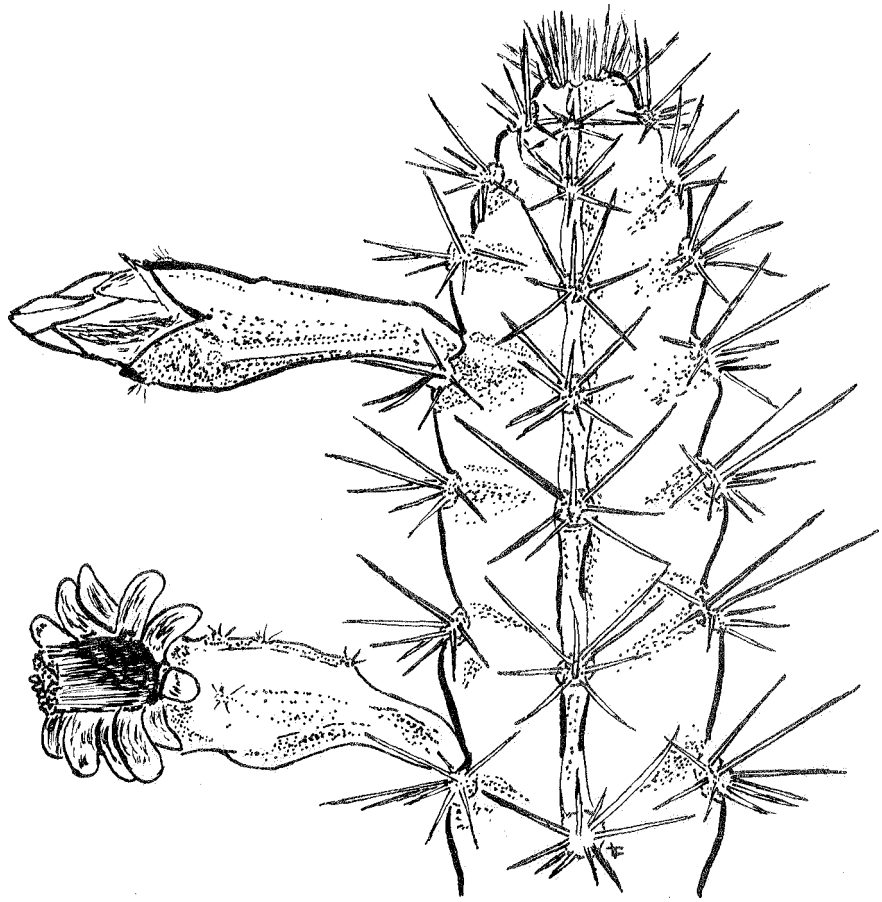
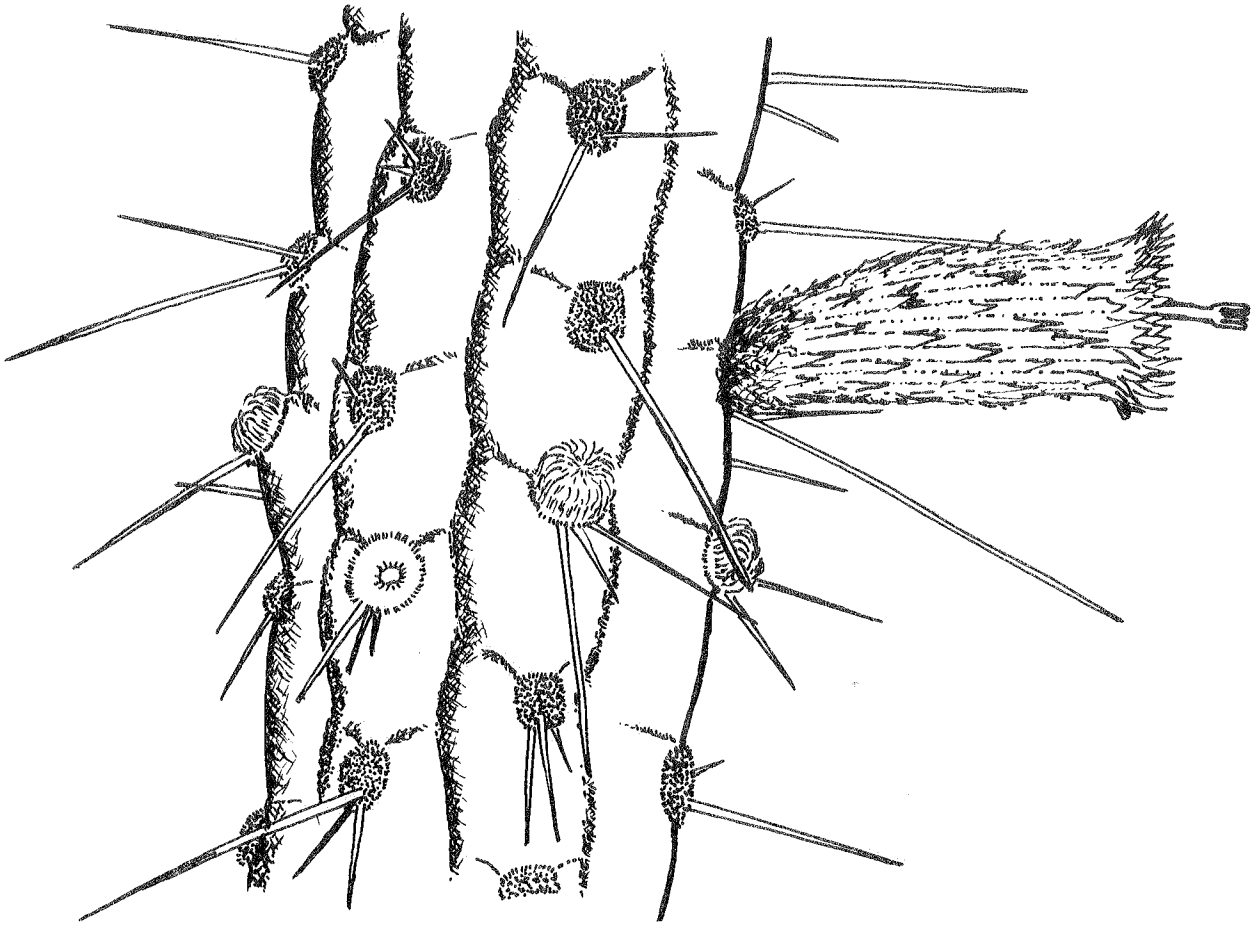
THE CHILEANS '82

VOLUME 12 NUMBER 41



Calymmanthium substerile

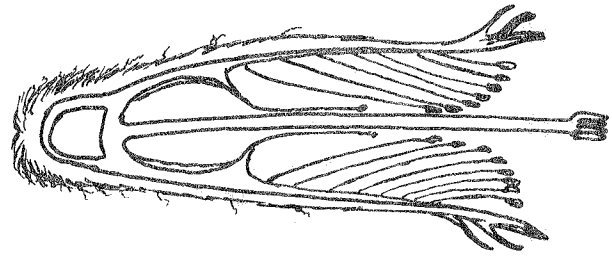
Collection - Jardin Exotique Monaco

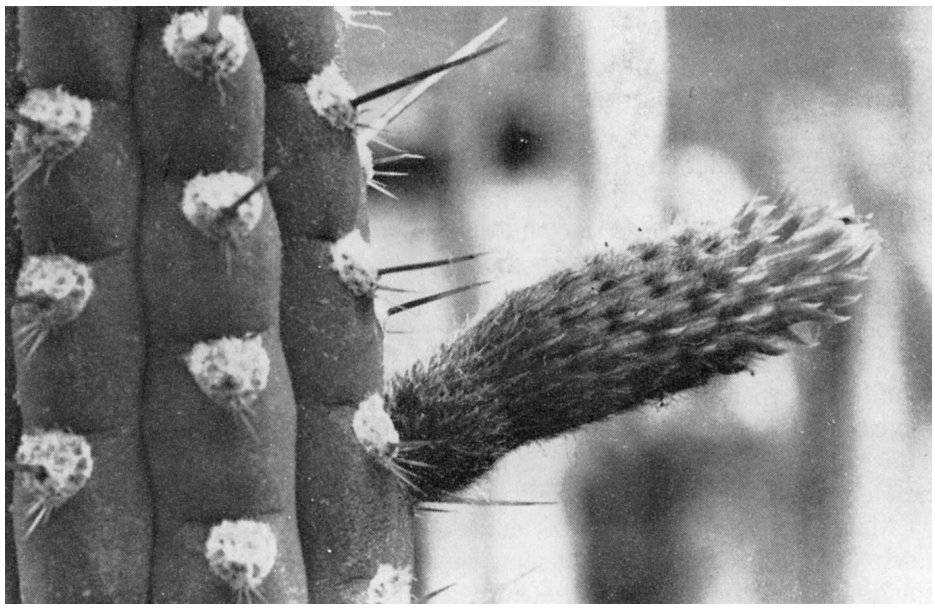


CLEISTOCACTUS LANICEPS

Collection - G. CHARLES

Natural size





CLEISTOCACTUS LANICEPS

Collection - A F H BUINING

Succulenta 45. 2. 1966

CLEISTOCACTUS LANICEPS FLOWERS **From G. J. Charles**

A few years ago I purchased a seedling Cleistocactus from Holly Gate nursery, under the name of C. villamontesii. This particular plant appealed to me as it seemed to be rather different from any other Cleistocactus that I knew. On many plants of Cleistocactus the areoles and spines are so numerous that you can only see the general outline of the body; on this stem, which was about 1½ inches thick, there were only 8 ribs, the areoles were fairly wide apart and the spines were not very numerous, so that altogether you could see almost all of the body. It was easy to see that there was a furrow across the rib right above each areole, a furrow in the shape of a shallow vee with the point of the vee immediately above the areole. This furrow ran across the apex of the rib but not right down to the groove between the ribs. The crown of the shallow tubercle lay below each areole so that the areole gave the impression that it was sitting on a sort of platform and facing more or less upward rather than facing outwards. The areoles themselves were fairly large, with pretty long yellowish felt, about 7 mm in diameter and they were 18 mm from the top of one areole to the top of the next one on the same rib. The spines were a pale yellow colour and were variable in number. Generally there was one long downward pointing spine up to 30 mm long from the lower part of the areole. There were also up to 5 shorter spines up to 10 mm long, randomly arranged. Some areoles, especially the older ones, also had fine short spines up to 3 mm long which were sometimes quite numerous.

This plant amazed me by coming into flower when it was not much more than one foot high, and still solitary. The buds all appeared on the top few inches of growth; they were flat-topped and covered in neat, short wool of a somewhat reddish-brown colour. The flower was about 1½ inches long and ½ inch in diameter. About a third of the flower near the stem tapered slightly and was inclined upwards a little, the outer two-thirds of the flower was cylindrical and horizontal. The base of the flower was a dark reddish-brown colour; the tube and petals were a bright red, possibly slightly orange-red, with a host of small greenish-yellow scales. The very tips of the outermost petals were also greenish-yellow, the outer petals red with yellow tips, the inner petals red at the base and the outer half yellow, the innermost petals yellow, red at the base. There was a large number of short, narrow petals in several rows at the mouth of the flower, the outermost row being almost fully open, the outer row half-open, the innermost row more or less continuing the cylindrical line of the tube. The outer surface of the tube was divided into narrow flutes, slightly convex, by a series of fine parallel grooves; there may have been as many as twenty-two such flutes along the length of the tube. The scales on the tube were arranged in a typical spiral pattern, the base of each scale being almost as wide as the flute on which it lay. At the ovary, the thin scales lay close against the tube but from there to the corolla the scales became steadily thicker and steadily more of a rump-backed or tortoise-shell shape. There was a fair amount of short brown hairy wool on the exterior of the ovary, enough to cover the base of the flower completely. I suppose the flower may well have been red right down to the base and it could be just the dense hairy coat that made the ovary look dark reddish-brown in colour. There was a fair amount of hair in the axils of the scales above the ovary, reducing towards the opening until there was very little hair associated with the outermost scales. The cream-coloured anthers were level with the mouth of the flower, and almost filled it. The pale yellow-green style and greenish stigma protruded some 6mm or so from the mouth of the flower, with the stigma lobes held loosely together in a bunch. When the flower was sliced in two, a large nectar chamber was disclosed at the bend in the tubee. The ovary and nectar chamber together were about as long as the remaining length of flower tube.

The flowers appeared a few at a time more or less continuously from July to October. The flowering did not seem to be much affected by the weather, except that better weather seemed to cause the flowers to open. The plant first flowered when it needed a new pot, but potting it on did not seem to make any difference to its production of flowers. It is my experience that Cleistocacti flower best when growing strongly. Perhaps I should mention that I put a mark on my pots so that if they happen to be taken off the staging or moved around for any reason they can be kept facing in the same direction when they are replaced. Because of this I can say that the flowers were not confined to any particular compass direction.

I am now quite certain that this Cleistocactus is not villamontesii — but what is it? Presumably it is nothing to do with the group of species with the long S-shaped flowers around chacoensis-baumanii-santacruzensis, which was featured in the Chileans some time ago. Obviously it is not one with numerous ribs and many spines like straussii, tupizensis or tarijensis. It is nothing to do with the slender-stemmed and fine-spined candellila or pojoensis. From the body and flower habit one can rule out micropetalus and morawetzianus. Again it is not of the wendlandiorum type. But what is it? Perhaps Tom Lavender could help?

. . . . . From Mr. and Mrs. Lavender

We have had a look at the slides of Graham Charles' Cleistocactus and noted the rib count, then we went carefully through all the descriptions of Cleistocactus in Backeberg's Die Cactaceae. As far as we could see, the only species with a description that could match this plant is that of C. laniceps. We do not have a plant of this species, nor do we have anything among our slides which shows this species in another collection. There are various names for Cleistocacti for which we do not have a description, so we could not be absolutely certain that this particular plant really is C. laniceps.

CEREUS LANICEPS By K. Schumann

Translated by H. Middleditch from Gesamtbeschreibung der Kakteen 1904.

Columnaris ramosous, costis 9 modice altis obtusis; aculeis radialibus paucis vulgo 3 solis subulatus saepe superpostis; flore tubuloso-infundibuliformi brevi, ovario squamoso lanato; bacca parva globosa lanuginosa.

Body upright, columnar, up to 4 m high, branching. Stem more or less 5 cm thick; ribs 9, vertical, blunt, separated by shallow, acute, 1 cm deep parallel furrows, faintly jointed by cross grooves. Areoles large, even the non-flowering ones of 6 mm and more in diameter, covered with a convex cushion of grey woolly felt, which becomes golden brown on those with flower buds. Few spines, usually three, from the upper part of the areole, often disposed in a line one above the other, stiff, straight, awl-like, cylindrical, rarely more than 1.5 cm long, grey.

Flowers at the side, singly from the areole, usually from only one rib, the others completely flowerless; overall length of flower 3.5 cm. Ovary almost globular, 5 mm long, furnished with awl-like scales from whose axils abundant brown wool protrudes. Flower sheath probably red, tube funneliform, somewhat curved. Tube elongated, bearing awl-like, somewhat thickened scales, from whose axils appears thick curly wool. Outer petals lanceolate, pointed, somewhat thickened; inner ones relatively very narrow lanceolate, pointed, barely 8 mm long, membranous. Anthers projecting, in two groups, the lowest about 3 mm above the bottom of the body of the flower, the upper inserted in the throat. Fruit globular, red, very thickly covered with wool, barely 1 cm in diameter. Seeds 1 mm in diameter, lenticular, circular or angular outline, thinner than broad, dotted with parallel lines of fine lacunae, shiny black.

Geographical distribution: Bolivia, near Tunari in the cordillera, 1,300 m above sea level; found by Otto Kuntze. Flowering in May.

CLEISTOCACTUS LANICEPS (K. Sch.) Gosselin 1904

Translated by H. Middleditch from "South American Cacti" Vol. 2 by F. Ritter.

I provide information supplementary to Schumann's description:- Body with numerous branches, especially from below, often in the lower parts semi-procumbent and then becoming 2-3 m high; stem 3-5 cm thick, grey-green, ribs 8-11; areoles about 5-7 mm diameter with prolific orange-brown felt later becoming grey, more or less 1 cm gap between adjacent areoles; spines straight, honey yellow, later going grey; radial spines only a few, needle-like, outstanding, around the lower margin of the areole, usually 2-3 mm long, central spines 1-3, awl-like, projecting 5-20 mm long, occasionally diminuitive or even absent. Flower 3-4 cm long, straight, sloping upward somewhat adjacent to the stem; pericarpel and tube red with grey-green scales, with abundant grey-brown wool around the base; tube cylindrical with much less wool; nectar chamber 4-7 mm long, 2-5 mm broad, with slight inward thickening of wall at the exit, without a diaphragm but half closed by the basal stamens. Filaments whitish, anthers cream, initially standing up to half height of the petals; style yellowish-white with 5-8 grey-green stigma lobes in the mouth of the flower or projecting slightly. Petals 5-8 mm long, 1.5 to 3 mm broad, pink, yellowish-pink or red with yellowish tips, which are not curved outwards, but rather inwards, the outermost petals deeper red. Flower opening very narrow. Fruit about 15 mm long and 20 mm broad, red or greenish-red, opening above when ripe. On account of the scant number of ribs, the simple structure of the flower and the manner in which the fruit opens, this is possibly the most primitive species of Cleistocactus. FR 603.

CLEISTOCACTUS LANICEPS By A. F. H. Buining

Translated from Succulenta 45.2.1966, by H. Middleditch.

For quite a number of years now I have owned a Cereus under the name of Cleistocactus laniceps. Planted out in the centre bed with a free root run it has grown well with side branches reaching up to a height of 1 m. Of flowers, nothing was to be seen. My plant compares fairly well with Schumann's description except that the so-called spines sit not on top of, but in the lower part of the areole. At that time the description of a plant would be made from only one specimen and we now know well that the disposition of the spines is not usually an essential requirement.

Imagine my pleasure last spring when some areoles becamee really woolly and golden brown and gradually went on to form buds and not side shoots. The flower, which finally made its appearance was indeed typical with thick hair, turgid scales and the flower petals really small and narrow, inconspicuous, whilst the whole flower tube which is indeed reddish, was covered in a fleece of reddish brown wool, so that no doubt remained any longer about the name. Much to my regret I did not have the opportunity to examine the flower section but I hope for flowers again this year. Since according to Backeberg in his Die Cactaceae Vol 11 p. 1018, this species has not been found again up to the present time, it seems to me that this tentative publicity is fairly important.

. . . . . From H. Middleditch

Schumann tells us that this plant was found by Otto Kuntze; in his "Pflanzenwelt der Bolivischen Anden" Herzog tells us that Kuntze was in Bolivia in 1891. Kuntze himself refer to his trip from Cochabamba to Santa Cruz, but any information as the the extent of any other of his travels from Cochabamba or concerning the location of Cleistocactus laniceps, seems to be conspicuous by its absence.

. . . . . From J. Medway (At the Chileans' Weekend)

This slide was taken in Vasquez' back garden and the plant with the tall, slender stem appears to be a Cleistocactus but I do not recognise it as any particular species. I do not believe that we saw a similar sort of plant on our trips out from Cochabamba to the east and south.

. . . . . From G. Charles (On the above occasion)

Hasn't the stem on that tall plant got the same sort of cross-grooves above the areole that I have seen on my Cleistocactus? Is it possible that it is the same sort? Where does C. laniceps come from anyway? From somewhere near Cochabamba?

. . . . . From D. W. Whiteley (on the same occasion)

Backeberg says that Cleistocactus laniceps comes from Tunari; whereabouts does Tunari lie exactly from Vasquez' back garden?

. . . . . Response from J. Medway

Tunari is one of the highest peaks in the Andes which lies more or less to the north of Cochabamba, so that the slope rising from behind Vasquez' back garden that you can see in the slide is more or less at the very foot of that moutain.

. . . . . From A. W. Craig

In Ritter's book of South American Cacti, there is a description for C. laniceps FR 603 but as far as I can see there is no habitat location given. However, for C. laniceps v plurispinus FR 603a, a location of Inquisivi is given. Ritter also says, in another part of the book, that Cephalocleistocactus and C. laniceps grow alongside each other. What does this tell us?

. . . . . From H. Middleditch

Schumann's original description for C. laniceps quotes a habitat altitude of 1,300 m; since the floor of the Cochabamba basin is nowhere lower than 2,400 m then this plant must have been collected by Kuntze from the Ayopaya side of Mount Tunari. This sort of location also follows from Ritter's comment that C. laniceps is found growing alongside Cephalocleistocactus, which also emanates from Ayopaya province. Then Cardenas (below) gives us an actual habitat location for C. laniceps in Ayopaya. It appears that the route from Cochabamba over the Tunari ridge and then via Moracheta to Independencia is a long established and well travelled trail, so that it would not be surprising if it was indeed used by Otto Kuntze in the course of his collecting trip in these parts

Ayopaya province lies within a basin that is surrounded on three sides by mountain ranges of very great altitude, reaching up to 5,000 metres in height. On the fourth side, to the north-west, it is enclosed by a spur from the main range. In this way it becomes partially isolated from the constantly wet climate of the eastern flanks of the Andes, so forming a miniature version of the Rio Grande basin which lies to the south of Cochabamba. The basin itself is deeply cut about by the Ayopaya river and its tributaries, into numerous steep-sided valleys separated by high ridges. Some areas of this basin are exposed to persistent rain-bearing winds and thus support the growth of dense tropical forest; other patches are in a local rain shadow and more xerophytic growths prevail. The traveller must tackle difficult gradients over unmade roads which are almost impassable in the wet, hack his way through trackless forest, or stick to the limited choice of passable routes. With a flora changing from slope to slope and so difficult of access, it is hardly surprising that more real novelties have appeared since about 1950 from this part of South America than from any other comparable region.

. . . . . From R. Ferryman

When Vasquez made a brief stopover here, we had a look at a selection of the slides which he had taken in habitat in Bolivia. One of these was of Cleistocacctus laniceps. The flower was quite like that in the illustration taken from Winter's catalogue, but the body of the plant was quite greyish in colour. The cross-grooves over each areole could be seen very easily but I would not describe them as strikingly obvious.

. . . . . From P. Allcock

I do have a number of species of Cleistocacti and it is rather surprising when you really look closely just how many of them you can find which show signs of a cross groove above each areole. There are some nice grooves on C. ritterii which almost divide the rib into tubercles. There are also grooves on C. candelilla and on C. rojoi grown from seed. One of my Cleistocacti came from Sargant who was very helpful and sent me some interesting bits and pieces when I asked for "any unusual Cleistocacti"; it came as C. samaipatanus. On looking very carefully it is just possible to see faint cross grooves all the way down the stem. Where the ribs are rather broader and flatter nearer the base, the cross groove can be seen rather more easily although in fact it is probably no deeper than those higher up the stem, but near the base some of the cross grooves do approach pretty close to the groove between the ribs.

After a request to Knize to send a couple of specimens of each sort of habitat collected cacti that he had available, one plant eventually arrived, named as C. buchtienii. In this plant, new tubercles appear almost like a series of ledges with aeroles growing on each, facing almost upwards. The cross-grooves on the topmost inch of the stem look as though they run right across the rib, but roughly one inch from the very top of the stem where the areole and central spine begin to face more outwards than upwards, the cross-groove is no longer touching the base of the ribs. The habitat stump is badly scarred around the areoles but in places the cross-groove is visible right down to soil level.

On C. morawetzianus there is a very clear, deep cross-groove, which does not run right down to the base of the ribs. On C. reae grown from Kohres seed, the plant has narrow ribs and fine, short spines on areoles some 7 mm apart. There is a faint cross-groove although it is very difficult to see it; on previous years' growth it has practically disappeard. C. micropetalus has a short faint groove over the top of the areole which is nearly the width of the rib when close to the crown; further down the stem it is difficult to see the cross-groove which is still short but the rib is much broader. On C. smaragdiflorus there does not appear to be any groove at all, but when examining the stem very meticulously there is a faint line to be seen, this time half way between the areoles, which is more like a darker coloured line than a groove. On C. mendozae ex Sargant, which has 21 ribs, there is again a faint groove which is very difficult to see. The same comment could be made for C. iothanus and C. ressinianus. All this seems to suggest that a cross groove above the areoles is the rule rather than the exception in Cleistocactii.

. . . . . From H. Middleditch

It seems to be more a question of how readily the cross-grooves catch the eye rather than whether they are there or not. Having been prompted by an obervation from Francis Fuschillo to take a look at some slides of Cleistocactus seeds, a preliminary examination would suggest that they all look very much alike — smooth, black, glossy seeds with an angled hilum — with the exception of C. laniceps, where the seed testa is tuberculate. Any seeds of Cleistocactus would be welcomed in order to advance further the study of this apparent anomaly.

MEMOIRS OF A NATURALIST By Prof. Martin Cardenas

Translated from his autobiography by H. Middleditch

When I returned to La Paz in August 1935, the war with Paraguay had already terminated. In La Paz I met up with my ex-assistant Dr. Urey, who suggested a trip to his estate in Sailapata and accommodation for as long as I needed for the collection of plants. For his part, he had already collected some 100 numbered specimens which were kept in La Paz. On seeing this material, I was very enthusiastic and we went to Sailapata via Eucalyptus, Quime and Inquisivi. On the estate I met Dr. J. Urey, father of Nathaniel, a man of great energy who, in a forested and uninhabited region, had built a fine country house of two storeys and organised a prosperous agricultural property whose production of maize and other crops rich in sucrose and starch, supplied a distillery which he had built. The alcohol produced was taken by cargo animals to Quime to be sold wholesale.

During the days following my settling in at Sailapata, I went out on horseback with my friend Nathaniel to collect plants in various directions . As usual, we spent all the day in botanical work, carrying our luncheon in our saddlebags. The flora of these places was very variable on account of the differences of altitude and level of humidity which existed. At this time I was still no expert in the taxonomy of the Cactaceae, Amaryllidaceae and solanum as I am now. One day we went riding to the high cordilleras, reaching a ridge at a height of 4,000m., where it was very humid. There I collected a wild potato with broadly spatulate leaves, almost simple, and with dark purple flowers, a plant which, in my view, was nothing but a Solanum sp. I also saw a Puya in flower which I wanted to photograph. Just as I had finished setting up my large camera, a Zeiss Ikon Ideal 10 x 15 on its tripod, a flash of lightning struck very close to us, frightening our horses and terryfying us to the extent that, although unharmed, we lay down upon the ground. When we recovered from the fright, we took the photograph that unhappily later proved to be out of focus and we returned rapidly to the house, arriving when it was already growing dark.

The wild potato was a new species which was described and published only in 1958 with the name of Solanum ureyii. The puya, that would turn up again on the other flank of Tunari on the descent towards Morachata, I sent as suitable herbarium material to the well-known specialist Dr. L. S. Smith. The result was also a new taxon which today is called Puya cardenasii. The scape of this handsome plant is barely 30cm. in length and the inflorescenee has the appearance of an enormous pineapple of more than 60cm. in length, with large and showy pale blue flowers. Of all the species of Puya with which we were familiar in Bolivia, the two most attractive by reason of the beauty of their inflorescences, were that which I have just described and puya tristis, from the ridge of the humid cordillera on the road to the Villa Tunari.

One of the sections of the estate of Sailapata which offered different phytogeographic formations was Llavetica. We all went there, Dr. Urey, his brother Raul, a student from Independencia, Larrazabal, who was spending his vacation in Sailapata, and I. We took two saddle horses and a pack mule and we spent four days living very agreeably in a canvas tent and cooking our meals, within surroundings of absolute tranquility, very far from the noisy world. Our sole occupation was to penetrate into the woodland and collect plants. This sort of return to nature with all the comfort of civilised life kept us in a state of buoyant physical health and gave us a unique spiritual satisfaction. I, as a botanist, felt very fortunate to come across so many interesting species, some of them new to science.

Another section of Sailapata where we also collected extensively was Curcurani. In these dry parts of the property were various cacti of which I collected neither herbarium specimens or photographs. Recalling it now, I think that one of these columnar and branching cacti was none other than Samaipaticereus inquisivenusis. The genus Samaipaticereus, discovered in 1950, was published in 1952 in the "Cactus and Succulent Journal of America". In this enormous estate there were some very picturesque places. Thus, on the route from the estate house heading towards Llavetica, beside a broad road and near to a wooden bridge, there was a grotto in which the water fell down a slender fall and the long flagelliform branches of the cactus Acanthorhipsalis paranganiensis (which I described 15 years later) dropped like a curtain in front of this grotto.

Near to the estate house, there remained standing one gigantic mountain pine where there ought to have been a grove of these trees. It had a trunk of more than one metre in diameter and a height of more than 15m. Dr. Bucholz described this pine on the basis of a herbarium specimen sent to him, as Podocarpus cardenasii. The groves of these pines were felled for the construction of the estate house and also for building the alcohol distillery. . . . . .

The Holy Week holiday arrived and we were invited, Ing. Gandarillas and I, to Choro by Sr. Gasser, son of the owner of this extensive estate. The University lacked any suitable transport for study trips and for this reason Sr. Gasser arranged to fetch us in a truck hired by him for transporting the potatoes from the estate to Cochabamba. There went also with us a student graduate of agronomy, Enrique Rocha, a keen explorer who on his long journeys through the waste moorland of the Andes, collected some interesting species for us.

At Casa de Vinto, I came across several wild potatoes such as Solanum decurrentilobum, S. toralapanum and others. There we waited for Sr. Gasser, who presently drove us to his estate house situated on the other side of the Rio Cocapata. We used a mule and four horses for this trip. The extensive estate of El Choro is opposite another equally large establishment called Cocapata, both situated at an altitude of 3,000m. with deep soil and a humid atmosphere on account of the proximity of the woodlands. At the entrance to the estate house, we noticed the presence of several species proper to the ceja de Montana, such as wild tobacco, Nicotiana wigandioides, then Calceolaria guntheri, Calceolaria chelidonioides, as well as that shrubby member of the Solanaceae with handsome yellow flowers, Acnistus guttatus.

Senor Gasser, who administered the estate with great energy, promised us a comfortable lodging to make our stay enjoyable on that occasion. El Choro produced about 8,000 loads of potatoes, utilised largely for seed since they had been infected neither by Phytopthera nor viruses. In order to establish a large breeding farm for choice sheep, both father and son had followed a progressive plan concerning the technique of cattle ranching devised by Sr. Aguilar, the cattle raising expert from the School at Chuquibambilla in Peru. After we had left El Choro, a Miss Brook also arrived there, spending some days in collecting plants. During our stay here we went around the estate which presented ecological conditions appropriate to the cultivation of potatoes. Crossing a small river below the estate house, I came to a formation of "ceja" among whose exuberant flora stood out a tree full of yellow flowers, Gaiadendron punctulatum. The area situated N.E. of the house was called Alisuni, because the alder Alnus jorullensis abounded there. Between the low bushes and thickets grew the wild potato Solanum capsicibaccatum.

We had a rough idea that at one day's journey by mule from El Choro in the direction of Cotacajes, there was a tropical xerophytic flora. In order to get some idea of the phytogeographic formation, I requested Gandrarillas and Rocha to go to the place named Naranjito within this zone. Senor Gasser provided them with mules, provisions and a guide. After two days, these determined travellers returned, bringing a few plants, amongst them a bush with broad leaves and lilac flowers which I could identify as Lantana glutinosa, and also Tibouchina calycina. The most interesting discovery was without doubt that of a small spherical cactus with yellow flowers and areoles varying in numbers of spines which I described much later under the title of Rebutia glomeriseta.

When my two companions left for Naranjito, we — that is, Sr. Gasser, his wife and I — accompanied them as far as the commencement of a rough slope. Up to that point we had passed through a very humid woodland with muddy soil, called El Carmen. In this woodland we came across a tree commonly called "verdologa" and which was Rapanea guyanensis. The trees in this place were completely covered with moss and with numerous epiphytic Bromeliacaeae and Orchidaceae. Amongst the former, I identified Tillansia fusco-guttata, which I had collected in 1935 at Sailapata at 2,700m. There were also in flower various handsome Orchids which I could not identify. I think that this humid woodland must contain various taxa, perhaps new, of these plants sought after by those with an interest in their cultivation. The beginning of the slope to Naranjito was very alarming even for those on foot. I attempted to follow this track and after half a kilometre I had to sit down, sliding with my hands for support on the sides of this track for vizcachas. I returned to rejoin the Gassers and go back to the estate house.

At the time when the travellers returned from Naranjito, we prepared to return to Cochabamba, where Sr. Gasser also travelled with us in his jeep. We went to El Choro by mule the next day and reached Casa de Vinto at 11 a.m. Here was the jeep which carried Senora Hasser, Gandarillas, Rocha and I in the direction of Cochabamba. Gandarillas and Gasser had to work hard with a spade in order to prevent the jeep being left hung up between the deep tracks left by the trucks with their cargoes of potatoes. We reached Cochabamba at 7 p.m. without incident, after having completed a very interesting and profitable trip.

In June of 1949, I undertook a new trip to the province of Ayopaya accompanying the Professor of Soils at the Faculty of Agronomy, Jorge Espinoza, who at this time also fulfilled the office of Director of Irrigation at Cochabamba. We set out in an Irrigation truck and on that day we reached Morochata where we were hospitably received as guests in the house of Dr. Juan R. Torres, an exile from Chile.

With the assistance of the Alcade of Morochata, we obtained a couple of scraggy mules, which were very troublesome to ride, for our trip to Independencia. We hastily despatched these wretched animals with a peon, early the following morning, to the Lachiraya end of the high road and towards where we could travel no further in our vehicle. From Lachiraya, some 10km. distant from Morochata, we proceeded on foot as far as Puente Pilatos where we came across a splendid cactus with yellow flowers and a long acicular spines which shortly afterwards I described as Parodia ayopayana. Crossing this rustic bridge, the road continued along a gulley of loose and broken slate and which was difficult to cover without slipping, even on foot. In the whole of this area, there were dense thickets of another cactus with leaves, very similar if not identical to the species which I described as Peireskia diaz-romeroana which I came across along the old highway to Santa Cruz, around Perez and in all the section from Comarapa to Saipina. The type of my species with a purple-magenta flower was from Tcako Laguna in the neighbourhood of Perez. In the vicinity of Puente pilato, there were plants with purple-magenta flowers and also some with white flowers.

Otto Kuntze, who collected a great deal in Ayopayo, came across the variety with white flowers which Schumann diagnosed in 1891 as Peireskia weberiana. In the whole of this region and even before Puente Pilatos, there were two columnar cacti which turned out to be new ones and which were published later with the titles of Cleistocactus ayopayana and Corryocactus ayopayana. About 2 p.m. we entered into the basin of Yayani, the extensive estate belonging to the Monastery of Santa Clara. We came across a small copse of cacti formed essentially by two columnar species — Cleistocactus laniceps described by Kuntze and Cereus huiluncho by ourselves.

Continuing with our journey, we arrived at the other hollow called Yakakano at 1,965m. above sea level and with abundant thickets of Peireskia weberiana. The ascent of the ridge of Yanok was very exhausting for my wretched mule. A friend who knew of our trip and lived in Santa Rosa, had the brilliant idea of sending a peon with a cold meal and a bottle of maize chica which we received at the start of our ascent and which alleviated our weariness and oppressive thirst on a very hot and rough road. Some seven kilometres from the Rio Yakako there was the little town of Santa Rosa, past which we proceeded as far as the house of the brother of our travelling companion Julio Cesar Crespo, passing a very comfortable night there.

On the following day we went down to the Rio Santa situated at 1,800m. in order to go down again later to Independencia, capital of the province of Ayopaya. On this slope, I came across the pine of the monte, Podocarpus cardenasii, which Dr. J. T. Bucholz described in 1948 on the basis of a specimen which I collected at Sailapata in January of 1936.

My travelling companion Jorge Espinoza had informed the authorities at Independencia of our trip, so that when we entered this village at about 11 a.m., we were received by the Subprefect, the Alcade, and other authorities of the provine, as well as the girls' and boys' schools with their colours and headed by a band of musicians. There was an official reception given by the Alcade, bidding us welcome in the name of the town, and by the Subprefect Sr. Soria in a protocol speech. I expressed thanks for this unexpected welcome giving an account of the object of my study trip through the different regions of Bolivia and deploring that there was not a glimpse to be caught of new botanists following on behind me who would explore our stupendous Andine flora in the future. We remained in Independencia for two days and then returned to Cochabamba.

On 20th November, 1956, I left La Paz accompanied by the Ingenieros Alandia and Zavaleta, with Quime as objective. Between Pongo and Quime, at an altitude of 3,500m. we came across very little cultivation of potatoes, it being almost all of the same variety. This very humid section is interesting from the botanical point of view. In July 1921 there passed through here the Mulford Biological Expedition en route to the confluence of the rivers La Paz and Miguilla. Between Pongo and Quime I came across two species discovered by Dr. White of that expedition: Nicotiana tomentosiformis and Echeveria whitei. The first is a wild aboreal tobacco of ornamental habit and abundant yellow flowers which were diagnosed by Dr. T. H. Goodspeed, the well-known American geneticist, who demonstrated experimentally the hybrid origin of the cultivated tobacco Nicotina tabacum, crossing the arboreal species which I have just cited, with a herbaceous species from the north of Argentina and the south of Bolivia, Nicotina sylvestris. The second species is a member of the Crassulaceae with a rosette of leaves and very attractive reddish flowers. Also attracting my attention in this stretch, the abundance of Digitalis purpurea, medicinal and garden plant, escaped from cultivation. Between 1926 and 1930 there existed at Pongo, the camp of the Caracoles Tin Company of Bolivia where this plant was cultivated as an ornamental species in the gardens of the houses of the employees. On this day, we arrived at Inquisivi at dusk. On the 21st November, we descended on foot some 6km. until we reached the bridge over the Rio Inquisivi, from where the road continued to Cajuata and Canamina.

The average altitude of the neighbourhood of Inquisivi was some 2,500m. and the predominant cultivation was of maize in small plots of parcelled-out land. On the slope from there to the river, the vegetation was xerophytic. We came across a "soto" similar to Schinopsis haenkei although with narrower leaflets and also various Cactaceae. There also abounded a branched columnar cactus of 3m. in height, which I identified as Cereus huiluncho although I did not see its fruits. On the edge of the river and in a sort of humid gallery, hung an Ophiorhipsalis and an Acanthorhipsalis which I could not identify. On the other side of the bridge, there appeared another columnar cactus of 2 to 3m. in height with cylindrical stems, low ribs, large and prominent areoles like Cleistocactus laniceps. and subulate spines, slim and short. Its flowers were narrowly funneliform with some 5cm. of tube furnished with fleshy scales and short white petals, having its mouth slightly open. The structure of the flower, corresponded to the new genus Samaipaticereus which I had described from the Puente de Samaipata, being a new species which I described later as Samaipaticereus inquisivensis.

On the same day, we went back in the direction of Oruro. Between Inquisivi and Quime, the road brought us to an exquisite fragrance which emanated from the white flowering convolvulus, Mandevilla langii, very frequent between the branches of the trees on the neighbouring slopes. On this same stretch we came across a new columnar cactus which has since been diagnosed as Cleistocactus reae, in honour of my travelling companion, Ing. Julio Rea. That night we slept at Oruro and on the following day we continued by train to Cochabamba.

. . . . . from H. Middleditch

Armed with the comment by Cardenas that C. laniceps was to be found in the basin of Yayani, I consulted the excellent map of Bolivia which came from Herr Brandt. This is a pretty large scale map and includes a great many place names that are lacking on most other maps of the country. A scrutiny of the patch between Morochata and Independencia quickly yielded Yayani. Not much further to the north was Santa Rosa and Cardenas tells us that the river here is at 1,800m. So if Otto Kuntze travelled this way and if his barometer was working correctly, then he must have found C. laniceps further downstream from Santa Rosa. Allowing for the average sort of gradient along the river, this would bring us to Kuntze's 1,300m. altitude somewhere around the parallel of 17%S. Well, well! Just there is a spot on the map called Tunari; on re-opening Schmann's book we find that Kuntze quoted the location for C. laniceps as "Tunari in the Cordilleras". With high ridges rising on all sides, a traveller at this spot would certainly consider himself to be "in the cordilleras". In his Die Cactaceae Vol. II, p. 1018, Backeberg converts the original phrase into "Cordillera of Tunari" which is definitely not the location for C. laniceps. The ecology of the two locations is quite different. Ritter does include a reference to the patch of country between Morochata and Independencia in his book "A forty-year life of Adventure". He may have seen Cl. laniceps growing with Cephalocleistocactus either there or near to Inquisivi. Both altitude and environment are fairly comparable in the two locations.

Unfortunately the ex-Brandt map does not give a location for Estancia Sailapata, but it does identity Llavecita, which Cardenas renders as Llavetica. It is interesting to read that the estate was developed in a forested region, but that there were "dry parts" within the property, the flora being very variable on account of "differences of altitude and level of humidity". The patchy occurrence of forest, grassland and xerophytic flora may be adduced by inference from several of the accounts of travel in Ayopaya which appear in this issue, but only Cardenas appears to put the situation into words. Information relating to rainfall and temperature experienced in the Ayopaya basin seems to be conspicuous by its absence. Perhaps an account of the 1921 Mulford Expedition may contain some pertinent travellogue information. So where do we find that account?

Now Ritter gives "near Inquisivi" as a location for Cl. laniceps, but Cardenas makes no mention of its presence there. For Cl. reae, Cardenas quotes a habitat "between Inquisivi and Quime". For Cl. laniceps var. plurispinus, Ritter provides a habitat location as "downstream from Inquisivi". Just what is the difference between Cl. reae, Cl. laniceps, and Cl. laniceps var. plurispinus? Is it similar to the difference in the hairiness of Trichocereus pasacana between those growing at the lower end of the altitude range and those growing at the upper end? Or similar to the differences in those Gymnocalycium from the Pipanoco basin which grow in the half-shade of a bush and those pretty well exposed to full sun? Since Cl. reae presumably comes from the above the upper margin of the forest and Cl. laniceps v. plurispinus from within the forested zone.

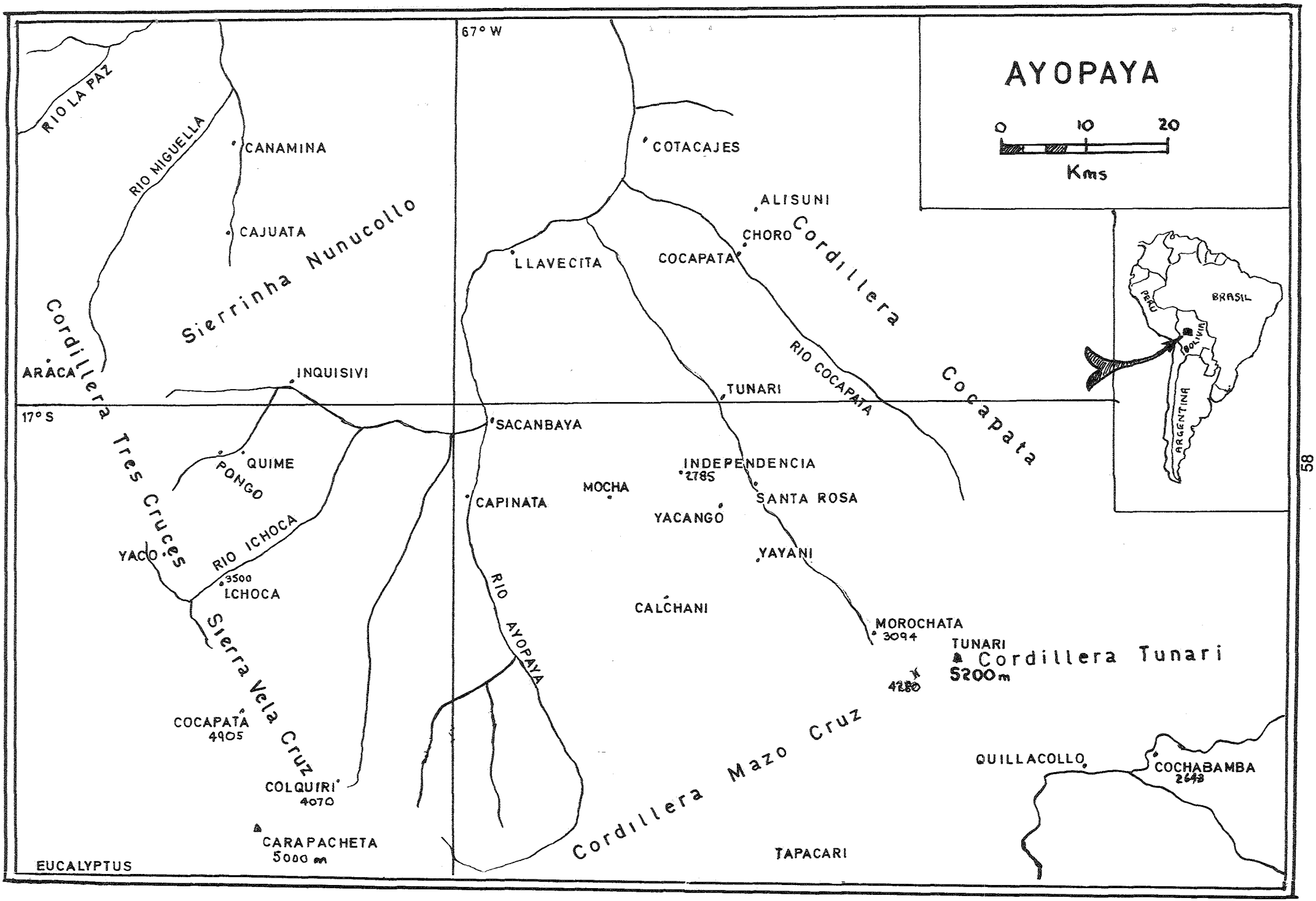
Any information regarding growing or flowering of Parodia ayopayana, Cleistocactus ayopayana, Cl. reae, Acanthorhipsalis parananiensis, Cereus huiluncho, Echinipsis ayopayana/R 244/ Echinopsis megacarpa FR 809, Cephalocleistocactus chrysocephalus, Lobivia "Inquisivi" or "Tirquipaya" would be welcome.

From A FORTY YEAR'S LIFE OF ADVENTURE By F. Ritter

Translated by H. Middleditch

Independencia 25th June, 1958.

Following a narrow path from the road between Santa Rosa and Independencia, leading, via endless hairpin bends, through completely uninhabited country in the direction of the Santa Rosa river, I was ascending a ridge when darkness fell. The moon came to my aid, so that eventually I arrived at the bottom of the gorge about 8.00 p.m. where I


AYOPAYA
0 10 20
Kms
67° W
17° S
RIO LA PAZ
RIO MIGUELLA
CANAMINA
CAJUATA
Sierrinha Nunucollo
Cordillera
ARACA
INQUISIVI
Tres Cruces
QUIME
PONGO
YACO
RIO ICHOCA
3500
ICHOCA
Sierra Vela Cruz
COCAPATA
4905
COLQUIRI
4070
CARAPACHETA
5000 m
EUCALYPTUS
COTACAJES
ALISUNI
CHORO
Cordillera
LLAVECITA
COCAPATA
RIO COCAPATA
Cocapata
TUNARI
SACANBAYA
INDEPENDENCIA
2785
MOCHA
CAPINATA
SANTA ROSA
YACANGO
YAYANI
RIO AYOPAYA
CALCHANI
MOROCHATA
3094
TUNARI
Cordillera Tunari
5200m
4280
Cordillera Mazo Cruz
TAPACARI
QUILLACOLLO
COCHABAMBA
2648
PERU
BRASIL
BOLIVIA
ARGENTINA

stopped overnight on the river sands. Despite the low altitude (I must have been at 1500m), the night was so cold that I froze in my sleeping bag. Even on the following day it was so cool that I wore two pullovers. I spent the day down along the valley; it was very trying, because the river continually rushed in its bed from one rocky wall to the other, so that one could not follow it, but must take off shoes and socks, turn trousers well up and wade through it on foot with the greatest of care; if one walked without heed, there was a danger of losing one's footing on the slippery stones and sliding into the grip of the current.

Between whiles, I opened my collected Cleistocactus fruits and washed them. Altogether on this day I made twenty crossings of the river. I had really intended to return on the next day, but eventually I decided to go on still further even though my provisions had nearly run out. In the last two days, I had only eaten a sandwich together with a cup of powdered milk mixed with water, twice a day, in order to husband my slender provisions for as long as possible. During the whole of the previous day I had seen neither a human soul, nor a dwelling, nor a domesticated animal. On the third day I made thirteen crossings of the river of which one was by a bridge, by means of which the residents of the eastern cordilleras could bring their produce over the river even in the rainy season. In addition I was able to avoid four river crossings by difficult scrambles along rocky walls. Towards midday, as I crossed to the western bank to obtain a specimen of Parodia, I saw a banana plantation opposite and also ascending smoke. Plainly someone was preparing a midday meal. Unquestionably I must be certain that I got a midday meal here, so as not to go on even further with the danger of collapsing from fatigue and hunger. I packed away the sample plants and the plant notes, forded the river and went in search of the hut, where eventually I was provided with a meal . . . he would not accept anything for the fine hospitality.

Later I continued further until the evening, when I stopped overnight in a dense shrubbery which kept out the cold winds. The next morning I arrived at a tomato plantation that had not been harvested and the fruits were spoiling in their thousands. Fortunately they were not all over-ripe so that I was able to consume a goodly number without becoming satiated. From there, I followed an upwards path and came to a hut where dwelt another recluse, cultivating the land. I was able to take breakfast with him; he too would accept nothing for his hospitality. He was kept quite busy, loading up mules with Aji, the Spanish pepper, to take them to Independencia. From there I walked further downstream, until after three further crossings of the river, I came to the confluence of the Rio Santa Rosa with the Rio Sacambaya, already twice as large. Here I again acquired some specimens and then started on the return journey. However, from there I did not take the terribly difficult way back, but instead followed a very roundabout route with a tremendous mountain ascent across to Independencia . . . .

Along the almost never-ending ascent from the mouth of the Rio Santa Rosa in the direction of Independencia, there are to be found virtually no human settlements and it became so cold that it was out of the question to spend the night out in the open. So I climbed rapidly uphill for hour after hour with my heavy rucksack and a sack full of cacti, resting only once. I did not know the height since my altimeter was kaput but I estimated that I must have climbed between 1700 and 2000m this night. In the darkness I finally came to an Indian village before the main ascent. The huts were all frightfully small and grass roofed, most of them uninhabited and shut up. Where I did find a hut occupied, I was refused admission. So I had to go on still further; fortunately the moon came to my aid. But it was freezing and what would I do about the cold when the moon went down around midnight and I had found no lodgings? I came at last to a slightly better hut where the occupant fortunately understood some Spanish and gave me shelter. He gave me a couple of sheepskins as a bed and a blanket which I laid over my sleeping bag. Within the hut it was not as cold as it was outside. Nevertheless, I was frozen in the night but I was still able to get some sleep. The man was amused as I crept into my sleeping bag which was an object quite unknown to him — he was wearing only a short vest. The next morning, I went out early on the road ahead. The surroundings were completely lacking in cacti. Finally towards noon I reached the large village of Independencia, where I obtained quarters and was able once again to eat my fill... On June 28th, around 3.00 a.m., the first lorry left Tuiri to go over the mountain pass at about 4,500m high to Quillacollo.

THE EXPEDITION OF STEINMANN, HOEK & BISTRAM IN THE BOLIVIAN ANDES 1903-1904.

Translated by H. Middleditch from Petermann's Geographische Mitteilungen 1906.2.

From the road between Oruro and La Paz we turned eastwards into the foothills of the front ranges. Through the valley of Cacapongo we reached the easy pass of Carapacheta at 4,520m. To our left rose the highest mountain in the whole region, the Cerro Carapacheta which we estimated to be 5,000m high. By numerous ascents and descents over the upper reaches of steep valleys draining towards the east (in the direction of Inquisivi) we arrived at the tin mine of Colquiri. The route then took us to the eastern flank of the Santa Vera Cruz chain, towards Ichoca. Generally it traversed slightly undulating country over an insignificant pass at Colcapata at 4405m. It was an arid, barren, stony country, often a little marshy, on the whole desolate and monotonous, which is very reminiscent of the higher central European mountains above the tree line, especially on account of the dull, misty weather.

Towards noon we came to a steep descent into the valley of the Rio Sayaquira, which flows southwards to the west of the Santa Vera Cruz massif. On the northern side of the deep canyon-like valley lies the hamlet of Ichoca, like an eagles' nest, among cultivated fields set off with some trees. From Ichoca the road goes towards Quime in an almost northerly

direction around the Santa Vera Cruz chain. To the left rise the high mountains, steep and rugged walls of quartzite andesite rock; rushing waterfalls plunge from them into the valley. Above, the view is soon lost in the clouds. To the right opens the deep, steep, acute valleys, difficult of passage and almost uninhabited, their waters going into the Yungas. Here on the east side of the mountains under the influence of the moist warm winds from the forest regions, the often impenetrable woodland rises as far as 4,000m up the mountains.

A deep pass crosses the depression between the long line of snowcapped peaks of the Santa Vera Cruz to the south and the mountains of Quimsa Cruz (Quimza-Tres-Three) to the north. A fairly good road through this pass, Abra de Tres Cruces at 4,620m, joins the hamlet of Yaco to the west and Quime on the east side. However, this road has no continuation to the west. From Yaco only a number of poor tracks lead over sandstone and through the Luribay valley up to the Altiplano. As already observed, the road from Yaco at 3,600m to Quime at 2,975m is not at all bad, even surprisingly good, especially on the eastern side in the great valley that runs away towards Quime and then further on towards Inquisivi. In its upper part this valley has a decided glaciated character: signs of impounded lakes are quite clear. Below the hamlet of Pongo, where there is a distinct end moraine, the valley narrows into a gorge. The abundant, often flower-covered vegetation, which delighted us at Quime, extended up as far as here.

(Many of the place names noted in this abstract may be located on the map of Ayopaya on p. 58).

FROM "STEPS TO A FORTUNE" M. Howell and T. Morrison

We were well into the rainy season by now but the weather took an unusual turn; the sky cleared completely and even in the east there were patches of blue between the cumulus piled up over the cordilleras. Without stopping to think for longer than it took to throw a few essential things into the back of the Land-Rover, we drove from La Paz up to the Altiplano and headed south. Halfway to Oruro, we left the main road and turned east towards the cordillera. The journey was everything we had expected: earthslides, cataracts across the road, the shoulders of bends washed away. We went through rain, hail and finally snow on the cumbre, and then in more torrential rain we slithered the 40 miles down to Quime.

In the morning we followed a street down to an old stone bridge, then we decided to drive along to Inquisivi, the village at which the road ended. The road was none too wide, the slope down on the left approached 3,000 feet in depth and varied between perpendicular and about 70°. The river continued its steep plunge invisibly below. The re-entrants into the valley side, where streams flowed down it, became steeper as we went along. About 18 miles out of Quime we crossed a tributary stream that was nearly vertical. The side of the bridge nearest the valley wall was 10 feet above the falling water; the other side, eight feet away, was more than five hundred. Inquisivi nestled on a narrow ledge that interrupted slopes approaching perpendicularity; it was an adobe Indian village, attractive with trees. We enquired about the trail to Sacambaya and it was explained that as the lower valley was flooded, we should have to follow a higher and longer route that would take two days to cover. The next day, two mules and a horse were waiting. In an hour we had descended below cloud level and were able to see the river and part of the valley along which we should go. By the time we came to a place where the trail went down into a deeply flooded part of the valley, the air was uncomfortably hot and insect-filled. From here a minor trail began a steep climb up the valley's wooded flank; two hours and 20 minutes of steep loose rock without one break in the gradient, but it was dry and the higher we climbed the cooler became the air. At dusk we reached a high pasture and an Indian village, where we camped. We set off at dawn, in thick cloud and rain. But by mid-day the cloud was lifting and when we came to the crest of the scarp overlooking Sacambaya we could clearly see the site nearly 3,000 feet below. The buildings, hidden by trees, were opposite the mouth of a river which joined the Inquisivi river from the south. On our map this was called the Ayopaya. Tony took photographs of the surrounding countryside, and we began the descent. For two and a half hours the grade flattened and the trail led through young trees to the river's edge.

. . . . . From H. Middleditch

Accompanying the above description is a photograph which appears to have been taken from the edge of the scarp overlooking the broad valley at the junction of the Inquisivi and Ayopaya rivers. It provides a superb panoramic view of the locality. Trees clothe the sides of the valleys up to the altitude of about the camera viewpoint, above which the treeless slopes rise almost as far upwards again. It seems likely that the village of Inquisivi will be located just above the tree line, that is, at a similar altitude to the pasture on the traveller's route to Sacambaya. There will be fewer problems in pursuing agriculture beyond the forest's margins, as well as fewer problems from the forest's insects. Cardenas states that Inquisivi is at 2,500 metres altitude so the local tree line is probably at this level. It is still difficult to understand where any xerophytic flora fits into this environment.

ADVENTURES IN BOLIVIA By C. H. Prodgers

On the 2nd of May, at the beginning of the dry season, I left Cochabamba with my saddle horse, pack mules, and Indians. The first day's march brought us to Anacoraira, below the Turani range of mountains, where we camped for the night. The next day we climbed a long steep path up the mountain, passing a good many Indians and llamas. We crossed the

Turani pass in good weather at 15,000 feet. The height of Mt. Turani is about 17,000 feet. We pitched our tents on the other side of the pass at 12,000 feet. There was plenty of grass about and running water. It froze hard all night and in the morning the pools were frozen over with an inch of ice. We started down the mountain through a pleasant fertile valley of long flats covered with grass. There were streams running in all directions and on either side low hills covered with small shrubs and grass. Only a few habitations were to be seen and near them cattle, sheep, horses, mules and llamas were grazing. At a place called Morochata I hired a mud hut for myself and stayed the next day; where we replenished our stocks. We got the loan of an oven and the cook made bread.

Next day we continued the journey and after a few miles came to the foot of the Santa Rosa mountains. The path up the mountains was a long one, but not too steep, and the ground at the top of the pass was covered with a thin layer of frozen snow. The height of this pass was 16,000 feet. The path down to the river was long and winding, through partial forest, with very few birds and not many flowers; it was nearly nine miles from the pass to the river. None of the land on eithe side appeared to be occupied at all and we met nobody on the road. We decided to pitch the tents just across the river where there was plenty of grass growing on a wide bank and up the hill on the other side, with plenty of wood and water near.

The next day, after two hours and a half's marching up hill and down, we got to the top of another range of hills. At the bottom was a wide green valley; as we came closer we could see that it was very swampy in places. Palca was some five leagues further on, in the belt of forest at the foot of a valley and surrounded by hills. In this valley I saw many bushes and flowers very similar to those to be seen at Trinidad, which was rather strange considering that the height of Palca is 7,500 feet and the highest hill near Trinidad is about 2,800 feet. I hired a hut on the river close to the village, where I spent a fortnight.

I left Palca to go along the valley of the Calatranca range, across the highest pass and made for the Sacambaja river below. We camped the night near the path over the mountains, where there was no forest, only a few hardy trees and some bushes growing in the gully; we were 15,200 feet up, very near the snowline. There was a light layer of frozen snow near the camp, plenty of long tufty grass about, and a stream of very cold water with ice and snow on the edges. At 1 p.m. we got to the top of the pass at over 17,000 feet by the aneroid. From the summit we saw an immense expance of country; nobody was to be seen, no dwelling and no living thing except some big white condors sailing magnificently in the clear air. Down the hill we followed the broad road, and after the last few miles through forests, reached the river Sacambaja. Next day, after nine miles of fairly level going up the river, we got to the spot where the big rivers Cato and Sacambaja meet. The big ranch (estancia) at Cuti was 27 miles away; it is nine leagues wide, mostly grass with plenty of water. The boundary on the north is the Rio Sacambaja. There are all sorts of climates on this estate, from tropical heat to the immense cold of the Calatranca range.

On our second visit to the spot (in 1906) the weather completely changed on the night of June 4th. At 8 p.m. the thermometer stood at four degrees below zero. In the morning at 7 a.m. it was seven degrees below zero, but at 9 a.m. it began to get warm again and at 12.30 it was 87°, going down quite suddenly after sunset. At eight that evening it was 14° below, next day between noon and 1 p.m., 86° above. This was a phenomenal year, there was black frost every night and a lovely blue sky all day. On the sixth night after the change had begun, the thermometer actually went down to 27° below zero. Between June and September the temperature twice touched 40° below zero. By the middle of September the nights and early mornings began to get warmer and one could sleep comfortably with three blankets on instead of six; the thermometer still registered between four and seven degrees below zero. The first week in October the cold spell ceased and the mosquitoes now began to appear. On October 23rd, it was the start of the first rains. Time for us to leave again.

. . . . . From H. Middleditch

It would appear that the spot where the writer stayed, at Sacambaja, lies at the confluence of the rivers named as Ayopaya and Inquisivi on the accompanying map. Since Inquisivi itself lies at under 2000m. altitude, it seems probable that Sacambaja will lie at an altitude of about 1500m. At first sight it seems to be astonishing that the temperatures quoted above could be possible at a latitude of 17° from the equator, in the midst of tropical jungle, not far from where Samaipaticereus grows. But these temperature readings were taken on the river bank, where the headlong flight of the river down the precipitous slopes of the cordillera changes to a far less abrupt descent through the foothills. Similary the cold mountain air could glide downhill at night time and collect in the valley bottom, leaving the Samaipaticereus on the slopes to suffer conditions of far less onerous cold.

Although the original text does state "Turani" this almost certainly refers to the peak and range of Tunari. The place name of Sacambaja is the same location as the Sacambaya of Howell and Morrison. The route followed by Prodgers from Cochabamba via Morochata to Santa Rosa was evidently also followed by Ritter (above) and by Cardenas (above) and very probably by Otto Kuntze at an earlier date.

THE DISCOVERY OF SOME ECHEVERIAS IN BOLIVIA By D. J. v. Vliet
Translated by H. Middleditch from Succlenta 49.11.1970

Now that the names of the new Echeveria species which I imported have been published, I will relate the circumstances under which I found these plants in Bolivia. At the time my travel plans had reached an advanced stage, van Keppel asked me to look out for Echeverias. I was quite willing to comply with the request, for I appreciated that those far too few active succulentphiles really ought to have an injection of new discoveries. It is quite common knowledge that the craze for new plants has enormously stimulated cactophiles.

The search for native Echeverias started in the north of Argentina, but although the literature made mention of these plants in that area, I was unfortunately unable to find any. In Bolivia it was quite different. I came across the first Echeverias on the trip that we made from Cochabamba city to the much smaller mountain town of Independencia which lies at 2788 m altitude. We left Cochabamba with a lorry on March 28th, heading for Morochata. This village lies about 30 km along the road to Independencia; according to the map a further 30 km remained after that. The lorry departed at 5 in the morning, stowed full with a complete indian family, their animals and their equipment. As I was ill I was able to obtain a seat in the windowless cabin. It was cold and there was rime from the night frost.

From Morochata we went further on, on foot. The path was often almost impassable owing to landslides; we became very weary. Towards the evening we were met by the manager of a silver mine, who provided us with food and shelter. The following day we went onwards again, now on muleback, through burning hot valleys and over high mountains where a thunderstorm preceded a snowstorm. We see the first Echeverias with Parodia ayopayana. At around 19.30 hours, Independencia at last, some spots of light shine up from a dark valley; we were hospitably received at the rectory. On the following days it was cold and also rained continually. At noon I made a trip into the surroundings; not a single cactus on the mountain. Only a small yellow and blue-flowering Irises, also a small yellow-flowering amaryllis, together with Begonias in all shades of red. Then the return trip by lorry follows a very poor road back to Cochabamba.

SAMAIPATICEREUS Cardenas By D. W. Whiteley.

The plant I have of this genus is about 6 feet high and forms two stems from a trunk about 2 feet high. It was bedded into the greenhouse staging and has flowered for the last two years. The flowers are nocturnal being very thick and fleshy-tubed and scarcely open out above the tube diameter at anthesis.

The tube is almost naked, with hair and small bristles confined to the the uppermost scales. The plant was grown from seed by somebody whom I knew and presented to me as "Cereus jamacaru". I do not know where he obtained this seed or how it came to be misidentified. When it flowered and I tried to identify it, the nearest photograph I could find to it was Curt Backeberg's in Das Kakteenlexikon (1) p.498 Abb 16 as Armatocereus matucanensis. In this, the stem looks similar and the flower also is similar, apart from more hairs and bristles and a wider speading limb. Backberg's rather poorer photo of Samaipaticereus did not, at that time, catch my eye (p.700 Abb 378).

I sent the flower to John Donald saying that I thought it came close to some of the slender stemmed Armatocereus listed by Backegerg in the Lexikon. (There are more slender stemmed species listed than one realises, being used to thinking of Armatocereus as huge plants like arboreus, etc.) Anyway, John identified it as "Samaipaticereus, probaly peruvianus" — an unpublished name for a slender stemmed, almost naked-flowered plant found in Peru by Harry Johnson.

The plant seems to be self fertile, as I must have had between 10 and 15 flowers on it in the last two years, everyone of which has set fruit and seed. The fruit is green, rather conical at first then later becoming globular, turning red and splitting almost in the same instant. I have never seen a green split fruit or a red unsplit one. On splitting it exposes an orange coloured pulp with black seeds. The fruit then drops off within a day or so.

Samaipaticereus is an interesting though unspectacular-flowered Cereus. Buxbaum, in an article in the Cactus and Succlent Journal of America (2) claims Samaipaticereus links his Browningiae with the Leptocereae. He considers Leptocereus to be the most "primitive", linking through Neoabbottia to Samaipaticereus, these three genera being members of the Leptocereae. He considers however that Samaipaticereus has relationships with his Browningieae which contains Rauhocereus, Castellanosia, and Browningia with Azureocereus as a subgenus of Browningia.

Backeberg's Kakteenlexikon (1) contains a good photo of the flower of Neoabbottia paniculata (p.624 Abb.245) and the relationship with Samaipaticereus is at once obvious. The Lexicon photo of Leptocereus grantianus (p.592 Abb.185) appears to be the same photo as that of Marshall and Bock (3) on p.79 fig 26, but turned through 45°. Backeberg seems to split these genera through quite a few of his tribes, making quite a nonsense of them. However, he has an excellent article and photos of Neoabbottia in the C. and S. J. A. (4) pp 50 and 52.

As Neoabbottia is central American we have a large gap between these obviously close relatives of Samaipaticereus and that genus itself in Peru and Bolivia. Armatocereus could serve geographically as the link, as it runs from Colombia (A. humilis) through Ecuador (A. godingianus) through Peru from north to south (all other species). However,

the flower is wrong, being too heavily haired and bristled; Armatocereus is probably related but possibly through common ancestors (Leptocereue, etc?) rather than on a direct line to Samaipaticereus. Armatocereus is West Andean in its distribution and Buxbaum suggests that Samaipaticereus is linked on the east Andean side; this is quite reasonable as the east Andean slopes are almost unbotanised, not being accessible from the sea as are the west Andean ones. A possible route for migration from central America is through Colombia via the "split" in the Andes along the Rio Magdalena and down the east Andean side of Ecuador into Peru and Bolivia.

The plant illustrated in "Notes from the Huntingdon Botanic Garden" by W. Heitrich in C. S. J. America (5) pp 156-157 as "Cephalocereus spec. Rose No. 20,093 Location No. 1-275", a plant originally part of a collection assembledby J. N. Rose without any habitat details known, appears to me to be of the Samaipaticereus affinity. The plant is said to be densely branched with slender ascending branches and fig 72, the photograph of this plant, shows this to be so. The photo of the flower fig 72 right hand, shows both a stem and flower similar to my Samaipaticereus.

Bibliography.

1. Das Kakteenlexikon, Curt Backeberg, Gustav Fischer Jena 1970.
2. "The origins of the Tribe Brownigieas" Cactus and Succulent Journal of America vol XXXVIII March-April 1966 No. 2 pp 43-46.
3. Cactaceae Marshall and Bock, genus 11 p 79 fig 26 Leptocereus grantiannus.
4. "Dendrocereus and Neoabbottia" Curt Backeberg, Cactus and Succulent Journal of America vol. XXVII March-April 1955 No. 2 pp 48-53.
5. Notes from the Hunting Botanical Garden. William Heitrich, Cactus and Succulent Journal of America vol XV November 1943 No. 11 156-157.

. . . . . from H. Middleditch

In his review of Samaipaticereus, David Whitely refers to an illustration in the C. S. J. Amer. of a plant identified as Rose No. 20,093 and he suggests that this appears to be of Samaipaticereus affinity. Now in 1915 Dr. Rose went on a field collecting trip to Bahia, Brazil, to Rio de Janeiro and finally to Mendoza and Cordoba. A selection of his field collection numbers abstracted from Britton and Rose's Cactaceae runs as follows:-

19722	Quiabentia zehntneria	Bom Jesus de Lapa, Brazil
19723	Tacinga funalis	Bahia
19730	Harrisia adscendens	Bahia
19760	Zehntnerella	Joazeiro, Bahia
19787	Opuntia palmadora	Barrinha, Bahia
19808	Acanthocereus albicaulis	Barrinha, Bahia
19903	Acanthocereus brasiliensis	Bahia
20068	Opuntia bahiensis	Bahia
20190	Cephalocereus brasiliensis	Rio de Janeiro
21002	Opuntia russellii	Mendoza
21029	Opuntia brunnescens	Cordoba
21181	Cephalocereus barbadensis	Barbados Island

Based on this information, I am inclined to suggest that Rose 20093 is much more likely to be a Brazilian plant either from Bahia or form Rio de Janeiro, than a Samaipaticereus.

I would not have been inclined to consider Armatocereus as a close relation of Samaipaticereus, but prompted by David Whiteley's comments on this kinship, I had a look into Rauh's "Beitrag z. Kenntnis d. Peruanischer Kakteenvegetation" and found illustrations of sliced flowers of several species of Armatocereus. All of these appeared to exhibit the same sort of stamen disposition as in my own flower of Samaipaticereus corroanus, with the lower third to half of the receptacle completely free of any stamen insertion. Most of the flowers of Armatocereus appear to have quite short petals and a long tube, again a characteristic which I observed in the flower on my Samaipaticereus; some species of Armatocereus certainly had flower petals of which the longest were two or three time longer than the shortest, but they were still relatively short in comparision with the length of the tube. So I am now inclined to accept that some features of the flower do bear comparison. I wonder how the seeds of Armatocereus and Samaipaticereus compare? If David Whitely has an annual crop of seeds on his Samaipaticereus then we only appear to need some Armatocereus seed for comparison.

SAMAIPATICEREUS INQUISIVENSIS Cardenas Sp, nov. By M. Cardenas

Translated by H. Middleditch from Cactus (France) 12.57:1957.

Columnar, branched, about 4 m high. Branches dark green, 4-5 cm thick. Ribs about 9, obtuse, 6 mm high, 1 cm broad. Areoles 2 cm apart elliptical to circular 7 mm diameter, grey felted; young ones prominent, light brown felted. Spines 8-11, not differentiated; shortest ones 2 mm long, medium ones 5 mm long, longest ones 25 mm. All spines acicular,

grey. Flowers from the upper sections of the branches, 5-8 in number, 5 cm long, narrowly funneliform narrowed at the opening. Ovary 1 cm long, globose, dark green with numerous whitish tipped, 1.5 mm long scales which bear dense dark grey hairs. Tube widening above with 1 cm long dark green fleshy scales bearing dark grey and brown hairs. Outer perianth segments lanceolate, whitish below, green above, 8 mm long; inner segments white, lanceolate, 1 cm long. Stamens numerous, 2 cm long; filaments white, anthers brownish. Syle 3.5 cm long, white; stigma lobes 11, yellowish.

This is the second species of the genus Samaipaticereus which we have published within a few years. It differs from the Type species Samaipaticereus corroanus by its more numerous ribs, by the greater length of its spines and above all by its zygomorphic flowers which do not carry any bristles on the ovary and the corolla tube. We hope one day to see the fruits of this interesting cactus which drew our attention as long ago as 1935 when we had photographed it at Sailapata, a farm located some 50 km below Puente de Inquisivi. That was in November and the plants were in flower but no fruit was to be seen. The distinguishing features of the above genus are not based upon the structure of the flower but upon the characteristics of the fruit which has an unusual orange pulp. In addition, the connection of this uncommon plant with the genus Samaipaticereus is provisional.

. . . . . from H. Middleditch

In additions to the data provided in the Latin diagnosis, given above, the English and French versions accompanying Cardenas's article also provide the following additional data:- Flower slightly zygomorphic, nectar chamber cavity 1 cm long, white, stamen insertion commences 1 cm above base of inside of flower, stigma lobes 3 mm long, style not exserted. Furthermore, the French version addes that the middle petals are brownish, white at the top whilst the English version tells us that the middle petals are white, brownish tipped. So much for the great importance of the Zygomorphic flower as a distinguishing feature that it does not even merit inclusion in the Latin diagnosis. From my own experience I would suggest that the "narrowed opening" of Cardenas's flower is due to it being not quite fully open, or else just starting to wilt. More probably not quite fully open, since Cardenas notes "style not exserted"; but this was just like my own flower (Chileans No. 32 p. 66) which had the stigma level with the anthers when the mouth of the flower was slightly constricted, before opening fully.

At first glance I would have been inclined to put the illustration of Cardenas's plant down as Cleistocactus laniceps. Few ribs, large and well spaced out areoles, not many spines, predominantly downward-pointing. Even the crown of the plant has the tapering top so often seen in Cleistocactus plants. Probably another good example of convergent evolution, the external morphology being similar in response to a common environment.

There is no reference in Cardenas's description to any slightly raised flutes running up and down the outside of the flower tube, but to judge from the apparent length of the scales depicted in Cardenas's sketch of the outside of the flower, I suspect that it may take up this form, again as on C. laniceps. However, my slide of a flower taken from my own S. corroanus indicates clearly that the flute does become less pronounced as it recedes below the scale, unlike the uniform flute on my C. laniceps. The free length of scale was very short on my S. corroanus but the gradual thickening of the flute as it comes up to the scale does make one wonder if this flute (like the human appendix) is a feature that is a residue of time past, the "leaf" seen on some Opuntia having coalesced with the tube. Presumably a coalesced leaf would first take on the appearance of the flutes seen on some Cleistocactus, Arequipa, etc., then it would start to lose its "tail" as on Samaipaticereus, and finally become a tail-less scale.

Perhaps David Whiteley may be able to place his plant from the rib count, at 4 to 6 for S. corroanus and 9 for S. inquisivensis?

YUNGASOCEREUS By F. Ritter

Translated by H. Middleditch from South American Cacti Vol 2

Yungasocereus Ritter gen. nov.

Typus — Samaipaticereus inquisivensis Card. Cactus No. 57 December 1957.

In May 1953 I found a bush-to tree-like cereus near Plazuela on the border of the provinces of Sud-Yungas and Loayza; this plant seemed to be reminiscent of Cleistocactus, but yet it exhibited too many peculiarities, so that it could not be validly accommodated within this genus. I found it again later near Coripata, province North Yungas, as well as below the town of Inquisivi in province Inquisivi. When I told Cardenas about it in 1954 and indicated the finding place, he told me that it was unknown to him. Accordingly I had already completed a manuscript dealing with this species under the name Yungasocereus microcarpus, when it was published by Cardenas himself as Samaipaticereus inquisivensis Card., with Typus collected from the bridge at Inquisivi in 1956. (Neither my discovery of 1953 nor my name was mentioned). Afterwards I suppressed my manuscript. (In the 1958 Winter seed list, which was prepared at the end of 1957, this species had already been offered as Yungasocereus microcarpus; I issued my seed list in 1957 before the publication of Cardenas was made in December 1957). Cardenas states in his publication that the inclusion of this species within the genus Samaipaticereus is provisional. In my opinion it can not really be placed within this genus. I give my reasons for this under "Samaipaticereus". My own description of Yungasocereus supplements the description by Cardenas in various respects.

Yungasocereus inquisivensis (Card) Ritt. comb. nov. Syn. Samaipaticereus inquisivensis Card. Cactus (France) No. 57, December 1957.

Body: tree or bush of 4 to 5 m height, moderately to profusely branched from the base upwards. Stems about 6-7 cm thick. Ribs 6-10 straight, about 10 mm high and 15 mm broad, very blunt, very slightly tuberculated, generally with wing grooves, that extend sideways from the aerole towards the groove separating the ribs. Young stems frequently have an increased number of ribs, up to 18, which on further growth return to the normal number of ribs, evidently an indication of a multiple-ribbed former ancestor. Aeroles white or grey-felted, round or somewhat oval, 3-6 mm diameter, ca. 10-15 mm gap apart. Spines about 4-12, pale brownish, needle-like without particularly thickened base, among them usually several longer central spines of 15-30 mm in length, straight or curved downwards and directed downwards, as well as several fine small central and radial spines.

Flower usually near the crown, sometimes further down as well, 52-60 mm long. Pericarpel ca. 15 mm long, 12 mm thick, green densely covered with tiny narrow pointed green scales and with brownish wool, as well as a slight external corrugation. Nectar chamber large 13-18 mm long by 8 mm wide, brownish or somewhat pink, closed by somewhat convex wall at the upper margin and by the very numerous filaments lying against the style. The upper portion of the tube above, 15-20 mm long, funneliform but somewhat narrowed at the opening; further narrowing occurs due to the inward facing scales at the margin of the tube. Opening about 15 mm broad, about 17 mm broad a little below; beyond that the flower opening is narrowed by the petals. Exterior of tube green, densely covered with narrow green scales and with brown hairy wool. Stamens white to greenish, in two series; the lowermost of 20 mm in length inserted for about 7 mm above the nectar chamber; the upper series about 7 mm long inserted round the margin of the tube. Anthers cream or pinky cream. Style ca. 35 mm long, pale green, whitish above, the 8-15 yellowish, yellow-green, or almost white stigma lobes ca. 15 mm long, often growing together, not projecting above the anthers. Petals projecting only slightly above the scales at the margin of the tube, they lend an urn-shape to the upper part of the flower, below they are directed somewhat inwards (like the scales), above they are curved outwards, thereby narrowing the opening of the flower, but the diameter of the flower extends to 20-25 mm. Petals about 10 mm long, 3-4 mm wide, almost linear, tip somewhat pointed, white to pinky white, the tip more reddish-brown, the outermost more reddish-brown than white. The flower data was obtained from several flowers on different specimens at the Typus site.

Fruit 20-28 mm long 15-20 mm across, widest below, rather tapered above, with flower remains firmly attached; fruit-bowl ca. 8 mm broad by 3 mm deep, the base particularly thick (about 5 mm), walls about 3 mm thick, green exterior, with numerous narrow green fleshy scales and brown woolly hair. The fruit splits down the side when ripe, if not already pecked into at the side by birds, which is what usually happens. Pulp fibrous-viscous, slightly juicy. Seeds black, shiny, almost smooth, ca. 0.9 mm long, 0.7 mm broad, 0.5 mm thick. Hilum oblique, basal end of testa projects somewhat spout-shaped beyone the margin of the hilum. Typus site: valley below the town of Inquisivi. FR 332.

Samaipaticereus Cardenas

This genus was published by Cardenas in C.S.J. (U.S.) 1952 p.141 with the Type species S. corroanus, with typical photographs. A further typical photograph is to be found in Backeberg Die Cactaceae Vol. 2 Abb. 1042. On the other hand Ibid Abb. 1043 looks like a branch of very different appearance.

An inclusion of the species inquisivensis in the genus Samiapaticereus is really impossible, because in the first place from its overall appearance this species stands closer to the genus Cleistocacatus. Hence if anyone felt unable to recognise the genus Yungasocereus it must be allocate to Cleistocactus, perhaps as a sub-genus. Since really important divergencies still exist and species with too much difference should not be considered for inclusion in one genus, Yungasocereus should continue to be considered as an individual genus.

A comparison between Yungasocereus and Samaipaticereus on the one hand and Cleistocactus on the other hand affords the following:- The treelike growth occurs only in the form of enlarged bushy growth; in this aspect the bushy growth of Yungasocereus is similar to the bushes of Cleistocactus laniceps, which grows in the same place as a variety (var. plurispinus Ritt.). The very low, broad and obtuse ribs are much more like those of Cleistocactus than Samaipaticereus, those on the latter being very slim, relatively much higher and parallel-sided. Samaipaticereus corroanus has only 3-6 ribs, of which I found 3 as often as I found 6. By comparison Yungasocereus has 6-10 ribs, in which respect it has almost the same number as the scantily-ribbed Cleistocactus laniceps with 8-11 ribs. The other species of Cleistocactus have a greater number of ribs. Yungasocereus on the other hand evidently derives from an ancestor with a greater number of ribs, since young stems often start off with greater rib count; Samaipaticereus by comparison always has very few ribs. The aeroles of Yungasocereus are larger, oval, prominent, and very similar in these respects to the aeroles of Cleistocactus laniceps. The areoles of Samaipaticereus on the other hand are small, triangular and depressed, which does not occur with Cleistocactus. The spines of Yungasocereus are like Cleistocactus, needle like without a particularly thickened foot; by comparison those of Samaipaticereus are awl-shaped, a few mm long and with a markedly swollen base — these spines characteristics occur neither with Clestocactus nor with Yungasocereus. The dense scales and wool on the flower of Yungasocereus is very similar to that of the Cleistocactus, but unlike Samaipaticereus, of which Cardenas stated that besides wool they also carried bristles,

which are absent with Yungasocereus inquisivensis and almost absent with Cleistocactus. For two species of Cleistocactus with bristles on the flowers, Backeberg has erected the genus Seticleistocactus. From Peru comes a further species, unpublished as yet, whose flower is almost naked and scaleless and consequently diverges still further from Cleistocactus and Yungasocereus (Photo in C.S.J. (US) 1966:2.45 and in Krainz "Die Kakteen" Morphology 35).

The inner flower structure of Yungasocereus is similar to that of Cleistocactus as well as to that of Samiapaticereus, but both flowers in regard to breadth, fleshiness, and the upward broadening shape of the tube, are more primitive than Cleistocactus with its narrow, cylindrical and more slender tube. Broad flowers with funneliform tubes are so widespread a characteristic that it signifies little for the determinatin of relationships. The bell shaped flower opening is a peculiarity of Yungasocereus. The extremely small petals however do match the petals of Cleistocactus. The flower of Samapaticereus is night opening, that of Cleistocactus and Yungasocereus opens both by day and night. The pulp of the fruit of Samaipaticereus is juicy and red, that of Yungasocereus white and slightly juicy, similat to Cleistocactus. The fruit opens sideways, just like the fruit of Samaipaticereus, whilst with Cleistocactus the opening of the fruit, is effected as a result of bursting open at the lid of the fruit except in a few species where it is a result of the fruit lid lifting off. This feature of Cleistocactus is of a recent innovation whilst with Yungasocereus it is a very widespread primitive characteristic of negligable taxonomic importance. The seed of Yungasocereus with its oblique hilum is similar to those of Cleistocactus whilst those of Samaipaticereus have a basal hilum; the hilum of Samaipaticereus seed is quite distinctive and similar to the hilum of the tall columnar group of Trichocereus species. Finally additional infallible evidence exists of a close relationship between Yungasocereus and Cleistocactus in that I found a natural hybrid between Yungasocereus inquisivensis and Cleistocactus laniceps near Inquisivi, whose flower also occupies an intermediate position.

Taking everything into account, Yungasocereus appears to have many primitive characteristics in common with Cleistocactus.

. . . . . from H. Middleditch

Is the thickened spine base, so common with Notocactus, Parodia, Sulcorebutia, etc., once you do start to look carefully for its presence, really quite absent from Cleistocactus, as Ritter states? Although many fruits have been set on my own Cleistocacti and I am used to seeing the fruit split open into two halves, I have never seen one that is just starting to open alongside the base of the flower remains. Now that Francis Fuschillo has taken slides of a fair selection of Cleistocactus species, it is looking as if the seeds are very similar in appearance and in the nature of the testa surface, throughout the genus. Hence a comparison with seeds of "Yungasocereus" could be quite useful.

Ritter does appear to lay considerable stress upon external morphological features when making the comparison above; these are the very characteristics which do tend to converge in response to the nature of the environment. One dreads to think of the effect of accepting the ideas that "types with too much divergence should not be considered for inclusion in one genus". What would happen if this proposal was applied to White, Dyer and Sloan's "Succulent Euphorbiaceae"? What would Ritter have done with the Euphorbia in W. Keble Martin's "Concise British Flora in Colour"? If this observation does indeed epitomise Ritter's outlook on taxonomy, then we should be able to use it as a yardstick when trying to assess the viability of the names which he has bestowed upon other plants which he found in habitat.

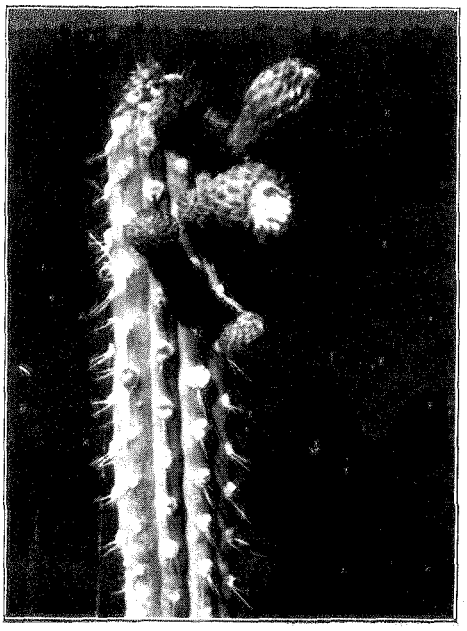
CALYMMANTHIUM — A NEW CEREOID GENUS FROM PERU **By Friedrich Ritter**

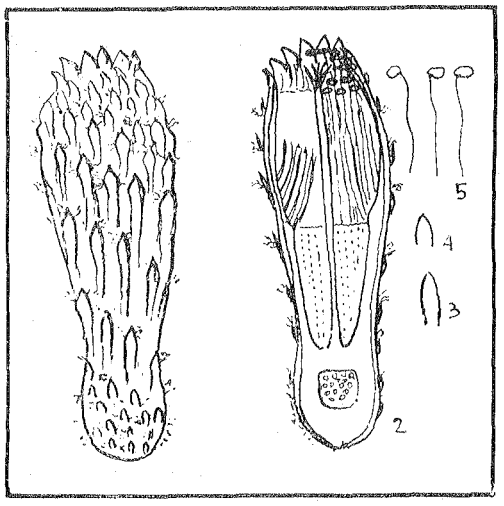
Translated by E. W. Bentley from K.u.a.S. 13.2:1962

When I first made my journey to Maranon on 8th August 1954 I noticed in the Huancabamba Gorge, from a moving truck, a specimen of a tree-like cereoid the branches of which resembled those of Acanthocereus. A cereoid of such an appearance was not known from Peru at that time and must be something new. I made the return journey, partly on foot, and eight days later I was again with my discovery. The specimen resembled in high degree a Dendrocereus from Cuba; but how could a Dendrocereus have strayed as far as Maranon? Unfortunatley there were neither flowers nor fruit.

While I examanied the specimen and with centimeter rule in hand, took notes, an inquisitive peasant, who hac his hut only 50 metres off, came up and watched me. He explained to me that the tree flowers freely every year but never yields a fruit. It was the only one of its kind for he had seen no other specimen as far as he had journeyed around. This was now highly remarkable. If the tree never fruited it was apparently self-sterile. Was it really "the last of the Mohicans" of its kind which a strange fate had saved for science just before it disappeared? That would be an event perhaps unique in biological systematics. At all events none could be expected in the near vicinity for this man would have found the plants, but at bigger distances one must look out for further specimens. It transpired that the man had erred: some 8 kilometres away I was able to find a small colony with nine further specimens of flowering age with a few young plants with them. That is definitely all I have been able to find so far on my various journeys to Maranon. At this second place also, fruit development is poor.

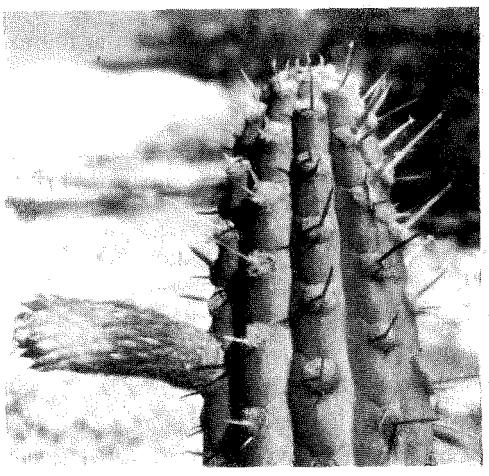
On my second journey to Maranon in the year 1956 again I found no flowers but some fruits with dry flower remains. And with these I made a second discovery which is also a remarkable one. Apparently there were two flower tubes, an outer spiny one without floral leaves and an inner, naked one with floral leaves. Doubtless it was a case then of a new cactus genus and I called it provisionally Diploperianthum.





SAMAIPATICEREUS INQUISIVENSIS

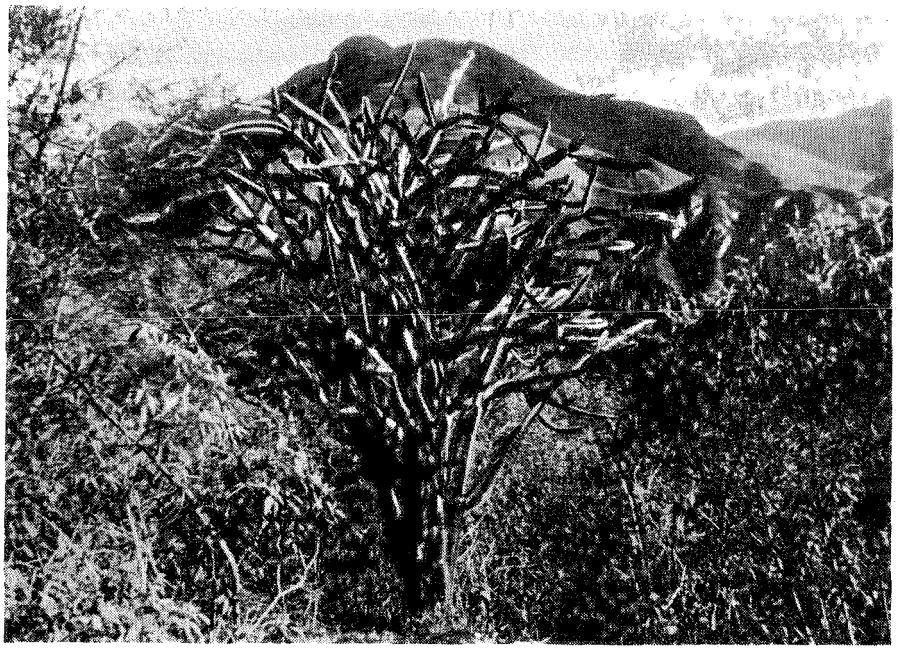
CACTUS FRANCE 12.57.1957



CLEISTOCACTUS
LANICEPS

F.R. 603

1960 Catalogue
H. WINTER



CALYMMANTHIUM SUBSTERILE

SUCCULENTA 49.11.1970 Photograph - W. KRAHN

On my third journey in 1957 I was admittedly again unable to get a flower photo but I found large buds and freshly withered flowers and so was able to complete and correct my notes. It transpired that it was not a case of a doubling of the normal flower coat but of a single flower coat with a spiny protective cap which completely covers over the bud and which later is broken from within by the growing bud. This protective cap is a continuation of the outer layer of the ovary. One branch had two buds which both would be taken for young branches since they are spiny to the tips and betray nothing of their flower nature. The third bud at a more advanced stage shows how the spiny protective cap is broken from within outwards; for the first time now one realises that the cap covers a bud, which at this stage grows out from the torn cap. I have accordingly altered the name of the genus to Calymmanthium. On my fourth visit in the year 1960 I had the rare luck to find and photograph a branch that presented all flower stages next to each other, two capped buds of different sizes, a bud with a burst protective cap and an open flower.

What seems most puzzling, for all that, is that the protective cap exhibits scales on its inner side. Only on my last visit did the fresh flower tube show me the answer to the puzzle. Above the nectar chamber the flower tube narrows — as can be seen from flower section. At this level the epidermal layers, which grow out into the cap, separate from the axial layer which produces the flower tube. Here at the separation point, all the floral leaves originate; the inner grow with the outside of the tube and become free right at the end of the tube while the outer are shorter and grow against the inner side of the cap, and only their very ends become free and thus form scales within the cap. One realises this first if one removes the cap; it separates then with a flimsy continuation below, which finishes at the junction of cap and flower tube.

I give now a full description of what up to the present is the only species of the new genus:

Body: bushes and trees of 3-8 m high. In stronger light more bush-like and low with many branches from top to bottom, broader than high, otherwise stem-building with branching more at the top and spreading widely.

Branches: light grass-green 20-50 cm long; sometimes, however, over a metre long, 4-8 cm in cross-section.

Ribs: 3-4 from 3-4 cm high and only 2-3 mm thick, leaf-like extending to the axis of the branch, slightly humped.

Aeroles: 3-6 mm in diameter, roundish, white-felted, 2-3 cm apart on the upper side of the small humps.

Spines: straight stiff, sharp, awl-shaped, ivory-coloured, the tips white in transmitted light, lacking from the upper areoles, the radicals sideways or more 'body-wards' directed, 3-8 from 0.5 to 1 cm long; the centrals 1-6, stronger from 1-5 cm long, variously pointing.

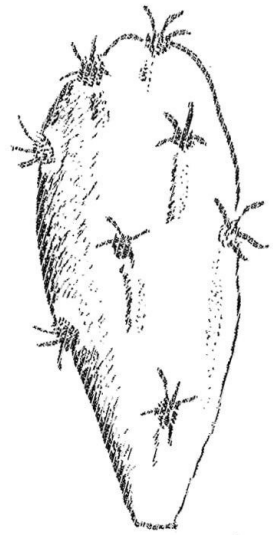
Flowers: laterally on the branches, somewhat horizontal, opening at night, closing again about 10 o'clock following a little sunshine. I saw a humming bird visit the flowers which frequently happens elsewhere with night-bloomers that are still open in the morning. Flowers somewhat scented, 9.5 to 11 cm long, 3-5 cm wide, opening regularly (the observations were based on 4 flowers from 3 trees).

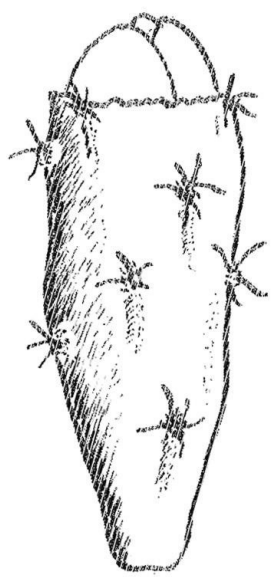
Ovary: grass-green, 24-30 mm long, 15-17 mm wide above, narrowed below. Seed-chamber 11-14 mm long, 3-4 mm wide, wall 4-7 mm thick. Receptacle 3-4 mm thick, white. On the outside somewhat fluted, smooth with a very few small white areoles, with or without small spines and with a green scale 0.5 mm long.

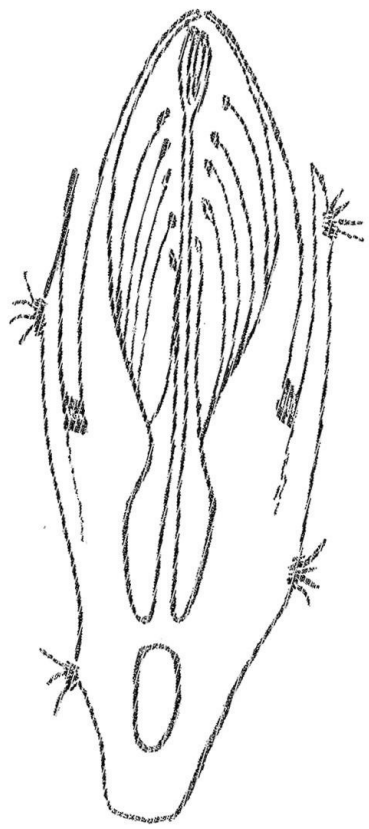
Nectar chamber: the lower part 17-22 mm long, somewhat funnel-shaped, 6-8 mm wide above, brownish, fluted with copious nectar. Above it, owing to a thickening of the wall, a narrower, whiter, tubular section 7 to 10 mm long and 4-6 mm wide, fluted (through the fusion of the stamen filaments), half-closed because of the lower filaments leaning against the style.

Protective cap: At the point where the upper part of the nectary begins the green outer layer of the flower separates from the white axial layer and forms a loose completely closed cap over the inner flower. The cap also is green and bears on the outside a few brownish areoles, denser at the upper end, of 1.5 to 3 mm in diameter with some brownish, fine, projecting, small spines, a few millimetres long, and each a green scale, 0.5 to 1 mm long. From the areoles fine, weak ribs run downwards. The cap grows with the bud till it has reached a length of about 2.5 cm. Then its growth ceases while the inner bud grows further and as a result the cap, through pressure, splits usually into two lobes which then lie against the inner flower.

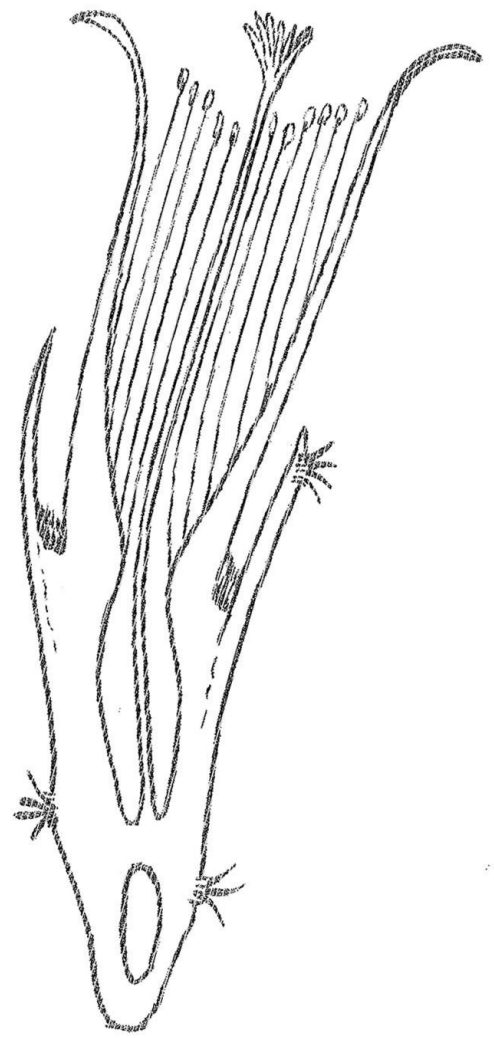
Flower tube: above the nectar chamber is a continuation of the inner white layer (axial layer) of the ovary and nectar chamber. At about the level of the white neck of the nectar chamber originate the outermost floral leaves of about 1 cm breadth, which lie against the inside of the cap and grow with it. Only the tips remain separated and appear as free scales at the upper end of the cap on the inside. A pair of subsequent floral leaves grow with the cap and then form round-tipped scales on the inner side of the cap, about 1 to 2 cm long, red below and green above. The following petals also spring from the same neck section but grow with the flower tube; next a few shorter ones that only grow at the bottom along with the tube and stand out free above, 1-1.5 cm wide, round tipped, red-brown with green ends. All subsequent inner petals grown in this way up to the end of the tube as can clearly be observed on the tube. Accordingly the tube is without areoles or hairs; above the nectar chamber it is 2-2.5 cm long, white, weakly funneliform, 1.5 to 2 cm wide at its end. Filaments 2.5 to 3 cm long, above shorter, up to above 1.75 cm upright, whitish; becoming free on the whole tube above the nectar chamber. Anthers citron yellow 1 to 1.5 mm long, pollen almost white. Anthers placed from the beginning to more than halfway up the petals and projecting from



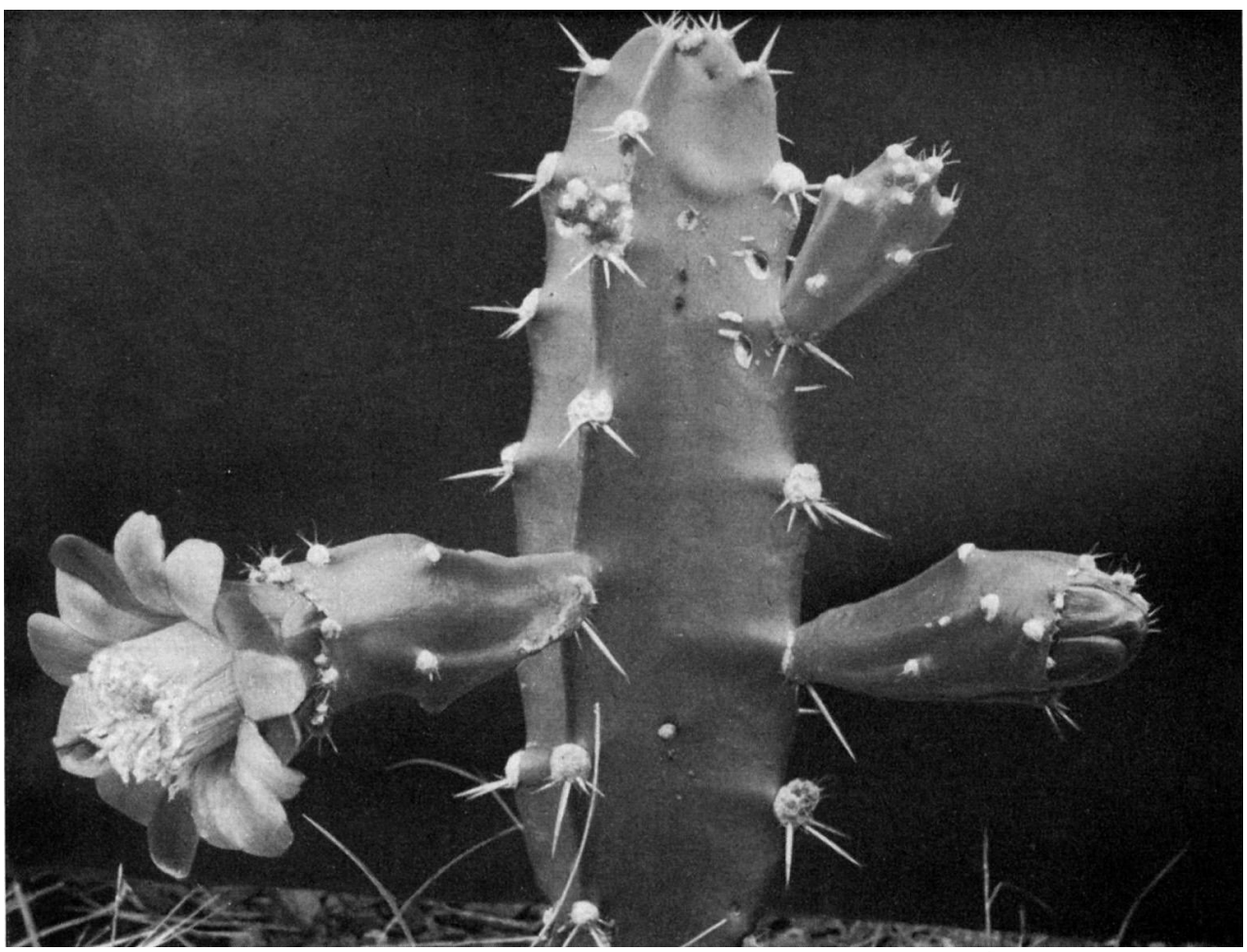




BUD & FLOWER SECTION



Calymmanthium substerile



K.u.a.S. 13.2.1962

the wide open flower. Style carmine, 1.5 mm thick, 6.5 to almost 8 cm long with 8-11 white to pale yellow (carmine pink below), 6-7 mm, small-tipped, spreading stigmas with a somewhat granular surface, which are somewhat over-topped by the anthers.

Corona: The free part of the crown petals around the tube is spread out and curved back, 22-25 mm long and 7-10 mm wide, round at the tip, a little narrowed below, on the whole almost linear; the inner white to red-brownish, white or greenish edged, the outer deeper red-brown with greener edges.

Fruit: light green to pale yellowish green, cucumber-shaped, clearly four-ribbed, sometimes five-ribbed, ribs not clearly defined below, sides rounded; thickest in the middle, narrowed above and below. Very few pale aeroles from 1 to 2 mm diameter on the ribs, with or without tiny spines; aeroles sometimes lacking, however. Fruitbowl (cavity of ovary? — H.M.) 1 cm in diameter, 1-1.25 cm deep without a plug at the bottom. Base of the style 4 to 5 mm thick, white. Persisent flower remains. Wall 6 to 9 mm thick, outer layer green, inner almost white. Fruiting is mostly poor, often only a few seeds develop, sometimes none at all; if the fruit produces a lot of seeds it is about 14 to 15 mm long and about 6 mm thick; but mostly it is much smaller. The fruit is full of white, juicy, slimy, acidulous flesh; it does not burst open on ripening, but finally rots still shut. Mostly the fruit are severely infested with pests so that for this reason also regeneration is poor. The majority of the flowers generally do not set fruit.

Seed: 1.5 mm long, 1.5 mm wide, 1 mm thick, sack-like grey-black; the basal end obliquely trimmed off with the oval, white, deeply sunken hilum.

Surface matt, somewhat granular.

Occurrence: Lower Huancabamba Gorge, Province of Haen, North Peru.

Systematics: Probably leads from Dendrocereus.

Chief points of distinction for this genus are the formation of a protective cap over the flower bud, the lack of a circular woolly plug to the nectar chamber, the abscence or aeroles on the flower tube, the origin of the perianth leaves in the region of the end of the nectar chamber and their growth partly with the protective cap, partly with the flower tube.

This species has been introduced by me since 1954 under my collecting number FR 315. The holotype was also deposited under this number in the Herbarium of the University of Utrecht, Holland.

. . . . . from Mr. and Mrs. T. Lavender.

During one of our visits to cactus collections on the French Riviera, we came across an interesting looking plant at the Jardin Exotique in Monaco. It was growing in the centre bed of the greenhouses which are not open to the general public. When we saw it, it was about seven feet high and branched at the base, the four ribbed stems showing odd patches which looked as if they were old marks. Our eyes were particularly caught by the flower, which was of a shape and size that looked very peculiar, especially on that sort of stem. The well-developed buds and the flower tubes were just as green as the body, four sided with a slight rib at each corner. The few felted areoles on each rib carried very short, slender spines. The bud itself would have about one inch length of vegetative growth which just looked as it the outer end had burst open to allow the flower to project from the vegetative growth. There was a horizontal side shoot of about one inch in length that was not burst open at the end, but from its appearance in comparison with the other buds and flowers on the stem we were convinced that it, too, was a bud just about to open and not an offset. The label said Calymmanthium substerile but, at the time, that did not really convey a lot to us. (This plant is shown on the front cover).

. . . . . from H. Middleditch

An understanding of the relationships which exist between pollinating agents and pollinated flowers was first put forward by Charles Darwin. Of the many subsequent publications dealing with this subject, "The Pollination of Flowers" by Proctor and Yeo is probably the most readable, the most comprehensive, the best illustrated and in addition based on a store of sound, scientifically established data. To those who wish to digest its contents, it provides a picture ranging from open, rotate flowers, many of which are visited by a variety of pollinating agents, to flowers of less simple form which are adapted to a specific type of pollinating agent. Nowadays there is an appreciable fund of knowledge relating to such specialised relationships; one particular example, of oligolectic bees, was discussed in Chileans No. 40.

When a seed is transported by bird or animal and germinates into a plant isolated from its fellows, particularly if it has a flower of specialised construction adapted to a specialised pollinating agent, it becomes highly probable that the flowers will fail to set fruit. Such a set of circumstances would be an obvious explantion for the "sterility" of Ritter's find; but it seems that Ritter was not familiar with the implications of pollinator/pollinated relationships and did not recognise a nice example of flower pollination ecology baulked by isolation. It would therefore seem to be most probable that the epithet "substerile" is irrelevant and invalid.

THE VALLEY OF THE RIO HUANCABAMBA By Prof. Werner Rauh

Translated by H. Middleditch from "Beitrage zur Kenntnis der peruanischen Kakteenvegetation" 1958

This river whose headwaters lie on the southern flanks of the Cordillera Guamani, takes a course first of all in a southerly direction, making use of the basin between the western and eastern chains of the northerly West Cordillera. Between San Felipe and Pomahuca the river passes through a narrow canyon in the eastern branch of the Cordillera and then

turns towards the south-east, and after its junction with the Rio Chotano it discharges as the Rio Chamaya into the Rio Maranon near Bellavista. According to Weberbauer, the true Huancabamba valley belongs to the driest area of northern Peru, and the dearth of precipitation also finds its expression in a xerophytically rich vegetation. This vegetation ascends higher in the Huancabamba valley than in the west Anndean lateral valleys at the same latitude. Hence in the interandine region the cacti still occur up to 2,400 m as a specific element in the appearance of the vegetation; whilst on the west flank of the Andes the upper limit of the cactus zone lies as low as 500 m.

The Huancabamba valley is accessible by two roads. One goes over Canchaque and over a 4,000 m high pass through rain forest and Jalca in the upper section of the valley, to the town of Huancabamba itself. The second goes along the valley of the Rio Olmos and crosses over the West Cordillera at the Abra Porculla which is at 2,144 m altitude.

First of all we present an impression of the vegetational associations in the vicinity of Huancabamba, that area from which A. v. Humbolt acquired for us the first knowledge of Peruvian cacti and from where he brought to Europe the fine Espostoa lanata.

Whilst the road from the Pacific side of the Andes passes through exposed rocky cliffs up the Jalca, in the broad basin of Huancabamba, the surrounding slopes are smooth and gently inclined. Below the Jalca there follows a dwarf scrub, whose characteristic plant is a 1.5m high shrub of compositae, Diplostephium (Nr. 316a 1956) forming a globular shaped bush. In company with it are to be found Polylepis, Weinmannia, Embothrium, Lupinus, Clusia, Melastomaceous and Ericaceous plants etc., all woodland genera, which are also typical of the upper region of the Ceja de la Montana on the eastern flanks of the Andes. Scattered around are small grassy marshes with groups of the bush Hypericum laricifolium, an inhabitant of moister and boggy habitats.

In cultivated areas the bush formation extends up to 3,000 m and with its green grasses and fields of cereals it recalls a central European vegetational formation. Of indescribable beauty is the view from the peaks down into the basin of Huancabamba, a landscape of gentle hillocks crossed by the course of the Rio Huancabamba, out of which the dominating far-reaching, intensely red coloured rocks of the Cerro Colorado are prominent, from which A. v. Humboldt collected Espostoa lanata and Cereus aurivillus (= Seticereus icosagonoides).

By 2,200 m there already appears on the lower, dry Cerros as well as on the the stony valley sides, cacti in dense stands, without any accompanying arboreal vegetation. The bushes, represented by Acacia macracantha and Prosopsis juliflora are at first all confined to the bottom of the valley. Predominant among the cacti is Espostoa lanata, which in many places completely dominates the landscape with its 3-4 m high white felted columns ascending in upright candelabra, and here develops a characteristic Association. Impressive are the extensive stands near Aguapampa, a few kilometres south of Huancabamba, near to the settlement of Sondorillo. Here the Espostoa are associated with Opuntia macbridei, Op. pestifer, Seticereus chlorocarpus — a branching candelbra-like sort and in growth reminiscent of the Mexican species Myrtillocactus geometrizans, Armatocereus laetus, Selaginella peruviana, more succulent Peperomias — P. dolabriformis (occasionally very abundant), P. nivalis, Peperomia sp. P 298 1956 — growing up to 1 m high, and Peperomia sp. 302 1956, Pilea serpyllacea, Croton and other low-growing bushes.

The most decorative appearance however belongs to the cristate forms of Espostoa lanata, which in no other parts of Peru are met with so often as in the immediate surroundings of Huancabamba. It is remarkable that rarely was there only a single cristate stem of a plant but commonly all the stems tend to go that way together. There were plants found that exhibited up to ten such cristates of a breadth up to 60 cm. Since the cristate formation usually succeeds the floral maturity of the stem, the cephalium presents itself as a continuous crest and also produces flowers which according to our observations exhibit an entirely normal appearance. It is to be presumed that the frequency of cristation is the result of an infection; perhaps it is a virus disease, since they all exhibit considerable necrotic tissue and perish after a few years. The secondary side branches developing from latent areoles at the base of the cristate stem meanwhile progress rapidly to the cephalium formation, renewing the cristate formation. One of our escorting guides drew our attention to a plant from which Backeberg had knocked down the whole of the cristate heads more than 20 years ago; since that time all had thrown out further side branches which had developed cristate heads again.

But in addition, the Huancabamba valley is rich in scarce cacti of localised distribution. Of these the first to be named is Thrixanthocereus blossfeldiorum a further representative of the Tribe of Cephalocerei. It inhabits steep slopes, occurs near Huancabamba (Sondorillo) only in solitary specimens; however, in the middle reaches of the Huancabamba valley near to its crossing of the western cordillera, this plant appears in extensive stands. It is one of the most striking Peruvian cacti, since it forms completely unbranched columns up to 4 m tall, which upon reaching floral maturity develop the formation of a bristly cephalium up to 2 m long. The fruits are up to 5 cm across, berries opening with longitudial slits, releasing seeds of singular form. Young examples of Thrixanthocereus are easy to distinguish from other cerei by their striking basal wreath of bristles. This basal bristle formation turns up elsewhere only in the east Brasilian Micranthocereus, a fact from which certain deductions could be drawn about common origin and the former area of distribution of Cephalocerei.

A further interesting genus is Seticereus, characterised by the way that the areoles of flowering potential form much elongated bristles, whereby the crown of plants capable of flowering takes on a crest-like appearance. The bristle formation is at its most striking with Seticereus icosagonoides (= C. aurivillus) a fine yellow spined species with

half-procumbent columns and pale orange-red flowers. They generally appear together with the more red-spined S. humboldtii (= C. plagiostoma). Backeberg also puts S. chlorocarpus and S. roezlii into the same genus; these are abundant candelabriform cerei in the Huancabamba valley. Although the bristle formation is quite insignificant in these two, yet it is nevertheless detectable in the stems capable of flowering from that, Backeberg indicates quite positively that it is not just a matter of modification of thicker spines into thinner, bristle-like ones, but a matter of additional spination.

In the neighbourhood of Huancabamba there is in addition a peculiarity of note, the procumbent Cleistocactus serpens which in its growth is reminiscent of the Mexican C. flagelliformis and which is probably the northernmost representative of its genus.

Later on we met with all the species presented above, when we made use of the Olmos valley as an entry to the Rio Huancabamba. After the crossing of the 2,144 m high pass and after passing through a very patchy mountain forest, there then followed, contrary to expectations, a semi-desert landscape whose rubble-strewn slopes coloured bright red by iron oxide supported a sparse cactus vegetation. Quite soon after the top of the pass, around about 2,100 m, there appear, the first candelabra of Seticereus chlorocarpus and the procumbent columnar clumps of S. icosagonoides and S. humboldtii. A little further down from there it was joined by Espostoa, which dominated the vegetation formation as far as about 1,000 m altitude. On account of their growth form they were a strikingly different species from the E. lanata growing at Huancabamba. The candelabras reached at most a height of 2 m; the individual stems are not straight upright but widely outspread; the flowers materially larger than those of E. lanata and the outer petals of a lively green colour. All these features culminated in the erection of a species designated as E. laticornua on account of the outspreading growth; like E. lanata, this is also very rich in forms.

Among the particularly sparse accompanying flora are to be noted Selaginella peruviana, Puya sp., Croton sp., Dodonea viscosa, Satureja vaccinoides, Jatropha ureus and Cantua quercifolia. Around 1900 m there appears a succulent bushy Euphorbia (E. weberbaueri) which forms a characteristic association between 1800 m and 1600 m in such dense stands spreading over the slopes that, from a distance, these look like green meadows. Between the bushes hides Cleistocactus crassiserpens (K. 126 — 154) that is distinguishable from the Huancabamba plants on account of thicker stems and finer spination.

Around 1500 m the valley floor was reached, without any modification of the morpholigical and floristic character of the vegetation. Still the landscape retained the impression of a wilderness. Only the river terraces exhibit a more luxuriant growth of Acacia macracantha, Schinus molle, Prosopsis juliflora and Salix humboldtianus. Also on the valley sides now appear some trees, Bombax discolor, Capparis angulata, Loxopterygium huasango and Cercidium praecox. Yet the vegetation even still further on is open and Espostoa laticornua, Seticereus chlorocarpus and S. roezlii and Opuntia macbridei are the plants categorising the vegetation. Around Km 81 at 1100 m they were joined by Thrixanthocereus blossfeldiorum which, as mentioned, is substantially more abundant in this section of the valley than around Huancabamba. As to new cacti, we noted the 3-6 m high candelabra-forming Armatocereus rauhii K 127 — 154 (conspicious on account of its blue-grey colour), that is distinguishable from all other Armatocereus known up to the present time on account of the well-nigh complete spinelessness of its areoles and the possession of carmine-red flowers.

Around Km 120 (900m) the vegetation formation starts to alter. The valley loses its wilderness-like character. The cactus formations give way to rainy-green shrubs, amongst which, standing in full bloom in September, belong Bougainvillea peruviana and Chorisia intregrifolia with its barrel-like swollen, spiniferous water-storing stem. This rainy-green woodland displays here and there a thick undergrowth of cacti, including a not precisely identifiable Cereus (perhaps C. chotaensis) and Monvillea jaenensis (K74, K78). This is a characteristic species whose distribution stretches, with interruptions, as far as the dry woodlands of Jaen, its 6m tall columns rising over the tops of the trees.

In the vicinity of the junction of the rivers Chotano and Huancabamba the valley broadens out into a dry basin in which, apart from Bombax discolor, Chorisia integrifolia and Acacia macracantha, the extensive woodland becomes insignificant and the vegetation again becomes dominated by the cacti — Espostoa laticornua, Seticereus roezlii (S. choatensis?), Armatocereus rauhii, Opuntia macbridei, and Thrixanthocereus blossfeldiorum. Eastwards from Pucarra the valley again becomes narrower and also at the same time moister, the rainy-green dry forest again becomes re-established, stretching up to the vicinity of Chamaya (500m.). Henceforth it is more and more joined by evergreen bushes; some of the more interesting are the sand-box tree, Hura crepitans, a tree-like Euphorbia of Ficus-like habit with capsule-like dehiscent fruits and a spiniferous succulent stem, which contains a slightly poisonous latex. Also remarkable are the epiphytes occurring in enormous numbers; the "grey" Tillandsias and numerous orchids, of which the most splendid amongst them is Cyrtopodium punctatum. Of the ground-flora there is to be noted a series of interesting Peperomia, as well as a conspicious member of the Amaryllidaceae forming huge bulbs which has been described by H. Traub as Rauhia peruviana (P.329, 1956).

In addition to the cacti already mentioned above, there appear those already known in the Sana valley and widespread in the Huancabamba valley — Rauhocereus riosaniensis forming thickets, Cleistocactus tenuiserpens (K.76) a procumbent species with very thin whip-like branches creeping along the ground, and the rare epiphytic Hylocereus microcladus (K.138, 1954). The area of distribution of this latter species runs from northeast Columbia to as far as northern

Peru; with its 4-angled stems furnished with closely spaced areoles it looks rather more like a Rhipsalis than a Hylocereus. For the first time we met with a representative of the genus Peireskia in Peru. This was a 2-4m high bush with partly intertwining branches and small flowers of white or reddish colour. At present only two species are known, P. humboldtii and P. vargasii, of which two new varieties were discovered.

Of special interest in terms of distribution range is the frequent occurrence of the new Melocactus bellavistensis (K.79a), a representative of the genus with which we had become acquainted in Peru only from the west of the Andes and typical of the rainless cactus vegetation. In the north, Melocactus now crosses over from the West of the Andes, becoming an inhabitant of a moister region and a constituent of the rainy-green woodland. In this way it advances as far as the Maranon where it appears in large numbers. Melocactus bellavistensis is one of the least known, and at the same time largest, Peruvian species; its succulent-green body attains a height of up to 50 cm and the cylindrical cephalium of one specimen attained a height of 30 cm.

The rainy-green cactus-rich dry forest stretches now with some interruptions (as for example around Chamaya) as far as the basin of Jaen which is surrounded by low chains of hills, whilst eastwards evergreen woodlands contain increasing numbers of species. Despite increased humidity and relatively higher precipitation in the direction of the Maranon, which has cut down only a few meters deep into the old alluvial terraces around Bellavista, a remarkable impoverishment of the vegetaion is observable. On both sides of the river the forest disappears almost completely and there is a cactus-rich Croton bush zone that not only colonises the river terraces but also the low chains of hills in the neighbourhood of Jaen. The vegetational relationships of the alluvial terraces opposite Bellavista on the east bank of the Maranon were closely studied. Many square kilometres of level ground were occupied here by almost impenetrable cactus scrubland, in which Espostoa laticornua, E. lanata (scarce), Seticereus chlorocarpus (?), and S. roezlii predominate. The undergrowth are found Opuntia macbridei, Melocactus bellavistensis (frequent), Croton (2 species), Selaginella peruviana (forming thick carpets), and a series of thorn bushes: Peireskia, Acacia riparia (?), Cercidium praecox, Mimosa pectinata (?), Leucaena trichodes. This vegetation follows closely the course of the Maranon as far as the new bridge (between Chamaya and Bagua). Here there appears once again Thrixanthocereus blossfeldiorum, whose distribution also stretches with short breaks from Huancabamba as far as the Maranon. In association with it are Seticereus roezlii, Monvillea jaensis, Melocactus bellavistensis, Armatocereus rauhii and A. laetus.

South of Chamaya the Maranon valley cannot be easily explored, so that no opinion can be given about the cactus vegetation there.

Comments

. . . . . From H. Middleditch

Professor Rauh made two trips to Peru, one in 1954 and the second in 1956. The review of the material obtained from these trips was published in 1958 and this included an illustration of a then unknown Cereus species found in the Camaya valley, although it does not seem to have received so much as a mention in the text. An account of the trip through northern Peru appeared in "Cactus" (France) for September, 1957, in which the same illustration appeared of the unkown Cereus in the Chamaya valley. Here the text noted that "Another Cereus of peculiar appearance was found at 800m altitude, in great quantities in comparison with the small crowd at Chamaya. "This same illustration then appeared for a third time as Fig.46 in Backeberg's Kakteenlexikon under the title of Calymmanthium substerile.

The account given by Backeberg of his trip from Canchaque over the chain of the Andes and thence into the Huancabamba valley (Chileans No.40) also describes the dripping wet woodland or Ceja de Montana which he encountered during his ascent of the Pacific slopes. Backeberg tells us very little of the high altitude vegetation but leaves an impression that it is pretty low growing. Near the beginning of the above extract, Rauh tells us that he will "First . . . describe the vegetation near Huancabamba" and then immediately talks about the Pacific slopes of the Andes; this is followed by reference to a bush formation, but whether this is on the Pacific slope, or the inland slope, or both, is not at all clear from the text. Up to date it has been virtually impossible to lay hands on any literature which provides a general picture of the topography and vegetation of the Huancabamba-Chamay valley and the adjacent section of the Maranon valley.

PERUVIAN DIARY By Werner Hoffman

Translated from K.u.a.S. 16:4 April 1965, by K. Wood-Allun.

Although we were in the middle of the southern winter we were literally baked in the last few days in the lower valley of the Rio Huancabamba not far from the Rio Marañon. Collecting cephaloid heads of Thrixanthocereus blossfeldiorum was a real grind and it was only the presence of my wife which stopped me throwing in the towel and returning without more ado to our base camp at Chiclayo. Here, with a cool beer, in the well kept garden of some German friends, the oven-like atmosphere of the Rio Huancabamba would seem like a bad dream.

Rauh (Beitrag zur Kenntnis der Peruanische Kakteenvegetation) says of this region "According to Weberbauer the actual Huancabamba Valley is one of the most arid regions of Northern Peru and the low precipitation finds its expression in a vegetation rich in Xerophytes." Although the river carries vast amounts of water from the evergreen Jalca

region all the year round, the scant amount of farming which takes place has to be confined to the immediate environs of the river because of the low rainfall.

Four days ago we left Chiclayo and soon after reaching the Olmos Valley we tried to find Neobinghamia mirabilis again. This species was discovered as a single specimen in 1956 by Rauh. I looked in vain for it in October 1959 and this time I again had no luck. N. mirabilis is the most northerly representative of the genus and with its purple red spines and white woolly crown certainly the most splendid. Althogh there are numerous reasons for believing that all 'species' of the 'genus' are natural hybrids between species of Espostoa and Haageocereus, Rauh says (op. cit.) of Neobinghamia "On the basis of examinations up to the present time, Neobinghamia cannot be united with Haageocereus" and also "Only exhaustive and systematic seedling trials with really pure seed, together with thorough hybridisation experiments in habitat between Haageocereus and Espostoa will solve the Neobinghamia problem".

On the first day therefore we only collected Tillandsia distachya, T. ebracteata and T. spinosa which grew in large numbers at the top of Erythrina spec. On the Atlantic side of the pass, which is only 2144m altitude, before reaching the Rio Huancabamba, there followed Peperomia dolabriformis in its frosted grey form. This strongly succulent Peperomia from the extremely arid regions of N. Peru is easily grown on a bright window sill or outdoors in the summer. An examination of the subsoil revealed that it would grow quite satisfactorily in the usual cactus compost, soilless compost or peat.

Under H653 we noted a striking member of the Bromeliaceae of unknown genus. Its stiff, sharply erect leaves were strikingly striped diagonally, grey-green and often with a reddish edge. It grew mostly on rocks, less frequently on low trees. Near to the village of Chimaya we stopped for the night and completed our day's collecting with Melocactus bellavistensis the only species of Melocactus to be found on the Atlantic side of the Western Cordillera. The especially large body with the remarkably thin spination distinguished it well from the other species. A curiosity was Selaginella peruviana which withstands the long droughts of the region well with its rolled up shoots.

Our camp fire attracted the natives who were bewildered by the craziness of our work. In future we will say yes to the often repeated question as to whether our collected material is to be used for medicine. In this way we should soon satisfy our questioners. On the following two days we collected Thrixanthocereus blossfeldiorum, as well as Rauhia peruviana (Amaryllidaceae) and Melocactus bellavistensis. They grew together with Espostoa procera in the fallen leaves of bushes which rot down very slowly because of the lack of continuous precipitation. The prevailing temperatures can be better appreciated if I tell you that heads of Thrixanthocereus, freshly cut and laid in the sun to dry the cut surface, are burnt and useless within half an hour. Before each renewed sortie into the glowing heat of the bush we consumed masses of oranges which we cut in two with our machete and then simply sucked. These were cheap refreshment at a farthing each. One highlight was the discovery of Jatropha peltata, a stem succulent, which, unlike the south Peruvian J. macrantha, forms unbranched columns which lack the shielding leaves in the dry season. Jatropha peltata has not yet flowered in cultivation whilst J. macrantha develops its glowing red flowers continuously from summer to late autumn.

We were in a hurry to leave the inhospitable Huancabamba Valley for the friendly Chiclayo but we did not miss the opportunity of collecting some of those broadly-crowned plants which were later described as Espostoa laticornus, in addition to specimens of Espostoa procera, just before the pass at the upper limit of the cacti.

THE GENUS CALYMMANTHIUM Ritter By Wolfgang Krahn

Translated by W. W. Atkinson from Succulenta 49.11:1970

In 1962 Friedrich Ritter described the extremely interesting Cereus genus Calymmanthium from northern Peru. The diagnosis in K.u.a.S. is very comprehensive and accompanied by excellent photographs.

Seeds were being offered as early as 1957, of the (as then) only species of the genus, although it was under the provisional name of Diploperianthium substerile. This generic title refers to a flower with a double corolla. In the meantime, during a second visit to the habitat, Ritter had been able to determine that the bud appears through a rather spiny protective hood, which is formed out of the ovary. Thus in the early stages the buds have the same characteristics as shoots. This discovery was the reason for Ritter changing the name from Diploperianthium to Calymmanthium (= hood flowerer), so that the flower structure of this singular plant is given its proper due.

Calymmanthium substerile grows near Pucara, in the lower valley of Huancabamba, Department Cajamarca, province Jaen, and until now only a few specimens have been found. On my study trip in 1964 I spent some time in Amazonas, the north-easterly department of Peru. The Calla-Calla mountains, with their regular changing vegetation seemed to be a veritable El Dorado for the plant collector; an undisturbed, and therefore perfect paradise. Only a few botanists such as Weberbauer and Ritter got so far into this remote area. The upper parts of the mountain ridge are shrouded in a mist-forest. Tree ferns and long yellow trusses of various orchids (Oncidium) excite the traveller. As one comes lower, the forest becomes less dense and one gets a clear view of the dry valley of the Maranon river, the upper reaches of the Amazon. It is an indescribable and unforgettable panorama; in the depths, the chocolate brown river, which winds its way through a colossal mountain world in a south-to-north direction towards the endless jungle.

Several new cacti were found here and duly photographed. A group of Cereiod plants can definitely be determined as Calymmanthium, because of their exceptional flowers. I thought at the time that I had discovered a second habitat of C. substerile, about 180 Km south east of the Huancabamba finding place. Meanwhile Ritter had also found this plant and discovered that it is another species which he named Calymmanthium fertile Ritter. The description appeared in 1966 in Succulenta.

In spite of the fact that both species so far known form large bushes in the wild, and reach a height of 3-7 metres, they can nevertheless be recommended to those with greenhouses equipped with warm winter conditions. On a visit to the well-known cactus collection of Dr. Cullman in Marktheidenfeld, I was able to admire a seedling of only about ten years old, with flowers.

Note: the habitat photograph by Professor Rauh in "Die Cactaceae II" Backeberg page 984, illustration 910, and in "Kakteenlexikon" Backeberg illustration 46, it is not a Calymmanthium species that is illustrated, but Gymnanthocereus altissimus Ritter.

Comments.

. . . . . from W. W. Atkinson.

In regard to a point of translation — I have used the English word "hood" as a translation of the Dutch word "muts". In the vernacular this means various sorts of cap or bonnet. It is also used in a compound word for tea-cosy. I should imagine that it is used here in a descriptive way rather than as a botanical term.

. . . . . from H. Middleditch.

The reference to the spiny protective hood, which is "formed out of the ovary", may appear to be somewhat confusing at first. The writer appears to be indicating that the protective outer hood is formed by an extension of the pericarpel (the tissue which surrounds the ovary) which grows up and around the outside of the bud. Perhaps it can be considered the equivalent of a calyx?

My own attempts to grow this plant have been rewarded only by early failure. Now that I have been able to find out not only whereabouts it grows but — much more important — what the climate and ecology of its valley habitat is really like, the cultivation conditions that this plant require become much more readily understood.

. . . . . from R. Zahra.

About three years ago my Calymmanthium substerile produced six flowers. They are very strange flowers because the buds look like a stem and shows no sign of a place where it is going to open. Only a few hours before the flower opens, the covering is torn open and out come the petals. It has not flowered again since that time. When I had to move house this summer, this plant had grown much too big to move, so I took eight large cuttings and sold the tree itself to a dealer. It took three men to take it up and now it is in the garden of a local hotel where I can still see it. The cuttings have not rooted yet but I am hoping that they do because this is a very interesting plant.

A TRIP TO PERU By Ing. Markus

Translated by H. Middleditch from a report of a slide talk, G.O.K. Bulletin December 1977.

Herr Markus has already been out to South America in search of cacti on several occasions. He went with Herr Rausch on a number of trips, at other times with Herr Zecher (in the course of which the entire film material was stolen from him in Arequipa) and this time with Herr Wolfgang Krahn and one other. Peru was chosen once again as the touring region, just as on previous occasions.

The itinerary amounted to about 6000km altogether and went through northern Peru. In Lima a Landrover was procured as a conveyance. Lima was likewise the starting and finishing point for the expedition, for it certainly can be described as such. The objective was the collection of cacti and tillandsias, though from localities established previously. The export of plants from the countries of South America has certainly become increasingly more difficult (this is something which cactophile and conservationist can only welcome); so for each participant only the contents of two chests were filled with the harvest. In view of the colossal amount of interesting and collectable material which was available, this was certainly not a great quantity.

The road from Cajamarca wound over a 3,300m high pass in the direction of Celendin. Matucana celendinensis is to be found in the valley at 800m altitude, quite 25km before Celendin. Note that naming plants after inhabited places is done in a very casual way. On the descent towards the Maranon, Armatocereus species grew up to 10m high. The first Espostoa mirabilis was sighted, badly battered and not quite so marvellous as promised by the name. However, the lower we went the finer the plants became, and then with their marvellous chocolate brown cephalia they really came up to their reputation. The finest ones were to be found around Balsas, a village that one looks for in vain on the map — it consisted of four houses.

A bridge went over the Maranon here. It was extremely hot and our friends atoned for a few sins (if they had any). In return they were then adequately rewarded with the discovery of a Thrixanthocereus blossfeldiorum, carrying a double cephalium. It is not quite clear for what reason Matucana formosa is said to be "handsomely shaped" since the stump which stood there was anything but a handsome figure.

Now we wished to travel on towards Bolivar; however, it remained but a 'wish' since there was a river in between and so we had to put up with some lodgings in the "Hotel" at Balsas. Our friends found one night quite sufficient. The lodgings were a rough room, more a compartment in the rear wing of a questionable structure and lacking any window. Thus at night the door was left open in order to admit the somewhat cooler night air into the oppressively hot inner room. Our Ing. Markus allocated himself the bed close to the door, so as to be even closer to the fresh night air. This however he was to regret for at night, as everyone slumbered peacefully, the owner's black sow came to pay a visit and on whom, would you believe dear reader, that it landed? For this experience our friends were richly compensated on the following day; a rarity was found from the cactus family so rich in forms, and this only a solitary specimen: Calymmanthium substerile. But one cannot have even better luck and gather a ripe fruit.

On dangerous, steep tracks without gradient signs and other modern paraphenalia we now went upwards and then it was up hill and down dale. Now a collector's paradise had been reached. From the trees waved the filigree rosettes of Tillandsia distichia; right next to them stood a clump of splendid yellow-brown spined Submatucana myriacantha, which had already been pretty well decimated by a professional collector. Everywhere were to be seen the widely distributed Tillandsia tectorum, which was very variable, depending on habitat conditions. Here too grew the new Melocactus balsaensis, in connection with which one could put a question mark after the name, since there each spot had its own Melocactus and probably all of them are only forms of Melocactus bellavistensis. In addition, none of the cacti were accompanied by a label! On the other hand the new discovery by Ritter, Lasiocereus fulvus FR 1303 was easier to recognise. At the same location were still to be found extensive groves of Espostoas with silvery cephalia close to extensive colonies of terrestrial bromeliads. When it was a matter of securing specially fine and rare examples of Tillandsia, which caught the eye from steep rocky slopes close to the road, even the car roof had to be used as a platform. Then having arrived at 3,300 m, once again there were immense Bromeliads, Orchids and even Fuchsias. There was a particulrly splendid specimen of a Lycaste, a succulent orchid with an umbel of egg-yellow flowers.

At 3,500 m altitude the cloud forest of Laymebamba began. In Laymebamba itself Hutchinson had spent six months in a not very luxurious hotel and catalogued the plants in the neighbourhood. This is really exact science. It could also be regarded as the labours of Sisiyphus. From the hotel balconies meat was hung to dry and although the flies and maggots were making nests in it, it did not taste too bad. Soon the Huancabamba river (Utcabamba, surely — H.M.) was reached, on the banks of which, with its roots almost in the water, a Hylocereus species budded. The enormous bud was close to the time of flower opening. As it provided a marvellous photograph the night's camp was pitched and early the next day the flower was on film, the delicate yellow superbloom measuring 25 cm in diameter (10 inches — H.M.). Gymnanthocerei up to about 2.5 m in height also grew in the vicinity of the river.

Collected tillandsias worth collecting were hung up in onion sacks stowed on the wing of the Landrover, for the purpose of despatching them dry. In this way the slipstream dried the plants and prevented them going rotten. Before the expedition reached the Rio Chamaya, a superb specimen of a Melocactus bellavistensis was seen; it was furnished with a cristate cephalium. Here too the first specimen of Epostoa ritteri was noted; treelike, but growing more in breadth, with jet black central spines in the new growth. In the valley of the Chamaya (Maranon, surely? — H.M.) was found Submatucana madisoniorum; however, it must be added that this fine plant is already pretty difficult to find. The blame for that is the excessive profit-mindedness of many a "collector".

A mishap forced our friends to an involuntary halt; a broken axle on the otherwise so excellent Landrover; they had to wait 25 hours for the replacement axle, which Herr Krahn had first to procure. The night was spent on the vehicle roof on account of the heat. Then they were off to the next larger settlement at Bagua, moving further on once again through the wilderness. Washing oneself was rarely possible and Pepsi-Cola was used for shaving, since the water contained too many bacteria. The Maranon was crossed at a ford, which was not quite so simple since only a foot or two away from the ford the water was already quite deep. At the confluence of the Rio Chamaya and Maranon were found more Melocactus bellavistensis, in groups as before. Here too grew Submatucana pujapatii, which is regarded by many authors as a variety of S. madisoniorum, but is probably identical with Submatucana paucicostata.

Here the first bottle tree was met with, of which there were two species. The flowers are very small and similar to those of our Narcissus. At the spot at which Ritter had found his first and only three specimens of Calymmanthium substerile, a short rest was made for the purpose of photography. Ritter's three specimens of a species which is slowly becoming extinct stand there yet and it was easy to find the habitat in consequence of the excellent description.

(The expedition then travelled via Huancabamba to the border with Ecuador and returned to Lima via the coastal flanks of the Andes).

. . . . . from P. C. Hutchinson "Browningia pilleifera (Ritt) Comb. nov. C. and S. J. of America XXXX.1.1968

Balsas is at the bottom of a gigantic canyon formed by the Rio Maranon, a major tributary of the Amazon river. The Maranon at this point separates the departments of Cajamarca and Amazons. From the upper reaches of the Cerros Calla Calla, Amazonas, at over 14,000 feet altitude, one looks across a gigantic canyon which rivals the Grand Canyon of the United States. It is nearly 30 miles across, and over 11,000 feet deep, and from the upper reaches one can see the chocolate brown river snaking its way towards the jungle to the north and east. The descent to Balsas, at 800 metres altitude, is

particularly dangerous from the Amazonian side and numerous fatal accidents have occurred along this road. Often only two tracks occur on a narrow winding road cut from the cliff faces and drops of thousands of feet may occur less than a foot from the edge of the road. When it rains, landslides are frequent.

The area had been previously collected over 50 years before by the Peruvian botanist Augustin Weberbauer and later by Felix Woytkowski. In April of 1964 we were based on the eastern side of the Calla Calla mountains at the small village of Leimebamba on the Rio Utcabamba. We had already found, in this canyon, a new hairless Espostoa and a new Browningia.. At Leimebamba and downstream to below Chacapoyas we had taken a new species of Borzicactus. On April 4th a young German cactus collector, Wolfgang Krahn of Stuttgart, accompanied by a friend, arrived in Leimabamba from the coast. He had heard we were in the area and had driven his Volkswagon in to visit. That evening after dinner I discussed with him what I expected to find on the western slopes of the Calla Calla down to Balsas. We set out for Balsas in our expedition truck on the 7th. That evening we were standing among thousands of the new Browningia which were intermixed with Armatocereus rauhii. These two large columnar cacti dominate the slopes in the bottom of the gorge of the Rio Maranon from at least this point to about 100 miles upstream. We learned that Ritter had been in the area the previous year, collected seed, and we were fairly sure that he would publish it.

As Balsas is extremely hot and dry it is probable that this species will not survive out-of-doors in most temperate climates. But under glass it would be expected to attract favourable attention from all cactus enthusiasts.

THE HUANCABAMBA VALLEY. By Alexander von Humboldt.
From "Views of Nature" 1850.

After having sojourned for a whole year on the Andes between 4°N and 4°S amidst the tablelands of Quito, it is delightful to descend gradually through a more genial climate into the plains of the upper Amazon. Descending S.S.E. from the mountains into the hot valley of the Amazon river, the traveller passes over the Paramos or mountainous deserts. They are stormy, frequently enveloped for several days in thick fog or visited by terrific hail storms. During this process, I have sometimes known the thermometer sink to 48° or even 43°F. When the temperature is below 43°F, snow falls in large flakes, but it disappears after the lapse of a few hours. The short thin branches of the small-leaved myrtle-like shrubs, the large size and luxuriance of the blossoms, impart a peculiar aspect and character to the treeless vegetation of the Paramos. In these very regions there sill exist wonderful remains of the great road of the Incass; maintained along an extent upward of 1,000 geographical miles from Cuzco to Quito.

As we were proceeding through the last pass before our descent, we experienced considerable difficulty in guiding our heavily laden mules over marshy ground, but for a distance of about four miles the remains of the Inca road which lay before our eyes was upwards of 20 feet in breadth. We saw still grander remains on the Paramo of Chulcanes not far from Guancabamba (= Huancabamba — H.M.) and also in the vicinity of Ingatambo, near Pomahuaca. I found the difference in level between the pass by which we entered the valley and Pomahuaca to be upwards of 9,700 feet; the distance in a direct line is 184 miles. During our long day's journey to the valley of San Felipe, we had to ford the Rio Guancabamba no less than 27 times, on account of the numerous sinuosities of the stream. The Rio de Guancabamba is not more than 120 to 150 feet broad, yet so strong is the current that our heavily laden mules were in continual danger of being swept away by it. The Rio Chamaya (the lower part of the Rio Guancabamba) has many falls in its course. In the short distance of 52 geographical miles from the ford at Purcara to the point where it joins the Amazon, it has a fall of 1778 feet according to my calculations.

On approaching the hot climate of the basin of the Amazon, the beautiful and occasionally very luxuriant vegetation delights the eye. The orange trees, laden with their golden fruit in thousands, attain here a height of between 60 and 70 feet. Their branches shoot straight up, like those of the laurel. At Chamaya we found rafts (balsas) in readiness to convey us to Tomependa at the mouth of the Chinchipe. "I made" says La Condamine "my first attempt at navigation on a raft (balsa) in descending the river Chinchipe as far as Tomepanda". Next morning we proceeded down the Amazon (or Maranon) river as far as the cataract of Pongo Retema. In the Pongo de Retema masses of coarse grained sandstone rock rise up like towers and form a rocky dam across the stream. I measured a base line on the flat sandy shore and found that the river is scarcely 1400 feet broad at Tomependa. In the narrows of Pongo de Manseriche, formed by a mountain ravine, the breadth is less than 160 feet.

SPEC. NOV. BRANDT? From A. W. Christie

Does the publication of the spec. nova Brandt by The Chileans indicate that it has finally adopted a pro-Brandt attitude? If this description is typical, I hope not. It may be technically valid but who collected the plant in the wild? What was the extent of the natural variation in the type locality? What other plants grow in the vicinity? What relationship does the plant bear to other Parodias? The poor reproduction of the photograph does not help but could you pick out this plant mixed with a hundred others in a collection? The pages of The Chileans are largely devoted to sorting out this information for older species. Why add problem species to the literature?

. . . . . from H. Middleditch.

Unfortunately we have no choice over the addition of new problem species to the literature; seemingly they get added in almost every other copy of the various cactus journals. The real problem is — do we ignore them, or do we discuss them? It may be as well to be under no illusion that this is only a "Brandt" problem. Let us recall Karl Reiche's comment that R. A. Phillipi published no small number of species on the basis of "incomplete or immature material" and that some of his later species were only new names for "plants he had previously described himself". Jorg and Brigett Piltz have told us just how variable are Gymnocalycium growing but a few yards apart: some with long spines, some with short, some with white flowers, some pink, some with three spines, some five, some seven. How do we regard this situation? Accept Gordon Rowley's contention that there are really only nine species of Gymnocalycium? Having heard from John Medway that Sulcorebutia are often found in a relatively compact area on the crown of a hillock, would we accept that each hillock carries its own species? Similarly Ritter's species of Copiapoa that are "confined to the area of the Type population". Is it more convenient to have a number of species names even though the dividing lines between them might even be considered arbitrary? And will one author's arbitrary line necessarily coincide with that of another author?

How does one set about assessing the acceptability of any such dividing line? Does one examine the description line by line, feature by feature, compare it with what could be considered as the closest related species and then decided whether or not the dividing line is acceptable? And would the conclusion drawn from such a comparision by one person necessarily be similar to that drawn by some other person? Can we take it from the existing literature that Ritter's conclusions about the existence of a dividing line or where it falls are not always the same as those of Backeberg? Or of Buining? Or of Brandt? Or of....? Since there is neither an accepted umpire or arbitor (be it person or Institution) for new "species" shall we take upon ourselves in The Chileans the task of Solomon and decide who is right and who is wrong? Or do we provide and discuss comparisions of descriptions and material and try and assess the viablility of each party's arguments?

Do we also take into account the author's own attitude to the question of "What is a species"? Instead of comparing item by item only a pair (or set) of descriptions made from plants which we ourselves did not see, do we take into account the attitude taken by the respective authors upon the inherent status of a "species"? Not just for Brandt! For years there have been expectations that Ritter's Cactus book will at last sort out the problems of South American cacti. It is now in print; either it has answered everyone's questions or else there is a stark realisation that it has merely added to the problems and queries. I suspect the latter is the case. Do we tackle the mammoth task of assessing all his new species names viv-a-viz those of other authors? Or do we start by considering Ritter's basic attitude to "What is a species"?

. . . . . response from A. W. Christie.

It is certainly not at all easy for the outside observer to reconcile the views of Backeberg, Ritter, Buxham, Rausch, Buining and Donald etc. with each other. Levin (The Nature of Plant Species, Science Vol. 204 p. 381 1979) suggests that "we create and amend species interpretation until we have a mentally satisfying organisation". Each of the above authors obviously feel that they have done just this. I suspect that the truth is that none of them really know their plants well enough (can you ever?) and even in their extensive travels they have probably only seen some part of the actual variation. They can only guess at how much of the variation in the wild is due to local conditions of microclimate, soil chemistry, etc. We would all like to see a definitive text on South American cacti, as Ritter and Backeberg both thought they were producing. Before this can be accomplished, a vast amount of work lies ahead in the field, in the greenhouse, in the laboratory and (despite Ritter's criticism) at the desk. If the Chileans supply only a little of the mortar for the eventual edifice, they will still be performing a valuable service.

THE SPECIES TYPE BY F. Ritter

Translated by H. Middleditch from "Cacti in South America". Vol. I.

Now in regard to species: a species may be expressed narrowly or broadly but in order that there is a clear concept upon which the species is based, it should remain permanently attached to a designated specimen, according to the Code of Nomenclature. To make this possible, the reference specimen or typical parts of this specimen prepared for a herbarium (thus in permanently preserved condition) should be deposited in a permanent specified place. If this original, deposited in accordance with the nomenclatural rule for the name of the species, is described as the "Typus", a notation of that sort is misleading and unsuitable since the meaning of the word does not match the concept of a "Typus". For what is thus designated as a type often has by no means typical features for the species concerned. Very often the reference species of a genus stands by chance more to the edge of the range of the genus; likewise the reference specimen for a species often exhibits very few of the typical features of the same. What the true Typus of a genus or species is, cannot be determined by the chance of a deposited original, but is given by nature and can only be determined by research. The Nomenclature Code does not even allow the remedy, in the event of the Typus of a species proving to stand between two species, of choosing a more appropriate Typus. At any rate one feels that the now accepted expression "type" was not a happy choice, indicating only a "nomenclatural typus" and leading to the result that it is not to be made use of as the specially typical component of a Taxon, but should only be the reference point to which the name should remain permanently connected.

The value of the deposited Typus for the clarification of systematics tends to be much over-rated; as currently defined it is able to contribute virtually nothing to the clarification of the species problem, especially since it states nothing about the breadth of variation of the species that it should represent. The valuable Types are quite certainly to be found at the habitat locations, where the species of varieties grow, and exist not in one single specimen or part of such, but in populations which alone demonstrate the range and the limits of the species and their natural boundaries between each other.

In other respects too, the practical value of the deposition of types and hence of original names is a very narrow and usually very questionable one, since satisfactory treatment can only be accomplished on the basis of field studies. Other treatments remain makeshift and a more doubtful substitute. The deposited originals are usually to be found in Europe or U.S.A. and have almost only a single use in the clarification of names and that is, to determine priorities. It is, however, virtually impracticable for the investigator who studies the cacti in their homeland, to view the original itself for the clarification of questions of priority. In practice there remains almost only the publication to depend upon, since only this can always be had to hand. One far greater practical gain would be achieved, if instead of the deposition of the "Typus" example, it was made a requirement that there must be published photographs of as typical as possible an example of each new species name and variety name, with which the name should remain attached, along with the diagnosis of the specimen. This would then be the photographically recorded original i.e. the Nomenclatural Type. This deposition can be examined anywhere without formalities in the hundreds or thousands of examples in which the publication is printed, wheresoever the investigator finds himself. How much more useful to the investigator this would be than a specimen deposited somewhere in the world, which an investigator cannot normally get sight of because of the great and time consuming formalities.

However with my many first descriptions and with my studies for their valuation, I have never examined any Typus example deposited on the other side of the world on account of the tremendous formalities. What practical worth therefore has this requirement had? In any case, even with a photo-illustration not much more emerges than the establishment of the name of a particular species. Indeed this is only so when the latter is in agreement with the original specimen photograph, because the original photograph tell us just as little about the breadth of variation as the deposition of a herbarium specimen. The determination and illustration of the breadth of variation, at least by means of descriptions, is however the most important aspect of the documentation of species and varieties. Without this, the door to species making becomes wide open and a true decision about the justification for new names is impossible. Absolutely necessary for that purpose are studies at various locations within the distribution area itself. How can one, from an office desk, arrive at the determination of all those characteristics of a species that can be collected through field observation alone, such as local and regional variability, distinctions between natural hereditary variations and environmental modifications, relationship of variability to habitat, climatic and other factors, range of variability, hybridisation etc.? Without such observations one cannot really determine what is species, or variety, or form, especially since the despatching collector tends to send off the most variable specimens and hybrids, whilst concealing the transitional forms so as to get "new" species manufactured in this way. Moreover if one such genus is set up in this way, it must be completely revised again on the basis of a later official investigation at the specific habitat. In that event there falls to a later competent worker the thankless and time consuming task of changing the previously made names unequivocally to that of his appropriately established species. This work often cannot quite be brought to a conclusion without a number of queries. It is most simple when only pseudo-species are under consideration which can all be brought together by a subsequent official investigation at the specific habitat (as in the case of Melocacti from Curacao, validly described by Suringar as 83 species names and 24 varieties, which Britton & Rose brought together as one single variable species).

Comments

. . . . . From H. Middleditch

Ritter complains bitterly about the formalities which effectively debarred him from consulting any of the Type specimens held in herbaria in U.S.A. or Europe. However, I can imagine that the herbarium curators concerned might well draw the line at sending their precious and carefully preserved records out to some out-of-the-way place in the wilds of South America for Ritter to examine.

The greater amount of botanical collecting work in the southern hemisphere has tended in the past to have been carried out by Europeans or North Americans. These collectors would spend a limited time in the field, making collections and notes: with the time and facilities available back home, they would study their material (indeed, often have it studied by an expert in that family) and compare it with existing herbarium records, in order to determine identification and classification. Those researchers domiciled in South America, such as Reiche, Soehrens, Hicken, and Castellanos, were based on academic establishments which already possessed formal links with other similar establishments in Europe and U.S.A. from whom reference herbarium data could be obtained on loan. However, Ritter had no such connections and he appears to have acknowledged that he was divorced from access to herbarium data. It would seem that not only did he criticise this "establishment", but that he also chose to ignore the requirement for a Type specimen with any new species name, for none of the descriptions in his Volume One appear to include a reference to deposition of a Type at any herbarium. Does this mean that his descriptions are thereby invalid, with the exception of those descriptions which have already

appeared in Journals such as K.u.a.S. or Succulenta, where the diagnosis did indeed include the requisite Type deposited specimen?

Ritter plays down the value of the "Type" called for in the Nomenclatural Code, contending that it fails to provide any guide to the degree of variation in a species. But I can recollect discussing Parodia with Roger Moreton when he observed that the big difficulty with Parodia was "knowing where to start". A recent communication from Theunissen concerning Notocactus observes that "I don't know where to start with the studying". It would seem that whatever it may not do, the Type does at least provide a starting point for studying or identifying a plant.

Ritter talks at length about the range of variation exhibited by one species, both about differences in habit under similar growing conditions and differences between plants growing under different micro-climates. He then goes on to indicate that this range of variation must be observed and recorded; otherwise it is not possible to decide whether any old or new species name lies within or without the range of natural variation of one species. However, this presupposes that a collector could and would provide a description covering all possible facets of this range of variation in habitat so that there would presumably be no subsequent problem in either placing a plant within a species or deciding that it required a new name. This also supposes that all subsequent workers find the comprehensive (Ritter?) description an acceptable definition of the species concerned. But then Ritter quotes the case of Melocacti from Curacao, carefully studied in the field by Suringar who was resident there. Britton and Rose subsequently, after a much shorter field survey, came to a quite different conclusion. So how much weight did the extended field study carry in that case? Again, Ritter throws four of Buining's "new" Melocacti back into M. bahiensis, even though Buining carried out a study of these plants in the field. Ritter also studied them in the wild, but he came to another conclusion. Are we therefore able to draw any conclusion ourselves from this, except that a species name is what anybody cares to say it represents, until someone else says differently? And this, irrespective of the extent of the field work, or whether the diagnosis does attempt to describe the range of variation in habitat? If that is the case, as indeed it appears to be, what is the point of bothering with the arguments of this authority or that "official expert" over whether a species name should stand or should be reduced to synonymity with another species?

. . . . . From G. J. Swales

Some years ago whilst studying under the auspices of Durham University I had occasion to write to the New York Botanical Garden requesting information regarding Gymnocalycium megalothelos. Herbarium material and photographs were made available to me only on condition that they remained in the keeping of the University herbarium. I can well imagine that there could be greater difficulties to contend with if an individual studying on his own wishes to obtain the loan of Herbarium material, even in this country. It is likely that the problems would be greater still if the request originated from overseas.

. . . . . From G. Rowley

Ritter's Volume One has scandalized the "establishment" by its sheer amateurish bungling in matters of nomenclature and its oversplitting of genera and species. Also, its long-winded presentation makes it an abomination to consult. On the other hand, it undoubtedly contains many useful field data and has value as such. It's all rather like a great painter doing "The Last Supper" on the back of an envelope with a child's paintbox from out of a Christmas stocking!

The date at which citation of an actual type specimen becomes obligatory is 1958. I hate to say so, but practically all the names in Ritter's book are validly published (just!). He gets away with typification by a broad statement in the introduction that all the types are in such-and-such a herbarium, so we have to accept this — and the names — at face value. Of course there are many individual cases that transgress for other reasons, and the exhuming of Piptanthocereus and Platyopuntia shows astonishing ignorance of the basic rules of typification.

. . . . . From Ritter, South American Cacti, Vol. I, Introduction

The "Nomenclatural Type" of the species and varieties newly published by me were sent to the "Botanical Institute" of the University of Utrecht, unless a deposition at another location is stated in the text.

. . . . . From K. Reiche, "A Springtime excursion to the Atacama", 1911.

(Reference to Euphorbis lactiflua). The following must serve for the more exact recognition of the plant which, because of its fleshy character, the herbarium keeps only unrecognisable fragments . . .

. . . . . From D. W. Whiteley

I have great respect for Ritter in his efforts to get his extensive work on the South American cacti published against all odds. Bearing in mind the printing trade does not want to know about expensive reference books nowadays, one must still comment on the poor quality of the illustrations in Ritter's book. Perhaps Ritter has done the best he could, but it does affect his argument about replacing the deposition of a type specimen in a herbarium. Ritter calls for this to be replaced by a photograph published so that it becomes readily available to a wider circle of people. But what a problem later workers would have in trying to equate material to the very few and poor photographs of new species in Ritter's work! I do not think that all the new names published there do have a photo anyway, so Ritter is not even following his own recommendations probably on account of the prohibitive cost of doing so. At least we do have his obligatory herbarium types to supplement these poor photos and aid later workers. Long live the herbarium type! Or should it not be: Long die the herbarium type! Would

it not be a good idea of the original photographic material used in any original publication had to be deposited along with the herbarium type and thus ensure that poor printing did not debase the material available?

In regard to borrowing "types", I once wrote for details on some of Ritter's type species from one of the herbaria he uses and was offered the loan of the "Types" and no questions asked! I presume that they must have thought that anyone requesting types must be attached to a recognised scientific establishment. I have always had the utmost help from the "establishment" be it Kew, Museo Nacional Chile, or wherever I have enquired. I am sure that provided the type stayed within a recognised scientific establishment and one was supervised by a competent person there, one could view types by arrangement. At Olmue, Ritter was not far from the Museo Nacional de Historia Natural in Santiago, who would be able to borrow types — indeed they have the types of some of the plants he worked on. Even at long range I have received every assistance from them. No, I do not think that Ritter has ever really tried to gain access to herbarium material.

I do agree with Ritter that the choice of the word "type" is unfortunate as it tends to mislead as to its real purpose. It is not the most typical element in many cases, nor can it really be as only when the full range of variation is known can one select the most typical element. Even in habitat nobody has ever covered every square inch of ground, but even if we had all the variation to hand, there may be no plant possessing the exact mid-point of development in every feature. We would need a plant of mid size, mid spine length, mid flower size, mid flower colour, mid this, that, and the other. It is highly unlikely that all these middle degrees of development would ever exist on one plant; perhaps even half a dozen plants would exhibit all the mid-features required. A type is unlikely ever to be typical and this is hardly its purpose.

Unless we are forever reassigning new types to place them in the midpoint of variation which each new expedition and collection brings to light, we will never have a type that is the midpoint of variation. This situation would lead to no permanent type species as nobody would ever be once and for all in possession of the knowledge of all the variation within one species let alone the Cactaceae. There is nothing to prevent further examples of the variations within a species being placed in a herbarium. It is open to any collector to do so. The Type is the plant as it was known to the person who named it at the time he named it and solely indicates to others what he meant by that name.

Ritter's arguments fall down unless we are to assume that he is now in possession of complete knowledge of the entire variation within the Cactaceae. But any selected type can only reflect the material which is known at the point in time when it is selected. The type is simply the plant that the name is permanently attached to — nothing more. As to a type species subsequently proving to stand between two species (as Ritter suggests), I find this highly improbable. If intermediates occur then surely it is all one species and not two; if the original type is in the middle of this complex, then it is the mid-form of the variation. A species surely should encompass all the variation found within the group and be separated by meaningful breaks from other species. If intermediates are found, do you then have not two species but only one large one with many ecotypes?

I think there is a certain amount of sense in Ritter's other points. It would surely be better to publish a new name with a photograph of habitat, plant, flower, fruit and seeds. For valid publication, a certain minimum of information should be obligatory on all these features — and certainly a precise type locality. I have heard all the arguments in favour of unspecific locality data but I am still unconvinced. Habitat information seems to be guarded most of the time for quite irrelevant reasons; possibly to make sure that nobody else comes along to restudy their so-called new species and call it rubbish and only a population of a well-known plant. Being able to study those plants which occur in a type area would immediately remove any doubts about what the original author really meant by his species.

Ritter sets out the well known disadvantages of the present system for "Types" but much of what he proposes in its place is no better. When I first started with cacti I was very sceptical of the typification system. Whilst still having reservations as to certain aspects of the system, I have come to appreciate the logic behind it. The typification system is intended to bring a degree of stability to nomenclature, not really to classify plants. It is there simply to try and ensure that we all call the same plant by the same name.

. . . . . From A. V. Fric (Chileans No.37 p.7).

I am not publishing a full description of the discovery place (of Neowerdermannia) so that insatiable "collectors" will not rob them. I have experience of what happens to some of my newly discovered plants; where such a greedy collector gets to, there no cactus grows.

. . . . . From J. Medway

A year or two ago Karel Knize was telling me that when he first went to the habitat location of Matucana madisoniorum, there were thousands of plants to be seen, but when he next visited the site he had to search for some time before he managed to find any and then he only managed to collect half a dozen plants.

. . . . . From G. J. Swales

When Copiapoa grandiflora was discussed in the Chileans, the habitat site was quoted where these plants had been found by Buining, despite his request not to publish this information. Do you not think that it would have been better not to have betrayed his confidence?

. . . . . From H. Middleditch

The site was described by Buining as "past a deserted gold mine". Lest anyone thinks that this could be a precise location, gold mines in Chile bear no resemblance to the massive structures at such mines in South Africa or Australia. Thus John Coleman ("Coleman's Drive" 1962) came across a mine which had "no buildings and no shafts, only a few Indians chipping the ore away from lumps of stone". The Herivals ("We farmed a Desert") had a "valley dotted with workings of disused mines" only half a mile from their farm, some of them "mere scratchings". To me, Buining's site location was anything but specific.

. . . . . From R. Mottram

I would like to suggest that it is not necessary to deposit a herbarium specimen in order to validate a new taxon, as the opening paragraph of this article might imply. You can see for youself the wording in the appropriate part of the International Code for Botanic Nomenclature; this is the 1978 issue, of which Division 2 consists of the Rules and Recommendations which are presented in 75 articles. Article 9 relates to Typification; Paragraph 9:1 defines the Type; paragraph 9:2 covers the situation where more than one taxon is included in a herbarium sheet. Paragraph 9:3 states that "If it is impossible to preserve a specimen as a Type of a name of a species (or infraspecific Taxon) of recent plants, or if such a name is without a type specimen, the Type may be a description or figure". The term recent plants probably means non-fossils since the next paragraph refers to fossil plants. Paragraph 9:5 states the "Type specimens of names of taxa must be preserved permanently and cannot be a living plant". The reason for this will be self-evident if we accept that the Type is there for posterity. Nowhere in these Rules do I find a requirement which demands the deposition of plant material in Herbarium, merely that a type specimen cannot be a living plant. If no Type specimen is preserved then the Code clearly accepts a description or an illustration. Mind you, I would have thought that the spirit of the Code would have been to accept only a description which makes quite clear the differences from other taxa and where these differences may not be completely clear from a description alone then an illustration would suffice, or better still, a preserved plant or parts of same. However, the desirable situation is one thing and the Rules are another and the Rules do not demand a permanently preserved herbarium specimen in order to make a new name valid.

. . . . . From G. J. Swales

My own copy of the I.C.B.N. is the 1972 issue, but as far as I can see it does not differ from Roy Mottram's copy in regard to the requirements for Type specimens called for by Article 9. After reading it carefully two or three times I would also be inclined to the view that the Rules do not specifically call for a Type plant for the purpose of validating a new name. But in "Name that Succulent" Gordon Rowley is quite positive in stating that when an author describes a new species he is "obliged" since 1958 to cite a specimen of the species and where it is deposited. Perhaps we should ask Gordon Rowley just where this is included in the Code?

. . . . . Further from R. Mottram

David Whiteley suggests that the Type may not be the most typical plant of a species. This is recognised by the I.C.B.N. which states quite plainly that "The nomenclatural Type is not necessarily the most typical or representative element of a taxon". The Type is simply an anchorage for the name. Further reading of the ICBN has revealed Article 37.1 "Publication on or after 1st January 1958 of the name of a new taxon is valid only when the nomenclatural Type is indicated (see articles 7 to 10)". There is also Recommendation 37B.1 "When the nomenclatural Type of a new taxon is a specimen . . . .". There is also Recommendation 7A — "It is strongly recommended that the material on which the name of a taxon is based, be deposited in a permanent institution . . .". As far as I can see this is the only reference to the deposition of a herbarium specimen, and it is clearly only a recommendation, not a necessity. The provision of a herbarium specimen is only one means of "citing a Type specimen". Citation of a drawing, photo, or description is also possible; thus if a description of a new name includes the words "This description is of the Type plant" then the Type has been cited in accordance with the ICBN. However, one would hardly consider this to be good practice. I would echo Geoff Swales' question and ask Gordon Rowley where the ICBN "obliges" an author of a new name to deposit a herbarium specimen.

. . . . . and from Gordon Rowley

Roy Mottram is correct that the ICBN nowhere explicitly states that an author must cite a herbarium specimen: but the conclusion is inescapable if you read the whole Code, especially Articles 37, 7 and 9, and the Guide for the Determination of Types. Historically, these often complex regulations arose from a common desire to free the botanist from the need to consult all hastily undertaken and dilettante work and to confine interest to properly documented research. Since herbarium botany has been the backbone of plant systematics for more than two centuries, and nobody seriously questions the importance of having an actual specimen as anchor for a name, it is hard to sympathise with an opposing view. Admittedly there are loopholes, and as in most legal documents one can argue over words. What is meant by "or other element . . ." in Art.9.1 — part of a plant, or an illustration? And would cacti be a case where it is "impossible to preserve a specimen" (Art. 9.3)? The wording is especially lax here; I have proposed an amendment in Taxon 29: 341, 1980, and appealed for greater clarity, but time alone will tell if improvements are made. But note especially Art. 9.5 "Type specimens of names of taxa must be preserved permanently and cannot be living plants or cultures".

So I remain of the opinion that we must reject names after 1958 when no type was indicated — or typify them and validate the name properly. I do not, however, go as far as some, who see in the Code authority to reject names, even when there is a type specimen, if that specimen does not show the diagnostic characters and is indistinguishable from that of other taxa. But this has been done — Lindsay proposes rejection of the name Ferocactus peninsulae var. vizcainensis on these grounds. Despite so many revisions, the Code still has "grey areas" where interpretations differ: in such cases one turns to the Preamble and follows the golden rule: "In the absence of a relevant rule or where the consequences of rules are doubtful, established custom is followed". Would somebody now like to table a proposal that we discard all the rest of the Code and retain just this one precept?

. . . . . from D. W. Whiteley

Regarding the deposit of types, David Hunt tells me in a letter on this matter "Citation of the nomenclatural type became obligatory on 1st January 1958. The type does not have to bear a reference number, and it is only a recommendation that it should be deposited in a recognised herbarium. Living material is not admissable as a type. Usually, statements in the literature regarding type designation are taken at face value."

AUSTROCACTUS "Lago Argentino" — Lembcke

This particular plant came to the notice of The Chileans in the course of the discussion dealing with the genus Austrocactus, which appears in Chileans No. 39. At The Chileans 1981 Autumn week-end we were able to view some slides from D. v. Vliet of Austrocactus in the wild and to review the distribution of various Austrocactus species in Patagonia. Taken together with v. Vliet's contribution to Chileans No. 40, it has emerged that the freely branching, more or less procumbent Austrocactus emanate from the close vicinity of the eastern slopes of the Andes whose peaks lie along the border between Argentina and Chile. Although the brief contribution to Chileans No. 40 from H. Lembcke did not provide us with any habitat data concerning Austrocactus "Lago Argentina", it would appear both from its procumbent, branching habit and from the approximate habitat location quoted, that it, too, emanates from the zone of the moderately good rainfall which exists along the easteren edge of the Andes.

Several authors have described the narrow belt of forest which runs south to north on the Argentine side of the Andes from the Straits of Magellan to Neuquen province. This is not really continuous forest, but consists of patches of forest of varing extent, dense and extensive in the lower-lying passes and saddles of the Andes, more broken in the eastern lee of the peaks and quite patchy around the foothills. Between the tracts and patches of forest lies open grassland with occasional patches of shrubs. Lago Argentino is found in the southernmost part of Patagonia. It lies with its western end tucked into the Andes and surrounded by dense forest; it stretches across the narrow band of rainy vegetation whilst the eastern end of the lake is surrounded by the arid Patagonian plateau. The account of this locality by Hauman (which follows) illustrates the variety of vegetation which is to be found in this short span; somewhere among this variety, Austrocactus "Lago Argentino" is expected to have been found.

Although the following account relates specifically to the surroundings of Lake Argentino, the general relationship of the lake to the local topography and vegetation will be substanially repeated with L. Viedma, L. San Martin, L. Cochrane, L. Buenos Aires, L. Fontana, L. Palena, and L. Nahuel Huapi. As Hauman himself says, there is no great change in the components of the vegetation over the quite considerable distance between L. Argentino and Neuquen province. Hence any discussion concerning the ecological niche for the Austrocactus from Lago Argentino is effectively an examination of the ecological niche occupied by all the procumbent Austrocacti from there to Neuquen.

H.M.

(Travellogue extracts providing more background to this locality will appear in future issues of "The Chileans").

A BOTANICAL TRIP TO LAKE ARGENTINO. By Prof. L. Hauman.
Translated by H. Middleditch from Anales de la Sociedad Cientifica Argentina Vol. 84 1920.

PHYTOGEORGRAPHIC STUDY OF PATAGONIA. By Prof. L. Hauman.
Translated by H. Middleditch from Bulletin de la Societe Royale de Botanique Belgique Vol. 48 Part 2 1926.

Patagonia, undoubtedly one of the most sterile and inhospitable regions of extratropical South America, and indeed also one of the least populous, is none the less amongst those which, from the botanical viewpoint, have been studied continually over a long period of time. But it is above all from 1880 that progress became rapid . . . . The works of Spegazzini form the principal source of floral information which we possess concerning Patagonia. The itinerary followed by the author in 1914 started in Buenos Aires in January, with a number of ports of call en route to Santa Cruz; from Santa Cruz to Lake

Argentino across the Patagonian plateau, at the end of January, and there we stayed until the beginning of March. (A detailed account follows of the flora at each port of call and along the valley of the Rio Santa Cruz).

The Precordillera

This particular aspect of the Patagonian vegetation is to be observed all the way from north to south of the formation, in a belt of some 60 to 75 kilometres in width; this lies between the level plateau and the even narrower forest zone on the same slope of the Cordillera. It is an uneven region, whose mountainous character always becomes more noticeable towards the west, with some hilltops or peaks which can exceed 1500 metres in the region with which we are concerned, but where the altitude of the valleys and plains varies between 400 and 800 metres. It is here that we came across the well-known series of Patagonian lakes, from Lake Aluminie at 39° as far south as Lake Argentino. The eastern extremity of the larger and more typical lakes is generally to be found enclosed by semi-desert hills, completely lacking any trees, while only their western part, usually divided into narrow arms (fjords) which reach into the valleys of the Cordillera, are surrounded by fine woods on the mountain slopes.

Another important difference from the plateaux, a difference for which any map provides evidence, is the existence in this zone of a network of rivulets. Before arriving at the plateau, these have already joined up into the large rivers which now receive no further tributaries in the whole of the lengthy travel which separates them from the ocean. More important still than the change in the character of the terrain is the change in the climate as we drew ever nearer to the region of greater rainfall. This region which we call the Precordillera forms an extraordinarily narrow and abrupt belt of transition between the precipitation of the plains and that of the corresponding part of the adjacent Chilean territory. There are no detailed metereological data available from this secluded and unpopulated region, but the rainfall maps, for all they are approximate, demonstrate the situation sufficiently well.

The changes in the vegetation are not very marked; the same elements as on the plateau are there, except that in one respect the flora is enriched by Andean species and, in the other respect, the countryside changes rapidly on account of the far greater abundance of individuals, especially of grasses. From this circumstance there results comparably more prosperous agriculture on the Precordillera than on the plateaux, as is well known. Another peculiarity is that all along the rivers and arroyas, we often came across isolated and dwarf specimens of the trees which form the nearby subantarctic forests, in particular Northofagus antarctica, in company with a number of herbaceous plants and shrubs. In spring these often create a veritable garden at the boittom of the valleys in the Precordillera, where there sometimes abound pretty orchids of the genera Chloraea and Azarca.

The vegetation to the east of the lake

It was the 8th day of February, with Lake Argentino visible on the horizon, when we moved into the Precordillera from the plateau which had been perfectly level up to that point. The valley which the road had entered was some 300 metres above the Rio Santa Cruz and in order to reach the Estancia Bilbao, we had to go down a steep escarpment for some 250 metres. The vegetation changes very little at first, but is less gnarled and a great many species, already dried up further to the east, were to be found in full flower here. (Verbena, Brachycladus, Phacelia). Grasses abounded: Poa (the three common Stipa, Elymus erianthus, Festuca and Bromus macranthus); Hypochaeris leucantha is fairly abundant, almost always sheltering inside a plant of Stipa, intermingly the filamentous leaves of the grass and those of the composite whose white flower head emerged at the side of the clump on account of the curved peduncle. In the more sheltered places in the valley and in the transverse canadones, there exist true copses of Anarthrophyllum rigidum, which attain two metres; this is the dominant species which may or may not be associated with Schinus dependens, Adesmia boronioides, and Lippia trifida. Between these often grow tiny clumps of the delicate and semi-creeping Loasa patagonica with pale yellow flowers, which we had not come across up till now. The Senecios are more abundant both as individuals and species. The plants in cushions are often large, especially on the more stoney parts; two Verbena (V. patagonica and V. tradactylites, this latter with fragrant flowers, at first of a wine colour, afterwards going paler), very large examples being called "mogotes"; Azorella monantha in full flower, emitting a sweet odour and very regularly visited by flies and stout beetles; another hairy Azorella (A. ameghinoi), Nierembergia patagonica (up to 2 metres in diameter), a Crucifer probably of the genus Xerodraba, an Adesmia with thickened leaves, Nassauvia glomerulosa and also worthy of mention is Nardophyllum kingii which reaches a limited height of some 10 to 15 cms in the shape of a less dense convex cushion. On the rocks lichens now increase in appearance and long filaments of Usnea were met with again, loose on the ground.

In the valley of the Rio Santa Cruz, there was noted an abundance of a Verbena with perforated leaves (related to V. erinacea) and, appearing after a single shower, a large number of stout white Agaricaceae which, with a Geaster met with some days earlier on the plateau, turned out to be the only fungus observed by me in this region. A little more to the west runs the Rio Bote, the first tributary of the Rio Santa Cruz which we had encountered since the Atlantic. Above the banks of this unpretentious tributary bushes always grew, including Berberis empetrifolia which we had not observed until now; but its hygrophylic flora was more abundant than we had got used to. In addition to the virtually persistent species (two species of Ranunculus, three species of Rumex, Hippuris, Arenaria, Azorella, Myriophyllum) there were to be distinguished Anemone multifida, Caltha sagittata, a large Deschampsia, Vicia and Lathyrus. (The waterside flora are then detailed).

At the extreme eastern end of Lake Argentino, between the Rio Santa Cruz and the Rio Leona, likewise on the southern shore, there are sand dunes with a very sparse flora, where a Juncus predominates in association with a herbaceious Adesmia (A. glandulifera); also Euphorbia portulacoides, small plants with somewhat thickened leaves, of insignificant appearance, but poisonous, so it was said, and dangerous for domestic animals. It was probably this species that was responsible for the death of three of our horses that occurred during our stay at the lake.

The vegetation of the southern shore

The particular place described here is to be found at some 35 kilometres from the eastern end of the lake, that is to say, about the middle of its length. Here the mountains are, in general, fairly distant from the shore (2 or 3 leagues) and we first came across a belt of dunes, then stoney hills, before arriving at the foot of the sierras which closed off the horizon to the south and whose peaks reach 1000 to 1500m in altitude, the level of the lake being only 187 metres above sea level. These mountains, first outliers of the Sierra de los Baguales, of a fairly uniform brownish tint, again present an almost barren aspect, without a trace of vegetation; the level parts are less desert-like but yellow because of the pasture that is now dry in this season (February). The only bush is the "calafate" Berberis buxifolia, here in full growth, taller and more abundant, although not sufficiently so as to form continous copses; it reaches and surpasses 2m in height, its dense foliage is dark green and its yield of fruit extraordinarily plentiful; its blue berries, almost black, of 5-7mm in diameter, are of a most agreeable taste, above all when about a thousand kilometres separates the traveller from the nearest source of fruit. While sauntering along eating them, I took note of the extraordinarly marked differences in flavour as well as of the firmness of the berry, the size of seeds and the amount of pulp, together with the consistency of these qualities in one and the same plant.

As subshrubs we may quote a Senecio with white leaves, and Adesmia boronioides; the grasses are represented by the inevitable Stipa. In addition, Mulinum spinosum, the very aromatic Artemisia magellanica, Nicotania monticola, Phacelia magellenica, Euphorbia portulacoides, Adesmia glandulifera, Cruckshanksia glacialis, Quinchamalium chilense, Arjona patagonica as a parasite on the roots of Stipa, an Acaena with silvery leaves, a Viola in rosettes, Galium pusillum, Ephedra frustillata, etc. In the stony hills which form the transition between the dunes and the mountains, the xerophyllous character is accentuated; thus in the Cerro Comision which rises up close to the margin of the lake and 200 metres above it, there reappears the "mata negra", cushions of Azorela and of Nassauvia. (The waterside flora is then described in detail).

The vegetation of the northern shore

Over almost all of its length, the northern margin of the lake rises steadily from the water's edge up to the high plateau which separates Lake Argentino from Lake Viedma. The shore is no wider than the road, or more accurately the path, falling in certain places on to the beach. In the only and very quick trip which I made over the ten leagues which separates the passage of the Rio Leona (which joines the two lakes) to the establishment of Senor Tosso, there gradually appeared a flora of Andean character (Violoa maculata, Geum), richer and more wide ranging (Valeriana, Calceolaria, Senecio, grasses occasionally a metre high). Behind the house of Senor Tosso, a spot at which the shore widens out appreciably, the first string of hills overlooked the lake at some 600 metres. A league further to the west the hills were breached by a valley where ran a fairly full flowing stream, on the banks of which were to be found the first Nothofagus (N. pumilo), low-growing and very few in number, outliers of the forest, now already quite close. But we continued to be in the domain of the calafate (Berberis buxifolia) and there was associated with it in the bottom of the quebrada abundant grasses (Alopecurus, Bromus, Hordeum, Agrostis, Deschampsia, Poa, Elymus) which form actively growing tufts, various Juncus, large Carex, Epilobium, Apium astrale, Bowlesia tropaeofolia, and Loasa patagonica in abundance.

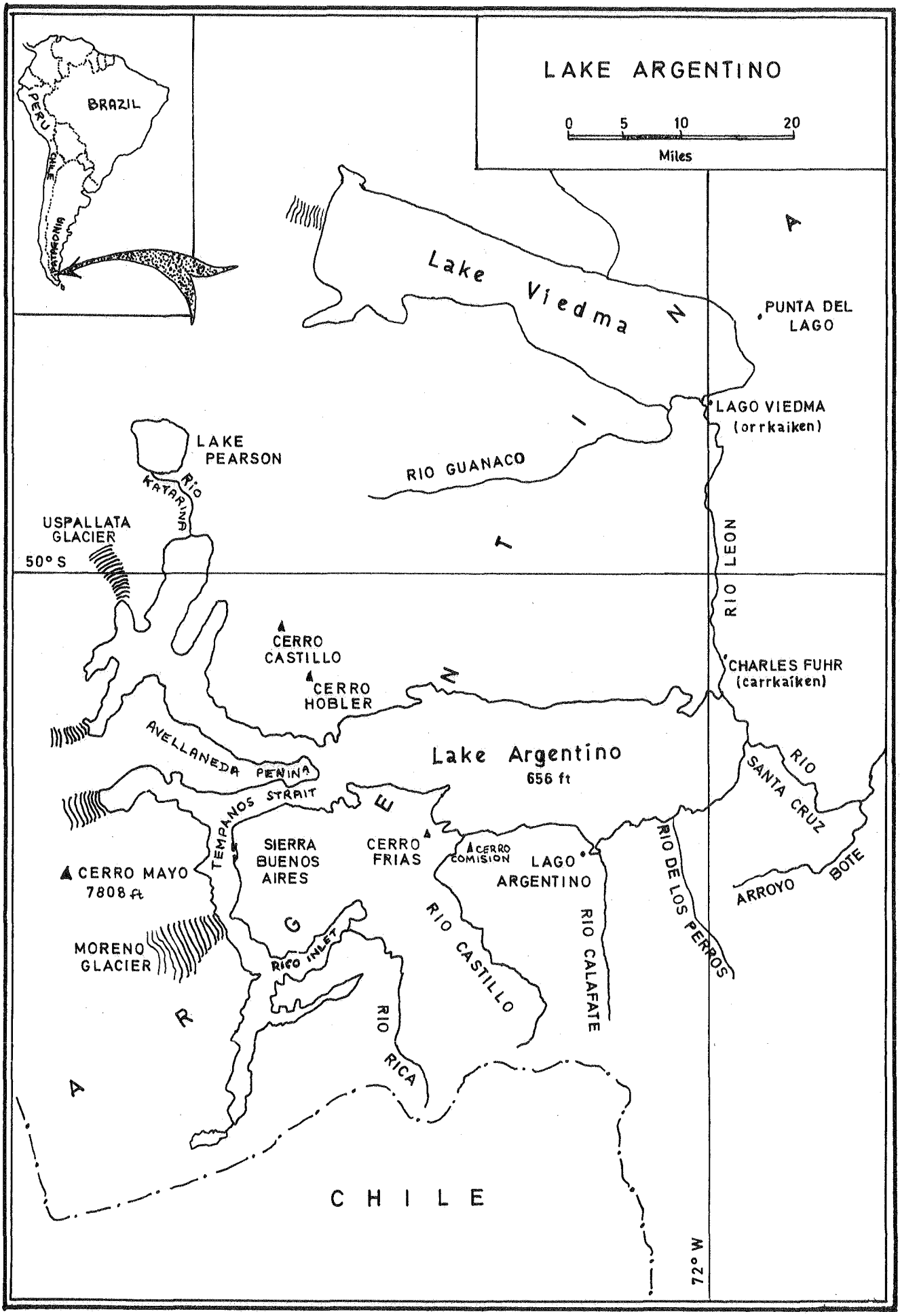
On the dry hills, still of a semi-desert appearance, there was noted, without difficulty, an appreciable reduction of the cushion plants, an Azorella (A. monantha) only remaining abundant on the more stony places. Besides Mulinum spinosum, in full growth at this place, the xerophylic grasses were predominant (Festuca, Bromus, Hordeum) with Nardophyllum kingii, various Nassauvia and Senecia, Hypochaeris leucantha, Armeria, Calceolaria, and Acaena.

It was necessary to put the expedition, whose other members and baggage were heading for the south shore, in touch with Sr. Tosso, whom we were expecting to take us in his launch to the western extremity of the lake; in doing this, he and his sons rendered us a service without which our plans would have fallen through.

The Magalanic Forest

Amongst those very unusual aspects which present themselves in this botanical region, one of the most curious is its extraordinary uniformity from Cape Horn up to the north of Neuquen. In Neuquen, in the woods of Araucaria imbricata, so distinct from the southern woodlands, I recently observed at quite moderate altitudes every one of a series of plants which I remember having collected 13 degrees of latitude further to the south — identical species from the genera Cortadera, Codornochus, Arachnites, Chloraca, Asarca, Maytenus, Osmorrhiza, Primula, Adenocaulon, Senecio, Perezia, etc., in addition of course to the Nothofagus pumilio and Nothofagus antarctica.

There is no date available, not even approximate, concerning the climatic characteristics of the zone occupied by the forests on the eastern slopes of the southern Andes. It is a matter of an essentially local climate. The isohets on the map published by the Argentine Meteorological Office answer well to large scale reality, but are quite hypothetical


LAKE ARGENTINO
0 5 10 20
Miles
BRAZIL
PERU
CHILE
ARGENTINA
Lake Viedma
PUNTA DEL LAGO
LAGO VIEDMA (orrkaiken)
LAKE PEARSON
RIO KATARINA
RIO GUANACO
USPALLATA GLACIER
50° S
RIO LEON
CERRO CASTILLO
CERRO HOBLER
CHARLES FUHR (carrkaiken)
AVELLANEDA PENINA
TEMPANOS STRAIT
Lake Argentino
656 ft
RIO SANTA CRUZ
SIERRA BUENOS AIRES
CERRO FRIAS
CERRO COMISION
LAGO ARGENTINO
RIO DE LOS PERROS
ARROYO BOTE
CERRO MAYO 7808 ft
RIO CASTILLO
RIO CALAFATE
MORENO GLACIER
RICO INLET
RIO RICA
CHILE
72° W

here. The zone in which we stand today is so narrow that it is only possible to indicate the modifications to the climate on a large scale map. In the few temperature observations which it was possible to make between the 16th February and the 3rd March, the minimum varied between 5.5° and 9°C and the maximum in the shade between 9°C and 23.5°C. The rains are very abundant in this narrow forested belt, as we have been able to observe during the three weeks that we stayed there, but nothing admits of estimating the precise rainfall coming from the Pacific which crosses the glacier covered peaks and falls on the Argentinian flank. The cold temperate nature of the climate is clearly indicated by the mighty glaciers which descend towards the lake, and into which they enter. Their promontories of ice break up into enormous blocks which fall off with a thunderous noise into the water. The very slight current takes these floating icebergs slowly away towards the east where the largest may still be seen, some 75 kilometres from their starting point, very near to the entrance to the Rio Santa Cruz, even in mid summer. The temperature of the lake in its broadest part was 7°C in March 1914.

The terrain in the zone in which we stood is entirely mountainous; the slope at the western end virtually runs down to the edge of the lake. The forest generally covers the steep slopes. But since at 600m above the level of the lake only stunted trees occur, the area covered by the forest is reduced to a belt very sinuous and extremely narrow, of 5 to 7 kilometres in width, as far as I have been able to estimate. I would add that there appeared to me to be very little active animal life. As large mammals, we have the Andean deer which was seen only in solitary examples in a meadow at the edge of the Moreno glacier, and foxes. The birds are also quite rare; in regard to the insects I have not had occasion to see a single butterfly. Few Hymenoptera were seen, but an abundance of flies which was surprising in these completely deserted places. The remains of food, or excrement, were immediately covered with Muscids belonging to five or six species, Muscids whose role is assuredly important in the fertilisation of many flowering plants.

The Mesophytic Forest

On the 14th February we left the Tosso establishment in the motor boat, travelling towards the west. Within a short time there appeared over the north coast the first patch of wood in a valley, doubtless an especially sheltered spot, at one league to the northwest of Castle Hill. This woodland covered the slope of the quebrada as far as three quarters of the height of the mountain; other similar small woodlands doubtless exist in neighbouring quebradas, but are not visible from the lake. More to the west, the continuous woods begin at the same point of the mountainous Avellanda peninsular, which separates the entrances to the north and south arms of the lake. These inlets are real lacustrine fjords which branch and penetrate the valleys of the central Cordillera for a distance of some 50 kilometres. The forest almost entirely covers the slopes of the hills and only some almost vertical places seemed to be covered with grasses. In that way we had our first contact with the forest, although on a small scale; nevertheless we came across it in a zone with relatively poor rainfull which the vegetation indicates by its slightly xerophytic character. The forest is not very dense, formed by two dominant species of Nothofagus with deciduous leaves.

Continuing our navigation towards the west we entered one of the arms of the lake whose initial narrow section is called the Tempanos Straight. After a few kilometres we touched ground under the southern slope of the same peninsula, finding there a hygrophylic form of woodland. It was similar at a point on the western bank of the lake some hours later and 20 kilometres further on. We found here a forest poor in species, as did Skottsberg, who made a major study of the flora of the district. (There follows an extensive description of the forest and its fungi).

Vegetation at the margins of the forest

We were only able to study the margin of the forest along the lakeside and along the glaciers which cut straight through it. There is often a pile of dead tree trunks between the glacier and the forest; at other places one can stand on the ice and touch the truck of a tree whose leaves throw their shadow on the glacier. Along the lakeside the shore is most often abrupt, rocky, and the trees come right down to the edge of the water. Generally it is less troublesome to walk along inside the forest rather than right on the edge of it. At other places there is a narrow level shore where it is possible to walk, wetting one's feet occasionally. Most exceptionally there are small bays with a real beach some metres broad. Uncommon too, and insignificant, are little rocky promontories not covered by forest. In one such spot we observed a fairly xerophytic flora. The stones were clothed with a moss covered with grey hairs and by foliaceous and fruitcose lichens. Among them grew Empetrum rubrum, Pernettya, Chiliotrichium diffusum, a creeping Ramnacea — Discaria magellanica, Baccharis magellanica, also creeping and with leaves covered with resin, a Hieracium, Hypocharis, a Senecio with pinnate leaves, and occasionally a Chloraea. On the same margin of the lake the only fern was observed, Hymenophyllum tunbridgense; it was barely 2 centimetres in height, all curled up by desication, forming carpets and reviving like a moss it is said, so that its leaves roll up in a dry period and open out again when it rains.

(The vegetation of the glacial margins is discussed). We came to a flora on the margin of the lake which included some Andean elements; for this reason it is rather difficult to separate the alpine flora from the forest-like region in such places. at an altitude of some 250 metres above the lake, alpine forms already appear: a Nassauvia with stout globular inflorescence (N. dusenii?) is the most common, then Primula megellanica, Perezia magellanica, etc.

The Alpine Flora

Designated here as alpine vegetation is that which we encountered above the forest described above. At 400 metres above the lake the trees are already impoverished; they consist of thin and dwarf specimens of the three species of Nothofagus, but Drymis winteri, Pseudopanax, and Maytenus have vanished; the same goes for the undergrowth such as Enargea, Osmorrhiza, and Adenocaulom. On the other hand Ourisia ruellioides, Macrachaerium and Valeriana persist, while the Andean elements always occur more often, predominantly in open places. When ascending the mountain flank, walking in the forest was found to be difficult on account of the bushes in between the trees. There are small individuals of the two Nothofagus, of Ribes which vanish at 750 metres above the lake, and Pernettya mucronata and Berberis buxifolia which reach 900 metres. Covering the ground and remaining abundant almost up to the limit of vegetation is sub-shrub Empetrum rubrum. Likewise there are herbaceous plants Senecio acanthifolius, Geum magellanicum, Epilobium, Pernettya minima, Nassauvia, Oxalis magellanica, Draba, Saxifraga albowiana, Perezia lactucoides and in addition Cystopteris fragilis, Macrachaenium gracilis (up to 800m), Lagenophora hirsuta and Rubus geoides up to 900m, and Myzodendron punctulatum and Cyttaria reach 800 metres. At 900m altitude Nothofagus betuloides (now reduced to a shrub) starts to disappear; while N. pumilio, lowgrowing here but neither adpressed to the ground nor bent over, continues in patches up to about 1000 metres, separated by bare stony areas or by marshy meadows. (The vegetation of the swampy meadows is listed).

At 1000 metres altitude, on a swampy terrace, there still occurs a little tree of Nothofagus pumilio of 3 to 3½ metres in height. Immediately afterwards the first patch of snow appeared, quickly followed by others of much greater volume. At 1100 metres we saw the last Nothofagus pumilio and we already found ourselves in the presence of the subglacial flora, greatly dwarfed, of a really mossy appearance, forming green patches among the stones as far as the margin of the perpetual snows. Empetrum rubrum gets steadily smaller, still covering the ground, a similar and lawn-like Marsippospermum of only a few cm in height. Large white flowers were noted on a small Cardamine, Armeria chilensis with rose coloured flower heads, Draba, Cerastium arvense, two Saxifraga in full growth, Acaena, Epilobium, Lycopodium magellanicum, the delicate Viola tridentata with a small white flower from 900m up to the perpetual snow, a delicate member of the family Scrophulariaceae Ourisia breviflora with pale blue flowers, two species of Nassauvia in flower right up to the snow, Perezia lactucoides up to 1140m, two Carex, only one small, sparse grass — Calamagrostis, a final dwarf fern and finally a whole series of plants forming a dense sward without rising more than one or two centimetres above the level of the ground; the umbellifers Azorella lycopodioides, A. selago, A. filamentosa, Bolax gummifera, B. caespitosa, Pernettya minima (Ericaceae) here in flower, Saxifragella bicuspidata, Drapetes muscoius (Thymelaceae), and the composite Abrotanella linearifolia.

With these dwarf forms the vegetation terminates right on the edge of the perpetual snow, at somewhat more than 1000m above the level of Lake Argentino, on 19th February, 1914. (There follows an account of the flora on a rocky island surrounded by the glacier; at this point the glacier was some four miles wide).

Sierra Buenos Aires

The last but one day of our stay in this arm of Lake Argentino was used for an ascent of the Sierra Buenos Aires, directly opposite the Moreno glacier, on the eastern bank of the inlet. Although but 1500 metres across the lake, we came across a totally different flora there to that on the other bank.

As we have already seen, the traveller who enters the Tempanos Straight has on his right hand, firstly the Avellaneda peninsula and after that the Cordillera Central, covered with woods, whilst on the left hand there arises the sierras of Magallane (or Burmeister) peninsula, bare on the whole, and which evidently only shelters small woodlands in its successive quebradas. Where the Buenos Aires mountain ascends opposite the glacier, these same conditions occur on the slopes. In the lower part low trees, solitary or forming insignificant copses in sheltered places and hiding within the woods the bushes and herbaceous plants. On this flank, we came across a little wood with almost all the elements of the forest opposite but in smaller examples.

But the differences from the flora of the opposite slope rapidly became evident. As a novelty, the curious cosmopolitan pteridophyte, Botrychium lunare distinguishes itself at 300m altitude; then at 375 metres an Azorella typical of the plateau, Bromus macranthus, Symphyostemon and Sisyrinchium (Irises) which have already finished flowering, Valeriana carriosa, Maytenus distichia, Senecio serico-nitens, a fine Perezia with very prolific blue flowers, Baccharis magellanica which produces enormous cushions at 425 metre altitude, whilst Berberis buxifolia and Pernettya mucronata decrease to dwarf sub-shrubs and which contribute to accentuate the character of the dry alpine meadow, recalling the steppe of the Precordillera but in greater density. Around 600m there appear between the rocks other species of hairy and brittle Azorella. We turned aside to come across Berberis empetrifolia, a Nassauvia from the plateau, a single-flowering Calceolaria and the magnificent Oxalis ennaephylla, a small vine having leaves with twelve to fourteen leaflets and large pink flowers. In the more fertile parts there abounds a Hypochaeris with white flowers and a sweet odour of vanilla.

Around about 700 metres in a waterless depression, there still occurs a small copse of Nothofagus pumilio, with individuals reaching 6 to 8 metres. In these woods the low-growing vegetation is markedly decreased, with large spaces of bare ground between clumps of Osmorrhiza, Luzula, Senecio, Empetrum and Escallonia. Somewhat higher up there appears a third species of Azorella. (The vegetation of a small marsh is detailed).

A little higher up, towards 1,000 metre altitude (820 metres above the lake), the ground turned more exclusively stony and the alpine meadow is replaced by the more sparse flora of the broken rocks, of an alpine character more marked at every step. At the same time, more lowgrowing completely shrubby species, such as Calceolaria, which had already set fruit further down the mountain are found in full flower here. The Azorella (three or four species) play a most important part, some forming enormous cushions; Berberis empetrifolia and Oxalis enneaphylla are now common, and Calceolaria is noted; various Nassauvia, among them one which formed handsome rosettes like those of the Andean Viola, Perezia, Leuceria, Draba, two Melandrium of which M. alpestris forms cushions, Erigeron vahli, a Senecio enwrapped in white wool, Phacelia, and the curious Hamadryas kingii (Ranunculaceae). Also encountered there is a crucifer which in my view is entirely unknown, probably near to Hexaptera and notable for its extraordinary prolonged and partly horizontal root, consequently a favourable adaption to the life among the broken rocks.

Finally, the snow-covered crest is reached at 1,400 metres above the sea. Starting from 1,250 metres, the flora changes very little but diminishes greatly. During the last part of the ascent it was noted that Hamadryas was now more prolific and also in flowr, an Oxalis with large leaves, Adesmia sp., Cerastium arvense, Azorella monantha, a Senecio covered with white hairs, and one very curious Caliceracea forming rosettes, just like the Andean Viola, Moschopsis rosulata.

In spite of the incomplete identifications coming to naught, they are worth noting since there are profound differences existing in the flora of these mountains between points at equal altitudes barely 10 kilometres apart in horizontal distance. In the central Cordillera we ourselves came across this between the evergreen forests and the glaciers and hills which they dominate and where Fuegean hygrophyllic elements abound, whilst on the other hand on the Sierra Buenos Aires which scarcely retained any snow during the summer and whose slopes are unprovided with woods, we came into contact with an aggregation of new elements but of a type analogous to the xerophytic flora of the Precordillera and to the Patagonian plateaux.

The panorama which unfolds from the crown of the Sierra Beunos Aires is superb. Towards the north there extends the mountainous peaks on which there descends like a dragon with several tails, the formidable glaciers which cut through the dark forests to the edge of the lake. To the southeast, bare mountains looking like castles shut out the horizon. The foreshortened peninsular which separates the Rico inlet from the south arm of the lake, appeared to be as poor in trees as the Sierra Beunos Aires, whose southern slope presented an identical aspect to the slopes on the west and north: bare with copses in the transverse valleys.

This was almost the end of the trip. On March 7th we broke camp and re-embarked. Without mishap we navigated the straights, stood out into the broad lake, leaving behind us one of the finest spectacles imaginable. The Cordillera already seemed more distant and of extraordinary breadth. Towards the north Castle Hill and Cerro Hodler stood erect, between which there could be made out in the distance the white peaks of Cerro Agazziz. Then came the chain of the Avellaneda peninsula, with its black patches of forest and its corrugated crest with patches of snow. There, through the great fissure of the Tempanos Straights where we had just come from, could be seen the formidable ensemble of ridges and ice of the glaciers which preceeded the Moreno, although this latter was quite concealed by the huge chain of the Sierra Beunos Aires. More to the south, another great void, bordered on the east by the modest Cerro Frias. Above the lakeside slopes to the north and south, the dry hills descend little by little to the level of the plateaux, whilst towards the east we had nothing but water, water, all the depth of the immense lake.

Comments

. . . . . from H. Middleditch

The two articles quoted in the title are almost identical in content but where differences do exist the later publication has been assumed to be correct. This provides us with a very comprehensive review of the vegetation in the surroundings of Lake Argentino; it is assumed that in these surroundings there lies the source of the Austrocactus collected by Lembcke, which was passed via Prof. Schreier to K. Mortimer and thence into limited cultivation in this country. The detailed descriptions of the vegetation of the forest, the waterside, and of marsh places has been omitted from the translation on the assumption that this Austrocactus is unlikely to be found in any such location. It may occur at the eastern end of the lake where the river valleys are somewhat less arid than on their transect through the Patagonian plateau; or on the slopes to the north and south of the lake where the extra humidity supports a wide range of herbaceous and fruticose flora together with occasional dwarf trees or small copses in sheltered places; or on the rocky promontories at the lake side; or within the confines of the forest where it is too steep or too rocky for trees (like Eriocactus in the forest of Rio Grande do Sul); or in the alpine zone between the forest and the snow-line.

It is observed by Prof. Hauman that the flora at the eastern end of the lake is not really dissimilar to that found on the Patagonian plateau and the valleys which intersect it; there is simply rather more of it and also it grows in a less stunted form. It would appear that Austrocactus patagonicus/dusenii is associated with the phytogeographic region of the Patagonian plateau. Would it be logical to expect a plant which is of short columnar stature in a harsh climate to change to a less stout and more decumbent form of growth when there is a slight amelioration in the climatie regime? Is it likely that the ex-Lembcke plant came from this association? Turning to the rocky promontories on the lakeside, these are stated to be severely limited in size and number; had a sprawling form of cactus appeared there it would be rather surprising if it had escaped this author's

attention. Hence it would seem to be unlikely that the ex-Lembcke plant came from this sort of location. This appears to leave two alternative probable sources for the ex-Lembcke Austrocactus; either growing with the transition flora which is found between the forest at the western end of the lake and the semi-desert plateau at the eastern end; or above the forest in the zone of alpine vegetation.

Now in his references to Austrocactus hibernus, Ritter describes the location of this plant as above the level of the forest, even above residual patches of snow. If this information could be used as an indication of the altitude at which Austrocactus is to be found on the eastern or Argentine side of the Cordillera, it would suggest that the ex-Lembcke Austrocactus may be found in the zone of alpine vegetation above the forest. Is that where it grows, near Lake Argentino? Would we also expect to find further plants of the sprawling, branching form of Austrocactus elsewhere in the same vegetation zone between Lake Argentino and province Neuquen? Was Austrocactus gracilis found in this vegetation zone? Who exactly was Cox who found an Austrocactus not far from the Chilean border in Neuquen? Other sprawling Austrocactus were found by van Vliet near Junin de Los Andes, which lies to the east of the string of lakes at the foot of the Cordilleras; surely these plants could not have been growing in a zone of alpine vegetation?

(We now have Mr. Cox's description of his trip to Neuquen; relevant abstracts will appear in a future issue of The Chileans together with a map defining his travel itinerary.)

C_3 C_4 CAM By H. Middleditch

Nowadays we tend to take for granted the reference books which can be picked off almost any Library shelf and which will tell us that a green plant requires sunlight, air and water if it is to grow successfully. Just as readily available are books that explain exactly the biochemical process which is fuelled by these components. But if we turn back some three centuries none of this knowledge was available. Possibly the first step in its acquisition was taken by a Dutchman, Van Helmont, who weighed a small willow tree and planted it in a tub in a weighed amount of soil. For five years he watered his willow tree and then weighed it again; he found the soil had lost two ounces in weight (which he attributed to experimental error) and the willow tree had gained 200lbs. in weight, a gain which Van Helmont belived was derived from the water.

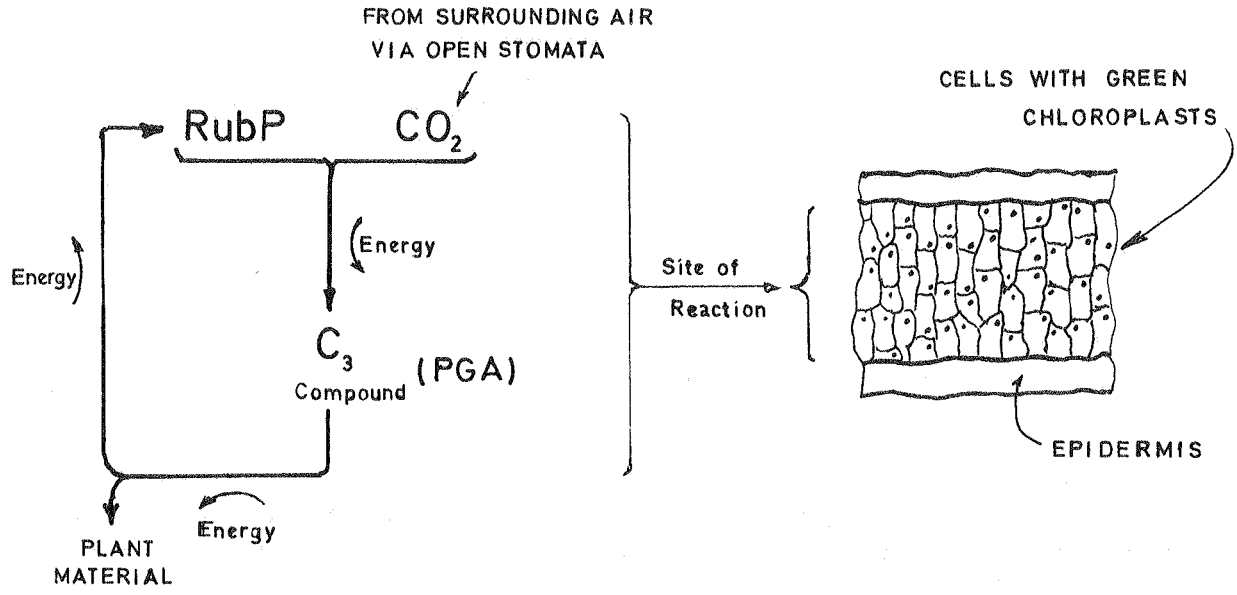
After the passage of about a century, a report was made to the Royal Society by Joseph Priestley in 1772 about burning a wax candle in air until the flame went out. Priestley then introduced a sprig of mint into this air; ten days later he found that a candle would once again burn perfectly in the same air. He described the process as one of "restoring the air". This work was taken one step further in 1778 by a Dutchman, Jan Ingenhouz, who noted that "bad air" could be restored not only in a matter of days as Priestley's experiments indicated, but in a few hours. Ingenhouz elaborated on his observations, noting that it was not just the plant which brought about this change, but that it arose from the influence of the light of the sun upon the plant. The plant commenced to improve "bad air" shortly after sunrise, and the action diminished late in the day, ceasing altogether at sunset. He also noted that the action was more brisk on a clear day or in full sunshine, and that only the green parts of the plant produced this effect. In this way Ingenhouz demonstrated that oxygen was generated by the green parts of a plant under the action of sunlight.

A few years later a Swiss, Jean Senebier, showed that this process formed the basis of plant growth and suggested that it was some portion of the general body of the air — possibly carbon dioxide — which was captured by the plant. Another Swiss, N. T. de Saussure confirmed this hypothesis in 1804 by weighing air before and after removal of the carbon dioxide by the plant. He also weighed the plant before and after the experiment and so discovered that the plant gained more weight than was lost by the air. It was surmised that the difference was accounted for by water taken into the plant. From this deduction it could be surmised that: CO_2 (Carbon Dioxide) plus H_2O (Water) plus sunlight = O_2 (Oxygen) plus Plant Material.

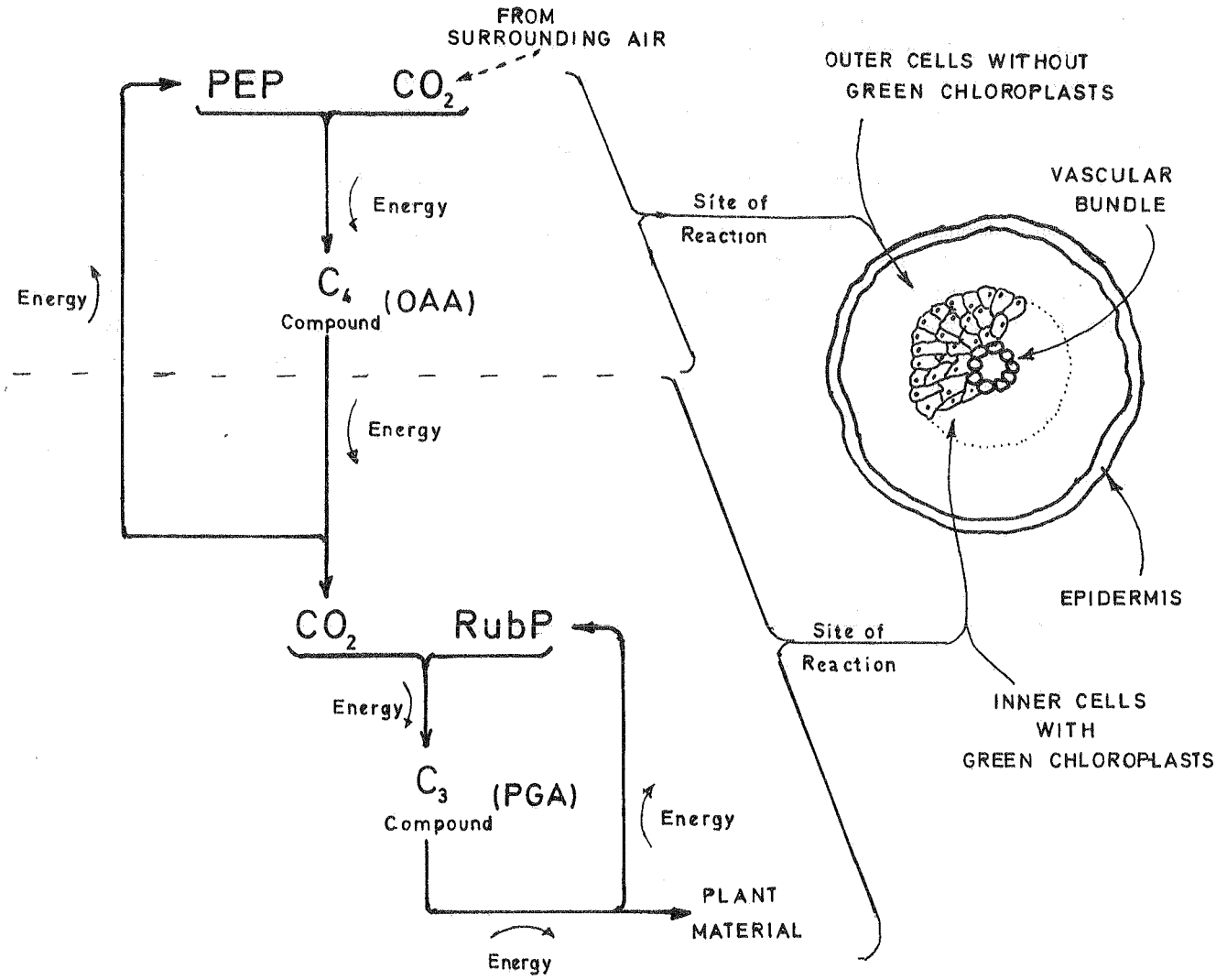
For many decades it was believed that the oxygen respired by the plant came from the inspired carbon dioxide. In the 1930's, Robert Hill at Cambridge produced oxygen from isolated green plant cells in the absence of carbon dioxide, which suggested that the oxygen probably came from the water taken into the plant and not from the carbon dioxide.

At about this time it became possible to produce oxygen with a molecular weight of 18 instead of the normal molecules having a molecular of 16. This O^{18} can still be traced after partaking in chemical reactions; it was combined both into carbon dioxide and into water, each being used separately for controlled plant growth experiments. The results of these experiments showed that: $C(O^{18})_2$ plus H_2O^{16} plus sunlight — $(O^{16})_2$ plus plant material & $C(O^{16})_2$ plus H_2O^{18} plus sunlight — $(O^{18})_2$ plus plant material, so demonstrating that the oxygen respired by green plants comes from splitting of the water molecules during the metabolic processes within the plant.

A further line of experimental research adopted the use of radioactive carbon C^{14} to form $C^{14}O_2$ carbon dioxide. Green plant leaves were then exposed to this radioactive carbon dioxide in the light. The resultant radioactive constituents which were produced (or photosynthesised) within the green plant were then extracted and identified by chromatography. It thus became possible to identify the products photosynthesised within a green leaf which had been exposed to radioactive carbon dioxide for periods of even less than 10 seconds in the light. Scientific investigation work of this nature was undertaken independently by both Benson and Calvin. In this way it was shown that the first stage of



C3 SYSTEM Energy indirectly from Sunlight.



C4 SYSTEM

photosynthesis was a reaction, in the presence of light, between inspired CO_2, the hydrogen split from water, and a sugar compound which already existed alongside the green chloroplasts. This initial reaction produces a 3-carbon molecule which is described as PGA for convenience. Some of the PGA is then reformed into the sugar compound which is re-used for the first stage of the reaction, so that amount which had been used is now replaced; this particular sugar is described as RubP for convenience. The remaining PGA then becomes transformed by further reactions into more complex plant-building material. This is a much-simplified description of the initial photosynthetic process, which became known as the Calvin-Benson cycle, named after its original discoverers. It is also known as the C_3 cycle since the first stage of the reaction is a 3-carbon compound.

In the plants which grow by the C_3 process, the green chloroplasts (which seem to function as a catalyst for photosynthesis) occur in layers of cells which reach close to surface of the epidermis. However, there are other plants which have chloroplasts that only occur in the inner layers of cells; within these inner layers the C_3 reaction takes place in exactly the same way as outlined above. In the outer layer of cells a reaction takes place between the inspired CO_2, the hydrogen split from the water, and a different sugar compound known as PEP for convenience, which in the presence of light yields a 4-carbon sugar molecule as the first stage of photosynthesis. This 4-carbon molecule (described as OAA for short) is then transported to the inner layer of cells and in the company of green chloroplasts it is reformed, releasing CO_2 in the process; this CO_2 then follows the C_3 cycle as already described. During the release of CO_2 alongside the chloroplasts, other compounds are produced including some PEP which is then transported back into the outer layer of the cells, to be recycled again and again. This process was elucidated by Hatch and Slack in 1966, and is known as the C_4 cycle because the initial product of photosynthesis is a 4-carbon molecule.

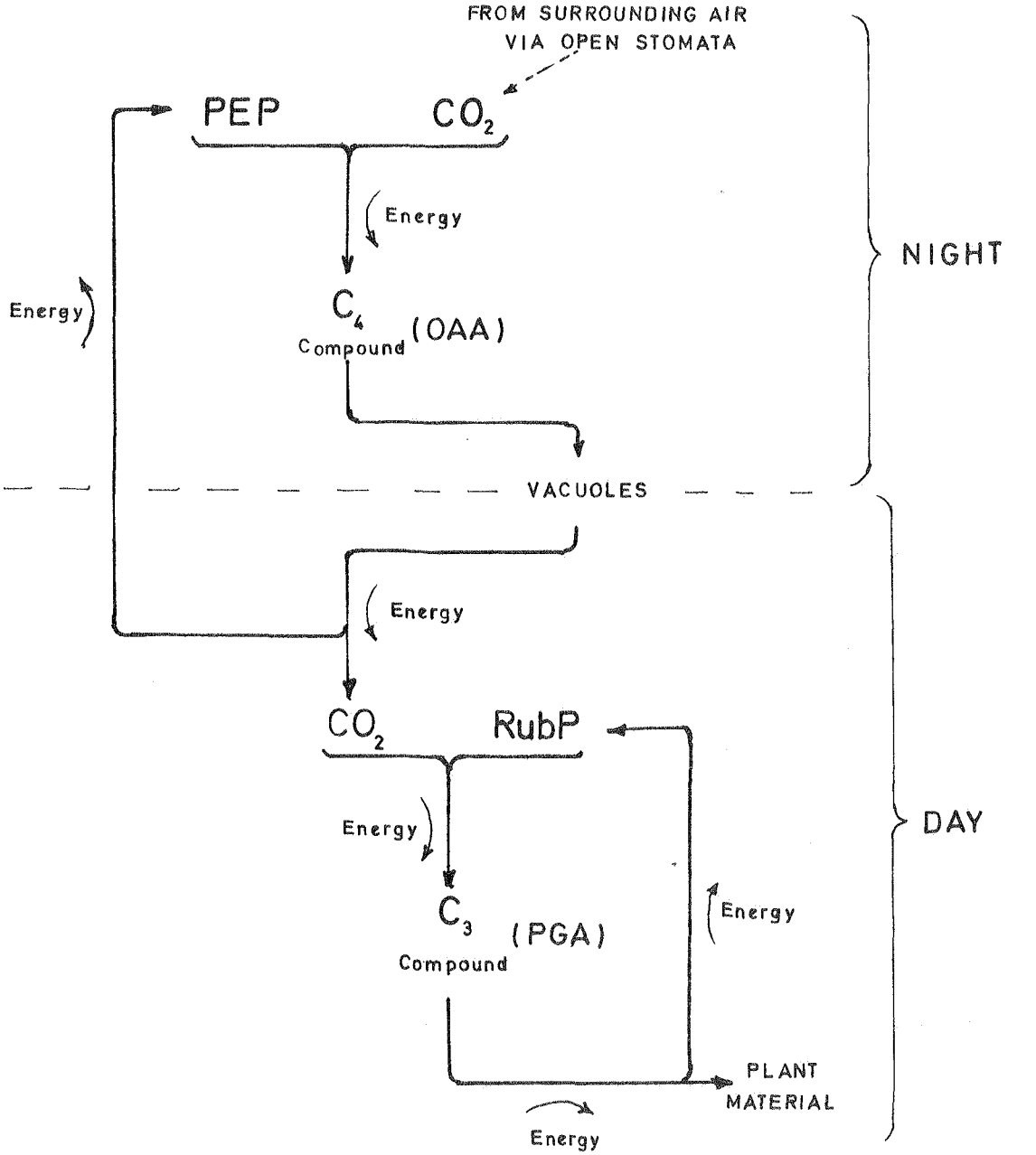
The C_3 process also involves a parallel reaction which is known as photorespiration. A proportion of the carbon obtained from splitting the CO_2 becomes reformed again into CO_2 and is expired from the plant. One sixth of the carbon intake is processed in this manner and then re-expired. On the other hand the C_4 process (for practical purposes) does not expire any CO_2 and so all the carbon split from inspired CO_2 is transformed into plant material. In this respect the C_4 process is more efficient than the C_3 process. However, in the C_4 process there is an additional energy requirement both for driving a two-stage rather than a single-stage process and for transporting products from the C_4 reaction site to the C_3 reaction site. At about 30°C ambient temperature the C_3 and C_4 processes have approximately similar efficiency. Above 30°C the extra carbon gain of the C_4 system more than balances out the additional energy demands of this cycle; below 30°C the C_3 system becomes increasingly more efficient than the C_4. For the same photosynthetic rate, the stomatal opening is lower with the C_4 system and hence the amount of water transpired is less than with the C_3 process. Thus for comparable growth rates the C_4 system has the advantage of water economy so that it is better suited to arid climatic conditions.

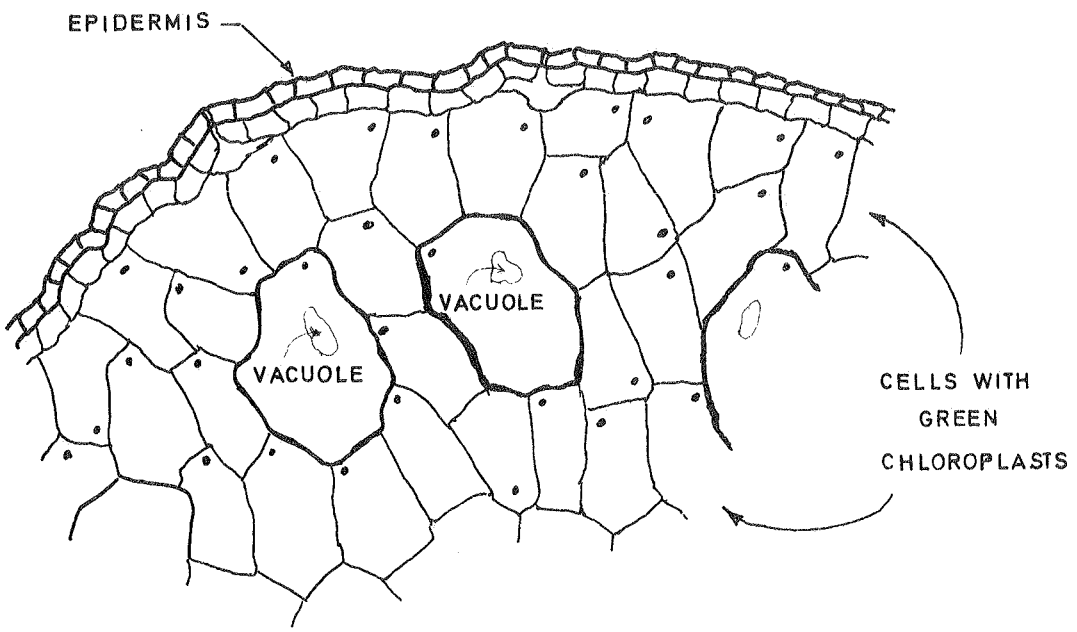
In addition to the scientific experiments carried out by Saussure in 1804 which have been noted above, Saussure also found that stem joints of Opuntia were able to remove CO_2 from the air during the course of the night. In 1815 Heyne discovered that organic acids would accumulate in the leaves of Bryophyllum during the night. These results might suggest conclusions different from those put forward by Priestley and by Ingenhouz i.e. that plants only grow in the presence of light. A great many years passed before an explanation of these experimental results was forthcoming. Shortly after the C_4 process became understood, it was established that certain plants followed the basic C_4 reactions but in a modified fashion. Instead of the initial C_4 reaction and the subsequent C_3 reaction being separated into different parts of the plant, they were separated in time; the C_4 part of the reaction occurs at night and the C_3 part of the reaction occurs in daylight. This is described as the CAM system.

In the CAM system the product of the night-time C_4 reaction has to be stored for reprocessing during the daylight hours. This requires storage volume and such storage space is usually provided by large succulent cells. Consequently succulence is a typical attribute of CAM plants. Since CO_2 is only inspired during the hours of darkness, the stomata of a CAM plant need only be open at night time. In typical low night-time temperatures, water transpiration via the open stomata will be very low indeed and so the CAM cycle is even more water-efficient than the C_4 cycle. Plants which grow on the CAM cycle can thus be expected not only to exhibit succulence but to be more suited than many other plants to grow in arid conditions. It would seem probable that most cacti and other succulent plants do indeed grow on the CAM cycle.

Because cacti do grow in this specialised manner they could well grow better if cultivated in a manner which is compatable with the CAM process. They could grow less well if cultivated in a manner which is not entirely suited to the CAM system and cultivation problems may even be encountered. On this account it could be of advantage to be aware of those cultivation practices which are compatible with or could even support the CAM process; and also to know how and why a CAM plant may be vulnerable to other methods of cultivation.

(Further information relating to the effect of environmental conditions on the CAM process and how this can be related to the cultivation of cacti will appear in a forthcoming issue).


FROM SURROUNDING AIR
VIA OPEN STOMATA
PEP
CO_2
Energy
Energy
C_4 Compound (OAA)
NIGHT
VACUOLES
Energy
CO_2
RubP
Energy
C_3 Compound (PGA)
Energy
PLANT MATERIAL
Energy
DAY


EPIDERMIS
VACUOLE
VACUOLE
CELLS WITH GREEN CHLOROPLASTS

CAM

DISCOCACTUS FRUIT From D. Rushforth

About half of the Discocactus "species" in my collection have been grown from seed, and the majority are grafted. I sow a lot of seed every year, of many genera and species, as my interest covers the whole spectrum of cacti. The seed comes from many sources — de Herdt, Kohres, Knize and others, besides some collected from my own plants. The largest order normally goes to Knize, as a group of growers from around Bristol share the seed among themselves.

I have several stock plants of Pereskiopsis, and aim to have a plentiful supply of cuttings about five inches high, rooted and growing vigorously, by the end of March, which is when the majority of seedling grafts are done. A smaller supply is usually available during the rest of the year.

Discocactus seedlings are grafted on to this stock at a few weeks old, when they are very small, and kept in a warm humid atmosphere until established. Most of these seedlings will grow to about 3-5cm. across the first year. Some of them have the tops cut off for re-grafting on to a more permanent stock after a few months, leaving the base to sprout. Those that are left on Pereskiopsis to grow, normally stay there for 2 or more years, by which time they will be 7 or 8cm. in diameter. At that stage they can be cut off, along with about 5cm. of stock and rooted down. Very often there will be roots formed both on the scion and the stock.

Of these seedlings Discocacti, nine or ten are now of flowering size, and along with other plants I try to get fruit to set, for interest if not for seed. I am fortunate in being home for lunch and this enables me to dab around with a brush, but this does not apply to the Discocacti. I think that I have had fruit set on all my Discocacti that have flowered, even when only one has been in flower. At the same time, not every flower sets a fruit. To encourage fruit to set I use an eyeliner brush — a fine brush with long bristles — dropping it into the flower as far as it will go and gently disturbing the stamens in the hope that the stigma will receive some pollen. This is done as soon as the flower is fully open and is repeated first thing in the morning. So far I have not observed any stigma growth during the course of the night. Of course if there is more than one flower open on a plant then each flower is similarly treated. If other plants have flowers open, often I cross pollinate and keep a record of the cross by tying a tag to the flower. This remains on the flower and on the fruit when it forms. I have several lots of seed produced in this way and look for some interesting results when it is sown.

The fruits on Discocactus are very variable. For instance on D. silicicola the fruit appears to be bright pink, about 6cm. long; but only the top centimeter or so is coloured — the rest being white until it is exposed to light. Clavate in shape, it is difficult to detach until dry, and often the seed will germinate in the fruit (endogenous vivipary). Discocactus magnimamus, on the other hand, has a white fruit, whilst D. bahiensis produces green fruits, both similar in shape to the fruit on D. silicicola. Discocactus albispinus produced a fruit about 10cm. long in 1980, but it was very thin, almost as if it had been extruded through a small cavity. The quantity of seed is very variable; it ranges from about 30 seeds in one fruit, up to 173 seeds in a fruit of D. griseus. This latter plant was not in good health at the time and such a large number of seeds is quite the opposite of what I would have expected.

Some Discocacti flower quite late in the year and set fruit themselves. It then becomes a bit of a problem to decide what to do for the best — if the fruit is left on the plant the close atmosphere tends to help the growth of fungus on the fruit; this can spread to the plant and lead to the demise of the plant. If there is an attempt to detach the fruit before it is really ready to part from the plant, then there is a chance of causing damage to the plant, with equally disastrous results. However, most fruit is set at a more suitable time of year and during this coming summer I will try to make a more detailed record of the fruits and also keep a note of any flower perfumes that may be apparent.

A TEPHROCACTUS FLOWERS — From R. Zahra

On many occasions I have tried to grow species of Tephrocactus from seeds without any success. I have tried everything in the book, but everytime germination was zero. Some six years ago I bought some seeds of KK 765 Tephrocatus viridis. After six months of waiting nothing had come up out of 100 seeds that I had sown, so I emptied the seed pot into a tray of Coryphantha that were growing out of doors in a very exposed position, where some of the soil had been blown away by the wind and needed topping up. I think that it was in the following winter and certainly several months after emptying the pot, that I noticed three Opuntis type seedlings growing in this tray; in due course they proved to be Tephrocactus viridis. Since that was the place where they had germinated I left them there for quite a long time. They were still in the same place when one of them flowered two years later. When I moved to my present house, this plant was given a special place in the greenhouse. It has now formed a very nice clump some six inches across, but since it has been in the greenhouse it has never flowered again. I am of the opinion that Tephrocacti need a lot of direct sun light both to germinate and to flower. The KK Field Number list says that this plant comes from Incuio in Peru, but I have no idea where that is.

PROBLEM WITH PESTS —SCIARA FLY From D. Angus

With one exception I have very little trouble with pests in the greenhouse; at least once a year I set off a fumigating smoke in the greenhouse, with all the ventilators and door shut. It is several hours later, or on the following day, before I open up the greenhouse again. But the one pest which seems to be immune to this treatment is sciara fly. The newly hatched flies are so small that it is not easy to see much beyond the sunlight flashing on their wings, but sometimes there is almost a cloud of them going to and fro over my trays of young seedlings. They must relish the growing point of the plant and then not long after they have chewed away right in the centre of the crown, the seedlings just collapse by the dozen.

From D. Walton

I am interested in growing insectiverous plants and I have a tray covered with moss in which I grow several different sorts which I keep in the small greenhouse where I do my seed raising. Certainly I have never had any problem with white fly and can only assume that any intruders fall prey to the insectiverous plants. Perhaps they catch sciara fly as well.

From L. Jeffries

I would question whether insectiverous plants are capable of solving the problem of sciara fly. Since I first owned a greenhouse in 1950 I have had no trouble with mealy bug and I attribute this to the regular prophylactic use of malathion, which was introduced in the same year. However, red spider is troublesome sometimes and always without warning. It has been shown that unless one filters the air entering a greenhouse, it is impossible to keep this pest out. This procedure is quite impracticable for the amateur who, so long as he continues to ventilate conventionally, will have to suffer periodical attacks on susceptible plants.

Not so long ago I discovered a dozen or so plants (Haworthias and a few small cacti), the roots of which were severely damaged by the larvae of sciara. I wonder whether this could be due to the fact that this year, for the first time, I am using a mixture of Bower's ericaceous soil-less compost mixed with my conventional loam-based compost, for cacti requiring a low soil pH (Melocacti, Notocacti, Gymnocalycium, etc.). I suspect that the peat-based compost may have favoured the establishment of sciara in the greenhouse and then the more vulnerable plants (most of which were in loam compost) were attacked.

From R. Sherwin

I had been having some trouble with one or two trays of very small seedlings — the odd gap would appear in the ranks just as if the seedling had been taken away altogether. One day I was looking at these plants when I thought I saw one of them move slightly. This really did make me look at them most intently and I was astonished to find that one of them really was moving, just as if something was inside the skin and pushing to get out. Then what had been a seedling perhaps four or five mm across just deflated into almost nothing. With the very greatest difficulty I could make out some mites which had presumably eaten the whole of the juicy inside. I gather that this is the sort of thing that you can expect with sciara fly.

CHILEANS 1983 AUTUMN WEEKEND

This will be held on September 9-10-11th when we look forward to an account of his visit to Rio Grande do Sul by K. Prestle, and to discuss the rather temperamental 'Brasili-Parodia' group of Notocactus. We understand that R. Ferryman had a productive trip to Chile in 1982 and will be telling us what he found there; Neowerdermannia will also be discussed. We hope to hear a further instalment from R. K. Hughes about his trip to Peru. From C. Rodgers we will hear about his visit to Curacao and his trip to Paraguay; Monvillea and Eriocereus plants will be welcome in order to identify those on the slides; there is also a Trichocereus with sunken areoles. Newer Sulcorebutias will be discussed. We expect to view slides from a natural history photographer who has been out in Peru. Bookings to Mrs. M. Collins please; anticipated cost may be around £33 per head.

VISITING SPEAKER FROM CHILE From R. Ferryman

During my trip to Chile I received invaluable advice from a local botanist who participated in the collecting trip to the Grand North. There is a possibility that she will be paying a visit to this country (possibly early to mid June), at which time she may give a talk about Chile and its Cacti. A meeting would be held on a Sunday, after lunch, at an East Midlands location, at which members and friends would be welcome. Bookings will be looked after by Mrs. M. Collins but there may well be very short notice for date, place, and time.

. . . . . from Mrs. M. Collins

We will endeavour to arrange a location where something in the nature of a buffet tea could be provided at the close of the talk, so that a charge of around £2 per head could be involved. Would members who wish to attend this event let me know names (or at least the numbers) of those planning to come, so that seating capacity can be established. Please provide a telephone number in case it becomes necessary to advise you of meeting details at very short notice.

NCSS NATIONAL SHOW From G. J. Charles

We shall be putting on a Chileans stand at the NCSS National Show again this year when we hope to be able to welcome quite a number of our members for a chat. Those members who are planning to visit the Show with Branch parties or with friends may care to encourage them to call at The Chileans stand, where information, back numbers, etc., will be available.

STUDY GROUPS/REFERENCE COLLECTIONS

Cleistocacti	T. Lavender, Kalanchoe, Market Place, Tetney, DN36 5NN
Frailea	J. Forrest, Spring Garden, 2, Darngaber Road, Quarter, Hamilton, Scotland.
Gymnocalycium	G. J. Swales, 5 Hillcrest, Middle Herrington, Sunderland, Tyne & Wear.
Lobivia	J. Hopkins, Primrose Cottage, Monks Lane, Audlem, CW3 0HP.
Melocactus/Discocactus	J. Arnold, 4, Lonsdale Court, Churchill Park, Washingborough LN4 1HJ
Neoporterianea	R. Ferryman, Nichelia, The Street, Stonham Aspal, IP14 6AH.
Notocactinae	G. J. Charles, 138, Whitehouse Common Road, Sutton Coldfield, B75 6DT.
Opuntia/Tephrocacti	J. W. Bagnall, Wendy Cottage, 128, Huddersfield Road, Meltham.
Photographing Cacti	A. W. Craig, 32, Forest Lane, Kirklevington, Nr. Yarm, TS18 5LY.
Rebutia	P. Smart, 5, Tomlinson Avenue, Gotham, Nottingham, NG11 0JU.
Sulcorebutia & Weingartia	J. R. Gooch, 51, Bourn Avenue, Hillingdon, UB8 3AR.
Trichocereus	N. T. Hann, The Retreat, 28, Beckenham Road, West Wickham, Kent.

THE CHILEANS

Organiser	H. Middleditch, 5, Lyons Avenue, Hetton-le-Hole, Co. Durham, England, DH5 0HS
Treasurer	R. L. Purves, 19, Brocks Drive, Fairlands, Guildford, Surrey, GU3 3ND.
Membership Sec. & Back Numbers	Mrs. G. Craig, 32, Forest Lane, Kirklevington, Nr. Yarm, TS18 5LY.
Seed Exchange	J. Hopkins, Primrose Cottage, Monks Lane, Audlem, Cheshire, CW3 0HP.
Slide Librarian	A. W. Craig, 32, Forest Lane, Kirklevington, Nr. Yarm. TS18 5LY.
Weekend Events	Mrs. M. Collins, 11, Tudor Gardens, Upminster, R.M.14 3DE.

CONTENTS