July 2025

Roadrunner News

Newsletter of the Long Beach Cactus Club
Founded 1933; Affiliate of the Cactus and Succulent Society of America, Inc.

Presention: Steven Hammer: *Riches to Rags: The Economics of Succulent Beauty*

Mr. Hammer will discuss and copiously illustrate the progression from high end to bargain basement and back again.

2003's high-end $450.00 Haworthia maughanii can now be had, roots included, for $12.99; and 1927's 12 mark Lithops rubra now costs a dime - if you buy 2000 of them. Meanwhile, thanks to better breeding by many more people, Conophytum wittebergense has more elaborate and more expensive tattoos than ever!

In June 1962 I met Harry Johnson and Lithops lesliei. Harry was 68 years old, the leslieis were 2, and I was 11 and too scared to speak. Nonetheless it was a most fruitful introduction and it led to a friendship with Harry - I must have been one of his youngest and shyest customers - and a lifetime's engagement with plants. After a misspent education at the San Francisco Conservatory of Music and UCSC, I turned semi-pro in 1977, selling and sowing Cole lithops seeds, and in 1986 I joined Mesa Garden in New Mexico as staff pollinator. In 1997 I moved to Vista to work at my own one-horse nursery, the Sphaeroid Institute. Early in 2022 it added a second horse. Meanwhile I visited South Africa 29 times and found some interesting things. Or they found me.

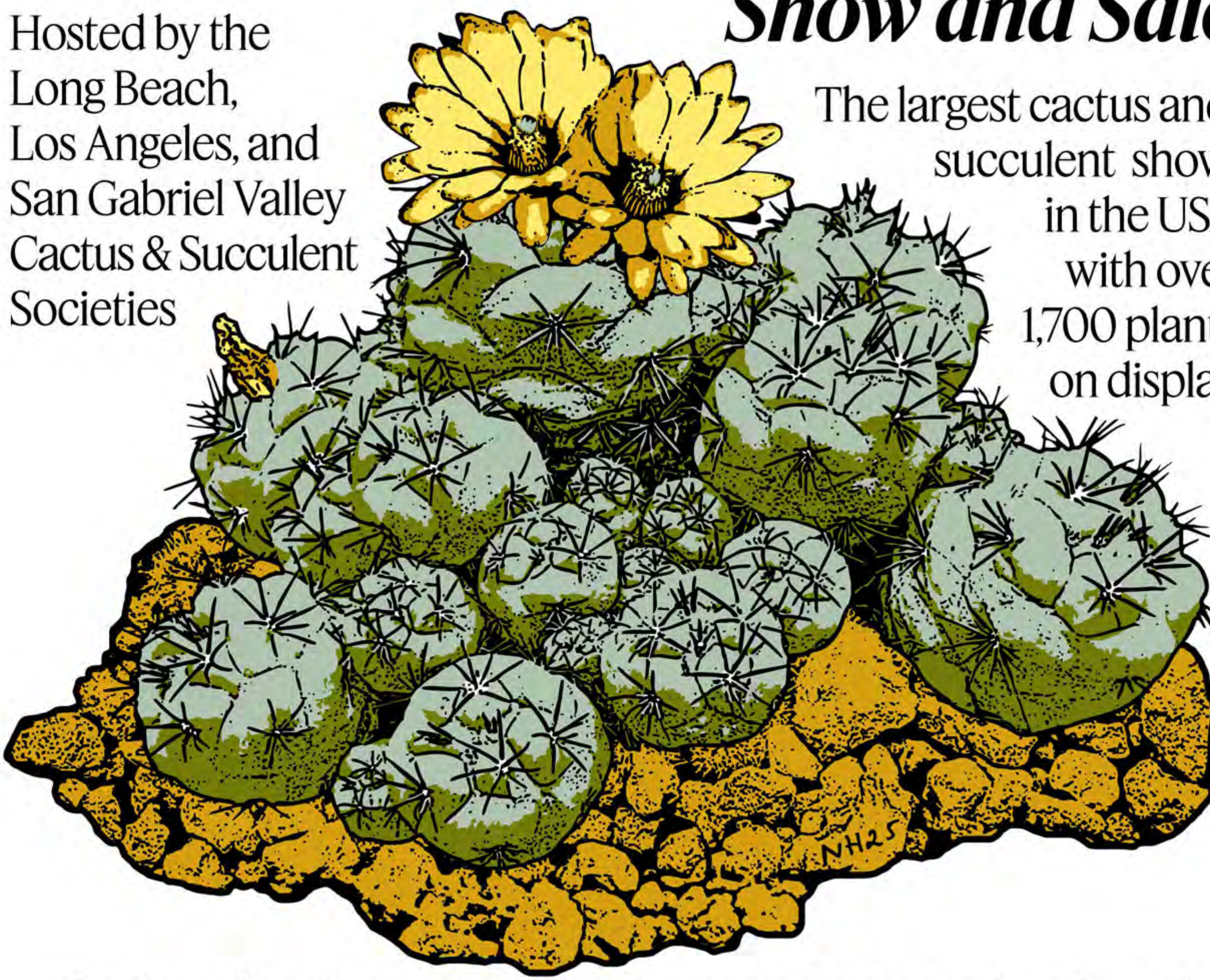
39th Annual *Inter-City* Aug 15-17 2025

Cactus & Succulent

Show and Sale

Hosted by the Long Beach, Los Angeles, and San Gabriel Valley Cactus & Succulent Societies

The largest cactus and succulent show in the USA with over 1,700 plants on display



Vendors selling thousands of plants, ceramics, books, tools and more!

August 15th, 2025 - Sale 8AM-5PM

August 16th & 17th, 2025 - Show & Sale 8AM-5PM

Los Angeles County Arboretum - www.intercityshow.com

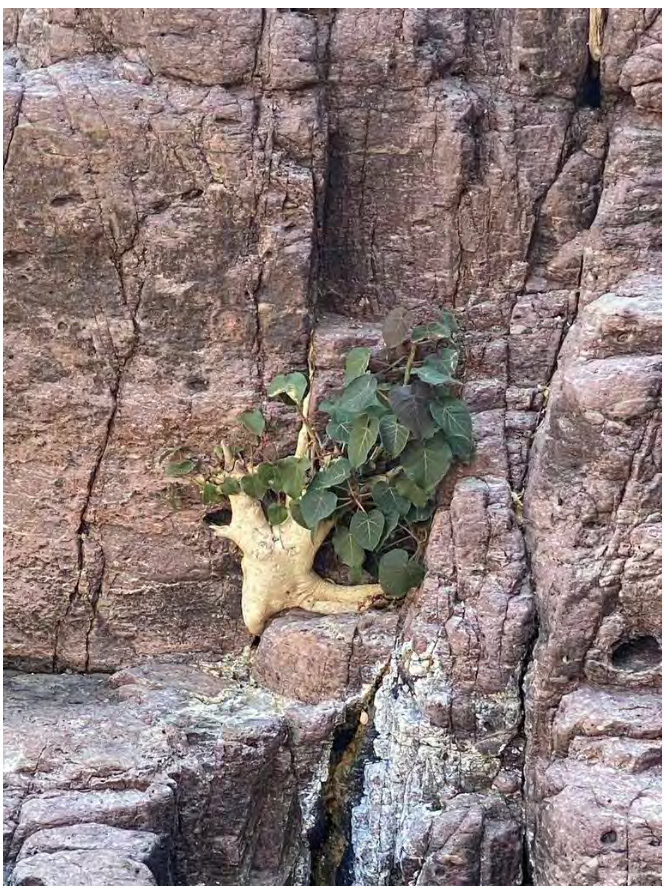
Instagram: @intercityshow **Facebook Group: intercityshow**

Succulents of the Month:

Fockea (named after German botanist Gustav W. Focke): Caudiciform plants with swollen bases and vining growth. Native to southern Africa. Deciduous* in dormancy; slow-growing, especially prized for their sculptural roots.

Ficus (Latin for "fig"): Includes many non-succulent trees, but some (like Ficus petiolaris) are grown for their thick caudex and drought tolerance. Native to tropical and subtropical regions.

Ipomoea (from Greek ips, "worm" + homoios, "resembling" – referring to twining habit): While known for morning glories, some species like Ipomoea bolusiana are grown as caudiciform succulents. Typically vining with swollen bases, often deciduous* in dry seasons.



* Deciduous: A plant that sheds its leaves seasonally, often during dry or cold periods.

Cacti of the Month:

Melocactus (from Latin melo, “melon” + cactus, “spiny plant”): Known for their globular bodies and distinctive woolly cephalium*, which appears at maturity. Native to the Caribbean and South/Central America. Require warm temps year-round; no frost tolerance.

Discocactus (from Greek diskos, “disc” + cactus): Small, flattened globular cacti with a white, woolly cephalium*. Native to Brazil, Bolivia, and Paraguay. Night-blooming, fragrant flowers. Very sensitive to cold and overwatering.

* Cephalium: A dense, woolly structure at the apex of some cacti where flowers emerge, marking maturity.

JAMES D. MAUSETH[1]

Are some cacti the fastest growing plants in the world?

1. This growing shoot tip of *Pereskia sacharosa* shows the repetitive nature of organogenesis growth in plants. Each leaf is obvious; nodes are the points at which each leaf is attached to the stem; and the regions of shoot located between the nodes are internodes. Leaves and internodes nearer to the shoot tip are smaller and shorter than those located lower because the higher ones are younger than the lower ones.

You may be thinking that the title of this paper is either a trick or the silliest question in the world. No one has ever worried that the cacti planted in their garden would crowd out the lawn grass and petunias. Instead, anyone with even a small collection of cacti knows that weeds outgrow cacti if given a chance. The key to answering the question in the title is to think about what we mean by "growing."

First, picture our own growth, the growth of human beings and other animals. We all undergo two very different types of growth. Immediately after we are conceived, the fertilized egg begins to become larger and heavier. Our tiny bodies absorb nutrients, first from our mother before we are born and later through our food, and we use those nutrients to make our own molecules, cells, and tissues. This increase in volume and weight is one type of growth. We usually qualify it by saying it must be **an irreversible increase in volume and weight**: just drinking water is not growing, and sweating off water is not "ungrowing."

The second type of growth we animals undergo is the formation of new organs. During a brief period while we are very young — while we are embryos — we form our organs: our arms, legs, heart, eyes, kidneys, and so on. This type of growth is called **organogenesis**, and it stops long before we are born. I am certain none of us has ever grown a brand new ear, finger or liver at any time after we were born. It may seem as if we are making new organs when we are six years old and our baby teeth are being pushed out by our adult teeth, but actually our adult teeth are merely enlarging during the process. They too originated when we were embryos, they have simply been dormant for several years. And during puberty, we rearrange our plumbing a bit and some hair follicles become active, but we do not make any new organs. Almost all animals are like us: the organogenesis type of growth is confined to a brief period after conception.

Plants also undergo both of these types of growth. Big trees and cacti grow from little seeds, each seed itself grows from a tiny fertilized egg (yes, plants have eggs, and sperm cells too). Most plants become heavier as they make their own "food" through photosynthesis; just as in animals, merely absorbing water after a rain is not growth.

A big difference between plants and animals is that plant organogenesis continues throughout the lifetime of each plant, it is not just a brief period during seed formation. Every time a plant produces a new leaf, root, flower, or cone, it is undergoing organogenesis. After a seed germinates, organogenesis of the shoot is amazingly long lasting and repetitious, especially when compared to organogenesis in animals. The growing point at the shoot tip produces the same thing over and over again: a leaf, a bit of stem that the leaf is attached to (called a node),

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2. Foliage leaves in this *Selenicereus* (*Deamia*) *testudo* stop growing while still very small, but they are easily visible here. As in other plants, the point at which the leaf is attached to the stem is a node, and the bit of stem between one node and the next higher node is an internode. Because cactus leaves typically are so difficult to see, we often just use the word "areole" because every areole is associated with one leaf-node-internode unit. Just as in the *Pereskia* of Fig. 1, the leaf-node-internode units at this *S. testudo* shoot tip are smaller and younger than those farther away from the shoot tip.

3. This saguaro (*Carnegiea gigantea*) plant has thousands of areoles and thus thousands of leaf-node-internode units, all of which were produced by the single shoot apex at the top of this shoot. An important questions is "How rapidly is this one shoot apex producing leaves?"

and a bit of stem between each node (called an internode)(Fig. 1). To get a mental image of this, think of your ribs and spine: a left and right rib are attached to a vertebra (like two leaves attached to a node) and above each vertebra is a disc (similar to an internode). We humans make only 12 units like this (we have 21 more vertebrae that lack ribs), but snakes make huge numbers of the rib-vertebra-disc units, and plants out do snakes by a huge factor. It is easy to see that vines such as morning glory spend the entire summer making many leaf-node-internode units one after another. In most cacti, the foliage leaf of each unit is too small to be seen easily, but each areole is located immediately above a leaf, so as we look at a cactus shoot, every areole indicates where each leaf-node unit is, and the green tissue above each areole is an internode (Fig. 2). Unless you are looking at a very little cactus, you are seeing hundreds of leaf-node-internode units.

We can now think more carefully about the title of this paper, "Are some cacti the fastest growing plants in the world?" Let's first consider organogenesis growth. Even a medium size saguaro has thousands of leaf-node-internode units but such a plant is many years old, so it's organogenesis does not appear to be especially fast (Fig. 3). But think about cacti such as *Cleistocactus* instead: their shoots have many ribs, each with many closely spaced areoles. It is not unusual for a *Cleistocactus* shoot to grow 33 cm (about 1 foot) longer each year (Figs. 4-6). I have examined a plant of *Cleistocactus ritteri* that I cultivated in a greenhouse at the University of Texas at Austin. Ten of its shoots were marked with tags so that I could reliably distinguish each shoot from the others, the length of each shoot was measured, and the date on which I measured the shoots was recorded. After that, the growth of each shoot was measured periodically throughout the summer. Each shoot had 18 ribs and on each rib,

4. In February 2015, the major branches were cut off this *Cleistocactus ritteri* to stimulate the growth of buds; newly activated buds were present by mid-March. This photograph of the plant was taken on April 9, 2015, about one month later, and ten buds were active and had been labelled with paper tags.

5. The length of the growing buds of the *Cleistocactus ritteri* plant were measured periodically through the spring and summer of 2015. This photograph was taken on April 30, 2015.

areoles were 0.52 cm apart (about 0.2 inches). Therefore, a section of shoot 10 cm long (just under 4 inches long) had 19 areoles per rib, and 342 leaf-node-internode units (19 areoles per rib multiplied by 18 ribs = 342 areoles in 10 cm of shoot). By the end of July when the experiment had to be stopped, the ten shoots had already grown an average of 28.3 cm (11.1 inches), which means that each shoot apex had already produced 968 leaf-node-internode units. The plants continued to grow throughout August and September and thus each shoot apex probably produced as many as 1,452 leaves or more (Fig. 6). Because I measured each shoot individually I could tell that the fastest of the shoots grew 29 cm in length and produced 992 units during the 118 days of the experiment. By comparison, many non-succulent shrubs produce only a dozen or so leaves on each shoot each year, and most of the big live oak trees around Austin often produce only five or 10 leaves per year on each shoot (of course, each large tree has thousands of twigs, so altogether a single tree may produce many thousands of leaves

6. This photograph was taken on April 27, 2016, and in a single year, each branch of the *Cleistocactus ritteri* had grown many centimeters, each with many more than one thousand areoles. Circumstances prevented me from taking measurements during autumn of 2015 and spring of 2016, so I do not know if growth slowed or stopped during winter.

Table 1. Rates of leaf production at individual shoot apices (organogenesis growth rate) of several cacti. The results in this table are preliminary and are based on only one or two shoots per species, and some of the plants were not being cultivated in optimal conditions.

Species	Leaves per day	Hours from one leaf to the next
Cleistocactus strausii	10	2.4
Cleistocactus ritteri	8.4	2.9
Austrocephalocereus dybowskii	3.4	7.0
Notocactus scopa	2.3	10.4
Pilosocereus tillianus	1.3	18.5
Harrisia martinii	1.0	24.0
Cereus forbesii	0.9	26.7
Pereskia sacharosa	0.7	34.3
Pilosocereus lanuginosus	0.6	40
Echinocactus grusonii	0.4	60
Astrophytum ornatum	0.6	384

per year, but here we are considering the rate at which each individual shoot tip produces leaves). I suspect that the 968 leaves produced by each shoot tip of my *Cleistocactus ritteri* may be the world record for rapid leaf production in plants.

I also examined 15 plants of *Astrophytum ornatum*, and as you might guess, they were in no hurry. Each shoot produced on average only 8 leaf-node-internode units during the 127 days I examined them (between March 3 and July 13, 2015); each shoot apex produced only one leaf-node-internode unit every 16 days (Table 1). I suspect that cacti such as *Ariocarpus fissuratus* are much slower.

When studying either total growth or growth rate, we use various time scales depending on what we want to understand. Someone studying the recovery of an area after a disturbance such as a fire or flood might be interested in the growth that occurs over a span of many years. A nurseryman will probably be interested in the growth that occurs within one or two years. Many plant biologists study growth rate per day or week, and they often want to know how growth rate changes from season to season. If a plant has a dormant period, such as when the tree is leafless in winter or during a summer drought, then we may want to measure growth only when the plant is actually growing. We cannot simply mark a plant on January 1 and then come back one year later. Instead we mark the plant and then examine it frequently, perhaps every month (good enough for *Astrophytum*) or every week (for *Cleistocactus*). If we examine a plant frequently and count leaves (or areoles) carefully, we should be able to discover rather precisely when a plant starts to grow, when it stops and how rapidly it grows during each active season. In the case of *Cleistocactus ritteri*, growth began in March and at its peak, shoot tips were producing 8.4 leaves per day: less than three hours passed between the time the shoot apex made two successive leaves (Table 1). This is astoundingly fast and makes me suspect that *Cleistocactus ritteri* produces leaf-node-internode units faster than any other species in the entire plant kingdom. For most other plants, a fast growth rate is one leaf every six or seven days, so *C. ritteri* is growing at lightning speed.

Studying the other type of growth — irreversible increase in weight or volume — is much more difficult. Because non-succulent plants have so little capacity to store water, the fraction of their weight that is organic molecules is fairly high and steady. For them, we can weigh a particular plant, then allow it to grow for several weeks or months then weigh it again. This weight of a living plant is called its fresh weight. For succulent plants, we usually need to be more precise about the weight of the actual organic molecules and not the water, so we must carefully wash all the soil from the roots, then put the plant in an oven that is warm enough to drive off all the water but not so hot as to burn up any organic molecules (usually about 60 to 80°C [150 – 180°F]) for several days. The result is the plant's dry weight. This treatment kills the plant of course so we cannot take it out of the oven, let it grow and then weigh it again. Instead we must cultivate hundreds of plants, then measure the dry weight of some, allow the rest to grow and then measure the dry weight of a second sample and so on throughout the entire season we are studying. This requires many plants, and it is difficult to do with large plants. It is not recommended for rare or endangered species of course.

7. Young plant of *Echinocactus grusonii* with the spines on one areole marked with fingernail polish. Because these shoots grow so slowly, it is not possible to simply measure their length with a ruler as in Fig. 5. Instead, an areole was marked with fingernail polish while the areole was young and very near the shoot apex. During this experiment, three new areoles were added to this rib. The shoot had 17 ribs, so the shoot apex had produced 51 leaf-node-internode units at this point in the experiment.

8. It is not possible to accurately count many of the young areoles because of the large amount of woolly hairs covering the apex of this *Echinocactus grusonii*, even though they are well developed. It may be that the wool is hiding areoles that are already one or two years old. If we were to give this plant a treatment that caused its organogenesis growth rate to increase greatly, we might not be able to detect that until one or two years from now, when the areoles produced this year finally emerge from the edge of woolly mass.

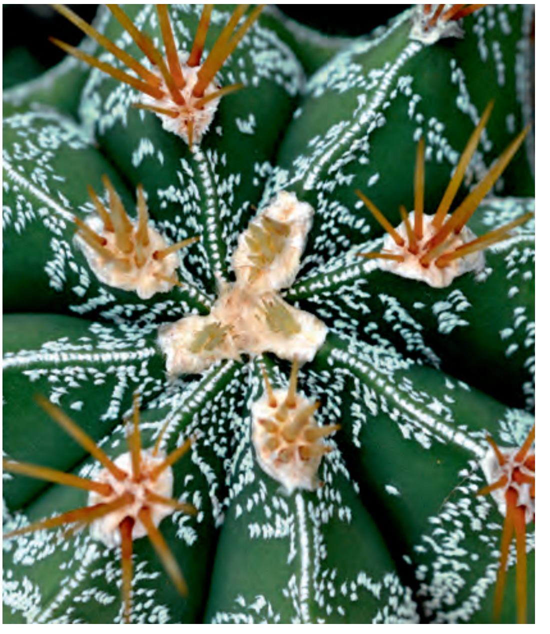
By contrast, studying the rate of organogenesis is not destructive, it does not need to damage the plant at all, and is more or less simply a matter of counting leaves or areoles every week or so. From my own experience, I offer some advice as to which techniques work well with cacti and which do not.

1. Mark the starting point areole clearly and unambiguously. Red fingernail polish is easy to see and many kinds are long-lasting (Fig. 7). You might experiment with various types because some colors fade and are difficult to see after several months, others crack and flake and are washed away as the plants are watered. It seems that dark red is the most visible and durable. Apply the polish only to one or several mature spines on one single areole. The solvent in many fingernail polishes is toxic and will cause severe damage to living cactus tissue if you try to mark on the green tissues of the shoot rather than on a spine. Areoles can also be marked by clipping off one or several spines. This works well for species that have very long spines, but if the plant normally has short spines, then after several months it can be difficult to be certain which areole had its spines trimmed. A drastic trimming that removes all spines is easy to see, but it might damage underlying tissue or at least risk sunburn. Small tags can be attached to the spines of the initial areole, but remember that string and plastic ties can decompose during the watering and sunlight exposure of a long-term experiment. I have been surprised at how difficult this step of the technique can be.

2. The starting point areole merely needs to be one that is easily visible, it does not have to be the highest, most apical one on a plant. After it is marked, count the number of areoles above it, then a week or month later, again count the number of areoles above it; the difference in the two numbers is the number of areoles that have been produced since the shoot was marked.

3. Define an uppermost areole at which you will stop counting. Close to the extreme tip of any cactus shoot, areoles are so young, small and crowded together that they cannot be counted reliably. And in cacti like *Echinocactus* and *Parodia*, the woolly hairs of the shoot tip hide large numbers of even well-developed areoles (Figs. 8, 9). Trying to count

9. In *Parodia* (*Notocactus*) *herteri*, there is no large mass of apical wool or abundant spines that block the view of many young areoles. Consequently, areoles should become visible and countable shortly after they are formed. A small amount of apical wool is present, consequently the shoot apical meristem and the very youngest leaf primordia are hidden; this will be true of all cacti and probably all other plants.



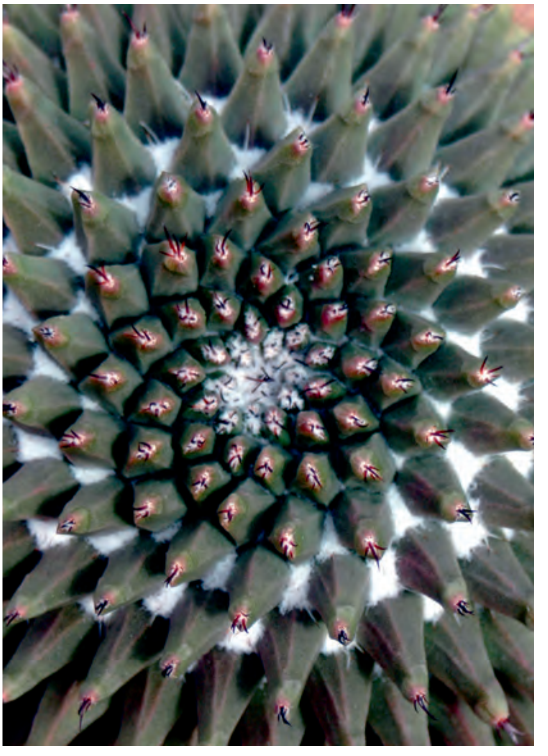
10. The marked areole on this *Astrophytum ornatum* is on the lowest rib (the rib at the 6 o'clock position; the mark is not visible here). The criterion I chose for a "countable areole" in this species is that the upper edge of the areole had to be old enough that at least a trace of green shoot was visible on the upper side of the areole. For this plant, I would count upward from the marked areole until I got to the areole visible here on this rib: the count for this plant would not go up until a new areole on this rib were present … at least a few weeks into the future here. If finer precision were needed, the length of the green internode above the areole could be measured and expressed as a fraction of the expected length of the internode.

these areoles would require pulling off all the hairs and young spines, which would be not only difficult but even worse, it would disturb the growing tip and make the experiment useless. Instead, decide on some developmental feature of an areole that will allow you to recognize a similar areole the next time you examine the shoot. For example, in *Astrophytum ornatum*, I would count the number of areoles upward from my marked areole until I came to the uppermost areole that was completely un-hidden by the shoot tip hairs. If I could see even a little bit of green internode above the areole, then I would count it, but if the upper edge of the areole was hidden, I would not count it (Fig. 10). Alternatively, if you are studying a cactus that has prominent central spines, you might decide to count upward to the highest areole whose central spine has reached a particular length. For long shoots with areoles closely spaced on each rib, it is possible to measure the length of the shoot above the marked area, then multiply the length of new growth by the number of areoles per centimeter (the technique I used for *Cleistocactus ritteri*).

4. Consider using photographs of the shoots. After the initial areole has been marked, it may be possible to periodically photograph the shoot and then count the areoles. Be certain that a photograph contains both the initial areole and the shoot tip, and be especially careful that the photographs have high enough resolution for you to count every areole reliably. Photographs might be especially useful for studying growth at the tips of tall plants such as saguaros and pilosocerei.

5. Consider the accessibility of the shoots, especially if you will study them for months or years. If you study a shoot that has a constant number ribs, it is only necessary to count the number of areoles on one particular rib, then multiply that by the number of ribs to obtain the total number of areoles produced during the study. But this requires that you accurately count the number of ribs and that you can periodically check whether the shoot has added a new rib or two. Examining all sides of a shoot can be difficult if it is growing among spiny shrubs in habitat, or if the

11. A ladder and extreme care would be needed to study the growth rate of these three plants of *Neoraimondia* (*Neocardenasia*) *herzogiana* in the Desert Botanical Garden in Phoenix, Arizona.



12. This *Mammillaria magnimamma* has spirals of tubercles rather than ribs, but its growth can be measured as described in the article. A tubercle would be chosen as the starting point, then marked, and the appearance of new tubercles above it would be counted periodically. Notice that each tubercle is a member of two spirals, one clockwise, the other counterclockwise.

plant is crowded among other cacti or against a wall in a garden. Many columnar cacti grow tall so quickly that a ladder is needed, which makes counting difficult and risky (Fig. 11).

6. Studying the rate of organogenesis growth in plants with ribs is rather straightforward: you just periodically count areoles upward a long one rib from the initial marked areole to the uppermost, youngest one that meets your criteria for being countable. But in plants that lack ribs, such as mammillarias, it is necessary to identify the lateral spirals formed by the tubercles. In many cacti, this is very easy and you can merely count the number of tubercles upward along a spiral until you come to the uppermost, youngest countable tubercle. To obtain the total number of leaves, it is necessary to count the total number of spirals on the shoot, which is usually easy to do (Fig. 12).

7. In studies like this, the objective typically involves comparing things. Do plants grow faster with one type of fertilizer as compared to another? With more water compared to less? What is the growth rate of one species compared to another? We know from casual experience that plants of *Cleistocactus* and *Pilosocereus* grow faster than those of *Ariocarpus* and *Sclerocactus*, but how do you compare these objectively? This technique allows reliable, repeatable quantification.

The use of ribbed succulents as described here allows us to measure and express rates of organogenesis easily and accurately, and I hope that many folks interested in the biology of cacti and succulents will use these methods to advance our understanding of these plants. After all, who would have guessed that some cacti are indeed the fastest growing plants in the world!

LBCC PLANT-OF-THE-MONTHS RULES

At the April, 2003 meeting, the following rules were adopted for the Plant-of the-Month (POM) competition:

- A maximum of three plants may be entered in each category (cactus and succulent).
- There will be three classes for entrants: advanced (blue tag), intermediate (pink tag) and beginner (yellow tag).
- Advanced and intermediate entrants must have had the plant in their possession for at least six months, beginners for three months.
- Entrants will receive 8 points for first place, 6 points for second place, 4 points for third place, 2 points for show/honorable mention (HM) and 1 point for showing a plant that does not place.
- At the discretion of the judges there may be up to three third places in a category. If plants are not deemed to be of sufficient quality, no third place will be awarded.
- For an entrant to receive points, the entry tags must be collected by the person in charge of record keeping for POM.
- At the annual Christmas party, award plants will be presented to the ten highest cumulative point holders regardless of class.

Long Beach Cactus Club 2025 Plants of the Months

MONTH	CACTI	SUCCULENTS
February	Copiapoa / Eriosyc / Islaya	Gasteria / Haworthia
March	Corypantha / Escobaria	Senecio / Othonna
April	Variegated cacti	Variegated succulents
May	CLUB SALE	
June	Hybrids & cultivars	Cultivars & hybrids
July	Melocactus / Discocactus	Fockea / Ficus / Ipomoea
August	Favorites (3)	Favorites (3)
September	Grafted cacti	Grafted succulents
October	AUCTION	
November	Miniatures (3) under 3 inches	Miniatures (3) under 3 inches
December	HOLIDAY PARTY	

2025 POM MINI-SHOW STANDINGS

Advanced		Intermediate		Beginner	
Gary Duke	64	Amy Angulo	73	Dam	43
Henry Angulo	43	Andrew Lander	8	Raymond Q.	41
Richard Salcedo	25	Lemono Lott	4	Shirley Kost	28
Daniel Zepeda	1			Gretchen Lewotsky	15
				Kelly Eddy	13
				Ivan Garibaldo	5
				Dan Papilli	1
				Arianna Gardeazabal	1

SNACK AND REFRESHMENT SCHEDULE

MONTH	LAST NAME STARTS WITH
July	N, O
August	P. Q, R
September	S, T , U, V
October	Auction
November	W, X, Y, Z
December	Holiday Party

LBCC OFFICERS AND BOARD MEMBERS FOR 2025

PRESIDENT	Nelson Hernandez	SECRETARY	Kelly Eddy
VICE-PRESIDENT	William Ramirez	TREASURER	Henry Angulo
BOARD OF DIRECTORS	Daniel Almanza, Christopher Bucka, Scott Bunell, Lemono Lott, Alfonso Molina		
CSSA LIAISON	M. A. Bjarkman	NEWSLETTER	Andrew Lander
VENDORS	Lupe Casas	PROGRAMS	Nelson Hernandez
MEMBERSHIP	Lawrence Hofman	HISTORIAN	Ken Shaw
INTER-CITY SHOW	Henry Angulo & Scott Bunell	MINI-SHOW	*Open*
LIBRARIAN	William Ramirez	X-MAS PARTY	*Open*
PHOTOGRAPHER	Dereck Diaz	REFRESHMENTS	Erika Villalobos
MAY SALE	Henry Angulo	AUCTION	Gretchen Lewotsky
INSTAGRAM	Scott Bunnell & Nelson Hernandez		
WEBSITE	German Rivera & Scott Bunnell		

NEWSLETTER

IF YOU HAVE ANY STORIES, cultivation tips, information about upcoming events, photos, corrections, or news in general about cacti and succulents that might interest our members, **please send them in**. Comments and suggestions are always welcome. Remember, this is *your* newsletter. Physical address: Andrew Lander, 3041 Roxanne Ave., Long Beach, CA 90808. Cyber address: landruc@gmail.com