (1923); *Coryphantha robertii* A. Berger (1929); *C. piercei* Fosberg (1931); *C. pirtlei* Werdermann (1934). Type (of *E. runyonii*): Mexico, Tamaulipas, near Reynosa, 1921, Runyon (US).

Plant caespitose with up to 100 stems, these are globular to short-oblong, greyish-green, 3-5 [-12]cm long, [2-2.5cm diam.] tub. 5 [-9]mm long, groove at first white-woolly; rad. sp.



E. muehlbauerana. Boedeker's original illustration (1930).

numerous [20-30], 4-5mm long, white; cent. sp. 5-7, 6-8 [-12]mm long, [pale yellow] with brown or black tips. Fl. 15mm long, [20-25mm diam.], pale purple [bronze-pink]; outer per. segs. narrow-oblong, with a dark purple midrib, inner per. segs. acute, pale purple; filaments purplish [yellow]; stigmas 6 [-7], green. Fr. globose to short-oblong, 6-9mm long red; [seed black or brown, 1-1.25mm long, punctate]. Range: SE. Texas and Mexico, Coahuila and Tamaulipas.

To be considered here is *E. muehlbauerana* (Boed.) F. M. Knuth in Backeb. & Knuth, Kaktus-ABC: 380 (1935); *Coryphantha muehlbaueriana* Boed. in MDKG 2: 18 (1930), with fig.; *Neobeseya muehlbaueriana* (Boed.) Boed. (1933). Type: Mexico, Tamaulipas, near Jaumave, 1929, Viereck, not known to have been preserved. Differs from the above: rad. sp. fewer, 15-20, to 8mm long; cent. sp. slightly longer, to 15mm. Fl. with outer per. segs. greenish-yellow with reddish-brown midstripes, inner per. segs. similar. (Fr., seed very similar to the above). These two taxa may be no more than later descriptions of *E. emskoetterana*.

Referable here is a living plant in Mr. Hunt's collection, collected by him in Tamaulipas, 25km. N. of Ciudad Victoria, Progreso, alt. 300m, in thorn scrub on low hillocks with *Mammillaria applanata*, *M. sphaerica*, *Lemairocerus* and *Opuntia* spp., 20 Nov. 1973, Hunt 8588. This plant has about 25 radial spines 4-8mm long and 7 brown-tipped centrals 8mm long (fewer on young offsets). The flowers are small, creamy, the outer segments with brownish mid-stripe.

E. sandbergii Castetter, Pierce & Schwerin in CSJA 47: 62 (1975), with figs. Type: New Mexico, W. slope of San Andres Mts., Rope Springs, 1967, Pierce 3409 (UNM 38739).

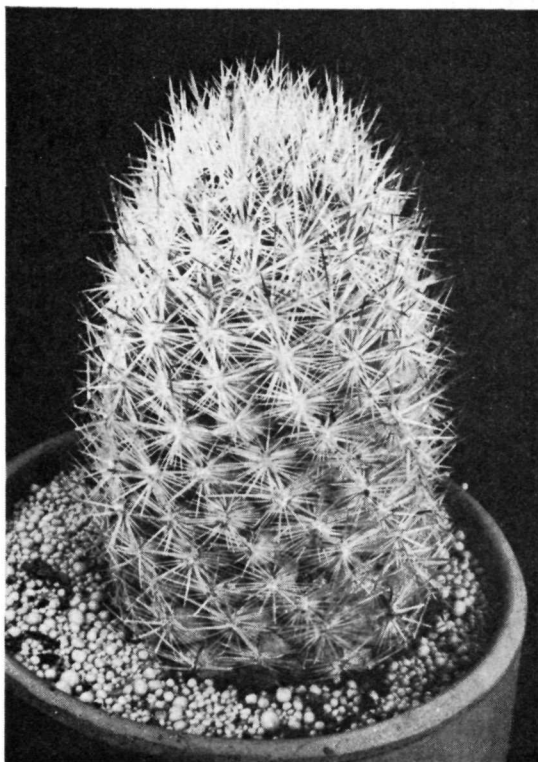
Plants solitary or with up to 20 heads, stems cylindric 5-12 (-15)cm long, 4-7cm across; tub. 5-12mm long, with a groove bearing dark wool near to the ax.; rad. sp. 23-55, 5-10mm long, white; innermost cent. sp. 1-5, 8-30mm long, white tipped reddish-brown; peripheral cent. sp. 5-15, 3-15mm long, white sometimes tipped reddish-brown. Fl. funnel-form to campanulate, 12-25mm long, 17-25mm diam. light pink to purple; inner per. segs. broadly lanceolate with darker mid-stripes; stigmas 4-6, white to yellow. Fr. 8-20mm long, c. 6mm in width, pale green or yellowish-green, lower part sometimes pale brownish-pink; seeds 1-1.5mm long, reddish-brown, reticulate [pitted]. Range: San Andres Mts., New Mexico at 1520-2256m.

The seed, fruits and habit ally this species to the *E. strobiliformis* Group.

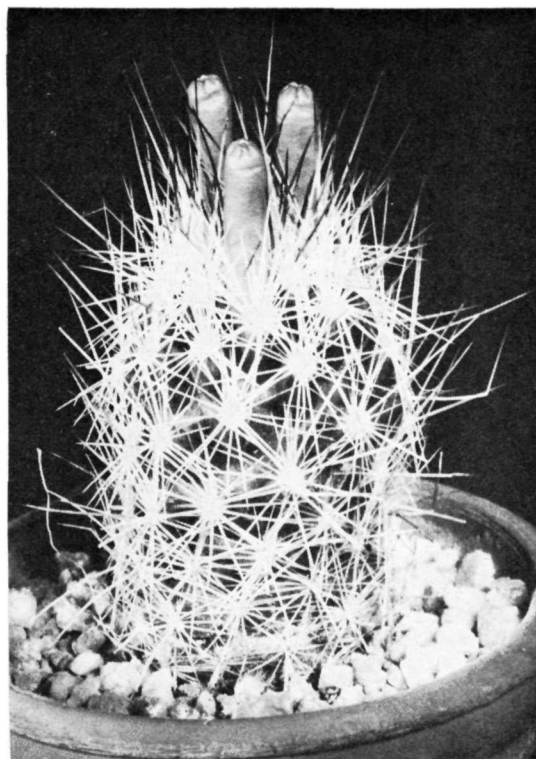
E. sneedii B. & R., The Cact. 4: 56, fig. 54 (1923); *Coryphantha sneedii* (B. & R.) A. Berger (1929). Type: Texas, Franklin Mts., 1921, Sneed (US).

var. **sneedii**

Plant densely caespitose with up to 50 heads; stems cylindric, to 6cm long, 1-2cm diam.; tub. 2-3mm long, naked and hardened at the base of old stems, with a narrow hairy groove; ax. not setose; rad. sp. 20 [-35], 3-6mm long, adpressed to the stem, white; [cent. sp. 6-9, 4.5-6mm long, white tipped pink or lavender]. Fl. small, 10mm long, [12-20mm diam.]; outer per. segs. white or pink with brown to green midstripes; inner per. segs. white with pink, magenta or brownish midstripes, lanceolate-acuminate; style cream, stigmas 3-5. Fr. clavate, to 15mm long, 6mm diam., green or



E. strobiliformis (photo: Margaret Martin).



E. strobiliformis, another form showing fruits
(photo: Margaret Martin).

tinged with brown or red]; seed globose, nearly 1 [-1.5]mm diam., brown, pitted. Range: New Mexico, Dona Ana Co., and Texas, El Paso Co., in the Franklin Mts.

Said to intergrade in certain parts of its range with *E. strobiliformis*.

var. **leei** (Rose ex Boed.) D. R. Hunt in CSJGB 40: 30 (1978); *Escobaria leei* Rose ex Boed., Mamm. Vergl.-Schlüssel, 17 (1933); *Coryphantha sneedii* (B. & R.) Berger var. *leei* (Rose ex Boed.) L. Benson in CSJA 41: 189 (1969). Type: from New Mexico, Rattlesnake Canyon, 30 miles SW. of Carlsbad, 1450m, 1924, Lee (US 72134).

Spines deflexed, pointing inwards from the ar. towards the stem. Fl. dull medium brownish-pink. Seed larger than that of var. *sneedii*. Range: Guadalupe Mts. in Eddy Co., New Mexico.

This species appears to be another part of the complex *E. strobiliformis* Group.

E. strobiliformis Scheer ex Boed., Mamm. Vergl.-Schlüssel, 16 (1933); *Echinocactus strobiliformis* Poselger in Allg. Gartenz. 21: 107 (1853), based on *Mammillaria strobiliformis* Scheer in Salm-Dyck, Cact. Hort. Dyck., 104 (1849), not Engelmann (1848); *M. tuberculosa* Engelm. in Proc. Amer. Acad. 3: 268 (1856); *E. tuberculosa* (Engelm.) B. & R. (1923), with fig. 51. Type locality (of *M. tuberculosa*): Texas, Mts. near El Paso and eastward. Description from Britton & Rose (1923) and Benson (1969).

Plant caespitose, more rarely solitary, stem cylindric to 20cm long, 2-6cm diam.; tub. 6-10mm long, becoming spineless and hard at the stem base; rad. sp. 20-30, 4-15mm long, pale

straw-colour, white or pale grey; cent. sp. 6-8, to 15mm long, straw-yellow, usually tipped pink to blackish. Fl. 20-30mm diam.; inner per. segs. lanceolate, acute, pink; style pale pink, stigmas 6-7. Fr. narrowly ellipsoid-cylindroid, 12-20mm long, 6-7.5mm diam., red or green; seed up to 1mm, brown, punctate. Range: S. New Mexico, SW. Texas, and Mexico, Chihuahua, (also Coahuila and Durango, fide Zimmerman in CSJA 44: 158, 1972).

E. tuberculosa (Engelm.) B. & R. (1923). See *E. strobiliformis*.

E. varicolor Tiegel (1932). See *E. dasyacantha*.

E. villardii Castetter, Pierce & Schwerin in CSJA 47: 64 (1975), with figs. Type: New Mexico, Sacramento Mts. E. of Alamogordo, 1972, Reaves 3984 (UNM 50, 789).

Plants caespitose, rarely solitary; stems globose, short-cylindrical, ovoid or clavate, 6-15cm long, 3-6.5cm in width; tub. 6-11mm long, with groove full length, densely white woolly when young, becoming woody and spineless at stem base; rad. sp. 20-36 (-47), 5-12mm long, white; cent. sp. 6-15, 6-20mm long, white brown tipped, plus 1-2 very stout principal cent. sp., 12-20mm long, reddish-brown, darker tipped. Fl. 20-35mm long, 8-25mm diam.; inner per. segs. white with a light brown to pink midstripe; stigmas 6-7, white. Fr. cylindrical, 11-21mm long, 5-8mm diam., green tinged reddish-purple; seed 1.25-1.5mm long, reddish-brown, alveolate. Range: New Mexico, W. face of the Sacramento Mts., at 1450-1830m.

Another member of the *E. strobiliformis* Group.

E. vivipara (Nutt.) F. Buxb. in Oesterr. Bot. Zeitschr. 98: 78 (1951); *Cactus viviparus* Nuttall in Fraser's Cat. No. 22 (1813), and in Pursh, Fl. Am. Septentr. 2: 735 (1814); *Coryphantha vivipara* (Nutt.) B. & R. (1913). For further synonymy of this species and its varieties, see Benson in Lundell, Fl. Texas 2: 304-6 (1969), The Cacti of Arizona ed. 3: 196-200 (1969) and The Native Cacti of California, 210-213 (1969). Type: Nuttall says he observed a living specimen in a collection cultivated by Lambert. Type locality: Upper Louisiana. Description from Benson.

Plant solitary or caespitose, sometimes forming clumps of 200 heads or more; stems depressed-globose to cylindroid, 4-15cm diam.; tub. 6-19mm long [grooved]; rad. sp. 12-40, 9-25mm long, white to brown or pink; cent. sp. 3-12, 12-25mm long, white, brown or grey, tipped pink, red or black. Fl. 25-50mm diam.; inner per. segs. pink, red, lavender or yellow-green; stigmas 5-10. Fr. 12-25mm long, 10-15mm diam., ellipsoid, green; seed 1.2-2mm [pitted]. Range: N. America, from N. Mexico to S. Canada.

var. *vivipara*

Stems solitary or caespitose, depressed-globose; rad. sp. 12-20, to 12mm long, white; cent. sp. 4, 12-20mm long, white or dark coloured, tipped red. Inner per. segs. very narrowly lanceolate-subulate. Fr. 12-20mm long; seed 15-18mm long. Range: N. Texas and NE. New Mexico north to Alberta and Saskatchewan in Canada. Illustration: Weniger (1969), t. 31.

var. *alversonii* (Coulter) D. R. Hunt in CSJGB 40: 13 (1978), *Cactus radiosus* (var.) *alversonii* Coulter in Contr. U.S. Nat. Herb. 3: 122 (1894); *Coryphantha alversonii* (Coul.) Orcutt (1926). Type: desert region of extreme SE. California, 1892, Alverson (MO).

Plant with subterranean branches; stems cylindrical; rad. sp. 12-18, 12-16 (-19)mm long, white; cent. sp. 8-10, 12-16mm long, tipped dark red or black. Fl. c. 32mm diam.; inner per. segs. magenta to pink. Range: Arizona (Pagumpa) and SE. California. Illustration: Benson, The Native Cacti of California (1969), plate 16.4 and fig. 72.

var. *arizonica* (Engelm.) D. R. Hunt in CSJGB 40: 13

(1978); *Mammillaria arizonica* Engelm. in S. Watson, Pl. Wheeler: 9 (1874), name only; in Bot. Calif. 1: 244 (1876), with description; *Escobaria arizonica* (Engelm.) F. Buxb. (1951). Syntypes: from the separate collections of Coues, Palmer, Bischoff and Johnson in N. Arizona and S. Utah.

With 1-many ovoid heads; rad. sp. 20-30, 12-16mm long, white; cent. sp. 5-7, 16-19mm long, red. Fl. 38-50mm diam.; inner per. segs. deep pink, narrowly lanceolate, not attenuate or acuminate, but acute and mucronate. Fr. 19mm long; seed 2mm long. Range: N. Arizona, S. Nevada, SW. Utah, W. & N. New Mexico at 1500-2350m. Illustration: Weniger (1969), t. 33.

var. *bisbeeana* (Orcutt) D. R. Hunt in CSJGB 40: 13 (1978); *Coryphantha bisbeeana* Orcutt, Cactography: 3 (1926), a new name for *Mammillaria aggregata* Engelm. in Emory, Milit. Recon.: 156 (1848), which Engelmann later decided had been described in error, and was a synonym of *Cereus phoeniceus* Engelm., (see Engelmann in Ives, Rept. Colorado R. West, part 4, Botany: 13. 1861); *Coryphantha aggregata* B. & R., The Cact. 4: 47, fig. 47 (1923), and of authors; *E. aggregata* F. Buxb. (1951). *E. bisbeeana* (Orcutt) Borg (1937). Type: Arizona, Benson, 1908, Rose.

With 1-many ovoid heads; rad. sp. 20-30, mostly 9-13mm long, white to brown; cent. sp. 5-6, 12-16mm long, brown or grey with pink or brown tips. Fl. 38-50mm diam.; inner per. segs. pink, narrowly lanceolate, the tips acuminate. Fr. c. 19mm long; seed 2mm long. Range: S. Arizona and Mexico, Sonora. Illustration: Benson, The Cacti of Arizona, ed. 3: fig. 11.7 (1969).

var. *deserti* (Engelm.) D. R. Hunt in CSJGB 40: 13 (1978); *Mammillaria deserti* Engelm. Bot. Calif. 2: 449 (1880); *Coryphantha deserti* (Engelm.) B. & R. (1923); *Escobaria deserti* (Engelm.) F. Buxb. (1951). *E. chlorantha* (Engelm.) F. Buxb. (1951). Type: California, Ivanpah, 30 miles NE. of San Bernardino, Parish (MO).

Plant usually solitary, cylindrical; rad. sp. 12-20, 9-13mm long, white; cent. sp. 4-6, 12-19mm long, tipped red. Fl. 25-45mm diam.; inner per. segs. yellow-green to straw-yellow or pink, lanceolate-linear, not attenuate or acuminate, but mucronate. Fr. c. 25mm long; seed 1.5mm long. Range: W. Arizona, SE. California, S. Nevada and SW. Utah. Illustration: Benson, The Native Cacti of California (1969), t. 16.5.

var. *radiosa* (Engelm.) D. R. Hunt in CSJGB 40: 13 (1978); *Mammillaria radiosa* Engelm. in Boston J. Nat. Hist. 6: 196 (1850); *E. radiosa* Frank K.u.a.S. 11: 157 (1960), invalid combination. *E. neomexicana* (Engelm.) F. Buxb. (1951); *Coryphantha neomexicana* (Engelm.) B. & R. (1923); *C. columaris* Lahman (1934); *C. fragrans* Hester (1941); *C. oklahomensis* Lahman (1949); *E. oklahomensis* (Lahman) F. Buxb. (1951). Type (of *M. radiosa*): W. Texas, Pterdenales, 1846, Lindheimer (MO).

Plant solitary or caespitose; stems ovoid to cylindric; rad. sp. 20-40, 12-20mm long, white to pink; cent. sp. 3-4, 15-20mm long, pink to red. Inner per. segs. narrowly lanceolate-subulate, attenuate. Fr. 20-25mm long; seed 2mm long. Range: S. New Mexico, W. Texas, S. Oklahoma at 200-2400m.

var. *rosea* (Clokey) D. R. Hunt in CSJGB 40: 13 (1978); *Coryphantha rosea* Clokey in Madrono 7: 75 (1943). Type: Nevada, between Kyle Canyon and Deer Creek, 2400m., Clokey 8038.

Plant solitary or caespitose; stems ovoid-globose; rad. sp. c. 12-18, 16-25mm long, cent. sp. 10-12, 19-25mm long, white tipped red. Fl. 32-50mm in diameter; inner per. segs. magenta to purplish, lanceolate. Seed 2mm long. Range: N. Arizona, E. California and S. Nevada. Illustration: Benson, The Native Cacti of California (1969), t. 16.3.

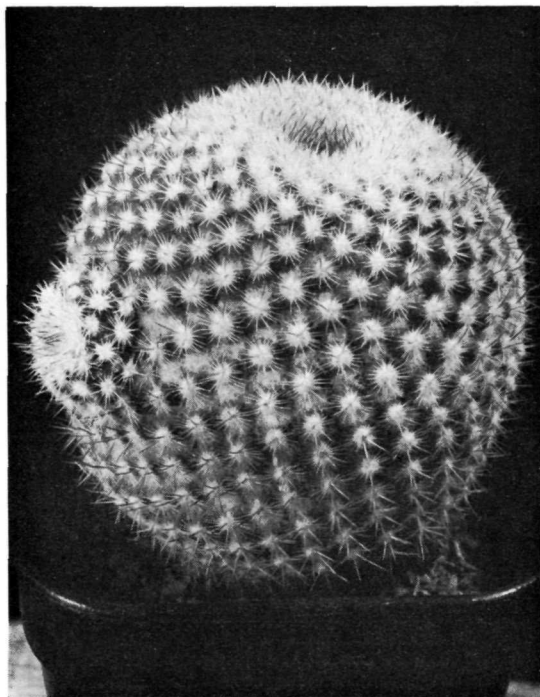
E. zilziana (Boed.) Backeb. (1961). See *E. asperispina*.

Mammillaria reppenhagenii

by D. R. Hunt

The original description of this species was published by me in the German journal last year (Kakt. u. a. Sukk. 28(6): 129-130. 1977). The English version is given in full below:

Stem solitary or more rarely offsetting, globose to shortly columnar, up to 9(15) cm. tall, about 6 cm. in diameter, the apex sunken and filled with white wool; *tubercles* in 13/21 or 21/34 spirals, conic, 5-7 mm. long, c. 5 mm. in diameter at base, epidermis pale grey-green, sap watery (examined in the month of June); areoles oval, 2 x 1 mm., with copious persistent white wool, the whole 3-4 mm. in diameter; *axils* with short persistent white wool. *Central spines* 2-5, usually 4, 3-6.5 mm. long, subcorrect, acicular, straight or slightly curved, at first pinkish or reddish brown with darker tip, later whitish below; *radial spines* (19-)22-23(-26), radiating, the lateral longest, 2-3 mm. long, setaceous, straight or sometimes irregularly curved, white. *Flowers* (produced in cultivation in May) in a ring round the crown of the stem, deeply set between the tubercles, tubular-campanulate or urceolate, 10-12 mm. in overall length, the limb narrow, only 5-8 mm. in diameter; *receptacle-tube* ('ovary') white; *outer perianth-segments* small, narrowly oblong-lanceolate, ivory coloured; *inner perianth-segments* narrowly lanceolate, c. 1 mm. broad, the free part c. 2 mm. long, carmine with lighter edges; *stamens* short, only half as long as the perianth, filaments pink, anthers yellow; *style* white, 8-9 mm. long with 3(-4) pink-tinged creamy white stigma lobes 1 mm. long. *Fruit* a red berry; *seeds* pyriform, c. 1 mm. long, brown, pitted with lateral hilum.



Mammillaria reppenhagenii (photo: R. Zabeau)

Type: Mexico, Colima, borderland with Michoacan, east of Colima City, near Rancho Tecuan, Cerro Barrigon, 2000 m. s.m., 24 Sept. 1972 *Reppenhagen* 382 (ZSS, holotypus; K, isotypus). Here the species was found growing in pockets of humus on scattered limestone rocks. The associated flora included *Ferocactus reppenhagenii* Unger (in Kakt. u. a. Sukk. 25(3): 50. 1974) and species of *Neobuxbaumia*, *Opuntia*, *Nopalea*, *Hylocereus*, *Agave*, terrestrial *Bromeliaceae*, *Euphorbia pulcherrima* and palms.

The same species was collected by Mr. Reppenhagen a few days earlier (20 Sept. 1972, R.382A) in another direction from Rancho Tecuan, on Cerro de Carrizal 1200 m.s.m., in humusy cracks of limestone rocks, where it was growing with *Agave filifera* and a species of *Hechtia*. The surrounding vegetation was an open deciduous undergrowth with fan-palms, but no other cacti.

This very attractive plant, distinguished by its copiously white-woolly areoles, reddish central spines and very small flowers is named for its collector, Werner Reppenhagen, who has travelled widely in Mexico and maintains a very comprehensive and well-documented living collection of the genus *Mammillaria* at his nursery at St. Veit-Glan, Austria.

M. reppenhagenii is one of the group of forms surrounding *M. albilanata* Backeb., which occur on limestone formations in south western Mexico. Its collection extends the distribution of the group some 500 km. across the basin of the Rio Balsas from the state of Guerrero to that of Colima.

XV IOS Congress at Monte-Carlo

The International Organization for Succulent Plant Study is holding its fifteenth Congress at Monte-Carlo from 14-19 May. The theme of the scientific sessions is 'Applications of the Scanning Electron Microscope in the study of Succulent Plants' and there will also be a symposium on 'Reserve Collections' and slide-lectures on cacti and succulents in habitat. There will be visits to the Jardin Exotique, of which the Congress Host, Mr. Marcel Kroenlein, is Director, to the famous Marnier garden 'Les Cedres' and to nursery establishments. A novel feature of the Congress will be the presentation of an award called the 'Golden Cactus' by H.R.H. Princess Grace of Monaco. Full report in our next issue!

NEW! JOURNAL INDEX 1969-75

An Index of Plant Names in Volumes 31-37 inclusive, covering issues for 1969-75, compiled by the Society's Librarian, Mr. G. G. Leighton-Boyce, is now available, price 90p post free, from the Editor, CSJGB, 67 Gloucester Court, Kew Road, Richmond, Surrey TW9 3EA.

The 'Ango Group' of *Caralluma* in Ethiopia

by M. G. Gilbert

East African Herbarium, Nairobi, Kenya

Four species of 'Ango Group' Caralluma have been recorded from Ethiopia (White & Sloane, 1937; Cufodontis, 1961). Of these one is usually treated as inadequately known. This paper raises the number of taxa recorded to eight species plus a further three subspecies. The total includes three new species plus three new subspecies. Two of the other species were inadequately known or understood.

Introduction

This primarily north tropical African and Arabian group was informally delimited and named by White & Sloane (1937). It is readily distinguished from other members of the very heterogeneous genus by the characteristic stems with soft, long-attenuate tubercles—the leaves are often indistinguishable from the rest of the tubercle, usually marked with irregular darker blotches, and with the flowers produced in small extra-axillary fascicles from the upper part of the stems. The pollinia also appear to be distinctive, resembling those of *Stapelia* rather than other groups of *Caralluma*. The only other group within the genus with similar stems is the south tropical African group that includes *C. lutea* and *C. caudata* and which differs very markedly indeed by the large basal umbels of flowers and distinctive coronas, much more comparable to species of *Stapelia* than *Caralluma*. Many of these species are further distinguished by the presence of well developed stipels. As has already been pointed out, *Caralluma* as currently conceived is remarkably diverse. Some of the groups of species included are very distinctive and certainly merit consideration for formal taxonomic recognition, quite possibly as separate genera. The 'Ango Group' is one of the most distinctive of these. Any such action must be based on a detailed survey of the entire genus throughout its range. Until this is possible the 'Ango Group' is retained within *Caralluma*. The name 'ango' is used by the Tigrinia-speaking people of northern Ethiopia for various edible species of stapeliad, usually *Huernia macrocarpa* and members of the group considered in this account.

Status of *Caralluma angu*

Caralluma angu (A. Rich.) N.E. Br. in Gard. Chron. 12: 369 (1892); *Stapelia angu* A. Rich., Tentamen Flor. Abyss. 2: 50 (1851).

The identity of this species is uncertain and thus it is necessary to treat it separately from the better known members of the group. As this is the oldest of the eastern

African species, the question of its identity has important nomenclatural consequences.

Richard's original description of this species is extremely inadequate, particularly as it makes no mention of the corona structure. This, coupled with the fact that no one has been able to find the type collection for at least the last 70 years (Brown, 1904) means that it is now impossible to state with certainty what the identity of this species is. Both *C. angu* and *C. sprengeri* have as their types specimens collected in Tigre Region* in northern Ethiopia by members of a French expedition led by Lefebvre. The former was collected by the botanist to the expedition, Quartin Dillon, from an unspecified locality in Shire Province whilst the latter was collected by Petit, a zoologist, from Adua further to the east. *C. sprengeri* is a well-known species described some 40 years after *C. angu*, the typical form of which is, along with *Huernia macrocarpa* ssp. *macrocarpa*, one of the most common stapeliads in the northern Ethiopian highlands. It is the only *Caralluma* so far seen from Shire. Collections made prior to the publication of *C. sprengeri*, notably by Schimper from around Adua, have all been determined as *C. angu*. Unfortunately the reliability of these determinations is not known. There is a possibility that at least some of these were compared with the type of *C. angu* in Paris where Quartin Dillon's collection was deposited. N. E. Brown (1904) suggested the possible identity of the two species but in view of the inadequate material then available thought it better to keep them separate. Berger (1910) made the tentative suggestion that it could be the same as *C. commutata*. The determination of northern Ethiopian material as that species adds credence to that view and in the absence of the type of *C. angu* it is not possible to eliminate such a possibility. White & Sloane (1937) were of the opinion that *C. angu* would have to remain a name of uncertain application but did add the possibility of its identity with *C. baldratii*. The linear revolute corolla-lobes of the Ethiopian form of that species however make this highly unlikely as it is difficult to imagine them ever being described as 'ovate-oblong' as were those of *C. angu*. Moreover *C. baldratii* is far more uncommon than White & Sloane appeared to suppose.

*The 14 major administrative Regions of Ethiopia were formerly referred to as Governorate Generals or, very frequently but incorrectly, as Provinces. This term is often reserved for subdivisions of the Regions, e.g. Shire Province within Tigre Region.

Circumstantial evidence, notably the naming of nearly contemporaneous collections and the absence of records of any other species of *Caralluma* from the type area, strongly suggest that *C. angu* and *C. sprengeri* are identical. It is, however, circumstantial only, and it is quite easy to imagine new evidence, most notably the discovery of the type, necessitating the changing of any identification of *C. angu* based on the information now available. Another factor to be borne in mind is the potential status of the 'Ango-Group'. Should this be elevated to genus, as well might be the case, the informal name for the group would make a very convenient generic name, in which case it could not be used as a specific epithet because of tautology. Under such circumstances *C. sprengeri* would be the correct name. For these reasons *Caralluma angu* is here regarded as a *species non satis cognita* and ignored.

'Ango Group' species recorded from within Ethiopia

1. *Caralluma sprengeri* (A. Rich.) N.E. Br.
 - a. ssp. *sprengeri*
 - b. ssp. *laticorona* M. G. Gilbert
 - c. ssp. *foetida* M. G. Gilbert
 - d. ssp. *ogadensis* M. G. Gilbert
2. *C. gemugofana* M. G. Gilbert
3. *C. commutata* Berger
4. *C. abayensis* M. G. Gilbert
5. *C. baldratii* White & Sloane
6. *C. circes* M. G. Gilbert
7. *C. sacculata* N. E. Br.
8. *C. vibratilis* Bruce & Bally

KEY TO SPECIES

1. Corolla lime green, lobes with long colourless hairs terminating prominent fleshy papillae; corona white; inner corona lobes produced into 2 or more subulate teeth 6. ***C. circes***
Corolla yellow to brown or deep red, glabrous, minutely puberulent or with larger hairs restricted to margin only; corona pink, brown or yellow, inner corona lobes entire or with short obtuse-deltoid teeth 2.
2. Corolla rotate to very shallowly campanulate with the corona projecting from the tube 3.
Corolla deeply campanulate to tubular with the corona enclosed within the tube 7.
3. Corolla lobes linear-revolute; inner corona lobes with one or more dorsal projections at base 5. ***C. baldratii***
Corolla lobes ovate to lanceolate with only margins and apex slightly revolute; inner corona lobes lacking dorsal projections 4.
4. Outer corona more or less annular or with flat lobes extensively fused laterally to each other 5.
Outer corona cup-shaped with deeply saccate lobes 6.
5. Corolla with very small tube completely occupied by corona and delimited from limb by narrow but distinct annulus; corolla epidermis rugose to velvety papillate/rugulose, sometimes papillae hair-tipped; margin of outer corona fleshy, smooth and rounded 1. ***C. sprengeri***
Corolla rotate to very shallowly campanulate, without any trace of an annulus; corolla epidermis smooth, glabrous; margin of outer corona thin, irregularly granulate 2. ***C. gemugofana***

6. Pedicel shorter than calyx; buds patent 3. ***C. commutata***
Pedicel more than twice as long as calyx; buds deflexed 4. ***C. abayensis***
7. Corolla tubular, erect, glabrous or uniformly puberulent 7. ***C. sacculata***
Corolla campanulate, horizontal or deflexed, with clavate vibratile hairs along margin 8. ***C. vibratilis***

Systematic treatment

1. ***Caralluma sprengeri*** (Schweinf.) N.E. Br. in Kew Bull. 1895: 263 (1895). *Huernia sprengeri* Schweinfurth, Cat. Dammann Co. 1893: 46 (1893).

Bullock (1963) regarded this species, along with *C. angu*, *C. commutata*, *C. hesperidum* and *C. venenosa*, as synonymous with the West African *C. decaisneana*. This synonymy is much too extensive and at least some of these species, certainly both the Ethiopian representatives, merit maintenance as distinct species. *C. decaisneana*, and the other western species, *C. hesperidum* and *C. venenata*, which are probably synonymous with it (Field, 1976), can be separated from *C. sprengeri* and other Ethiopian members of the group by the distinctive corolla with a deep tube often hiding the outer corona and the very dark epidermis conspicuously 'frosted' with short white hairs.

Typical *C. sprengeri* is currently only reliably recorded from northern Ethiopia. There are records from Tropical Arabia (originally as *Stapelia dentata* Forssk., *nom. nud.*) but none are recent and no material has been



Fig. 1. *Caralluma sprengeri* ssp. *laticorona* growing near Lake Shalla, Shoa Region.

seen. In view of the occurrence of other members of the group in Tropical Arabia and the absence of any records of authentic material the identity of Forsskal's plant must be viewed with suspicion. The record by Bruce & Bally (1947) from Sudan is here regarded as belonging to a separate taxon, one of three subspecies established in this paper for material from southern Ethiopia and neighbouring countries. The groups differ in a substantial number of characters but the differences are largely cryptic and it seems likely that intermediates might occur. As they each have discrete distributions it is thought best to treat them as a series of subspecies.

KEY TO THE INTRASPECIFIC TAXA OF *C. SPRENGERI*

1. Corona more than 7mm across; inner corona lobes overlapping over stigma cap ... ssp. **laticorona**
 Corona less than 6mm across; inner corona lobes barely exceeding anthers, leaving white stigma cap exposed ... 2.
2. Corolla lobes (13.5-)16-20mm long*; corolla epidermal papillae terminated by white hairs ... ssp. **sprengeri**
 Corolla lobes 9.6-12 (-13.4)mm long; corolla glabrous ... 3.
3. Corolla lobes revolute, never reflexed; corolla epidermis rugose, distinct papillae absent ... ssp. **ogadensis**
 Corolla lobes flat, usually markedly reflexed; corolla velvety rugulose with minute papillae... ssp. **foetida**

1a. ssp. **sprengeri**

The nominal subspecies is limited to the northern Ethiopian plateau where it is found in dry evergreen bushland, often dominated by *Euclea schimperi*, at altitudes in the order of 1600-2000m. It is usually associated with the slightly more abundant *Huernia macrocarpa* ssp. *macrocarpa*, it being unusual to find one without the other. It is readily separated from the other subspecies by the longer and relatively narrower coarsely puberulent corolla lobes and the brighter overall colours of the flowers, especially the yellowish corona. The stems tend to be more robust and erect than the other subspecies and are occasionally 5-angled and/or dichotomously branched.

DESCRIPTION. *Stems* ascending or erect to 15cm high sometimes shortly soboliferous; *buds* somewhat pendant, very acute; *corolla* rotate, lobes narrow lanceolate, slightly revolute, 13.5-20mm long, 5.7-7.0mm wide, papillate, each papilla terminated by a short white hair, these longest in the area immediately adjacent to the corona, corolla uniform light greyish-brown to tan in colour; *corona* partially immersed in very shallow

corona tube which is delineated from the rest of the corolla by a very narrow annulus normally hidden by the corona, 4.3-5.2mm diameter, yellow, outer corona annular, not conspicuously swollen, inner corona lobes barely exceeding anthers to leave white stigma-cap exposed; *pollen masses* yellow.

1b. ssp. **laticorona** M. G. Gilbert **subsp. nov.**; *a typo gemma obtusa lobis corollae latioribus minus revolutis glabris rugulosis corona latiore atrobrunnea lobis corollae interioribus superpositis differt.* Typus: Ethiopia, SHOA: Green Lake ('Areguardi Hayk'), a crater lake c. 5km south of Debre Zeit, 8°5'N 38°59'E, c. 2000m a.s.l., denuded rocky slopes with *Ficus* spp., *Carissa edulis* & *Pterolobium stellatum*, M. G. & S. B. Gilbert 1383, in spirit, holotype K, isotype ETH.

This subspecies appears to have the widest distribution as, although only recorded from Shoa Region from within Ethiopia, there are isolated records from Kenya and Sudan. As the subspecific epithet indicates this subspecies can be separated from the rest of the complex by the wider corona. The corona is also distinctive through the more pronounced fleshy rim and the interlocking inner corona lobes concealing the stigma cap. The corolla closely resembles that of ssp. *foetida* but is larger and has smooth, not minutely asperous, rugosities. The greenish pollen masses are also distinctive. *C. commutata* and *C. abayensis* have very similar corollas but differ markedly in corona morphology.

Plants have been found in a variety of habitats varying from calcareous black soils under a canopy of stunted *Acacia etbaica* to steep rocky slopes under a variety of bushland types. Most, if not all, plants seen have been on substrates of volcanic origin. The most common type of associated vegetation is *Acacia* woodland which has been locally modified by shallow or calcareous soils. Altitudes vary between 1400m and 2000m.

DESCRIPTION. *Stems* procumbent, to 10cm high, never soboliferous; *buds* horizontal to deflexed, obtuse, rarely



Fig. 2. *Caralluma sprengeri* ssp. **foetida**. Clonotype material cultivated at Addis Abeba.

*All the taxa covered by this account have been cultivated in Addis Abeba. Wild plants are usually smaller in all parts than cultivated material whilst specimens that are preserved in alcohol based fixatives show marked shrinkage, in the order of 10%. Size ranges given attempt to cover fresh cultivated material (upper limit) and preserved wild material (lower limit). Corolla lobe length in species with rotate corollas is measured from the apex of the pedicel to the tip. In species with a well defined tubular or campanulate corolla limb, the lobes are measured from the top of the tube which is measured separately.

apiculate; *corolla* rotate to somewhat reflexed, lobes ovate, flat, 12.5–16mm long, 8.4–9.3mm wide, glabrous, rugulose to rugose, uniform medium to light brown; *corona* as in type, 6.9–8.0mm diameter, very dark brown, at anthesis covered entirely with glistening nectar, rim conspicuously thickened, inner lobes interlocking over and concealing stigma cap; *pollen masses* greenish.

FURTHER RECORDS. ETHIOPIA. SHOA: 8km S. of Nazareth, 8°30'N 39°16'E, growing amongst boulders on a small hill covered with remnants of *Acacia* scrub; 13 June 1971; S. Edwards & Tewolde B. G-E. s.n.; 5km S. of Meki, 8°10'N 38°48'E, alt. 1750m. a.s.l., ridge of volcanic ash with tuffa, *Acacia etbaica*, *A. senegal*, *A. tortilis* ssp. *spirocarpa* & *Balanites aegyptiaca* woodland; 26 June 1972, Gilbert & Tewolde B. G-E. 2472; Awash River, 2km upstream from Sodere, 8°27'N 39°24'E, alt. 1400m. a.s.l., *Acacia*–*Balanites* *glabra* woodland, at base of rocky slope, 14 July 1975, Gilbert 3968. KENYA: 60 miles W. of Lodwar, Williams in Bally B11965. SUDAN: Erkawit, Red Sea Hills, Darval in Bally 5107. (fide Bruce & Bally 1947).

1c. ssp. **foetida** M. G. Gilbert **subsp. nov.**; a typo *gemma obtusa lobis corollae latioribus minus revolutis glabris rugulosis minutissime asperis odore foetido conspicuo differt*. Typus: Ethiopia. HARERGHIE: 8km from

Babile along track to Fiche, 9°10'N 42°20'E, alt. 1650m. a.s.l., marly limestone outcrop with almost horizontal bedding, dominated by candelabriform *Euphorbia*, sterile plant collected in the company of J. J. de Wilde April 1970, M. G. Gilbert 2297; cultivated Addis Abeba and material preserved in spirit February 1971 onwards (K, holotype; ETH, isotype).

C. sprengeri ssp. *foetida* combines the corona structure of the nominal subspecies with the corolla form of ssp. *laticorona*. It is clearly distinguished from these and ssp. *ogadensis* by the minutely asperous epidermis of the corolla. This is caused by many of the epidermal cells, especially those at the tips of the rugosities, projecting as minute conical papillae. The other subspecies have rounded epidermal cells. Another distinctive feature is the penetrating foetid smell of the flowers at anthesis from which the subspecific epithet is derived. The flowers of the other subspecies are far less conspicuous in this respect. Plants at the type locality have very dark corollas but a collection made by Frank Horwood from near Awash Station had a much paler corolla more closely resembling ssp. *laticorona*. Plants cultivated in Addis Abeba were pollinated by the sheep blowfly, *Lucilia cuprina* (Diptera: Calliphoridae). This was not seen to visit any of the other *C. sprengeri* subspecies.

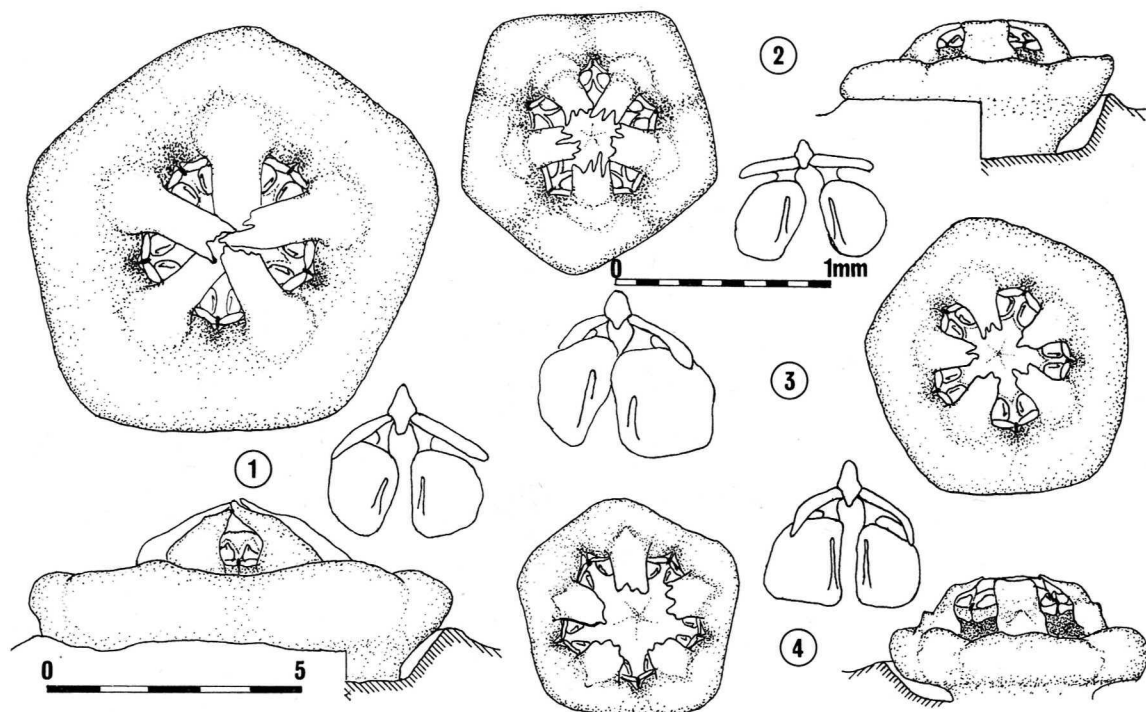


Fig. 3. Corona details of the subspecies of *Caralluma sprengeri* (side and top views of the corona and an enlarged view of a pollinium are given for each subspecies except ssp. *foetida* where the corona side-view is omitted). 1. ssp. *laticorona*, clonotype; 2. ssp. *sprengeri*, based on cult. material orig. near Quiha, Tigre Region; 3. ssp. *foetida*, clonotype; 4. ssp. *ogadensis*, clonotype.

DESCRIPTION. *Stems* procumbent, to 7cm high, sometimes shortly soboliferous; *buds* horizontal to deflexed, truncate to broadly acute, up to 5 together (more than in the other subspecies); *corolla* slightly to strongly reflexed, lobes ovate, flat, 11–13.4mm long, 6.2–7.1mm wide, rugulose, with minutely papillate epidermis, glabrous, light brown or chocolate brown sometimes with narrow pale ring in region of annulus; *corona* resembling that of ssp. *sprengeri*, 4.7–6.0mm diameter, very dark brown; *pollen masses* relatively large, orange.

1d. ssp. **ogadensis** M. G. Gilbert **subsp. nov.**; *a typo caulibus soboliferis lobis corollae brevioribus revolutis rugosis atrobrunneis differt.* Typus: Ethiopia. HARERGHIE: 6km SE. of Jijiga on road to Degehabur, 9°20'N 42°50'E, alt. 1800m. a.s.l., low hill with sparse cover of *Acacia* bushes and forbs including *Erythroxylamys eufodotii* on stony brown soil overlying limestone, 25 April 1970, J. J. de Wilde & M. G. Gilbert 6481, in spirit, holotype WAG, isotype ETH.

This subspecies has the corona structure typical of ssp. *sprengeri* and ssp. *foetida* but differs from them and ssp. *laticorona* by the form and size of the corolla and the well developed soboliferous habit. The corolla is the smallest within the species and has distinctive revolute lobes that are very obviously rugose. The corolla colouring is very similar to some plants of ssp. *foetida*, the conspicuous pale ring adjacent to the corona being a constant feature in ssp. *ogadensis*. The subspecific epithet is derived from the Ogaden, an area well noted for its very rich and interesting flora. Plants have been seen in areas with scattered trees and shrubs of *Acacia* and *Balanites* and a wide variety of shrublets, mainly belonging to the *Labiatae* and *Acanthaceae*, on brown soils overlying limestone.

DESCRIPTION: *Stems* procumbent, to 6cm high, markedly soboliferous with underground stems up to 20cm long, stems sometimes solitary, erect; *buds* obliquely erect, subacute; *corolla* with lobes lanceolate, revolute, semierect, 9.6–11mm long, 5.0–5.5cm wide, glabrous, markedly rugose, liver-brown with distinct



Fig. 4. *Caralluma sprengeri* ssp. *ogadensis*. Holotype before preservation.

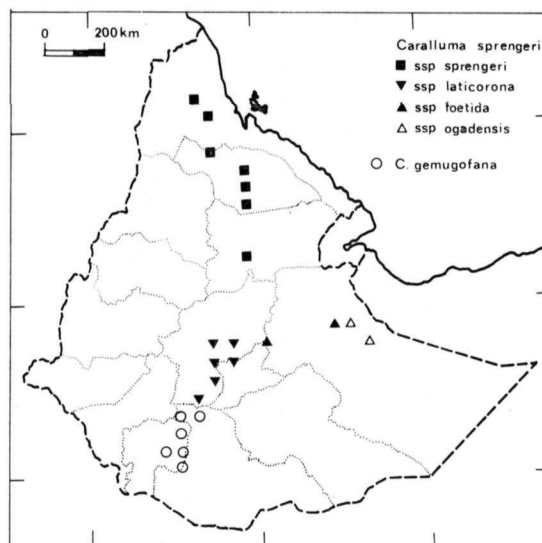


Fig. 5. Distribution of spp. nos. 1 & 2.

whitish ring in region of annulus; *corona* resembling that of ssp. *sprengeri*, 4.5–4.9mm diameter, yellowish or pale pinkish brown with yellowish inner lobes dull pink at tip; *pollen masses* yellow.

FURTHER RECORDS: ETHIOPIA. HARERGHIE: 124km SSE. of Jijiga on road to Degehabur, 8°45'N 43°30'E, alt. 1500m a.s.l., open area with some trees and quite a lot of evidence of trees having been cut, mainly *Acacia*, soil very thin, overlying limestone, large variety of shrublets present, 10 June 1971, M. G. Gilbert 2041a. SOMALIA. Northern Region: 2 May 1949, P. R. O. Bally S211. (Material of this collection was sent to the 'Exotic Collection' run by W. T. Neale & Co., Worthing, England and subsequently illustrated as *Caralluma chrysostephana* Defl. as plate 2632b in their 'Photographic Reference Plates'. There is in fact no particularly close relationship between the Arabian *C. chrysostephana* and the plant illustrated beyond the fact that the Somalian plant is also a member of the 'Ango Group' and has a yellow corona, a feature to which the Arabian species owes its name.)

2. *Caralluma gemugofana* M. G. Gilbert **sp. nov.**; *a speciebus quas White et Sloane et auctores posteriores ad 'Ango Group' tribuerunt, corolla laevi sine annulis corona exteriore disciformi margine tenui obscure sinuato-denticulato differt.* Typus: Ethiopia. GEMU GOFA: E. of Arba Minch at base of escarpment along track leading N. from pumping station, 5°59'N 37°39'E, alt. 1250m a.s.l., rocky slope with *Acacia mellifera* bushland, sterile plant in grass clump, 18 Aug, 1969, M. G. & S. B. Gilbert 1731, cultivated Addis Abeba, specimens preserved in spirit at various times from December 1969 onwards (K, holotype; ETH, EA, isotypes).

C. gemugofana has been found in numerous localities within Gemu Gofa Region and is named accordingly. It is also known from the immediately adjacent areas of Sidamo region and from some widely scattered localities in East Africa. The latter collections had been tentatively named as *C. commutata* by Peter Bally (in herb. Kew.) The species can be easily identified by the distinctive very shallowly campanulate (virtually rotate in some collections) glabrous corolla completely lacking an annulus or any suggestion of papillae or rugosities. *C. commutata*, *C. abayensis* and some forms of *C. sprengeri* at first sight appear to have smooth corollas but closer examination will show them to be minutely velvety papillate or rugulose. Most collections can also be readily distinguished by the yellow corolla, not seen in any other members of the group occurring in Ethiopia. There are however light brown flowered forms. The corona is in many ways intermediate between those of *C. sprengeri* and *C. schweinfurthii*, in particular the margin of the outer corona falls between the smooth swollen rim of *C. sprengeri* and the thin lacerate margin of *C. schweinfurthii*. It differs from both those species by the lack of an annulus.

Most of the plants seen occurred on level or gently sloping brown soil under bushes in deciduous bushland, usually dominated by shrubby species of *Acacia*. One collection was exceptional in that the plants grew amongst grass in black cotton soil with *Caralluma vibratilis*. Altitudes vary between 1100m and 1400m. Plants cultivated in Addis Abeba were regularly pollinated by the bluebottle *Calliphora croceipalpis*

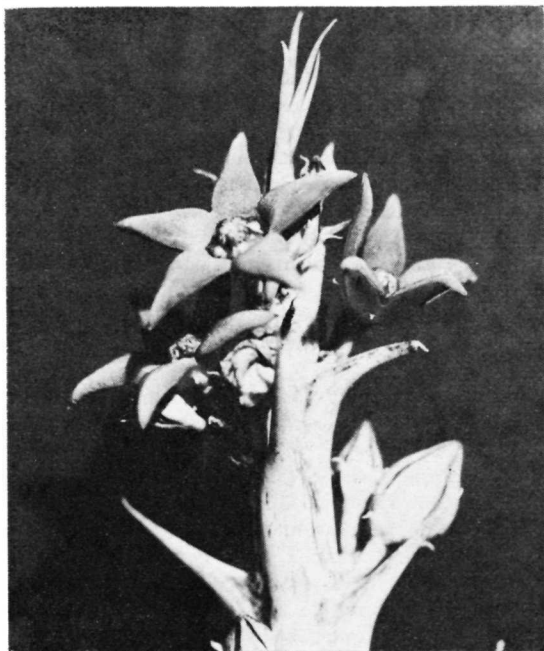


Fig. 6. *Caralluma gemugofana*. Clonotype material cultivated at Addis Abeba.



Fig. 7. *C. gemugofana*. Flowers from five clones belonging to two separate populations. Top row: Gilbert 2290; bottom row: Gilbert 3305.

(Diptera: Calliphoridae). The flowers are apparently scentless to the human nose.

DESCRIPTION. *Stems* more or less erect, less often procumbent, up to 22cm high in cultivation, much less in wild, not soboliferous, tubercles long attenuate, to 22mm long; *bracts* more or less obsolete; *pedicels* 3.5–5.0mm long; *sepals* linear-lanceolate, 3.2–5.0mm long, 1.2–1.5mm wide, glabrous; *buds* up to three in succession from a fascicle, erect, acute; *corolla* fleshy, shallowly campanulate to rotate with spreading to reflexed lobes; tube (1.0–)2.3–3.5mm deep, 7.8–8.3mm diameter, annulus absent; lobes ovate deltoid, slightly revolute, 9.5–12.5mm long from tip of pedicel, 4.0–4.9mm wide at base, 0.2–0.3mm wider at broadest point, epidermis quite devoid of hairs or papillae, bright yellow, greenish yellow fading to brownish yellow, or light tan, sometimes tube and basal parts of lobes more brightly coloured than tips of lobes; *corona* protruding from corolla tube; outer corona discoid, 5.2–5.4mm diameter, margin thin, obscurely sinuate-denticulate with the most prominent teeth opposite the inner corona lobes, dull pink with narrow dark margin, brown or glistening dark red; inner corona-lobes incumbent on anthers, oblong with irregularly toothed apex barely exceeding the anthers or narrow deltoid, sometimes overlapping so as to conceal the white stigma-cap, dull to glistening dark red to reddish brown; anthers broader than inner corona lobes; *pollen masses* yellow; *follicles* narrowly divergent, 11–16cm long, 1.0–1.2cm thick, grey with numerous longitudinally elongated blotches; *seeds* light brown, 7.5–8.0mm long, 3.5–4.0mm wide with conspicuous white coma.

FURTHER RECORDS. Except for Edwards & Gilbert 200, all Ethiopian material cited below was obtained as living sterile plants during a joint collecting trip by the author and J. J. de Wilde in February 1971, material being preserved when the plants flowered in Addis Abeba.

ETHIOPIA. GEMU GOFA: 15km N. of Konso on Arba Minch road, 5°18'N 37°32'E, alt. 1250m a.s.l., grassland on loose black soil growing with *Caralluma*

vibratilis, M. G. Gilbert 2290; base of escarpment S. of Arba Minch on road to Gidole, 5°59'N 37°36'E, alt. 1300m a.s.l., under bushes, mainly *Acacia* spp., on fairly level dark brown soil, M. G. Gilbert 2291; S.W. corner of Lake Chamo, 5°45'N 37°31'E, alt. 1250m a.s.l., under bushes on steep slope covered with *Acacia* bushland, M. G. Gilbert 3305; 87km N. of Arba Minch on road to Soddu, 6°30'N 37°45'E, alt. 1400m a.s.l., growing on bare soil under low *Acacia* bushes with *Huernia recondita*, M. G. Gilbert 3306; SIDAMO: 49km W. of Yavello on road to Konso, 5°05'N 37°45'E, alt. 1100m a.s.l., growing in deep shade of evergreen cappari-daceous shrub (plant more prostrate than usual with almost rotate brown flowers), M. G. Gilbert 3307; near hot springs at NW. corner of Lake Abaye, 6°37'N 37°44'E, alt. 1400m a.s.l., with *Huernia recondita* on bare brown soil under fairly dense *Acacia* bushland, June 1972, Sue Edwards & M. G. Gilbert 200. KENYA: 5 miles from Moniget, March 1940, A. Ritchie in Bally S39; UGANDA: Bukomero, Kampala, cult. Nairobi, Eggeling 940 & 940b in Bally S21.

3. *Caralluma commutata* Berger, Stapelien und Kleinien: 105-107 (1910).

The identity of *Caralluma commutata* is dependent on the interpretation of Berger's original description and figure as no type specimen is known to exist. The type locality is also unknown, the description being based on plants cultivated in the garden of the Medical School in Cairo. These were supposed to have originally been collected by Schweinfurth, possibly in Tropical Arabia, but there is no documentation to support such a supposition and no comparable plants have been found there since. Two groups of specimens from Ethiopia match Berger's description and figures, one originating from the eastern highlands of Tigre, the other from the Abay (Blue Nile) Basin in central Ethiopia. Most evidence suggests that the Tigre plants can be regarded as synonymous with *C. commutata* rather than the Abay plants which are here treated as a new species.

Berger clearly indicates *C. commutata* to have a more or less rotate corolla with broad ovate lobes and a cup or bowl-shaped ('napf- oder schusselformig') corona, Apart from the Ethiopian plants mentioned above, all other members of the 'Ango Group' with a similar corolla, e.g. *C. sprengeri*, have discoid coronas whilst species with possibly similar coronas, e.g. *C. sacculata*, have campanulate or tubular corollas or very deeply divided linear revolute corolla-lobes. The differences in corona structure between the two groups of Ethiopian plants are best shown by a side view, unfortunately not give by Berger. He does given a side view of an intact flower but this has slightly incurved corolla-lobes which apparently conceal the corona completely. This might suggest a relatively shallow corona like that of the Abay plants but could equally likely be a simplification by the artist. Most features favour the Tigre plants, particularly the short pedicel and the distinct groove at

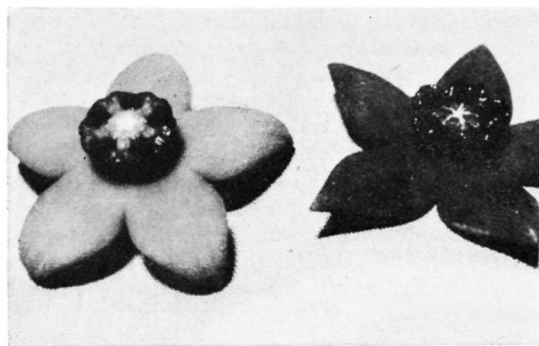


Fig. 8. *Caralluma abayensis*. Holotype (left); *C. commutata*, from cult. plant orig. near Mekele, Tigre Region (right).

the base of each inner corona-lobe separating adjacent outer corona-lobes. The Abay plants have long deflexed pedicels and no distinct groove between adjacent outer corona lobes. They also have much larger stem tubercles when well grown. Both groups of plants have broader inner corona-lobes than indicated for *C. commutata* whilst the Tigre plants have the outer corona lobes quite deeply notched, again not indicated by Berger. The discrepancies do not seem sufficient to justify treating the Tigre plants as a species separate from *C. commutata* though the discovery of plants matching Berger's description more exactly could possibly necessitate treating the Ethiopian plants as an infraspecific taxon. However it could well be that the discrepancies observed originate from deficiencies in the drawings. Certainly the drawing of a pollinium leaves much to be desired, particularly with regards to details of the projecting flange that is such a characteristic feature of the pollen masses of all members of the *Ceropegieae*. Errors of a similar order in the rendering of the features in question would be quite adequate to account for the discrepancies noted. Schweinfurth made quite extensive collections in Eritrea immediately to the north of Tigre. It is quite possible that *C. commutata* exists in the area visited by Schweinfurth and was thus collected by him and taken to Cairo.

The plants ascribed to this species have been found around Mekele, the administrative centre of Tigre, at altitudes between 1800m and 1900m growing in shallow soils overlying limestone. Most plants were found in the shelter of *Aloe camperi* s.lat. and *Euclea schimperii* though one was found in a more exposed situation on a slope with *Olea africana* and *Psiadia arabica*. Cultivated plants are visited regularly by flesh-flies, *Sarcophagus* sp. (Diptera: Sarcophagidae). The flowers emit a fairly strong foetid smell.

DESCRIPTION. *Stems* procumbent, forming loose mats, occasionally shortly soboliferous, to 5cm high in wild, much larger in cultivation, tubercles to 7mm long, attenuate; *bracts* virtually obsolete; *pedicel* 3.2-6.0mm long, 2.1-2.5mm thick; *sepals* lanceolate, 3.5-6.0mm

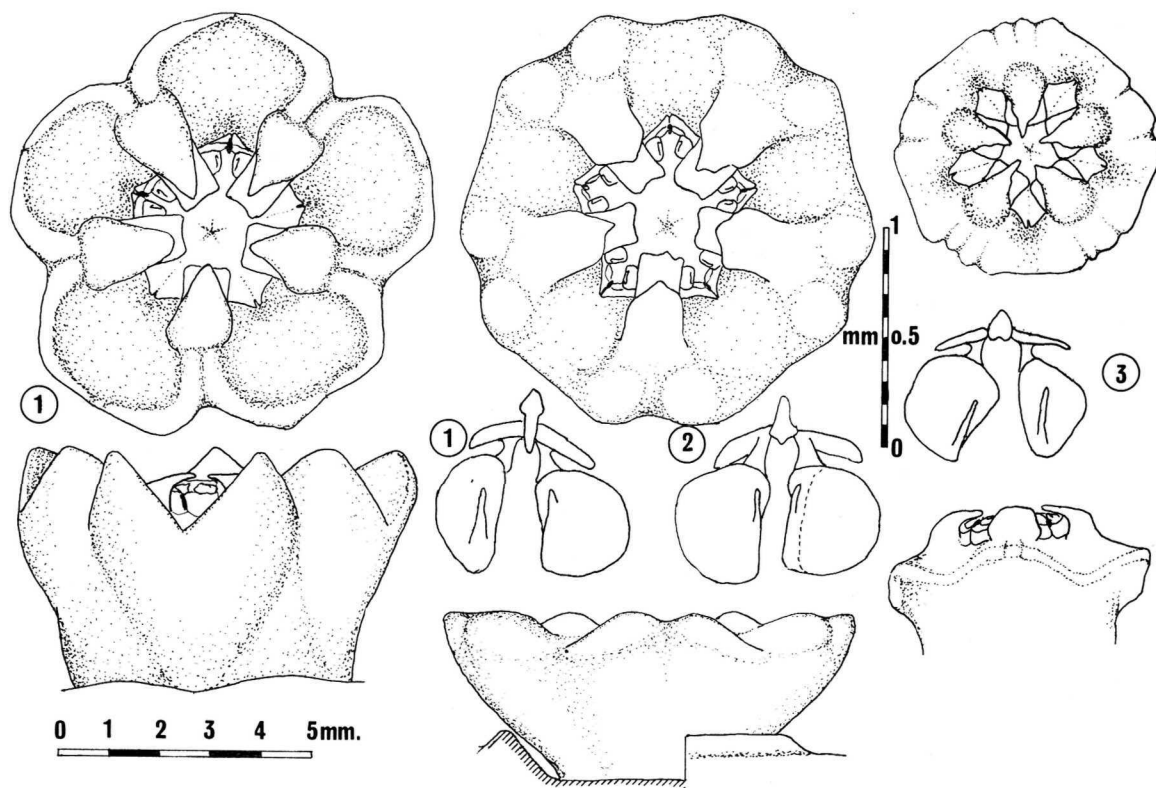


Fig. 9. Corona details of *Caralluma abayensis*, *C. commutata* and *C. gemugofana*. 1. *C. commutata*, based on cult. material orig. near Mekele, Tigre Region; 2. *C. abayensis*, holotype; 3. *C. gemugofana*, clonotype.

long, 1.8–2.5mm wide, glabrous; *buds* patent to more or less erect, broadly acute, rarely more than two reaching maturity from each fascicle; *corolla* fleshy rotate, in some cases with a narrow annulus c. 1mm high closely adpressed to the corona, no suggestion of a tube as in *C. sprengeri*, lobes ovate-deltoid, 11–18mm long, 6.9–8.9mm wide, flat with the tip often slightly reflexed, glabrous, more or less rugulose, uniform medium brown; *corona* 6.2–8.0mm diameter, 2.5–4.0mm high at margin, dark glossy brown, less often same shade of brown as corolla, outer corona-lobes deeply saccate with conspicuous notch in middle of each, adjacent ones separated by groove, inner corona-lobes horizontal, adpressed to anthers, ovate-lanceolate, barely exceeding anthers leaving stigma-cap exposed.

4. *Caralluma abayensis* M. G. Gilbert **sp. nov.**; a *C. commutatae* Berger et *C. sprengerae* (Schweinf.) N.E. Br. *caulibus altioribus tuberculis longioribus pedunculis longioribus deflexis coronis plus 3-plo latioribus quam altioribus marginibus incrassatis differt*. Typus: Ethiopia. SHOA: Abay Gorge, c. 5km S. of bridge across the Tilik Abay (Blue Nile) river near 205km marker, 10°03'N 38°13'E, alt. 1350m a.s.l., brown alluvial soil with dominant cover of *Amnogeissus* & *Dichrostachys*

bushes, *Boswellia papyrifera* frequent on low rock outcrops, ground cover poor, sterile plant collected July 1971, M. G. Gilbert 3891, cultivated, material preserved from June 1975 (K, holotype, ETH, isotype).

This species has been referred to in the discussion of the identity of *C. commutata*, sharing with that species the bowl-shaped corona, constricted at the base and with the rim both the broadest and highest part of the structure. Other features closely resemble both *C. commutata* and *C. sprengeri*, most notably the rotate brown corolla with ovate deltoid lobes and a narrow annulus immediately adjacent to the corolla. The corona can be considered intermediate between those of the above mentioned species in that the outer corona lobes, though definitely saccate as in *C. commutata*, have thick fleshy rims and are extensively fused laterally so as to give a clear impression of the annular outer corona of *C. sprengeri*. It can be immediately differentiated from both these species by the erect stems with robust horizontally spreading tubercles up to 20mm long. The long pedicels are also distinctive, especially before anthesis when the bud is conspicuously deflexed at the tip of the horizontal pedicel.

So far the species is only known with certainty from the Abay Gorge near the main Addis Abeba—Debre

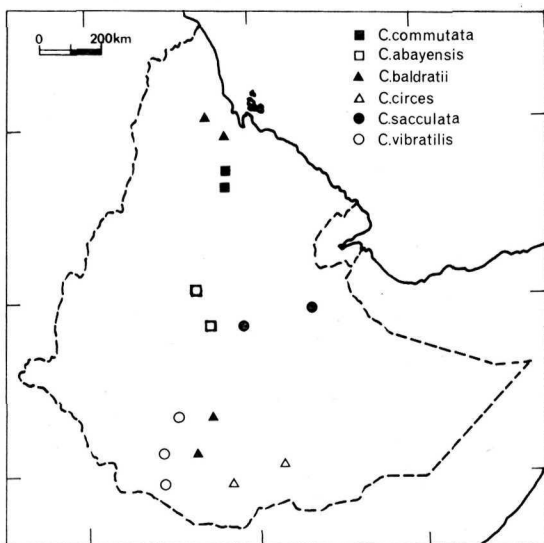


Fig. 10. Distribution of spp. nos. 3-8.

Marcos road where, apart from the type collection, plants have been seen growing on gypsum at 1550m a.s.l. It is also highly probable that plants found by Jonquil Ash and Anne Sandford in the Bole Valley, on one of the upper tributaries of the Abay, also belong to the same species. These were found at the margin of *Bridelia micrantha* - *Ficus* gallery forest at 1650m a.s.l. These plants suggest that the species might be quite widespread within the Abay Basin, most of which is very difficult of access, and the species has been named accordingly.

DESCRIPTION. *Stems* erect, forming compact clumps, to 14cm high, tubercles spreading horizontally, to 20mm long, fairly robust; *bracts* virtually obsolete; *pedicels* 8.5-9.0mm long, 2.5mm thick; *sepals* ovate, 4.6-4.9mm long, 2.7-2.8mm wide, glabrous; *corolla* rotate with annulus, closely adpressed to corona, c. 1mm high and wide, lobes ovate-deltoid, 15-16mm long, 9.0-9.3mm wide, flat with reflexed tips, light brown, glabrous except for minutely puberulent annulus, rugulose; *corona* 8.5-9.0mm diameter, 2.5mm high, outer lobes shallowly saccate with thick fleshy margins slightly depressed in middle, extensively fused laterally so as to form an almost annular outer corona as in *C. sprengeri*, inner corona-lobes horizontally adpressed to anthers, ovate lanceolate, barely exceeding anthers and leaving white stigma-cap exposed.

5. ***Caralluma baldratii*** White & Sloane, The Stapeliaceae 1: 268 (1937), non Bruce & Bally, Fl. Pl. Afr. t. 1003. 1947).

Caralluma subterranea Bruce & Bally, Cact. Succ. J. Amer. 13: 165-167 (1941), **synon. nov.**

The equating of *C. subterranea*, a well-known East African species, with *C. baldratii* is based on the belief

that Bruce & Bally misinterpreted White & Sloane's original description, applying their name to another distinct species and giving plants of White & Sloane's species a new, superfluous, name. As a consequence the plants currently regarded as *C. baldratii* are correctly called *C. meintjesiana* Lavranos whilst those plants now called *C. subterranea* should be called *C. baldratii*.

C. baldratii was described by White & Sloane from plants grown by them from seed sent by Baldrati who had collected it at his estate, Addi Che, near Asmara. They designated plant no. 208 in their collection as the 'type plant' but it seems virtually certain that no adequately documented material now exists. Their collection was presented to the Huntington Botanical Gardens where most material was subsequently lost. No index of plants in the collection was kept (*vide* Myron Kimnach) and so even if plants have survived it will not be possible to be sure of their origin. If material from Addi Che can be obtained it should be designated neotype. White & Sloane did not provide a clear illustration of the coronal structure of their new species and thus the main difference between it and the plants dealt with by

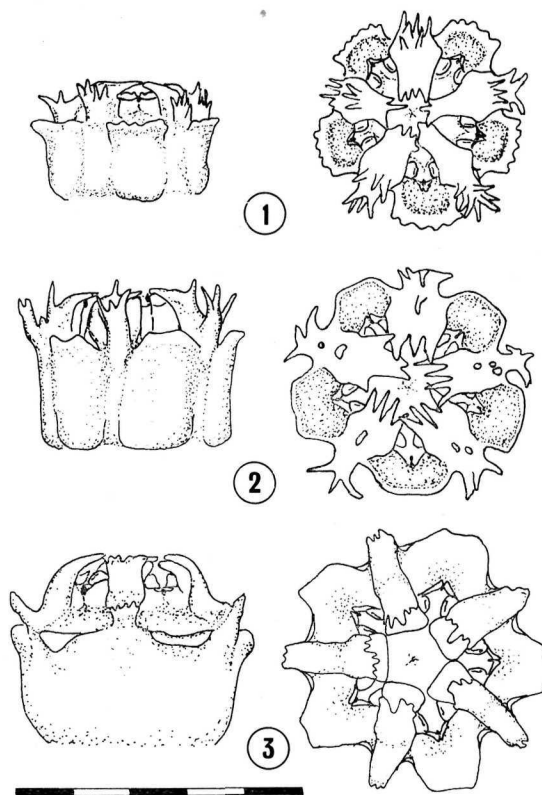


Fig. 11. Corona details of *Caralluma baldratii* and *C. meintjesiana*. 1. *C. baldratii* (southern form), based on cult. material orig. Nairobi-Namanga road, Kenya; 2. *C. baldratii*, based on material orig. Sidamo Region, cult. Addis Abeba; 3. *C. meintjesiana*, clonotype.

Bruce & Bally was obscured. The corolla form in the two groups of plants is very similar, at least in the case of material of *C. baldratii* from Ethiopia which probably accounts for the misinterpretation of White and Sloane's species. As Bruce and Bally provided what was apparently the first clear illustration of *C. baldratii* and Kenyan material of *C. subterranea* differed rather in corolla form later authors had little cause to doubt their treatment.

C. subterranea was described from material collected at various localities in Kenya. The original account compared it to *C. sprengeri*, mentioning no other species, and both commented on and illustrated the unusually wide range of variation, particularly in corona morphology, to be observed within the species. It has now been collected many times from East Africa, the collections emphasising further the variability of the species. Plants from Tanzania and southern Kenya have small flowers with broad relatively flat corolla-lobes and complex series of projections from the base of the inner corona-lobes. Plants from north-east Uganda and Ethiopia have larger flowers, narrow revolute corolla-lobes and relatively fewer projections from the base of the inner corona-lobes, sometimes merely an outer horn with a projection or gibbosity between the outer horn and inner horn or inner corona-lobe proper. This material approaches *C. baldratii* sensu Bruce & Bally very closely, differing most markedly by the extra projections between the inner and outer horns of the inner corona-lobes.

Two main facts support the sinking of *C. subterranea* into *C. baldratii*. First White and Sloane specifically indicated that their plant did have an extra projection on the inner corona-lobes apart from the outer horn:— 'inner corona-lobes . . . with a short projection or fin just above the base; outer horn . . .'. There is no suggestion of such a feature in the material taken by Bruce & Bally to represent this species. Second, plants collected from Eritrea (Addi Keyih, 110 km by road south of Asmara) match exactly White & Sloane's photographs and descriptions and yet have the corona structure currently assigned to *C. subterranea*. Moreover they intergrade completely with that species through other material from southern Ethiopia and Uganda. The match in colouring between White & Sloane's photographs and the Addi Keyih material is particularly close with the 2-tone corolla lobes and very dark coloured corona. *C. baldratii* sensu Bruce & Bally usually has a yellowish corona. White & Sloane make no mention of *C. baldratii* having the rhizomatous habit so typical of *C. subterranea* and more or less absent from Bruce & Bally's plant. This must be a major factor in the current interpretation of these species. The omission probably results from the fact that they were working with plants grown from seed in which the rhizomatous habit had not yet developed. The plants from Addi Keyih were very markedly rhizomatous.

C. meintjesiana was described by Lavranos from material from tropical Arabia. He first compared it with other Arabian species such as *C. chrysostephana* and *C. luntii* rather than any of the African members of the genus. Later however he became aware of its identity with *C. baldratii* sensu Bruce & Bally and reduced it to synonymy with that species. Most of the material now in cultivation as *C. baldratii* probably originated from this Arabian material. Now that it has been shown that these plants cannot be included within *C. baldratii* s.str. the only other legitimate name available is *C. meintjesiana* Lavranos. This species is indubitably closely related to *C. baldratii*. However apart from the differences in corona structure and colour, it can be distinguished by the absence of rhizomes and the microscopic indumentum of the corolla, that of *C. baldratii* being quite conspicuous with stiff white hairs. These seem to justify maintaining two separate species. Further investigation of the variation within *C. baldratii* is most desirable in view of the extensive range recorded and the possibility that this might correlate fairly well with geographical distribution. Bally (in herb.) has already suggested that the small flowered plants be given varietal status but has never formally published this.

6. ***Caralluma circes* M. G. Gilbert sp. nov.**; *C. dummerae* (N.E. Br.) White & Sloane *affinis*, *caulibus erectioribus*, *lobis coronis exterioribus simplicibus saccatis*, *lobis coronae interioribus in segmenta 2-3 subulata profunde divis* et *basi cornibus 3-4 brevibus depressionibus 2 non profundis proxime supra differt*. Typus: Ethiopia. SIDAMO: 6 km E. of Wachile, 4°35'N 39°05'E, alt. 1100 m a.s.l., dry deciduous bushland with *Acacia* spp. and *Dobera glabra*, single sterile plant collected in the company of J. J. de Wilde, February 1971, M. G. Gilbert 2288, cultivated Addis Abeba, material preserved February 1972 onwards (K, holotype; ETH, isotype).

The flowers of this species bear a close resemblance to those of the East African *C. dummeri* in overall form, colouring and ornamentation. The extremely distinctive corolla-papillae are particularly noteworthy in this con-

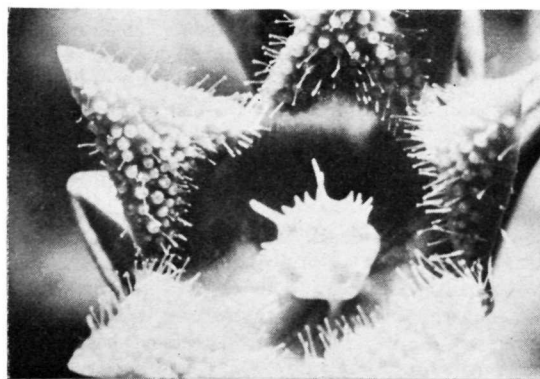


Fig. 12. *Caralluma circes*. Clonotype, cult. Addis Abeba.

text. *C. circes* is best distinguished from the East African species by the form of the corona lobes, the latter having outer lobes that are almost flat with a distinctly bifid apex and inner lobes that are irregularly divided at the apex into subulate segments that interlock over the stigma-cap. They also lack the dorsal horns and cavities at the base of the inner corona lobes of *C. circes*. As is usually the case with members of the 'Ango Group', clear-cut differences in vegetative characters are lacking. However the material of *C. circes* seen has stems distinctly more robust and erect than those of any of the *C. dummeri* collections available. They resemble most closely those of *C. gemugofana*.

This species is known from a small number of localities in the Borana area of Sidamo Region towards the Kenya/Ethiopia border. The first plant seen, the holotype, was in an area of rather flat and uniform bushland. Immediately after this find the author lost his bearings and as a result spent several rather unpleasant hours lost in the bush. As the plant was at least partly to blame (a check on the surroundings being sacrificed to the search for more plants), it is dedicated to the beautiful witch of Greek mythology, Circe.

Plants have now been seen in a variety of types of *Acacia* bushland usually in association with a variety of other succulents, particularly *Euphorbia triaculeata* sens. lat. and an *Echidnopsis* close to *E. sharpei*, probably new*, found in each of the three localities where *C. circes* has been found. A feature of two of the localities was the very soft soil, such that shallow rooted plants such as the *Caralluma* could be easily lifted out of the ground with little or no damage. The third locality, most noteworthy as the type locality of *Monadenium reflexum*, was subject to much greater grazing pressure resulting in considerable erosion and compaction of the soil. The plants seen there were in much poorer condition though the *Monadenium* was apparently reproducing vigorously despite the cattle and goats. Though plants grow readily in cultivation, flowers are not freely produced and tend to abort at an early age. It possibly needs more heat and moisture at this stage than other members of the group.

DESCRIPTION. *Stems* erect, branching from the base to form dense clumps, up to 20cm high in cultivation, less in wild, not soboliferous, tubercles long attenuate, up to 15mm long, pinkish-green with maroon blotches or pale green with darker green blotches depending on the degree of exposure to the sun; *flowers* rarely more than two per fascicle, other buds aborting; *pedicels* 8mm long, 3mm thick; *sepals* linear-lanceolate, 6mm long, 2mm wide, fleshy; *bud* obtuse, grey green; *corolla* fleshy, lime-green, campanulate with semi-erect lobes; *tube* 12mm diameter, 5mm deep, virtually smooth inside; *lobes* ovate deltoid with slightly reflexed margins, 11mm long, 6mm wide at base, covered with prominent fleshy papillae, each terminated by a prominent colourless unicellular hair up to 1.3mm long; *corona* pure ivory

**Echidnopsis bavazanossii* Lavranos.

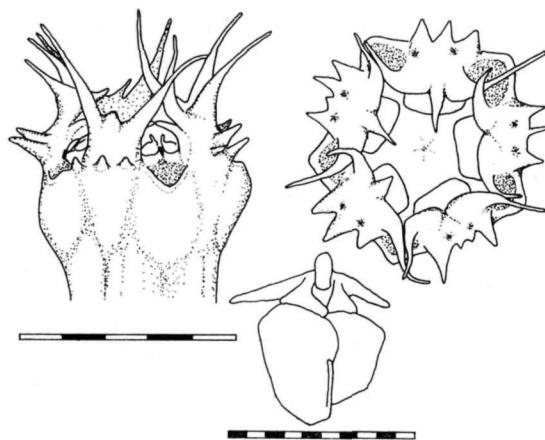


Fig. 13. Corona details of *Caralluma circes*, clonotype.

white except for yellowish anthers, 4.5mm high excluding inner corona-lobes, 4.5mm diameter, distinctly stipitate; outer corona-lobes small, deeply saccate with entire margin; inner corona-lobes flat with apex divided into 2-3 subulate segments up to 2mm long, the outer ones erect with those of adjacent lobes often somewhat connivent, the inner when present overlapping over stigma-cap; at the base of each inner lobe there is a row of 3-4 short conical obtuse projections with a pair of pits immediately above them; *pollen masses* pale yellow, overlapping as soon as the translator to which they are attached is removed.

FURTHER RECORDS: ETHIOPIA. SIDAMO: 75km from Neghelli on road to Filtu, 5°11'N 40°15'E, alt. 1150m a.s.l., *Acacia mellifera*/*A. drepanolobium* bushland on black cotton soil, ground cover poor, 8 May 1974, M. G. Gilbert 3450.

7. *Caralluma sacculata* N. E. Brown in Bull. Misc. Inf. Kew 1909: 328 (1909).

This species is one of the lesser known members of the genus and was known to White & Sloane only through N. E. Brown's original account. They give no indication of its distribution beyond 'Southern Ethiopia: without precise locality'. In fact the type specimen, Drake-Brockman 174, at Kew, is clearly labelled 'Fantale', the name of a dormant volcano within Awash National Park (8°59'N 39°56'E). The only other herbarium specimen seen, Negri 1228, at Florence, was also collected near to Mt. Fantale in 1909, the year after Drake-Brockman's collection. There appear to have been no further collections until 1969 when the author collected it, again near Mt. Fantale. *C. sacculata* is fairly common to the south of Mt. Fantale but is otherwise only known from a single plant collected near to Urso, west from Dire Dawa and it would seem that the species is of very restricted distribution. It occurs in *Chrysopogon plumulosus* grassland on very shallow stony soils at altitudes between 900m and 1100m. The stems are often markedly



Fig. 14. *Caralluma sacculata*. Gilbert & Thulin 202 growing near Metahara, Shoa Region, immediately to the south of Mt. Fantale, the type locality.

soboliferous, a feature which enables the plants to survive grass fires which are not uncommon in the area.

Three other members of the 'Ango Group' have the same erect tubular corolla and saccate outer corona lobes, the East African *C. tubiformis*, the Arabian *C. deflersiana*, and the Somali *C. kochii*. Another East African species, *C. distincta* has a similar corolla form but differs markedly in corona morphology. *C. sacculata* was supposed to differ from all these species by having

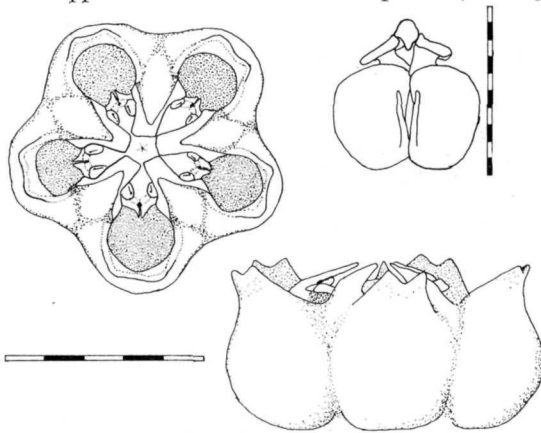


Fig. 15. Corona details of *C. sacculata*, based on cult. material orig. near Mt. Fantale.

erect inner corona-lobes but this seems to be an artefact produced by shrinkage of the original dried material as living plants have the inner corona-lobes incumbent on the anthers. It is thus more closely related than realised to *C. tubiformis* and only differs appreciably by the indumentum of the corolla, that of *C. tubiformis* being composed of long shaggy white hairs whilst *C. sacculata* has the corolla glabrous to shortly puberulent. *C. sacculata* has somewhat more robust stems and tubercles but is otherwise strikingly similar and could possibly be regarded as conspecific.

8. *Caralluma vibratilis* Bruce & Bally in Cact. Succ. J. Amer. 13: 168, 179 (1941).

This species is readily identified by the vibratile clavate hairs on the corolla margin from which the species derives its name. These are not known from any other member of the 'Ango Group' though they are found in a wide range of other stapeliads. It is also rather distinctive vegetatively, spreading by means of slender white rizomes up to 75cm long and rarely forming the clumps of stems typical of most members of the group, most stems being solitary. *C. baldratii* has a somewhat similar habit but has stouter stems that frequently form small clumps. A further distinguishing feature of *C. vibratilis* is that the stems are sometimes distinctly glaucous a feature apparently unique in the 'Ango Group'. Both collections seen came from areas of impeded drainage with very loose black soil, the first, made by J. J. de Wilde, in grassland where it grew with *C. gemugofana*, the second in very open *Acacia drepanolobium* ('whistling thorn') bushland with a very sparse ground cover. The species was first described from Kenya and has not hitherto been recorded from Ethiopia.

Incompletely known species

N. E. Brown (1904) tentatively included within *Caralluma* the species *Huernia engleri* Terracciano (1894), mentioning 4-angled stems with sharply pointed tubercles, marked with purple blotches, stellately spreading corolla lobes and a subentire angulate outer corona. Unfortunately the material upon which the name was based could not be found at Florence where other material collected on the same expedition was housed. The description strongly suggests that the species is not a *Huernia*, stellately spreading corolla lobes being most unusual for that genus, and it seems more likely that the plant is a member of the 'Ango Group'. Certainly the description of the stems and outer corona would be more appropriate. The original collection came from Anfilah Bay on the Red Sea coast and thus there is a very big altitudinal separation between this and any other species of similar habit. It is thus most likely that it is a distinct species but its true taxonomic position must remain doubtful until more information becomes available.

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Forum

More on *Mila*

by John D. Donald

Stung out of my winter lethargy by Terry Smales's contribution to last November's Journal on the genus *Mila*, I am encouraged to accept David Hunt's invitation to comment. I have some hesitation, though, in diving in too far, because Terry has anticipated several of my own observations which will appear in a comprehensive review of the genus and rationalisation of the species in *Ashingtonia* Vol. 3, Nos. 2 & 3. I agree with much of what he has to say about the status and affinities of the species within the genus itself, but less with the other philosophical guesswork. But first let us deal with David's added note. He has given only half my tentative suggestion as to the place of *Mila* amongst the Peruvian *Cactaceae*. *Mila* has possibilities of being an extension of the *Neoporteriinae* but also nearly equal possibilities of an affinity with the *Borzicactinae*. Maybe it is derived from them both for the distribution of *Mila* coincides with their confluence.

The *Rebutia* connection is I think spurious and only a case of convergence. I discussed the curious morphological similarity of *Rebutia* and *Mila* many years ago at the Kiel I.O.S. Congress in 1959 with Prof. Franz Buxbaum after he had emended my diagnosis for the Subtribe *Rebutiinae* to include *Mila* (Buxbaum in Madroño 14: 191. 1958). It was put there for convenience rather than anything else. As a genus he could not find a satisfactory phylogenetic slot, except that the flower appeared to show a related appearance to a generalized *Rebutia* flower, not exactly to any one *Rebutia* section, as for instance *Aylosteria*, but more to a combination of several. However, to this day he keeps it still in the *Rebutiinae* in the latest version of his Tribe *Trichocereae* (Die Kakteen Lfg. 60, January 1975). But it must be appreciated that this reference is only a list; no botanical justification is given by Buxbaum, so I must object to Terry Smales putting words into Buxbaum's list which are not there. There is no tentative suggestion that *Mila* is related to *Chamaecereus* any more than any other of the genera listed under Subtribe CVc *Rebutiinae*. *Mila* merely appears at the bottom of the list after *Chamaecereus*. The list order has not in fact changed since the 1958 paper in Madroño! However, back to the subject of our conversation, which was largely about some attempted hybridizing experiments I had carried out, trying to cross *Mila* and *Rebutia*, and *Mila* and *Chamaecereus*. Fruits certainly set on the *Mila* using pollen from *Rebutia marsoneri* and from *Chamaecereus*, but never the other way round. The seeds from the *Mila* fruit germinated but mostly they failed to develop into plants, remaining as white to pink blobs without developing any chloroplasts. The few that did survive have long since developed into normal *Milas* identical with the female parent *Mila nealeana*. Since then I have obtained fruits on *Mila*

plants using pollen from a number of different genera but the seeds have never produced any obvious hybrid. Since no attempt was made to emasculate the *Mila* flower before pollination, I suspect that these apparent crossings leading to fruit formation and partially viable seed are due to a reduction in the normal barrier to self-pollination in *Mila*. Certainly as Terry Smales observes, *Milas* do produce fruits occasionally without any obvious cross-pollination. The viability of the seeds from these small fruits produced is always low. Crossing two *Mila* plants in general produces larger fruits and much better viability in the seeds. We also discussed the superficial resemblance in habit of *Mila* and *Chamaecereus* and concluded that this was again convergence. I believe, like Terry, that there are several objections to placing *Mila* and *Chamaecereus* in the same subtribe—not the least is their wide separation of habitat with no close relatives in between.

Chamaecereus is an *Echinopsis*-ally (*Rebutia* line), even though it has a *Lobivia*-like flower—all the rest of it is *Echinopsis* in stem, fruit and seed. In *Mila* the seed seems close to the *Neoporteriinae*, the stem and fruit are close to the *Borzicactinae*: the true fruit of *Mila* is a thick-walled fleshy berry larger than any produced in the *Rebutiinae*. The areole and spine armament are *Borzicactus* purely and simply; a stiff spined *Mila* could easily be mistaken for a dwarf '*Loxanthocereus*' like *Borzicactus sextonianus*. I will admit though that several *Mila* forms have a soft spine-armament like *Cleistocactus vulpis-cauda* or even *C. wendlandiorum* and several '*Loxanthocereus*' forms like *eriotrichus* and *pullulatus*. A similar range of spine armament may be found in *Erdisia* but not I think in *Corryocactus*. While *Erdisias* usually have fairly thin rounded stems with shallow ribs and small areoles, *Corryocactus* has thicker angular stems often with a square cross-section and large spine pads and are generally much larger plants all round. The flowers, fruits and seeds of *Erdisia* and *Corryocactus* despite Terry Smales's qualitative table are not at all similar to *Mila*. On close examination there are several points of difference. It is not enough to quote only the colour; seeds are complex structures from which a number of taxonomic characters can be derived. Buxbaum places both these genera well away from *Mila* in quite a separate tribe *Leptocereae* and Backeberg places them in two separate sections of the same subtribe *Austrocereinae*.

I cannot accept the stylized cactus flower drawing accompanying Terry Smales's article as a good representation of a typical *Mila* flower (*Milacereoides*) although the drawing could pass for that of any of the genera he proposes as relatives of *Mila*. Even more remarkable is its uncanny resemblance to the flower of *Chamaecereus*: just provide one or two more scales, lengthen the axillary hairs a little and extend the insertion of the filaments nearer the base of the receptacle and the result would be near-perfect for *Chamaecereus*. Terry Smales's

drawing is in fact a good general representation of most of the South American dwarf cactus flowers in basic form showing the basic floral parts. By slight modifications to the dimensions and to the relative number and placement of the parts of the flower shown, almost all S. American dwarf genera could be drawn. I would suggest that of all the genera from this part of S. America, the *Mila* flower comes closest to that of *Islaya*. The drawing would have been better if the receptacle had been slimmer; as shown the length is too short for the width. The nectary at the base of the tube is not shown. This is quite small almost rudimentary and in contrast to the deeper more open nectaries of the *Rebutiinae* but nevertheless a distinctive feature. The *Rebutiinae* also differ from the *Mila* flower in having longer and generally broader blades to the scales, but I must agree that the *Mila* receptacular scales are closer to those on the flowers of *Corryocactus* and *Erdisia* in form although far fewer in number. The receptacle of both *Corryocactus* and *Erdisia* flowers are relatively much shorter and thicker than those for *Mila* and the perianth display also presents a much flatter disc of more numerous segments than that of the truly funnelliform display by *Mila* flowers. It is also quite wrong to assume that *Corryocactus* and *Erdisia* flower only at the stem tip. They can flower there certainly, but in most mature plants of my experience they can flower almost anywhere along the stem. *Mila* only flowers at or near the tip, i.e. at 1–2-year old areoles. *Rebutia* flowers at much older areoles usually on the side of the stem, never on or near the crown.

Quite frankly, *Mila* is a puzzle with characters from a number of widely separate genera. It is easy to group together a few convenient characters and then ignore the rest and say it's close to the *Rebutiinae*, equally it could be a S. American small-flowered *Echinocereus*, or a dwarf *Borziacactus*. Maybe, as David has said, it could be a missing link, the primitive progenitor of the cereioid and cactoid genera of S. America. Could it be a hybrid swarm?

I would like to thank and congratulate Terry Smales for his courageous presentation of a difficult taxonomic problem. I do not completely disagree with his tentative solutions to it but simply say that I can see it another way and as so often happens in subjective analyses that I do not always see what he sees and *vice versa*. What is fairly clear is that there are far too many species with each river valley having its own unique populations of ecotypes within which there is considerable phenotypic variation depending largely on altitude. If more than one form occurs in the particular valley, then there is usually a distinct separation of the populations by altitude. This is a fairly common phenomenon amongst the coastal cacti of both Peru and Chile. In Chile each valley has its own population of forms of the *Neoporteriinae*, *Copiapoa*, *Eulychnia*, etc., while in Peru one finds *Islaya* in the extreme south or *Mila* succeeding it

northwards, with *Loxanthocereus*, *Arequipa* or *Matucana*, *Weberbauerocereus* and the occasional *Haageocereus*, plus the ornamental giant *Neoraimondia* as Terry has pointed out, and the ubiquitous *Opuntia* and *Tephrocactus*. I do not quarrel at all with his grouping of species as derived from the comparative descriptions given in Das Kakteen Lexicon, but the individual plants themselves are quite distinguishable in the flesh. The purely white, often soft-spined species described are almost invariably the higher altitude form as one can easily ascertain from the Lau and Knize reports of altitude for their discoveries.

I have always thought myself as conservative in the matter of the classification of the *Cactaceae*, but it is a little too conservative for me to accept *Mila*, *Corryocactus* and *Erdisia* as expressions within a single genus.

A further contribution on *Mila* comes from c. v. BRIGNALL, who writes:

'I have but one *Mila*, a specimen of *M. pugionifera*, which I have had now for some five or more years. I regret to admit that when I came to look it up I found I'd failed to book it in and so have no record of how I came by it. However, what is more to the point is that it now has a prostrate main stem of about 12–15 cm length with about seven still largely erect branches up to about 10 cm high.

'For two or three years now, it has borne some 5 to 10 flowers each year, yellowish in colour, brown-red tipped in the bud and funnel shaped to campanulate when open. My tall *Corryocactus melanotrichus* carried its first flower last summer, but it was much more goblet shaped than the *Mila*. To me, the *Mila* looks more like *Haageocereus* in form and habit but as neither of mine have flowered, I have not been able to compare the flowers.'

Forum: your contributions, please

Many readers have said they enjoy Ray Pearce's 'Forum' feature, but few write in. Admittedly, *Frailea* and *Mila*, the two most recent topics, are off-beat genera and a greenhouse full of either could be rather depressing. Some people say that *Echinofossulocactus* (*Stenocactus*), which is Ray's next choice, has only two species, *E. coptonogonus* and *E.sp.* (everything else), but I suspect the scope for discussion is wider than such cynicism might suggest.

Please send your observations, comments, experiences with *Echinofossulocactus* to Dr. Ray Pearce, Department of Forestry, Commonwealth Forestry Institute, South Parks Road, Oxford OX1 3RB.

If you have absolutely nothing to say on the genera mentioned, how about *Ferocactus*? Nigel Taylor, c/o The Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AE, would like to hear your views on cultivation, flowering, rate of growth, or any other aspect, for a future Forum feature!

Book Review

H. R. Tölken. *A Revision of the Genus Crassula in Southern Africa.* Contributions from the Bolus Herbarium No. 8. 2 Vols. 9½ x 7 ins. paperback. 595 pp., 7 plates of line drawings. Bolus Herbarium, University of Cape Town, Rondebosch 7700, S. Africa, 1977. Price: To be announced.

A hearty welcome can be extended to this much-needed monograph, which will be a blessing to the more serious-minded students of African succulents who have waited so long for an up-to-date manual for identifying *Crassulas*. Dr. Tölken has a sensibly conservative outlook: his broadly conceived genus takes in *Rochea*, *Pagella*, *Tillaea*, *Rhopalota*, *Vauanthes* and other 'splits', and the species, which already totalled 223 in Schönland's 1929 account, are reduced to 144, with 126 infraspecific taxa. That leaves "a few more in the rest of Africa and a further 10-20 species occur scattered throughout the world." All but two he has personally investigated in the wild, and the care lavished upon sorting out their enormously involved synonymy, typification problems and diagnostic features inspires the confidence that it will be a long time before a better treatment is offered.

The heart of the book is the key, which I tested out on five *Crassulas* which Dr. Tölken had checked for me during a visit last year. I found it practical, ideally logical and easy to use. The detailed descriptions include diagnostic differences from related species, full synonymy and citations of herbarium specimens. Inevitably there have had to be changes of name: those at species level and below were made the subject of a separate paper two years ago (in *J. S. Afr. Bot.* 41: 93-124, 1975) and the present volume introduces an improved classification into subgenera, sections and subsections.

The opening chapters make interesting reading, and leave one wanting more—especially of the historical introduction, which is very brief. The emphasis is on variability in the field rather than exaggerated regard for differences between individuals, and a refreshingly new look is taken at seedling anatomy and the value of cytology. I predict that *Crassula* is in for a new wave of popularity—there is nothing like a thoroughly practical manual for triggering off a new cult. The book is well indexed and properly stitched, although being split into two volumes is a little inconvenient, and I shall have my copy rebound as one in stiff covers.

On the debit side there are a few misprints, none of them serious, and, in view of the fine professional polish throughout, I feel it almost churlish to have to point out that nine of the varietal names contravene Art. 60 of the Code which requires adoption of the earliest available epithet at the varietal level. To put the record straight I am appending the combinations needed to replace them.

Crassula atropurpurea Dietr. var. **muirii** (Schoenl.) Rowley, **comb. nov.**; *C. clavifolia* Harv. (d) *muirii* Schoenl. in Trans. Roy. Soc. S. Afr. 17: 263. 1929, vice *C. atropurpurea* var. *rubella* Toelk.

N.B. Although Schönland does not explicitly state the rank of (d) *muirii*, it is evident from the text where he refers to "in the other varieties . . .".

Crassula muscosa L. var. **obtusifolia** (Harv.) Rowley, **comb. nov.**; *C. lycopodioides* Lam. var. *obtusifolia* Harv., Fl. Cap. 2: 351. 1861, vice *C. muscosa* var. *rigida* Toelk.

Crassula muscosa L. var. **polpodacea** (Harv.) Rowley, **comb. nov.**; *C. lycopodioides* Lam. var. *polpodacea* Harv., Fl. Cap. 2: 351. 1861, vice *C. muscosa* var. *sinuata* Toelk.

Crassula natans Thunb. var. **minus** (Eckl. & Zeyh.) Rowley, **comb. nov.**; *Helophyllum natans* Eckl. & Zeyh. var. *minus* Eckl. & Zeyh. Enum. 288. 1837, vice *C. natans* var. *filiformis* Toelk.

Crassula perfoliata L. var. **coccinea** (Sweet) Rowley, **comb. nov.**; *Rochea perfoliata* DC. var. *coccinea* Sweet, Hort. Brit. ed. 2: 224. 1830, vice *C. perfoliata* var. *miniata* Toelk.

Crassula perfoliata L. var. **minor** (Haw.) Rowley, **comb. nov.**; *Larochea falcata* Pers. β *minor* Haw. Rev. Pl. Succ., 5. 1821, vice *C. perfoliata* var. *falcata* Toelk.

N.B.: Although Haworth does not explicitly state the rank of β *minor*, elsewhere in the same book (e.g. pp. 49, 53, 63) he refers to taxa indicated by Greek letters as varieties (*varietates* in Latin).

Crassula schimperi Fisch. & Mey. var. **illecebrionides** (Welw. ex. Hiern) Rowley, **comb. nov.**; *Tillaea subulata* Britt. var. *illecebrionides* Welw. ex Hiern, Cat. Afr. Pl. Welw. 1: 325. 1896, vice *C. schimperi* var. *lanceolata* Toelk.

Crassula setulosa Harv. var. **rubra** (N.E. Br.) Rowley, **comb. nov.**; *C. curta* N.E. Br. var. *rubra* N.E. Br. in Kew Bull. 1895: 145, vice *C. setulosa* var. *curta* Schoenl.

Crassula tomentosa Thunb. var. **glabrifolia** (Harv.) Rowley, **comb. nov.**; *C. interrupta* Mey. var. *glabrifolia* Schoenl. in Trans. Roy. Soc. S. Afr. 17: 267. 1929, vice *C. tomentosa* var. *interrupta* Toelk.

G. D. ROWLEY



Crassula nemorosa
(drawn by Christabel King)

Espostoa senilis

by N. P. Taylor

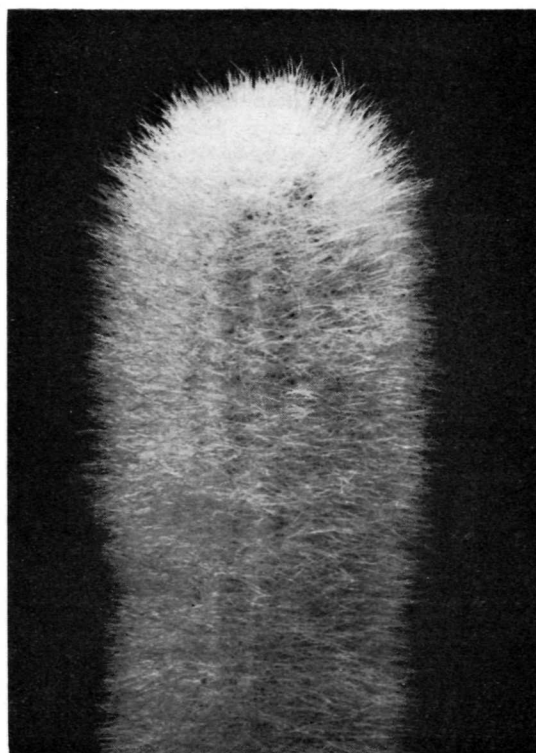
Espostoa senilis (F. Ritter) N. P. Taylor, **comb. nov.**
Thrixanthocereus senilis F. Ritter in Kakt. u.a. Sukk. 12: 89 with figs. (1961). Type: Peru, dept. Ancash, 1956 Ritter FR 569 (U, holotype).

The genus *Thrixanthocereus* was proposed by Backeberg in 1937 for *T. blossfeldiorum* (Werd.) Backeb. (*Cephalocereus blossfeldiorum* Werd.). However, in 1959 Buxbaum examined the genus and gave good reasons for making it synonymous with *Espostoa* B. & R. Accordingly *T. blossfeldiorum* was transferred to *Espostoa*, but since that time Ritter has described *T. senilis*, which similarly has all the characteristics of *Espostoa* B. & R. emend. Buxbaum. The new combination needed under *Espostoa* is made above.

Espostoa senilis is one of the most outstanding cereoid cacti in cultivation at the present time. This plant makes a fine counterpart to the popular *Cleistocactus strausii* which it closely resembles. The cultivation of *E. senilis* is relatively easy provided that a minimum temperature of 5°C (40°F) is maintained in winter, when the plant should be kept dry. During the summer months full sunshine and liberal watering will suit this plant so long as it is grown in an open, well-drained compost. Propagation is by seed, and young plants 5 cm. in height can be grown within 3-4 years.

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Espostoa senilis (photo R. Zabeau).

Further Illustrations. Nat. Cact. Succ. J. 18: 42 (1963),
ibid., 27: 45 (1971); Succulenta 50(11): 201 (1971);
Cact. Succ. J. Amer. 47: 253 (1975).

Spines and Glochids

by D. C. Speirs*

A xerophytic adaptation commonly seen involves spines or sharp leaf tips on about anything one cares to mention. It is doubtful that plants evolved them solely to restrict field collectors or to annoy overweight hobbyists with undersized glasshouses. They do serve the purpose of protection against thirsty predators in arid lands where water is the limiting factor of life. Spines are not always successful against herbivores but are advantageous in the long run of evolution. When coupled with toxic sap, as in *Euphorbia*, spines are even more formidable since they can open up wounds into which the sap can reach. Elaborated into an interwoven mesh or into long hairs, they serve to protect high

altitude species from excessive insolation, especially with regard to ultraviolet. At the same time, air circulation is reduced immediately next to the plant, and water loss from evaporation thereby decreases as well.

It has been recently shown, using *Opuntia* spp., that glochids are made of pure crystalline cellulose and in their initial development are multicellular (Hall & Pritchard, 1976). Fun can be had by using hormones to trip up the plant and keep it from normal growth. Cytokinin will produce leaves from axillary buds while gibberellic acid (GA) produces spines instead (Mauseth, 1977). GA will induce excessive glochid growth on an *Opuntia* pad, although it will not translocate to other pads on the same plant and do the same for them. The effect of GA can apparently be simulated by enclosing the growing pad in polyethylene bags (Burnside, Chow & Lavy, 1966). Perhaps some readers of this journal might like to duplicate this experiment and report on it.

There has long been a superstition that *Sempervivum*

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should be planted on a house roof to keep away lightning. As with many old wives' tales, a grain of truth lies concealed within. The leaf tips of *Sempervivum* apparently serve to discharge any electrical build-up and thus dissipate chances of a lightning strike. The roots, embedded in a moist albeit tiny amount of soil, conduct and are electrically grounded to the house (Anon., 1962). In the desert, this trick works a different way with cacti. Spines become electrostatically charged by natural means, water droplets are attracted from the air and some condensation then takes place. Even the small amounts of water obtained this way can make the difference between life or death for a plant (Paturi, 1974).

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Succulent Snippets

May is the month when the new season's growth is well and truly under way. It's the time to root cuttings, whether they be to increase the stock of a particular species or to re-establish a plant which appears to be static. If a particular specimen disappointed during 1976 and is failing to get under way now, remove it from its pot and examine the root system. If this is sparse, shrivelled or comes away readily, boldness will usually pay dividends. Cut back to firm tissue and, very probably, a new root system will form quite quickly and there will then be a return to active growth. It may be worthwhile reminding those with *Epiphyllums* and other epiphytic genera such as *Schlumbergera* and *Rhipsalidopsis* that it is a good idea to put them outside in mottled shade once all danger of frost is past, in mid-June probably. If possible the pots should be raised off the ground as this prevents damage by slugs and snails.

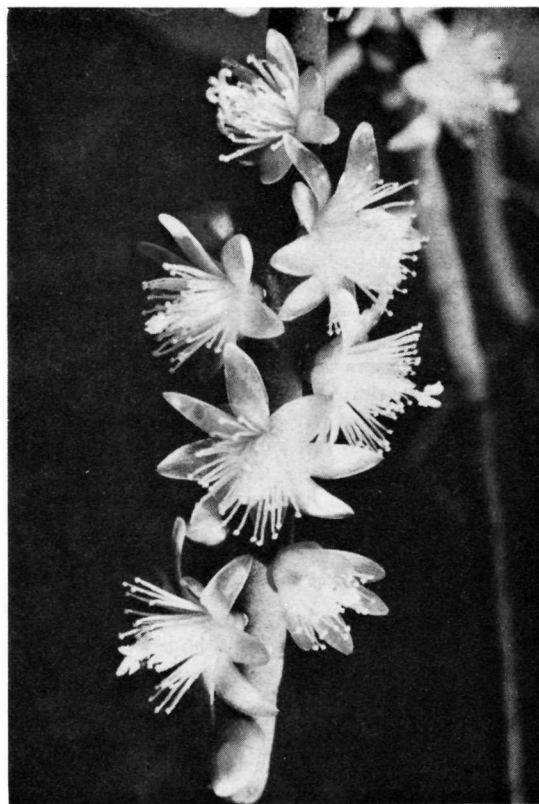
Unfairly neglected

When you mention epiphytics to anyone they generally say, 'Oh well, they only flower in May or June and you have those untidy green stems the rest of the year'. True enough, perhaps, of the hybrid *Epiphyllums* or 'orchid cacti', but there is great variety of form amongst the

species of *Disocactus*, *Rhipsalis*, *Schlumbergera* and related genera, and what many of them lack in flower-size they make up in the number of flowers. They can be really rewarding to grow, especially as they'll thrive in the shadiest part of the greenhouse or conservatory, or indoors. Take *Rhipsalis grandiflora*, for example. Although rather like the other 'strap' or 'thong' types, the whole effect is larger and more impressive because the stem is stronger and, in the case of my plant, the flowers are larger and more flamboyant than the normal *Rhipsalis*. For an added bargain there are at least two flowering spells a year and sometimes more and the shining cream-coloured flowers with pinkish stamens can open up to over an inch in diameter and remain open for four days or more according to the weather.

Why not try growing some of these plants? They may require a little more warmth in winter than a normal cactus house but as they are often budding up by then they can be brought indoors to a bright situation so that you can enjoy the flowers even more. A little addition of leaf mould or hop manure to the compost is beneficial and watering with a high potash fertilizer every fortnight when budding up gives good flowering.

Sally Cornioides



Rhipsalis grandiflora.

Forthcoming Events

SUMMER SHOW, PIMLICO

Saturday 17 June at St. Saviour's Church Hall, St. George's Square, Pimlico, London SW.1, from 2-6 p.m. Closing date for entries: 12 June.

Staging of exhibits: On the day, from 9.30-10.45 a.m.

Judge: J. W. Pilbeam.

Presentation of Awards and Prize Draw: 5.30 p.m.

Admission: 10p (children 5p); free if you exhibit in five or more classes.

St. George's Square lies between Vauxhall Bridge Road and the Embankment, not far from Vauxhall Bridge. From Pimlico Underground Station it is a few minutes walk in a southerly direction.

Please send for your schedule (enclosing a stamped foolscap envelope) to the Show Secretary as soon as possible or ask your Branch Secretary for one.

The main schedule is the same as last year but the Novice Classes (for those who have not won a first prize in Society Shows) have been changed. Class 16 is for three cacti in pots not exceeding 3½ inches diameter and Class 17 for three cacti in pots not exceeding 5 inches diameter (all pots measured half an inch below the rim *inside* the pot); this should give new exhibitors a good opportunity to select their best plants of any genera for showing. In the 'other succulents' the Novice is asked for one *Aloe*, *Gasteria* or *Haworthia*. For Novices there is now the Pryor Award of £2, which will be given to the member gaining the highest points in the Novice classes in *both Shows*, this one and the Autumn Show on 7 October.

The Society's List of Genera should supply the answers to any queries on the other classes for cacti and those for other succulents have been set out in more detail to help new exhibitors. However, if you still have any doubts the Show Secretary or her Committee will be very pleased to help so please contact them in good time to ensure your entry is correct.

There will be the other usual Show attractions, plant sales on the stage, Society goods and seeds on sale, the Lucky Draw (tickets still available from the Publicity Officer) and refreshments available throughout the afternoon. If you can help with preparations for the Show or stewarding on the day or can supply cakes or savouries to help with the refreshments please contact Mrs. Maddams as soon as possible.

Autumn Show, Saturday 7 October

This will be held at Napier Hall, Hide Place, Vincent Street, Westminster, from 2-6 p.m. Further details in the August issue.

Meeting at Ewell, Surrey

A half-day meeting is to be held at St. Mary's Church Hall, Ewell, Surrey on Saturday 28 October, from 2.15-6 p.m. Speakers will include Keith Grantham and Robert Holt.

THE CACTUS & SUCCULENT SOCIETY OF GREAT BRITAIN

Report of the Council for the year ended 31 December 1977

During 1977 a Finance and Policy sub-committee was set up by Council to begin a review of the aims and policy of the society. The committee met for the first time on 26 February and shortly before each Council Meeting thereafter.

Decisions have been taken to abandon the monthly meetings at Westminster and the name Gilbert Leighton-Boyce will be remembered not only as the Society's Librarian and compiler of the Index of Plant Names 1964-1968 and more recently 1969-1975 but also as the lecturer on *Opuntias* which, apart from a slide competition in December marked the last of our Meetings at the R.H.S. Hall.

Despite the necessity for a further rise in subscriptions the membership has remained virtually steady and with a modest increase fixed for 1978 there is every chance of some growth in the future.

David Hunt has, in addition to his work as Editor, taken on the post of Treasurer and the balance sheet speaks for itself as evidence of his efficiency in that sphere. The journal also continues to improve and be much sought after. It is also noted that its overseas circulation is growing.

The North Surrey Branch were again responsible for the Society's Chelsea exhibit and gained a further Silver Flora for their efforts. Although perhaps not so colourful as in 1976 it nevertheless did us great credit and many new members were recruited there.

Once again the Annual Dinner was held at the Mecca's Colonial House Viceroy Suite where, after a splendid meal, we were shown some truly superb slides of the Zurich Collection by Dieter Suphtut who is its curator. We were also sorry that as in 1976 our President was unable to attend the event due to her continued ill health.

Mrs. Boote who distributes and Dr. Smale who purchases and by fair means or otherwise entices volunteers to packet our seeds earn the grateful thanks of Council for their efforts and the smooth running system which together they operate.

Thanks must also be recorded here to Hugh Miller who for many years has provided a first-class projector and stand for the various Westminster lectures and slide shows and it is hoped that he will soon be fully recovered from the injuries he sustained as a result of a raid on his premises.

The June show now regularly held at Pimlico was also highly successful with many fine plants on display and the October Show—held for the last time in the R.H.S. Hall—was memorable for some new exhibitors and also for some extra large plants on the benches. Our usual thanks must be extended to Mrs. Hodgson, Show Secretary, and her show sub-committee.

We must also pay tribute to the fine work which has been done by Mr. and Mrs. Dennard who between them have made a very commendable effort in their combined work as Membership Secretary and Journal Distributors. Due to other pressures Mrs. Dennard has found it necessary to relinquish these offices at the end of the year.

Council wishes to conclude by offering its sincere thanks to all the senior and junior officials of the society, to its own members and the various speakers and show organisers and all the society's Branch Officials and members who have assisted in any way in the organisation of the Society or the stewarding of its shows.

R. H. I. READ
Hon. Secretary

TREASURER'S REPORT

The financial statement is presented in a revised form this year in order to provide a simple balance sheet and relate subscription income to the year *for which* rather than *in which* it has been paid. In past years, subscriptions paid in advance have been included in the accounts for the year under report and the increasingly perilous state of the Society's finances has not been immediately apparent.

Allowing for the fact that the Annual Dinner bill for that year had yet to be paid (£175), the Society's net reserves were really only £76 at the end of 1975. There was a slight net improvement in 1976 to £107. I am glad to say that there has been a more significant up-turn in 1977, thanks to the loyalty of subscribers and advertisers in the face of substantially increased rates.

In 1977, printing costs and subscription and advertising income all went up broadly in proportion to the higher charges applied. Of the other figures, few require comment as they are

comparable with those for 1976. On the expenditure side, the apparent increase in Show Expenses was not a real one, as expenses totalling £87 in connection with shows in 1976 were included under the heading of Sundry Expenses. The Sundry Expenses for 1977 were abnormally high owing to the purchase of binders (£96). On the income side, it should be mentioned that the sum shown for sales of offprints includes a margin of profit only, the cost of the offprints to the Society being included under journal printing costs.

A further small subscription increase has been made for 1978 to offset equivalent increases in journal production costs announced by the printers during 1977. If further rises are to be avoided, membership must continue to increase, and I urge all members to do their part in publicizing the Society and its journal as widely as possible.

D. R. HUNT
Hon. Treasurer

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31st DECEMBER 1977

EXPENDITURE				INCOME			
1976		1977		1976		1977	
£		£		£		£	
1873.24	Journal: printing	2594.71			Subscriptions for year:		
292.09	Journal: postage	320.00		760.33	Paid in advance	875.93	
90.53	General postage	184.13		1029.33	Paid during year	1835.68	
170.04	Printing and stationery	96.76					
63.25	R.H.S. Affiliation and		1789.66				2711.61
	hire of rooms	25.25			Journal sales:		
153.86	Seed purchases	112.56		207.17	Back numbers	351.57	
66.43	Show expenses and			—	Offprints	145.00	
	cup engraving	160.30		173.21	Advertising	362.90	
375.10*	Annual Dinner	226.97		191.39	Journal donations	246.29	
141.17	Sundry expenses	188.70		134.53	Booklet sales	82.31	
9.89	Returned cheques	7.00		136.61	Seed sales	144.61	
	(* includes cost of 1975			121.50	Raffle and plant sales	127.38	
	Dinner)			193.50	Annual Dinner	236.50	
				5.00	Donations	37.10	
3235.60	Excess of income over expenditure,	3916.38		139.03	Sundry income	179.85	
	carried to Balance Sheet	708.74					
(144.00)	(Deficit, 1976)						
<u>£3091.60</u>		<u>£4625.12</u>		<u>£3091.60</u>		<u>£4625.12</u>	

BALANCE SHEET 31st DECEMBER 1977

251.07	Accumulated fund:		985.81	Cash at Barclays Bank Ltd. ..	1956.50
	Balance at 1 January	107.07			
	Add excess of income				
	over expenditure	708.74			
(144.00)	(Deduct deficit, 1976)		2.81	Deduct unrepresented cheques ..	25.76
107.07		815.81			
	Current liabilities:		<u>£983.00</u>		<u>£1930.74</u>
875.93	Subscriptions in advance ..	1018.93			
	Advertisements pre-paid ..	96.00			
<u>£983.00</u>		<u>£1930.74</u>			

Audited and found correct: J. S. KEESING, R. I. BEYER,
Hon. Auditors.
D. R. HUNT, Hon. Treasurer.

Branch Activities

North London

Secretary: Mrs. B. Massey, 86 Auckland Road, Potters Bar, Herts.

Meeting Place: Capel Manor Primary School, Bullsmoor Lane, Enfield, 3rd Friday in month, 7.30 p.m.

We ended 1977 with our usual social gathering just before Christmas which was as enjoyable and successful as ever. Our first speaker of the New Year was Mr. David Hooker who gave a talk on the general cultivation of cacti and succulents and an interesting point revealed by the slides he showed was his ability to produce flowers on young plants. At our February meeting we enjoyed the long-awaited talk by Mr. Leighton-Boyce on *Opuntias*.

Forthcoming meetings:

The May meeting will be given over to staging and preparing for our Summer Show at Capel Manor, this year's judges being Mr. & Mrs. W. F. Maddams.

We are having a Slide Quiz for our June meeting and look forward to a talk by Mr. Rodney Sims in July, the subject of which has yet to be fixed.

North Surrey

Secretary: W. F. Maddams, 26 Glenfield Road, Banstead, Surrey, SM7 2DG.

Meeting Place: Adult School, Benhill Avenue, Sutton, 1st Tuesday in month, 7.45 p.m.

After the Annual Restricted Branch Competition on 6 June when the hall is generally somewhat overfilled with plants which are judged with some candid comments on the spot from the judge, the climax of the year, our 21st Anniversary comes in July. Mrs. Stillwell, who was the first visiting speaker to the Branch all those years ago, has kindly agreed to come back and talk again on 4 July on 'Plants I have Grown' to make a special celebration evening. On 7 July the Branch are holding an Anniversary Dinner at the Pickard Motor Hotel. Any former Branch members now in 'distant parts' who would like to join in the celebrations please contact Mrs. Maddams.

On 1 August there is the usual Branch theme for the month and this year Graham Cryer will be talking about some of his favourite plants. The Branch will be having their Show in conjunction with the Carshalton Show at Carshalton High School for Girls, West Street, Carshalton, on Saturday, 2 September. The Show is open to all so any non-Branch members wishing for schedules should apply to Mr. Maddams enclosing a stamped addressed envelope.

Society Sales

Booklet on cultivation	30p
Society Badge	60p
Tie (Navy blue)	£1.10p
Car sticker	30p
Ballpoint pens (4 colours)	10 for 60p
Key fobs (mixed colours)	25p
Journal binders (to hold 4 vols.)	£2.50p
All items post paid inland. Overseas extra.	

Order from: Mrs. B. Maddams, 26 Glenfield Road, Banstead, Surrey, SM7 2DG, England. Please quote your membership number and enclose a return address label.

Sales items are usually available at Society meetings. For bulk orders and binders please contact Mrs. Maddams beforehand.

IOS International Organization for Succulent plant Study

Publications available:

Repertorium Plantarum Succulentarum

Nos. I-X (Reprint, complete in one volume)	£8.50
Nos. XI-XXVI (Separate issues)	£1.80

IOS Bulletin Volume 3 (1972-)

Parts 1, 2, 5, per part	£1.00
Parts 3, 4, 6, per part	£1.50
Succulents in Peril (1974) .. .	0.35p

Register of Specialist Collectors in the United Kingdom (1975) 0.60p

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**Order from: D. R. Hunt,
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The Succulent Euphorbieae, by White, Dyer and Sloane, also other works on individual genera; American Society journals prior to 1976, early N.C.S.S. journals, Exotic Collection monthly notes and photographic reference plates. Please write or 'phone stating condition and price, to R. T. Baker, 11 Irons Way, Romford RM5 3RJ, Essex.

Gardens to Visit booklet

Listing the many gardens opening in 1978 in aid of the Gardeners' Charities. Price 20p at bookstalls or 30p (incl. postage) from: Gardeners' Sunday, White Witches, Claygate Road, Dorking, Surrey.

The Cactus & Succulent Journal of America

Six issues per year, fully illustrated, total on average 300 pages and catering for all levels of interest. Subscription: \$12.50. Apply direct to Box 3010, Santa Barbara, California 93105, USA.

CSIE: Cactus & Succulent Information Exchange (founded 1968) encourages communication and fellowship among amateur collectors. Nine issues a year. Further details from: Mrs. G. Rollerson, 5512 Clinton St., Burnaby, B.C. V5J 2L8, Canada.

The Cycad Society (founded 1977) is an international organization for the study, conservation, and preservation of Cycads. Subscription \$10.00 U.S. per annum. Apply to: 5988 South Pollard Parkway, Baton Rouge, La. 70808, U.S.A.

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Volume 40/Number 3
August 1978

The Cactus and Succulent Journal of Great Britain



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Full Membership (minimum rate)	£4.00
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Small ads (pre-paid only) can be accepted at 20p per 10 words, 50p minimum.

Copy advertising plants must conform with the recommendations of the IOS Code of Conduct.

Cover design: *Euphorbia antiquorum*, drawn by Pam Stephens. The prize-winning entry in this year's competition for students at Middlesex Polytechnic (Art & Design).

BACK VOLUMES

The following are available:

Vol. 22 (1960)	£1.20
Vol. 24 (1962)—Vol. 36 (1974), per volume ..	£1.20
Vol. 37 (1975), nos. 2—4 only	£1.20
Vol. 38 (1976)	£2.50
Vol. 39 (1977)	£3.50

Prices include postage by surface mail. For air-mail, add £1 per volume.

All applications for membership, advertising and back volumes should now be made to the following address:

Cactus & Succulent Society of Great Britain
67 Gloucester Court
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Surrey TW9 3EA
England

Cheques, etc., should be made payable to the Society and not to individual officers. When remitting in a currency other than sterling, please add the equivalent of £0.70p to cover currency negotiation charges.

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The Cactus and Succulent Journal of Great Britain

Volume 40 Number 3 August 1978

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The Editor regrets . . .

. . . the late appearance of recent issues, due partly to production running behind schedule and partly to the changeover to new arrangements for addressing and despatch.

Pilbeam's Choice

Judge at the Society's Summer Show on 17 June was *Haworthia* and *Mammillaria* specialist John Pilbeam, who gives his own recipe for success with Haworthias, and describes a selection of worthwhile species, in an article on pp. 64-68.

Entries at the Show, though fewer in number than last year, were of a high standard. Awards-winners are listed on page 83.

Skeleton key

Now that botanists are getting down to the minutest details of cactus seeds, pollen and spines in the search for better classification, you might think that all the larger parts of the plant had been systematically examined long since. Not so. Until recently the woody skeleton of the cereoid cacti had scarcely received any attention. The problems of obtaining and working on such unwieldy structures would daunt any but the bravest and most imaginative. Dr. Arthur Gibson has the necessary pioneer spirit, plus the clear pre-requisite of an address within reach of the plants in their native habitat, the University of Arizona at Tucson.

Dr. Gibson has now examined nearly 250 species, and the variety of designs he has found is fascinating. Moreover, the evidence suggests that, in conjunction with other features, the skeleton may hold the key to the phylogeny and classification of some of these plants. The inside story is on pp. 73-80.

Books galore

None of us need go short of reading matter this autumn. Recent books cover our subject at every level and the number of journals or 'serials' has increased by five (perhaps more?) in the past twelve months. In this issue we have only space for brief reviews of some of the books, but are planning a longer feature on current journals for later.

Backeberg by Backeberg

For serious collectors, the publishing event of 1978 must be the Cactus Lexicon, and I confidently predict there will be enough reviews to fill a separate volume.

What did Backeberg think of his own work? He spoke for himself in a letter written in November 1965, a few weeks before he died, when the first German edition of the Lexicon was still in press. By courtesy of Will Tjaden, we print the letter on pp. 71-72. It gives a rare insight into the mind of a man for whom the end justified the means.

Wisdom of the Wilds

Another of the legendary figures of the cactus world, Friedrich Ritter, also figures prominently amongst those whose work has been published in recent months. Ritter, who in the course of the last five decades has travelled throughout the countries of Central and South America, studying and collecting plants, was 80 on 9 May. He is still intellectually and physically vigorous, Helmut Broogh tells me, and is nearing the completion of a treatise in several volumes which will contain the scientific descriptions of his numerous discoveries. Meanwhile, his personal document, '40 Jahre Abenteuerleben und die wilde Weisheit' (40 Adventurous Years and the Wisdom of the Wilds) has appeared as a prologue. It is briefly reviewed by Mr. Broogh on p. 83.



Princess Grace of Monaco at the Jardin Exotique on 15 May, after presenting the Cactus d'Or (Golden Cactus) to Professor Dr. Werner Rauh (on her right, holding the trophy). Congress Organizer and Director of the Jardin, Marcel Kroenlein, is on her left, with Hernando Sanchez-Mejorada, representing Mexico, where the next Congress will be held in 1980. On Werner's right is IOS Secretary Dr. Heimo Friedrich (Austria).

(Photo : Margaret Johnson)

Werner Rauh receives the first 'Cactus d'Or'

The prestigious curtain-raiser to the XVth Congress of the International Organization for Succulent Plant Research, held at Monte-Carlo on 14-19 May, was the presentation of a new award, to be presented biennially, to someone who by their research in the countries of origin has contributed to the extension of knowledge of succulent plants. The award, an initiative of the Jardin Exotique, has been instituted by H.S.H. Princess Grace of Monaco, and she herself made the first presentation on the opening day of the Congress (*see picture*). For the recipient, Professor Dr. Werner Rauh, the honour was not only well-deserved but well timed: it was his 65th birthday the following day. As Director of the Institute for Systematic Botany and Plant-Geography at the University of Heidelberg, Werner Rauh has made some fifteen expeditions to Africa, Madagascar and America in the past twenty-five years, and his researches and publications, and those of his students, have set new standards of excellence for succulent plant research in several fields.

The breadth of Professor Rauh's interests and influence came through at many points in the Congress week. There were his own illustrated lectures on 'Mimicry in Cacti' and the Madagascan Succulent Flora and its conservation; the lectures by his former student Dr. Wilhelm Barthlott, now a staff-member at the Institute in Heidelberg, which opened the scientific sessions on 'The Applications of the Scanning Electron Microscope in the Taxonomy of Succulent Plants'; the

visit to Les Cèdres, where the late Julien Marnier-Lapostolle built up such a fine collection with Werner Rauh's help, and where Werner continues to act as adviser to Mme Marnier; and not least on the 'day out' to the country where delegates learned from him the names and properties of each member of the native flora as they walked down a valley in the foothills of the Alpes-du-Sud.

Lectures on SEM studies formed the core of the scientific sessions at the Congress. There was also a symposium on IOS Reserve Collections. At the members' business meeting Marcel Kroenlein was elected to fill the Board vacancy caused by the resignation of Charles Glass and amongst candidates newly elected to IOS were Britain's Bill Keen and Bryan Adams.

On the final morning, the delegates visited the nurseries of Delrue (Menton) and Pallanca (Bordighera). The latter's enormous new fully automated production greenhouse represents cactus culture from seed on a truly industrial scale, with a capacity of 4,000,000 plants per annum.

The Congress proceedings concluded with an evening banquet for the 100 delegates and guests at Loew's Hotel, Monte-Carlo, next to the Casino. The restaurant was entertaining many other guests besides the large IOS party and so, for once, there were no speeches of thanks or valediction, instead a dance and the Folies . . . Each IOS Congress is uniquely enjoyable and memorable, and Monaco, 1978, lived up to every expectation.

Mr. H. P. Jones

We were very sorry to learn that Mr. Peter Jones died in July after a short illness. He was a leading member and librarian of North London Branch and father of our Council member Miss Iva Jones, and we offer our sympathy to Iva and her mother.

We also offer our best wishes to Iva Jones at the commencement of her new career in the Women's Royal Air Force.

Warrington & District Cactus Society

This new group has been organized by Mr. & Mrs. A. Pritchard in collaboration with other GB Society members in the Warrington area, and has been formally recognized by Council as a Branch of the Society.

Anyone in the Warrington area (including Manchester, Liverpool, Northwich, Ormskirk, St. Helens, Widnes and Runcorn) who would like details of meetings should contact: Mrs. Daphne Pritchard, 81 Birdwell Drive, Great Sankey, Warrington, Cheshire.

Can you help?

There has been a steady demand for back numbers of the Journal in recent months, and we have run out of one issue: it is Volume 37 Number 1 (1975).

Most members, of course, will not wish to break up their set, but anyone's unwanted copies would be gratefully received to pass on to those who do want them. Maybe you know someone who has discontinued their membership and would be willing to return their copy.

We are willing to pay 50p for clean copies of this number and to refund the postage.

Early volumes (Vols. 1-21) are also wanted by a number of subscribers, and anyone who has these (volumes or single parts) to sell should also contact the Editor, stating the price wanted.

Visiting California?

The Sunset Cactus & Succulent Society of Santa Monica welcomes speakers from overseas, especially those with slides and/or movies. Contact the Chairman, GB member Seymour Linden, 1508 San Remo Drive, Pacific Palisades, California 90272, if you're headed that way.

Toelken's *Crassula* in Southern Africa

Gordon Rowley reviewed this valuable new work in our May issue but we were unable to give the price. We have now heard that the monograph is available, price 10 Rand (plus about 1 Rand postage) from: The Curator, Bolus Herbarium, University of Cape Town, Rondebosch 7700, South Africa.

DATES FOR YOUR DIARY

7 October

28 October

25 November

Autumn Show

Meeting in Surrey

Annual Dinner

Further details on page 85

Illustrated Encyclopaedia of Succulents

I confidently predict that Gordon Rowley's own new book (see p. 84) will be a best-seller, though he volunteered to supply a list of faults to be mentioned in a review! Well, I'm afraid we haven't space for your list, Gordon, but remembering what you went through during the book's production, here is a short allegorical tail-piece . . .

Noddy's New Periwinkle

It was getting late and Professor Nodrog could not see to continue his Research. So he locked the greenhouse with his master Key and went indoors to listen to a Sibelius symphony or two.

Usually the music made him sleep very soundly, but that night he was restless and uncomfortable. Hideous illegitimate hybrid genera swarmed over him, like *Pilocopiosocereus* (*Pilocopiapoa* x *Pilosocereus*) and *Schlumbergolychnia* (*Schlumbergera* x *Eulychnia*) and his pillows grew awful hooked spines. His *Echinopsis* plants suddenly grew taller and taller till they broke all the glass in the roof of the greenhouse, and a cannibal *Neoporteria* ate nearly all its relations, except *Eriosyce* (which would have been very indigestible). Worst of all, his newest *Combinations* were all undone by an international panel of lady botanists, leaving his *nomina nuda* and his *Repertorium* bare . . .

At last morning came, and an anxious look out of the window confirmed that the Professor had dreamt it all. What a relief! Everything in the greenhouse was lovely. It was not until after breakfast, when he looked more closely, that he noticed something of, well, an Un-natural Order. One rather special plant had a brand new label which said: "THIS *Tavaresia barklyi* is a member of the PERIWINKLE family" (which, for the technically minded, is the *Vinca* family, of course).

'That's odd', said Nod, 'I'm sure I put it in the MILKWEED family yesterday. Whatever can have happened?'

The Pachypodiums laughed so much they almost fell off their *podia* and the poor *Tavaresia* covered up its flowers and fruits in embarrassment. No one would own up to the prank, and to this day the Professor has no idea who did it. But I have just a suspicion, don't you? . . . *A Noddy's as good as a Vinca!*

(with apologies to John Rayner, Rose Fyleman, Enid Blyton, Frank Muir and Dennis Norden, and all our readers)

Grow Better Haworthias

by John Pilbeam

with photographs by Bill Weightman

To say that this genus is in the Cinderella class is a positive understatement—it is the equivalent in the succulent plant world of battered babies. Everyone seems to find room for at least a few Haworthias, but often they are treated badly. This arises most often I think from a misunderstanding of their requirements.

Yes, they will tolerate shady conditions, but this is relative, and the gloom of cobwebby sub staging, where they never see the sun, and depend on the overwatering of the plants above, just will not do if you wish to grow them at their best.

They will grow under the staging in a light, glass-to-ground greenhouse, with shading in summer if they are on a sunny side, but they do need some sunshine to bring out the best colouring in these very colourful plants. And some need more sun than others, notably those in the section *Retusae*.

I grow mine in a mixture of John Innes No. 2 potting compost and equal parts of Arthur Bowers potting compost and sharp grit, although I vary the grit content according to the character of the species; more for the thick leaved or thick rooted species and less for the fast growing kinds.

Watering is a problem because most Haworthias can do with some water all the year round, but growing them at ground level means low temperatures in the winter, so for safety's sake I tend to let them go dry at the coldest time of year. Like most other succulent plants they do need potting on each year, though from some I have seen in collections or even on the show-bench this is not generally believed. This enforced residence in wasted compost is often the cause of their tired or even battered appearance. They will remind you that they are in need of potting on sometimes by shedding their roots and steadily shrivelling, until you realise something is amiss. Do not just screw them back into the same pot of compost; they are telling you as plainly as they can that either they have had all they can take from the present potful, or that they do not much like what is there—or maybe you have drowned the roots, as continuing soggy conditions do not please them much either. Remember that if they are getting a lot less sunlight than those plants at higher levels in the greenhouse they will dry out that much more slowly.

Propagation is with many species of Haworthia simply a matter of a sharp knife to winkle out the offsets, although care should be exercised when doing so with plants which produce offsets snugly set in the main rosette. Often you will fail to get the knife below the deeply set growing point of the offset and be left with a small bunch of leaves. And be careful how you lift out

the cutting as often there will be roots already formed and maybe already anchored in the compost. Dry off cuttings for a day or two before rooting in dryish compost, withholding heavy watering until roots appear and keeping out of direct sunlight.

Leaves too can be rooted to produce new little plants from their base, but some species take a long time to root. They are best taken as complete as possible by gently easing them from side to side until they come away, and the leaves to choose are not the lowermost, but those a little way up from them, still growing lustily and full of sap. Put them up to their waists in dryish compost and treat as for cuttings. The odd offset which appears on the flower-stalk can be left until it is of a size you would readily take as a cutting, when the stalk can be snipped off just below the new plant and rooted in the way described above.

If you have more than one plant of a species—but not from the same clone, i.e. two offsets from the same original plant—you can set true to type seed on them if they oblige by flowering at the same time. A slim brush, or even a single hair is needed to transfer the pollen from one flower to the deep-seated stigma on another. Seed should be sown fresh as soon as the seed-capsules have dried and released the flaky seed. Some of the more choice species are very slow from seed, but most will make a good-sized plant within a year or two.

With so many different Haworthias the question is most often asked: which should I grow? This must in the end come down to individual choice, but there are some Haworthias which seem to have a steady popularity with collectors. The Haworthias most collectors prefer fall into five well-defined categories: the spotted or barred, the bristled or toothed, the truncate, the recurved and the rare.

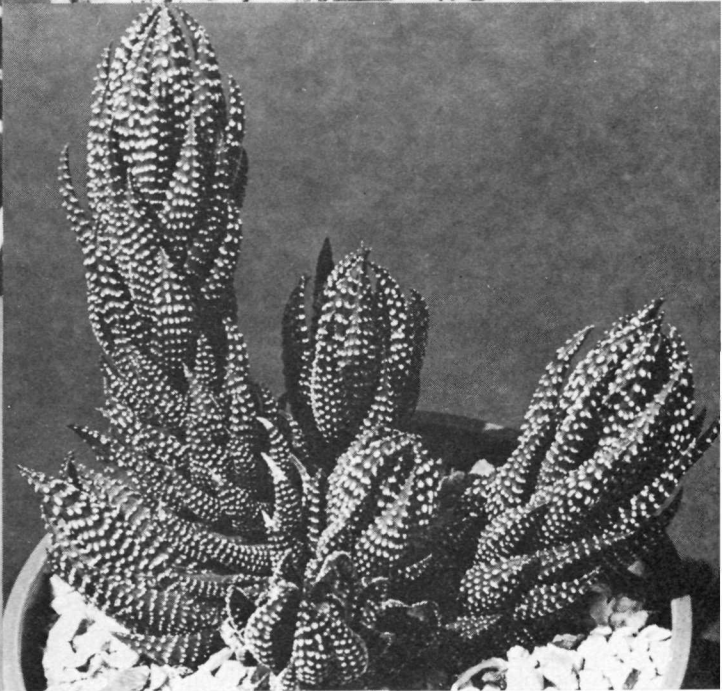
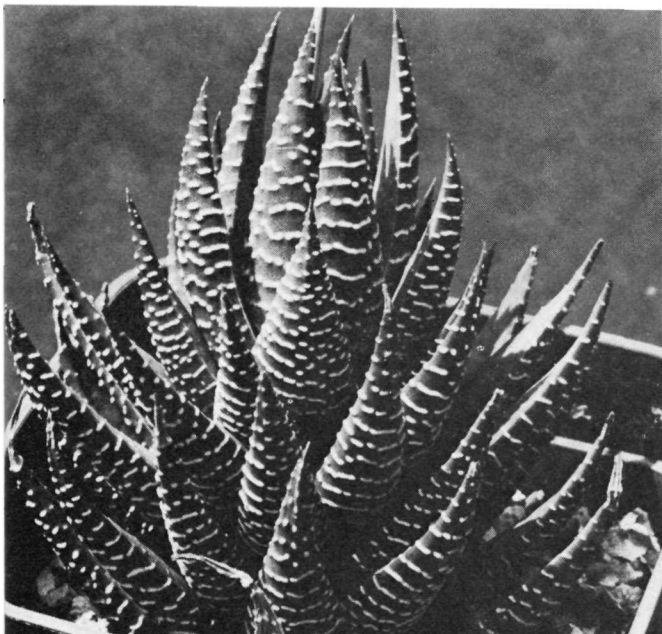
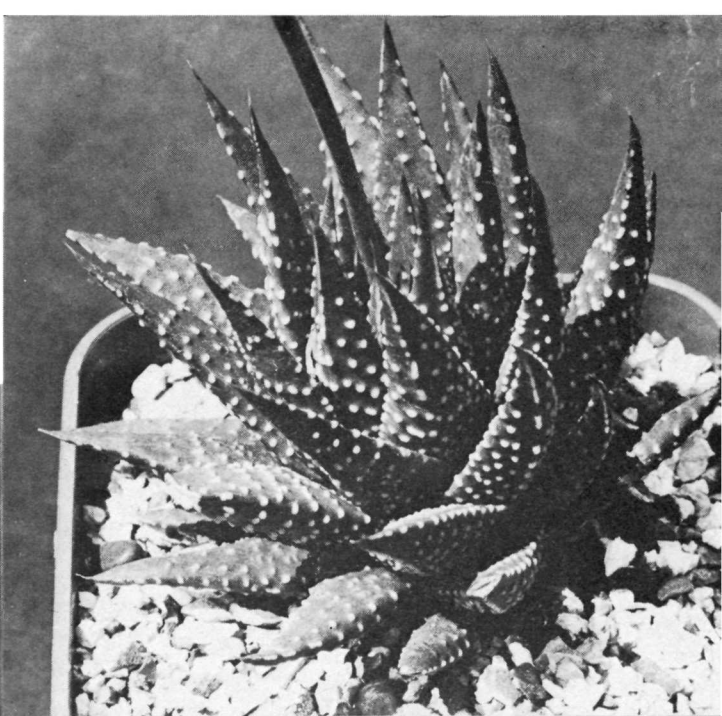
Spots or bars

Of the spotted kinds—the bars are merely coalescing spots or tubercles—there are many which are worth growing, but a few stand out in the crowd as being more desirable. Perhaps the most commonly seen of this sort of Haworthia is nevertheless one of the best if grown strongly to give the deep green, contrasting background to the pearly bars of tubercles. Often mislabelled *H. fasciata*, a similar but substantially different species, the freely offsetting *H. attenuata* var. *caespitosa* is widespread in collections but too often stands in need of some care and attention. Clustering rapidly and growing vigorously as it does it often needs repotting badly, having outgrown its original small pot of acquisition or one-and-only repotting. It is the sort of plant which, after four or five years, forces you to make up your mind whether it warrants the bench space needed for a 10 inch pan, or should have its children sent to a better or different home. Space and your regard for the plant will no doubt determine which course you take.

Such a problem will not beset you for some time with

Right, *H. margaritifera*, with ice-drop tubercles all over the leaves, and reaching small football proportions. Figured as long ago as 1701 by Commelin.

Below, *H. fasciata*, with stiff, incurving, deltoid, barred leaves, glabrous on the upper surfaces, reluctantly clustering, originally described by Willdenow in 1811.



Above, *H. coarctata* subsp. *adelaidensis*, NOT from Adelaide (where the sender lived), this lovely Haworthia comes from Queens Road, near Grahamstown.

Left, *H. reinwardtii* fa. *chalumnensis*, a chunky form from the banks of the Chalumna River.

my second choice of *H. margaritifera*, since this remains solitary for many, many years, and is indeed a rare sight off-setting at all. It will, however, steadily demand a larger pot over the years until it reaches a 7 inch or perhaps a 9 inch pot. For collectors who think big is beautiful, this is the one.

And there are a number of plants of this kind in the complex centred around *H. reinwardtii* and *H. coarctata*, the more prominently marked being the former species with its umpteen 'varieties', now thankfully reduced by Bruce Bayer to a handful of the more readily distinguishable. A good two lengths in front of most others in my form-book are two: *H. reinwardtii* fa. *chalumensis*, with thick, robust pillars of spiralling leaves, liberally spotted and colouring well to deep shades of red in sunlight, quickly demanding more pot room and making a handsome clump of stems about 12 cm or more tall in a few years. The second, or the first sometimes, since I find it hard to split the two in my affections, is *H. reinwardtii* fa. *kaffir-driftensis*, with coalescing, sometimes broken, rows of tubercles down the lengths of the leaves, more prominently white than most forms. This makes a slower cluster of more modest stems about 10 cm or so tall.

Bristles or teeth

Of the bristled or toothed species the most well-known is perhaps *H. bolusii*, but some others are worth attention and make as handsome plants as this deservedly popular species. The trick of growing them well, or, rather, of not reducing them to mush, is to keep water out of the flat rosette of leaves. The usually thick stem of these species sits at or below ground level throwing up its whorls of leaves which quickly channel any water down to the centre of the plant—fine in sunny South Africa, where water is hard to come by and welcomed by the probably shrivelled plants, but in our English soggy summers it tends to hang around in the heart of such plants far too long, and rot sets in. *H. aranea* and *H. semiviva* are two delightful species raised from their varietal status by Bayer as well as *H. arachnoidea* (syn. *H. setata*), all with hundreds of glassy teeth bordering the leaves. *H. decipiens* is one of the largest leaved of this sort of Haworthia, with just the isolated tooth on the keel of the leaf, but with large, well-spread teeth down the margins. The light green colour of seedlings of this species reddens wonderfully in full light, and providing watering is kept up to prevent the natural drying of the leaf-tips this will show this species to its best advantage. But probably my favourite of this type of Haworthia is *H. blackbeardiana* var. *major*, which will rapidly fill a 5 inch pan with its forest of light-splintering bristles and its translucent ended leaves, a plant which positively demands to be held up to the light to appreciate its beauty. I almost forgot the more modestly sized *H. herbacea*, with bristles all over the leaf-surfaces in some forms and translucent spots in the leaves at the bases of those bristles, giving the whole plant a light-

reflecting quality of a different sort from the preceding species and in its way just as appealing.

Truncate

In their adaptation to harsh conditions two Haworthias have taken a leaf out of Lithops's book and gone further than other Haworthias in using the translucent ends of the leaves to filter the light down into the buried heart of the plant. These are the well-known *H. truncata* and *H. maughanii*, with leaf-tips which look as though they have been scythed. Some large clumps of *H. truncata* are sometimes seen and rarely a clumping plant of *H. maughanii*, but these are usually many years old, and the possession of a solitary plant of either species is a delight. The more sought-after form of *H. truncata* is that with wider leaf-ends, known as fa. *crassa*, and in my experience this is more rapidly growing and more readily clumping than the type.

There are some interesting hybrids produced in cultivation between these two species and various other Haworthias, such as *H. limifolia*, *H. setata* and *H. cooperi*, to name a few. The influence of the truncate species is strong and results in a low-growing rosette of leaves with somewhat translucent leaf-tips, variously shaped and textured according to the influence of the other half of the mating.

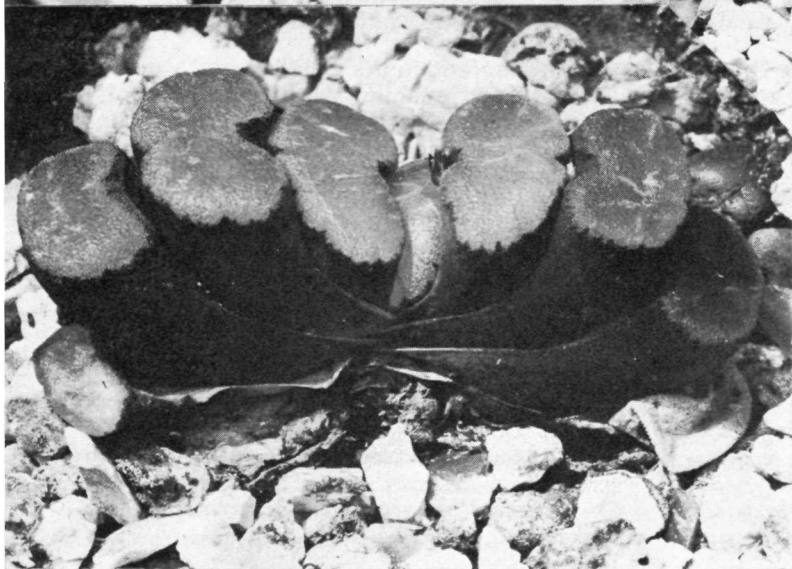
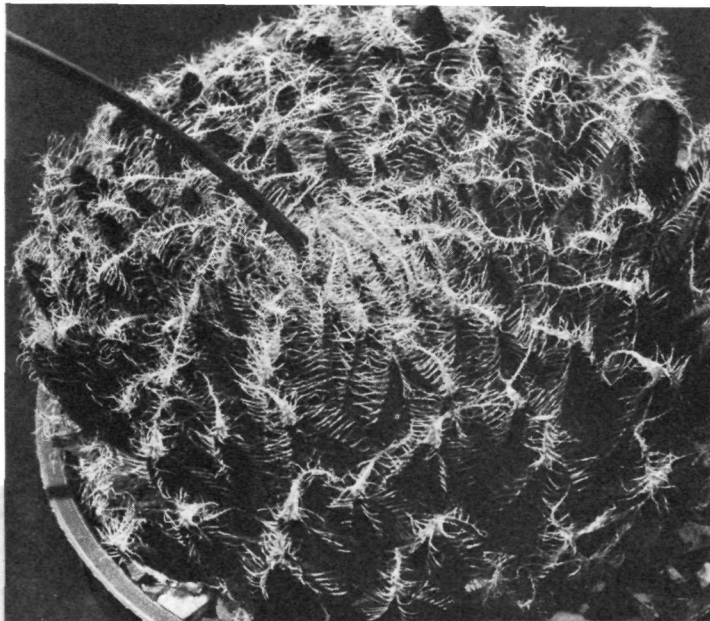
Recurved

Which brings us to the 'recurved', by which I mean those species placed in the section *RETUSAE*, named for the thumb-like recurving leaves. The species in this section have various degrees of translucence and marking in the recurved end-area of the leaf and the angle and definition of this area varies somewhat too. Another variable is the colouring of species in this section, from grass-green plants reluctantly reddening in full light, to dark pigmented species with basic dark green colouring which in full light in the summer becomes wonderful shades of dark bronze, the colour of old, time-polished statues.

These latter species in the section are some of the most sought-after in the genus, and have in recent years toppled some of the more traditional winners on the show bench. There are several to choose from, but *H. mirabilis* subsp. *badia* takes some beating for its slow, translucent beauty, the large isosceles end-areas glowing in sunlight with the reflected green-brown pigment within. If grown in good light to bring out the chestnut colouring for which it was named and given sufficient water to retain the wispy tips of the leaves, it is a myopic judge who will ignore it. But better still perhaps for its variety of colours displayed in the flat end-areas, which fit together like a triangular mosaic pavement, is *H. emelyae* (syn. *H. picta*) roughened on the surface with small, rounded, translucent tubercles, and having lines and spots beneath the surface in shades of browns, pinks and reds. And there are more of this sort, like *H. mirabilis*, *H. atrofusca*, *H. retusa*, *H. pygmaea*,

Right, *H. aranea*, this specimen is five inches across. Keep water out of the centre!

Below, *H. atrofusca*, a scarce small member of the RETUSAE from one small locality at Riversdale.



Above, *H. mirabilis* subsp. *badia*, a chestnut-coloured beauty from west of Napier.

Left, *H. truncata* fa. *crassa*, a coveted form with wider leaf-ends than the typical one.



Upper left, *H. mirabilis*, described by Haworth in 1812, widespread in the Caledon and Bredasdorp area. **Upper right**, *H. blackburniae*, a rare grass-leaved species with tuberous roots, preferring less sunshine than most. **Lower left**, *H. springbokvlakensis*, a discovery of recent years now becoming very popular, slow-growing and pulling itself down in the soil. **Lower right**, *H. koelmaniorum*, a rare species from the Transvaal, growing well (but alas as a spinster) at Kew.

H. springbokvlakensis and *H. mundula* to name some of those more obtainable.

The rare (and not always beautiful)

Lastly there are the rarities which are coveted for their own sake, like the grass-leaved species *H. blackburniae*, *H. graminifolia* and *H. wittebergensis*, which most people sensibly eschew once they have seen how unprepossessing they really are even when grown well, which they have a marked tendency not to do. Or *H. lockwoodii*, with wide, onion-skin leaves which dry up in the upper

half to make a not very attractive plant at all. Or *H. parksiana*, another difficult species to grow well, and at only an inch or so fully grown is for the lovers of all things small, but I admit a beauty in its own right. Or *H. sordida*, well named for its cussedness in cultivation, but having a reptilian, ugly sort of beauty. Or . . . I could go on, as the numbers of Haworthias still not commonly in cultivation are surprisingly high. Not so surprising perhaps when the rate of producing offsets in some is so slow, and the chances of having two plants on which to set seed not very high. One or two people are working on it, though . . .

Twenty Years On: Still Thriving on Neglect?

Survival with the Editor still demands plenty of *Grit*

by David Hunt

Readers whose sets of the *Journal* stretch back to 1958 and Volume 20 no. 3, will be able to confirm that, where cactus-collecting is concerned, I was almost from the start an 'absentee landlord'. I was away at school or university most of the year from the age of 13, and my plants learned self-reliance from never knowing when they would next be watered or receive a kindly word of encouragement. They were a resilient bunch and (mostly) thrived on neglect.

However, quite early on, I learned the benefits of sinking the pots (clay ones, of course) in gravel or grit and of keeping it wet during the growing season to provide a reservoir of moisture to soak into the pots by capillarity. Vigorous plants could make quite a nuisance of themselves by sending yards of roots down to hog the water, but at least they proved they were thirsty. You could always tell the boozers by their more cheerful appearance compared with those who had not found their way to the Bar.

I made my own gravel trays from flat galvanized sheets by nicking the corners with wire cutters and turning up the edges. The first trays were about 3 inches deep. I thought granite chippings (the sort used on roads) rather better in appearance than ordinary washed gravel, and obtained a supply. (I think what I objected to about the gravel I had seen, apart from the uneven size of the pebbles, was the way it seemed to get dirty with moss and lime if you used hard water. Granite chips are presumably on the acidic side, which might benefit plants like ours and explain why they stayed clean.)

Later, when my parents moved to Sussex, my greenhouse, trays and chippings were all left behind in London and, after a summer in the open air, the plants were re-housed in a new cedar-wood lean-to. My Mark II gravel trays were similar to the Mark I but shallower, to save using vast quantities of chippings. Unfortunately, this time I bought chicken grit with an admixture of crushed shells and, unless regularly raked, it soon became a good medium for growing weeds.

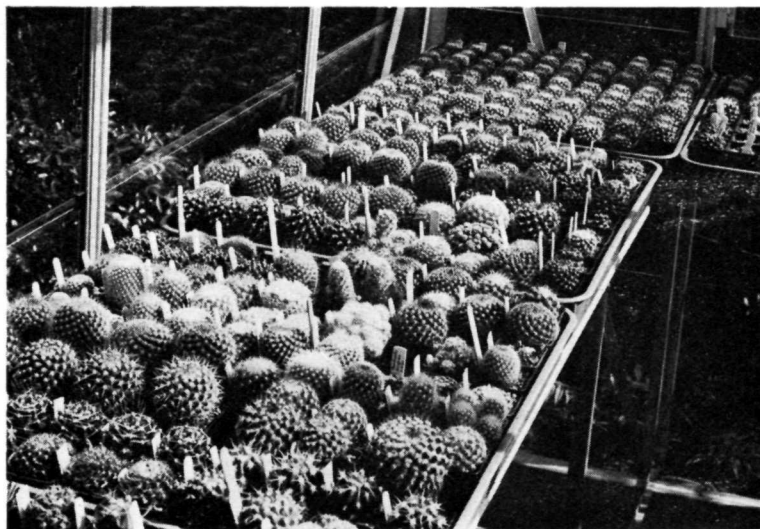
It was about the time of the move that I began to work at Kew, only visiting Sussex very occasionally at the weekend. My parents were busy with a very difficult new garden and my plants (none, I hasten to add, very choice or rare) really were neglected. Many were given away over the years and some fell victim to leaks in the greenhouse roof or even, dare I say, to mealy bugs. Over twelve or so years the collection was whittled down to fifty or sixty species, with *Lithops* and a *Conophytum* from the 'fifties surprisingly amongst the most determined survivors. *Mammillaria* seedlings from seed sown in 1961 would have won booby prizes for the slowest rate of progress.

So much for ancient history. I began to grow my own plants again after a trip to Mexico in 1973, having found the need to develop a *Mammillaria* reference collection under my personal control. I was living in a block of flats at the time and acquired a couple of plastic gravel trays so as not to damage the sideboard(!) on which the embryonic new collection now stood, either with scratching or condensation from the pots. This time I dispensed with gravel altogether. The inevitable move to a house-with-garden soon followed, and the inevitable greenhouse, a Hall's Europa 8 ft x 6 ft. At first, I used the bare staging slats provided by the makers, but the small pots kept falling through and watering was tiresome. It was not until I had copied a friend's idea and put expensive asbestos sheets over the slats that I realized the plants in the two plastic gravel trays, which I had put in a cold-frame, were doing much better and that once manoeuvred safely through the narrow doorway, the gravel trays fitted perfectly each side, resting on the slats. Moreover, four to a side, the trays filled the staging, with room for one more in the centre of the gable-end. So seven more gravel trays soon found their way into the greenhouse. The next discovery was that the empty gravel trays, made by Stewarts, might have been expressly designed to accommodate 100 2-inch square B.E.F. pots, so perfectly did they fit. Most of the available larger sizes also fit very well (up to 7-inch, which go 9 to a tray), with scarcely any wasted space.

In the spring of 1974 I sowed large quantities of seeds from my Mexican *Mammillaria* trip, expecting, on the basis of previous experience with commercial seeds and inefficient methods of raising (see my 1958 article!) to get next-to-nil germination. My fresh seed and Humex 'Propatray', however, soon gave me a forest of seedlings and by the summer of 1975 my new greenhouse staging bore nearly 900 two-inch pots—891 to be exact, since I left a space in the corner of each gravel tray to insert the hosepipe for watering purposes. The rest of the seedling crop, as I recall, were still on the housing-list, un-pricked out beneath the staging or in the frame.

For the incurably lazy and neglectful like myself, I cannot recommend the Mark III system of work-avoidance too highly. Turn on the hose, fill or partly fill the trays once every two or three weeks during the growing season, according to the weather, and slop in some high potash feed and systemic insecticide once or twice at the beginning. A little restraint is needed at first, until the plants are growing well, and any non-starters must be removed for a root-check. By this method, watering takes about 15 seconds per tray and my whole collection (now about 1,250 pots in 30 trays) no more than ten minutes. By experience one learns

Trays of three-year old seedlings in the author's private collection (photographed in 1977). A year later, after badly-needed potting on, many of these fill 3½ or 4 inch pots.



how much water to put in each tray so that it is sufficient to soak the compost in every pot. Properly judged the water will be soaked up in 12-24 hours, leaving the tray itself more or less dry. Careful attention must be paid to the openness of the potting medium especially in larger pots to prevent clogging and ensure good aeration. For compost I have been using whatever soil-less mix is readily to hand, Levingtons, Arthur Bowers, etc., with added grit, though now experimenting with my own peat/grit/base-fertilizer mix in the interests of economy. For aeration I use liberal quantities of our old and trusted granite chips, up to one part in three according to circumstances, and sometimes even more towards the bottom of the larger pots. Originally, I bought the grit for top-dressing as well, but now prefer blue flint chips for this purpose. They look better, and are a better defence against rot at the stem-base, mis-aimed hosepipes and leaf-cutter bees. (When using peat-based compost, by the way, a coarse top-dressing is also a good defence against sciara fly). When repotting I only cover the roots with compost, never the stem-base, where it can only promote rotting. Coarse grit is also used to surround and support the base, and since the intention is to water from below there is no need to leave the statutory half-inch gap at the top of the pot for watering. In fact, since loose soil-less compost tends to settle down after a time, I usually top-dress my pots right to the brim.

I am full of praise for the Stewart gravel tray. Its size and depth are admirable for my purpose. Plants can be easily grouped according to their water-requirements, and the diagonal dimension of the tray (about 30 inches) is such as to provide each accessibility to the back of trays in the corner of the greenhouse. It is rigid enough to require only support at the corners and centre beneath, and, even when tightly filled with all but the

largest of pots, quite readily lifted—a point which I found very time-saving when I moved back to a flat in February of this year and sent my plants down to the country again. I just lifted the trays off the staging on to the floor of a van, no packing necessary, and not one pot fell over during the twenty-five mile drive.

The choice of a new greenhouse, on this occasion, was dictated by factors which some might regard as of secondary or even trivial importance: Plenty of head-room (with the Europa I was always hitting my head on the automatic vent-opener), and a size which would conveniently accommodate 30 or more gravel-trays, all adjacent to the path and at staging level. I chose a Banbury Horticultural nominally 20 ft x 10 ft, and, to date, I am very pleased with it, though its do-it-yourself erection involved the expenditure of much effort and bad language, for reasons I will not go into here!

My gravel-tray system has its limitations, of course. It depends on being able to pack the pots together closely, which one cannot do with Agaves, large Echeverias and so on, whose diameter is inevitably greater than that of the pots. Also, the largest square pot currently available seems to be the 7 inch size, so one is restricted to young plants and the smaller-growing species. Essentially, the method has been born of necessity. It enables me to leave the collection for weeks at a time, even at the height of the growing season, and, if my absence is for a month or more, to entrust the watering to anyone capable of turning on a hose. In the last three years, there have been enough such absences to prove the method works. And now, once again, I usually only see my plants at weekends. 'Here he comes', says my original *Chamaecereus silvestrii*, with contempt backed by nearly thirty years experience, 'our absentee landlord'. I only wish I could say of the landlord, as I could of that plant, that he doesn't look a day older.

Backeberg: 'I must require that my special and unusual method is consented'

The late Curt Backeberg was the *enfant terrible* of cactus taxonomy. Yet only he could produce the *Kakteenlexikon*, the one-volume directory of the *Cactaceae* so needed by collectors and now available in English translation. Backeberg was aware and unashamed of his unconventionality. For him, it was the only way to get the job done.

By courtesy of Will Tjaden, we publish below a letter written by Backeberg three months before his death to the late Cyril Parr, in which he argues the expediency of his approach. But first, the other side of the coin; the case, so to speak, for the prosecution. Two paragraphs from a review by Myron Kinnach, Superintendent of Huntington Botanical Gardens, of one of Backeberg's pre-monograph publications, are a damning bill of indictment. The review appeared in the *Cactus & Succulent Journal of America* 29: 146(1957). Of the 'Descriptiones Cactacearum Novarum I' (1956), Kinnach wrote:

'The work will probably always be regarded as a curiosity of botanical literature, for here the customary low quality of Backeberg's work sinks to a grotesque level. Indeed, it could well be used as a classroom example of what the conscientious taxonomist should avoid in his own work. In the first place he has employed questionable ethics in publishing a number of Rauh's collections which he knew had been collected earlier by Johnson, Ritter and Akers and which he also knew the

*latter were planning to publish. Secondly he seems to have described every minor variation so that for example we are confronted with some 20 new *Haageocereus* species from one river-valley in Peru! The descriptions are ridiculously short and he fails to mention how the new species differ from one another and from older species. The result is that practically none of his new taxa are established as being actually distinct.*

'It can be imagined what the effect of these 200 newly published, but inadequately distinguished, species will be on the revision of Peruvian cacti now in progress by different workers. Their task has been difficult at best, due to the amateurish manner in which most of the older species were published. Now that confusion, for which Backeberg was also largely responsible, has been fantastically multiplied.'

Backeberg, it must be granted, always had the journalist's desire to be first with the news. In his letter to Mr. Parr, written eight years after the Kinnach review, when the *Kakteenlexikon* was in press (he died before it was published), he pleads the need for a sense of urgency with the enhanced conviction that an imperfect command of English can somehow manage to convey. The letter also contains references to *Lepismium saxatile* which are omitted from the following transcript, as are Backeberg's opening and closing greetings to the Parr family.

11.10.65

'Dear Cyril:

Many thanks for your letter 8 inst. . . .

. . . You say: "These botanists!" Oh, oh: I am recognized here as "special botanist" also since many years, even by the Deutsche Forschungsgemeinschaft and our authorities. Who knows of it? But there is a little difference: I must pay our livelihood myself, and I have to get on with the given situation which is *very* difficult in cactology—therefore my partial reserve to some antiquated rule-details (even recognizing very well the rules in general). There is no business like cactus business . . . to change a bit the song of Irving Berlin. Either I can publish a work as complete as possible and without the risk of changing names by descriptions of others during the time until my text is printed, by following a special viewpoint and shift, or there is no possibility at all to complete the work. One example: I described for instance *Pyrrhocactus setosiflorus* one year earlier than the same name of Ritter. But the manuscript was longer than one year with the editor. By that, Ritter's name

appeared a fortnight earlier in "*Succulenta*", and I had to change my name. In handbooks as "*Die Cactaceae*" and "*The Kakteenlexikon*", as well as in Rauh's Peru-book, we could not take such or any risk, and to avoid great difficulties with the editor by intolerable changes, I published my "*Descr. Cact. Nov.*" to fix the names. And Rauh, who agreed with me, and I have good photos and drawings (see also Rauh's Peru-book). This had been the only possibility. Therefore I must require that my special and unusual method is consented, or . . . I cannot care about in the interest of the given situation and the great work that has to be published as complete as possible for a general information about all plants and details known until the date of publication. Africa has become an "uninteresting" continent. Nearly everything is known, as it seems. Nothing new, some countries not even a seduction to make botanical expeditions under the actual circumstances. In South America are collecting at present or have collected recently for cactus research only: Ritter, Lembecke, Krahle, Cardenas, Rausch, Hoffman, Rauh, Zehnder, Fehser, St. Pie

(just there, as I have been informed), Mrs. Muhr, the late Mr. Schickedanz (who recently died on a collecting trip), Lad Cutak in Colombia and Ted Hutchison in other countries . . . 14 collectors!! Everybody found something new, some of them much new material. How do the fathers of the Rules realise a possibility to collect all new knowledge, all phytographic details, requirements for a possibility of publication? If I would not have found an unconventional solution for it, for all difficulties, working with unwieldy conventional methods only: what, then, do you believe, would have been done just in our time of so much intensive research-work, of an enormously increasing material and knowledge, to collect all actual knowledge? Nothing would have been done, because it could not be done. Only the unconventional method permitted me to do it. The Lexikon, with the new ways shown, the area-maps, the illustration-part with its additional figures to the handbook may convince the reader of it. And for me it is a sign of long-sightedness of Micromethods that they are ready to publish this total work in English.* Nobody will be able to realize all difficulties I had with this work. I had to pay my 7 expeditions, I had to fight since many years against a man like B— who will never be able to do anything else than morphologic work or unproved hypothetic short-living changes, but who has completely failed in plant knowledge in all great collections of Southern Europe. The envelope-texts of the Lexikon will show however that now many serious botanists have recognized all this and are assisting me. I cannot get by it a capital like the Beatles. I did it for the great task and if I did some of it unconventionally, one should know and fairly recognize that I am old enough to overlook whether there was another possibility how to do it or not. There was none!

‘Certainly the Lexikon will be a great help in control and determination, also as a list of used names (for those who want to publish new descriptions, to know which name exist already), also as an interesting literature by the completely new genera-texts, by the area-maps and my details of the systematic possibilities and methods which permit only to complete such a work. And believe me: since 30 years of reflections: there is no other one. Of course others want to complete anyhow . . . but where are the complete solutions? With 71 one is dispassionate enough in such questions. I thought long enough about all points. Now I must leave it to the others to understand that for instance B— would be more wise by writing a morphologic work and phylogenetic studies only; of plant-knowledge he does not understand enough. This is my job and only this one. And this is as complete as possible now. I was very

* The project to translate the whole of ‘Die Cactaceae’ eventually had to be abandoned.

pleased therefore to receive very kind letters of Sr. Riviere and just also from Mr. Marnier, saying that the French members are more interested now, also by my activity. I think something more must still be done. You see: we both have enough to do, not to think of retirement.

‘Well, this is almost all for to-day. I had just a bit of time and therefore the pleasure to have a little conversation by letter with you.

‘Yours very sincerely
CURT’

The *Kakteenlexikon* was the distillation of Backeberg’s life-work and many will say, his self-vindication. The argument will continue. There is, as Backeberg said, no business like cactus business.

D.R.H.

The English edition of the Kakteenlexikon (The Cactus Lexicon), translated by Lois Glass, is published by Blandford, price £25.

GLOSSARY OF ANATOMICAL TERMS

used in Dr. Gibson’s paper on Wood Skeletons in Cacti

by N. P. Taylor

anastomosing. Interconnecting.

areolar traces. The conducting strands connecting the areole to the central vascular tissue of the stem.

cambial activity. The division of cells in a localised region of the stem (the cambium) allowing growth in girth to occur.

cortical. The soft tissue between the woody vascular cylinder and the exterior of the stem or bark.

decorticated. Having lost the non-woody tissue.

fastigiate. With closely arranged vertical elements.

fruticose. Shrub-like.

lignified. Tissue strengthened by lignin deposition; woody.

medullary ray. A strand of non-woody living tissue connecting the pith with the outer regions of the stem, traversing the vascular wood.

orthostichies. Vertical line on which a row of leaves or areoles is found; arrangement of areoles in this row.

parastichies. Spiral arrangement seen in the spacing of leaves or areoles on a stem.

parenchymatous. Tissue of a structurally unspecialised nature in plants; in cacti largely that concerned with water storage.

phyllotaxy. Arrangement of areoles or leaves on a stem.

phyllotactic fraction. Fraction of stem circumference between successive leaves or areoles.

pith. The central core of parenchymatous cells found within the vascular cylinder of higher plants.

reticulum. Network.

secondary xylem. Wood, including the medullary rays.

vasculature. The tissues concerned with sap conduction.

Architectural Designs of Wood Skeletons in Cacti

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Introduction

In most woody dicotyledons secondary xylem is formed as a relatively solid cylinder, interrupted only by the presence of emerging lateral branches or by depressions where branches have been shed but cambial activity has not filled in the arc. The most discussed exceptions are plants with anomalous secondary thickenings, especially in lianas of the wet tropics, and, to lesser degrees, xeromorphic shrubs, e.g. members of the Chenopodiales. Most botanists have also observed parenchymatous regions at nodes or decorticated shoots in early stages of secondary growth or in large annuals or short-lived perennials with scanty accumulation of secondary xylem. Traditionally these unligified zones, presumably composed of primary ground tissues, have been termed "gaps", either leaf or branch gaps or, sometimes, leaf-branch gaps, depending on the taxonomic group. Perhaps the most pronounced and picturesque "gaps" are those of cacti and other stem succulents, e.g. *Fouquieria columnaris* (Humphrey, 1974), which exhibit regular patterns of holes or long vertical discontinuities protracted for considerable distances into their woody cylinders. Although the wood-skeletons of stem succulents have been frequently photographed and crafted into furniture and art items, the nature of these holes has rarely been discussed (Bailey, 1964; Spalding, 1905; Shreve, p. 166 in Britton & Rose, 1920) and has never been thoroughly investigated. The purpose of this paper is to describe the variety of architectural designs in cactus woods and to explain the meaning of this diversity.

Since 1970 I have studied and described the vegetative anatomy of cacti (Gibson 1973, 1975, 1976, 1977a, 1977b, 1977c; Gibson & Horak, 1977) and have, therefore, accumulated a large, diverse collection of dried and liquid-preserved woods representing major tribes and subtribes (after Buxbaum, 1958) and most genera and subgenera. Moreover, for intensive studies on the structure and development of primary vascular systems in cacti (Gibson, 1976) I have made numerous microslides for comparisons. The observations presented here summarize data collected on nearly 250 species of Cactaceae, including all taxa studied to date and materials that have been added since those studies.

Materials used in this study were obtained in part during field work on National Science Foundation Grant GB-37664. Figures 1-7 and 10-15 were drawn by Chris van Dyck and fig. 25 by Debbie MacDonald.

Observations

Wood-skeletons may be categorized largely on the basis of sizes and distribution of unligified primary and medullary rays in inner and outer wood, the amount of secondary xylem, and the diameter of the pith. The diversity in designs is most easily discussed for each of the three cactus subfamilies in turn.

Pereskioideae. All treatments on cacti recognize that certain species of *Pereskia* have retained the primitive vegetative features for the family, having leaves with broad laminae and widely spaced areoles with smooth, unspecialized spines but lacking tubercles, ribs, and cortical succulence. Their stems are cylindrical in outline, and all species have narrow pith except in very vigorous shoots of arborescent species, where pith may be up to 2 cm. wide. Woody cylinders of *Pereskia* (figs. 1, 2) are essentially solid from inner to outer growth layers, interrupted only by small, often inconspicuous, unligified primary rays (Type I). Areoles occur in helically alternate phyllotaxy and, therefore, the primary rays or holes ("gaps"), which occur opposite the areoles, exhibit the same arrangement. These unligified rays are barely discernible in dried, old wood specimens. Wood accumulation is moderate at the base of arborescent specimens.

Maihuenia, the other genus of *Pereskioideae*, is composed of profusely branched, pulviniform species in which the small, helically arranged leaves with associated areoles (future branches) are so closely placed that the internodes are extremely short. Consequently, the first-formed wood-skeleton is a reticulum of axial elements separated by conspicuous holes opposite the areoles. These holes persist in old stems (fig. 3); cells with lignified walls accumulate largely opposite the original axial bundles of the primary vascular system (see Gibson, 1976), not opposite the bridges between the axial bundles (fig. 3; Type II).

Opuntioideae. *Pereskopsis* and *Quiabentia*, which lack prominent tubercles, have relatively solid woods, as in *Pereskia*, with a small hole associated with each areole (fig. 4; Gibson, 1975). However, relatively little wood is accumulated in stems of these fruticose species. In more highly specialized opuntias with cylindrical stems, decorticated wood-skeletons have conspicuous helically arranged holes (Type III), which, depending on the species, are slit-like, narrowly to broadly fusiform, or nearly circular in outline, their shapes being directly related to the shapes of the tubercles. For example, the

North American chollas *Opuntia acanthocarpa*, *O. arbuscula*, and *O. leptocaulis* (fig. 5) have vertically elongate holes. These species typically have fairly narrow pith. Species with thicker stems and very wide pith, e.g. *O. fulgida*, *O. prolifera* and *O. spinosior*, have broad holes, which are often crowded because there are more contact parastichies. At first these holes comprise over half the total area of the woody cylinder (fig. 6), but in time they are greatly diminished in size. In old stems, where wood accumulation may exceed 10 cm., one may observe the helices of holes (fig. 7). The major segments of lignified wood are produced opposite the valleys between the stem tubercles.

In contrast, platyopuntias have more delicate wood-skeletons. As seen in fig. 8, bundles of the primary vascular system form an anastomosing lattice of small vascular bundles (see also Gibson, 1976). When secondary growth is initiated, lignified cells are produced only outside these bundles, and the elaborate network is protracted long distances into secondary growth (fig. 9; Type IIIA). Only in very old stems of arborescent and large fruticose species does the reticulum become obscured by a more complete, solid cylinder, e.g. in species of *Nopalea*.

Cactoideae. Six basic architectural designs of young wood-skeletons in Cactoideae are illustrated in figs. 10-15.

Fig. 10 shows a species with a solid young cylinder interrupted only by small, often inconspicuous, unligified primary rays. As in species of *Pereskia*, these plants have narrow to extremely narrow pith but differ in that the holes are generally arranged in a vertical, rather than a helical, series, occurring beneath the areole-bearing ribs (Type IV). These species generally have relatively few, thin or low ribs, and in some species ribs are absent and the minute holes occur in a helically alternate pattern. Wood accumulation is scanty to moderate, exceeding a centimeter only in large terrestrial growth habits. Old wood-skeletons lack conspicuous holes. Examples of solid cylinders are *Leptocereus quadricostatus* (Leptocereaceae); most Hylocereaceae, including *Acanthocereus*, *Peniocereus*, and all genera of epiphytes; *Corryocactus* and *Rhipsalidinae*, which I treat in tribe Notoctaceae; and *Neoevansia* and *Wilcoxia* (taxonomic position uncertain).

A skeleton similar to ones in cylindropuntias occurs in *Harrisia* (Hylocereaceae), in which relatively large, lenticular holes are arranged in a helically alternate pattern (fig. 11; Type IIIB). It should be noted that these species generally lack prominent ribs and have strongly developed tubercles, superficially resembling in vegetative features North American cylindropuntias. Species of *Harrisia* accumulate less than 1 cm. of wood at the base of the plant, and pith-diameter never exceeds 15 mm.

Fig. 12 illustrates a distinctive design in which the young woody cylinder is neatly subdivided into a ring

of discrete, fastigiate rods, each rod occurring opposite a valley of the stem (Type V). Principal cauline bundles of the primary vascular system occur in a ring but are aggregated opposite the valleys, six or more per valley (fig. 16); consequently, species like *Carnegiea gigantea* and *Neobuxbaumia polylopha*, which have numerous ribs, have over 200 cauline bundles. Bundles within each arc are irregularly and infrequently interconnected, and anastomosing between outer bundles of adjacent sets is very restricted. Underneath each areole-bearing rib the vascular cylinder is interrupted by a vertically continuous ray of unligified parenchyma cells. On either side of this vertical ray a bundle gives rise to a vascular trace for an areole, and the resulting pair of bundles commonly fuse somewhere in the stem cortex. When secondary growth begins, rods of wood are produced behind the arcs of bundles, separated by the vertical rays.

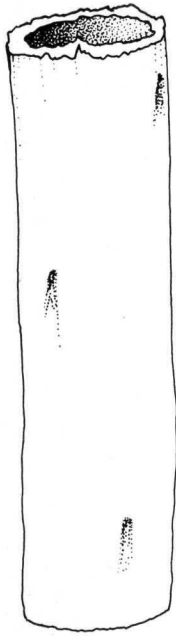
Mature wood-skeletons do not always exhibit the rod-like organization that is so easy to observe in the young stems (fig. 17). In species with relatively narrow pith, e.g. *Lophocereus schottii*, *Machaerocereus gummosus*, *Pachycereus hollianus*, and *Polaskia chichipe*, the rods coalesce early in secondary growth to form a smooth, circular, complete cylinder. The only sign of the initial vertical rays is the presence of minute holes oriented in vertical series. Other species with wider pith accumulate 5 mm. or more of wood before rods are fused, as in *Stenocereus thurberi* (figs. 18, 19) and North American species of *Cephalocereus*. Here the rod-like organization is still distinguishable when the cylinder is fully formed. In species with extremely wide pith, e.g. *Carnegiea gigantea* (figs. 20, 21), *Cephalocereus hoppenstedtii*, *C. senilis*, *C. totolapensis* (syn. *Neodawsonia*), *Mitrocereus fulviceps*, *Neobuxbaumia mezcalaensis*, *Pachycereus pecten-aboriginum*, and *P. pringlei*, the vertical rays increase in width with the rapid enlargement of the pith so that the rods of wood remain discrete for many years. This expansion is possible because the areolar traces do not fuse across the vertical rays. Rods increase in width and may eventually fuse at the base of the plant, but mature solitary columnar species, e.g. *Neobuxbaumia mezcalaensis*, often have discrete rods at ground level. Examples of taxa with fastigiate rods are *Neoraimondia* and *Armatocereus humilis* (Leptocereaceae); *Bergerocactus* (taxonomic position uncertain); and all genera properly assigned to Pachycereaceae.

In another group of columnar cacti, holes in young woody cylinders are oriented in vertical series beneath the areole-bearing ribs, and smaller holes are scattered throughout the arcs of wood opposite the stem valleys (figs. 13, 22; Type III). The smaller holes occur because

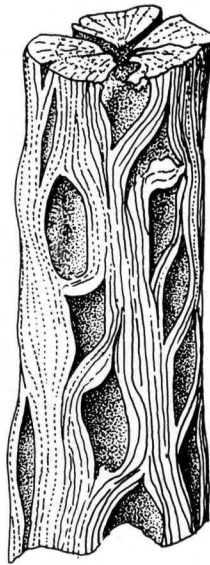
Figs. 1-7. Wood-skeletons of Pereskioideae and Opuntioideae. 1. *Pereskia cubensis*, young branch. 2. *P. grandifolia*, large stem. 3. *Mathuenia patagonica*, old decumbent stem. 4. *Pereskiaopsis aquosa*, young stem. 5. *Opuntia leptocaulis*, old stem. 6. *O. bigelovii*, young branch. 7. Same, old trunk.



1



2



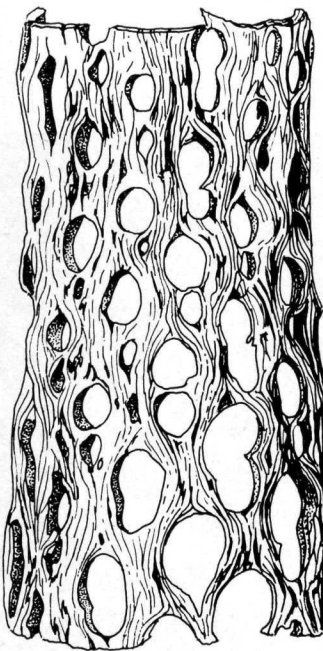
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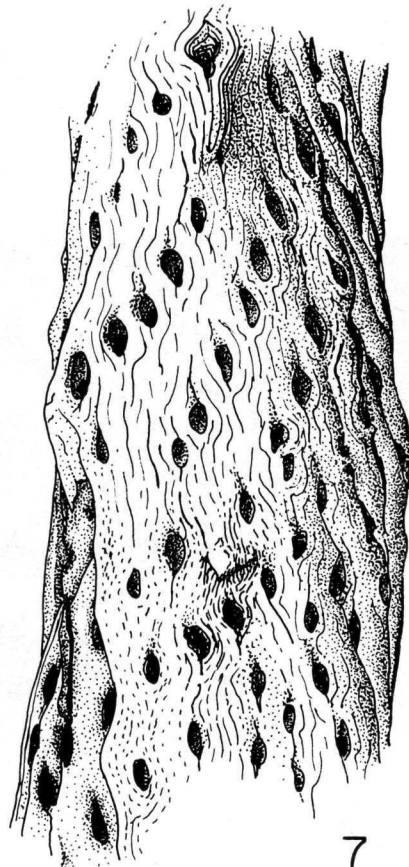
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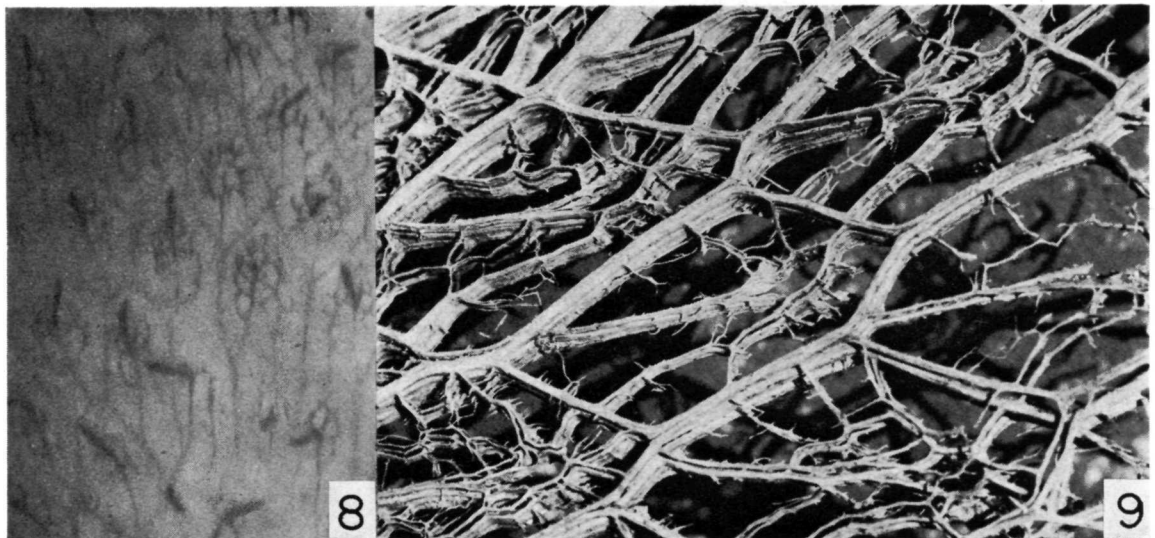
fibrous wood is deposited only outside the bundles of the primary vascular system, which is an anastomosing system with wide parenchymatous rays. In later growth the reticulate skeleton is covered by more solid wood (fig. 23), leaving only the vertical series of holes, which are protracted long distances into secondary xylem. Most species have a wide pith, and those cylinders with the widest pith have the largest holes. Woody cylinders of large arborescent species, which may accumulate more than 10 cm. of wood, generally lack conspicuous holes. Examples of this pattern are "*Lemaireocereus laetus*" (Leptocereace); Cereace, including *Cereus*, *Monvillea*, *Stetsonia*, and South American cephalocere; *Browningia* (Browningiaceae); and "*Cephalocereus russellianus*" (taxonomic position uncertain).

Many columnar cacti of South America, including *Samaipaticereus* of Leptocereace, many Notocactaceae, and all Trichocereace, exhibit elaborate reticula in young wood-skeletons (figs. 14, 24; Type VII). Holes associated with the areoles are generally very numerous and crowded; when ribs are broad and high, the holes appear in vertical series, but when ribs are low and very crowded, the holes appear in their original helices. Each hole is narrowly or broadly fusiform and bisected in the lower half by the prominent areolar vasculature (fig. 14). Wood produced opposite the stem valley forms as a single strand, as in *Cleistocactus areolatus* a simple reticulum with small, nearly linear holes, as in *Espostoa*; or an elaborate reticulum, as in *Trichocereus*

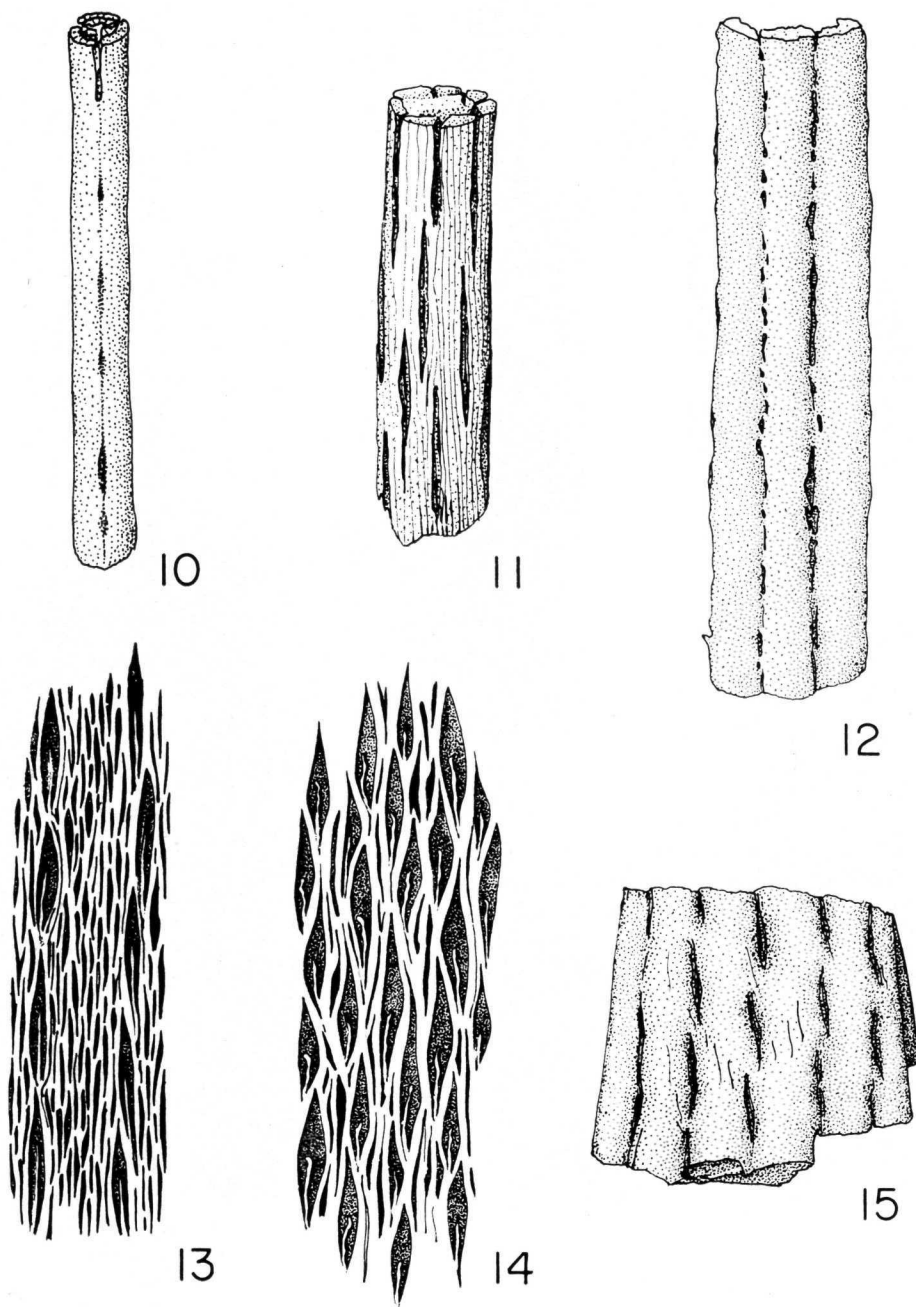
terscheckii. The amount of wood produced is proportional to the size of the plant.

A case study can be made of the variation in a single genus, *Trichocereus*: *T. terscheckii*, which has large ribs and extremely wide pith, has large areolar holes oriented in vertical series and elaborate reticulations in regions opposite stem valleys (fig. 25); *T. macrogonus*, which has wide pith and relatively few large ribs has large areolar holes oriented somewhat in vertical series and elaborate inter-rib reticulations; *T. spachianus*, which has fairly narrow pith and many low ribs, has small areolar holes crowded in helices and simple inter-rib reticulations; *T. thelegonus*, which has narrow pith but well-defined ribs, has small areolar holes arranged in vertical series and a single inter-rib strand; and in the genus *Echinopsis*, which has narrow pith and many ribs with crowded areoles, has small areolar holes oriented in vertical series and a single inter-rib strand with very weak interconnections between adjacent strands. Small globular growth forms of Trichocereace and Notocactaceae that lack ribs have a very regular lattice of diagonal bundles.

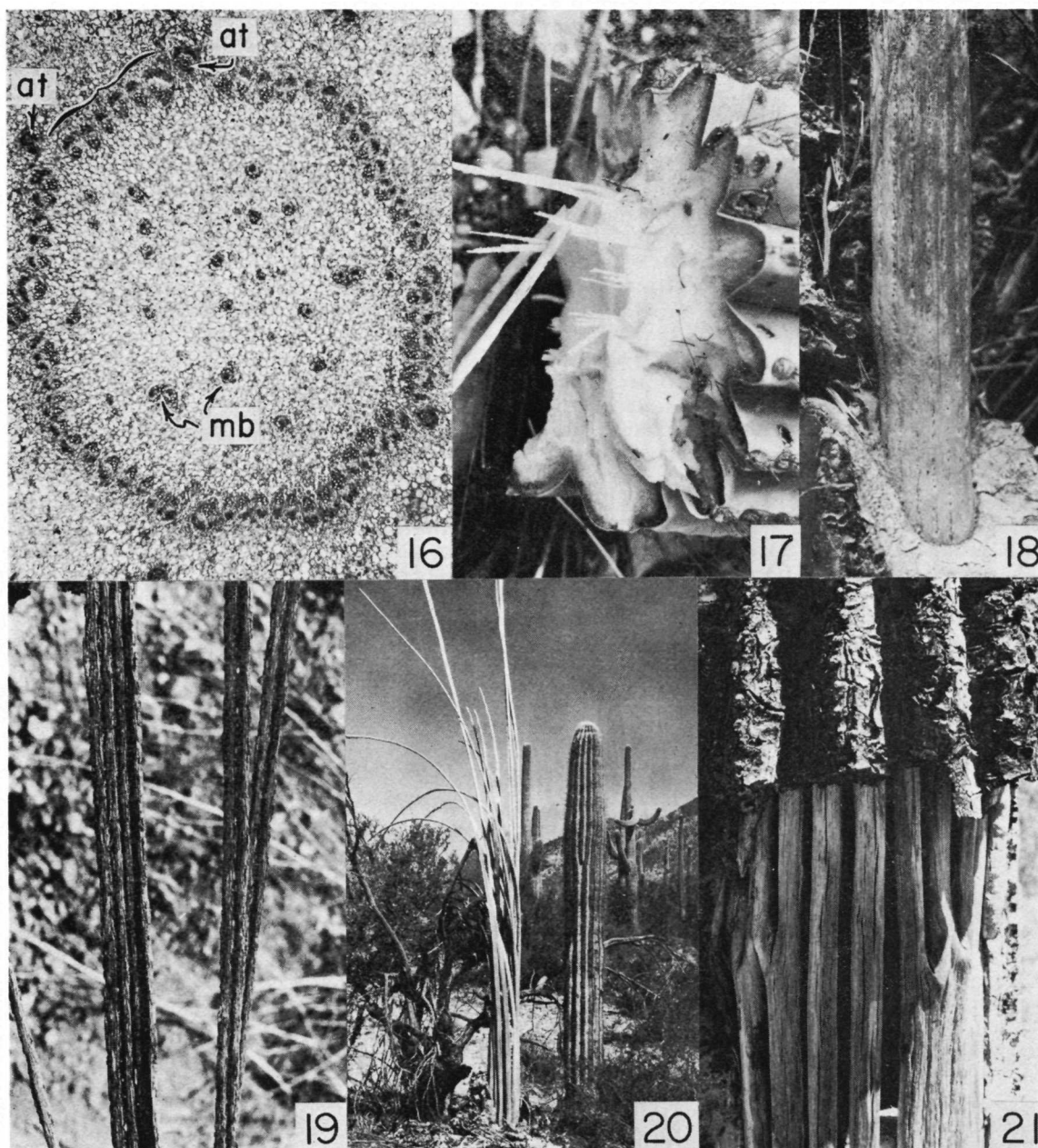
Small cylindrical and globular growth forms of North American Cactaceae and Echinocereace have woody cylinders similar to those of *Harrisia* and *Maihuenia*; a reticulum is produced with large bundles oriented opposite the axial bundles of the primary vascular system, and smaller portions develop along bridges between adjacent axial regions (fig. 15; Type IIIC). The number of major vertical bundles either



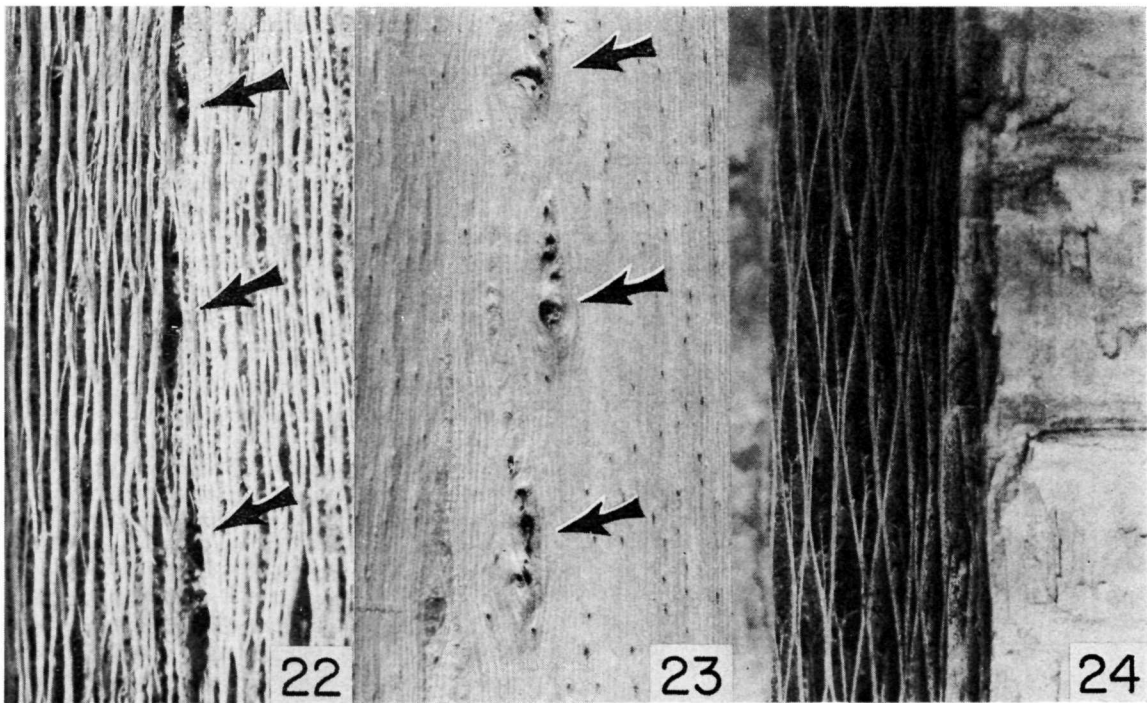
Figs. 8-9. Reticulate systems of platyopuntias. 8. *Opuntia basilaris*, decorticated pad stained to show the bundles of the primary vascular system. 9. *O. phaeacantha* var. *discata*, old pad showing four years of secondary growth in which fibrous xylem is deposited opposite the original bundles of the primary vascular system.



Figs. 10-15. Young skeletons of Cactoideae. 10. *Leptocereus quadricostatus*. 11. *Harrisia pomanensis*. 12. *Stenocereus thurberi*. 13. "*Lemaireocereus laetus*." 14. *Espostoa lanata*. 15. *Ferocactus wislizenii*.



Figs. 16–21. Architectural designs of vascular tissues in Pachycereaceae. **16.** *Polaskia (Heliabravoa) chende*; Transection of young stem, showing vascular cylinder of primary vascular bundles from which areolar traces (at) diverge toward the ribs. Bracket shows a set of parallel bundles opposite a stem valley, and medullary bundles (mb) are observed in the pith. **17.** *Mitrocereus fulviceps*; young stems show rod-like nature of first-formed woody skeleton. **18.** *Stenocereus thurberi*; young wood skeleton in which rods of wood have begun to fuse. **19.** Inner view of same, in which rod-like nature of young skeleton is observed. **20.** *Carnegiea gigantea*; skeletonized plant showing rods of wood. **21.** Closer view of partially skeletonized saguaro, showing how rods of wood form opposite the stem valleys, not the ribs. Number of rods increases where number of ribs also increases.



Figs. 22–24. Wood skeletons of Cactoideae. **22–23.** *Cereus dayamii*; inner (22) and outer (23) view of wood, showing how the holes associated with areoles (arrows) are protracted long distances into secondary xylem but general reticulate structure becomes more solid. **24.** *Cleistocactus areolatus*; large branch, showing the lattice-like network in innermost wood.

equals the number of ribs or the number of sympodia in the primary vascular system where ribs are absent. Consequently, plants that lack ribs with $3/8$, $5/13$, or $8/21$ phyllotactic fractions have 8, 13, or 21 major strands, respectively. Because ribs and orthostichies are usually slightly helical rather than perfectly vertical, the major strands of wood curve slowly around the stem. Even globular species tend to have asymmetrical skeletons with the major near-vertical and minor diagonal strands, indicating that globular forms in both tribes have cylindrical origins. As in small Notocactaceae and Trichocereaceae, the primary vascular system is reduced to a single bundle per stem valley, unlike large columnar forms, which have numerous bundles in these regions. Wood accumulation rarely exceeds 1 cm. except in large barrel cacti, which also have the widest pith and largest holes.

Independent medullary and cortical vascular systems are absent in Pereskioideae and Opuntioideae (Gibson, 1976), but many Cactoideae have primary vascular tissues in pith and cortex. Medullary vasculature is absent in Echinocereaceae, most Hylocereaceae, and some Cacteae, Leptocereaceae and Notocactaceae. In Cacteae, Hylocereaceae, and Notocactaceae, medullary vasculature appears mainly in highly derived taxa, not in species with the primitive features for each tribe. Patterns of cortical vasculature in Cactoideae are poorly known.

Phylogenetic implications

Because the large holes in wood-skeletons develop opposite the areoles, it is not surprising that changes in rib morphology, tubercle formation, and phyllotaxy cause changes in hole size and distribution. In species with broad, high ribs, areolar holes are generally oriented in vertical series beneath the ribs; those with numerous low, crowded ribs have small areolar holes oriented in both vertical and helical series; and those with prominent tubercles but no ribs have areolar holes oriented in helices only, their sizes and shapes determined by the nature of the tubercles. Pith-development also affects gross morphology of the wood skeleton, influencing the size of areolar holes and the amount of vascular tissue produced opposite the stem valleys. Therefore, one might expect that data on cactus wood architecture would not have phylogenetic applications. On the contrary, each subfamily, tribe, and genus shares a common design that is subject to modification through evolutionary changes in pith size and rib morphology.

Thus, pairs of unrelated species with identical growth forms, e.g. *Carnegiea gigantea* and *Trichocereus terscheckii* or *Bergerocactus emoryi* and *Cleistocactus baumannii*, have markedly different basic designs even though there is some convergence in hole distribution. Based on known skeletons, the following basic designs (types) are characteristic of tribes in subfamily Cactoideae:

Browningieae, VI (incompletely known); Cacteae, IIIC; Cereae, VI; Echinocereae, IIIC, Hylocereae, IIIB, IV; Leptocereae, IV, V, VI (incompletely known); Notocacteae, IIIC, IV, VII (incompletely known); Pachycereae, V; and Trichocereae, VII. Since Buxbaum (1950), authors have treated Leptocereae as the group possessing the most primitive features for the subfamily. In this vein, it is interesting to note that certain Leptocereae possess relatively solid woods (Type IV), which are probably primitive for the subfamily and closely morphologically and anatomically resemble solid woods of *Pereskia* (Gibson, 1973). Moreover, this tribe exhibits two other patterns; taxa with fastigiate rods (Type V), especially *Armatocereus*, undoubtedly share phylogenetic relationships with Pachycereae,

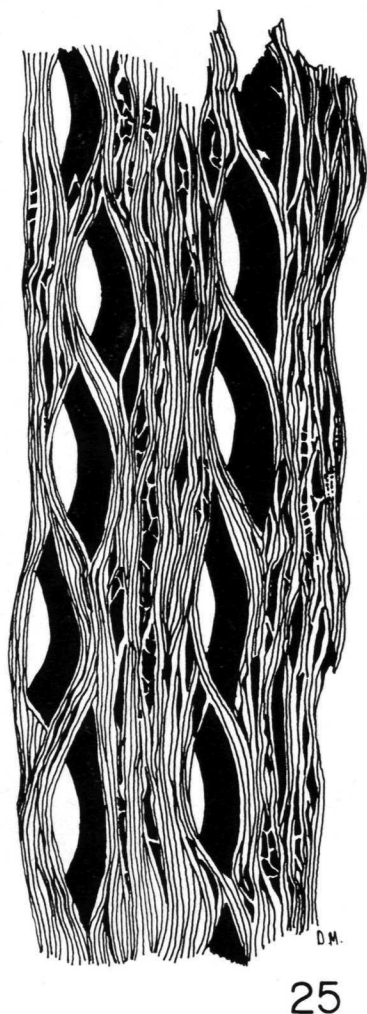


fig. 25. *Trichocereus terscheckii*; wood skeleton with 1 cm. of secondary growth, showing how holes associated with areoles are protracted long distances in the wood.

whereas Cereae and Trichocereae with reticulate patterns probably share closer relationships with different genera of Leptocereae.

The key to understanding the diversity of architectural designs of cactus wood skeletons in Cactoideae is a thorough study of the structure and development of primary vascular systems (in preparation). This study must attempt to isolate the factors controlling the structure of primary vascular systems so as to determine how and why these systems have evolved. When the study is completed, we may be able to use these data in phylogenetic studies of cacti, especially the early radiation of tribes with columnar growth-forms.

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Forum: Frailea

Some further letters introduced by Ray Pearce

The *Frailea* Forum in the February issue of the Journal has elicited several further letters on this genus. First came one from ROY MOTTRAM, who mentions several points made by Jack Forrest at the Chileans weekend last September. On the flowering behaviour of *Frailea* he writes:

'One of Jack Forrest's most interesting points concerned the morphology of cleistogamous flowers in *Frailea*, which he reckoned could easily be recognised quite early in the development of the flower. Those which were going to be cleistogamous in fact appear to exhibit apetal— in other words that state is already determined at the outset of bud initiation. How clever of the plants not to waste their energies producing floral parts that are not required in the self-fertile buds!

'Even more than that, the flowers which develop normally are usually self-sterile, and require cross-pollination from flowers of other plants. These findings, however, need checking as they may not apply to all species.'

On his own experiences, ROY MOTTRAM writes:

'The conditions for flowering *Frailea* are, in my experience, much the same as those for any cactus, a healthy plant and plenty of strong light. We get plenty of opening flowers throughout the growing season, but they are generally only open for a few hours each day. They are not always small and insignificant, *F. grandiflora* is as large as any *Notocactus*, and we had one *F. alacriportana* last year which absolutely smothered itself with flowers one day, then repeated the same performance on the following afternoon!

'With regard to affinities, I've never really believed Buxbaum's idea of a relationship with *Astrophytum*. The seed-type is subject to convergence, and the resemblance between the stem-form and receptacle is rather superficial. *Astrophytum* has scarious-tipped scales on the receptacle and fruit, not axillary bristles as you get in *Frailea* and the other *Notocactinae*. Incidentally, the observation of the method of dehiscence of *Astrophytum* fruit by opening from the top only applies to *A. myriostigma* and *A. ornatum*. *A. asterias* does not split at all, but slowly disintegrates (as in *Frailea* in fact!).

'With regard to distribution, the late Mike Taylor unequivocally stated that *F. colombiana* did not come from Colombia, and cited a Rancho Columbia at some more plausible location as being the correct position. However, I've never seen anything in print to corroborate this statement.'

In conclusion, ROY MOTTRAM says:

'I've never been a special fan of *Frailea* personally, mainly because they lack any sense of permanence. As young seedlings they can be quite attractive, but slowly

but surely they become distorted and ugly, and a proportion each year will lower their defences and succumb to lurking diseases. This is also a feature of the allied *Parodia* and *Notocactus* to a slightly lesser degree, especially with regard to root-loss in winter. This can be overcome to a large extent by using a well-drained mixture, and keeping them growing through the winter with an occasional watering on bright sunny days. Jack Forrest found the same. You also get much stronger plants producing a much higher proportion of fully developed flowers.'

In contrast C. V. BRIGNALL, of Whetstone, has some *Fraileas* that he has kept going for nearly 25 years. He has written:

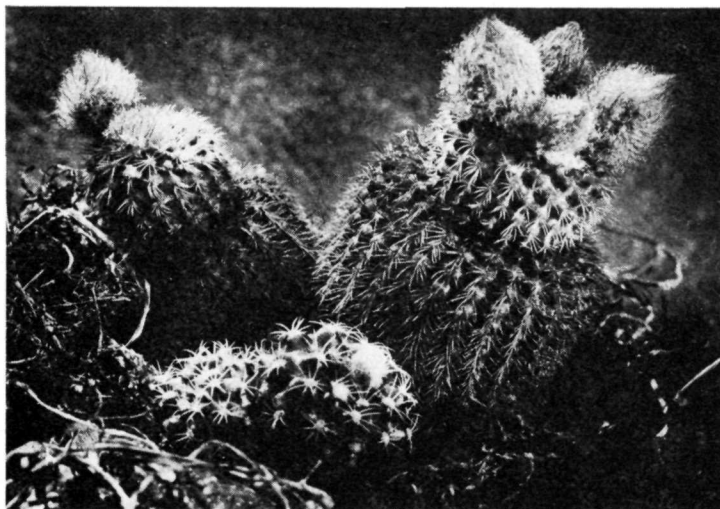
'I have very little experience with this genus, but I have grown a couple of *F. pumila* plants now for a number of years. They are the remaining plants of a sowing in February 1954. What happened to the others I cannot remember. I see from an old note that by 1961 they had produced several liberal crops of seed, which they have continued to do most years since.

'None of the seed which I have harvested and sown has germinated, but a number of self-set seedlings have arisen in the pots surrounding the two older plants. I wonder if it is a matter of precise timing, with the seed being fully viable only about the time of dehiscence of the seed vessel. (Is it a dry berry or a capsule, or what?).

'The two plants are now, and have been for some years, about 5 cm in diameter and 4 cm high excluding the spines. They have not been repotted for at least 10 years, and get only an occasional dosing with a general fertilizer in the water two or three times in the growing season, with a dose of high potassium feed some time in July or August with the rest of my plants. If the season is very sunny they get less potash; if cool and damp they get perhaps an extra dose. They are in 2½ inch to 3 inch pots. I have not been able to associate opening of the flowers with any type of season. I had thought that the cooler summers tended to produce more open flowers. Certainly the hot summer of 1976 opened none, but neither did last year! Could this have been conditioning by the previous year? I shall be interested in what happens this year.'

In answer to Mr. Brignall's question, the fruit of *Frailea* is indeed a dry berry. Obviously *Fraileas* are not necessarily very short-lived though I too find many of these plants go into a decline after a number of years. The longevity of cacti is something on which I have seen little information published, except for estimates of the age of giant specimens, generally *Cerei*, and guesses as to the age of relatively small plants of the slow-growing genera like *Ariocarpus*. It would be interesting to hear from readers ages at which plants of various genera tend to go into decline. Many species seem to reach a peak, then become steadily less attractive; in many cases through this is merely an aesthetic decline, judged from the standpoint of the show bench, rather

Frailea magnifica (back) and
F. pygmaea (front)
 (photo: Helmut Broogh)



than an actual deterioration in the health of the plant. Some plants though are definitely short-lived. Probably the most extreme case is *Setiechinopsis mirabilis*. Plants can be kept alive for a number of years if carefully 'nursed', but generally they do not live much more than 4 or 5 years. With many of the newer species, plants have probably not been in cultivation long enough for much information on their longevity to be available yet.

Returning again to *Frailea*, IAN ROBINSON has given the ages of some of his plants:

'I currently have as seedlings (12-18 months): *F. grahiana*, *F. cataphracta*, *F. phaeodisca* and *F. sp.* HU12b, and as older plants: *F. colombiana* (10 years), *F. magnifica* (4-5 years), *F. lepida* (4-5 years) and *F. pseudopulcherrima* (7 years). This last is probably a pseudonym for *F. colombiana*. All the mature plants open their flowers reasonably regularly on hot, not necessarily sunny, afternoons. I have recorded times between 2 and 4 o'clock. I suspect that humidity might be a relevant factor as suggested by David Hunt. I don't shade my plants, but often spray them when the sun is very hot, in order to provide humidity and prevent scorch. I have also flowered *F. phaeodisca* in the past.

'I have had experience of small plants dehydrating from the roots upwards. This is not always apparent until after the plant has been watered in the spring, and the dehydrated parts start to rot. However, since I have adopted a policy of keeping them slightly moist over winter I have not experienced this problem. I hold a temperature of about 50°F.'

He adds: 'The plant named *F. magnifica* does not appear on the map in the Journal, but could well be a synonym for *F. horstii*.'

Now that the English edition of Backeberg's 'Kakteenlexikon' has been published, and the information therein is easily available (at a price!), the task of confirming identifications should be that bit easier. In this

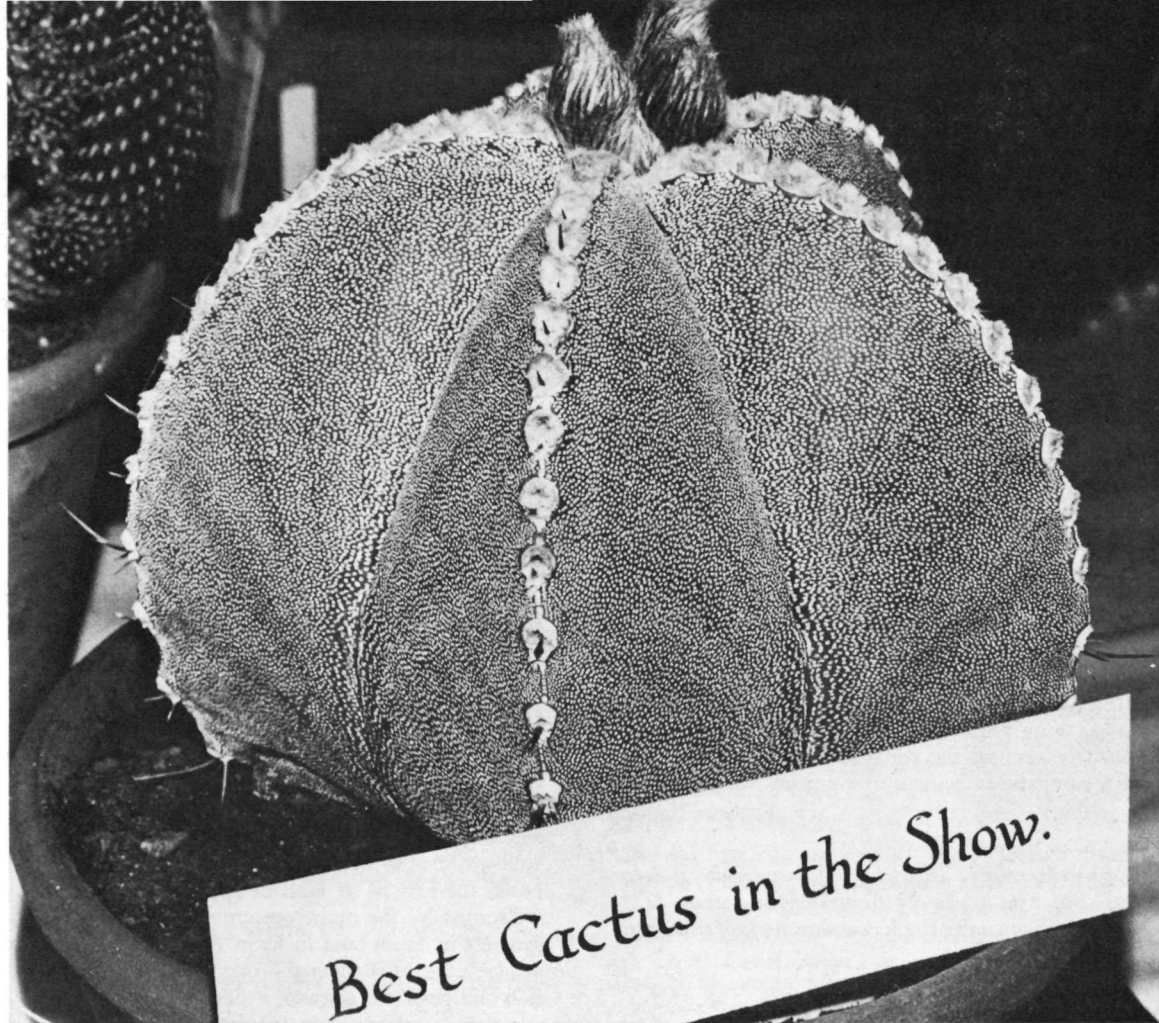
context this book provides an illustration of the recent interest in this genus. Nineteen out of the thirty-five species listed have been added since the book was first published (1966)!

As a footnote to this 'Forum', ROY MOTTRAM has appended a brief paragraph on *Mila* in response to David Hunt's appeal.

'The relative unpopularity of *Mila* probably relates to the great reluctance which the species have to flower in collections. A corollary of this is that popular handbooks never illustrate the flowers, which is one of the main criteria for popularity! We now have some 8 "species" in the Collection, and each new addition fills in the gaps which separate the taxa, so that a complete continuum of localised forms is established. The flowers and fruit are all the same, so I'm inclined to believe the best taxonomic treatment would be to include them all within the scope of a single species, with varietal names for the more prominent sub-populations. The type species, *Mila caespitosa*, has perhaps the most beautiful spination, and deserves cultivation on this merit alone. They don't appear to present any special problems in cultivation.'

The next genus for consideration in 'Forum' will be *Echinofossulocactus* (*Stenocactus*). Contributions are still welcome on this genus, as also are further comments on *Frailea* and *Mila*. Please send your letters to me at the following address: Dr. R. B. Pearce, Department of Forestry, Commonwealth Forestry Institute, University of Oxford, South Parks Road, Oxford, OX1 3RB.

In conclusion may I take this opportunity of thanking all who have contributed to these 'Forum' articles. Without your letters compilation of these articles would have been impossible. May I also add an appeal for more letters from more readers—if you grow a few plants of any of these genera you are bound to have some experiences worth relating.—R.B.P.



Summer Show Awards

Pimlico, 17 June 1978

Judge: Mr. J. W. Pilbeam

Photograph by Mark Eban

Cacti

The Ibbotson Cup for Six Cacti (Class 1) was won by DR. & MRS. T. C. SMALE with *Ariocarpus retusus*, *A. fissuratus* var. *lloydii*, *Echinofossulocactus crispatus*, *Noto-cactus buiningii*, *Parodia maassii* and *Submaticana weberbaueri* var. *flammea* (Lau 109).

The 'Amateur Gardening' Red Ribbon for the Best Exhibit in the Show went to the winners of Class 7 (Three Echinocactinae), MR. & MRS. W. F. MADDAMS. Their *Astrophytum*, pictured above, was also declared 'Best Cactus in the Show' and the two other plants in their winning group were *Copiapoa hypogaea* and *Sulcorebutia steinbachii* var. *gracilis*.

For Three Cacti in pots not exceeding 4½ in. diameter (Class 3) MR. R. H. I. READ won the Luty Wells Cup. His entry consisted of *Aztekium ritteri*, *Blossfeldia liliputana* and *Lophophora williamsii*.

The Shurly Cup for Cacti raised from Seed by the

exhibitor and sown on or after 1 January 1975 went to DR. & MRS. T. C. SMALE for large and well grown seedlings including various S. American species, *Echinocereus subinermis*, *Pelecypora pseudopectinata* and *Mammillaria longiflora*.

Succulents other than cacti

No trophies were offered in the Succulent classes, but MR. D. T. BEST's *Euphorbia bupleurifolia* was declared 'Best Succulent in the Show'.

General Classes

The Flora Award for a miniature garden (Class 28) was won by MR. A. BYLES and the William Denton Trophy for a Group of Cacti and/or Succulents arranged for decorative effect (Class 29) by MR. G. CRYER.

Show Draw Results

Clock: Dr. R. Pearce (Oxford). *Camera*: B. Baker (Wheatley, Oxon.). *Table Lamp*: J. Reeves (Dagenham). *Wine*: Miss L. Best (Sutton, Surrey). *Sherry*: D. Brewerton (Essex). *Pictures*: Mrs. I. Boote (Wirral). *Mirror*: Mrs. R. Beyer (Kew). *Glass bowl*: W. Kelsey (S. London). *Tea towel*: M. Martin (Dartford). *Air cushion*: J. Owen (Oxford). *Cushion cover*: R. H. I. Read (Cheam).

Book Reviews

F. Ritter. *40 Jahre Abenteuerleben und die wilde Weisheit* (40 Adventurous Years and the Wisdom of the Wilds). Pp. 320, 29 b/w illustrations; linen-bound with dust-cover, 8½ x 5½ in. F. Ritter-Verlag, D-3509 Spangenberg, W. Germany, 1977. Price DM 36 (about £10). In German.

Ritter's 'wisdom of the wilds' is a far cry from that of the scholar; it stems directly from what the writer himself has seen and felt, from his own observations and his deep sense of commitment.

He has travelled very extensively on foot and by primitive transport, from Mexico to Patagonia, prospecting in the different cactus-lands, often living the rude and comfortless existence of a native Indian, familiarizing himself with the lands and their peoples, collecting, observing, taking careful notes. No other cactologist of our times can speak with such great authority. Ritter's book will certainly never leave his readers unmoved for his views, expressed with a clarity which ignores all the conventional glosses, will meet with emphatic agreement or vigorous rejection.

HELMUT BROOGH

Gordon Rowley. *The Illustrated Encyclopedia of Succulents*. Pp. 256, profusely illustrated in colour. (12 x 8½ in.) A Salamander Book, London. 1978. Price £7.95.

Here is a book that can disappoint no one. In the well-planned extremely readable text, Gordon Rowley has excelled himself; the illustrations, mostly from his own photographs, are a feast of beauty and variety, and the overall design and presentation of the book leave one speechless in admiration. And note the price!

In his self-effacing way, Gordon has been leading some of us to believe that his book would be for beginners only. Now we can say 'Pull the other one!' Just as the very best books written for children tend to be read and enjoyed as much, if not more, by adults, so this 'general treatment' cannot fail to be a favourite with everyone, however expert, and even the most expert will obtain new insights from its original approach.

Edgar & Brian Lamb. *The Illustrated Reference on Cacti and Other Succulents, Volume 5*. Pp. 482, with over 280 illustrations including 100 in full colour. Blandford Press, Poole, Dorset. 1978. Price £8.50.

Although it is twelve years since the previous volume was published, the Lambs' well-known and valued 'Illustrated Reference' series needs no introduction, and with volume 5 the total number of photographs published in their encyclopaedia has passed 1,300. Besides the usual selection of plants illustrated and briefly described, the new volume has articles on progress with

Exotic Collection and on Frost and Snow Hardy Cacti, and various indexes and cross-references to the other volumes. Two very minor comments: the picture of '*Pachycereus pecten-aboriginum*' (page 1253) seems to me to be *Lemaireocereus thurberi*; and I cannot agree with the inclusion of two *Gymnocactus* spp. (pp. 1335-6) in *Escobaria*. (The 'new combination' made for *Gymnocactus aguirreanus* under *Escobaria* is, in any case, invalidly made).

Signs of the times, when comparing this volume with the last, are the necessity of grouping the colour plates in a single section, the poorer quality of the paper on which the half-tones are printed, and the inevitably higher price.

J. G. Ballester Olmos. *Los Cactus y las Otras Plantas Suculentas*. Pp. 145, with more than 270 illustrations in full colour. 10 x 7½ in. Flora Print Espana, Valencia. 1978. Price: 600 pesetas (about £4), plus postage, from Apartado 5028, Valencia, Spain.

José (Pepe) Ballester is a Technical Officer at the Research Department of the Spanish Ministry of Agriculture and has been working on improved techniques of cacticulture from a physiological viewpoint, and on pests and diseases and their treatment. He is well-qualified to write on these topics, and his attractive book, the first of its kind in Spanish, will be greatly welcomed by the numerous amateur and professional growers in Spain (and in Latin America, if it is to be available there). Besides thorough coverage of cultivation and pests and diseases, it describes and illustrates a selection of nearly 250 species, with a synopsis of classification, glossary, index, etc. The pictures are mostly good, and at £4 the book is excellent value. When reprinting, the opportunity will no doubt be taken to correct errors of spelling in the plant names and authorities.

D.R.H.

OTHER BOOKS RECEIVED

G. H. Orians & O. T. Solbrig (editors). *Convergent evolution in warm deserts*. US/IBP Synthesis Series no. 4. Pp. xiv+333, fully illustrated. 9½ x 6¼ in. Dowden, Hutchinson & Ross, Inc. Stroudsburg, Pennsylvania. 1977. Price (hardback) \$25.00.

A fascinating study of convergence in independently evolved desert ecosystems and their component plants and animals, based on five years' study of the Sonoran Desert in North America and the Monte in Argentina.

B. B. Simpson (editor). *Mesquite. Its biology in Two Desert Scrub Ecosystems*. US/IBP Synthesis Series no. 4. Pp. xix+250, numerous half-tone illustrations, maps and text figures. Dowden, Hutchinson & Ross, Inc. Stroudsburg, Pennsylvania. 1977. Price (hardback) \$22.00.

The desert ecosystems compared in the Orians & Solbrig volume (see above) are both dominated by creosote bushes (*Larrea* spp.) and Mesquite (*Prosopis* spp.). This monograph presents an exhaustive biological study of mesquite in the two areas and is the companion to another on *Larrea* in the same series.

Susan Jellicoe & Marjory Allen. *Town Gardens to Live In*. Pp. 192, fully illustrated in black and white. Penguin Books. Price in U.K. £1.50.

Christopher Lloyd. *The Well-Tempered Garden*. Pp. 393, (no illustrations). Penguin Books, Price £1.25.

Two additions to Penguin's extensive Gardening List. The first is a Penguin original, the second was first published by Collins in 1970.

Forthcoming Events

AUTUMN SHOW

Saturday 7 October at Napier Hall, Hide Place, Vincent Street, Westminster, London S.W.1, from 2-6 p.m.

Closing date for entries: 2 October.

Staging of exhibits: On the day, from 9.15-10.45 a.m.

Judge: Mrs. M. Stillwell.

Presentation of Awards: 5.30 p.m.

Trade Stand: Jumanery Cacti.

Admission: 10p (children 5p); free if you exhibit in five or more classes.

This is our first one-day Autumn Show and it is hoped that all members who can will help to make it a successful one. The venue, Napier Hall, is a few minutes walk from the R.H.S. Halls, just off the other side of Vincent Square, and not far from buses and Victoria Station. Cars can be parked round the sides of the Hall, but there is a 20 minute limit and those coming with plants are requested to unload and then park elsewhere in adjoining streets, please.

Please send for your Show Schedule and entry form, enclosing a stamped addressed foolscap envelope, to the Show Secretary, Mrs. H. Hodgson, 16 The Braid, Chesham, Bucks HP5 3LU. (Classes are the same as for last year's event).

Whoever gains the highest total points from the Summer and Autumn Shows will win the Banksian Award (provided they have not won it in the previous two years). Highest aggregate points in the Cactus classes and Other Succulents classes win the Sir William Lawrence and Evelyn Theobald cups respectively. The Pullen Cup is for the highest points for Miniature Gardens in both Shows. There is also a special Award for Novices gaining the highest aggregate, and the Junior Shield for Juniors.

There will be a Tombola (for which gifts of any kind,

any value—as long as they look worth trying for!—will be welcomed, beforehand or on the day) and refreshments available throughout the afternoon.

If you can help in any way, setting up staging on the Friday night, clearing it on Saturday, stewarding, or providing/serving refreshments, please contact the Publicity Officer, Mrs. B. Maddams, 26 Glenfield Road, Banstead, Surrey SM7 2DG (tel. no. Banstead 54036).

HALF-DAY MEETING

Saturday 28 October at St. Mary's Church Hall, London Road, Ewell, Surrey, from 2.15-6.15 p.m.
Speakers: Keith Grantham, Robert Holt and David Clark.

Plant Sales: Oakleigh Nursery (David Clark).

Admission: 50p.

Nearest B.R. stations: Ewell West (Waterloo-Epsom line), less than half a mile; Ewell East (Victoria-Epsom line), about three-quarters of a mile.

In view of the excellent attendance at the Kew A.G.M. we hope this second half-day venture will be well-supported. Those hoping to attend are asked to contact Mr. or Mrs. Maddams by 23 October.

ANNUAL DINNER

Saturday 25 November at the Viceroy Suite, Colonial House, Mincing Lane, London E.C.3.

Guests of Honour: Susan & Dennis Holmes.

Details and booking form are enclosed with the Journal. The Dinner is always a very enjoyable occasion, and this time there will again be an after-dinner talk with slides.

The main course this year will be a *veal* dish. If you do not eat veal and would like an alternative, please notify Mr. Read when booking.

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Sales items are usually available at Society meetings. For bulk orders and binders please contact Mrs. Maddams beforehand.

Branch Activities

North London

Secretary: Mrs. B. Massey, 86 Auckland Road, Potters Bar, Herts.

Meeting Place: Capel Manor Primary School, Bulls-moor Lane, Enfield, 3rd Friday in month, 7.30 p.m.

The event of the year so far was the visit of Mr. Les Carruthers. His talk on Echeverias attracted a record attendance, for not only was there a good turnout of Branch members, but also members and friends from local branches.

The Summer Show on 20/21 May did not produce as many entries as usual but the standard was as good as ever and the weather was kind once again. Our judges were Mr. & Mrs. Maddams.

Forthcoming meetings:

18 August Bring and Buy
15 September Mini-Show
20 October Branch A.G.M.

North Surrey

Secretary: W. F. Maddams, 26 Glenfield Road, Banstead, Surrey SM7 2DG.

Meeting Place: Adult School, Benhill Road, Sutton, 1st Tuesday in month, 7.45 p.m.

The Branch's restricted competition in June brought a good number of entries and the judges, Dr. & Mrs. Randall, had quite a task. The highest total points, to win the Mellins Cup, were gained by Dr. & Mrs. Smale. Second came Mr. Read and third Mr. Cryer.

It was announced in July that Carshalton Show, in which the Branch hold its Show is cancelled for 1978, but it is hoped that the Branch can hold a display with other organizations on 30 September.

On 3 October, David Minnion is giving his illustrated talk 'Baja California'.

Essex

Secretary: F. Braun, 63 Heighams Road, East Ham, E6 2JJ.

Meeting Place: Room A3 (film room), Little Ilford Comprehensive School, Church Road, Manor Park, London, E.12. 1st Saturday in month, 7.30 p.m.

Hatfield and District

Secretary: Mrs. P. Jenkins, 33 Bridge Road, Welwyn Garden City.

Meeting Place: Hatfield Congregational Church Hall, St. Albans Road East, Hatfield. 4th Monday in month, 7.30 p.m.

North Staffs

Contact: J. Wilson, 5 Monkton Close, Dresden, Longton, Stoke-on-Trent, ST3 4BG.

Northern Counties

Secretary: Dr. M. J. Watson, 87 Queens Road, Whitley Bay Tyne & Wear.

Meeting Place: Social Service Centre, Park Road, Whitley Bay. 3rd Monday in month, 7.30 p.m.

Warrington and District

Contact: Mrs. D. Pritchard, 81 Birdwell Drive, Great Sankey Warrington, Cheshire.

Wirral

Secretary: Mrs. I. Boote, 110 Mount Pleasant Road, Wallasey, Cheshire, L45 6HU.

Meeting Place: The Grange, Grove Road, Wallasey. 3rd Thursday in month, 8 p.m.

Small ads

For Sale. THE STAPELIEAE, White & Sloane. 2nd edition, 1937, 3 vols.; THE SUCCULENT EUPHORBIEAE, White, Dyer & Sloane. 1st edition, 1941, 2 vols.; THE ALOES OF TROPICAL AFRICA AND MADAGASCAR, Gilbert Reynolds. 1st edition, Sept. 1966, inscribed by author; THE ALOES OF SOUTH AFRICA, Gilbert Reynolds, 1st edition, Dec. 1950. Offers to Box 1, CSJGB, 67 Gloucester Court, Kew Road, Richmond, Surrey TW9 3EA.

For Sale. Collection of Lithops, approx. 130 species and varieties, about 450 plants in all. £30. Collections not split. Buyer collects. Also collection of about 70 Conophytums, £15. R. H. Martin, 158 Broadfields Avenue, Edgware, Middx.

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CSIE: Cactus & Succulent Information Exchange (founded 1968) encourages communication and fellowship among amateur collectors. Nine issues a year. Further details from: Mrs. G. Rollerson, 5512 Clinton St., Burnaby, B.C. V5J 2L8, Canada.

The Cycad Society (founded 1977) is an international organization for the study, conservation, and preservation of Cycads. Subscription \$10.00 U.S. per annum. Apply to: 5988 South Pollard Parkway, Baton Rouge, La. 70808, U.S.A.

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Volume 40/Number 4
November 1978

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The Cactus and Succulent Journal of Great Britain

Volume 40 Number 4 November 1978

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Hermann Jacobsen at Kew in 1973 (photo: Peter Chapman)

Hermann Jacobsen

With great regret, we record the death on 18 August of Dr. Hermann Jacobsen, formerly Gartenoberinspektor at the Botanic Garden of Kiel University, and author of the standard reference works on succulent plants excluding cacti. He was 80.

In an autobiographical article under the title 'Why I wrote books' (in *Cact. Succ. J. Amer.* 46: 230-231. 1974) Jacobsen said he regarded himself 'less as a systematician but more as a compiler of facts'. Professor Schwantes, who took office as Professor at Kiel on the same day that Jacobsen took over the curatorship, once remarked to him that gardeners usually took their knowledge to the grave with them, and so he began to take notes and build up a card-file. Out of this came the monumental three-volume *Handbuch der Sukkulenten Pflanzen* and *Das Sukkulentenlexikon* and their respective English versions.

Jacobsen was awarded an Honorary Doctorate of Kiel University in 1963. He was a founder-member of I.O.S. and was honoured by Cactus & Succulent Societies in Germany, Britain and America.

Subscription Rates for 1979

Membership of the Society has steadily increased this year and despite a further rise in printing costs announced for 1979 the ordinary subscription rate is to remain at £4 and joint membership at £5. A new concessionary rate of £2.50 will be available for 'Senior Citizens' who have been members of the Society since 1974 or earlier, and the junior rate for next year will also be £2.50. Associate membership has been abolished by Council, also the half-year rate. Subscriptions will in future be available for the Calendar year only.

Subscription renewal forms are enclosed with this issue of the Journal. Please do not wait until the New Year to renew—do so now!

Seed Distribution

One result of increased membership this year was that the stock of seed for distribution was exhausted earlier than usual. Some members were too late to get their free quota or additional items, and we are sorry for the

DORA SHURLY MEMORIAL FUND

A number of members have suggested that an appropriate memorial to our late and much-loved President should be organised, and Council have given some thought as to how best this may be done. Although no final decision has yet been taken one idea receiving very serious consideration is that there should be an annual prize for the best contribution to the Journal and we are happy to report that this scheme has the approbation of Mrs. Shurly's family, who wish to be involved jointly with our plans. Such an award, which it is hoped will stimulate the submission of articles, has the additional merit that it will also provide a fitting memorial to the late Ernest Shurly, who served the Society well both as Editor and President. Few organisations can be so fortunate in having an active husband and wife partnership who contributed so markedly over a long period of time.

Members are invited to forward contributions to the Memorial Fund to the Treasurer.

W.F.M.

disappointment caused. Council is very aware of the welcome trend to raising from seed and will hope to obtain sufficient seed to meet demand in 1979.

Do you need larger half-pots?

Many cacti do not need full-depth pots and often a shallow pan promotes healthier roots, besides saving compost. The manufacturers are apparently aware of the demand for larger sizes in half-pots but do not yet regard their production as commercially viable.

Recently we approached B.E.F. Products (Essex) Ltd. to enquire what level of demand they would need to justify 'tooling-up' for say a 10½ inch square half-pot, 5 inches deep. The reply was '20,000 in the first year'.

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If you would buy square half-pots of the size mentioned (price around 30p per pot), write to us at 67 Gloucester Court, Kew Road, Richmond, Surrey TW9 3EA, and say how many you would want as a first order. Or suggest a different size (but we shall have to agree on one size, I think). Please ask your friends too. We will let B.E.F. know the response.

Arbeitskreis für MammillarienFreunde

One of the most enthusiastic members of the Mammillaria Society almost from its inception has been Horst Berk of Münster, W. Germany. In 1977, Mr. Berk and friends launched a new study-group and journal under the above rather formidable title to serve the very large body of German-speaking Mammillaria enthusiasts. Five well-produced issues have up to now appeared. They are illustrated in black and white and the photographs are also available in colour at extra cost. Articles cover both study and cultivation and there is good publicity for and discussion of the many new introductions circulating under catalogue names or numbers only. An English summary is provided. The annual subscription is DM 30.00 (about £8), plus an initial fee of DM 20.00 (£6). It is hoped to appoint a local treasurer



A family photograph of our late President, Mrs. Dora Shurly, taken in 1976, with the youngest of her great-grandchildren.

to collect U.K. subscriptions soon, but for the present anyone interested should write to: Manfred Fiedler, Am Heisterbusch 8, 2430 Neustadt-Ostsee, W. Germany.

Colour supplement: *Aloe ciliaris*

Aloes vary in habit from miniature, stemless species like *A. albiflora* and *A. bellatula* to trees like *A. bainesii* and *A. pillansii* which can attain 10-20m. in height. Between these extremes they come in all shapes and sizes and there are even a few scrambling or climbing species. *A. ciliaris* Haw. has probably the best claim to be called a climber, as in nature its slender stems have been observed to reach 5m. or more in length, scrambling up through the coastal bush of eastern Cape Province, South Africa, their ambitions only limited by the height of the surrounding and supporting vegetation.

Besides its climbing habit, *A. ciliaris*, which was first discovered by Burchell and later brought to Kew by James Bowie, is unusual in other ways. Firstly, it is the only known hexaploid in the genus, with 42 pairs of chromosomes rather than the usual 14 (several tetraploids with 28 pairs are known, but no other hexaploid). There is evidence to suppose that it is descended from its close ally *A. tidmarshii* (Schoenl.) F. S. Muller. Secondly, *A. ciliaris* seems to have a very odd distribution. It is mainly found in E. Cape Province, from Alexandria and Albany Districts to the Transkei, but it is also reported to occur on Mt. Kulal in Northern Kenya, 2500 miles further north. Several botanists in Kenya, including Peter Bally and George Classen have material in cultivation, and Peter Brandham has confirmed that it is morphologically and cytologically indistinguishable from the South African form. The obvious explanation that the Mt. Kulal plant is an escape from cultivation must be doubted, since the locality is remote from any settlement.

FOR YOUR 1979 DIARY

24 March	Annual General Meeting
16 June	Society's Summer Show
29 September	Society's Autumn Show

Further details in the next issue

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Aloe ciliaris Haw. Reproduced from the plate by Margaret Stones in Curtis's Botanical Magazine 182: N.s.t. 763 (1978) by courtesy of the Bentham-Moxon Trust, Royal Botanic Gardens, Kew. By arrangement with the Bentham-Moxon Trust, a copy of the plate in full colour is also enclosed with this issue of the journal free of charge.

Curtis's Botanical Magazine, founded 1787, is prepared at Kew and published for the Bentham-Moxon Trust by Academic Press Ltd. There are two issues per year, each containing 11 full-colour illustrations of choice plants and text on their botany, history and cultivation. The U.K. subscription for 1979 is £9.80, overseas £12.45 (postage inclusive) and subscriptions should be sent to: Academic Press Inc. (London) Ltd., 24-28 Oval Road, London, NW1 7DX, England, except those from Canada, Central and South America and the U.S.A., which should be sent to Academic Press Inc., 111 Fifth Avenue, New York, N.Y. 10003, U.S.A. Subscriptions from these countries: \$25 including postage.

Each year the 'Kew Calendar' features a selection of plates from the Botanical Magazine. The calendar is available from Kew Gardens Galleries, 305 Sandycroft Road, Richmond, Surrey, in UK, price £1.60 post free, overseas £2.00.

Forum: Echinofossulocactus

*Contributions from Nigel Taylor, Roy Mottram, Penny Jones and Ian Robinson
Compiled and introduced by Ray Pearce*

Echinofossulocactus is a genus that is notable for three main reasons—the length of the generic name, the unmistakable appearance of the plants, and the taxonomic confusion that exists at specific level.

Firstly the name. This was first used by George Lawrence in 1841 in an article in Loudon's Magazine of Gardening entitled 'Catalogue of the cacti in the collection of the Rev. Theodore Williams, at Hendon Vicarage, Middlesex'. Lawrence, about whom little seems to be known, was gardener there. He included 35 species in this genus, which he divided into three sections. The first of these ('Gladiatores') was of 10 species, and corresponded with the present genus; the other two sections included species of diverse relationships, including several *Ferocacti*, *Astrophytum ornatum*, and (possibly) *Echinocactus ingens*. (In his article Lawrence relates that the collection of the Rev. Theodore Williams consisted of 222 species and varieties and 869 specimens, plus about 4,000 small plants and seedlings and 'numerous specimens of *Opuntia*, though, as they belong to very few species they have not been inserted in the catalogue'. It seems that even in the 1840's *Opuntias* were not highly esteemed by collectors!)

The name *Echinofossulocactus* vanished into obscurity until it was resurrected by Britton and Rose in the 1920's, who included about 22 species, but commented that more study was necessary for a proper understanding of the genus. Meanwhile, in 1898, Schumann had established *Stenocactus* as a subgenus of *Echinocactus* for these plants. Both *Echinofossulocactus* and *Stenocactus* have been widely used by growers and in the literature—indeed both names have been used in contributions to this 'Forum'. Although *Stenocactus* has had a number of advocates, the most influential of whom was, at least in amateur circles, John Borg (who described the name *Echinofossulocactus* as 'very uncouth'), *Echinofossulocactus* is the correct generic name. A third name, *Brittonrosea*, was proposed for these plants (by Spegazzini in 1923), but the laws of botanical nomenclature rule out its use on grounds of priority.

The plants themselves are generally fairly small, and are characterised by having numerous or very numerous thin, often wavy, ribs. The areoles are well separated on these ribs—in some species there may be only two or three present on each rib. The spines, which are never hooked, are often more or less flattened, and the flowers which are relatively small are produced at the apex of the plant. An exception to this generalized description of these plants is *E. coptonogonus*, the type species of the genus. This lacks the characteristic thin wavy ribs, having some 10–14 ribs of more normal appearance. The habitat for all species is Mexico.

When I first became interested in cacti (at quite an early age) I remember that I was powerfully impressed by the appearance of these plants, seen as illustrations in a book—although I think the length of the name may also have contributed! Some years were to pass before I started collecting plants seriously; a couple of *Echinofossulocacti* were among the first plants I then bought.

Taxonomy

The chaotic taxonomy of *Echinofossulocactus* is summed up by NIGEL TAYLOR, who commences his contribution: 'Amongst the genera of the *Cactaceae* restricted to N. America there can be few that present the taxonomist with such a headache as the Mexican genus *Echinofossulocactus*. This genus gives us examples of many of the problems that face the serious student of the family, and is a reminder that we are still merely 'scratching the surface' in cactus taxonomy.'

He goes on to consider the problems of this genus at some length:—

'The systematic position of the genus is clearly near to *Ferocactus* B. & R., there being considerable similarities in their flower and fruit morphology, and in their stems with areoles arranged on prominent ribs. Indeed, the type of *Echinofossulocactus*, *E. coptonogonus* (Lem.) Lawr. is remarkably similar to the well known *F. macrodiscus* (Mart.) B. & R. However, the two genera do differ in respect of their areole morphology. *Ferocactus* has nectar-secreting areolar glands, while in *Echinofossulocactus* these are normally absent, or when occasionally present they then appear to be non-



E. coptonogonus, type of the genus

functional, and might be considered the relicts of evolutionary reduction.

Having briefly mentioned the genus it is now time to examine its component species. This is easier said than done! The problems alluded to above immediately become apparent. First, there is only one reliably identifiable species, the type, *E. coptonogonus*. Interpretation of the remainder is in general bedevilled by the lack of typification, incomplete or inadequate descriptions, and an ignorance of the type localities and range of phenotypic variation. Secondly, such attempts as there have been to improve this situation have scarcely proved successful. In her revision of the genus Dra. H. Bravo (1969) recognized some 33 species in addition to the type, most of which appear to have wide, overlapping geographical distributions. This situation is not common amongst the *Cactaceae* of Mexico, where endemism seems to be more typical, and thus one's suspicion is that too many taxa have been accepted at this level. Over-emphasis has been placed upon dubious characters such as those of spination, while descriptions in greater detail of the flowers, fruits and seeds have not been achieved. Fieldwork, upon which any study of this sort must rely, has so far been inadequate, though Meyran (1972) has begun to show the way to a better understanding in this respect.

In the absence of fieldwork I have tried to arrange the validly published names into groups, using the present day interpretations of the plants to which these names are said to relate. These groupings have been deduced largely from a study of the first descriptions, and of the literature with its illustrations mentioned below. Improved understanding of the plants in the field will likely as not show these groupings to be unsatisfactory or entirely erroneous, since, inevitably, they are the product of guesswork. However, the aim is to stimulate interest in the taxonomy of this genus, and that is never going to be achieved by remaining silent.

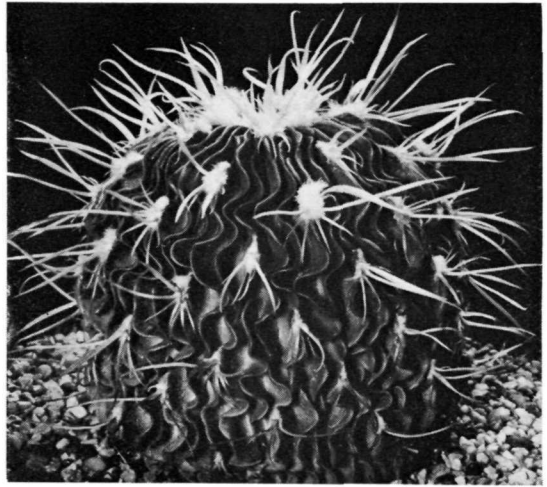
It is difficult to decide upon the criteria to be used in forming groups of this sort, but, in general, characters of colour, size and shape of the flower have been the first consideration. Due to the flowers having been poorly described, vegetative characters have been employed, but their use is barely justifiable in view of the variation apparent in the genus. An understanding of the breeding system would doubtless help our appreciation of this variability.

Suggested species groups

1. *E. coptonogonus* (Lem.) Lawr. (1838)*.

A distinctive species, having only 10-14 broad, straight ribs and 3-5 upward curving central spines, the radial-like spines seen elsewhere in the genus being absent. Said to range from Zacatecas and San Luis Potosi to Hidalgo on the high central N. Mexican plateau.

*The dates given are those of the basionyms.



E. multicostatus (photo: R. Zabeau)

2. *E. multicostatus* (Hildm.) B. & R. (1890)

incl. *E. lloydii* B. & R. (1922)

E. zacatecasensis B. & R. (1922)

E. erectocentrus Backeb. (1961)

These plants have small whitish or violet-tinged flowers (larger in *E. zacatecasensis*) and very numerous, extremely narrow ribs. The group is the most northerly situated in the genus, occurring from Zacatecas and Durango north to Coahuila and Chihuahua. (The habitat of *E. erectocentrus* is unknown.)

3. *E. phyllacanthus* (Mart.) Lawr. (1836)

incl. *E. tricuspidatus* (Scheidw.) B. & R. (1841)

This species has a small, very short-tubed, pale yellow flower and broader ribs than the *E. multicostatus* group. Ranging from Hidalgo north to San Luis Potosi. Seems to be self-incompatible in cultivation.

4a. *E. obvallatus* (DC.) Lawr. (1828)

incl. *E. arrigens* (Link) B. & R. (1840)

E. lexarzai (H. Bravo) Croizat (1937)

E. bustamantei (H. Bravo) Croizat (1937)

The following may also belong here, but insufficient is known about the flowers at present:

E. anfractuosus (Mart.) Lawr. (1837)

E. xiphacanthus (Miq.) Backeb. (1838)

E. grandicornis (Lem.) B. & R. (1839)

E. lamellosus (A. Dietr.) B. & R. (1847)

E. guerraianus Backeb. (1942)

E. flexispinus H. Bravo (1969)

b. *E. crispatus* (DC.) Lawr. (1828)

incl. *E. dichroacanthus* (Mart.) B. & R. (1837)

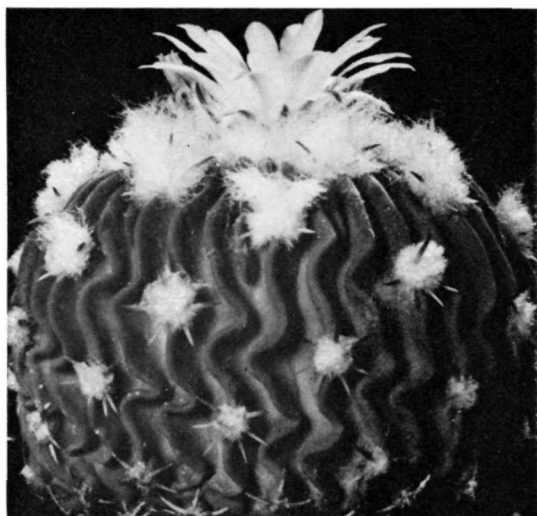
E. pentacanthus (Lem.) B. & R. (1838)

E. acroacanthus (Stieber) Rowley (1847)

E. tetraxiphus (Otto) Oehme (1898)

E. violaciflorus (Quehl) B. & R. (1912)

E. kelleranus Krainz (1946)



E. phyllacanthus, young plant raised from seed collected near Pachuca, Hidalgo (Hunt 8201) (photo: R. Zabeau)

This large complex is linked together by common possession of flowers with a pronounced scaly flower-tube, and perianth-segments coloured violet-purple-pink with a white margin. The flowers of sub-group (4a) appear to be larger or to open more widely than those of (4b). Ribs number between 25 and 55, but are usually about 35 in cultivation. The complex is centred on the states of Hidalgo and Mexico, but extends northwards to Zacatecas (*E. dichroacanthus*) and to Puebla and Oaxaca in southern Mexico (*E. crispatus*, *fide* Meyran, 1972). In cultivation some members of this group appear to be self-compatible and produce copious seed.

5. *E. albatus* (A. Dietr.) B. & R. (1846)

- incl. *E. wippermannii* (Muhlenpfordt) B. & R. (1846)
- E. boedekerianus* (A. Berger) Croizat (1929)
- E. vaupelianus* (Werderm.) Tiegel & Oehme (1931)
- E. ochoterenaus* (Tiegel) Whitm. (1933)
- E. densispinus* Tiegel ex Pechanek (1971)
- E. parksianus* C. Schmoll ex Pechanek (1971)
- E. rosasianus* Whitm. ex Pechanek (1971)

This group is characterized by the possession of small yellowish flowers and very numerous, acicular radial spines. The central spines are usually more or less terete and the green plant body is generally obscured by the spination. The group is closest to groups (2) and (3). The geographical origins of these plants, some of which are well-known in cultivation, remain uncertain. *E. ochoterenaus* is said to be a native of Querétaro and Guanajuato, and there is a specimen of *E. wippermannii* in the Kew Herbarium collected by Eschancier in San Luis Potosí. *E. boedekerianus* which is only tentatively referred to this group is recorded from Zacatecas.

Meyran (1972) suggests that there are no *Echinofossulocactus* in Hidalgo with more than 10 radial spines, and this therefore tends to exclude this group from there.

'Of the remaining taxa, the first two seem distinctive, but do not obviously fit into any of the above groups:

E. caespitosus Backeb. (1950). The flowers suggest affinity with group (2), but the rib-count is only c. 27, and these appear to be broader than in the *E. multi-costatus* type.

E. multiareolatus H. Bravo (1960). Described from the State of Mexico, this plant might be another part of the group (4) complex.

'The following are poorly known with inadequate descriptions or dubious type localities:

E. gladiatus (Link & Otto) Lawr. (1827). The description does not seem to fit any species of this genus known today.

E. lancifer (A. Dietr.) B. & R. (1839). A name of uncertain application, but perhaps another of the group (4) complex.

E. heteracanthus (Muhlenpfordt) B. & R. (1845). Flowers undescribed. Type locality said to be Hidalgo, but said to have 11-13 radial spines, which does not fit plants found in that State according to Meyran, who, however, regards this as the oldest name for *E. lexarzae* and *E. bustamentei* in group (4).

E. hastatus (Hopffer) B. & R. (1898). H. Bravo suggests that this might be a form of *E. lamellosus*.

E. confusus B. & R. (1922). Apparently known only from the illustration in *Bluhende Kakteen*, t. 159, upon which the description was based.

E. latipetalus, *E. recurvispinus*, *E. reicheanus* and *E. mocinianus* are names keyed out by H. Bravo in her monograph, which she presumably intends to validate with diagnoses.

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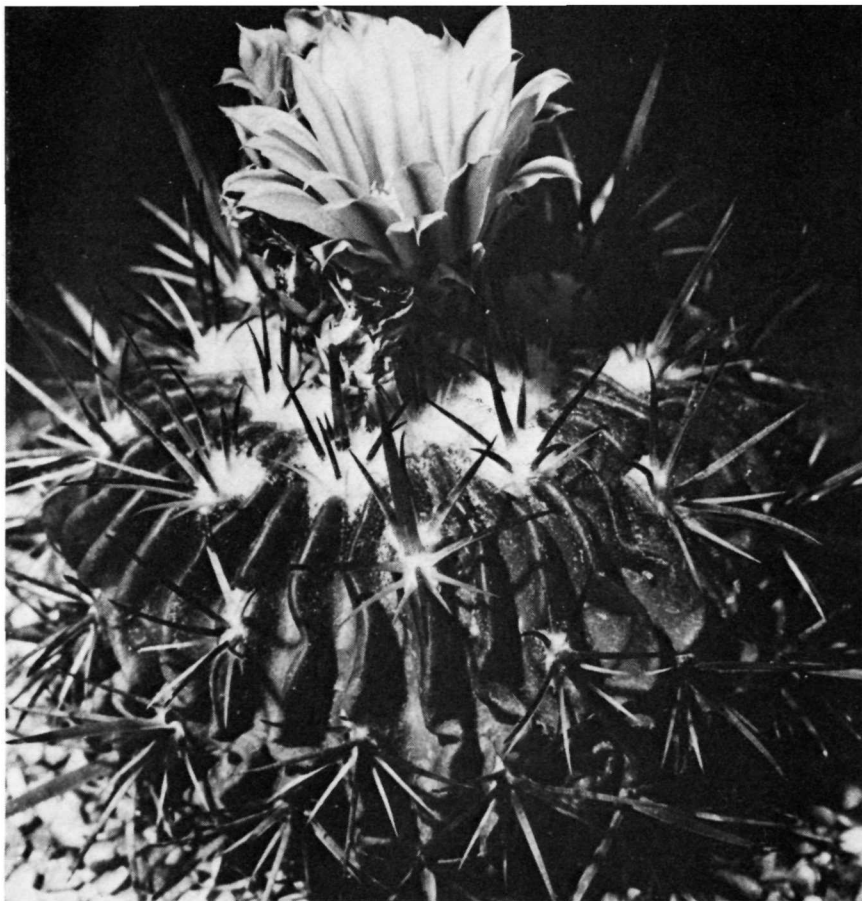
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ROY MOTTRAM is even more extreme than Nigel Taylor in his comments on the taxonomy of this genus. After mentioning Jorge Meyran's work he goes on to say:

'For the moment only three species appear to have any sort of reliability, and most others will probably end up as varieties or forms of these. The type species, *E. coptonogonus*, is the most distinctive with only few, broad, obtuse ribs.

'*E. albatus* has the numerous wavy ribs for which the genus derives its name, and a dense spination which more or less obscures the plant body. The flowers are

One of the *E. obvallatus* group. Plants like this are often labelled *E. xiphacanthus*, but this 'species' is a very uncertain quantity. (photo: Peter Chapman)



normally pale yellow, although we have some purple-striped examples in the collection, mostly under the name *E. vaupelianus*. Most populations of Echinofossulocacti appear to exhibit both coloured and 'white' flowered forms in varying degrees, also a feature of the related Thelocacti. The white-flowered forms are always from the yellow-spined forms, while the purple-striped examples are from plants with reddish or brown spines.

'The third species could comfortably account for the rest of the 30-odd published names, the oldest name for which appears to be *E. crispatus*. These have characteristically flattened spines in various degrees and configurations.'

Whether there be thirty-odd or three species, this is a genus that requires further study. In view of the distinctive body forms of the plants it is surprising that the genus hasn't attracted more attention; could it be that all the species look sufficiently similar for the average cactophile to take the attitude 'you've got one, you've got the lot'? As well as the study of authentic field material of known provenance, one feels that the production and study of carefully documented hybrids could perhaps cast some light on some of the so-called species—the continuous distribution of the species, and the continuum of morphological forms, one 'species' merging with the next, suggests that natural hybridization may be important. If, however, experimental hybrids got into general circulation one dreads to think

of the chaos they could add to the taxonomy of the genus!

Cultivation

On to less weighty matters! *Echinofossulocactus* does not seem to present any particular cultural problems. ROY MOTTRAM merely comments:

'All Echinofossulocacti appear to be easy to grow and flower, and the latter can last anything up to a week or more, opening each day in full sunshine and slowly enlarging and fading in colour as they age.'

PENNY JONES writes: 'I have about 15 *Echinofossulocactus*, not a large collection, but one that I would not be without. I do not find them difficult to grow, by and large, but some have a tendency to loose their roots; probably a wide, shallow pot is better for them than a deep one. I grow them in ordinary J.I. No. 3, with added grit. Those that are of flowering size are among the first to bud up in my collection, but if we get the usual bleak, dark spring, the buds mysteriously disappear, but this does not often happen. I do grow them in shade, which they do not mind; the spines are good, they do not mark at the base, but perhaps, when in bud, they could benefit from more light.'

IAN ROBINSON's comments on cultivation follow along similar lines: 'I find Echinofossulocacti do well under the staging.' He also adds: 'I have experienced infertile stamens on plants of *E. kelleranus* and *E. xiphacanthus*, and self-fertility on an unnamed species which might

be *E. zacatecasensis*. I have also found seedlings of *E. albatius* to be very slow. It may or may not be significant that a plant I bought under the label *E. vaupelianus* is far more likely to be *E. albatius*, although its central spines are dark yellow-orange.

This brings us back yet again to the significance of species in this genus—undoubtedly the predominant theme of all the letters received. IAN ROBINSON merely remarks:—‘I feel there is room for a great deal of study on this genus, as there seem to be either a lot of synonyms, or hybrids.’

PENNY JONES, whose letter was sent in March, says: ‘There seems little about this genus in the literature, perhaps if the English edition of the Cactus Lexicon ever appears I may be able to find out more about this attractive group of plants.’

Now that this book has been published there is, at least, a reasonably readily available source of information on these plants. Among the illustrations, Backeberg includes a series of drawings of spine clusters of various species of the genus (after Oehme), which look as if they might be helpful when it comes to trying to put a name to a plant. Has anyone any comments on the usefulness of this in practice? *Echinofossulocactus* seems to have defeated even the great splitter Backeberg, who writes on this genus in the Cactus Lexicon: ‘Where a plant does not fully conform to any description of this most variable genus, it must be regarded as transitional to the most closely related described species’!

In her letter PENNY JONES went on to say:—

‘I briefly describe my plants, hopefully someone will either verify or correct some of the names.

‘The largest plant that I have is *E. lamellosus*, in a six-inch pot, a lovely plant, dark green, with multi-coloured spines, pale, to light brown to dark reddish brown; the flowers are mauve striped.

‘A plant that I have labelled *E. xiphacanthus* is similar, but spines are broader and consistently horn coloured. BUT, another so-called *E. xiphacanthus* has thick white wool at the areoles and crown, yellow spines with a brown tip. I would welcome any comment as to which, if either, is the correctly named plant.

‘*E. vaupelianus* is the first to flower always: a lovely plant but shallow rooted. The spines are black, much white wool in the areoles, yellow flower. My *E. zacatecasensis* looks similar, the central spines are black, the radials white and glassy, a more robust plant.

‘*E. lloydii* is another vigorous plant, a very wavy body, wool in the crown, and broad, reddish spines, the centrals being very prominent.

‘*E. ochoterenaus* and *E. albatius* are very similar; they look identical to me in fact. Very close spination, white glassy radials, yellow central, much wool in areoles and crown, flowers easily produced, yellow.

‘*E. phyllacanthus*, broad, wavy yellow spines, interlaced.

‘*E. violaciflorus*, very wavy ribs, reddish body, no wool.

‘*E. coptonogonus*, least ribbed body, tough spines, no wool.’

As far as I can tell from the books I have to hand, none of these brief descriptions seems grossly wrong for its name, except that *E. albatius* is described as having a pure white flower. None of these books (including the Cactus Lexicon!) describes *E. xiphacanthus*, so I can’t comment on this one.

Returning to cultivation, my own experiences with the genus have been similar to those of the other contributors. Although I do not deliberately grow my *Echinofossulocacti* in the shade, I keep these plants in a more rather than less shady part of the greenhouse. There they get what might briefly be termed the ‘standard average cactus treatment’—whatever that might be. This treatment exists in as many variations as there are growers of cacti, and works equally well for all (or at least most!) of them. The only way my treatment of this genus differs from the normal cactus treatment is that I give them, along with my *Frailas* and some *Notocacti*, a little extra water in winter. *Echinofossulocactus* plants sometimes dry out rather if left unwatered for too long in winter—this may also contribute to the loss of roots sometimes suffered by these plants. The very large number of thin ribs possessed by these cacti means that they have a much greater surface area, volume ratio than most other genera. A very crude calculation suggests that the surface area of an *Echinofossulocactus* is likely to be at least 10 times greater than that of a globular plant of the same overall diameter, having shallow ribs. Although surface area is only one of a considerable number of factors influencing the rate of water-loss from a plant, the large surface area of *Echinofossulocacti* would tend to favour rapid (relatively) desiccation.

Echinofossulocacti appear to present no difficulties in propagation from seed. It is interesting to note that at an early stage—for the first year or so—the seedlings show no sign of the characteristic ribbing, but instead bear their areoles on tubercles.

Conclusion

Culturally the genus *Echinofossulocactus* presents few problems; taxonomically, however, it more than makes up for this! Any thoughts on any aspect of *Echinofossulocactus* stimulated by the above letters will be welcome for a supplement to this ‘Forum’. As a final thought, has anyone got a cristate *Echinofossulocactus*? What does it look like?

Please send any further contributions to me at the following address:

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University of Oxford,
South Parks Road,
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Gymnocalycium buenekeri sp. nov.

by G. J. Swales

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Gymnocalycium buenekeri Swales, **sp. nov.**; a *G. horstii* corpore atroviridi impolito, spinibus 3-4 (-5) tantum, parum curvatis et tortis, valdius protrudentibus, fructu viridi minus squamato, seminum forma et testa lacunosa differt. Holotypus: Cult. Swales G.261 (K). (*G. horstii* var. *buenekeri* Buining in Kakt. u.a. Sukk. 21(9): 162 (1970), sine design. typ.)

DESCRIPTION. *Plant body* hemispherical at first, later becoming somewhat more cylindrical, up to 10 cm. or more in diam. in old specimens, dark green with characteristic matt surface; *ribs* usually 5, broadly rounded, bearing areoles situated in shallow notches, the notches very shallow or entirely absent in young specimens; *areolar wool* almost white to pale yellow, darkening with age and become less conspicuous on older areoles. *Central spines* 0; *radial spines* 3-5, usually 3, sometimes exceeding 2.5 cm. long on old plants, usually somewhat shorter, c. 1 mm. in diam. at base, moderately well-developed, slightly curved and standing out to some extent and slightly irregularly, pale yellow at first, darkening in age to pale brown. *Flower buds* arising at young areoles near apex, pinkish green at first with numerous scales, later greenish, slow-developing. *Flowers* 4.5 cm. long, 6.5 cm. in diam. when fully open, very pale peach with pink mid-stripe to uniform rose-pink, somewhat deeper in the throat; stamens with very pale pink filaments, pale pinkish-fawn anthers and pale fawnish yellow pollen (N.B. some specimens appear to be male sterile); *style* pale green; *stigma lobes* c. 9, white. *Fruit* sub-cylindric at first, later ovoid, when ripe mid-green, with few, pale green scales and scarcely any waxy bloom, crowned by the persistent withered floral remains splitting when ripe to expose the seeds embedded in juicy white pulp composed of the succulent funicles; *seeds* c. 1 x 1.5 mm., testa very dark brown-black with conspicuous interstitial lacunae.

In his original publication of *G. horstii* as a new species, Buining (1970) included the description of a variety, *G. horstii* var. *buenekeri*. The type of the species name was deposited in the herbarium of the University of Utrecht, Holland, but no type specimen of the variety seems to have been preserved, thus invalidating the varietal name under Art. 37 of the International Code of Botanical Nomenclature. Similarly, no illustration of the variety was provided.

Originally it had been the present author's intention, having confirmed the details of the original description from living plants in his collection, to validate the taxon as a variety as Buining had intended. However, in the light of the further facts outlined below, it now seems more appropriate to suggest the establishment of a separate species. From opinions expressed in a previous publication (Swales, 1977) this would appear to be a retrograde step, but it is undertaken only after careful

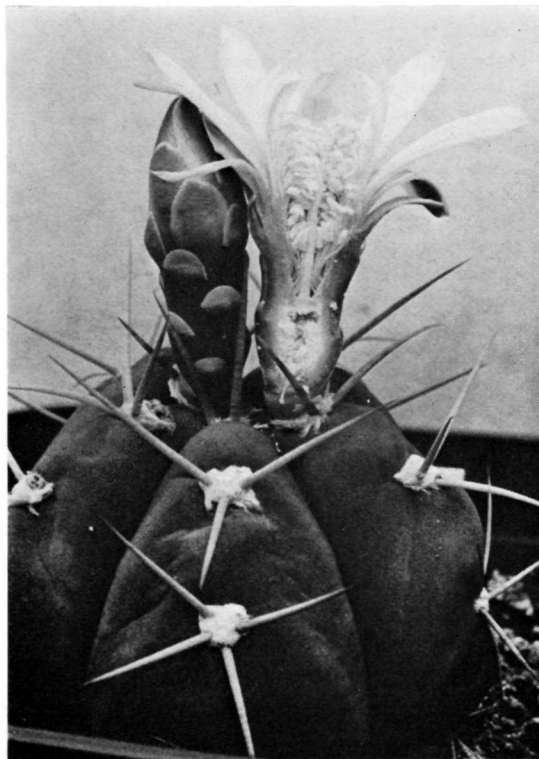


Fig. 1. *Gymnocalycium buenekeri*, showing flower-bud and flower sectioned vertically.

consideration and in the knowledge that many of the present species of *Gymnocalycium* exist on the basis of differences nowhere near as marked as those existing between *G. horstii* and *G. buenekeri*.

Since 1970, these plants have been re-collected on more than one occasion from their very restricted habitats 200 km apart in Rio Grande do Sul, Brazil,* and made available to growers in Europe. Study of such material in cultivation over a period of years indicates that the two taxa do indeed exhibit differences in body colour, flower colour, and spination as described by Buining.

*The native locality of 'var *buenekeri*' was given by Buining as near Sao Francisco de Assis, ca. 200km NW. of Cacapava, R.G.S.—Ed.

One feature which helps distinguish *G. horstii* from *G. buenekeri* in addition to the body colour is the texture of the epidermis; that of the species is lustrous while that of the variety is matt. Detailed examination of the epidermis reveals the cause of this, the differences in epidermal structure being quite striking (figs. 5, 8).

Flower colour in *G. buenekeri* seems more variable than is indicated by Buining's description of 'rose pink', the petals varying from very pale peach (almost white) with a pink mid-stripe to a uniform rose pink in different specimens.

Only a limited number of flowers have been available for study by sectioning, as initially it was considered more important to produce mature seed. However, preliminary examination of the flowers of *G. buenekeri* indicates that the flower structure is very similar to that shown by Buining for *G. horstii*. Differences observed in the length of the style of *G. buenekeri* appear to be due to the occurrence of unisexual flowers (longer style in the female, shorter and presumably non-functional in the male) rather than to any basic difference in structure.

In the cultivated specimens investigated, the spination of *G. buenekeri* does not differ appreciably in colour from that of *G. horstii*, but Buining states that the spines of the former are thicker. In the specimens examined, this is not at all obvious but well may be the case in some plants. However, while *G. horstii* usually has 5 (-6) straight spines per areole, *G. buenekeri* would appear to have only 3 (-5) which are slightly and somewhat irregularly curved, particularly towards the tip. They are not so regularly arranged as in *G. horstii* and tend to stand out from the body to a greater extent. The areoles themselves are also situated in shallow notches in the ribs in contrast to the species where the ribs are virtually without notches.

When fruits were produced in cultivation by habitat-collected plants of *G. buenekeri*, it was noted that while being comparable with *G. horstii* fruits in size, they were of somewhat different appearance. The fruit of *G. buenekeri* has scales on its surface that are pale green and few in number whereas in *G. horstii* the scales are more numerous and each has a distinctive pink tip. In addition, the fruit of *G. horstii* has a well developed waxy coating, resulting in the whole fruit having a distinctive bright blue-green colour, particularly in the early stages of development. The fruit of *G. buenekeri* has little or no wax and is mid-green in colour.

Investigation of the seed of *G. horstii* produced in cultivation showed the illustration given by Buining to be a most accurate one with the exception of the 'aril'. No signs of such a feature were noted on the material examined, but, as in other species of the genus it is perhaps a somewhat variable feature. With or without an 'aril', the seed would seem to have little connection with the series *Mostiana* of Buxbaum, although, in the original article, Buining states: '*G. horstii* was not at first easy to classify . . . Finally the seed was the deciding

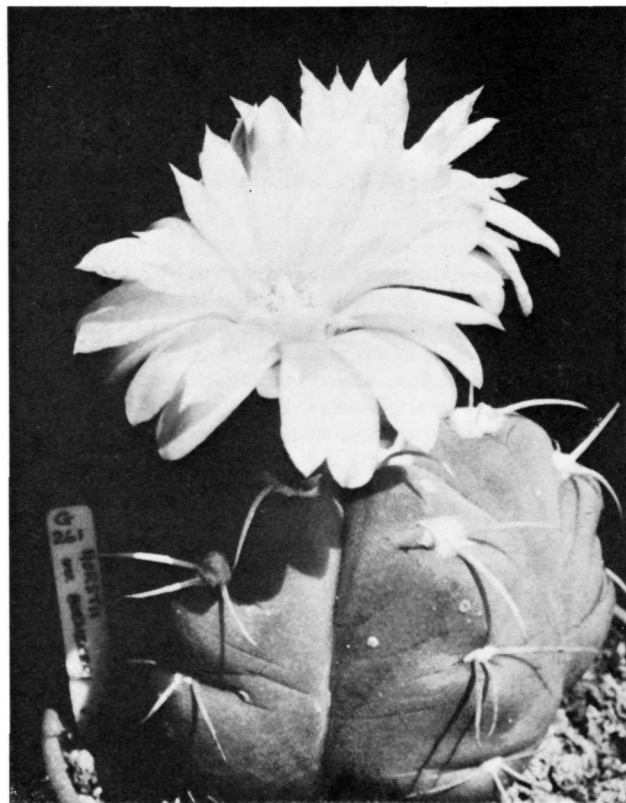


Fig. 2. *G. buenekeri* G. 261 in flower (later preserved as nomenclatural type). Note the dull epidermis.

factor, allocating the plant as a new species in Buxbaum's Section *Mostiana*'. His reasons for this conclusion are difficult to envisage as the illustrations of the seed provided with the original description seem to bear little resemblance to the example provided by Buxbaum (1968) of his seed Type III for the series *Mostiana*. The seeds of *G. buenekeri* are markedly different from those of the species and again, not of Buxbaum's series *Mostiana* type. The position of both species in the Buxbaum system would seem to be most uncertain and will be left an open question for the time being.

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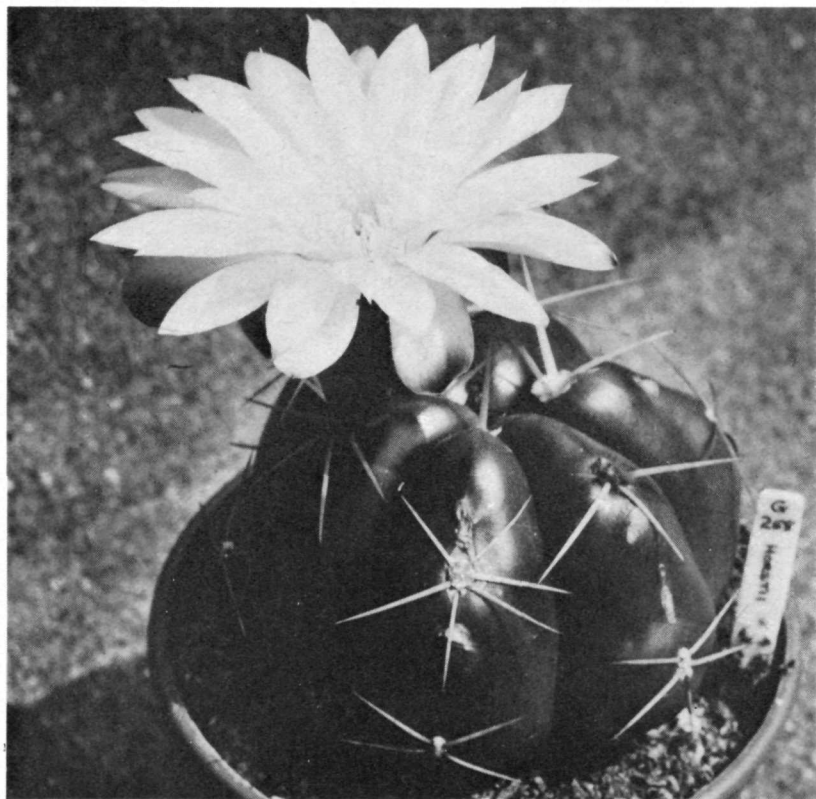


Fig. 3. *G. horstii*, G. 258 in the author's collection.
Note shiny epidermis.

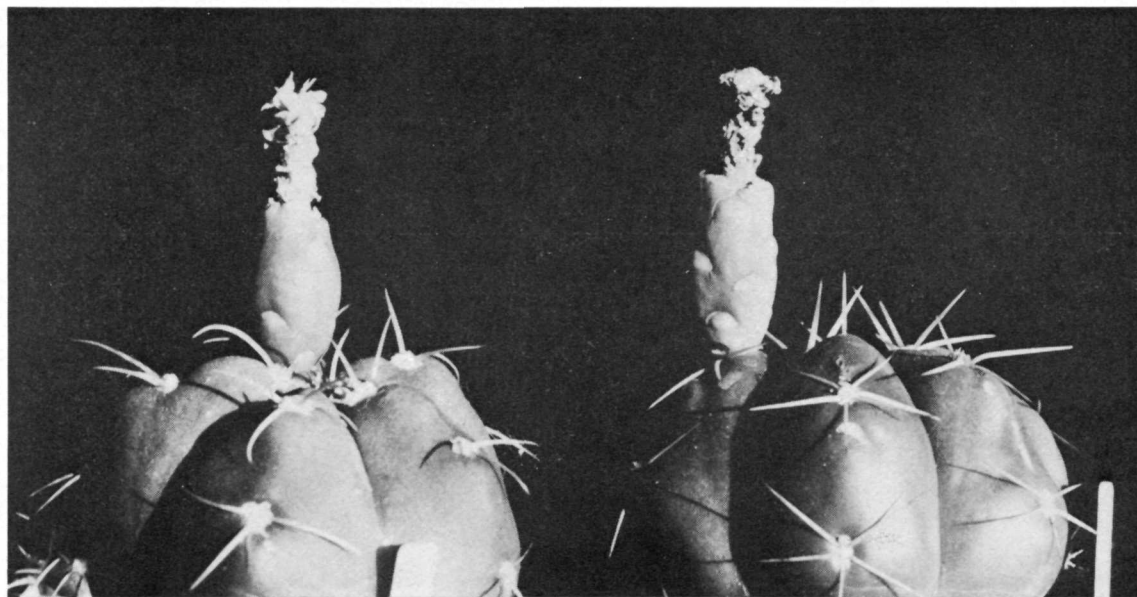
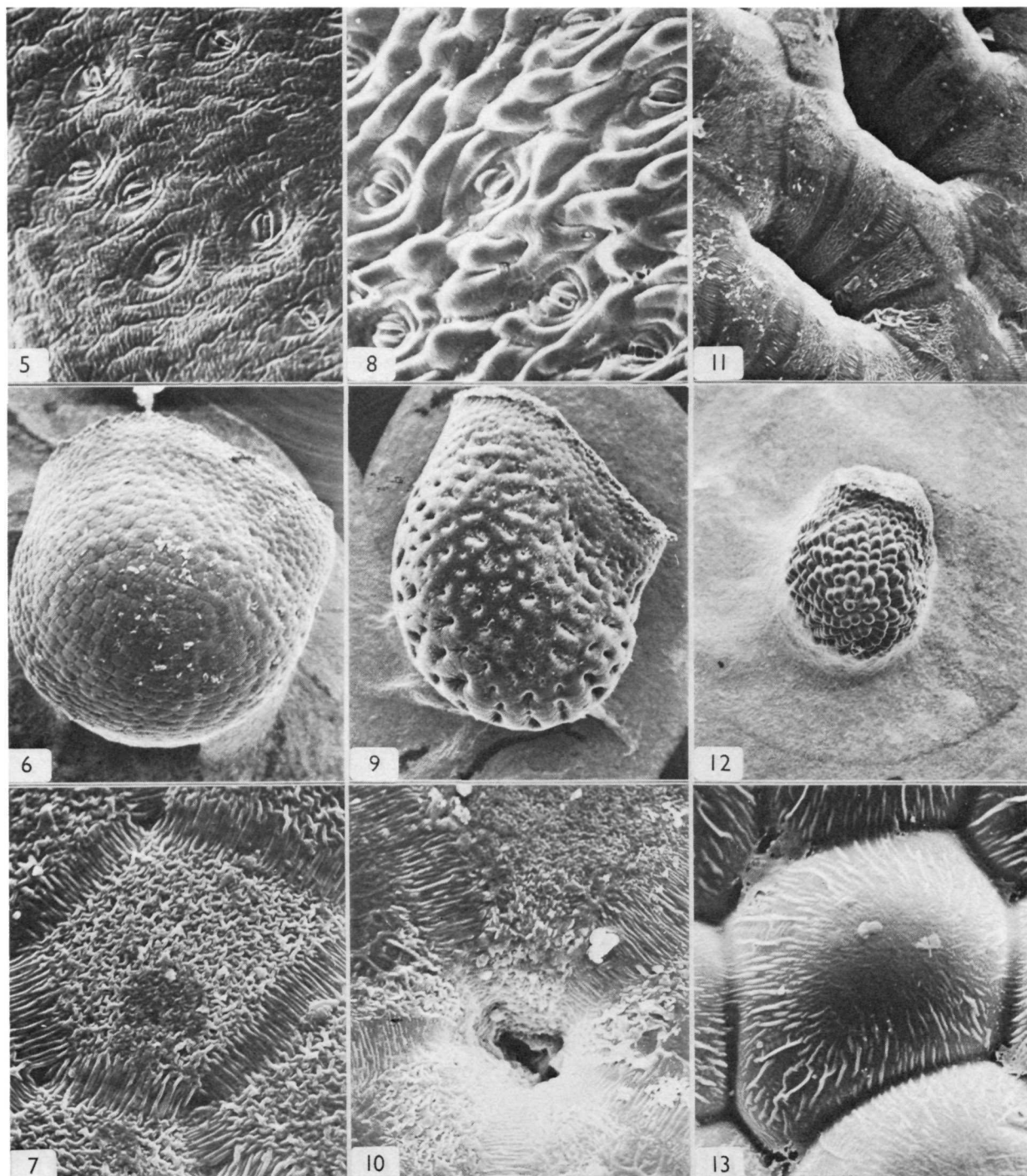


Fig. 4. *G. buenekeri* G. 261 (left) and *G. horstii* G. 258 (right), at fruiting stage.



Figs. 5–7. *Gymnocalycium horstii* (all from Swales G. 258): Fig. 5, epidermis ($\times$ c. 90); fig. 6, seed ($\times$ c. 25); fig. 7, part of testa ($\times$ c. 500). Figs. 8–10. *G. bueneckeri* (all from Swales G. 261): Fig. 8, epidermis ($\times$ c. 90); fig. 9, seed ($\times$ c. 25); fig. 10, part of testa ($\times$ c. 500); fig. 11, another view of testa ($\times$ c. 250). Figs. 12–13. *G. mostii* (ex Linz Bot. Gard. T41.496): Fig. 12, seed ($\times$ c. 25); fig. 13, part of testa ($\times$ c. 500).

Type specimens of Cactaceae in the Berlin-Dahlem Herbarium

by B. E. Leuenberger

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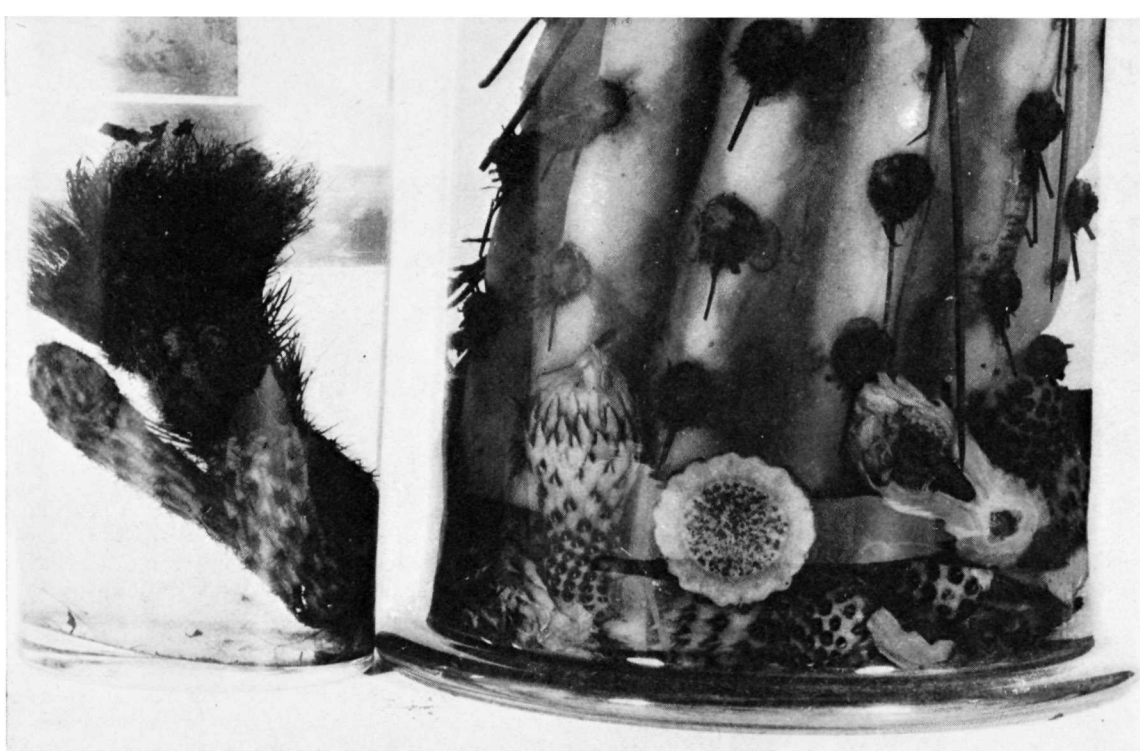
Before the Second World War, Berlin was a major centre of cactus research. Among renowned botanists of the 'Museum Botanicum Berolinense', the names of Link, Schumann, Gürke, Vaupel, and Werdermann are the ones familiar to cactophiles. Link, and Otto, inspector of the botanical garden (Hort.Berol.) introduced many new species and proposed the well established genera *Melocactus* and *Echinocactus*. Schumann's *Gesamtbeschreibung der Kakteen*, in 1898 a comprehensive monograph of the then known species, is still a basic treatment of the whole family and stimulated cactus research considerably. In the second edition of 1903 many new taxa were added as a consequence of collecting activities in South America, that contributed much to the herbarium and living collection at Berlin. After Schumann's death in 1904 Gürke and Vaupel described many new species from the material collected by Weberbauer in Peru and Ule in Brazil. Vaupel initiated a careful taxonomic review of the whole family which was to remain a fragment. After Vaupel's sudden death in 1927 it was Werdermann who decided to continue research tradition in cacti at Berlin. His famous book on the columnar cacti of Brazil (Werdermann, 1933) was the result of a collecting trip to eastern Brazil in 1932. Gradually Werdermann built up what was to be the most complete herbarium collection and documentation of photographs, colour slides, seeds, collectors' notes and

literature, paralleled moreover by a famous living collection.

During World War 2 activities slowed down and in 1943 came to a sudden and disastrous end when a fire caused by a bomb raid over Berlin destroyed parts of the museum building including the herbarium, library, and the laboratories. In 1949 Werdermann described the history and fate of the Dahlem cactus collections stating that all dried herbarium specimens and all preserved type specimens in the separate spirit collection of Cactaceae had been destroyed. Hundreds of bottles with spirit-preserved cacti and all documents kept in the laboratory were lost. It has therefore up to now been assumed that no more type specimens exist, although it was known that in the general spirit collection there were still some Cactaceae. Only recently this was drawn to the author's attention, and a bottle-by-bottle examination of the material showed that not all of the 600 specimens are of minor importance or of garden origin as had been generally believed. Some of them turned out to be types that had apparently been stored elsewhere and later on remained unnoticed due to missing type labels. Among them are large bottles with fine and well preserved specimens collected by Anisits, Ule, and Weberbauer (see illustrations) and even some plants described by Werdermann himself, marked as types in his own handwriting.



Cactaceae types preserved in spirit at the Berlin-Dahlem Herbarium



Type material in spirit at Berlin. Left, *Cereus penicillatus* Guerke (*Arrojadoa penicillata*); right, *Cereus brachypetalus* Vaupel (*Corryocactus brachypetalus*).

Eighty-five types or probable type specimens are listed in the accompanying table, including some poorly preserved or fragmentary items. A more detailed list will be published elsewhere (Leuenberger, 1978, in press). An alphabetical list of collectors with the collection numbers of type and other specimens preserved at Berlin is also appended here. Numbers in bold type represent type or probable type collections.

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- (1949). Aufbau und Schicksal der Dahlemer Kakteen-Sammlungen. In Sukkulantenkunde 3:34–38.

List of Collectors

- Anisits 2, 3, 4, 5, 6, 7, 9, 10, **11**, 12, **13**, 14, 15, 16, **17**, **18**, **19**, 20, **21**, 22, 23, **24**, **25**, 27, 28, 29, 30, **31**, 33, 34, 35, 38, 39, 40, 47, 49, 50, 51, 53, 54, 59, 61, **63**, **64**, 65, **s.n.**
- Anon **s.n.**
- Blossfeld 84, 86, 87, **88**, **Atl**, **s.n.**
- Blossfeld & Marsoner **s.n.**
- Buch 1916.
- Campos-Porto **s.n.**
- Castellanos **s.n.**
- Diels 341, **s.n.**
- Eggers 12347, 14035, 14260, 14578, 15077, 15439, 15505, **s.n.**

- Eichlam **s.n.**
- Fechser **s.n.**
- Glaziov 2, 3, **11**, **s.n.**
- Hassler **s.n.**
- Heller see Snodgrass.
- Hosseus 58b, 109, 116, 179, 205, 220a, **s.n.**
- Hübner 145.
- Hummel **s.n.**
- Jussen **s.n.**
- Kerber **s.n.**
- Lützelburg **22**.
- Peckolt **s.n.**
- Pérez-Moreau **s.n.**
- Pflanz **s.n.**
- Pilger 217.
- Pirtle **s.n.**
- Ragonese **s.n.**
- Reiche **s.n.**, **s.n.**
- Ritter **s.n.**
- Runge (?) **s.n.**, **s.n.**
- Samietz **s.n.**
- Schmoll **s.n.**
- Schreiter **s.n.**
- Sintenis 4186, 4841, 4919.
- Snodgrass & Heller **917**, 919, **934**, **935**.
- Soehrens 35, **s.n.**
- Stuckert **s.n.**
- Stümer **222**, **s.n.**, **s.n.**
- Tonduz **s.n.**
- Ule **1**, **1**(1906), **1a**, 2, 4, 5, 6, 9, 10, **11**, 12, 7052, 7072, **s.n.**
- Viereck **s.n.**
- Villar **s.n.**
- Weberbauer 265, **1353**, **1355**, **1356**, **1357**, **1370**, **1412**, **1413**, **1414**, **1506**, **1549**, **1550**, **1580**, **1581**, **1677**, 1678, **1679**, **1699**, 1713, 1717, 1718, **1719**, 1806, **2511**, **2629**, 2630, 3024, 3743, **3846**, **3906**, 4222, **4271**, **4272**, 6834, 6912a, **s.n.**
- Wercklé 8.
- Werdermann **2934a**, 2980, 3295, **s.n.**
- Winkler 18a.
- Witt **s.n.**

No.	Name	Authority	Collector/number	Remarks	Present genus
1	Binghamia climaxantha	Werdermann	<i>Blossfeld</i> 84	V.	(Neobinghamia)
2	Blossfeldia liliputana	"	<i>Blossfeld & Marsoner</i> s.n.	V.	Blossfeldia
3	Cephalocereus blossfeldiorum	"	<i>Blossfeld</i> 88	V.	Espostoa
4	melanostele	Vaupel	<i>Weberbauer</i> 2630		"
5	purpureus	Gürke	<i>Ule</i> 4		Austrocephalocereus
6	ulei	"	<i>Ule</i> 12		Espostoa
7	Cereus acanthurus	Vaupel	<i>Weberbauer</i> 1699		Loxanthocereus
8	acranthus	"	<i>Weberbauer</i> 1679		Haageocereus
9	adscendens	Gürke	<i>Ule</i> 7072		Eriocereus
10	amazonicus	K. Schumann	<i>Ule</i> 53		Monvillea
11	anisitsii	"	<i>Anisits</i> 19		"
12	apiciflorus	Vaupel	<i>Weberbauer</i> 3743	Fl., fragmentary	Erdisia
13	brachypetalus	"	<i>Weberbauer</i> 1549		Corryocactus
14	brevistylus	K. Schumann	<i>Weberbauer</i> 1414		"
15	decumbens	Vaupel	<i>Weberbauer</i> 1550		Haageocereus
16	glaziovii	K. Schumann	<i>Glaziou</i> s.n.		Leocereus
17	hassleri	"	<i>Anisits</i> 13	syntype	Mediocactus
18	huntingtonianus	Weingart	—	Fr.	Cereus
19	iquiquensis	K. Schumann	<i>Reiche</i> s.n.	Fl.	Eulychnia
20	lamprospermus	"	<i>Anisits</i> 2, 11	syntypes	Cereus
21	leucostele	Gürke	<i>Ule</i> 2		Stephanocereus
22	luetzelburgii	Vaupel	<i>Lützelburg</i> 22	Fl., fragmentary	Coleocephalocereus
23	megalanthus	K. Schumann	<i>Ule</i> s.n.	V. (type ?)	Mediocactus
24	micranthus	Vaupel	<i>Weberbauer</i> 1353		Acanthorhipsalis
25	pachyrrhizus	K. Schumann	<i>Anisits</i> 39		Cereus
26	penicillatus	Gürke	<i>Ule</i> 7052		Arrojadoa
27	phatnospermus	K. Schumann	<i>Anisits</i> 27		Monvillea
28	piauhyensis	Gürke	<i>Ule</i> 9		Pilosocereus
29	plagiostoma	Vaupel	<i>Weberbauer</i> 3906		Borzicactus
30	pseudosonorensis	Gürke	<i>Runge</i> s.n. (fl. ?)	Fl.	Rathbunia
31	rhodanthus	"	<i>Ule</i> 11		Arrojadoa
32	rhodoleucanthus	K. Schumann	<i>Anisits</i> 5, 18, 24	syntypes	Monvillea
33	sclerocarpus	"	<i>Snodgrass & Heller</i> 934, 935	syntypes	Cereus
34	sonorensis	Runge ex K. Sch.	<i>Runge</i> s.n. (?)	Fl.	Rathbunia
35	squamosus	Gürke	<i>Ule</i> 10		uncertain
36	squarrosus	Vaupel	<i>Weberbauer</i> 1719		Erdisia
37	stenogonus	K. Schumann	<i>Anisits</i> 31, 53, 54	syntypes	Cereus
38	trigonus	Eichlam	<i>Eichlam</i> s.n.	V. (type ?)	Hylocereus
39	var. guatemalensis				
39	weberbaueri	K. Schumann	<i>Weberbauer</i> 1413		Weberbauerocereus
40	wittii	"	<i>Witt</i> s.n.		Strophocactus
41	xanthocarpus	"	<i>Anisits</i> 59	syntype	Cereus
42	Coryphantha pirtlei	Werdermann	<i>Pirtle</i> s.n.	V.	Escobaria
43	Echinocactus anisitsii	K. Schumann	<i>Anisits</i> 21		Gymnocalycium
44	aurantiacus	Vaupel	<i>Weberbauer</i> 3846		Matucana
45	damsii	K. Schumann	<i>Anisits</i> s.n.		Gymnocalycium
46	hastifer	Werderm. & Boed.	—	Fl.	Thelocactus
47	molendensis	Vaupel	<i>Weberbauer</i> 1506		Arequipa
48	myriacanthus	"	<i>Weberbauer</i> 4272		Islaya
49	nidulans	Quehl	—	Fl., fragmentary	Thelocactus
50	peruvianus	K. Schumann	<i>Weberbauer</i> s.n.	(type ?)	Oroya
51	reichei	"	<i>Reiche</i> s.n.	V. (type ?)	Neoporteria
52	umadeave	Fric ex Werderm.	<i>Stümer</i> s.n.	Fl., syntype	Pyrrhocactus
53	vorwerkianus	Werdermann	—	Fl.	Notocactus
54	weberbaueri	Vaupel	<i>Weberbauer</i> 4271		Matucana

Key to 'Remarks' column: V., vegetative only. Fl., flower(s) only. Fr., fruit only. Fragmentary = damaged specimen, partly or completely dried out. Where no details are given, specimens mostly consist of vegetative parts with flower or fruit.

No.	Name	Authority	Collector/number	Remarks	Present genus
	Echinopsis				
55	densispina	Werdermann	<i>Stümer 222</i>	Fl.	Lobivia
56	hossei	"	<i>Hosseus</i> s.n.	Fl., fragmentary	"
57	rhodotricha	K. Schumann	<i>Anisits 20, 25</i>	syntypes	Echinopsis
58	violacea	Werdermann	<i>Stümer</i> s.n.	Fl., fragmentary	Acanthocalycium
	Lobivia				
59	schreiteri	Castellanos	<i>Schreiter</i> s.n.	V. (isotype ?)	Lobivia
	Mammillaria				
60	aylosteria	Werdermann	<i>Ritter</i> s.n.	V.	Oehmea
61	hahniana	"	<i>Schmoll</i> s.n.	V. (type ?)	Mammillaria
62	herreriae	"	—	—	"
63	melispina	"	<i>Viereck</i> s.n.	Fl., fragmentary	"
64	microhelix	"	—	Fragmentary (? type)	"
65	microheliopsis	"	—	Fl., fragmentary	"
	Melocactus				
66	horridus	Werdermann	<i>Werdermann 2934a</i>		Melocactus
67	peruvianus	Vaupel	<i>Weberbauer 2629</i>		"
	Opuntia				
68	assumptionis	K. Schumann	<i>Anisits 63</i>		Opuntia
69	cardiosperma	"	<i>Anisits 64</i>		"
70	crotilla	"	<i>Weberbauer 1412</i>		"
71	dactylifera	Vaupel	<i>Weberbauer 1357</i>		"
72	hanburyana	Weber	—	(type ?)	"
73	helleri	K. Schumann	<i>Snodgrass & Heller 917</i>		"
74	hyptiacantha	Weber	—	Fr. (type ?)	"
75	ignescens	Vaupel	<i>Weberbauer 1370</i>		"
76	pachypus	K. Schumann	<i>Weberbauer [1677]</i>		"
77	schumannii	Weber	—	(type ?)	"
78	spgazzinii	"	—	V., fragmentary (type ?)	"
79	stenarthra	K. Schumann	<i>Anisits 6, 17, 47</i>	Syntypes	"
	Parodia				
80	dichroacantha	Brandt & Weskamp	<i>Fechser</i> s.n.		Parodia
	Pilocereus				
81	setosus	Gürke	<i>Ule 1</i>	coll. 1906/7	uncertain
82	ulei	K. Schumann	<i>Ule 1</i>	coll. 1903 or earlier	Pseudopilocereus
	Rhipsalis				
83	epiphyllodes	Campos-Porto & Werderm.	<i>Campos-Porto</i> s.n.	Fragmentary	Rhipsalis
	Trichocereus				
84	campos-portoi	Werdermann	<i>Campos-Porto</i> s.n.	Syntype	Trichocereus
	Wilcoxia				
85	tamaulipensis	"	<i>Hummel</i> s.n.	V., fragmentary	Wilcoxia

Book Review

Werner Rauh. *Schöne Kakteen und andere Sukkulenten.* Pp. 292, 27 b/w and 222 colour illustrations and 12 diagrams; hardback. Gebr. Borntraeger, Berlin, 1978. Price DM 19.80 (approx. £5.50, plus postage). In German.

This is a new and completely revised edition of Prof. Rauh's best-selling pocket-sized book on cacti and 'other' succulents in which—thanks to brevity and sometimes rather small print—an enormous amount of information is stored. The most significant new feature is the updating of the nomenclature. From the point of view of the hobbyist, even if he does not know German,

the numerous first-class colour illustrations will be sufficient attraction, while those who can follow the text will find much practical cultural information, chapters on the nature of succulence and the adaptations of succulent plants to their environment, the handling of imported plants, etc. Half the work is devoted to the 'other' succulents, with representatives taken from many different families, as well as a section on the morphology and cultivation of the Mesembryanthemaceae.

There are one or two errors of identification, such as the illustration of '*Echeveria subrigida*' which appears to be *E. derenbergii*, and mis-spelled names, but these are minor flaws in a book which is good value for money.

LOIS GLASS

Echeveria agavoides and the mysterious variety corderoyi

by J. C. van Keppel* and Susan Roach

It is always very satisfying when, after years of detective work and thought about a particular taxonomic problem, one sees one's efforts rewarded with the solving of an age-old mystery. But let me—just as with a jigsaw-puzzle—begin at the beginning and delve into history.

In the years 1860/1861 the Belgian nurseryman Verschaffelt introduced into Europe from Mexico an *Echeveria* unknown at that time. This was described by Lemaire (1863) as *E. agavoides* (resembling *Agave*). The first plants were put on the market for no less than a hundred francs, a huge sum of money in those days. Vegetative propagation was initially a difficult business. The plant does not (or only sparingly) form side-shoots, and propagation from leaf-cuttings—in contrast to other *Echeverias*—appeared to be practically impossible, because it is difficult to get the thick fleshy leaves away from the plant intact. Propagation was also carried out in the beginning by means of seeds, although later only one clone remained preserved in cultivation in Europe.

The first clear illustration of *E. agavoides* appeared in 1869 with a description by Baker, who set the clock back, however, by calling the plant *Cotyledon agavoides*. This coloured illustration (here reproduced in black and white as fig. 1) was designated as the neotype of the species by Walther (1972) which means that the illustration is to be taken as representing *E. agavoides* var. *agavoides*. W. W. Saunders, who grew the plant which was used for the illustration, obtained it from seeds which had been imported from northern Mexico. The plant described by Baker is clearly different from the plant which at present is generally known in cultivation in Europe as *E. agavoides*. I shall come back to this later; firstly something more about the systematic classification.

Although Lemaire described the plant as *Echeveria*, it was grouped by later writers (amongst others Baker) under *Cotyledon*. Rose (1903) even proposed a new genus for *E. agavoides* and several related species: *Urbinia*, based on the habit of the plant and the form of the calyx. The differences are, however, so slight that nowadays not a single expert recognises *Urbinia* as an independent genus, and *Urbinia agavoides*, *U. purpurorum*

and *U. lurida* (synonym of *E. tobarensis*) are classified under *Echeveria* again.

Walther (1972) included *E. agavoides* in his series *Urceolatae*, plants whose flowers are urn-, cylinder- or cone-shaped. This group is rather heterogeneous and will certainly need further division in the future, but that is not important for our subject, so we will not pursue the matter at this point.

Echeveria agavoides var. *agavoides*

The original description by Lemaire does not really give many clues as to what the plant he described looked like. The description by Baker, supplemented by the colour-plate (fig. 1) does give a good picture of *E. agavoides* as it appeared in cultivation in Europe around 1870. We are struck by the compact rosette with very light bluish green, wide, short leaves, of which the older ones show a faint red flush at the edges. The flowers (there are only 4-6) are arranged in a cyme or cincinnus. Saunders, who was a good observer, remarks correctly that *E. agavoides* is more like a *Haworthia* than an *Agave*!

If we compare Baker's illustration with the plant in my collection (fig. 2; van K. 6805), which I received in 1968 from the American *Echeveria* expert Dr. Reid Moran, then our attention is caught by the striking similarity between the two plants. Moran's plant was collected in the wild at an altitude of 2500 m. near Santa Rosa, Guanajuato, Mexico (Moran 14735). I sowed seeds (obtained by self-pollination) from this plant, and the seedlings, which are now fully grown, are completely identical to the mother-plant and have been sent to all the most important *Echeveria* collections in Europe.

The following is the description of *Echeveria agavoides* (var. *agavoides*) according to Baker (1869), and the remarks that Saunders appended:

'Glabrous, not at all caulescent. The leaves fifteen to twenty in a dense rosette, ovate, an inch and a half to two inches long, by an inch broad half-way up, narrowed above to a rigid spiny point, the centre of the blade three-eighths of an inch thick, the upper surface slightly concave, the back much rounded, both sides a very pale glaucous-green, and distinctly reticulated with papillae, the old ones faintly tinged with red at the edge. Flowering branch eight to twelve inches long, slender, with only a very few small bract-like leaves. Flowers four to six in a sparse cyme. The bracts linear, very minute. The pedicels half to three-fourths of an inch long. Calyx under one-eighth of an inch deep, the lobes deltoid, equal, ascending. Corolla orange, half to five-eighths of an inch deep, scarcely at all pentagonal.

A very distinct species.—J.G.B.'

*Author's address: Jonkerlaan 14, Wassenaar, Netherlands. This article is a translation, with revisions, of one which was published in the Dutch journal *Succulenta* 55(9): 166-174 (1976). The illustrations, by F. Noltee and J. C. van Keppel, are reproduced by courtesy of *Succulenta*.

Fig. 1. A reproduction of the original plate of *E. agavoides* from Saunders' *Refugium Botanicum* vol. t. 67 (1869)

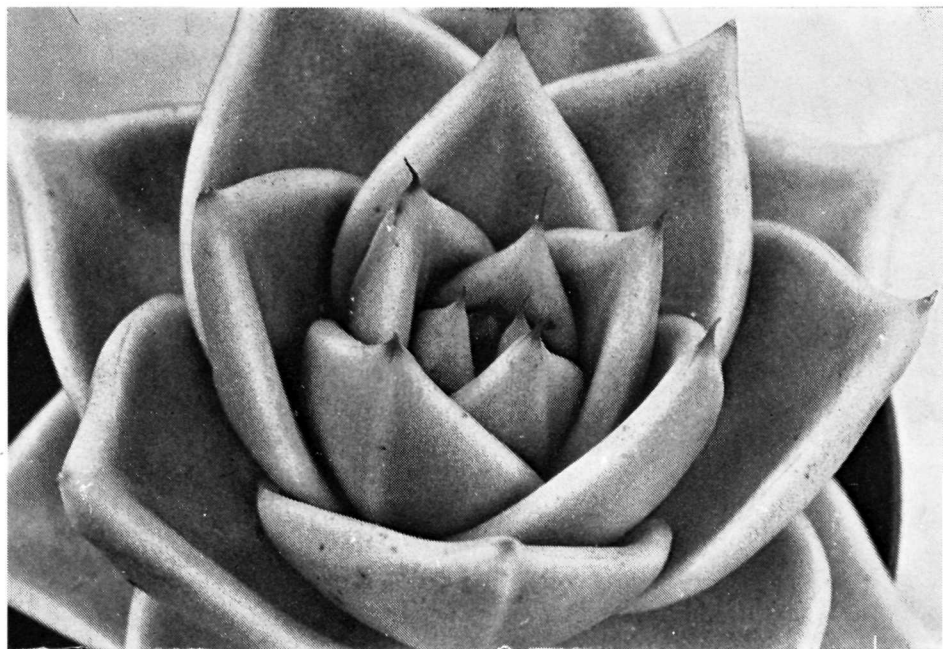


W.W.S. del Fitch lith.

J. H. Fitch, imp.

Cotyledon agavoides, Baker

Fig. 2. *E. agavoides* var. *agavoides* (K. 6805), a plant collected by Reid Moran near Santa Rosa, Guanajuato, Mexico (Moran 14735)



'This is another species hitherto rare in collections, and difficult of increase except by seeds. The plant requires much of the same treatment as the last, and greatly resembles an Aloe of the section Haworthia, notwithstanding that it has been likened to an Agave, whence its name: I have raised the plant from Northern Mexican seeds, presented to me by H. Moberly, Esq. I am also indebted to the Royal Gardens at Kew for a plant of this interesting species.—W.W.S.'

E. agavoides* var. *corderoyi

In 1874 Baker published the first description of *Cotyledon* (*Echeveria*) *corderoyi*, as follows:

'Glabrous, acaulescent. Leaves, 60 to 70 in a dense rosette, 7 to 8 inches broad and 3 to 4 inches deep, ovate, 2 to 2½ inches long, 1¼ to 1½ inch broad at the middle, half an inch thick, quite flat on the face in the upper half, rounded on the back, produced into a firm lanceolate mucro, both sides a very pale whitish-green, smooth and rather shining. Flower-stems 3-4 to a rosette, the scape below the cyme 15 to 18 inches long, terete, with only a few minute, scariose, bract-like leaves; cyme trichotomous, with 15-20 flowers on long red, flexuose branches; bracts minute, lanceolate; pedicels ½ to ¾ inch long, bright red; calyx rotate, ¼ inch broad, with lanceolate divisions reaching quite down to the pedicel; corolla urceolate, ¾ inch long, bright red at the base, yellow upwards; the lanceolate divisions three times as long as the campanulate tube.

J. G. Baker.'

Cotyledon corderoyi was transferred by Morren the same year to *Echeveria* and, much later, treated by von Poellnitz (1936) as *E. agavoides* var. *corderoyi*.

Baker received the plant from Justus Corderoy, an amateur succulent collector, who lived at Blewbury, near Didcot, England, and named it in his honour. If he did not have personal contact with Corderoy, Baker

at any rate corresponded regularly with him (see postscript).

The only information about the origin of the plant was that Corderoy had received it some years previously from Belgium. Baker, who had already described more than 40 species which he included in the subgenus *Echeveria*, saw enough differences from *E. agavoides* to make it a separate species. It has a much larger number of leaves; big, fully-grown specimens have 60-70, which are much narrower and fairly flat. The most striking feature, however, is the difference in inflorescence which has triple branching and smaller flowers than *E. agavoides*.

Nine years later, Baker (1883) returned once again to the plant with a drawing made from a photograph which he had received from Corderoy (fig. 3), saying once more that its origin had remained unknown. Not a single plant that had recently been imported from Mexico or the southern United States resembled the plant that he had described. From this it seems that *Cotyledon corderoyi* was wiped from the face of the earth. All subsequent publications about this plant point to the fact that the authors did not identify it with plants in cultivation. Morren merely changed the genus name *Cotyledon* for that of *Echeveria*. Berger (1930) placed the plant in his section *Urbini* of the genus *Echeveria*, but not immediately under *E. agavoides* as one would have expected from someone who knew the plant well.

Von Poellnitz (1936) called the plant *E. agavoides* var. *corderoyi*, but probably based this more on a herbarium

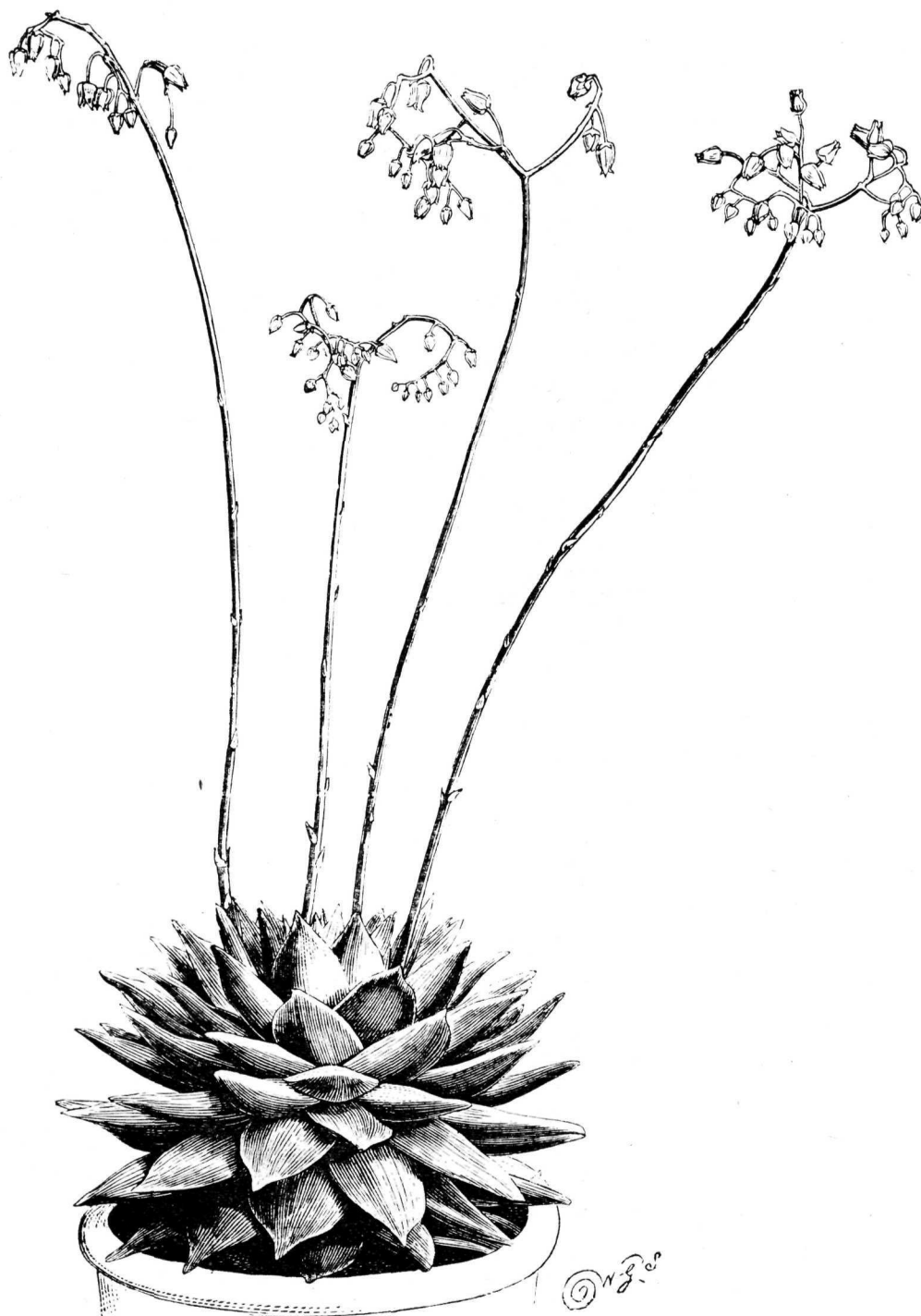


FIG. 56.—COTYLEDON CORDEROYI.

Fig. 3. The original illustration of *E. agavoides* var. *corderoyi* from the *Gardeners' Chronicle*, n.s. I: 599 (1874).

Fig. 4. *E. agavoides* var. *corderoyi* (K. 5109). This form is generally grown in Europe as *E. agavoides* itself.

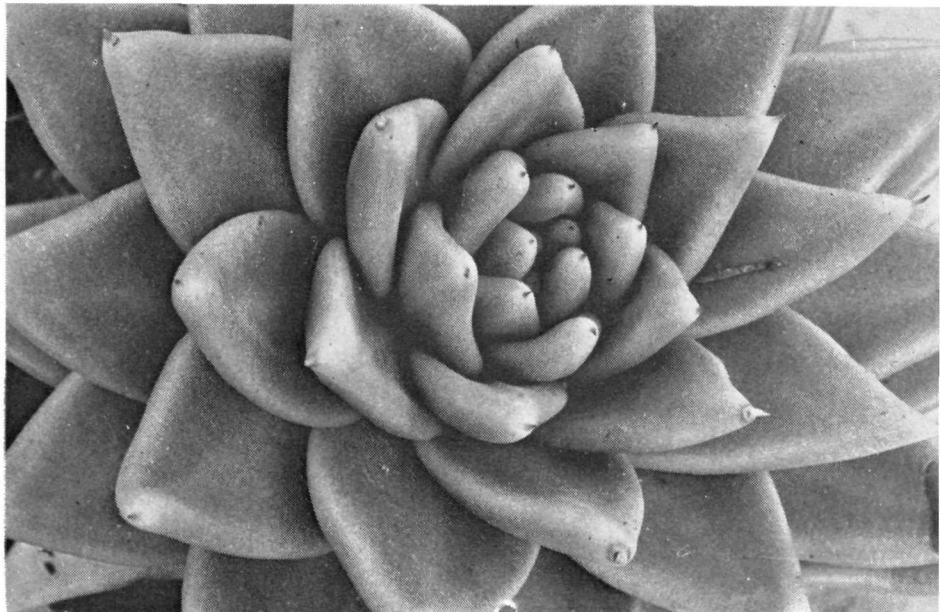
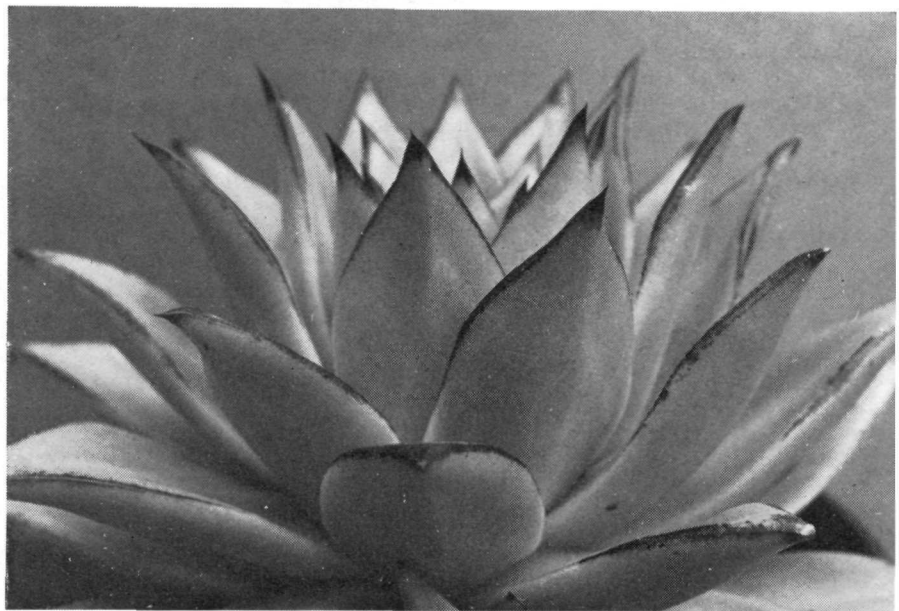


Fig. 5. Inflorescence of *E. agavoides* var. *corderoyi*

Fig. 6. *E. agavoides* cv. 'Red Edge', distributed by ISI (no. 322) as var. *corderoyi*.



specimen collected by Palmer in 1902 in south-east San Luis Potosi (Palmer 499). Even Walther did not know the plant, as he wrote (l.c. page 96) 'the imperfectly known *Echeveria agavoides* var. *corderoyi*'. He supposed that *E. agavoides* var. *prolifera*, a cultivated plant which he described, might be closest to it but he was wrong. 'Prolifera' means 'producing issue' and indicates the formation of offsets, which was not mentioned by Baker and was also certainly not present, otherwise the plant would not have been described after nine years as 'still of rare occurrence'.

Plants do crop up all the time in cultivation under the name *corderoyi* and they often differ greatly from the original description. Walther, for instance, found the name amongst plants which belong to *E. parrasensis*. For years there has also been a monstrose *E. agavoides* hybrid (van K. 6309) from Southern France circulating in Europe under the name *corderoyi*. This plant forms a large number of very small rosettes but no large main rosette. It does not testify to specialist knowledge on the part of the one who attached the name to the plant. In 1960 the International Succulent Institute (ISI) began the circulation of yet another plant under the name of *E. agavoides* var. *corderoyi* (ISI no. 322). Walther (l.c., page 84), however, described this plant as *E. agavoides* cv. 'Red Edge' (fig. 6). He found this form in 1937 growing wild near San Luis Potosi (Mexico).

'Red Edge' forms large rosettes with leaves which have a clearly delineated red border at the edge. Older plants form offsets easily. The flowers are more slender and more reddish than the var. *corderoyi*. The inflorescence is a three fold forked loose cyme. Why Walther described this plant, which is found in the wild, as a cultivar, when he described cultivated plants of unknown origin as a variety and sometimes even as a species (amongst others the hybrid *E. gilva*) is a mystery. In addition to the above-mentioned var. *prolifera* (which I strongly suspect belongs to the 'gilva-complex') Walther described yet another variety, *multifida*. I do not know this variety from authentic material. Accord-

ing to the description it is generally a solitary plant, with strongly coloured leaf-edges and an inflorescence with quintuple branching. Because 'Red Edge' according to Walther was collected in the same habitat as var. *multifida*, it is not impossible that 'Red Edge' is a selected clone of this variety.

After this digression about the variation in *E. agavoides*, I must return to var. *corderoyi*. To which plant does this name really belong? In my opinion, to the one clone of *E. agavoides* which has been spread over the whole of Europe and which has been regarded for decades as the 'species'. This plant is the one that answers best to Baker's description and illustration. That none of the later investigators of the genus *Echeveria* have realized this is a result of the fact that we have only known that one clone. Thanks to the fact that I obtained new material for comparison I was able to establish the true identity of this plant. The question arises as to why this variety was preserved in cultivation whilst all other clones which were introduced or sown in Europe between—to estimate somewhat broadly—1860 and 1890 have disappeared?

Nine years after the first description Baker was still talking about a rare plant. This indicates that the plant was difficult to propagate vegetatively. My oldest plant formed an offset in 1975 for the first time in 25 years. From my own experience I know that the plant can easily be propagated from seed, but this method is hardly ever used by professional nurserymen. So there must be another reason why this variety has not only been able to preserve itself but, moreover, occurs very frequently.

The solution is quite simple. There is a cristate form of this plant in cultivation which was illustrated as early as 1929 (Anon., 1929). It is a well-known characteristic that cristate forms have atavistic tendencies, i.e. the cristate form separates itself up into a large number of ordinary rosettes. These can serve for propagation and were indeed used for this. The clones which never or only seldom formed cuttings, and which also did not

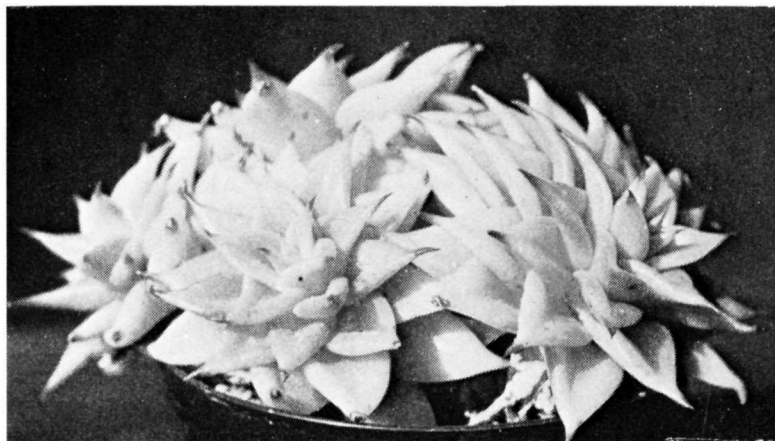


Fig. 7. A monstrose hybrid of *E. agavoides* which originated in southern France and is often grown as var. *corderoyi* (K. 6309).



Fig. 8. *E. agavoides* var. *corderoyi*, showing normal shoots which have arisen by reversion from a cristate form. The cristate part of the plant is visible in the bottom left-hand corner of the photograph, which was taken in the Reference Collection belonging to Holly Gate Nurseries Ltd., Ashington, Sussex.

have a cristate form, slowly but surely died out in cultivation. I do not exclude the possibility that Corderoy's plant was a normal cutting of a cristate form whose descendants were spread simultaneously throughout Europe as *E. agavoides*. This would at the same time be an acceptable explanation of the fact that none of the experts connected this plant with the var. *corderoyi*, described by Baker.

Other illustrations and synonyms

Finally, a few remarks about some illustrations of *E. agavoides* and the variety *corderoyi* which are not reproduced here, and some synonyms of minor importance. In *Flore des Serres* 19: t. 2003, 1873, there is a coloured drawing of *E. agavoides*; in *Gard. Mag.* 1873, p. 237, there is likewise an illustration which was reproduced by Morren in *La Belgique Horticole* 24: 156, fig. 4, 1874. Both represent a plant with rather more leaves than the one in Baker's drawing, but which is more in agreement as regards leaf-shape with Baker's *E. agavoides* than with *E. corderoyi*. The cristate form of var. *corderoyi* is illustrated in *Succulenta* 1960, p. 103, as *E. agavoides* 'Cristate'. *E. agavoides* var. *corderoyi* is illustrated in Jacobsen, *Lexicon of Succulent Plants*, t. 57(2) (1974) under the name *E. agavoides* var. *agavoides*.

The following are synonyms of *E. agavoides*: *E. yuccoides* hort. ex Morren (1874), a plant of which no description is known (therefore a *nomen nudum*); *E. obscura* (Rose) von Poellnitz (*Urbinia obscura* Rose), a plant with an abnormal number of rather large lower bracts on the peduncle. According to Walther the peduncle was normal again the next year.

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POSTSCRIPT

by David Hunt

The name Justus Corderoy, though not recorded in Desmond's 'Dictionary of British and Irish Botanists and Horticulturists' (1977), is one that is familiar to succulent plantmen, being commemorated not only in *Echeveria agavoides* var. *corderoyi* but also in *Crassula justicorderoyi*. Mr. Corderoy exchanged plants with Kew and corresponded with various staff members over a period of 35 years or more, and some of his letters are preserved in the archives. One letter, dated 17 January 1899 and addressed to, William Watson, at that time Assistant Curator, contains the following interesting references to *E. agavoides* and var. *corderoyi*:

'... I have not quite made up my mind if I shall dispose of a young plant of *Echeveria corderoyi* but it is quite probable. I have only 3 young ones from the original in 30 years. The plant I had from Kew of *Agavoides* is not so large as one of my young plants 3 or 4 years old and I had that when the late Mr Smith first came to Kew; it has never flowered either ...'

These remarks clearly substantiate Mr van Keppel's observations on the difficulty of propagation of the plants and the relative growth rate of var. *agavoides* and var. *corderoyi*. John Smith II was Curator of Kew from 1864 to 1886.

Book Review

H. Sanchez-Mejorada. *Manual de Campo de las Cactáceas y Suculentas de la Barranca del Metztlitlan. Field Guide to the Cacti and Succulents of the Barranca of Metztlitlan.* Pp. 132, with over 50 text figures and illustrations in b/w and colour; paperback, art paper, 9×6½ inches. Sociedad Mexicana de Cactología, Mexico, 1978. Price (in Mexico) 90 pesos*. In Spanish and English.

The Valley of Tehuacan and the Barranca of Metztlitlan, each within a day's drive of Mexico City, are two most important sites for students of succulent plants and favoured localities for one's first excursions as a visitor to Mexico. Only 150 miles apart, but separated by the Trans-Mexican Volcanic Belt, their respective floras are fascinating to compare, with some species in common to both, several pairs of species with one in each area, and some species, even genera, with no close allies in the other locality.

Five years ago, the small but enterprising Sociedad Mexicana de Cactología published a Botanical Guide to the Cacti and other Succulents of the Valley of Tehuacan, by Jorge Meyran, which is invaluable for visitors. Now its companion, a 'Field Guide to the Cacti and Succulents of the Barranca of Metztlitlan' has also been published by the Society. The author is our very good friend Hernando Sánchez-Mejorada, who speaks fluent English and has provided the complete text in English as well as Spanish. After a geographical introduction, 57 species of cacti are dealt with, followed by 18 Crasulaceae, 11 Agavaceae, 13 Bromeliaceae and a variety of other succulent and xerophytic plants. Appendices list the birds and mammals of the Barranca, provide historical and touristic information, and supply a valuable gazetteer of place names. There are identification keys to each of the plant genera treated, concise descriptions and notes for each species, including distributional data, and many of the species are illustrated, six of them in colour (four of these without captions, by the way, and wrongly referenced in the text: 'Plate III' *Thelocactus horripilus* is Plate I, and so on).

It goes without saying that this authoritative text will be indispensable to all visitors to the great Barranca, but anyone who does not aspire to follow in the footsteps of Ehrenberg, Karwinsky and the rest will find the descriptive sections full of interest and the ecological and climatic data instructive for cultivation of many well-known Mexican species.

D. R. H.

*While stocks last this book is available from 67 Gloucester Court, Kew Road, Richmond, Surrey TW9 3EA, price £2.75 post free.

Show Awards

The Society's one-day Autumn Show, held on 7 October at Napier Hall, Westminster, was a notable success with twice as many entries as we had at the corresponding two-day event last year and a very good attendance by members and visitors, including a party from the new Warrington & District Branch. The judge was MRS. M. STILLWELL.

At the Autumn Show the emphasis is on the 'Other Succulents'. The P. V. Collings Cup for Three Euphorbias (Class 7) was won by MR. & MRS. MADDAMS with *E. aeruginosa*, *E. didierioides* and *E. sainte-mariensis*. The Pryke-Howard Cup for Six South African Succulents in pots not exceeding 4½ in. diam. (Class 13) went to MRS. M. LEACH with *Adenia glauca*, *Anacampseros papyracea*, *Euphorbia monteroi*, *Kedrostis nana*, *Pachypodium saundersii* and *Tavaresia barklyi*, and the William Denton Memorial Medal for Six Stemless Mesembryanthemums (Class 16) to MRS. A. WHICHER for *Conophytum incurvum* f. *leucanthum*, *Argyroderma framesii*, *Fenestraria rhopalophylla*, *Gibbaeum album*, *Lithops olivacea* and *Ophthalmophyllum* sp. The Hedges Cup for Succulents from Seed (Class 17) was won by MRS. R. EDMONDS.

MR. & MRS. MADDAMS made a clean sweep of the Cacti classes with six first prizes and the 'Best Cactus in the Show' (*Astrophytum* aff. *myriostigma*). They also gained two Diplomas for Excellence in Horticulture, awarded by the Worshipful Company of Gardeners, one for Three Cacti (Class 1) and one for Three Liliaceae (Class 10). MR. D. T. BEST's *Euphorbia bupleurifolia*, pictured opposite, again took the award for 'Best Succulent in the Show'.

Other First Prize winners were MRS. P. POULTER (Classes 8 & 14) and MRS. M. NIGHTINGALE (Intermediate Classes, 18 & 19). MR. & MRS. PRITCHARD (Warrington Branch) won the Novices Classes (20 & 21) and were awarded the Worshipful Company of Gardeners' Novice Awards for Merit in Horticulture.

In the General Classes, MRS. NIGHTINGALE won Class 23 and the Flora Award for her miniature garden, and MR. A. BYLES's decorative group won Class 24 and the Joan Farrow Memorial Cup.

Awards for highest aggregate points at the Summer and Autumn Shows were won as follows: Sir William Lawrence Cup (Cacti) and Evelyn Theobald Cup (Succulents), MR. & MRS. MADDAMS; Pullen Cup (Miniature Gardens) MRS. NIGHTINGALE; Royal Horticultural Society's Banksian Medal, MR. R. H. I. READ; Junior Shield, C. M. LEACH; Pryor Award (Novices), C. M. LEACH.

The Show Committee thank all those who exhibited, stewarded and helped in other ways at our show this year, and to those who provided prizes for the Show Draw and Tombola.

Don Best's fine Euphorbia bupleurifolia (photo: Mark Eban)



Best Succulent in the Show.

Branch Activities

Reports for inclusion in the next issue must reach the Editor by 15 December.

North Surrey

Secretary: W. F. Maddams, 26 Glenfield Road, Banstead, Surrey SM7 2DG.

Meeting Place: Adult School, Benhill Road, Sutton, 1st Tuesday in month, 7.45 p.m.

The 'now it's on, now it's off' Carshalton Show finally took place on the original date, thanks to the assistance of the Carshalton Society. Although the conditions in the Ruskin Hall were somewhat crowded the seventeen Branch members who staged entries in the Cactus Section put on an eye catching display. Mr. & Mrs. Maddams were awarded a certificate for the highest points in the Open classes and Mrs. M. Nightingale won the Chuter Cup for the highest points in the Novice classes.

The Branch are thrilled that Dr. Len Newton from Ghana (our former Editor) is coming down to talk to them on 7 November. His first-hand illustrated account 'Aspects of Arabia' should be a fitting climax to the Branch's twenty-first anniversary year.

Small ads

Wanted Cactus and Succulent Society of Great Britain Journals, volumes 1-19, reprint of first 8 vols. or any odd vols. Contact, stating price, John Cox, 32 Windsor Road, Hebden Bridge, W. Yorks HX7 8LF, 'phone (office hours) Hebden Bridge 2203.

The Cycad Society (founded 1977) is an international organization for the study, conservation, and preservation of Cycads. Subscription \$10.00 U.S. per annum. Apply to: 5988 South Pollard Parkway, Baton Rouge, La. 70808, U.S.A.

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Sales items are usually available at Society meetings. For bulk orders and binders please contact Mrs. Maddams beforehand.

The Cactus & Succulent Journal of America

Six issues per year, fully illustrated, total on average 300 pages and catering for all levels of interest. Subscription: \$12.50. Apply direct to Box 3010, Santa Barbara, California 93105, USA.

CSIE: Cactus & Succulent Information Exchange (founded 1968) encourages communication and fellowship among amateur collectors. Nine issues a year. Further details from: Mrs. G. Rollerson, 5512 Clinton St., Burnaby, B.C. V5J 2L8, Canada.

Annual General Meeting

In accordance with Rule 6, I hereby give notice that the Annual General Meeting of the Cactus and Succulent Society of Great Britain will be held on Saturday, 24th March 1979, at Queen Elizabeth College, Campden Hill W8 7AH, commencing at 2.30 p.m.

The attention of members is drawn to Rule 5, sections (d) and (e), which define the procedure to be followed in the election of Officers and Council. The Rule requires that the President and the several Vice-Presidents be elected annually by a show of hands at the Annual General Meeting. The Chairman, Honorary Secretary, Honorary Treasurer and members of Council to fill the vacancies resulting from the retirement of members who have completed their three-year term of office will be elected by postal ballot in the event of the number of nominations exceeding the number of vacancies.

Nominations are therefore invited for the offices of Chairman, Honorary Secretary, Honorary Treasurer and three members of Council. These nominations must be in writing and must bear the signature of a proposer and seconder and be accompanied by the written and signed consent of the person nominated. Such nominations must be in the hands of the Honorary Secretary not less than nine weeks prior to the Annual General Meeting, that is, not later than Friday, 19th January 1979.

The following are due to retire and are eligible for re-nomination:—

Chairman	Mr. W. F. Maddams
Honorary Secretary	Mr. R. H. I. Read
Honorary Treasurer	Mr. D. R. Hunt
Members of Council	Mr. N. Taylor, Mrs. A. Whicher

In the event of the number of nominations exceeding the number of vacancies, a ballot paper will be circulated to paid-up members not less than six weeks prior to the Annual General Meeting.

R. H. I. READ
Honorary Secretary.

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