

CACTI AND STEAK—THIS MUST BE ARGENTINA

JAMES D. MAUSETH

Department of Botany, University of Texas, Austin, TX 78713

ROBERTO KIESLING

Instituto Darwinion, Casilla de Correo 22, Labarden, 1642 San Isidro, Argentina

Part 2

Near Mazan, cacti show us how finicky they are about their roots. Most of the area is more or less flat, with soil; there are some bushes and herbs, there are many open spaces, but there are no cacti. Then a small set of granite hills appears and you can barely walk through the abundance of *Gymnocalycium ferrarii* and *Pyrrhocactus bulbocalyx*. On a different set of hills is *Cereus forbesii*. It is interesting that cacti will live in rocks next to soil but they usually do not live in soil. Obviously many of the seeds must wash out of these rocky areas into the richer, moister soil below, but all resulting seedlings must die quickly.

The *Cereus forbesii* has an abundance of large fruits with luscious red pulp and hundreds of black seeds. We collect many and begin the process of cleaning seeds. We have small bags, smaller than a sandwich bag and made of fine-mesh cloth; they have a drawstring to close the mouth. Pulp and seeds are scooped out of the fruit and placed in the bag, then the mouth is drawn shut and the bag is kneaded in a bucket of water or under a tap (Fig. 13). The slime of many juicy cactus fruits can be truly revolting, and it seems that one cup of pulp produces ten gallons of slime. After kneading for five or ten minutes it seems that no progress is being made, then suddenly the seeds lose their sliminess and the water runs clean. To dry the seeds, just tie the bag to your car's rear-view mirror as you drive. The desert air blowing through will do the trick in an hour or two.

By this time we have reached Andalgalá. From here our destination is Tucumán and we head east. After driving across flat plains for about an hour, we turn into a series of medium-size mountains and begin climbing steep switchbacks. Near the top is *Trichocereus andalgalensis* and two or three plants of *Gymnocalycium baldianum*. Continuing to the summit, we expect an equally steep descent but instead encounter a broad flat plain, cool due to the altitude of 6300 feet, with potato fields in many areas. *Gymnocalycium baldianum* is abundant in the uncultivated areas; it appears to be almost everywhere. As we continue, vegetation becomes abundant and soon there are large trees with *Rhipsalis floccosa* and *R. lorentziana*. It is hard to imagine that we are only a few miles from the desert at Andalgalá; this is a reminder of the rain-shadow effect—moist air from the east cools as it rises over these mountains. As it cools,

clouds form and rain falls. By the time the air has crossed the mountains it is drier, but then it descends, compresses and becomes warmer. The plains on the lee side receive much less rain. Rain-forest epiphytic cacti on one side, desert cacti on the other.

From Concepción we turn toward Tafi del Valle. We now begin to climb once more, passing through tall forests of big trees. The pendant *Rhipsalis* reach lengths of several feet and dangle just out of reach. If they hang from a branch that juts over the roadway, it is a high branch, and even with long poles we cannot hook the rhipsalis. Passing trucks have broken them off so high we cannot reach them. If they hang from a low branch, right at eye-level, it projects away from the road, out over the steep precipice. We continue empty-handed. The rhipsalises smirk. Our one consolation is that tonight we are going to have steak for dinner.

At 6000 feet the forest begins to break up and open meadows appear. At the very edge of the forest are clumps of *Trichocereus schtickendantzii*. The plants here grow on a slope and many of the short branches are pendent, hanging almost straight down with just their tips turned upward. This is a common growth-form among cacti. We saw it on many cleistocacti last year in Bolivia—the major portion of the plant was upside down, completely vertical with just the tip upturned. But is this really upside down? It is what we expect from *Rhipsalis*, *Hildewintera*, and *Aporocactus*. Maybe it is time to re-think some of our ideas—and growing methods—for some cacti.

For a day or two now we have seen quite a bit of rainforest, pastures and farmland. Now we are in a high meadow above 9000 feet. The sky is overcast and rain appears imminent. The lush grass indicates that rain is frequent here. There are even streams with water actually running in them—a very bad sign for cacti. Tafi del Valle is another area obviously too wet for cacti. Except that this is the home of two outstanding species: *Soebrensia bruchii* and *Austrocylindropuntia verschaffeltii*. *S. bruchii* is not the type of cactus you would expect to have to wade to, but it grows in areas with sodden soil. Most of the plants here cling to low outcrops of rock that keep their roots at least slightly dry, but others grow in wet soil with grasses overarching them and mosses around their bases. This area can be very dry in the cool season (from March to December) but wet in the summer. We are visiting them in March, experi-



Fig. 13. James Mauseth cleaning cactus seeds.

encing the last of the summer rains; the low clouds and steady drizzle seem appropriate for *Epiphyllum*, not for a giant globose cactus. *Austrocylindropuntia verschaffeltii* grows nearby, also in a habitat that seems improbable. It will be necessary to experiment with the plants back at the University of Texas—give them more water, maybe increase the amount of organic material in the soil mix. This trip is more educational than expected—it is easy to accept that cacti have

many shapes and flower types and that epiphytes must be kept wet. But it is also easy to develop stereotypes of other aspects of cacti, that they must be kept dry, that they need sun, that they must not be kept too cold in winter. But here is a large succulent globose *Soebrensia* that appears to need unusual amounts of moisture. In a few days we will encounter *Echinopsis silvestrii*, which prefers heavy shade, just as do many gymnocalciums. *Trichocereus thelegonus* (Fig. 14)



Fig. 14. *Trichocereus thelegonus*.



Fig. 15. *Trichocereus pasacana*.

grows flat on the ground, never even trying to grow upright. Many more field studies are needed, as well as descriptions by field botanists who know the plants in habitat, who are familiar with the climates to which particular cacti are adapted.

Near Cafayate are the giants of Argentina—*Trichocereus pasacana* (Fig. 15)—growing in abundance. Many are well over ten feet tall, some with numerous branches, others almost solitary columns. We hate to have to fell one to get samples, but tissues in the center of the base are important and cannot be obtained any other way. Besides, there are many plants here and many seedlings. In the long run, in a stable population, hundred die every year and are replaced by younger plants. The saw comes out of the pickup and a tall pasacana comes down. We are careful to take samples of all the important tissues; we do not want to waste this plant. We think nothing of killing and eating plants every day, and big trees are killed all the time just to make newspapers, but still you have to steel yourself to sacrifice a big cactus. But you review all the benefits to ease your conscience, and you proceed.

Around the next corner, a farmer is clearing

land, and perhaps fifty pasacanas are chopped down. It is not uncommon for farmers here to fell these plants and feed the juicy stems to their livestock. Perhaps our taking that one plant was not the greatest threat to the ecosystem after all. Feeling a bit foolish for having debated so long over whether or not to cut down a big plant for critical samples, we decide that this is a great opportunity to collect duplicate samples and get more measurements. Some have wood over four and one-half inches thick—an incredible amount for a cactus other than *Pereskia*.

Traveling on toward Jujuy we pass from one species to another: *Acanthocalycium thionanthum*, *Gymnocalycium spegazzinii*, *Tephrocactus molinensis*, *T. weberi*, *Parodia microsperma*, *Trichocereus thelegonus*, *Echinopsis silvestrii*, then, entering rainforest again, *Rhypsalis lumbricoides*, *R. floccosa* and *Pfeiffera ianthothele*. We had to stop for a rather surprising epiphyte—*Trichocereus terscheckii*. Not a seedling but several large plants well-balanced in a tree. *Pseudolobivia ancistrophora* is the last cactus before Jujuy.

Jujuy is a good R and R site—Rest and Relaxation. The idea is that we will stay here a day or two, have a short break. A leisurely breakfast, some dissecting, some sight-seeing, a nice dinner. This plan goes perfectly until we begin to unpack the pickup and organize the plants. Living plants for propagation need cleaning. Many fruits need to have the seeds extracted and cleaned. Several boxes of live samples need to be measured and dissected. All the samples that have already been dissected need to be checked, ensuring that the labels are okay and so on. Our two days of R and R turn into two days of work. But the people at the Hotel El Balcón generously provide us a huge table, running water and many other essential items, so the work is really pleasant.

During the first day, we had cleaned the live samples of *Maihueunia* that we are keeping for propagation. In the evening, we put them on the balcony to dry overnight. But that night it rained in Jujuy, as it often does, and this morning we discover that the cover had blown off the maihueunias and the cold drizzle had fallen on them all night. They look great, much healthier than yesterday. The cold drizzle is just like the Patagonian climate they are adapted to. We decide to leave them here while we make a circuit to the north—they will be happier being here than being in boxes in the pickup.

By the time we leave Jujuy, all the samples have been taken care of and we have complete peace of mind for this last leg of the journey. The hotel has kindly agreed to watch over several boxes of live specimens and seed packets; maihueunias are spread out in the rain. The bottles of fixed specimens for anatomy go with us; they do not ever leave my sight.

Our objective now is the town of La Quiaca on the border with Bolivia—there we will be in Or-



Fig. 16. *Parodia chrysacanthion* in a clump of *Abromeitiella*.

oreocereus country. It will be a climb: Jujuy is at only about 3000 feet altitude, La Quiaca is over 12,000. As we leave Jujuy behind, we drive through a green, rich valley, and clouds follow us northward, upward. We see *Cleistocactus hyalacanthus* on the grassy slopes around us, but only on rocky outcrops where there is better drainage so their roots will not stay water-logged. As we climb, the clouds dissipate and the sky brightens. At the town of Volcán, we can look a few miles back down the valley and see an area so wet that it is not suitable for cacti, but turning around we can look up the valley and see dry desert, home to lobivias, parodias, austrocylindropuntias, blossfeldias and more.

It does not take long to find *Lobivia densispina*, *Parodia chrysacanthion* (Fig. 16) and *Rebutia wessneriana* in this area. The trick is to find dense cushions of the bromeliad, *Abromeitiella*, growing on rocks on the steep cliffs. The cacti grow in the mounds of *Abromeitiella*, their roots in a stable, moist-but-airy substrate. Small seedlings of the cacti can be found on the soil, but mature plants are only in the bromeliad mounds. It must be that the soil is either too moist or too mobile.

At Humahuaca, we turn off the main road and proceed toward Ocumaco. The cacti here are unlike anything you would expect: *Lobivia ferox* almost two feet tall, plants of *Parodia stuemeri* almost one foot tall, an abundance of *Parodia maassii*, their orange spines beautiful in the sunlight. We climb onward to over 10,000 feet and arrive at huge populations of *Oreocereus trollii* (Fig. 17), some of their short fat stems barely holding themselves up at a precarious angle; other

stems have given up and lie flat on the ground. At these high altitudes the setting is magnificent—a brilliant blue sky—is this what azure really means?—everything so clean and fresh that it shines; there seems to be no dust anywhere. There is no sound except wind, and in this late afternoon the wind is cold. The excitement of the *oreocereus* keeps us immune to the cold for a short while, then we search the back of the pick-up for sweaters and jackets; we use all the warm clothing we can find. Do the cacti prefer (need?) these cold temperatures? It is not yet autumn.

Continuing on from Humahuaca the next day, we find many interesting small cacti—*Puna subterranea* (Fig. 18), *Maibueniopsis nigripina*, *M. boliviensis*, *Mediolobivia pygmaea*. We have reached the altiplano, and the landscape is one of gently rolling, grassy hills—we could easily be in Wyoming except that we are well over 12,000 feet. Seeing llamas instead of buffalo reminds us of our location.

After reaching La Quiaca, we unpack some things in a hotel, then depart immediately to the east. *Oreocereus celsianus* is a critical objective for us. We had wanted to collect it in Bolivia last year, but incessant rains in the mountains had washed out some roads even as we were driving on them and we had been forced to turn back. Years ago Hans Britsch had given us a large plant of *Oreocereus celsianus*, and at its base a very unusual type of wood was discovered. Because such wood had not been reported before, this one plant had initiated a major study of cactus wood. But the plant from Hans had been cultivated, of course, and I had always worried that the unusual aspects of its wood had been caused by fertilizers,

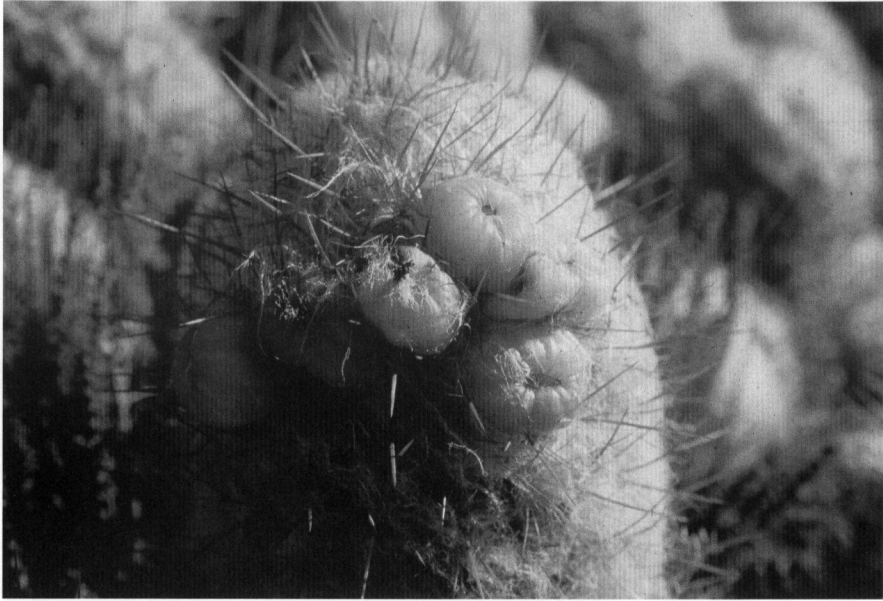


Fig. 17. *Oreocereus trollii* in fruit.

herbicides or maybe even just repotting from one type of soil to another. It was imperative to obtain a sample from a plant in nature to see if this wood formed naturally.

And there they are—an entire “forest” of *Oreocereus celstanus* (Fig. 19). More beautiful than ever imagined, their golden spines a brilliant halo around the long, snow-white hairs. A black, stormy sky as the background. We resist the temptation to run over to them, careful not to risk altitude sickness at this point. We spend a long time

with the cacti before even thinking about taking photographs, notes and measurements. It is probably cold, but we do not notice. How old can these plants be? Each plant has many stems that tower over us. Is it possible that these actually grow quickly? But finally we turn to our task and begin measuring and photographing plants. We collect samples of tissues from the entire length of one big branch, being careful to obtain as many wood samples as might be necessary to study this complex creature.



Fig. 18. *Puna subterranea*.

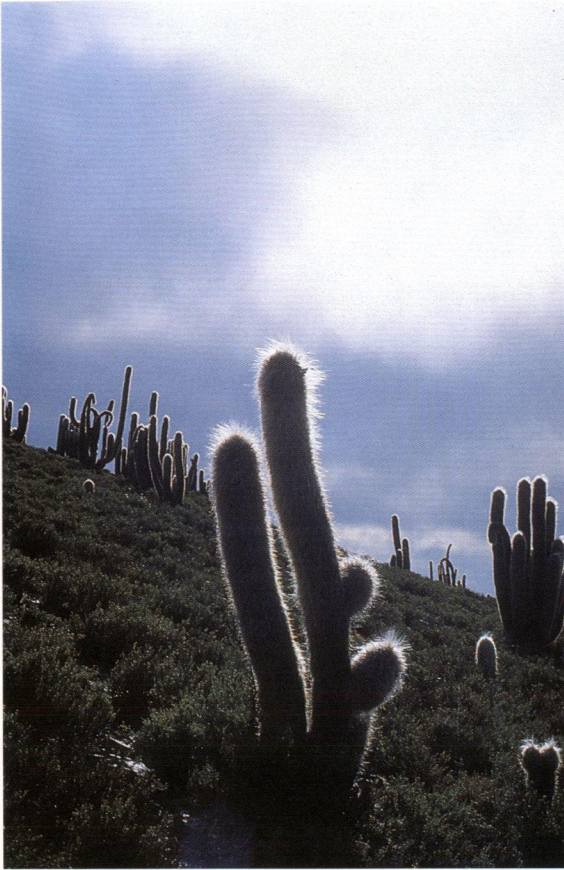


Fig. 19. *Oreocereus celsianus*.

Even though darkness is falling we do not head back to the hotel but instead continue on in hopes of finding *Neowerdermannia vorwerkii*. The locality information is vague and of little help, but we encounter an old woman tending a herd of llamas. Perhaps she would know the plant, even though it is inconspicuous; it is worth stopping to ask. "It is everywhere here," she says in Spanish as she moves a low shrub back, and indeed it is. Though difficult to see in the gathering darkness, we find plants every few feet. A sample is quickly collected, then our attention turns to the baby llama that follows the old woman's every step. When we pet it, it nuzzles us for milk; it had been orphaned and is hungry. Its fur is soft, its eyes big and brown. There is no question of it finding a new home in Austin, but Buenos Aires is considered seriously for a while. Mrs. Kiesling's later reaction when hearing this story indicates that leaving the baby llama with the old woman was the proper choice. We return to the hotel in complete darkness; tomorrow we begin the journey back to Buenos Aires.

During the night a powerful lightning storm moves across the area and rain pelts down. It is

difficult to sleep, not so much because of the noise but because of remembering that, last year in Bolivia, rain had turned dirt roads into impassable quagmires. If we get stuck in axle-deep mud here, there will be little chance of finding help. Morning light reveals a sodden altiplano with a threatening sky. We depart as quickly as possible, thinking about hundreds of miles of dirt road but not about breakfast. Rain falls off and on until we reach Humahuaca. The road is muddy but passable—this area no longer has many heavy trucks carrying cargo between Bolivia and Argentina, and the big trucks are what really chew up a wet dirt road. We are greatly relieved to reach a paved road. The mountain tops that surround us had been brown two days ago, now they are covered with snow. This may be the last precipitation of the summer, falling as snow. The winter, just a few days away, will be dry.

The sunny skies of the lower altitude revive our energy, and our resolve to leave no cactus uninvestigated returns. Off we go toward Purmamarca to find *Soebrensia korethroides* (Fig. 20). We climb rapidly on the narrow mountain road and are soon at 13,000 feet, just the right altitude for *Soebrensia*. The population is dense, with globose plants scattered thickly over the area. One mile before there were none at all. Unfortunately, even though we search many plants carefully, none has fruits with mature seeds, and there is only one plant small enough to be useful for propagation.

Continuing upward to the pass at almost 14,000 feet we encounter *Maibueniopsis boliviensis*; R. K. has found it at over 16,000 feet in protected habitats. At the pass we pause to enjoy the magnificent view in all directions, then turn backward and head to Jujuy, pausing only for *Lobivia glauca* and *Parodia stuemeri*. In just one day we have descended rapidly several thousand feet from La Quiaca to Humahuaca, then climbed rapidly back up to *Soebrensia*, then dropped rapidly again to Jujuy. We feel a bit light-headed and queasy, but not too bad. At this point, we have had 100% success—all three species of *Maibuenia*, both species of *Oreocereus*, an *Echinocereus leucantha* almost a yard tall, numerous samples, seeds and living material for propagation.

After spending another day dissecting in Jujuy, we set out south, back to Buenos Aires. On the way we will collect *Opuntia quimilo*, *Pereskia sacharosa*, *Stetsonia coryne* (Fig. 21), *Opuntia sulphurea*, and *Trichocereus terscheckii*. Often on trips like this, once the homeward portion begins, the mood changes and thoughts turn from all the new sights to be seen to all the mail and work that has accumulated in your absence. But that does not happen now; our work is far from over. The next day or two will mostly be just driving, but then we will be packing, checking samples, obtaining CITES permits for handling endangered species, cleaning seeds and living plants. Back at the University of Texas, it will take about two



Fig. 20. *Soebrensia koretbroides*.

Fig. 21. *Stetsonia coryne*. All photos by authors.

months just to dehydrate the samples and embed them in paraffin, a process that preserves them permanently. Cutting them into slices thin enough to study by microscopy will take years—fortunately there are many undergraduate students eager to help. With their assistance, the work will proceed rapidly; in return, their education will encompass actual involvement in real research, rather than just hearing about it in some lecture. As we leave the beautiful high deserts, the amount of work that remains is sobering. The one bright

spot is knowing that soon we will write an article for the *Cactus and Succulent Journal* and try to share some of the beauty and excitement with the people whose generous contributions helped us accomplish this expedition. As we drive back to Buenos Aires, what we do not know is that one night Mrs. Kiesling will make pizza for dinner. Yes!

Acknowledgment

This work was supported by a research grant from the CSSA.

Suggested Reading

- Kiesling, R. 1995. Argentine notocacti of the genus *Parodia*. *Cact. Succ. J. (U.S.A.)* 67:14-22.
- Kraus, R. 1995. The environmental conditions of Cactaceae in Chile. *Haseltonia* 3:110-129.

- Mauseth, J. D. 1996. Comparative anatomy of tribes Cereeae and Browningieae (Cactaceae). *Bradleya* 14: 66-81.
- Mauseth, J. D., and R. Kiesling, in press. Comparative anatomy of *Neoraimondia roseiflora* and *Neocardenasia herzogiana* (Cactaceae). *Haseltonia* 5.

**FERDINAND ROEMER (VI):
Botanizing in Texas, 1846 Style**

Ferdinand Roemer (1818-1891), a German geologist, was an outstanding and influential teacher and many of his students later became distinguished scientists. In recognition of his unusual ability as a researcher, he received many honors from the state and learned societies. He traveled extensively, visiting every country in Europe, some of them several times. His great aptitude in learning foreign languages was of tremendous importance in pursuing his research outside of Germany.

He journeyed to Texas in December 1845 and returned to Germany in late fall, 1847. His trip was made primarily for the purpose of geological studies. He is called "the father of Texas geology," being the first well-trained geologist to make an extensive and detailed study of geology in the state. But he also botanized and made important collections that were sent to Dr. George Englemann in St. Louis for diagnosis.

For his collecting trips, Roemer ought a mule which proved itself a useful and trusty servant. The mule accompanied him on all his wanderings in Texas. Wrote Roemer: "He patiently allowed himself to be loaded with the manifold subjects of natural history. Often he presented a grotesque appearance when I came home in the evenings from a collecting trip, carrying in addition to myself, a leather saddle-bag full of stones, a bundle of plants, and perhaps a young alligator hanging behind the saddle and a four- or five-foot chicken snake suspended from the pommel.

"The herbs are not so conspicuous as to draw the attention of the European newcomer. Only the yucca and cacti are such strange plants which cannot be compared with any in the native country. Several species of both grow in western Texas. One species of the yucca with large, swordlike stiff leaves reaches a height of from 10 to 12 feet and reminds one, in manner of growth, of the palms. Among the cacti are none of the tall, treelike species found in southern Mexico, but the majority of them are low round species of the genus *Echinocactus*, *Echinocereus* and *Mammillaria*. Only two kind of cacti reach a height of several feet and are shrub like, *Opuntia vulgaris* L. and *O. frutescens* Engelm. The agave (*Agave americana* L.) is not found in the region of New Braunfels, but appears in southwest Texas toward the Rio Grande."

Larry Mitich

BOOK REVIEW

(continued from pg. 31)

Another major article is contributed by Graham Williamson, in which he describes the Succulent Euphorbia Species of the Richtersveld (sic) and Southern Namib Desert, again, well illustrated. After a detailed introduction to the geology, climate and ecology of the region, an easy-to-follow field-key precedes the descriptions, arranged alphabetically. All necessary features for identification are described, together with habitat and distribution notes. This comprehensive information is especially valuable for the addition of informative personal observations by the author, based on his knowledge of the species in habitat.

An essential cumulative index for all 10 volumes concludes this issue. Immediately preceding this and following the format of previous issues, the final pages also show illustrations from the Photographic Collection, but this time without accompanying descriptive text. Just two are wrongly named: on page 200, *Euphorbia furcata* is illustrated but given the name of *E. ubligiana* var. *furcata*, a combination which has never been validly made. On page 212, *E. "wissmannii"* appears, but there is no such species—the illustration is, in fact, of *E. meulentiana*, a softly woody free endemic to the Hadramaut of south Yemen.

And this brings me to my only serious criticism of an otherwise exceptional series of superbly produced books. Each volume, including this one, begins with one or two pages of errata and notes with reference to the previous volume. How much more satisfactory it would have been if authors had been made aware of proposed editorial amendments, notes had been added to the relevant articles, and errors corrected *before* printing, instead of a year or more later. Where and when are the corrections and notes for *this* volume to be published—and there are quite a few?

Sorry Herman—my only moan! You have done wonders in the publication of a marvellous series, and I, for one, have enjoyed immensely being part of an exceedingly worthwhile project. This volume brings the series to an end and completes a set of books that should find permanent room on the shelves of every succulent plant enthusiast—the hobbyist, the nurseryman, and the professional botanist.

Susan Carter