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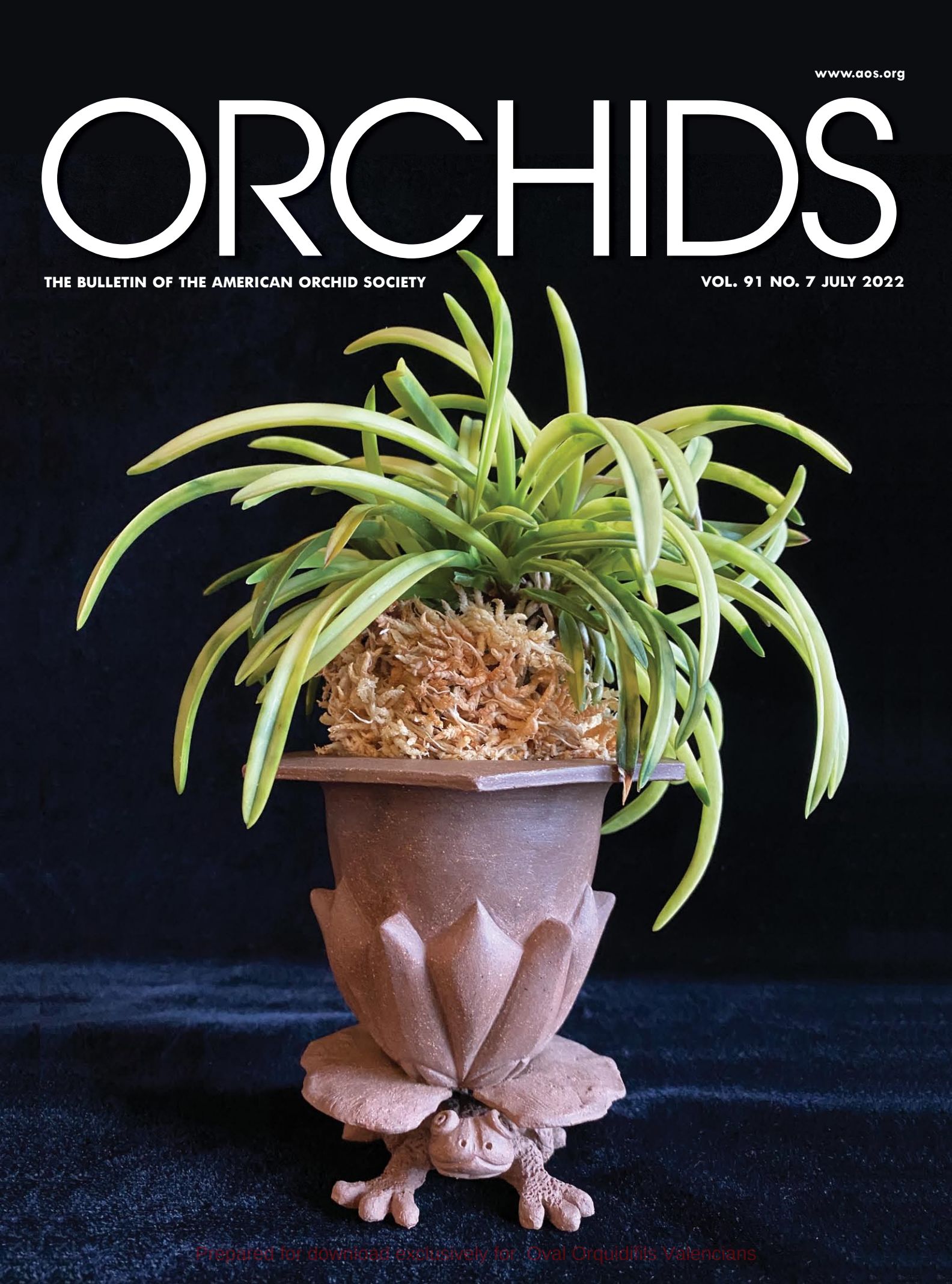
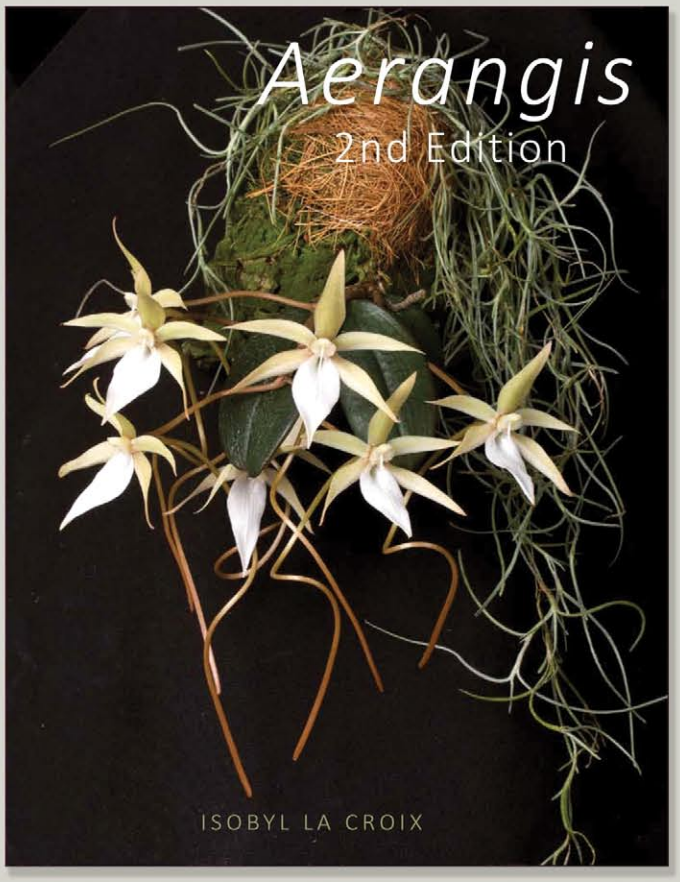
ORCHIDS

THE BULLETIN OF THE AMERICAN ORCHID SOCIETY

VOL. 91 NO. 7 JULY 2022

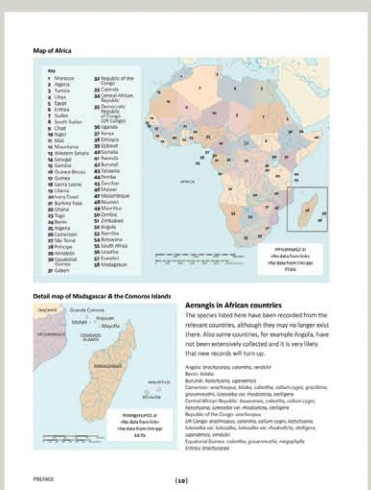


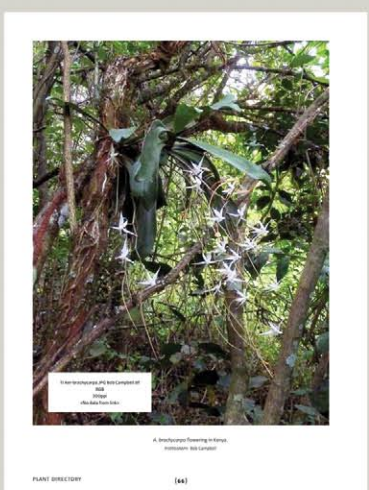
AERANGIS 2nd Edition



Author: Isobyl la Croix
ISBN: 979-8-9859580-0-3
Pages: 228
Images: 270
Page size: 7.5 x 10 inches (190 x 255 mm)
Cover format: Hardcover

The genus Aerangis is the focus of this spectacular book by Isobyl la Croix who spent many years studying African orchids in their native habitat.
It features detailed descriptions of the 59 species, accounts of the terrain, climate and habitats in which they live, and cultivation advice. These orchids, which grow on branches and rocks in the forests of Africa and Madagascar, have long nectar-filled spurs that release a delicate scent at night attracting hawk moths. This feature, along with their often disproportionately large flowers, make them rewarding to grow and, given the right conditions, they will flower year after year. Many are threatened in their native habitat and home cultivation makes an important contribution to their long-term welfare. Beautiful photographs of the plants and essential botanical information make this a unique reference that will deght orchid lovers.





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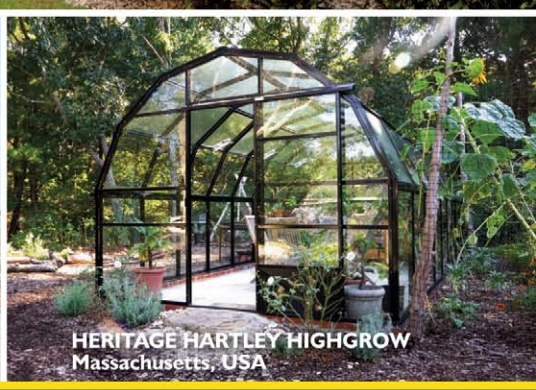

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ORCHIDS

The Bulletin of the American Orchid Society

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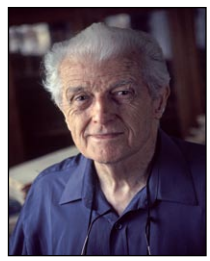
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FEATURES

DEPARTMENTS

In This Issue

FRONT COVER

One of this month's feature articles is the second installment of Carol Helen Beule's "From Costume to Clay" series. This pot, an engineering feat Carol has only replicated three times, is composed of multiple pieces assembled at different stages of drying to hold the structure secure and took about three weeks from start to finish.

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PRONUNCIATION GUIDE

Pronunciation of orchid names can be daunting for the novice and experienced grower alike. Presented below is a simplified pronunciation guide specific to the names found in this issue of *Orchids* magazine. An attempt has been made to represent each syllable using easily recognized sounds or words separated by hyphens and not standard phonetic symbols. Check out the Orchidist's Glossary on our website at https://www.aos.org/orchids/orchidists–glossary.aspx.

Aerangis (ay-er-ANG-iss)
Aeranthes (air-AN-theez)
albidiflora (al-bid-ee-FLORE-a)
alborubrum (al-boh-ROO-brum)
amoenum (am-EE-num)
Angorkis (ang-ORE-kiss)
Angraecum (an-GRAY-kum)
Anguloa (ang-yew-LOH-a)
Anjozorobeense (an-joe-zore-oh-bee-EN-see)
apiculatum (ap-ik-yew-LAY-tum)
apifera (a-PIFF-er-a)
articulata (are-tik-yew-LAY-ta)
aurea (AW-ree-a)
aureorubrum (aw-ree-oh-ROO-brum)
barringtoniae (bare-ring-TONE-ee-eye)
bicolor (BYE-kuhl-ur)
biloba (bye-LOBE-a)
Blephariglottis (bleh-far-ih-GLOT-tiss)
Bletia (BLEE-tee-a)
Bulbophyllum (bulb-oh-FILL-um)
Calanthe (kal-AN-thee)
Calopogon (kal-oh-POH-gone)
Campyloplectron (camp-ee-loh-PLEK-tron)
canbyi (KAN-bee-eye)
Cattleya (KAT-lee-a)
channelii (chan-EL-ee-eye)
chapmanii (chap-MAN-ee-eye)
ciliaris (sill-ee-AIR-iss)
citrate (sih-TRAY-ta)
clowesii (KLOWS-ee-eye)
conspicua (kon-SPIK-yew-a)
costata (kos-TAY-ta)
coutrixii (koo-TRIKS-ee-eye)
cristata (kris-TAY-ta)
Cryptopus (kryp-TOH-pus)
Cycnoches (SIK-noh-keez)
Cymbidium (sim-BID-ee-um)
Cynorkis (sin-ORE-kiss)
Dendrobium (den-DROH-bee-um)
dissectus (dye-SEK-tuss)
ellisii (el-LIS-ee-eye)
Epidendrum (eh-pih-DEN-drum)
Erwinia (er-WIN-ee-ah)
Eulophia (yew-LOH-fee-a)
falcata (fal-KAY-ta)
fastuosa (fast-yew-OH-sa)
filifolia (fill-ih-FOLL-ee-a)
Fimbriatae (fim-bree-AY-tee)
furcata (fur-KAY-ta)
Fusarium (few-SAR-ee-um)
Gastrorchis (gas-TRORE-kiss)
gigantea (jye-GAN-tee-a)
Grammangis (gram-MANG-iss)
guianensis (gye-an-EN-sis)
Habenaria (hab-en-AIR-ee-a)
Ida (EYE-da)
incarnata (in-kar-NAY-ta)
integrilabia (in-teg-rih-LAY-bee-a)
intermedia (in-ter-MEED-ee-a)
Laelia (LAY-lee-a)
Laeliocattleya (lay-lee-oh-KAT-lee-a)
lawrenceana (law-rens-AY-nah)
Lemurella (lee-mur-EL-la)
locusta (loh-KUS-ta)
longicalcar (long-ee-KAL-kar)
luteoalba (loo-tee-oh-AL-ba)
Lycaste (lye-KAS-tee)
maculata (mak-yew-LAY-ta)
maculatum (mak-yew-LAY-tum)
masuca (MAS-yew-ka)
Micorcebus (mye-kore-SEE-bus)
modesta (moh-DESS-ta)
mossiae (MOSS-ee-eye)
Mycelium (mye-SEE-lee-um)
mycorrhizae (mye-kore-RYE-zee)
namoronae (na-more-OWN-ee)
Neottia (nee-OT-tee-a)
nidus-avis (NEE-dus-AY-viss)
Oncidium (on-SID-ee-um)
oomycetes (oh-oh-mye-SEE-teez)
Ophrys (OFF-riss)
Orcheomyces (ore-kee-oh-MYE-ceez)
osceola (oss-ee-OH-la)
pallida (PAL-lih-da)
pallidiflora (pal-lid-ee-FLORE-a)
palmiforme (palm-ee-FORE-mee)
Paphiopedilum (paff-ee-oh-PED-ih-lum)
Papilio (pa-PEE-lee-oh)
Papilionanthe (pap-ee-lee-oh-AN-thee)
papillosa (pap-il-LOH-sa)
peyrotii (pay-ROT-ee-eye)
Phaius (FYE-us)
Phalaenopsis (fail-en-OP-sis)
Phytophthora (fye-toff-THOR-a)
pinifolium (pin-ee-FOLE-ee-um)
Platanthera (pla-TAN-ther-a)
pleurothallid (plur-oh-THAL-lid)
plicata (ply-KAY-ta)
apalachicola (ap-a-lach-ee-KOH-la)
pulchellus (pul-KEL-luss)
purpurata (pur-pur-AY-ta)
Pythium (PITH-ee-um)
raditis (ra-DYE-tis)
Rhaphidorhynchus (ra-fid-oh-RIN-kus)
rhinehartii (rine-HART-ee-eye)
rhodosticta (rho-doe-STIK-ta)
rubellum (roo-BELL-um)
sandrangatensis (san-drang-a-TEN-sis)
Sarcochilus (sar-koh-KYE-luss)
Sarracenia (sar-ra-SEEN-ee-a)
sororium (sore-ORE-ee-um)
Spathoglottis (spath-oh-GLOT-tiss)
spectabilis (spek-TAB-ih-liss)
suavis (SWAH-viss)
Sudamerlycaste (soo-da-mer-lye-KAS-tee)
teres (TEH-reez)
therezienii (ter-eez-ee-EN-ee-eye)
Tolumnia (tol-LUM-nee-a)
triquetra (TRY-kweh-tra)
tuberosus (too-ber-OH-sus)
Vanda (VAN-da)
zoosporangium (zoo-oh-spore-ANJ-ee-um)
zoospore (ZOO-oh-spore)

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In addition to vital support through membership dues, the American Orchid Society relies on grants, bequests and other gifts to support its programs. We would like to thank the following donors for gifts received between May 1, 2022 and May 31, 2022.

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AS I WRITE this month's President's Message, we are just closing out our first local orchid show in three years! It was wonderful to see the excitement and energy of our members bringing in display plants, setting up exhibits, arranging plants and hearing the groans of the society display team when a late-arriving specimen cattleya was dropped on their doorstep! And, of course, everyone kept an eye on what the vendors were pulling out of their boxes as they set up their sales areas! We all seemed to fall back into the routine of show set up. Our member with the best handwriting is our "tag" person (and naturally the silver ink pen runs out with only three tags to go). The member with the computer with OPro and OWiz is there to help with hybrid names and parents for registration. And our expert on the ribbon-judging classes is there to help determine if that phalaenopsis really fits in the novelty class. In short, it was "normal," and it was marvelous to feel that way again!

Our show is always on a weekend after our regular society Thursday night meeting, and we use that meeting as our "heavy set-up" night for the show; many of our members are there to help. We bring in pizzas, cookies and sodas and work well into the evening. But at the end of the night, you can really see the bones of all the exhibits taking shape. It is a long night, but very rewarding and fun.

I hope you have been able to resume having shows in your local area. If you have not had one and you have already passed the normal month when you would have had your full show, I would strongly encourage you to consider trying to do something smaller later in the year, maybe just a few tabletop exhibits and a few vendors to build some excitement back for your local group. Malls are usually very open to having small, interesting outside events come in. Our local show is in the rotunda of a local mall. Malls often can provide all the tables and the coverings you would need for a small event, so your cost would be minimal. And if your normal society meeting is late in the week, perhaps use that meeting as a set-up party like we do.

I also recently had the chance to do something orchid related that I had never done before; finding native Texas orchids in the wild. Rather than meeting at a local member's house for our local society's monthly hands-on "Culture Club" meeting, our group took a field trip to visit the Watson Rare Plant Preserve in East Texas. This preserve covers 10 acres (4 ha) of bog and marsh area which was mostly logged about 75 years ago and is now covered in native ferns, pitcher plants (*Sarracenia* species) and a number of terrestrial Texas orchids. The primary orchid blooming when we were there was the grass pink orchid, *Calopogon tuberosus* — and these orchids were blooming by the hundreds along with pitcher plants that were blooming by the thousands! Both the orchids and the pitcher plants like very bright light and were growing with just the barest of shrub cover in nearly full sun. The previously logged area of the preserve with its sparce tree coverage is the perfect habitat for them. As we walked into the unlogged areas of the preserve, the orchids and pitcher plants gave way to ferns, nice in their own way, but not as nice as the orchids!

Brent Arnspiger photographs a colony of *Calopogon tuberosus*. Photograph by Jay Balchan. Inset photograph by Brent Arnspiger is a close-up of a single flower of this beautiful North American species. Flowers are pollinated by large pollen-foraging bees that perceive the long yellow hairs on the lip as pollen-bearing stamens. The lip is hinged and when a bee lands on the lip to collect pollen, the lip folds forward pressing the bee into the flower's anther cap.

What small nature areas are in your backyard? Do they have any native orchids? Can you convince your local society to take a field trip and find out?

As you all know, one of the pillars of the AOS is conservation. Sites such as the Watson Rare Plant Preserve with just 10 acres (16 ha) really drives home the impact of small-scale, "backyard" conservation. We tend to think of conservation on a grand scale such as "saving the rainforest," but in reality, truly effective conservation is made up of the small efforts all around us, where collectively, they have a huge impact.

In this issue you will read about the success of the AOS Centennial Celebration in raising funds for the Conservation Endowment; it is important that we put these funds to good use including potential conservation grant opportunities in your local area. Please see the AOS conservation area on our website for more information (https://aos.org/about-us/orchid-conservation.aspx).

— Jay Balchan, AOS President (email jay@aos.org).

IX International Conference on Orchid Conservation "Soroa 2022"

NEW DATES

THE SOROA BOTANICAL and Orchid Garden and the University of Artemisa IX International Conference on Orchid Conservation "Soroa –2022," has been postponed from February 2022 to NOVEMBER 2022 with exact dates to be determined soon.

This second postponement has become necessary due to damage caused by a recent tropical weather system as well as the COVID–19 pandemic situation in Cuba. Vaccinations are underway in Cuba but February was too soon to safely hold the Conference.

Celebration!

by Nile S. Dusdieker

Reflections on the AOS Centennial Meeting

THE LONG-AWAITED American Orchid Society's Centennial Celebration was held April 6–9, 2022 in Coral Gables, Florida honoring our 100+ anniversary. Donations to support our centennial celebration, Friday's evenings auction and the online auction raised nearly $130,000 to support the AOS's Conservation Endowment.

Our society was organized in April of 1921. This celebration was postponed twice last year due to concerns about the global pandemic. Nevertheless, the current meeting was a great success! Members and friends from the US and around the world reconnected to reflect on the society's past and provide direction for its future, as well as to just have fun discussing our passions for anything orchids!

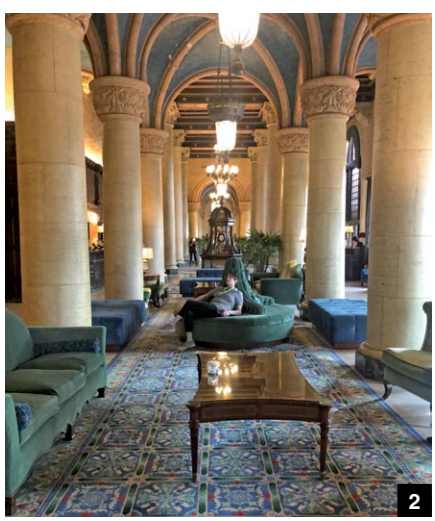
Like many attendees, this was the first time my wife, Lois, and I had been on an airplane in the last two years. Not much had changed: long security lines, same cramped leg room, crunchy tasteless in-flight cookies, and even a few shrieks when the plane was jostled by turbulence. But we made it!

The charming Coral Gables Biltmore was our host hotel. Built in the late Roaring '20s, it was nearing its own centennial with ornate lofted ceilings, grand ballrooms, a piazza with a classic fountain, plus my favorite, the huge outdoor swimming pool. The hotel was nestled in a residential area away from the bustle of Coral Gable's Miracle Mile. The meticulously manicured golf course and 19th Hole Restaurant offered a relaxing atmosphere for conversations. Spathoglottis, epidendrums and phalaenopsis were found adorning the poolside, lobby and grounds.

Getting down to business: Each registrant was presented with a goodie bag containing an orchid seedling from Better-Gro Orchids, a centennial pin and the hot-off-the press Centennial Booklet.

Thursday morning was a time for attending AOS service committees. The Judging Committee reviewed personnel, recommended individual judges for advancement, accepted new students, announced retirements and sadly acknowledged the deaths among our ranks. This committee pulled together ideas and opinions from 27 judging centers all across the country in an effort to promote excellence and consistency in evaluating orchids for awards. An educational judges' forum was held later in the evening that allowed some cordial banter about controversial topics.

1 NILE DUSDIEKER



2 WES NEWTON

Affiliated Societies, Education, Library and Archives and Editorial were some of the other committees that met. Much of the AOS's ongoing business is done through these committees, all on a volunteer basis. Policy changes and recommendations were then forwarded for approval by the governing Board of Trustees at their meeting on Friday morning.

Thursday afternoon offered a trip to Fairchild Tropical Gardens for lunch, browsing the grounds including the AOS library and regional orchid judging sponsored by the Florida Caribbean Judging Center. I enjoyed seeing beautiful orchids that are less commonly seen at our Chicago Judging Center. I believe a dozen awards were given. My wife relaxed watching young debutantes being photographed in the gardens and counting the multicolored lizards that adorned the foyer in front of her bench.

Outgoing AOS President, Robert Fuchs, presided at the Town Hall Members Meeting Friday afternoon. He presented plaques with award photos to the AOS Special Annual Award winners for 2020 as described in the April, 2022 *Orchids*

[1–2] Coral Gables Biltmore Hotel.
[3] Judges from all over the country took part in Thursday's judging event at the Fairchild Tropical Botanical Gardens.
[4] Annual year-end special award winners present for the townhall meeting Friday.
[5] Newly elected officers of the American Orchid Society. Left to right: newly elected trustees Dr. Larry Sexton, Russ Vernon, treasurer Julio Hector, vice-president Alison Gallaway, president Jay Balchan, vice-president Cherly Erins, trustees Jurahame Leyva, Manuel Aybar, immediate past-president Robert Fuchs and trustee Thomas Mirenda.

Magazine issue. Photographers were also recognized as their pictures of the awarded plant were a major component in the selection criteria for the awards. The remainder of the meeting focused on much deserved recognition and appreciation given to the officers, trustees, committee chairs, volunteers and AOS staff for all their hard work on behalf of the organization — various awards were presented to staff and volunteers. The AOS simply could not function without its many volunteers giving of their time, expertise and financial support. The Centennial Celebration Committee chaired by Robert Fuchs with Cheryl Erins, Alex Rodriguez, Chris Morales, Michael Coronado, Bonnie and Will Riley, a myriad of hard-working committee members, regional liaisons (see the Centennial Booklet, April 2022 for a full list) and our hard-working AOS staff: Naya Marcano, Victor Parera, Sandra Kurzban and Ron McHatton deserve a huge special thanks for pulling off this amazing event.

Finally, Robert Fuchs passed the gavel to the incoming AOS President, Jay Balchan and the new officers of the society: Cheryl Erins and Alison Gallaway, Vice Presidents; Theresa Kennedy, Secretary; Julio Hector, Treasurer; and Nancy Mountford, Assistant Treasurer, in addition to new-to-the-Board of Trustees Jurahayme Leyva, Denise Lucero, Tom Mirenda, Larry Sexton and Russell Vernon. Robert Fuchs remains on the Executive Committee as Past President. Jay Balchan presented an ambitious and well-received outline for the future of the AOS to the trustees, including incoming trustees, and some committee chairs.

Saturday featured five educational lectures by well-recognized authorities all dealing with orchid conservation throughout the planet. Thanks to Will Riley for organizing lecturers including Roger Hammer (*Native Orchids of Florida*), Dennis Whighan (*Ecological Principles for Orchid Conservation*), Lawrence Zettler (*Conservation in a Changing World*), Michael Tibbs (*Rwanda Orchid Conservation*) and Tom Mirenda (*Conservation and the* Circa Situm *Strategy*). Between talks, Roger Hammer gave me directions in Everglades National Park where we later found two spring-blooming species, a Grass Pink (*Calopogon*) and Pine Pink (*Bletia*). We saw a few 'gators as well, my wife's favorites!

Now for the FUN! On Friday evening, a live auction raised over $25,000 from the sale of some remarkable items: beautiful paintings, antique memorabilia, specimen orchid plants, and some quirky things only orchid fanatics would love. Manuel Aybar from Dallas paraded auction items throughout the audience to encourage higher bidding.

The grand Centennial Celebration Gala held Saturday evening in the Alhambra Ballroom and balcony was the penultimate event of the entire meeting. Appetizers and cocktail hour on the veranda afforded attendees time to chat with those they may not have seen in the past two years. Professional photographers were present to capture guests casually and to offer a picture with one of the lovely ladies in formal gowns and parasols. I nearly dropped my salmon hors d'oeuvre when the statuesque lady centerpiece at the appetizer table actually moved!


WES NEWTON 3


WES NEWTON 4


WES NEWTON 5


5 WES NEWTON


6 WES NEWTON


7 CAPTIVATING PHOTOGRAPHY


8 CAPTIVATING PHOTOGRAPHY


9 CAPTIVATING PHOTOGRAPHY


10 CAPTIVATING PHOTOGRAPHY


CAPTIVATING PHOTOGRAPHY

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CAPTIVATING PHOTOGRAPHY

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We then entered the ornate ballroom where meticulously set round tables each had a tiered, tall glass centerpiece featuring a large display of pink and white dendrobiums. I understand RF Orchids provided these, which were designed for aesthetic beauty but also to allow cross-table guests to see one another. Each guest setting had a delicate orchid nameplate, AOS champagne glass, and a hand-crafted pewter orchid dish that guests could take home with them. A three-course meal was served by the Biltmore staff. My salad had what appeared to be a small miniature pear; I do not recall that I have ever had a persimmon before, what fun! A modern dance troupe in green costumes presented a spirited program while being chased by what looked like an artistic version of police or military. Then, a colorful DJ Adora offered up disco music for dancing. I was literally swept off my feet to "*Copacabana*." All in all, it was a wonderful conclusion to the celebration of the AOS hundred-year legacy. Let us all hope the AOS mission *"To promote and support the passion for orchids through education, conservation, and research"* will continue on well into the future.

— Nile Dusdieker is a retired physician, accredited American Orchid Society judge and the current chair of the Chicago judging center. He and his wife, Lois, grow around 900 orchids of varied genera in a greenhouse atop their third garage at their North Liberty, Iowa home. Most of the orchids move to an outside pergola for the summer months. Nile enjoys giving presentations on a wide variety of orchid topics and has presented at international meetings (email: niledusdieker@gmail.com).


CAPTIVATING PHOTOGRAPHY

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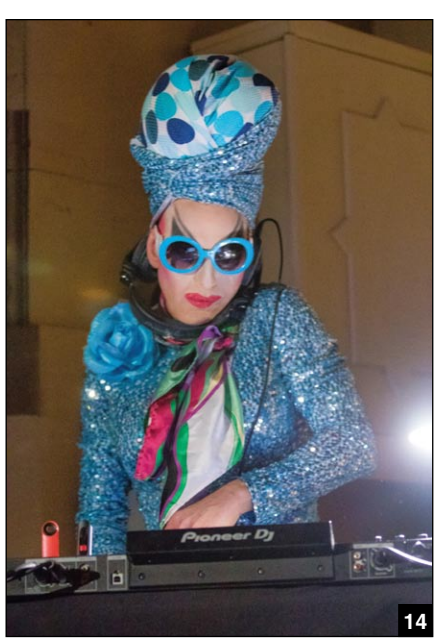

CAPTIVATING PHOTOGRAPHY

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[6] Friday evening's auction benefited conservation.

[7–9] Scenes from the veranda prior to Saturday's gala dinner.

[10] Newly elected AOS President Jay Balchan and his wife Tonya Jacobs.

[11] Robert Fuchs welcoming the attendees of Saturday's gala.

[12] A bird's-eye view of the banquet hall.

[13] Attendees were wowed by a special dance performance, *The Discovery of Orchids*, by Miami's New Century Dance Company.

[14] DJ Adora kept the gala attendees on their feet throughout the evening.

July: The Month of the Empath

By Thomas Mirenda

A BEAUTIFUL WORD, utterly overused in the last few decades to the point where its meaning and importance have been sadly diluted into platitude, it is stronger than "good intentions," hope or even love. Empathy, in its truest sense, allows us to care about and feel what others are experiencing, with the full emotional force of the joy, sadness, anger and even terror they might be going through. Empathy is not an easy thing to do or feel, but it can often make all the difference for friends that are in turmoil, to know that it is shared, and they are not alone.

Thomas Mirenda

Although I am not the biggest fan of social media, I do often post images of my blooming plants, mostly orchids of course, and botanical places I visit regularly. In a recent post, feeling a little down, I mentioned how my flowers sustain me through dark times and heartache. I figured we all have heartache from time to time and that it would be taken as a universal truth. But my friends, especially the local ones, recognized a soul in anguish, and made sure to reach out to keep me from wallowing. It turned out to be one of the most beautiful weeks of my life so far. I am so grateful for the empathy of my orchid friends.

SHARING Although I would never espouse completely dropping our guard, it seems very much like the orchid world is roaring back and much stronger than it was before. We have all been starving for the beauty and fellowship we experience at orchid events. We are certainly all safer outside in the open air and so festivals, celebrations and markets abound this month. Not only is this an opportunity to share your plants with your friends, neighbors and the world, but it is also time to replenish your collection with vigorous new plants to be found practically everywhere. Gift plants to your curious friends whom you have not seen in a couple of years. That is a great way to reestablish friendships with the folks who may have faded from your life during the pandemic.

RELATIONSHIPS Keeping orchids is like having pets. Over time, you develop feelings and relationships with those plants that return your attention and care with the gift of stunningly beautiful flowers, just like you would a loving dog, cat or bird. But of course, caring for a pet is a daily routine and the love between them and us is shared literally every day. Orchids, and plants in general, move in slow motion comparatively but the concept is the same. What you provide for them, in terms of water, food, light, humidity and air movement are loving acts that will be returned to you when your plants bloom in season.

KEEPING YOUR COOL The biggest challenge for growers in the Northern Hemisphere this month is heat stress. Even here in Hawaii we have warmer weather and must feed and water more often. But where excessive heat occurs, frequent this month and next, some adjustments must be made. Many epiphytic orchids are airy, montane plants that are often shaded by a cool canopy of leaves, and therefore never really get terribly hot or completely dry in their natural habitats. Every orchid is different in its needs and adaptability and "sun vandas" in a Jamaican garden can handle full sun and intense heat, while cattleyas and oncidiums might prefer a more dappled light and stronger air movement. Phalaenopsis and pleurothallids with their broader leaves and lack of pseudobulbs are better in lower light conditions and with regular watering. It is your job to build that relationship with your plants so you can understand them and be empathetic with them. Chances are, if the light and weather are uncomfortable for you, it is probably just as stressful for your orchids.

EXPRESSING YOUR LOVE Every successful relationship involves learning, compromise, and fulfillment of each other's needs. That is what love is. Hopefully all plants were repotted or divided in the spring, and now have wonderful new roots and growths. Although it is important to feed plants in active growth, it is also true that when it is too hot, plant metabolism can shut down and that fertilizer may not be readily absorbed. If a plant stays too wet it can lead to fungal issues, so it is always a good idea to group your plants that need similar care together so that cattleyas in well-draining coarse bark needing water two or three times on a hot week are not with phalaenopsis in moss that need far less. Plants on mounts and in baskets may need daily attention so keep similar plants together so you do not overwater some and parch others. Many people cool their plants with a fine mist. This can work well if done sparingly and strategically but overdoing it can lead to mix that never dries out and stomata on plants opening during the day, the exact opposite of what you want. Most orchids are succulent and use the desert adaptation known as Crassulacean acid metabolism to respire at night rather than during the day. Most can handle the daytime heat if dry if they cool off by 10–15 F (5.6–8.3 C) at night. If you are truly empathetic to your plants, cooler growers such as draculas and lycastes might prefer an air-conditioned space, just like YOU do.

BRYON K. RINKE

Anguloa clowesii 'Amsterdam' AM/AOS grown by Douglas Needham. Commonly called "tulip orchids," flowering occurs from the most recently matured, leafless pseudobulb along with the flush of new growth. The contrast of unusual flowers against bright, shiny green foliage makes for a dramatic display. They are close relatives of lycastes and sudamerlycastes.

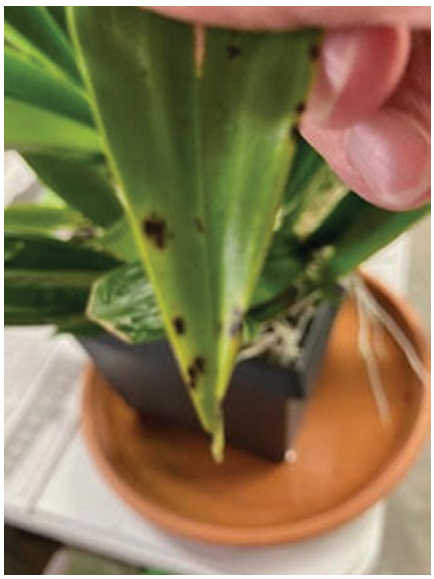
— Tom Mirenda has been working professionally with orchids for over three decades. He is currently an AOS trustee and is a past chair of the AOS Conservation Committee. He is an AOS accredited judge in the Hawaii Center (email: biophiliak@gmail.com).

USEFUL TIP

IT IS DISAPPOINTING when the stem on which a heavy blossom is borne droops so the flower cannot be seen properly. To remedy this problem, cut a piece of plastic tubing the length of the stem holding the flower. A straw works well. Slit the tubing along us length so it can be opened and slipped around the stem. The tubing will straighten the stem and support the blossom for better viewing.

— Barney Hakkala, 3061 Penneni Way, San Diego, CA 92122. (reprinted from the AOS Bulletin *63(7):813. 1994.)*

SPOTTED LEAVES



QUESTION

I know it is not unusual for *Oncidium* Sharry Baby ('Sweet Fragrance' is the clone I have) to get spots on the leaves but this pattern of spots is something I have not seen before, and seems to be affecting the tips of newer leaves. Although there are other leaves that are loaded with spots as well, that diffuse spotting does not seem to be unusual to me. I have seen no insects, scale, etc. but I have had a problem with thrips in the past. The other question I would like your opinion on is about the prolific air roots - I have not had as prolific air roots on other oncidiums and am not sure why they grew like this.

The plant was transplanted just over a year ago into Orchiata bark in a square black container, so I doubt the medium has broken down. However, I am tempted to transplant it into a clear plastic pot because it is too hard to gauge when it needs water, and I like seeing the roots to be able to judge the moisture level. This season it produced seven inflorescences and bloomed for a long time (December), so I presume it has been healthy. Should I just leave well enough alone?

ANSWER

These spots do appear to be different from the typical black flecking to which this hybrid is prone and, based on the yellowish areas around them, I am inclined to think this is a minor fungal issue. Copper-based fungicides and thiomyl will give good control for this sort of thing.

Seven inflorescences on a plant that appears to be in a 4-inch (10 cm) pot is outstanding. Congratulations. Looking at the righthand photograph, I think the plant is overall very well grown. I can understand your preference for translucent pots (I like them as well) but I think what I would do here is leave this alone until it needs to be repotted and then move it into such a pot. I cannot see any accordion pleating of the foliage that would suggest insufficient water so it appears that however you are gauging water needs is working.

QUESTION

One week ago we experienced an excessive amount of rain (13 inches [33 cm]) in a short amount of time. Within a few days of this event, one of the approximately 250 orchids in my collection began to display these disturbing blemishes. Because it was mounted, I did not take it out of the rain for protection during the storm.

The leaves are firm not soft. The blemished areas are depressed as if the cells inside have collapsed. The problem has affected only the original leaves that were on the plant when I bought it four months ago. All of the six new growths with young leaves that have developed since I acquired the plant are normal. These pictures illustrate the front and back of one of the damaged leaves. All my orchids are up-to-date with preventative dithane and thiomyl fungicide spraying.

I wondered if the condition was mesophyll cell collapse but online research indicates that condition is triggered by cold temperature, which was certainly not present in southern Florida this week. Then I wondered if it was edema, but online researched indicates that condition presents with small blisters, not the large disfigured areas that this plant displays.

I would like to learn about this condition and find out if there is something that I should do about it now, and how to prevent it occurring in the future.

ANSWER

I think the key to what you are seeing is the fine black spotting on the backside of the leaves. This is a characteristic of anthracnose infections in cattleyas caused by collectotrichum fungi. In thin-leaved orchids, anthracnose usually begins at the tip of the leaves moving down the leaf with alternating bands of necrotic tissue and sporing bodies in the damaged areas. It turns out that in thicker-leaved orchids, the damage appears completely different ranging from the areas of mesophyll collapse you see here that eventually will blacken to black damaged areas but one defining characteristic is this black spotting on the undersides of the leaves.

Your first step should be to remove all the damaged leaves. This helps to remove the established fungus because killing what is already inside the leaves is much more difficult than preventing new spore germination. Copper fungicides, Daconil, Thiomyl or Heritage fungicide (Azoxy 2SC is the generic) can then be used as a preventative to help control further infection during the wet summer months. Pageant fungicide, although more expensive than the others, also provides good control. There is a good article in the January 2021 *Orchids* (pages 12-14) by Sue Bottom that discusses this disease and its control in cattleyas.

FIGHTING MOTHER NATURE

QUESTION

I have a large specimen of *Oncidium altissimum* tied to my coconut palm. The inflorescences (arrow) are now 8–9 feet (2.44–2.75 m) tall and I want the flowers to hang down, not go up into heaven! Any suggestions? Should I weigh the spikes down into a curve as they are forming?

ANSWER

Oncidium altissimum naturally produces a stiffly upright inflorescence and it will be very hard to train them to cascade.

These questions were part of one or more recent monthly webinar Q&As and compiled by Larry Sexton for inclusion here. Each month, a Q&A webinar is held during the first two weeks of the month. To view recorded Greenhouse Chats (Q&A webinars) or register for a future one, see https://www. aos.org/orchids/webinars.aspx. Send questions to greenhousechat@aos.org — *Ron McHatton, AOS Chief Education and Science Officer.*

To do so, you must start training them as early as possible and tying them to a bent wire is probably the best option. I suspect though, if you can train them to cascade, they will fight it at every opportunity and you will likely need to wire them for their entire length or they will turn back up as soon as they extend beyond the wire they are tied to. To get the effect you are looking for, *Oncidium sphacelatum* and *Oncidium baueri* are probably better options.

Fertilizer Baskets

These little baskets were first introduced to me by Desert Valley Orchid Society (Phoenix) member Karla Velasco who was using them with a timed-release fertlizer. Because I was using a liquid fertilizer at the time, I put it aside for future use. Then I read about a fertilizer called Purely Organic manufactured in South Carolina (purelyorganicfertilizer.com/about/how-to-order). Sue Bottom's article (2017) showed excellent results on struggling orchids. The instructions were to put it into a tea bag and place the tea bag on top of the medium. The fertilizer will slowly release its nutrients as you water. I used the tea bag approach, which worked but looked really ugly sitting in the orchid pot. So, I ordered these little fertilizer baskets (the small size is 0.8 inches [2 cm]) from Amazon, 100 for around $16.50. They were designed for pelletized fertilizers for plants such as bonsai and orchids. So far, they work beautifully. They blend in well with the plant and even fit into my small 2-inch (5.1-cm) pots. For my larger pots, I use two. You would think that the powdered fertilizer would fall through the small holes but if you press it down firmly, it does not leak out. — *Cindy Jepsen (email: cindyjepsen@cox.net).*

References

Bottom, S. 2017. Purely Organic. *Orchids* 87(5):344–349.

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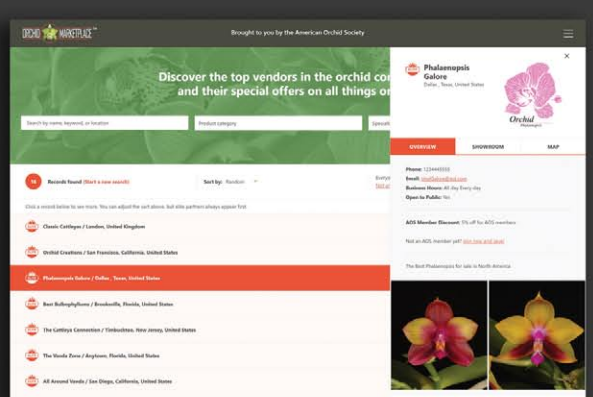

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Orchid Gardens

Text and photographs by Thomas Mirenda

AS A GUY who has worked at and visited some of the world's most cherished botanical gardens, I still count among the most beautiful days I can remember my visits to some outstanding private gardens. This was reinforced by my time in Jamaica with my dear friend Claude Hamilton this past February, when I was treated to the experience of a type of orchid gardening I never really knew existed: vandas as bedding plants. Two gardens in particular, that of Betty Chun of Ocho Rios and Paulette Henry of Negril, absolutely dazzled me with their densely planted, exuberant landscapes.

Thomas Mirenda

The area around one's dwelling place should be a personal retreat of beauty, solitude and soul-renewing respite. In addition, it should be a haven and favorite place to share with your friends. These two generous ladies exemplify the gracious hospitality, not to mention horticultural prowess, of many in the Caribbean. Both gardens are consistently warm, humid and drenched in sun, which explains the vigor of the plants, but the eye for detail and visual perfection and immaculate presentation at every turn rivals the most professional of public garden displays.

Although many native orchids such as broughtonias were incorporated into the mix, the most notable and impressive orchids present were undoubtedly the vanda and dendrobium hybrids. Both ladies apologized and insisted that there should be much more in bloom, but I cannot imagine where another flower might have fit in! The greatest gardeners, it seems, are always humble and modest. In particular, the vandas were simply outrageous. Most of those used are referred to in Jamaica as "sun vandas" which appeared to be hybrids with *Papilionanthe teres* in their background. This species imparts in its progeny the ability to tolerate torrid, sun-drenched conditions and achieve near constant, year-round blooming.

I was so impressed to see marvels I never dreamed of in these luxuriant gardens. I can only imagine the investment in time, treasure, energy and perspiration it must take to maintain such a spectacle.

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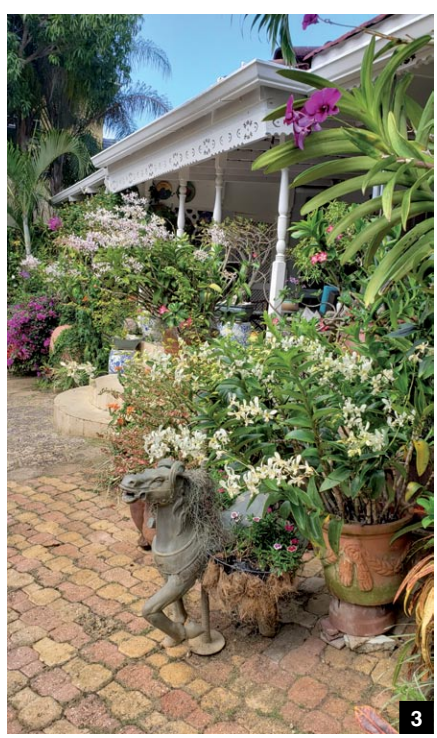

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Whatever it takes, it is well worth it. Thank you, Betty and Paulette, for opening my eyes to the glory that is possible in orchid gardening.

— Tom Mirenda has been working professionally with orchids for over three decades. He is currently an AOS trustee and is a past chair of the AOS Conservation Committee. He is an AOS accredited judge in the Hawaii Center (email: biophiliak@gmail.com).

[1] What joy and pride must it bring Ms. Paulette Henry when visitors arrive at her house to find her surrounded by such glorious vandas!

[2] Similarly, in Ocho Rios, Ms Betty Chun proudly maintains astonishing dense hedges of blooming orchids in her front yard, and indeed completely surrounding her dwelling!

[3] Antelope type dendrobiums become stunning floriferous specimens when given adequate space in elegant ceramic pots and balmy Jamaican conditions.

Aerangis biloba (Lindl.) Schltr.

The “Bilobed” Aerangis

By Judith Rapacz–Hasler

1

BASIONYM

Angraecum bilobum Lindl. *Edwards's Botanical Register* 26(Misc.): 69 (1840)

HOMOTYPIC SYNONYMS

Angorkis biloba (Lindl.) Kuntze, *Revisio Generum Plantarum* 2: 651 (1891), *Rhaphidorhynchus bilobus* (Lindl.) Finet, *Bulletin de la Société Botanique de France* 54(9): 39 (1907)

HETEROTYPIC SYNONYMS

Angraecum apiculatum Hook., *Botanical Magazine* 71: t.4159 (1845), *Angraecum campylo-plectron* Rchb.f., *Bonplandia (Hannover)* 3: 226 (1855), *Angorkis campyloplectron* (Rchb.f.) Kuntze, *Revisio Generum Plantarum* 2: 651 (1891), *Aerangis campyloplectron* (Rchb.f.) Garay, *Botanical Museum Leaflets (Harvard)* 23: 157 (1972)

Many species of *Aerangis* were initially described under the name *Angraecum*. It was in 1865 that H.G. Reichenbach proposed the genus *Aerangis*, separating this species from *Angraecum* based on the long slender rostellum that stretches forward from below the column apex across the stigmatic surface and by the long slender stipe that is located on the upper surface of this rostellum and supports the two pollinia.

The name *Aerangis* is coined from two Greek words, *aer* = air and *angos* = vessel, likely a reference to the nectariferous spur at the base of the lip.

Aerangis biloba, also known as two-lobed *Aerangis*, is a small-growing, hot-to-warm, epiphytic species native to tropical west and central Africa. Plants allocated to this genus are among the most attractive of the white-flowered vandaceous orchids. Their pristine white blooms with long, curving nectaries, or spurs, present a most elegant sight.

The plants are found mostly in tropical forests, woodland and thickets, as well as on cultivated crops such as coffee and cocoa to elevations of 2,300 ft (700 m).

This species can grow into long stems and may display 4–12 obovate, apically unequal curved, dull-green leaves with black spots. It blooms in late summer on one-or-more axillary, 4–16 inch (10–40 cm) long, pendulous or arched raceme bearing up to 20 waxy, gardenia or lily-scented, long-lasting flowers. Because the native habitat of this species is in a tropical climate it requires high humidity. The plants can be grown in a pot with a bark mix or, more desirably, mounted on cork or tree fern in a moderately shaded spot.

Other species commonly found in cultivation include *Aerangis articulata*, *Aerangis citrata*, *Aerangis ellisii*, *Aerangis fastuosa*, *Aerangis luteoalba* and its variety *rhodosticta,* and *Aerangis modesta*.

LOIS CINERT

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[1] *Aerangis biloba grown by Dora Gerhard,* mounted on a cork slab; photograph by the author.

[2] *Aerangis biloba* 'Winterfell' CCM/AOS grown by Orchids Limited in Bloomfield, Minnesota carried 130 flowers and 11 buds. In addition to its CCM, it was also the 2017 winner of the Fred Hillerman Award for the most outstanding angraecoid of the year. Plants of *Aerangis biloba* freely make basal keikis and develop into nice specimen plants over time.

CULTURE Provide plants a bright and warm spot in the greenhouse or windowsill protected from direct sun. The leaves must not heat up in the sunlight! Provide humidity as high as possible and strong air movement is a must.

Temperatures should not fall below 60 F (15 C) for long periods and 86 F (30 C) should not be exceeded. Light and temperature must be balanced; that is, with more light the temperature will rise, with less light it will be lower.

Use tepid water and spray mounted plants daily, occasionally dipping the plant.

During active growth, the plants should be fertilized every two weeks using ¼- to ½-strength balanced fertilizer. Plants need only weak fertilizer during the growing season when new roots and new leaves are produced. A balanced fertilizer, with NPK in equal proportions (20-20-20, 5-5-5…) is recommended. Before fertilizing, the plants should be wet so that the roots are not burned by the fertilizer. Do not fertilize during periods of low light (November–February).

The resting period follows blooming and is the most critical time for successful culture. If the plants are kept too dry, they will desiccate and lose their leaves. If they are sprayed with too much cold water or too frequently, the plants will suffer, lose their leaves and die. Careful management of both the plants and their environment is the key to long-lived plants and the reward of many flowers every year.

Further Reading

DuPuy, D., P. Cribb, J. Bosser, J. Hermans, and C. Hermans. 1999. *The Orchids of Madagascar*. Kew: Royal Botanic Gardens.

Stewart, J. 1986. Stars of the Islands — A New Look at the Genus *Aerangis* in Madagascar and the Comoro Islands. *American Orchid Society Bulletin*. 55:792–802, 903–909, 1008–1015, 1117–1125.

Travaldo's Blog. n.d. *Aerangis biloba* care and culture. https://travaldo.blogspot.com/2017/12/aerangis-biloba-care-and-cluture.html. Accessed September, 2021.

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Summer Rots — The Water Molds

Text by Sue Bottom/Photographs by Terry Bottom

IT IS SUMMER. The days of low humidity are gone, and each day seems hotter and more humid than the last. The water molds (also known as "oomycetes") thrive in this environment. Different organisms in this group of devastating plant pathogens are responsible for the Irish potato famine, sudden oak death syndrome and downy mildew. In orchids, black rot is caused by *Phytophthora* and *Pythium*.

Sue Bottom

As Janna Beckerman of Purdue University wrote in *Greenhouse Management* magazine (Beckerman 2013):

Water molds are quite possibly one of the most destructive groups of plant pathogens. At first glance, they seem very similar to fungi, and they share a lot of traits in common. Both are barely visible, spreading by fine threads called hyphae, and both produce unbelievable numbers of spores. But that is where their likeness ends. Water molds are more like algae than fungi, so the fungicides that control them aren't the same as what you would use for Fusarium wilt or powdery mildews. The key take-home here is that many fungicides that work great on true fungi, like Cleary's 3336 or Systhane, don't work on water molds.

Understanding what these disease-causing organisms are and how they live is essential to managing them and limiting their destructive potential. The website Small Things Considered (Schaechter 2009) provides more detail, but as the Purdue article explains:

All of the water molds have a similar lifecycle: Upon germination from thick-walled oospores, hyphae emerge to directly infect or develop into a zoosporangium, a big word that describes a swollen sac that develops at the end of a hyphal thread and releases tiny, swimming zoospores in the presence of water. These zoospores then swim to and infect plants. The zoosporangium can also germinate and infect plants directly. Upon infection, new hyphae grow into and throughout the plant, absorbing nutrients as a food source and breaking down plant tissues. These water molds then form news zoosporangia or oospores to repeat the cycle.

SYMPTOMS In cattleyas, the infection usually starts on the roots or basal portion of the pseudobulb, though all plant parts are susceptible. The first signs are a cream-colored discoloration that starts at the base of the pseudobulb and moves upward, followed by a dark brown to black, often sharply delineated discoloration. As the infection moves up the pseudobulb, the leaves begin to yellow at the leaf axil moving toward the leaf tip, very different from the yellowing that occurs as a result of normal aging

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[1] Black rot travels quickly through your plant destroying it in a matter of days.

[2] If you see leaf yellowing, it is time to investigate; inspect the plant to find the problem.

[3] See the creamy discoloration (red arrow) on the pseudobulb with the leaf yellowing in picture 2?

that usually begins at the leaf tip. The leaf falls from the plant with a slight jarring. The infection moves quickly along the rhizome from growth to growth. The entire plant can be consumed in a matter of days, so quick action is required.

The aerial portion of the plant can also be affected, particularly during periods of extended leaf wetness during the tropical-storm season. The damage caused by water molds is difficult to distinguish from the damage caused by bacterial organisms such as *Erwinia*. Both types of organisms produce black, water-soaked lesions that spread rapidly, though the odor of the ooze produced by bacterial infections is quite offensive.

The water molds also cause damping off in seedlings and community pots. Small water-soaked spots may start on the seedling, and plant after plant rots and dies.

TREATMENT Unless the plant is valuable, the best approach is to discard it, as the disease is highly contagious and will spread from plant to plant from splashing water. If you cannot part with the plant, isolate it from your other plants, remove infected tissue with a sterile tool, and drench with a suitable fungicide such as Aliette, Subdue or Banrot following label instructions. Act quickly: sanitize the plant immediately upon diagnosis to prevent the disease from spreading.

PREVENTION You may be able to avoid radical surgery if you alter your cultural practices so as to avoid the conditions that favor the growth of the water molds. Prevention requires managing water, in that the motile spores require free water to move around and infect new plant tissue. Some suggestions:

- *Adjust watering practices* Let your plants dry completely throughout the root zone between waterings, sometimes referred to as going to a "hard dry." This means you will be watering less frequently than you did during the low-humidity spring and fall when the pots dry out so quickly. Avoid watering late in the day; better to have everything watered before noon so the leaves can dry by evening. Do not use overhead watering systems, especially for cooling.
- *Avoid repotting* Avoid repotting during the high-humidity summer months. Repot through the spring months, and then wait until the humidity breaks in the fall to do any last-minute repotting. If you have a bifoliate cattleya in need of repotting that is throwing out new roots and you cannot simply drop it into a larger pot, repot it dry. Do not wet the plant or the roots before repotting, dust any cut surfaces with Banrot and then repot it, but do not water for a week or two. Let all the wounds seal over before watering. This will also encourage new root growth.
- *Consider protective drenches* If your plants tend to get black rot every year, you might consider a monthly drench with the active ingredients fosetyl aluminum (trade name Aliette), metalaxyl (trade name Subdue) or etridiazole (trade names Banrot, Terrazole and Truban). To help prevent the disease from getting a foothold, start in June and continue through September.
- *Do not overpot* Whatever mix works for your watering habits, remember that as the mix ages, salts accumulate and organic matter degrades. The mix tends to hold much more water after two or three years than it did when it was fresh. Ideally, your plant will outgrow both the mix and the pot before the time the mix is degraded and starts to hold too much moisture.


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[4] The rot on this plant is fairly advanced, time for radical surgery to remove infected tissue.

[5] The rot moves up the pseudobulb, dissolving the plant tissue. Adjacent healthy growths are next!

[6] It does not just move up the pseudobulb, it is also moving through the rhizome looking for its next target.

- *Monitor during tropical-storm season* Extended periods of leaf wetness can result in bacterial rots on the aerial portions of your plants. Protective sprays with hydrogen peroxide (and the stronger Zerotol) and quaternary ammonium compounds (Consan, Physan, pool algaecide) before and after storms can help protect your plants. Copper is an excellent fungicide and bactericide, but can accumulate to toxic levels in sensitive plants, particularly dendrobiums and thin-leaved orchids, so caution is advised in its use.
- *Provide proper nutrition* Use dilute fertilizer solutions, say ⅛ to ¼ strength, to help the plant grow, without growing too quickly. The form of nitrogen in the fertilizer makes a difference; ammonium and urea nitrogen tend to produce lush, soft growths while nitrogen in the nitrate form tends to form harder growths. Understand your water quality so you can select the right fertilizer, and use calcium and silicon supplements, if needed.

One of the best preventatives against black rot and other diseases is growing plants with strong, hard cell walls that are more impenetrable to pathogenic organisms. This requires you to grow the healthiest and strongest plants you can, with the proper balance of light, water, air and all the other essentials. As you maximize your culture, you will enjoy your plants more, even when not in bloom. When you are watering, really look at your plants. If you notice something is not quite right, stop what you are doing and investigate. Early intervention can prevent you from administering their last rites during the summer rot season.

References

Beckerman, J. 2013. *Minding Water Molds*. https://www.greenhousemag.com/article/gm0213-disease-water-molds-control/. Accessed June 26, 2020.

Schaechter, M. (E.). 2009. *Five Questions About Oomycetes*. https://schaechter.asmblog.org/schaechter/2009/11/fiv-1.html. Accessed September 4, 2020.

— Sue Bottom started growing orchids in Houston in the mid–1990s after her husband Terry built her first greenhouse. They settled into St. Augustine, Florida, Sue with her orchids and Terry with his camera and are active in the St. Augustine Orchid Society, maintaining the Society's website and publishing its monthly newsletter. Sue is also a member of the AOS Editorial Board (email: sbottom15@gmail.com).

JUDGES CORNER

Using Fillable Award Forms

By Jean Allen-Ikeson

STRUGGLING WITH THE concept and implementation? I admit I hated them at first. I am a fan now.

They are easier to read and correct and look more professional than sometimes less-than-perfect handwriting with corrections.

To get started, you need three USB sticks or so that each team has one (or if a single large team, each 'description writer' has one) to prevent a logjam waiting to use a stick to transfer the description to the center printer, or, if at a show, to print from and for your JC chair for uploading into the JC awards program. EVERYONE needs to load the free, 2-minute download of Adobe Acrobat Reader DC—otherwise saving and printing will not work properly.

Write the description directly into your computer (everyone should be bringing a small laptop for OrchidPro anyway!). Read it to the team. Correct. Team captain reads and you correct. Center chair or judging chair at a show corrects. Do a SAVE AS to your computer so that you will always have a clean form. Insert USB stick. Do a SAVE AS to it. Close the file after checking that it has saved to the stick by using File Explorer (file folder icon on your task bar). Remove USB. Insert USB into center computer or computer connected to a printer. Print three copies.

Hint: write descriptions as you judge to avoid a logjam waiting for a stick or to print. If at a show, use clear fishing line tied to the plant and to a paperclip on the award sheet. Sheet stays on the bottom of the display so is not distracting.

— Jean Allen-Ikeson (email: jean.ikeson@gmail.com)

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HOME REMEDIES

— Rather than expensive and potentially dangerous herbicides, spray full–strength vinegar to kill weeds between pavers and on greenhouse floors. (Do not spray on orchids.)

— Aspirin (just ¾ of one 325 mg tablet per gallon of water) helps protect plants from fungal and viral pathogens when used as a spray. More is NOT better. Do not exceed this amount.

— Homemade insecticide (mix in a 1 gallon [3.8 L] jug): 1 pint (0.5 L) rubbing alcohol, 1 pint (0.5 L) 409 spray cleaner, and 3 quarts (2.8 L) water. Apply as a spray.

— Isopropyl (rubbing) alcohol can be put into an empty spray bottle and used to treat scale, mealybugs, thrips, aphids, red spider mites and perhaps other pests. It works only while wet and must contact the insect.

—Neosporin has been reportedly used to treat orchid crown rot; remove rotted area of plant before treatment.

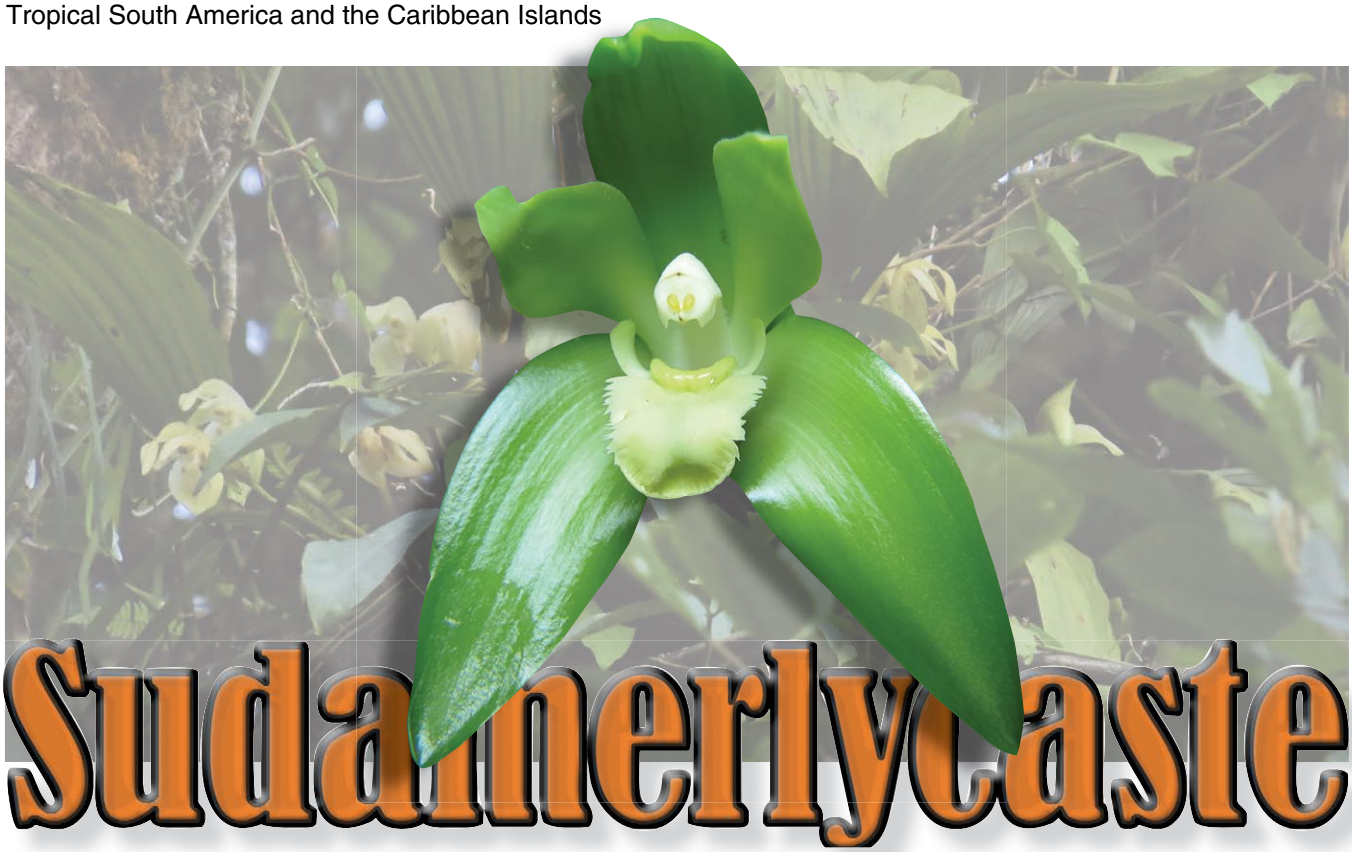
J. Nugent Fitch del. et lith.

B.S. Wi[illegible] & Son Publ[rs].

LYCASTE GIGANTEA.

Sudamerlycaste by Wesley Higgins and Peggy Alrich

Tropical South America and the Caribbean Islands



ETYMOLOGY Named for location of the species, South America and *Lycaste*, an orchid genus.

Forty-two species, two varieties and three natural hybrids; sympodial epiphytes, lithophytes or terrestrials found in wet, low to middle elevation, shady to full sunlight, hill scrub, savannas, lava flows, montane forest margins, along river banks and among cliff faces from Jamaica, Cuba, Hispaniola, Colombia to Bolivia, Venezuela and southeastern Brazil (São Paulo). These plants, which often form tangled clumps with other orchids, have large, spindle-shaped to ovoid pseudobulbs, subtended by brown bracts borne from the tip, each with several, large, broad, pleated, petiolate leaves. The erect, wiry, solitary-flowered inflorescence, borne from the pseudobulb base, has a large, nodding, green, white, orange to yellow, nocturnally fragrant flower with similar sepals. The broad to narrow petals are either wide-spreading or converge, forming a hood over the long, slender, curved, winged column. The prominent trilobed lip has a narrow hypochile, side lobes that rise vertically but do not form a side wall to the hypochile, and the midlobe often has a fringed or entire margin.

Phylogenetic studies by Ryan et al. (2000) show that *Lycaste* sensu Dressler is not monophyletic. *Lycaste* sect. *Fimbriatae* forms a clade sister to *Anguloa*, not with the remainder of *Lycaste* sensu Dressler requiring a new genus name for the section.

Sudamerlycaste has a convoluted nomenclatural history. The genus *Ida* A.Ryan & Oakeley ex Brieger was proposed in Orchideen (Schlechter), ed. 3, 1C (44–45): 2780 (2001) without a Latin description. Fredy Archila proposed the name *Sudamerlycaste* in the obscure, vanity press journal *Revista Guatemalensis*, 5(2): 26 (2002) for *Lycaste* section *Fimbriatae*. However, that publication was not valid (*nom. nud.*). Angela Ryan and Henry Oakeley then published the genus *Ida* based on *Lycaste* section *Fimbriatae* in *Orchid Digest*, 67(1): Jan.–Feb.–Mar. 2003. The name *Sudamerlycaste* was validated by Archila in *Revista Guatemal.*, 5(3): 77 (2003). *Sudamerlycaste* was treated as *Ida* by Pridgeon et al. (2009) because, at that time, it was thought that *Sudamerlycaste* was invalid. *Sudamerlycaste* is the currently accepted name for this clade (Chase et al. 2015). Although some taxonomists still question the validity of *Sudamerlycaste*.

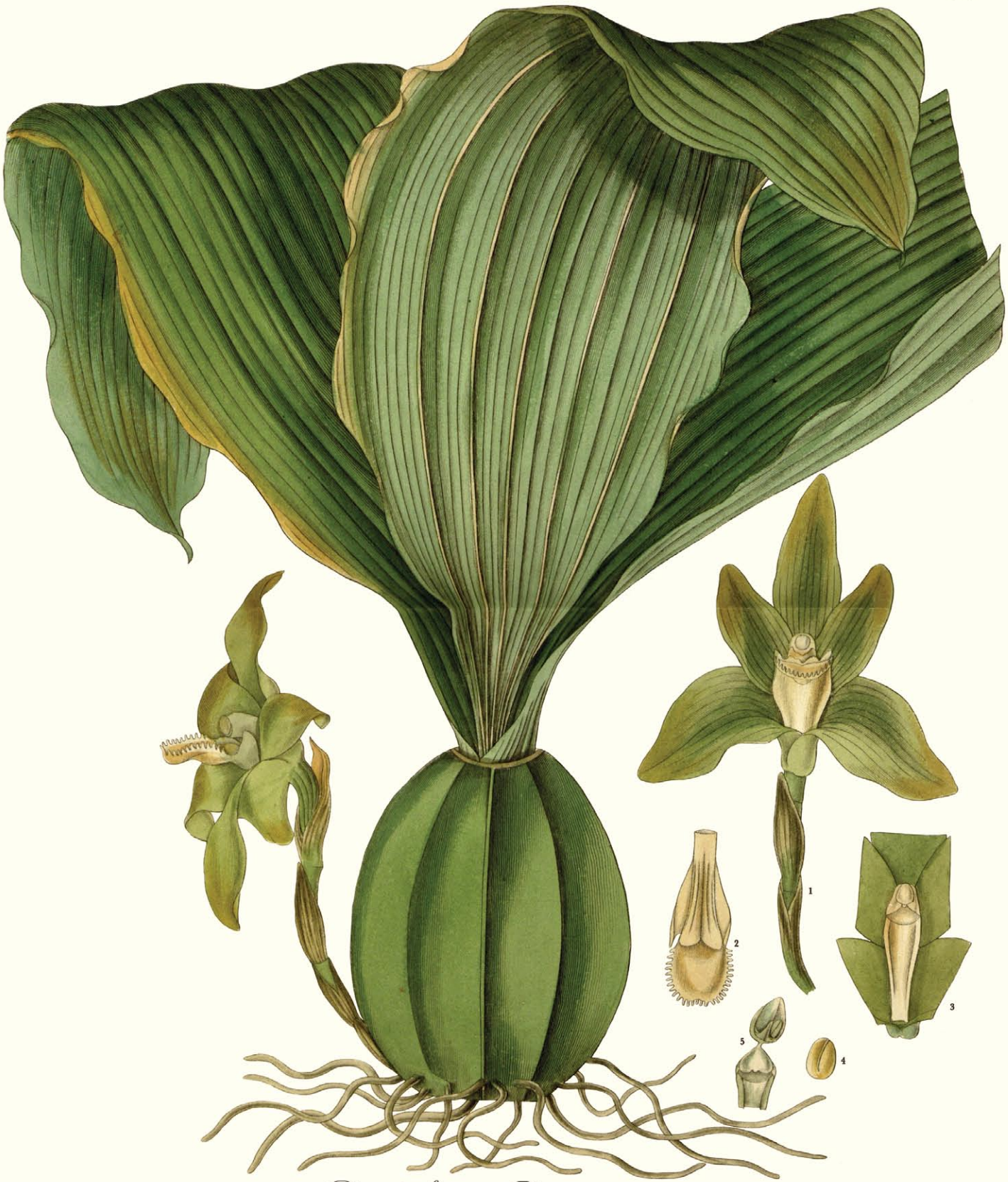
CULTURE **Temperature**: Nights of 60 F (15.6 C) and days of 75–80 F (23.9–26.7 C). Most species will tolerate summer heat with good air movement. **Light**: 1,500–2,000 footcandles or 60–80 percent shade. **Fertilize**: regularly and heavily when plants are actively growing. A higher nitrogen formulation (such as 30-10-10) can be used during active growth. **Watering**: During the period of growth these species need abundant and regular watering. **Humidity**: Should be maintained at 40–70 percent RH. Brisk air circulation will help prevent damage to leaves by leafspot. **Potting**: Best when new growth starts, usually in spring. A fine-grade potting medium is often used; fir bark and perlite (3:1) is a common, fast-draining mix.

References

Chase, M.W., K.M. Cameron, J.V. Freudenstein, A.M. Pridgeon, G. Salazar, C. van den Berg, and A. Schuiteman 2015. An Updated Classification of Orchidaceae. *Botanical Journal of the Linnean Society* 177:151–174.

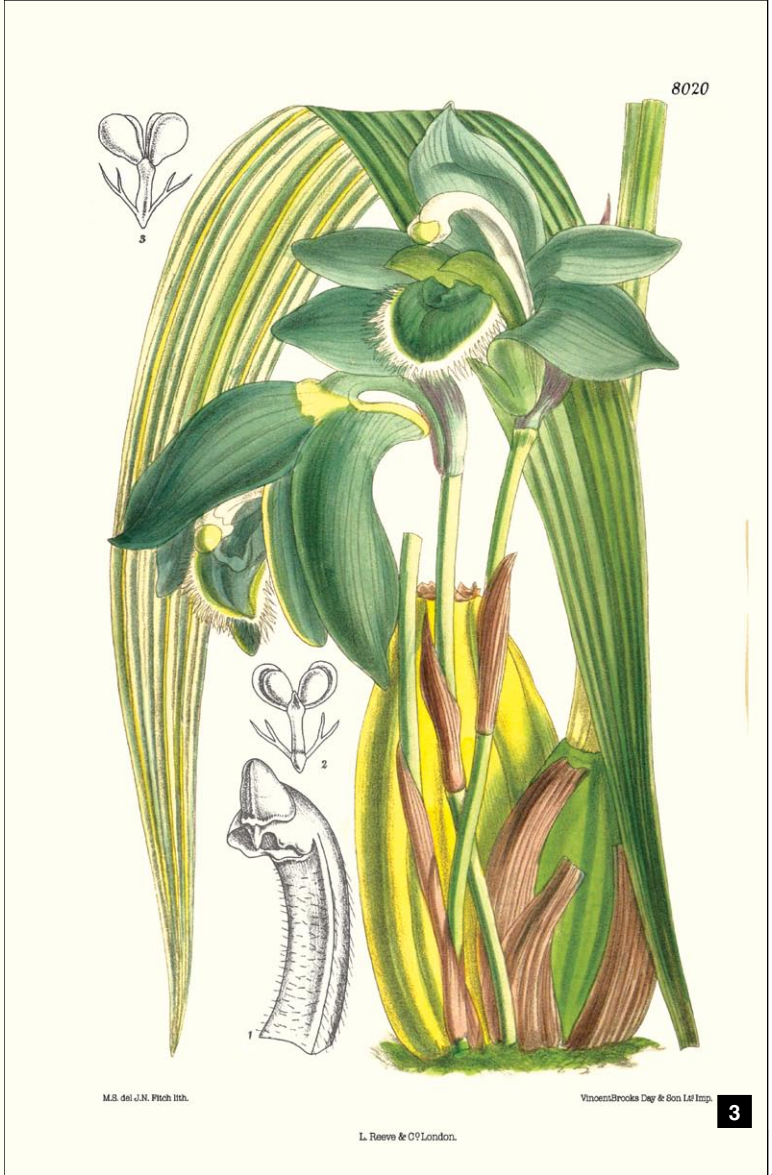
Pridgeon A.M., P.J. Cribb, M.W. Chase, and F.N. Rasmussen. 2009. *Genera Orchidacearum*, Vol. 5. Oxford: Oxford University Press.

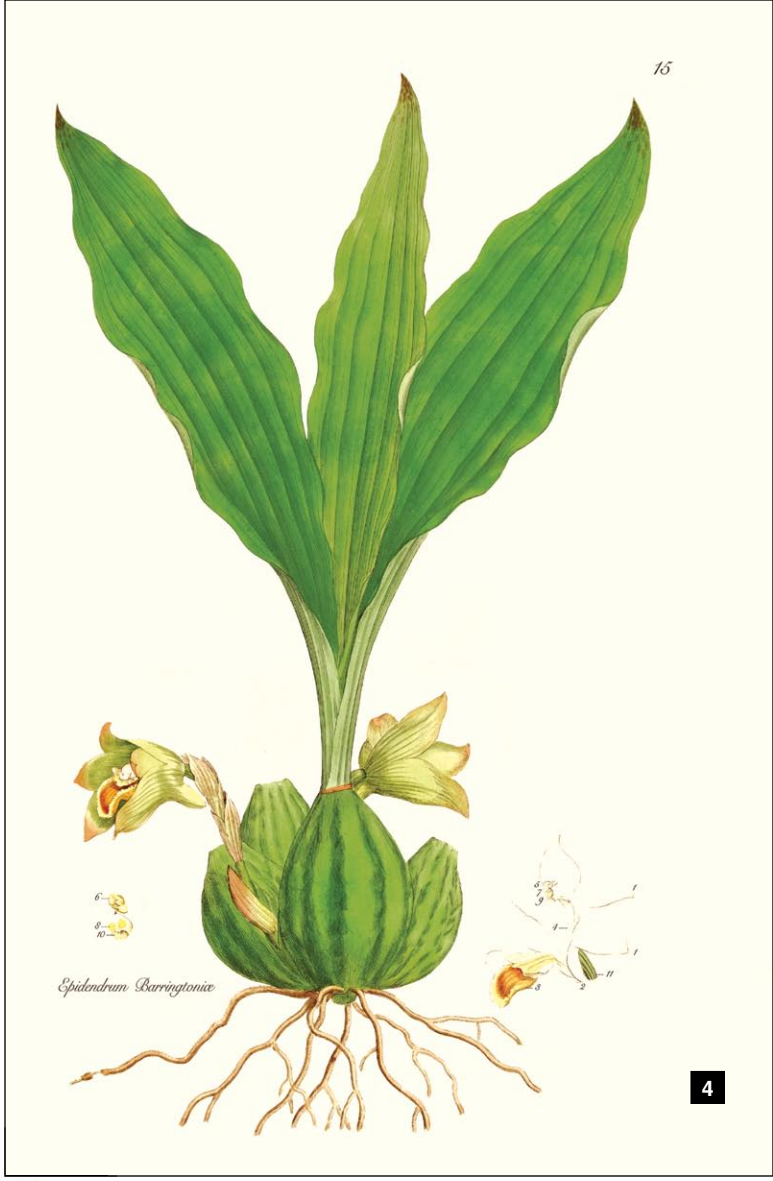
Ryan, A., W.M. Whitten, M.A.T. Johnson, and M.W. Chase. 2000. A Phylogenetic Assessment of *Lycaste* and *Anguloa* (Orchidaceae: Maxillarieae). *Lindleyana* 15(1):33–45.



Dendrobium Barringtonie

J. Swan Sculpt. Ratisbon.





Sudamerlycaste

ANTIQUE PLATES

[1] *Sudamerlycaste gigantea* as *Lycaste gigantea*, *Orchid Album*, 9: t.408 (1891).

[2] *Sudamerlycaste barringtoniae* as *Dendrobium barringtoniae*, *Exotic Flora*, 2: t.119 (1825).

[3] *Sudamerlycaste locusta* as *Lycaste locusta*, *Botanical Magazine*, 131: t.8020 (1905).

[4] *Sudamerlycaste barringtoniae* as *Epidendrum barringtoniae, Icones Pictae Plantarum Rariorum*, t.15 (1790).

[5] *Sudamerlycaste costata* and *Lycaste costata*, 18: t.620 (1869).

From Costume to Clay: Part 2

The journey continues

CAROL HELEN BEULE/PHOTOGRAPHS BY THE AUTHOR UNLESS CREDITED OTHERWISE

ONCE RETIRED AND settled into a new life, I started to create pots to highlight my specific *Vanda falcata* specimens. First thing I learned was to paint decorative Asian motifs on pots that were hand made. Presently, I have at least 6 feet (1.8 m) of research books on Asian pottery, artifacts and motifs and have visited every museum I could find in my yearly trips to Japan. These first clay "bodies" took upwards of two weeks to individually make as there was no wheel or throwing mechanism at my disposal. I was teaching myself as I went, with whatever pottery and clay books available to me.

My pots are what is termed "hand built." It begins with chunks of semisoft clay fashioned into a shape, or slabs of clay rolled flat, cut to size and attached to each other. My kitchen table, some plastic bags, kitchen knives, old dissecting tools from college and a rolling pin were the original tools. Once that was mastered, I realized it would be best to make plaster molds of the pots in the manner of those I began with. Those early orchid pots for phalaenopsis and cattleyas had been made from leather-hard clay bodies, using poured clay slip that had come out of a mold and were more easily reproduced. So instead of two weeks to make a clay body, it could be two days for the process to pour one and a two-month wait to have a mold made. And often, the original pot that was molded was destroyed in the process by cracking or breaking. The cost of a mold was $350 to $600. Of course, I now needed to learn to pour and produce from a mold, which I had never done before.

The next experiment was cutting into the wet clay as had been done in earlier pots, but this time in the style of Japanese cut-work pots. I used utility knife blades, as well as other tools that I began to collect and buy. However, some of the most valuable tools turned out to be several dissecting instruments from my freshman year in college, and I still use them! It was here that I learned the importance of making a pattern of what was planned. I realized the necessity to design a pot on paper before proceeding to the actual clay item. Flat patterns, as much as they can be made for pots that are circular or hexagonal, are now made for any design necessary, both for cut-work pots and overall painted designs. Most pots require both thoughtful design and planning. It is why I often tell clients: "I need time to think about what you want."

This was followed by my attempt to replicate an antique pot, first seen in 2014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[1] A pot made to mirror the shape of the leaves of the plant. *Vanda falcata* 'Jukai'.

[2] An early example of figuring out how to create graphic designs on an object that goes from large to small. Plant and photo by Scott Laskowski. *Vanda falcata* 'Suruga Fukirin'

[3] My first commission, by Don Brown of Santa Barbara.

[4] A custom made duplicate of the 1st leaf patterned, open work pot. Plant and photo by Kiyoshige Negi. *Vanda falcata* 'Jyunihitoe'


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at the Tokyo Dome Show. Experiments in carving and applying raised decoration on a pot body soon followed. The dragon pot I made took at least three weeks of putting it back into a plastic bag every night after working, making sure to always spray it with water to keep the clay uniformly wet as I was working nightly. If clay is not kept uniformly damp during this process, anything applied will simply fall off as the pot dries or is fired. I also learned the need to make any relief far more dramatic because it was soon filled by both coloring agents made of slip and then glaze. A great deal of definition was lost with the addition of coloring agents.

I moved on to further experiments that often failed and no one ever saw, and those that were successful that I tried to perfect. Some of them are illustrated here.

Looking back on my life, being a costume designer might have been one of the best decisions I ever made, instead of the scientific or medical direction I took at first. Not that it was exactly planned, but I now know I am easily bored with doing things over again, because a costume designer rarely duplicates anything. No actor or actress is ever the same, even if you think the costumes need to be identical or if you have costumed them in years past. I found that out when I designed and made the costumes for the Rockettes for a L'Eggs pantyhose commercial. For fifty lovely ladies that are definitely not the same shape or size, each costume needed adjustments to make every figure look its best.

I have done exactly the same with pots. No pot is ever the same as the one before, even if I try to make it so. Things always change. My next thought was to try and teach myself how to paint realistic pictures in "englobes," the technical term for clay slip containing chemical agents that give color to clay when fired. That was when I was asked to make a pot

[5] The traditional "hemp" pattern on paper as planned.
[6] An antique pot seen at the Tokyo Dome Show in 2014.
[7] An attempt to reproduce a similar pot to the one at the Tokyo Dome Show. *Vanda falcata* 'Taiga'
[8] Carving a fantail gold fish and then gold leafing it.
[9] Painting with diluted "englobe" pigments is hard to control. *Vanda falcata* 'Akibana'
[10] Relief carving of a dragon pot. The raw clay pot in this picture still needed more definition to better define the dragon.


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[11] Early “blue flow” type pottery looked similar to this.

[12] Painted images using “China Paints”. A totally different type of image painting allowing for many layers of colors and pigments.

[13] An experiment with unglazed backgrounds using glazed relief surface detail. No shading possible using this method.

[14] A one and only attempt at using melted wax to seal the surface of a pot. It was not successful at first, but as the years have passed the pot has settled into a beautiful surface texture. Not matte or shiny, but sealed and lustrous. The pot is now 10 years old.

[15] Result of a request to put a hummingbird on a pot sized for a fuukiran. Photograph and plant by Hiroshige Matsuoka of *V. falcata* ‘Kincho’.

[16] The original hummingbird pot. Photograph by Randall Robinson.

[17] This very large Asian-cymbidium-pot was made for Scott Barrie’s mother as a gift.

[18] A pot commissioned after visiting the JFS several times. Plant and photograph by Junishi Kishi. *Vanda falcata* ’Juko’.


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reminiscent of a Pennsylvania hometown backyard with orange trumpet flowers and hummingbirds. It was soon followed by making a large Asian-cymbidium-style pot that eventually held any type of orchid for the mother of a nursery owner. The theme was to be the Asian symbolism of longevity of life and a good marriage. It was a thank-you gift for a cherished mother who selected the colors to use. I chose a pine tree and two cranes as the images to use. Research into classical Asian iconography has always been integral to what I have done. I have not always gotten it right, but I try.

Because of my trips to Japan, I realized that the classical shapes of pots that were normally for sale in the United States were limiting for the presentation of plants. What was used for display in Japan were often pots made for small bonsai or specifically by personal pot makers to the Imperial Family or individual wealthy individuals. Centuries ago, many had their own personal pot maker and ideas, and personal quirks were introduced into pot making as a result. So, I added more new shapes and more new molds to those I could make. Many of the pots that are shown in this article have been what I term "custom" work. They are based on a grower's plant or an idea that a client has for a pot, and I have tried to make their ideas come to life. But I also make what I like and learn from it and the mistakes I make along the way. Some of those pots are pictured as well.

As I have become more accomplished, I have had the honor to be asked by several younger Japanese growers to make pots to their specifications. Not only has my friend Kiyoshige Negi asked me to make pots for his specific plants, but also as gifts for others. Most of the Japanese clay used for pots is very porous with a high percentage of sand and the older generation likes pots with this type of clay. It is easily breakable and not always sturdy. In addition, it is hard to ship around the world and not break. I am forced to use what is available to me here in the United States and therefore use other types of clay. Were I in Japan, I would source their particular clays. After all, "clay" is mud dug from the earth or made of finely ground natural local soil material or minerals.

I use classic earthenware solid clays, in white and red-brown. I also use stoneware, earthenware and raku slips. Most recently, thanks to a friend from mainland China, I have gotten blocks of Zisha clay directly from China


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[19] Quite tall and large, a new and highly flared hexagonal pot for display. Plant and photograph by Duane McDowell of 'Honghyeon' (of hybrid origin).

[20–21] A woodblock print of a Samurai warrior out of a fictional story [20] and the pot that was inspired by his clothes. *Vanda falcata* 'Karanishiki' pictured in [21].

[22] Commissioned as a Christmas present for a woman who loves "blue lobelias". Pictured is *V. falcata* 'Mangetsu'. Plant owned and grown by Mariko Kojima.

[23] This plant won a special excellence award at the JFS on May 20, 2022. Photograph and plant of *V. falcata* 'Seikai' by Kiyoshige Negi.

that holds it shape extremely well when carved. It is also known as Yixing purple sand clay. This has allowed me to start to carve detailed shapes that are more intricate and delicate. This clay is fired much hotter and is glass hard. I am in the process of experimenting with the temperatures at which to fire specific clays, and learning the various properties of each of the Chinese-sourced clays I have obtained. This clay is normally used to make the famous Chinese teapots, but both temperature and clay type changes the colors of the final product. I am also trying to learn their techniques. Each Chinese region has a different recipe for their specific clay, always based on the chemical components of the local rocks. It is extremely finely ground.

The next place to which I will turn, is to fully acknowledge Japanese pot makers historical tools. Their use of pointillism to fill spaces and move the eye around a designed surface, and their use of squeezed applications is challenging. I also want to use the new glazes that are being commercially developed in the United States for hobbyists and schools to use at higher temperatures. There is still much to learn.

— Carol Helen Beule is an award-winning costume designer who retired after a 45+ year career and moved on to making pots for Vanda falcata*, Asian cymbidiums and other small plants. She both makes what she likes and takes on commissions. She travels to Japan whenever possible to do more research and learn about what they call their Fukiran, our* V. falcata*, and is a fully accredited AOS judge in the Pacific South region. All pottery is handmade, not on a wheel but in a process known as "hand built" or by molds (website: firsthousefurnishings.com; email: cbeule@sbcglobal.net).*

[24] New Chinese sourced clay of a dragon pot that is one of a kind. Plant and photograph by Phyllis Prestia of *V. falcata* ' Shunkyuden'.

[25] ZIsha clay from China shows the differences in types of clay to be found, and how temperature affects the final product. Photograph by Wendy Fisher.

[26] Things to learn better … Pointillism and fine gold tracery.

[27] The art of filling in an area using a squeeze applicator.

[28] Painting in washes and shadings.

[29] Carving images and perfecting the celadon finish.

An Expedition, Digging Through the AOS Digital Archives

A Lifetime of Orchid Advertising — From Print Publications to Digital Access

Winner of the 2021 Dillon-Peterson Essay Contest

BY EILEEN HECTOR

BOOKSHELVES MIGHT BE obsolete in the years to come but for now mine are stocked full. Let me tell you why. About 10 years ago, before my husband made the commitment to join the student judging program of the American Orchid Society, I had a few empty bookshelves in my house. Once his studies were underway those few empty shelves were soon overpopulated with orchid reference books, magazines, and American Orchid Society Bulletins gathered from the beginning of time.

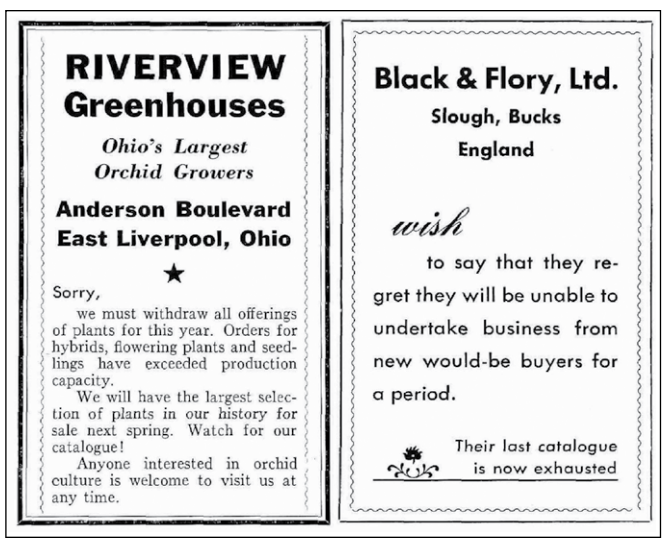
As he wrote his papers and prepared his presentations for the judging center, I carefully avoided tripping over the printed material he selected to complete his assignments. There were other times I deliberately flipped through the invaders occupying my now-crowded shelving. Issue after issue, I wondered what happened to the orchid collectors, growers, sprawling orchid ranges, and suppliers of orchid-related products from decades ago. How many of them that advertised in those yellowing *American Orchid Society Bulletin* issues (taking up space on my shelves) still existed in today's marketplace?

Almost half a century ago, back in high school, I was on the newspaper staff. We did weekly layout and paste-up for our little publication down at a local newspaper that so graciously allowed students into their professional offices. Furthermore, in days gone by, I assisted in the labor-intensive layout and preparation of print and display advertising for a well-known department store that ceased operations in 1983. It all looked so familiar. I understood how much work went into getting everything ready for printing. That background is what piqued my curiosity in viewing the historical record of orchid advertising in the *AOS Bulletin*.

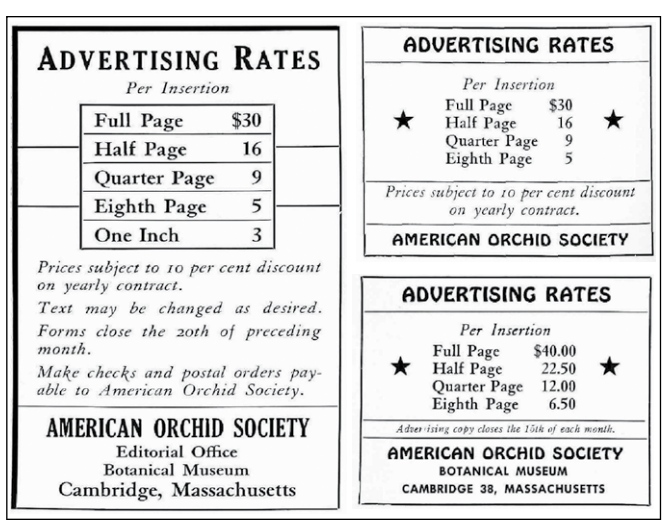
I was keen to explore the appearance of orchid-related advertisements from the early days. I was fascinated by the many growers that were represented and pondered whether any of them were left today. Did they still exist or was there a big box store, a housing development, or a parking lot where orchids once grew? I challenged myself to see if I could find the answers to those questions.

From 1932–1939, *The American Orchid Society Bulletin* was a 6-inch × 9-inch (15 cm × 23 cm) compact-sized quarterly publication. It was not only full of information about growing orchids, but also full of offers for the latest and greatest orchid hybrids or species. Many orchids back then were wild-collected. Most ads invited correspondence or had instructions to send a self-addressed stamped envelope to receive a current list of orchids for sale or to receive the latest catalog.

It was a time when addressing an envelope with only the company name, city, and state or country got your mail delivered to its intended destination. The addresses in the early advertising are oversimplified compared to today's United States Postal Service requirements: complete street numbers, suite numbers, cities, two letter abbreviated state codes, and an extended zip code, plus four. You must marvel at how efficient early mail delivery may have been. Perhaps by the time the orchid seller's catalog reached the inquirer, the inventory on hand had drastically changed or, heaven forbid, was no longer available.



Nowhere in the earliest editions of the *AOS Bulletin* is the cost of advertising mentioned. In 1941, the *Bulletin* transitioned to a monthly publication, and the cost of advertising was included in the advertising section. A small ad inserted into the back



Advertising Rates Published in the *American Orchid Society Bulletin*. Above left: 1940; top right: 1941; bottom right: 1946.

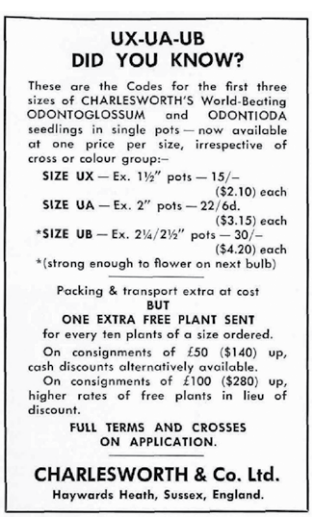
pages of the *AOS Bulletin*, recommended that readers patronize advertisers. By 1946, an advertising cost increase was merited. Today a full-page ad can cost upwards of $1,224 depending on placement in the publication (https://www.aos.org/AOS/Media/AOS-Docs/Orchids-Media-Kit-2022-LR.pdf).

Early ad content was mostly standard-font, blocky text, which displayed contact information and orchid nomenclature (some outdated by today's standards) with a line drawing inserted to complete the ad. Later black and white photos were inserted into the ads and fancy fonts and borders called out for the reader's attention.

Some businesses survived the test of time by reinventing themselves, expanding services or relocating their business. Lord and Burnham Greenhouses — Current location Madison, Ohio for example (https://lordandburnham.com/lord_burnham.html).

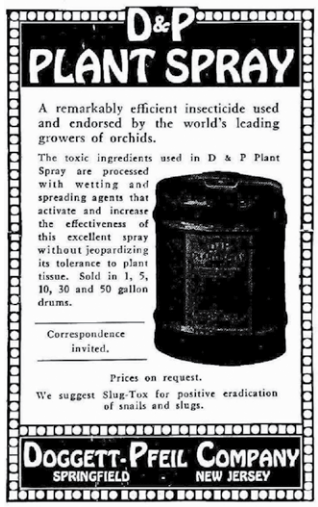
As the AOS became more well known and recognized, more companies became interested in advertising. Soon the *Bulletin* was bursting with ads. Many of the advertising inserts came from businesses in the northeast, the west coast of the United States, and from our Pacific Ocean state, Hawaii. Ads were also placed by growers from far flung places such as Thailand, India, Africa, and Brazil. Others came from popular places in Europe such as France, Belgium, and England. Orchid collectors (exporters and brokers) traveling through South and Central America placed their ads to entice purchases from the increasing number of elite orchid buyers. In the early days of the AOS, orchid growing was not yet as popular or as accessible as it is today.

Well-known names in the orchid industry, the likes of Armacost and Royston, Inc., Vacherot-Lecoufle, J & A McBean, Stuart Low Co.'s, Sanders, Westonbirt, and Charlesworth's were featured prominently in the ad section of the *AOS Bulletin*. Ads for greenhouse structures, shade systems, potting supplies, and pest control appeared in every issue, much like the advertising we see in our modern publication, *Orchids*. However, pest control offerings touting toxic ingredients are a far cry from the trend towards organic or natural pest control and fertilizers applied in modern cultivation.



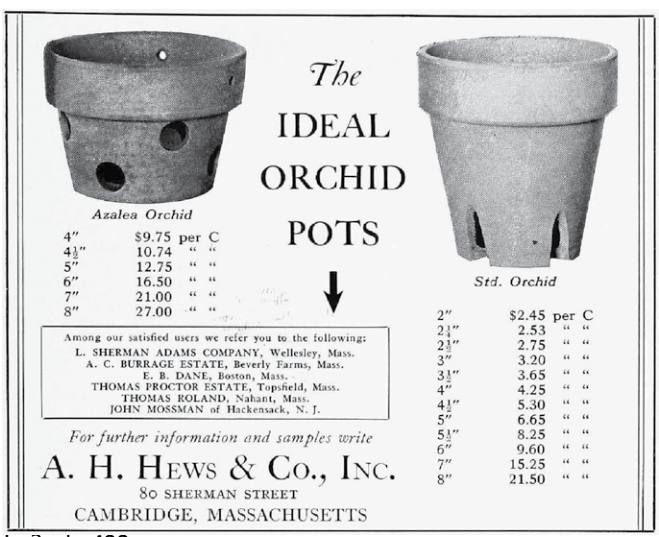
I was compelled to dig around and see what remained of some of these advertisers. It was a competitive market. Pulling a random selection of *AOS Bulletins* from the digital archives, I set out to see what I could learn by using internet search tools to research an advertiser's address or company name. As I dug around, I discovered the glory days of yore have seemingly passed. More than a few orchid related businesses have gone by the wayside. There were also surprises to find some still exist, albeit in another form.

The pesticide dealers illustrated here are still in operation but



Both these companies still exist in some form but no longer sell toxic chemical applications.

now sell among other products, organic fertilizer.
Doggett-Pfeil Company, from Springfield NJ to Delray Beach, FL.
About – Plant Life (plantlifeco.com)
Dramm Company, still in Manitowoc, WI. DRAMM - Drammatic Organic Fertilizer (https://www.dramm.com/html/main.isx?sub=422



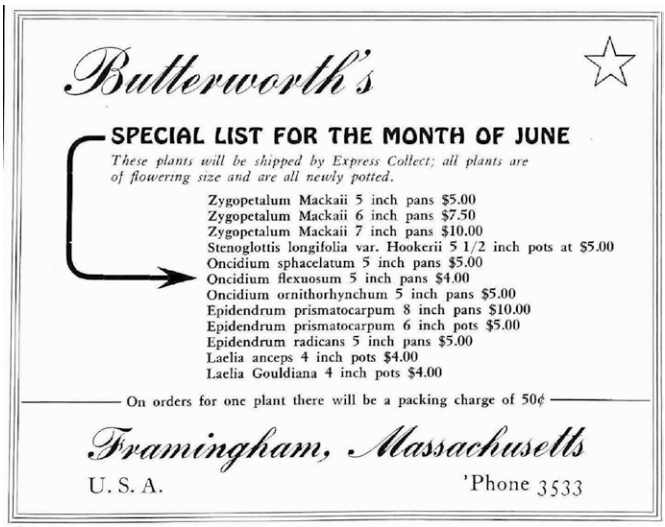
This clay pot vendor was sold off to another entity that made, of all things, plastic flowerpots. Check out the pricing from the 1940 ad. That price line was per 100 pots. Delve into the history of A.H. Hews and Company/Lockwood Products, Inc at https://colonialnorthamerica.library.harvard.edu/spotlight/cna/catalog/99014648634020394l

"The records of A. H. Hews and Company and its successor company, Lockwood Products, Inc. cover the period of its beginning in the 18th century until the mid-1990s. The records in this collection document early examples of products manufactured — Hews invented the stacking flowerpot in 1888 — and sold by a company which remained in the same family for four generations." (https://hollisarchives.lib.harvard.edu/repositories/11/resources/7361)

The property belonging to AOS historical figures, George and J.T. Butterworth, was sold to St. Stephen's Church. The greenhouses were razed in the 1960s. The church still exists at this address. (http://biographies.framinghamhistory.org/1-bio-template/)

The AOS Special Annual Award — Butterworth Prize

From the AOS website: "This prestigious honor, the first of the AOS's permanently endowed awards, was established in 1966. It is



Butterworth's

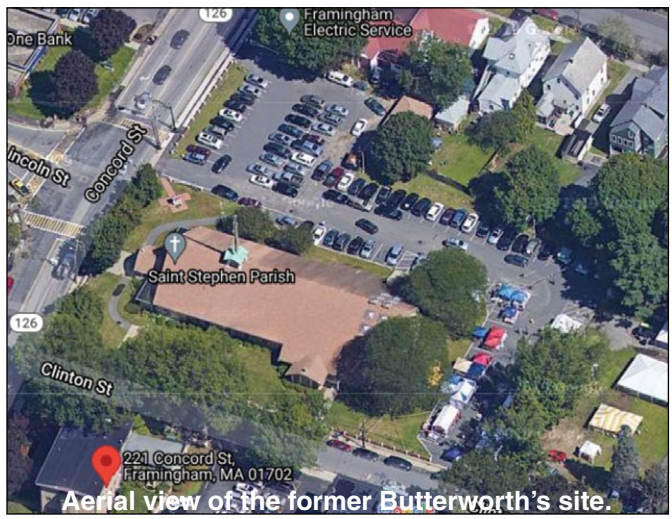
SPECIAL LIST FOR THE MONTH OF JUNE

These plants will be shipped by Express Collect; all plants are of flowering size and are all newly potted.

Zygopetalum Mackaii 5 inch pans $5.00
Zygopetalum Mackaii 6 inch pans $7.50
Zygopetalum Mackaii 7 inch pans $10.00
Stenoglottis longifolia var. Hookerii 5 1/2 inch pots at $5.00
Oncidium sphacelatum 5 inch pans $5.00
Oncidium flexuosum 5 inch pans $4.00
Oncidium ornithorhynchum 5 inch pans $5.00
Epidendrum prismatocarpum 8 inch pans $10.00
Epidendrum prismatocarpum 6 inch pots $5.00
Epidendrum radicans 5 inch pans $5.00
Laelia anceps 4 inch pots $4.00
Laelia Gouldiana 4 inch pots $4.00

On orders for one plant there will be a packing charge of 50¢

Framingham, Massachusetts
U. S. A. 'Phone 3533



Aerial view of the former Butterworth's site.

granted annually by the trustees of the Society to the grower of the plant exhibiting the finest orchid culture and awarded a Certificate of Cultural Merit or a Certificate of Cultural Excellence the preceding calendar year. The endowment for this award was established by Mrs. Rachel Butterworth Dietz in memory of her parents (John and Nancy Butterworth) and of George Butterworth Sr., president of the AOS from 1953 to 1956." (https://www.aos.org/orchid-awards-judging/aos-awards.aspx)

By Popular Request
DIVISIONS OF THE LOVELY GREEN
PLOVER 'FUCHSIA'

Plover 'Fuchsia' (Lowio-grandiflorum × Paswehlii) possesses many desirable traits which endear it to the hearts of beginners, hobbyists, and connoisseurs, the world over.

PLOVER 'FUCHSIA' IS OUTSTANDING

For Striking Color Contrast — Regarded by many hobbyists and connoisseurs as one of the most attractively colored Cymbidiums in existence. The clear lime-green of the petals and sepals is handsomely emphasized by the bold, solid red contrast of the lip.

For Floriferousness — One of the most productive Cymbidium hybrids known, it is customary for one or two flowering spikes to originate from each pseudobulb. Each spike bears from 15 to 30 gay blooms.

For Vigorous Growth Habit — An easy growing cultivar ideally suited for the novice or hobbyist, as well as for specimen plant or landscaping purposes. A rapid grower, numerous divisions may be made within a short time.

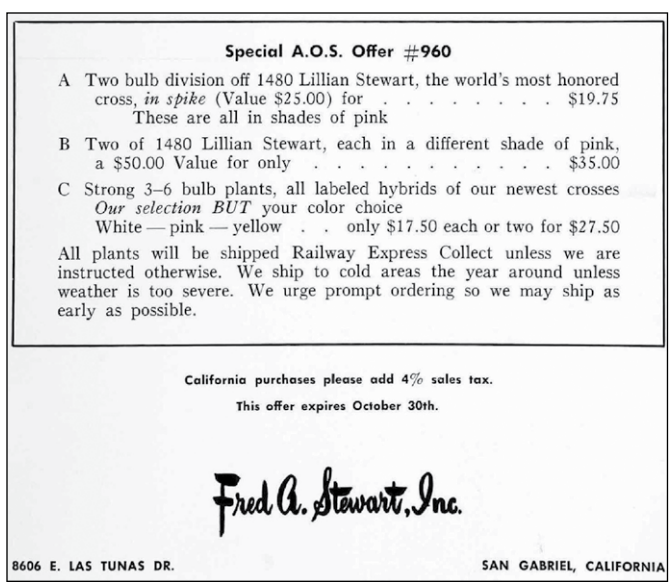
6"-7"-8" pot sizes @ $10 & $15;
12"-14" tubs @ $25 & $35

dos pueblos Orchid Company

P.O. Box 158 Goleta, California
Samuel B. Mosher, Owner & General Manager

728 AMERICAN ORCHID SOCIETY

Searching a sample of California Growers — Dos Pueblos Orchid Company still shows a California location, though with a very different use from the one advertised in the 1960 *AOS Bulletin*. It is now a wedding and event venue. (https://www.dospueblosorchidfarm.com/about-1)



Special A.O.S. Offer #960

A Two bulb division off 1480 Lillian Stewart, the world's most honored cross, *in spike* (Value $25.00) for $19.75
These are all in shades of pink

B Two of 1480 Lillian Stewart, each in a different shade of pink, a $50.00 Value for only $35.00

C Strong 3–6 bulb plants, all labeled hybrids of our newest crosses *Our selection BUT* your color choice
White — pink — yellow . . only $17.50 each or two for $27.50

All plants will be shipped Railway Express Collect unless we are instructed otherwise. We ship to cold areas the year around unless weather is too severe. We urge prompt ordering so we may ship as early as possible.

California purchases please add 4% sales tax.

This offer expires October 30th.

Fred A. Stewart, Inc.

8606 E. LAS TUNAS DR. SAN GABRIEL, CALIFORNIA

Fred Stewart Orchids property, formerly of San Gabriel, California is an Airstream dealership.

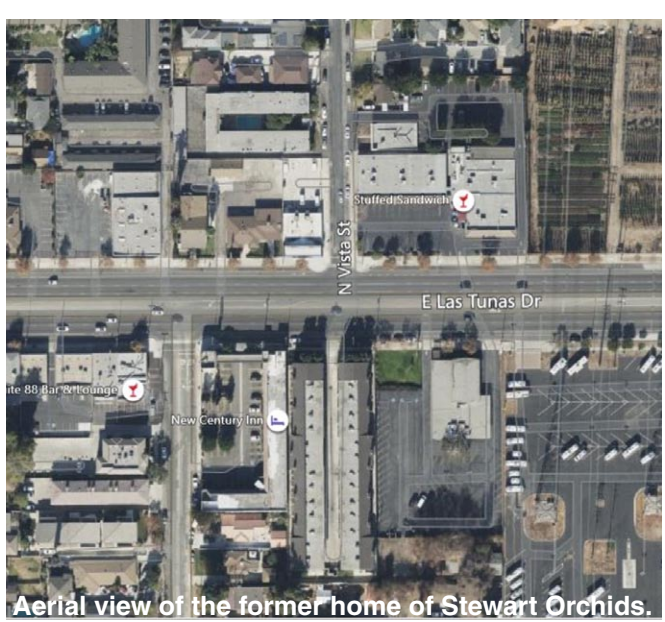
This is just a sample of orchid history that lives on, in the internet pages of the American Orchid Society website, forever memorialized on a digital platform.

So much orchid history can be found among the archived pages of the American Orchid Society publications. As an AOS member, it is all ours to reminisce with digital access on the website, available with the click of a few keys. Though much has changed globally from California to Florida, across the Atlantic, and Pacific north and south of the equator, orchids continue to fascinate us.

The monthly publication now known as *Orchids, The Bulletin of the American Orchid Society*, is still available as bound and printed matter. Optionally, the publication went digital in 2013. I no longer need to have tons of bound paper on my bookshelves.

My next project — moving all those dust-collecting printed versions of the *AOS Bulletin* off *my bookshelves*. Though I am not sure what I should call them now. Empty, might be the right word.

The magazines are up for grabs. Let me know if you want them. Hope you have a few empty shelves. — *Eileen Hector (email: em.hector@verizon.net)*



Aerial view of the former home of Stewart Orchids.

Asymbiotic Germination

A Centenary of the Discovery by Professor Lewis Knudson

BY JOSEPH ARDITTI

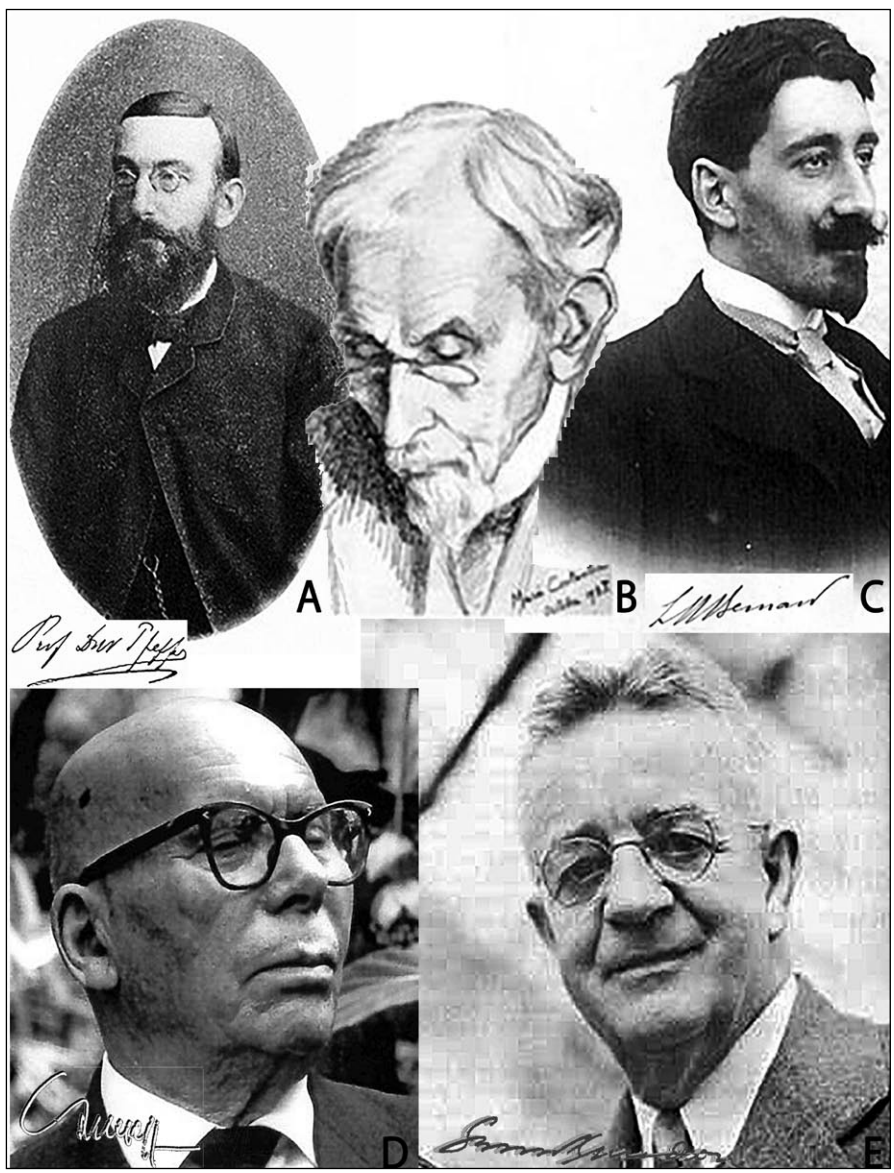
HORTICULTURAL GERMINATION

IN 1768, a scion of an old Scottish family, John Veitch (1752–1839), moved to London to work at a nursery. Two years later, in 1770, he started to work for Sir Thomas Acland (there was a series of baronets with the same name, this one may have been the seventh, 1722–1785), who helped him start a tree nursery in 1779. His youngest son James (1792–1863), described as a "born gardener" (Heriz-Smith 1988), joined the family nursery in due time. It flourished under him. In 1832, he opened a shop in Exeter, built five stove houses and offered for sale "various kinds of Orchidaceous, or Air Plants" (Heriz-Smith 1988). His son, James, Jr. (1815–1869), joined him in the nursery in 1835. He, too, had an interest in orchids. A year before that John Dominy (1816–1891), who was to become a legend in orchid history, joined the firm. By May 1842, James Veitch included *Cycnoches maculata* among the plants his firm was selling. James Jr.'s son Harry James (1840–1924) also became interested in orchids (Heriz-Smith 1988; for extensive reviews see Arditti 1984, 1990; Yam et al. 2002). The stage was set for the Veitch nursery to make orchid history.

David Moore (1897–1879), director of the Glasnevin Botanical Gardens in Ireland, maintained a respectable orchid collection there, but orchids were not of special interest to him (Yam et al. 2002). Still, he did pollinate several species and obtained seeds. He spread the "seed gently over the surfaces of the other Orchid-pots, on the loose material used for growing them, or in pots prepared for the purpose, after which constant shade, a steady high temperature, with an abundance of moisture, are all requisites which are absolutely necessary to ensure success." (Moore 1849)

J. Cole was gardener for J. Willmore at Oldford near Birmingham. He reported (Cole 1849) that "Bletia Tankerville was... obtained from seeds sown on common soil; also Epidendrum elongatum sown on blocks of wood covered with moss."

Richard Gallier, gardener to J. Tildesley,



Plant scientists. **(A)** Wilhelm Friedrich Philipp Pfeffer (1845–1920). **(B)** Julien Noël Costantin (1857–1936). **(C)** Noël Bernard (1874–1911). **(D)** Hans Edmund Nicola Burgeff (1883–1976). **(E)** Lewis Knudson (1884–1958). [Sources: (A) Image and signature. Wikipedia. (B) Allorge, F., and I. Blaringhem (eds.). 1937. *Volume publié a la memoire de Julien Costantin 1857-1936.* Masson et Cie. Paris. (C) Photograph and signature courtesy Professor Francis and Mrs. Michelle Bernard, first published in Arditti 1990. (D) image, https://www.uni-wuerzburg.de/aktuelles/einblick/single/news/vater-der-orchideen/; signature, https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1438-8677.1978.tb03650.x. (E) photograph, courtesy Professor Emeritus Charles H. Uhl; signature, courtesy Archivist Kathleen Jacklin, both at Cornell University and first published in Arditti 1990.]

# of Orchid Seeds

Esq., of West Bromwich, Staffordshire, placed dendrobium seeds on a piece of cork floating on water and covered with a bell jar. Two of his seeds germinated. I was unable to obtain information about Cole and Gallier.

Around 1852, Dr. John Harris (1782–1855), a senior surgeon of the Devon and Exeter Hospital (Arditti 1980) and a man of many talents and interests, described the structure of orchid flowers to Dominy, demonstrated pollination and suggested the possibility of hybridization (Veitch 1886). Dominy started to experiment by crossing *Cattleya mossiae* C. Parker ex Hook. and *Laelia* (now *Cattleya*) *purpurata* Lindley & Paxton in 1852, but the cross did not flower until several years later (for a review see Arditti 1984).

In 1853, Dominy crossed *Calanthe masuca* (D. Don.) Lindley and *Calanthe furcata* Batem. ex Lindley and obtained seeds in 1854 (Arditti 1984, Yam et al. 2002). The plant flowered in October 1856 (Arditti 1984, Yam et al. 2002). John Lindley, the so-called "Father of Orchidology," named it *Calanthe* Dominyi "…in order to put upon permanent record the name of the first man who succeeded in this operation. He is indeed especially entitled to this distinction…in consequence of having produced other Orchidaceous mules…." The first *Cattleya* hybrid appeared in 1859. Other hybrids followed. In 1864, Dominy succeeded in germinating seeds of the first *Paphiopedilum* hybrid, which flowered in 1869 (Arditti 1984).

The seeds were germinated by being "…sown on blocks of wood, pieces of tree-fern stems, strips of cork [and] upon… moss…" (Veitch 1886). Additional details were not provided, but it is reasonable to assume that the methods used were similar to those published in the *Gardeners' Chronicle* (Moore 1849, Cole 1849, Gallier 1849). Regardless, "…when we consider the myriads of seeds that have been sown, and the comparatively few plants raised, we cannot be said to have achieved great success" (Veitch 1886). The methods used in Britain to germinate orchid seeds spread to Europe (Anonymous 1850) and other parts of the British Empire (Jennings 1875) and were used widely (Arditti 1984, Yam et al. 2002). Those who used them could not know at the time that the seed germinated symbiotically because mycorrhizal fungi present in the germination substrate(s) colonized the orchids' seeds and made germination possible.

SYMBIOTIC GERMINATION

Noël Pierre Joseph León Bernard (1874–1911), the son of Francois Bernard, age 49, and Marie Margerite Sabot, 19, was raised from early age by his widowed mother, who worked as a milliner. An outstanding student, Bernard was admitted to the École Normale Supérieure where he came under the tutelage of Julien Noël Costantin (1857–1936), who considered him his star student and took special interest in him, perhaps as a replacement for a son he lost at war. Bernard earned his Licencié in Sciences Naturelles in November 1897 and decided to specialize in orchids. Before starting his specialization, he was drafted and served near the Fontainebleu forest, where he took regular walks. And, there, while on one of his walks, he made the second discovery (chronologically and in importance) in orchid science, the first being the very discovery of orchids (Boullard 1985, Arditti 1990, Yam et al. 2002, Selosse et al. 2011).

Bernard wrote in French, a "language [which] lost its position as a preeminent international language of science, and as a result, [his] papers were no longer being read" after World War II (Pierre Jaquet and Joseph Arditti in Jaquet 2007, p. 313–314). Fortunately, his writings were translated into English in 2007 by the noted French historian of orchid science, Pierre Jacquet. In Bernard's (here abbreviated and condensed) own words (Jacquet 2007), the discovery came about when he "had the opportunity to observe the germination of seeds of *Neottia nidus-avis*…last autumn, most likely, an aerial stem of this plant bearing fruit laden with seeds was accidentally buried into the soil under a layer of dead leaves. In the spring, the seeds, still enclosed in the fruit, germinated in great numbers, this allowed me to observe the first stages of germination from seed to 5-mm [0.2-in] long seedlings…. In sections [of seedlings], three sorts of cells can be observed…2) some layers of cells are almost entirely full with a tight clump of mycelial filaments, …the same…can be found in roots and rhizomes of adult plants, notably the cells…containing mycelial filaments called *mycorrhizae*, have been described often…. In dead stems, there are many filaments of free mycorrhizae. Filaments are only found in the buried and humid parts of the stem…. The germinating seeds within the fruit are enclosed within these filaments and gathered in more or less bulky packs. So, the germination of seeds took place inside a culture of free mycorrhizae. Authors who attempted to germinate seeds of *Neottia* under conditions…that as a rule, are sufficient to induce germination, have not observed any changes in these seeds. Personally, I also have not obtained any results in experiments of this kind. Thus, I am led to conclude that mycorrhizae are required by the plant during germination…. From descriptions…for *Angraecum maculatum* and…*Ophrys apifera*, it seems that such a symbiotic relationship exists…early [in] germination. Symbiosis would then be more necessary for these species and, obviously, for many orchids than for plants with mycorrhizae the seeds of which may germinate and grow in a sterilized soil." (For Bernard's complete statement see Jaquest 2007, Boullard 1985, Arditti 1990, Yam et al. 2002, Selosse et al. 2011)

A less brilliant observer could have concluded that the presence of the fungi was pathological rather than beneficial. Not Bernard. He drew the correct conclusion. With this (abbreviated here) statement, Bernard announced his great discovery to the world.

After his discovery, Bernard carried out research on orchid mycorrhiza and developed a method for symbiotic germination of orchid seeds, which was

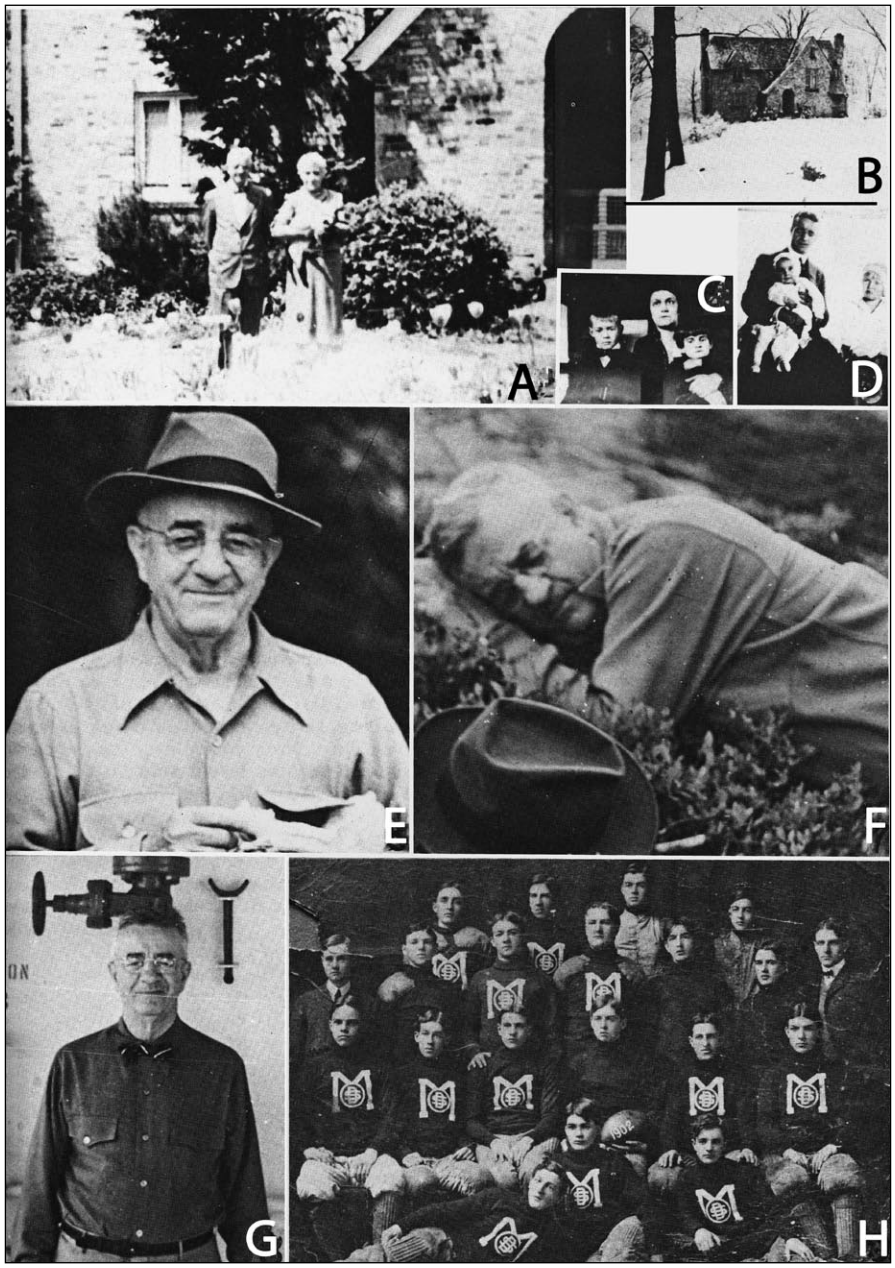
used widely by orchid growers and/or served as a basis for the formulation of additional methods. He also tried to germinate orchid seeds asymbiotically (Jacquet 2007), but died prematurely. Others continued the research he started, but lacked his brilliance. Bernard made major and seminal contributions to orchid science, but is not remembered as extensively as he should be. Hopefully, he and his work will come into prominence again, now that his papers have been translated into English (Jacquet 20O7).

SYMBIOTIC AND ASYMBIOTIC GERMINATION

Hans Edmund Nicola Burgeff (1883–1976) became the leading orchid mycorrhiza researcher following Bernard's death. He was born in Geisenheim, Germany, and lost his mother at the age of two. His father took him on hunting trips when he was 8–10 years old and that is when young Hans started to collect plants. Following gymnasium, he studied biology at the University of Freiburg and learned how to culture fungi. After that, he moved to the University of Jena, worked with Ernst Stahl (1848–1919) and developed an interest in both mycorrhiza and orchids. Then Burgeff spent a year with the well-known physiologist Wilhelm Pfeffer (1845–1920) at the University of Leipzig but did not become interested in physiology. His next move was to the University of Munich to work with the prominent plant morphologist–anatomist Karl von Goebel (1855–1932) until 1920. Three positions as professor followed: University of Halle (1920–1921), University of Munich (1921–1923), and the University of Göttingen (1923–1925). Finally, he became professor at the University of Würzburg in 1925 and stayed there for the rest of his life.

At Würzburg, Burgeff worked on orchid mycorrhiza and orchid–fungus interactions, and cultured orchids and fungi. He also tried unsuccessfully to develop methods for asymbiotic orchid seed germination. This did not prevent him from using Knudson's method (see following section) to try to improve Knudson medium B (Burgeff 1936) and, on his way to Indonesia in 1927–1928, to introduce R.E. Holttum (1895–1990), then director of the Singapore Botanic Gardens, to it.

Holttum used the asymbiotic method to germinate the seeds of the first horticultural orchid hybrid in Singapore, *Spathoglottis* Primrose (*Spathoglottis aurea* × *Spathoglottis plicata*), in 1932 (Yam et al. 2002; Arditti and Hew 2007).



Lewis Knudson and his family. **(A)** Professor Knudson and Mrs. Knudson in front of their house in Ithaca, 1955. **(B)** The Knudson home in winter, 1925. **(C)** Mrs. Knudson holding sons Louis (left) and Giltner (right). **(D)** Professor Knudson with sons Giltner (left) and Louis (right). **(E)** Informally dressed Professor Knudson at a Botany Department party or picnic. **(F)** A resting or napping Professor Knudson at the same event. **(G)** Professor Knudson on board ship, 1940–1945. **(H)** The Milwaukee High School Football team ca. 1904 with Lewis Knudson as quarterback at front row right. [Source: Courtesy Giltner Knudson, first published in Arditti 1990.]

Since *Spathoglottis* Primrose (and most certainly not *Vanda* Miss Joaquim, a natural hybrid) started orchid hybridizing in Singapore (Yeoh 1963), it is reasonable to state that Hans Burgeff played (an albeit small) role in making the Lion City famous for its orchids.

Burgeff believed that orchid endophytes belong to a separate group of fungi, which he named "Orcheomyces." He also developed a cumbersome nomenclatural system, which included the words "Mycelium raditis", meaning root fungus, followed by the name of the orchid from which it was isolated, for example, *Mycelium raditis Vanda suavis.* He was wrong. The fungi did not belong to a separate group. His nomenclatural system was not workable.

Burgeff also believed in a strict

orchid–fungus specificity and clashed with Knudson over this. Now we know that neither of them was fully wrong or completely right regarding specificity. There seems to be little or no specificity in tropical epiphytes, but at least some temperate climate (north or south) orchid species may require specific fungi.

The pH of culture media that support orchid seedlings usually drops to a level that can cause (at least sometimes) unjustified (Piriyakanjanakul and Vajrabhaya 1980) concern among growers. Burgeff must have had such concerns because in some of his media he replaced 1 g KH_2PO_4 or 250 mg K_2HPO_4 with a K_2HPO_4/KH_2PO_4 buffer (Burgeff 1936). He must have aimed at different starting pH values because he used the following buffers (Burgeff 1936, p. 282–289):

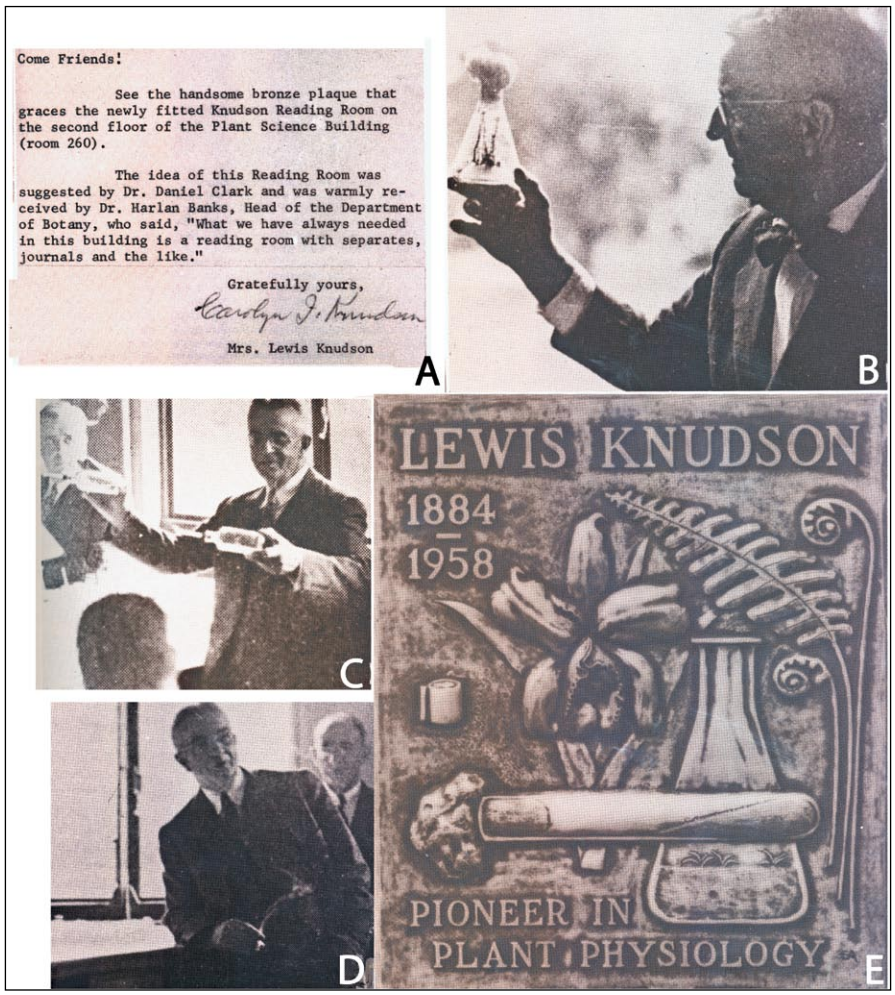
- 250 mg K_2HPO_4/250 mg KH_2PO_4
- 300 mg K_2HPO_4/700mg KH_2PO_4 and
- 350 mg K_2HPO_4/150 mg KH_2PO_4.

The use of such buffers is an interesting and perhaps useful idea that did not catch on, probably because: 1) it was published not long before the start of World War II, and 2) Burgeff wrote in German, which lost its importance after the war. In one instance when Burgeff's buffer was used (Ernst 1994) he is not even cited. Burgeff is not remembered widely at present.

ASYMBIOTIC GERMINATION: MEDIUM B

Son of a Norwegian immigrant father who captained ships on the Great Lakes and an American mother, Lewis Knudson (1884–1958; according to his son, Giltner, the family insisted on pronouncing the K in their last name) was born in Milwaukee, attended schools there, played football and graduated from high school at the age of 20 on July 1. 1904. He attended the University of Missouri and received a Bachelor of Science degree in agriculture on January 30, 1908. Immediately after that, Knudson was appointed assistant in plant physiology at Cornell University where he taught an advanced course on the subject. He must have performed excellently because even before his term there was over, he was promoted to instructor.

Knudson received his doctorate in 1911 and was appointed assistant professor in plant physiology. In 1912, Knudson became acting head of the department. Sometime before 1921, he was promoted to full professor of plant physiology. When the Department of Plant Physiology became part of the Department of Botany, his appointment was changed to professor of botany. In 1941, he became head of the department



Lewis Knudson lecturing and being remembered. **(A)** Note from Mrs. Carolyn J. Knudson regarding the Knudson Reading Room. **(B– D)** Professor Knudson showing and lecturing about his medium C. A three-piece suit, bow tie and cigarette are easy to notice. **(E)** Plaque commemorating Professor Knudson in front of the Knudson Reading Room showing his interests, orchids, ferns and plant cultures in vitro. [Sources: (A, E) Courtesy Mrs. Betty Knudson {Gilter Knudson's first wife}. (B–D) Courtesy Mr. Giltner and Mrs. Lee Knudson {Gilter Knudson's second wife}. All first published in Arditti 1990]

and remained in this position until his retirement on June 30, 1952 (for more details see Arditti 1990, Yam et al. 2002). According to one of his doctoral students, Randolph T. Wedding (1921–1995), Knudson ran the department "with an iron hand in a steel glove" (see recollections by Wedding in Arditti 1990, p. 53–54).

Personally, Knudson was described as "a quiet man" (memoir by Harlan P. Banks [1913–1998] in Arditti 1990, p. 57), a "fastidious and somewhat withdrawn person" and "basically shy" who was referred to as "Lewie" behind his back (Wedding 1990) and of "stiff formal appearance who was very friendly once he got to know you" (memoir by Dr. Arthur Bing [1916–2006] in Arditti 1990, p. 54). He had a "dapper appearance with iron grey hair, a bow tie…and always with a coat and vest but sometimes not. He wore heel taps on his brilliantly shined shoes, and his clicking progress down the hall of the Plant Science Building was a reliable indication that morning coffee time was approaching" (Wedding 1990).

According to his friend and colleague, Professor Frederick Campion Steward (1904–1993), Knudson was an excellent poker player (Steward, pers. comm.).

Knudson met his wife, Carolyn Bell Ingels (born 18?? [according to her son Giltner, she erased the last two digits in an identity card], died at age 94), in Missouri. According to their second son, Giltner John Knudson, Mrs. Knudson "ruled her husband silently" (Arditti 1990). They had two sons, Louis Ingels (died at age 69 in 1983) and Giltner John (1919–mid-1990s), and a dog, which was loyal to him and accompanied him to his office on Sundays (Bing in Arditti, 1990; G.

Knudson, pers. comm.). Their house on 502 Cayuga Heights Road in Ithaca had a large garden, which was tended mostly by Mrs. Knudson with some help from her husband (G. Knudson, pers. comm.; Arditti 1990).

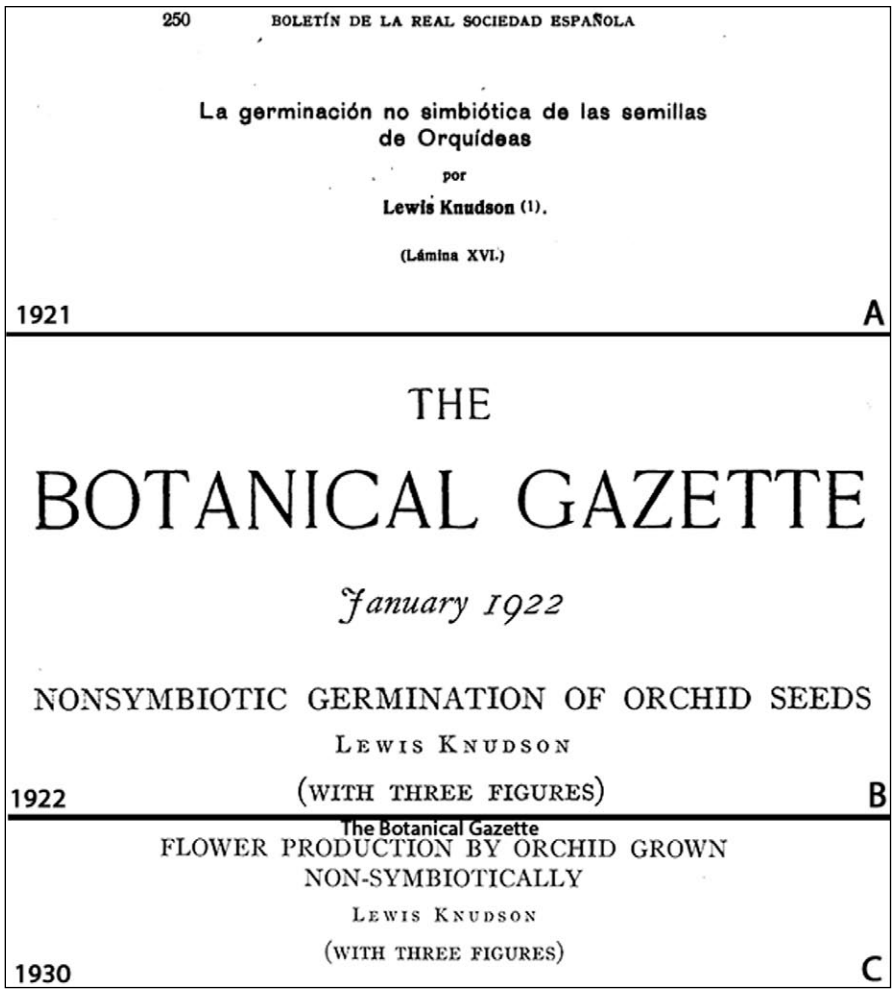
A workaholic with few real hobbies, Professor Knudson loved classical music and owned a piano and an organ, both of which he played frequently. He also had many records and a wind-up record player, but did not play them often. His reading was limited to science, financial journals, the *National Geographic* magazine and the *Saturday Evening Post*. Football was his favorite sport. He also liked to go to movies. As a heavy smoker, he smoked Chesterfield cigarettes. Scotch and soda was his favorite drink (all of the above is from personal communications by his son Giltner in Arditti 1990).

Professor Lewis Knudson died suddenly of a heart attack in his home on Sunday evening August 31, 1958. He was 74. A Knudson Reading Room was established in room 260 of the Plant Science Building at Cornell University to commemorate him. His living memorials, found all over the world are

- the thousands of beautiful orchid hybrids, the seeds of which were germinated on his media B or C,
- millions or even billions of orchid seedlings raised on these solutions B and C (named Knudson B and Knudson C by those who use them) and
- the first clonally propagated orchid explants on Knudson C (Rotor 1949).

Some of Knudson's papers are still being cited in the orchid literature. It is highly unlikely that Professor Lewis Knudson will ever fade from memory.

As a plant physiologist, Knudson had wide interests (for a list of his publications see Arditti 1990, Yam et al. 2002), which included sugar utilization by green plants as well as fungal nutrition. His research in these areas and reading must have led him to orchid seed germination (Arditti 1983, 1990; Yam et al. 2002). He reasoned that "the fungus…might digest some of the starch, pentosans and nitrogenous substances, which digestion products, together with secretions from the fungus or products produced on decomposition of the fungus might be the cause of germination," and that "…germination of orchid seeds might be obtained by the use of certain sugars…" (Knudson 1922a). To make a long and highly interesting story short, his reasoning led Knudson on July 18, 1919, to place seeds of *Cattleya intermedia* × *Cattleya lawrenceana* on a solution of minerals formulated by the German plant physiologist Wilhelm Friedrich Philipp Pfeffer (1845–1920) to which he did or did not add sucrose, fructose or glucose. He called the sucrose-containing media solution B.


250 BOLETÍN DE LA REAL SOCIEDAD ESPAÑOLA

La germinación no simbiótica de las semillas de Orquídeas

por

Lewis Knudson (1).

(Lámina XVI.)

1921 A

THE

BOTANICAL GAZETTE

January 1922

NONSYMBIOTIC GERMINATION OF ORCHID SEEDS

LEWIS KNUDSON

(WITH THREE FIGURES)

1922 B

The Botanical Gazette

FLOWER PRODUCTION BY ORCHID GROWN NON-SYMBIOTICALLY

LEWIS KNUDSON

(WITH THREE FIGURES)

1930 C

Journals and title pages of three papers by Professor Lewis Knudson. **(A)** First paper in Spanish in Spain reporting on the asymbiotic germination of orchid seeds. **(B)** Second, longer and more detailed paper regarding asymbiotic germination of orchid seed in medium B. **(C)** Paper on in vitro flowering of an asymbiotic orchid plant. [Sources: (A) Knudson 1921; (B) Knudson 1922a, 1922b; (C) Knudson 1930.]

Knudson visited France and Spain during parts of 1919 and 1920. Therefore, he did not examine the cultures until June 9, 1920. Seedlings were developed on fructose-, glucose- and sucrose-containing solutions, but the media had lost most of their water. There was no seedling development on sugar-free solutions (which he may have called solution A). Thus was invented asymbiotic germination of orchid seeds. Knudson published his findings first in Spanish (Knudson 1921) and a year later in English (Knudson 1922b).

The discovery was solely due to Knudson's superb mind, excellent and logical reasoning, experience as a research scientist and enviable talent as an experimenter. However, luck also played a role. Knudson obtained orchid seeds from Theodore Luqueer Mead (1852–1936) of Olviedo, Florida. By fortuitous accident or intentionally, Mead sent him seeds of *Cattleya*, *Epidendrum*, *Laelia* and *Laeliocattleya*, all of them tropical epiphytes, which are easy to germinate asymbiotically. Had Mead provided Knudson with seeds of difficult-to-germinate species, temperate terrestrials in particular, Knudson may have either failed in his experiments, at least at first, or been less successful.

There are several reports in the older literature (for reviews see Arditti 1967, 1979) that orchid seeds germinate better on media containing cane rather than beet sucrose. However, there are also claims that beet sucrose is as suitable for orchid germination as that derived from cane. But, there are no definitive reports in peer-

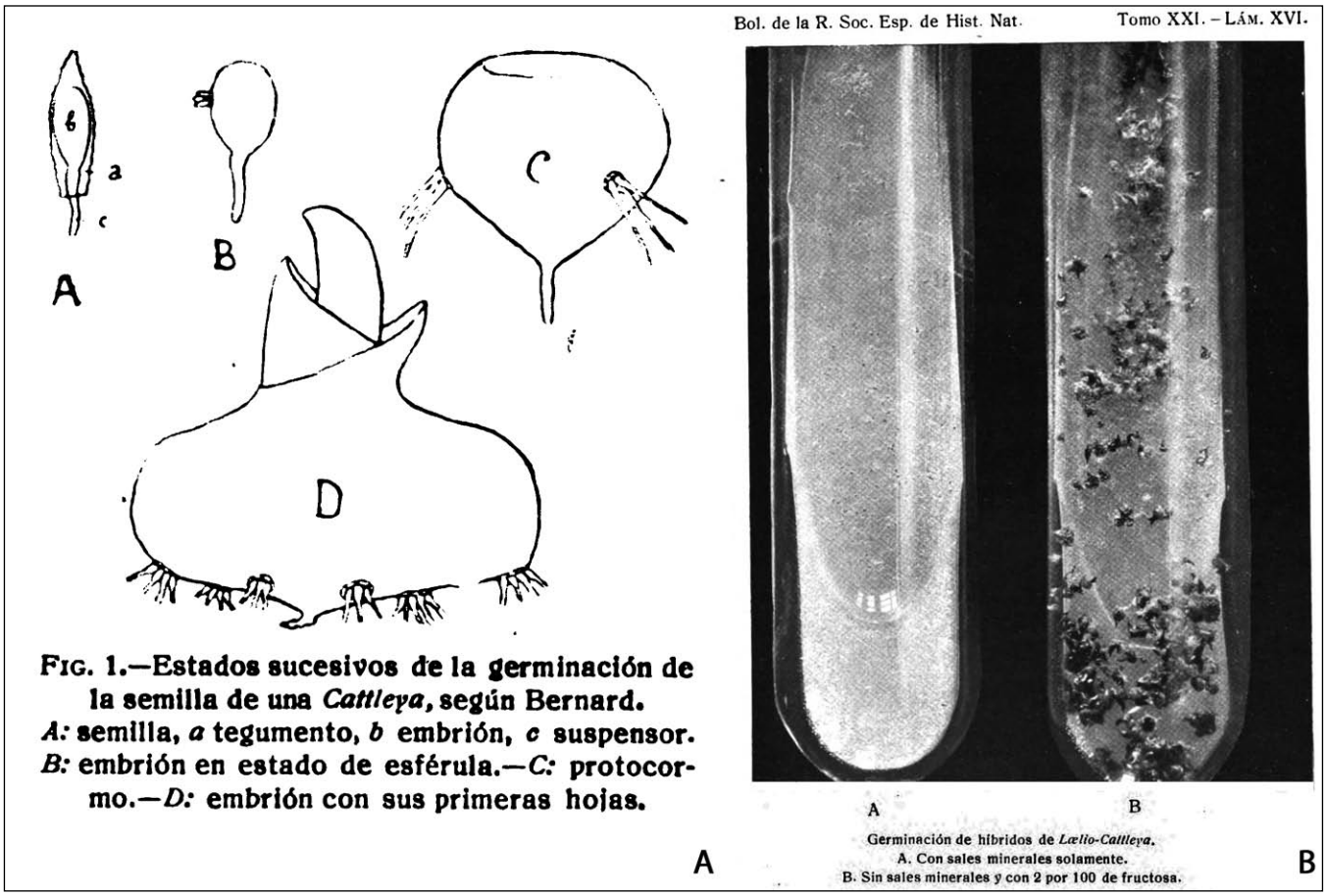


Fig. 1.—Estados sucesivos de la germinación de la semilla de una *Cattleya*, según Bernard. *A:* semilla, *a* tegumento, *b* embrión, *c* suspensor. *B:* embrión en estado de esférula.—*C:* protocormo.—*D:* embrión con sus primeras hojas.

Orchid seeds, embryos, protocorm and first published photographs of asymbotic germination with original captions. **(A)** Line drawings. A. Seed. a = seed coat, b = embryo, and c = suspensor. B. embryo in early germination spherule stage. C. Protocorm. D. Protocorm with first leaves. **(B)** Germination of *Laeliocattleya* hybrid. A. Medium containing only mineral salts (Pfeffer's solution). B. Medium with 2% fructose. Both media lost water (i.e., dried) and moved away from the tube walls. [Source: Knudson 1921]

reviewed papers. If differences in orchid seed germination on the two sucroses do exist, they could be due to the presence or absence of impurities. Knudson seems to have used cane sugar (Knudson 1922a, 1922b). Had he used beet sucrose, the results of his experiments may have been less successful or at least different.

AMERICAN "NAÏVETÉ" AND "LE GRANDE DÉCOUVERTE FRANCAISE"

Knudson's media B and C made possible mass hybridization and propagation of orchids and showed that plants can be propagated in vitro. They elated orchid growers and breeders and were welcomed by horticulturists and plant scientists all over the world. One person was outraged by medium B. It was Julien Noël Costantin, Bernard's mentor.

Even as late as 1922, Costantin did not accept the principles of Mendelian inheritance and stuck to the debunked theory of Jean-Baptiste Lamarck (1744–1829), which presaged the concepts of genetics formulated by the communist charlatan Trofim Lysenko (1898–1978) in the Soviet Union! The only explanations for this are a narrow mind clouded by nationalism, chauvinism and, perhaps, excessive dedication to his star student, N. Bernard, who was, sadly, dead by then.

Costantin complained that the work of the "American author" (i.e., Knudson) was based on "naïveté" and could lead to conclusions that "the theory of symbiosis formulated by Noël Bernard is a novel" (he used the French word, "roman"). This was just the beginning. In defense of what he called "Le Grande Découverte Francaise," Costantin added vitriol, petulance and nonsensical arguments, including the following:

- Asymbiotically germinated orchid plants are not normal because they produce starch.
- Like lichens, which consist of two plants (a fungus and an alga), true orchids are a combination of fungus and a flowering plant. Therefore, asymbiotic orchids are not true orchids.
- Orchids produced asymbiotically will not flower.

(For more details than presented here see Arditti 1983, 1990; Yam et al 2002 and the literature cited therein).

Knudson replied, but limited himself to facts (for more details than presented here and extensive quotes from the arguments between Knudson and Costantin see Arditti 1983, 1990; Yam et al. 2002 and literature cited therein), which seemed to anger Costantin even more. He also grew an orchid plant in a Florence flask asymbiotically to full flower (Knudson 1930). This was the first orchid and probably any plant to flower in vitro. The debate ended with the in vitro flowering. Knudson won. Costantin made a fool of himself and cast a shadow on Bernard's memory and excellent work.

ASYMBIOTIC GERMINATION: MEDIUM C

Knudson was not satisfied with his Medium B and continued to experiment with different solutions. In 1946, he published a medium he called C (Knudson 1946), which became instantly popular and was named Knudson C by growers. It differs from medium B by containing 25 mg ferrous sulfate ($FeSO_4 \cdot 7H_2O$) and 7.5 mg manganese sulfate ($MnSO_4 \cdot H_2O$.) The ferrous sulfate tends to precipitate, but

iron chelates were not available at the time. At present ferrous sulfate is often replaced by an iron chelate.

CONCLUSION

Horticulturally, Knudson's asymbiotic seed germination media are the most important contributions ever to orchid science and cultivation. Chronologically and biologically, his contributions rank third after the discovery of orchids and Bernard's discovery. In fact, Knudson's work may not have come to be without Bernard's. Knudson's research and medium C led to the first attempt by Dr. Gavino Rotor (1917–2005) to propagate orchids vegetatively in vitro (Rotor 1949, Arditti and Krikorian 1996). Every orchid hybrid produced and seedling germinated since 1922 is a memorial to Professor Lewis Knudson.

References

Anonymous. 1850. Multiplication des Orchidées de Graine. *Journal de Horticulture Pratique de la Belgique* 7:234–235.

Arditti, J. 1967. Factors Affecting the Germination of Orchid Seeds. *Botanical Review* 33:1–97.

_. 1979. Aspects of the Physiology of Orchids. *Advances in Botanical Research* 7:421-655.

_. 1980. John Harris—Surgeon and Orchidologist. *Orchid Review* 88:200–204.

_. 1983. Lewis Knudson. p. 14–17. *In:* J. Janick, editor. *Classic Papers in Horticultural Science.* Prentice Hall, Englewood Cliffs, New Jersey.

_. 1984. An History of Orchid Hybridization, Seed Germination and Tissue Culture. *Botanical Journal of the Linnean Society of London* 89:359–381.

_. 1990. Lewis Knudson (1884–1958): His Science, His Times, and His Legacy. *Lindleyana* 5:1–79.

_. 1992. *Fundamentals of Orchid Biology.* Wiley-Interscience, New York.

Arditti, J. and C.S. Hew. 2007. The Origin of *Vanda* Miss Joaquim. p. 261–309. *In:* K.M. Cameron, J. Arditti and T. Kull, editors. *Orchid Biology, Reviews and Perspectives*. Volume IX. The New York Botanical Garden Press, New York.

Arditti, J. and A.D. Krikorian. 1996, Orchid Micropropagation, the Path from Laboratory to Commercialization and an Account of Several Unappreciated Investigators. *Botanical Journal of the Linnean Society* 122:183–241.

Bernard, N. 1899. Sur la Germination du Neottia nidus-avis. *Comptes Rendus Hebdomadaires des séances de l'Academie des Sciences, Paris* 128:1253–1255. [Available in English translation in Jacquet 2007.]

Boullard, B. 1985. *Un Biologiste d'Exception Noël Bernard 1874–1911.* University of Rouen, France.

Burgeff, H. 1936. *Samenkeimung der Orchideen und Entwicklung Ihrer Keimpflanzen*.Verlag von Gustav Fischer, Jena, Germany.

Cole, J. 1849. Orchids from Seed. *Gardeners' Chronicle* 1:562.

Ernst, R. 1994. Effect of Thidiazuron on in vitro Propagation of *Phalaenopsis* and *Doritaenopsis* (Orchidaceae). *Plant Cell Tissue and Organ Culture* 39:273–275.

Gallier, R. 1849. Orchids from Seed. *Gardeners' Chronicle* 1:661.

Heriz-Smith, S. 1988. The Veitch Nurseries of Killerton and Exeter c. 1780 to 1863. Part I. *Garden History* 10:51–57.

Jacquet, P. 2007. A Translation of the Writings of Noël Bernard. p. 311–431. *In:* K.M. Cameron, J. Arditti and T. Kull, editors. *Orchid Biology, Reviews and Perspectives*. Volume IX. The New York Botanical Garden Press, New York.

Jennings, S. 1875. *Orchids and How to Grow Them in India and Other Tropical Climates*. Reeve & Co., London.

Knudson, L. 1921. Le Germinación no Simbiótica de la Semillas de Orquídeas. *Boletin de la Real Sociedad Española de Historia Natural* 21:250-260, plate 16.

_. 1922a. Nonsymbiotic Germination of Orchid Seeds. *Botanical Gazette* 73:1–25.

_. 1922b. Raising Seedlings on Sugar. *The Garden Magazine* 36:162–163.

_. 1930. Flower Production by Orchid Grown Non Symbiotically. *Botanical Gazette* 89:192–199.

_. 1946. A New Nutrient Solution for the Germination of Orchid Seed. *American Orchid Society Bulletin* 15:214–217.

Moore, D. 1849. On Growing Orchids from Seeds. *Gardeners' Chronicle* 35:549.

Piriyakanjanakul, J. and T. Vajrabhaya. 1980. Nutrition of Orchid Plantlets: Effect of Initial pH. p. 67–74. *In:* M.R. Sukshom Kashemsanta, editor. *Proceedings of the 9th World Orchid Conference*, Bangkok, 1978.

Rotor, G. 1949. A Method for Vegetative Propagation of *Phalaenopsis* Species and Hybrids. *American Orchid Society Bulletin* 18:738–739.

Selosse, M.-A., B. Boulard, and D. Richardson. 2011. Noël Bernard (1874–1911): Orchids to Symbiosis in a Dozen Years, One Century Ago. *Symbiosis* 54:61–68.

Veitch, H.J. 1886. The Hybridization of Orchids. *Journal of the Royal Horticultural Society London. 7:*22–49.

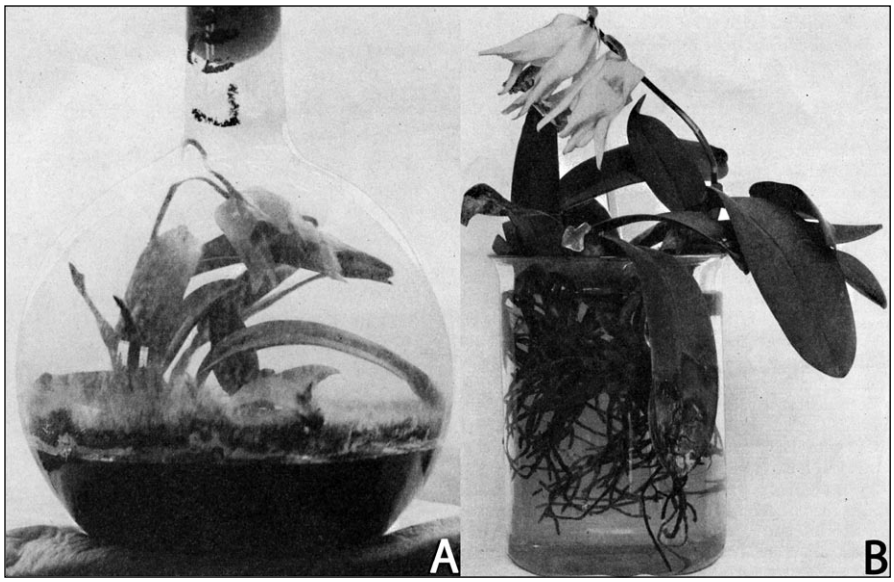
Yam, T.W., H. Nair, C.S. Hew, and J. Arditti. 2002. Orchid Seeds and Their Germination: An Historical Account. p. 387–504. *In:* T. Kull and J. Arditti, editors. *Orchid Biology, Reviews and Perspectives.* Volume VIII. Kluwer Academic Publishers, Dordrecht, Netherlands.

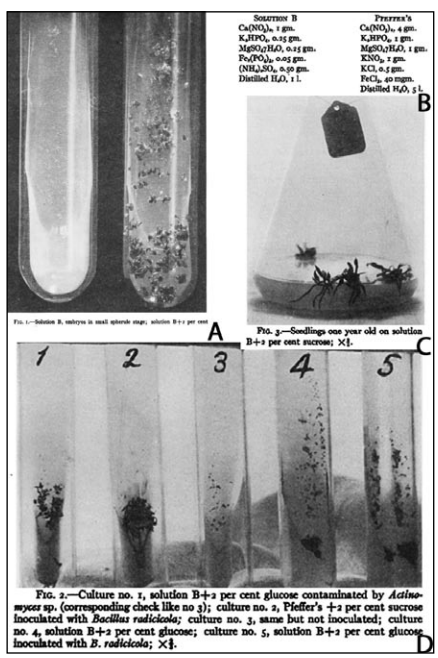
Yeoh, B.C. 1963. *A List of Malayan Orchid Hybrids 1893–1963.* Times Press (M) Ltd., Singapore.

Dedication

For Lam Heston, a friend of 30 years.

— Joseph Arditti, Professor of Biology Emeritus at the University of California, Irvine, received his doctorate from the University of Southern California in 1965. From 1966 until his retirement in 2001, he carried out research on orchids. He is the proud father of Dr. Jonathan O. Arditti and father-in-law of Dr. Alexandria N. Arditti, both University of Southern California alumni (email: jarditti@uci.edu).





Top: Orchid flowering in vitro. **(A)** *Laeliocattleya* flowering in a Florence flask. **(B)** *Laeliocattleya* plant, which flowered in vitro removed from flask and placed in water. [Source: Knudson 1930.]

Bottom: First asymbiotic germination of orchid seeds with original captions and recipes of media. **(A)** Left, seedlings not past early spherule stage on sugar-free solution. Right, seedlings in protocorm and further stages on solution B plus 2% sugar. Both media have lost water, dried and pulled away from tube walls. **(B)** Left, sugar-free solution. Right, Pfeffer's solution. **(C)** Seedlings in Erlenmeyer flask and original caption. **(D)** Seedling cultures in test tubes with original captions. [Source: Knudson 1922a.]

Jean Bosser (1922–2013)

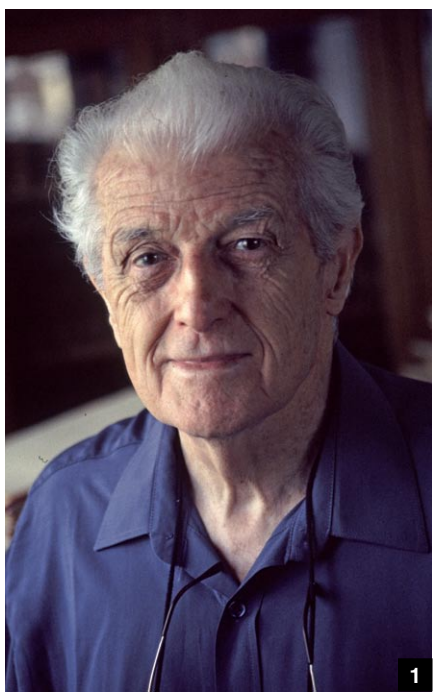
A Life among Flowers

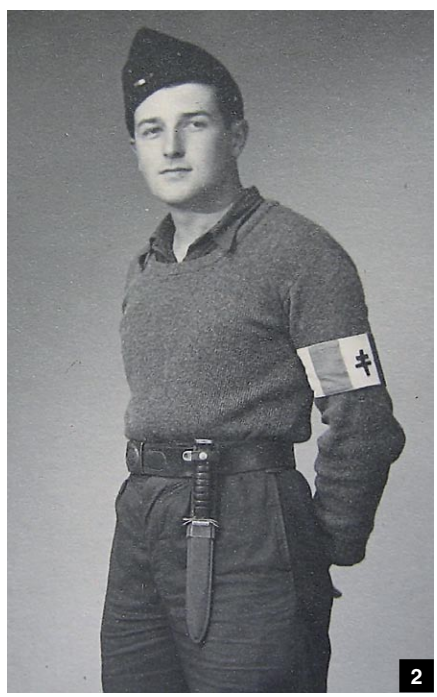
CLARE HERMANS, JOHAN HERMANS AND CATHERINE BOUDIER

THE *FLORE DES Mascareignes* series, covering the flora of Mauritius, la Réunion and Rodrigues, in the West Indian Ocean, started in the early 1970s. It is a collaboration by the Mauritius Sugar Industry Research Institute; the Royal Botanic Gardens, Kew; and the Institut de Recherche pour le Développement in France (IRD), and is published by IRD Éditions, with over 200 plant families covered so far. It is rare for floras to be completed but this year will see the publication of the final part, the orchids. It will be in two extensive volumes by Johan Hermans, Phillip Cribb and others, with numerous photos and line drawings. The flora of these islands overlaps partly with that of Madagascar and is equally unique, greatly endemic and threatened. The completion of this gargantuan project will be a fitting tribute to the botanist Jean Bosser, who started it. He is one of the unsung heroes of Madagascan and Mascarene orchid botany; he was a modest man, and his life and work are comprehensively recorded here, in collaboration with his daughter Catherine.

EARLY LIFE This year (2022) marks the centenary of Jean Bosser's birth and also celebrates the publication of the Orchidaceae, as the final volumes of the *Flore de Mascarenes*; this is a family of plants he adored, and he also was one of the founding fathers of the *Flore*. As one of the editors from its inception in 1970, Bosser played an important role as author and coauthor of more than a dozen plant families. However, the orchid part remained incomplete and fragmentary; towards the end of his life, despite writing notes on several species and genera, he recognized that this family would have to be left to others to resolve.

Jean Michel Marie Bosser was born on the December 23, 1922, in Audierne, Finistère, Brittany, France, in a humble family where Breton was the language of choice. His father was Jean Guillaume Marie Bosser (1882–1944), a forest ranger later fish merchant in Douarnenez, Brittany; his mother Marie Catherine Gloaguen (1880–1962) was from an agricultural family. Between them he had five uncles and aunts and 25 first cousins. At school he showed early promise in languages and natural history in particular. He gained a state bursary and his elder sister and only sibling, Maria, helped finance his higher education at the Lycée La Tour d'Auvergne in Quimper by working as a housekeeper from age 13. Like many of his generation, the Second World War interrupted further education; in 1942 he joined the Maquis to resist the occupying Nazi forces and to avoid being enrolled into forced labor. In the summer of 1946 Bosser met Marie Thérèse Lozachmeur in Douarnenez. He then left the area to resume his studies at l'Institut Agronomique in Paris where he gained a certificate in agronomy and a diploma in pedology (soil science). Soon after qualifying, in 1948, he was employed by the Office de la Recherche Scientifique et Technique Outre-Mer (ORSTOM; now the IRD) as a research scientist in grasses ("graminées"). The next spring, he married





[1] Jean Bosser (1922–2013)

[2] Jean Bosser joined the Maquis in 1942. Photo courtesy of the Bosser family.

[3] Jean Bosser, with his mother Marie Catherine in the 1950's. Photo courtesy of the Bosser family.

Marie Thérèse in Paris and they lived in the city where they both worked, she as a secretary.

MADAGASCAR In early 1951 he was assigned by ORSTOM to set up a botanical research center in Antananarivo (Tana), Madagascar, then a colony of France. This was a major relocation, especially as the family by now had expanded, with two young daughters, Catherine and Michèle. Rather than subject the young family to joining him and the luggage on the two-month-long sea journey via the Cape, he persuaded his employers to fly his wife and daughters to Tana where they arrived shortly after him. There they made a new home close to the Botanic Garden, Parc Tsimbazaza in the outskirts of Tana where the new research center was based.

Although his botanical focus was on the graminées, in particular the study of the flora of natural pastures, orchids became a private passion. Madagascar provided enormous opportunity for this new pursuit and his daughter Catherine recalls many family outings and picnics exploring for them. He was an enthusiastic photographer, and his numerous orchid photos were a great asset for subsequent studies. Soon after arrival in Madagascar, Bosser met Dr. Jean-Pierre Peyrot and Dr. A. Coutrix, both army doctors and fellow botany and orchid enthusiasts. They accompanied him on weekend expeditions in his official car to sites including Mount Ibity, Lake Itasy, Périnet (Andasibe) and Lake Tsiazompaniry. The pediatrician Peyrot in particular enjoyed botanizing in addition to looking after his young patients; he was also a keen photographer. Bosser named orchids for his companions including *Angraecum coutrixii*, *Angraecum peyrotii* and *Aeranthes peyrotii*.

One of Bosser's first major publication was in 1956, *Considérations sur les plantes de couverture, engrais verts, plantes fourragères, en pays intertropicaux et plus particuliérement à Madagascar*, published by the Institut de Recherche Scientifique (Bosser 1956). His first orchid articles were in 1960 in *Le Naturaliste Malagache* and *Notulae Systematica*, and were collaborations with Jeanne Toilliez-Genoud, also a botanist at Tsimbazaza, and Eugène Ursch, director of the Tsimbazaza Botanical Garden (Toilliez-Genoud and Bosser 1960a, 1960b; Toilliez-Genoud et al. 1960). They described several new species in *Aeranthes, Angraecum* and *Bulbophyllum*, some of which had flowered in the glass and shade houses at the Botanic Garden. During his time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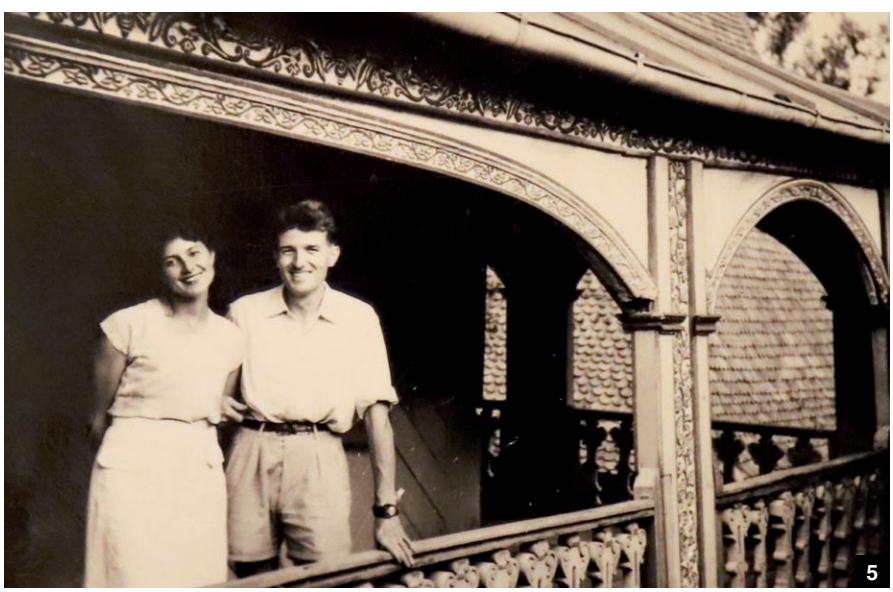
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in Tana, Bosser also wrote a fascinating set of instructions as a rainforest survival guide for pilots; the idea came to him when a plane spraying for locust control had to make an emergency landing close to him on field work. The pilot had been overcome by fumes leaking from the insecticide canisters and Bosser used his drinking water to decontaminate him. Aside from the local flora Bosser was also interested in and collected seashells and butterflies, later bringing an interesting selection back to France. Amusingly and memorably for his children he had a pet mouse lemur (*Microcebus*) called Mic-Mac; for 10 years it lived in his top shirt pocket in daytime, and roamed freely at night until, sadly, a cat got the better of it.

PARIS In 1964, four years after Madagascar's independence, Bosser was recalled to France by Professor Guy Camus, then director of ORSTOM. Camus believed researchers should not remain in a single country for long, so it was remarkable and fortuitous for orchidology that Bosser had been working in Madagascar for 13 years. The family returned to live in an apartment in leafy Chatenay-Malabry, near Paris. Bosser continued to work for ORSTOM, but as a botanist rather than an agronomist and was based at the Laboratoire Phanérogamie of the Muséum National d'Histoire Naturelle (MNHN), Paris becoming a director of research in 1967. Aside from Orchidaceae he also became a world-renowned expert in cypéracées and graminées of Madagascar and published his seminal work, *Graminées des pâturages et des cultures à Madagascar*, on the latter in 1969 (Bosser 1969). He returned to Madagascar in 1972, meeting up with his old friend Peyrot, and again in 1976 both to collect plants and help local botanists.

THE MASCARENES By this time Bosser was already involved with the *Flore des Mascarenes,* the first volume of which was published in 1976. As a result, he traveled to Réunion on at least four occasions in the 1970s, where he was often accompanied on field trips by Francis Friedmann and Thérésien Cadet. In addition, Bosser went to Mauritius with Friedmann and also met Reginald Vaughan, director of the Mauritius Herbarium and Joseph Guého, Vaughan's assistant and afterwards curator of the Herbarium; all four were involved with the *Flore des Mascareignes*. During this period Bosser also traveled to the Rodrigues, the third island covered by the *Flore*.

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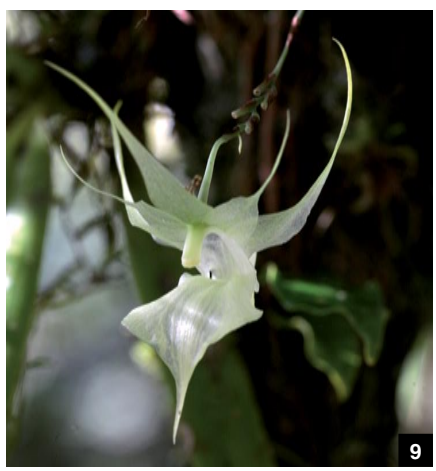
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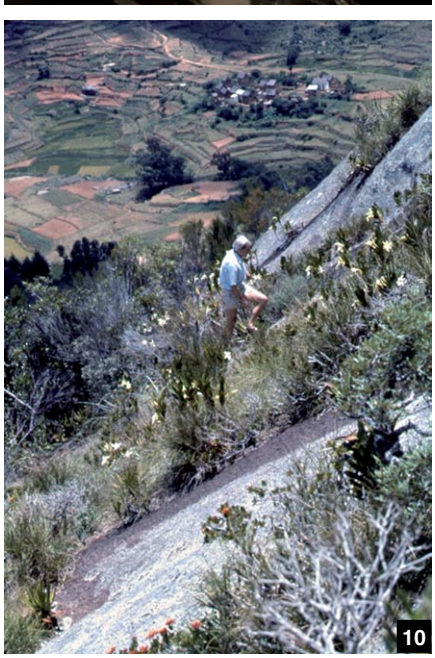
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[4] The wedding to Marie Thérèse Lozachmeur in 1949. Photo courtesy of the Bosser family.

[5] Marie Thérèse and Jean Bosser soon after their arrival in Madagascar, 1952. Photo courtesy of the Bosser family.

[6] The Bosser Family, near Antananarivo, 1955: Jean, Marie Thérèse, Catherine and Michèle. Photo courtesy of the Bosser family.

[7] The IRSM vehicle laden with botanical specimens at a fuel station in Madagascar, 1950–1960s. Photo courtesy of the Bosser family.

[8] Mic Mac the mouse lemur (Micorcebus) lived in Jean Bosser's pocket in Madagascar. Photo courtesy of the Bosser family.

[9] *Aeranthes albidiflora*, described in 1960 by Toilliez-Genoud, Ursch and Bosser from E Madagascar.

[10] Jean Bosser exploring in the 1960s, among a large colony of *Angraecum sororium* at Mt. Angavokely in central Madagascar. Photo courtesy of the Bosser family.

In 1982 he was sent by ORSTOM to Réunion to suggest areas to be protected. The report he wrote, although viewed by some as having a somewhat botanical focus, led to the creation of a limited number of new reserves. His work partly overlapped with that of Thérésien Cadet who was a professor of Plant Biology at the University of Réunion; unfortunately, Cadet died suddenly in 1987 at age 50, the same year Bosser officially retired from ORSTOM. Thérésien's wife Janine, his assistant and botanical artist, published a book of her illustrations of the island's orchids in 1989 with a foreword by Bosser (Cadet 1989). Over the following years he would continue to meet up with Janine either in Réunion, where he stayed with her, or later in Paris.

LATER WORK In total Bosser collected 20,000 specimens for the Paris Herbarium. Over the ensuing years he continued to work on the *Flore* in his garret office at MNHN and publish articles on Madagascan orchids, generally in the journal *Adansonia*.

Retirement from ORSTOM made little difference and Bosser carried on with his work on the *Flore des Mascareignes* and Madagascan orchids at the MNHN. The Hermans met him for the first time in 1994 while researching their bibliography of the orchids of Madagascar. It was the start of a long collaboration, culminating in the publication in 1999 of *The Orchids of Madagascar, Annotated Checklist and Annotated Bibliography* (Du Puy et al. 1999) with Bosser as coauthor. Gradually, through annual visits to the MNHN the Hermans got to know Bosser, who has been called reserved and modest but was described by his family as sometimes stubborn and a true Breton. Some young and ambitious botanists found him difficult to collaborate with; he was always cautious about their intentions at first and communicating with him via letters through the post was sometimes too much of a challenge to those who had gotten used to the instant gratification of email. Some persevered and found him charming, clear-headed and very happy to share his extensive knowledge in conversation and in detailed letters in his usual minuscule script. A visit to his office, high in the loft of the Muséum, was a botanical treat; unsurprisingly it was piled high with pressed specimens, books, and bottles of spirit material, and appeared somewhat chaotic. Yet Jean knew exactly where everything was and, when asked, he quickly laid his hands on an elusive specimen. Sadly in 1995 Bosser suffered


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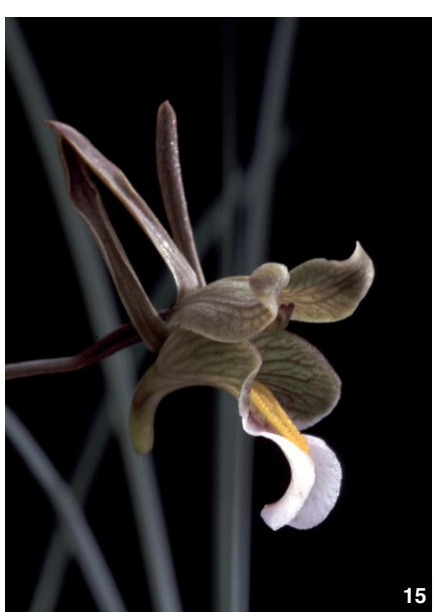
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[11] Jean Bosser photographing *Habenaria incarnata* in the 1960s, a widespread species in Madagascar and the Comoros. [J.-P. Peyrot], courtesy of the Bosser family.

[12] *Cryptopus dissectus* was described by Bosser in 1965 as a variety of *Cryptopus elatus* but recognized as a species in its own right in 1980. It was thought extinct until rediscovered in E Madagascar.

[13] *Angraecum longicalcar*, a long-spurred variant of *Angraecum eburneum*, named by Bosser in 1965, it is now endangered and restricted to a few rocky outcrops in central Madagascar.

[14] *Bulbophyllum amoenum* described by Bosser in 1965 from Lake Mantasoa in the highlands of Madagascar.

[15] *Eulophia filifolia*, a terrestrial from southern Madagascar, described by Bosser and Morat in 1965.

[16] Photographing *Angraecum longicalcar* near Lake Itasy, Madagascar in 1964, described by Jean Bosser in 1965. Photo courtesy of the Bosser family.

[17] *Grammangis spectabilis* a spectacular species from the dry forest of SW Madagascar, described by Bosser and Morat in 1969. It is now critically endangered.

[18] *Cynorkis peyrotii*, a widespread species from Madagascar and La Réunion, described in 1969 by Bosser.

[19] *Bulbophyllum peyrotii* described by Bosser in 1965, from the eastern forest of Madagascar.

[20] *Angraecum coutrixii* from the Itremo mountains in central Madagascar, named for Dr Coutrix by Bosser in 1970.

[21] *Lemurella pallidiflora*, from the eastern rainforest, described by Bosser in 1970.


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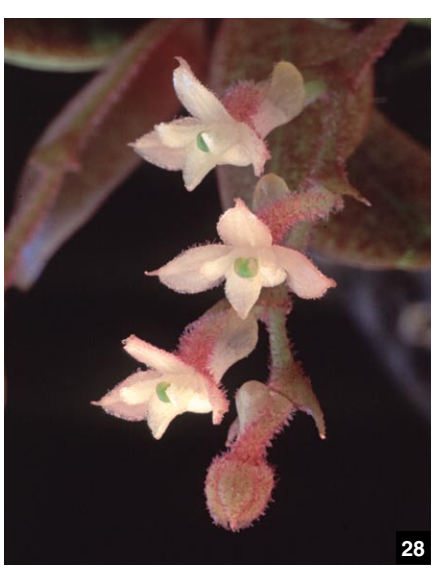
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[22] *Lemurella papillosa* described by Bosser in 1970, from Maroantsetra in NE Madagascar.

[23] *Angraecum pinifolium* from the eastern rainforest of Madagascar, described by Bosser in 1970.

[24] \ *pulchellus* var. *sandrangatensis* described in 1971 by Bosser. It is now rare in eastern Madagascar.

[25] *Bulbophyllum therezienii* described by Bosser in 1971, from E Madagascar.

[26] *Gastrorchis peyrotii* described by Bosser as *Phaius peyrotii* in 1971, from E. Madagascar.

[27] *Bulbophyllum namoronae* from Masoala in NE Madagascar was described by Bosser in 2004.

[28] *Angraecum rubellum* from the eastern rainforest, described by Bosser in 1988.

[29] *Bulbophyllum anjozorobeense* described by Bosser in 2000, from Anjozo-

a most devastating personal tragedy, the death of his wife Marie Thérèse in a road traffic accident; it greatly affected him.

Nonetheless he remained one of the editors of the *Flore des Mascareignes* until 2008, working from his handwritten notes without a computer; he often said he would get around to the treatment of the orchidéess once he had finished the graminées. However, as he only published when he was totally confident about his findings and would rather wait if not, it sometimes took a long time. By now his central vision had started to deteriorate, a cruel fate for a botanist who slowly became unable to see the fine details of his beloved plants. He spent the warm summer months with his sister in Brittany and made regular visits to the MNHN, often combined with a sociable lunch in one of the small restaurants around the museum; these gradually diminished as his sight failed. He continued to work at home on manuscripts for the *Flore* and corresponded with Francis Friedmann and others right up until his death. It was a special occasion in 2007 to see him attend a meeting of the Société Française d'Orchidophilie to listen to "les Brittaniques" (the Brits) deliver a lecture on the orchids of Madagascar; he was in the illustrious company of Philippe Morat, Jean-Noel Labat and Marcel Lecoufle. It was a rare but daunting occasion — perhaps a stimulus to produce *Les Orchidees de Madagascar*? In the introduction to Bernet's (2010) book on the orchids of La Réunion he complimented the work of the author and other amateur botanists on the island and hoped that the orchid volumes for the *Flore des Mascareignes* would be achieved at some stage. In 2011 his long-anticipated book, *Les Orchidees de Madagascar* (Bosser and Lecoufle 2011), was published, coauthored with the nurseryman Marcel Lecoufle using Bosser's, Lecoufle's and Peyrot's photos with a text based on various notes and literature, although Lecoufle afterwards admitted that Bosser's corrections had not been included. Lecoufle had met Bosser through Peyrot and had helped identify many of the unnamed orchids brought back from Madagascar in the 1970s.

Jean Bosser died December 6, 2013, aged 91, having described no fewer than 131 orchid species, subspecies and varieties, and there are now eight orchids named for him. His treatment of the graminées of the Mascarenes was published posthumously in 2018.

He told his daughter Catherine that he had a good life as "I am lucky because I had a life among flowers," a fitting epithet for this self-effacing man who left such a huge botanical legacy.


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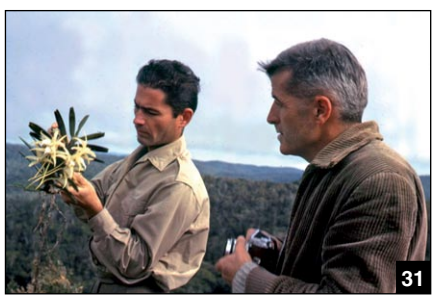
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References

Bernet, P. 2010. *Orchidées de la Réunion*. Naturae Amici éditions.

Bosser, J. 1956. *Considérations sur les Plantes de Couverture, Engrais Verts, Plantes Fourragères, en Pays Intertropicaux et plus Particuliérement à Madagascar*. Publications de l'I.R.S.M., hors sér., Tananarive-Tsimbazaza, Madagascar.

_. 1969. Graminées des Pâturages et des Cultures à Madagascar. *Mém. O.R.S.T.O.M.* 35:1–440.

Bosser, J. and Lecoufle, M. 2011. *Les Orchidées de Madagascar*. Biotope, Mèze, France.

Cadet, J. 1989. *Joyaux de nos Forêts: Les Orchidées de la Réunion*. Réunion

Du Puy, D., P. Cribb, J. Bosser, J. Hermans and C. Hermans. 1999. *The Orchids of Madagascar, Annotated Checklist and Annotated Bibliography.* Kew Publishing, Royal Botanic Gardens, Kew, United Kingdom.

Jacquet, P. 2007. Un Orchidologue Émérite Contemporain: Jean Bosser. *L'Orchidophile* 38(3):187–193.

Lecoufle, M. 2014. Jean-Marie Bosser. *L'Orchidée* 31(125):12.

Morat, P. 2007. Jean Bosser. *L'Orchidophile* 38(3):195–198.

Toilliez-Genoud, J. and J. Bosser. 1960a. Contribution à l'Étude des Orchidaceae de Madagascar I. Sur Trois Nouveaux *Angraecum*. *Naturaliste Malgache* 12:9–16.

_. 1960b. Contribution à l'Étude des Orchidaceae de Madagascar II. *Bulbophyllum rauhi,* Nouvelle Orchidée Malagache. *Naturaliste Malgache* 12:17–19.

Toilliez-Genoud, J., E. Ursch and J. Bosser. 1960. Contribution à l'Étude des *Aeranthes* de Madagascar. *Notul. Syst. (Paris)* 16:205–215.

Acknowledgments

We are most grateful to Francis Friedmann for checking our manuscript and for adding pertinent detail.

— Clare Hermans is chairman of the RHS Orchid Committee (email: clarejepson@btinternet.com). Johan Hermans an honorary research associate of the Royal Botanical Garden, Kew and vice-chairman of the RHS Orchid Committee (email: orchids1@btinternet.com). Catherine Boudier née Bosser, was born in Paris in 1950. She spent her childhood in Madagascar. She is an engineer in life sciences, and a retired lecturer.

robe in the eastern forest.

[30] Botanizing in Madagascar, on the Sambava to Andapa road in 1972 with Jean-Pierre Peyrot on the left, and guides. Photo courtesy of the Bosser family.

[31] Jean Bosser with Dr Coutrix holding a fine specimen of *Angraecum peyrotii*, a species described by Bosser and Peyrot in 1989. Photo J.-P. Peyrot, courtesy of the Bosser family.

[32] Jean Bosser in his office at the MNHN in Paris in 1998, holding the remnants of *Angraecum palmiforme* from La Réunion.

[33] At the meeting of the French Orchid So-

Quantitative Morphological Variation in the Orange and

Ida Hartvig, Simone Evans, Jason Ligon, Lauren Eserman, Emily Coffey and Melissa McCormick

ABSTRACT The orange and white fringed orchids in section *Blephariglottis* of *Platanthera* subg. *Blephariglottis* are among the showiest terrestrial orchids in the US. Still, frequent hybridization between closely related species can make field identification difficult, and differing perceptions of species boundaries challenge a common understanding of which taxa should be considered distinct entities. In order to evaluate species boundaries in the section, we explored quantitative morphological variation within and among taxa by assessing seven floral traits in populations of five species and three putative hybrids across the eastern US from Pennsylvania to Texas. We found that floral traits generally discriminated well among taxa, albeit with some overlap for closely related taxa. Two of the hybrids displayed traits intermediate to those of their parents, whereas the third could not be differentiated from one of its parents. The data revealed considerable intraspecific variation along a north–south gradient for some taxa, which could be related to adaptation to different pollinator faunas across the distribution area. We advocate that descriptions of species, subspecies and varieties should be based on quantitative data across distribution area to cover the breadth of intraspecific variation and avoid artificial splitting due to geographically limited sampling.

INTRODUCTION The high diversity and large number of orchid species are related to recent rapid radiation events with high speciation rates (Givnish et al., 2015), in some cases leading to large complexes of closely related taxa that can complicate species identification and challenge conservation efforts (Baguette et al. 2020, Fay 2016, Łobas et al. 2021). The ability of many orchids to hybridize and produce viable hybrid offspring that are able to reproduce independently as well as backcross to parent species (Bersweden et al. 2021, Mallet 2008) can further confuse species boundaries and create hybrid swarms or zones. Hybridization is not an uncommon mechanism of speciation in orchids or the broader plant kingdom (Brandrud et al. 2020, Rieseberg et al. 2006, Wettewa et al. 2020), and to some extent, hybrid taxa may be seen as examples of early speciation. For perfect morphological separation of species, variation within species should be smaller than the variation between species, displaying a "gap" in morphological variation (Mallet 2008). In species complexes with frequent and widespread hybridization and backcrossing, the reality may be a continuum of morphological variation rather than distinct entities (Sun et al. 2018). Plant taxonomy is traditionally qualitative in its species descriptions, and among orchid scientists, there can be a tendency to split species due to morphological variation at the subspecies level, a tendency well known for large colorful organisms (Galtier 2019). Often these splits are not adequately supported by data (e.g., Pedersen and Hedrén 2010), and can result in excessive naming (Geiger et al. 2020). The natural level of intraspecific variation, which is an inherent feature for wild plants and especially for widespread species, can often be misinterpreted. Morphometric analysis, the quantitative study of variation in morphological traits, is a valuable tool for exploring variation both within and among species (Cope et al. 2012) and could ultimately guide identification and delimitation of entities in orchid species complexes.

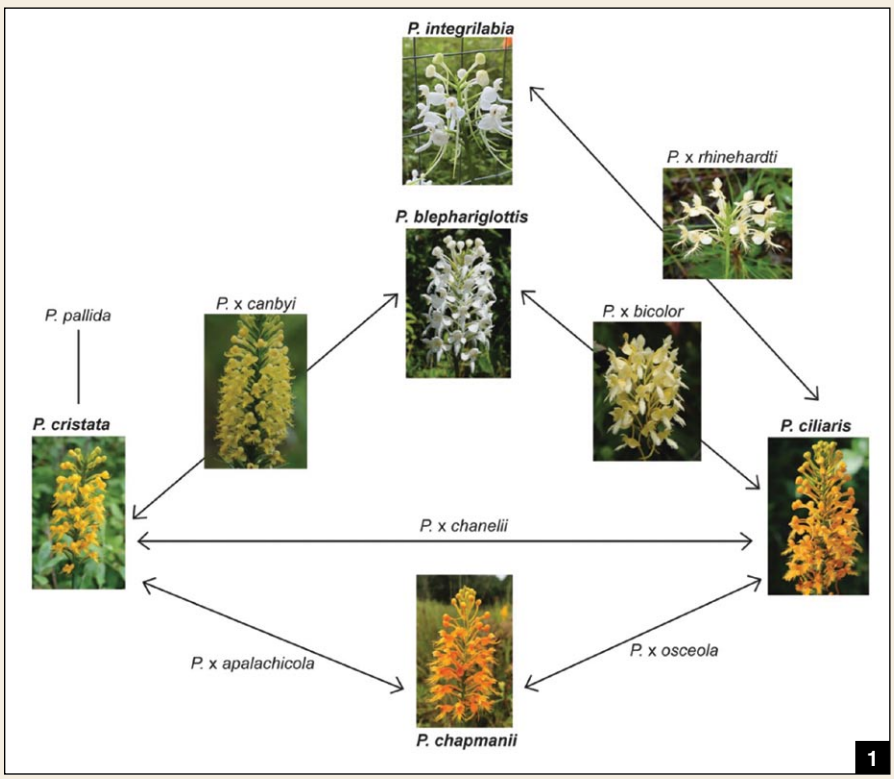
The large terrestrial orchid genus *Platanthera* contains several species complexes where species boundaries are difficult to determine and where reported hybridization blurs the picture further (Brown 2020, Pedersen and Lange 2021, Sheviak 2003, Wettewa et al. 2020). The species in subgenus *Blephariglottis* sect. *Blephariglottis* (Efimov 2016) are some of the most remarkable native orchid species in the northern US, with their showy white, yellow or orange inflorescences and heights up to 1 m for the tallest taxa. The White Fringed Orchid, *P. blephariglottis* (Willd.) Lindl, the Orange Fringed Orchid, *P. ciliaris* (L.) Lindl, and the smaller Crested Orange Bog Orchid, *P. cristata* (Michx.) Lindl, overlap broadly in the eastern United States from New England to Florida and as far west as Texas, with *P. ciliaris* being the most common of the three (Luer 1975, Sheviak 2003, USDA 2022). The White Fringeless Orchid *P. integrilabia* (Corr.) Luer has a much more restricted distribution, occurring from Virginia to Texas, and Chapman's Fringed Orchid *Platanthera chapmanii* (Small) Luer is only found in few localities, with a disjunct distribution in Florida, southern Georgia and Texas (Folsom 1995, Luer 1975, Sheviak 2003, USDA 2022). At localities where the species co-occur, morphologically intermediate individuals are not uncommon and hybridization has been described for almost any combination in the section (Brown 2020, Luer 1975), yet remains to be confirmed by genetic data. Reports of cross-pollination seed set and many observations of hybrids confirm that reproductive barriers among the described species are very porous. *Platanthera chapmanii* was previously described as a hybrid due to its intermediate appearance between two proposed parent species *P. ciliaris* and *P. cristata* (Brown 2020, Luer 1975). In 1995 it was promoted to species rank (Folsom 1995), warranted by the presence of distinct morphological features and independently reproducing populations in the absence of either parent species. The species is still considered to have arisen as a result of an older hybridization event between the suggested parents.

Within *P. blephariglottis*, two distinctive varieties have been described, a northern var. *blephariglottis* with smaller flowers with shorter spurs (approx. 15–26 mm) and a simply fringed lip, whereas the southern var. *conspicua* (Nash) Luer has larger flowers with longer spurs (>30 mm) and more elaborate fringes (Luer 1975, Sheviak 2003); however, the exact distribution and potential geographical overlap of the two varieties are not agreed upon (Brown 2002, Luer 1975, Sheviak

White Fringed Orchids (*Platanthera*) in the Eastern US

2003, USDA 2022). Brown (2002) argued that var. *conspicua* should be considered a distinct species, *P. conspicua,* and while the claim for species rank has not been adequately supported by data and is not acknowledged (KEW 2022), the name is to some extent used for any *P. blephariglottis* in the southeast. Brown (2002) also described a light colored *P. cristata* population on Long Island, NY as a distinct species, *P. pallida*, but there is uncertainty whether this is justifiable, as the variety, apart from color variation, appears to fall within the morphological variation observed across the distribution area of *P. cristata* (McGrath 2008, Sheviak 2003).

The similar morphology and reported hybridization between taxa in Sect. *Blephariglottis* indicate a shared pollinator fauna, which facilitates cross-pollination and gene flow in sympatric populations. While there are no common and range-wide investigations of pollinators across the section, several separate studies have identified butterflies, moths and bees as pollinators, consistent with the presence of spurs of variable lengths across the taxa. Primary pollinators reportedly vary among the species. However, species of swallowtail butterflies (*Papilio* spp.) have been observed as pollinators or visitors to all five species in the complex (Cole and Firmage 1984, Folsom 1995, Hapeman and Inoue 1997, Robertson and Wyatt 1990, Smith and Snow 1976, Zettler et al. 1996), which can explain hybridization events. Folsom (1995) argues that differences in spur length and column morphology between *P. ciliaris*, *P. chapmanii* and *P. cristata* lead to pollinia being deposited at different parts of the insect (Hapeman and Inoue 1997), thus keeping cross-pollinations a rare event and maintaining the integrity of the three taxa. This may be the case also for co-occurring *P. ciliaris* and *P. blephariglottis* (Smith and Snow 1976). With its much smaller flowers and shorter spurs, *P. cristata* is thought to be mainly pollinated by bees (Folsom 1995, Hapeman and Inoue 1997), which have also been noted as pollinators or visitors to *P. ciliaris* and *P. blephariglottis*



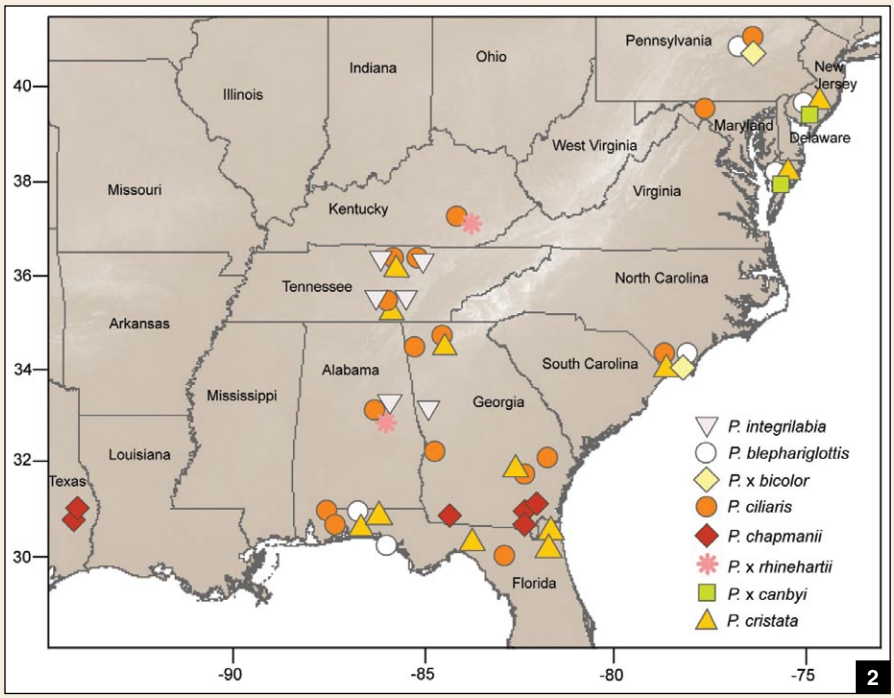
[1] Diagram of the relationship of focal taxa in *Platanthera* section *Blephariglottis* of subgenus *Blephariglottis* (Efimov 2016). Modified from Folsom (1995) and Brown (2020). Photo of *P.* x *rhinehartii* by Patrick Thompson, all others by the authors. Accepted species names in bold. *Platanthera* x *channelii*, *P.* x *apalachicola*, *P.* x *osceola* and *P. pallida* are not covered in this study. The proposed but not accepted species name *P. conspicua* (Brown 2002) and associated hybrids are not treated here.

(Smith and Snow 1976), and could explain cross pollination between these flowers of significantly different sizes. Floral adaptation to specific pollinators is a well-known speciation mechanism in the Orchidaceae, and despite overlap in pollination and evidence of cross-pollination ability, seems to be a plausible contributor to differentiation among the closely related species in Sect. *Blephariglottis*.

The level of morphological variation within and among species, combined with the presence of hybrids and potential backcrosses, can make it complicated to identify the taxa of Sect. *Blephariglottis* in the field, and a lack of documentation of variation within and among taxa hinders a proper assessment of newly proposed species and varieties. Incorrect field reports of threatened taxa and insufficient descriptions of species, subspecies and hybrids can create misleading perceptions of species distributions and species delimitation, and create confusion on which taxa require management. The objective in this study was to investigate and document morphological floral variation within and among taxa in the section using a set of quantitative traits that can be easily measured in the field by nonexperts, covering a broad geographical area where the taxa overlap (Figure 2), to improve the morphological definition of the taxa and improve detection of boundaries among

taxa. We measured floral morphology in populations of the five accepted species in the sections and included putative hybrid individuals as identified in the field by color intermediates, where available: *P.* x *bicolor* (Raf.) Luer from *P. ciliaris* and *P. blephariglottis* (Luer 1975), *P.* x *canbyi* (Ames) Luer from *P. cristata* and *P. blephariglottis*, and *P.* x *rhinehartii* C. Wilson *ex* P.M. Brown, which was recently reported as the hybrid between *P. ciliaris* and *P. integrilabia* (Brown 2020). Specifically, our aims were to (1) assess whether quantitative floral traits can reliably discriminate among accepted taxa in sect. *Blephariglottis*, including *P. chapmanii* as an independent species; (2) determine whether field-identified tentative hybrids possess floral traits intermediate in values from their respective putative parents and can be distinguished as hybrids; and (3) determine whether geographical variation in floral traits, including spur length, in primarily *P. blephariglottis*, warrants splitting into distinctive subspecies.

METHODS Fieldwork. We assessed morphological variation in flowers of individuals of *P. integrilabia*, *P. blephariglottis*, *P. ciliaris*, *P. chapmanii* and *P. cristata* in 45 localities from Pennsylvania to Texas, during flowering seasons in 2019, 2020 and 2021. Some localities had several of the species represented. In a few of these localities with sympatric occurrence, putative hybrids were identified (*P.* x *canbyi, P.* x *bicolor* and *P.* x *rhinehartii,* Figures 1 and 2) and measured as well. Hybrids were primarily identified by intermediate colors between parent species present at the localities, but color itself was not evaluated as a trait. We assessed two flowers each from a minimum of two individuals per population, where available. Measurements were conducted in the field to avoid removal of flowers and minimize disturbance of the plants. For a few populations, we took high-resolution photos of single flowers with a ruler for scaling and later used these for measurement of the traits using ImageJ (Schneider et al. 2012). We chose seven measurements that reflect floral traits used to discriminate among the species (Luer 1975, Sheviak 2003), could objectively and relatively easily be measured, and did not require expert knowledge. For these reasons, we did not assess variation in column and orifice shape. Measurements were conducted by the authors and by volunteers associated with Atlanta Botanical Garden and Smithsonian Environmental Research Center. We measured lip width (LW): broadest point of the labellum, including any fringes; lip length (LL; distance from the orifice to the labellum apex, including any fringes); lip with fringes (LWF; length of the fringed part of the labellum measured from the point of the labellum where the fringes appear to the labellum apex, including any fringes); longest fringe (LF; length of the longest lateral fringe segment from labellum body to segment apex [Robertson and Wyatt 1990]); spur length (SL; length of the spur when straightened); flower width (FW; maximum distance between the apexes of the lower sepals, measured across the open flower), and lastly, inflorescence width (IW; maximum length across the inflorescence from a dorsal view).



[2] Approximate locations of study populations of *Platanthera* across eastern United States. Background topographical map created with NASA SRTM data set as implemented in the raster package (Hijmans 2021, SRTM 2013).

Data analysis was conducted in R 4.1.2, using R base functions where no specific packages are mentioned. We used the MorphoTools (Koutecký 2015) functions to calculate mean and standard deviation of all measured traits for each taxon. In order to visualize how the combined traits were able to discriminate among the taxa, we conducted an individual level principle coordinate analysis as implemented in the MorphoTools and prcomp base function in R. We calculated Euclidean distances among all samples and conducted a permutated analysis of variance (permanova) to test for differences among taxa, using the adonis function in the vegan package in R (Oksanen et al. 2020). We then tested whether the dispersal in traits differed among taxa with the betadisper function. Both the adonis and betadisper functions were repeated on pairwise comparisons among taxa. The permanovas were performed with 9,999 permutations, implementing Benjamini-Hochberg corrections of *p*-values for multiple comparisons. To investigate whether the single traits differed among the taxa, we conducted Manova tests for each trait separately using the dplyr package in R (Wickham et al. 2021). We conducted factor analysis with two factors to identify which traits explained the most variation in the dataset.

To assess geographical variation in selected traits within taxa, we tested the linear correlation between the latitude of the surveyed populations and measurements of spur length (SL) and longest fringe (LF) using the lm function. We only did this for the four taxa for which the sampling had a large latitudinal span: *P. blephariglottis*, *P. ciliaris*, *P. cristata* and *P.* x *bicolor*.

RESULTS We measured 377 flowers across the eight selected *Platanthera* taxa, spanning 13 to 109 flowers per taxon, with measurements from *P. ciliaris* and *P. cristata* making up the majority of the data (Table 1). The populations of *P. blephariglottis*, *P. ciliaris* and *P. cristata*

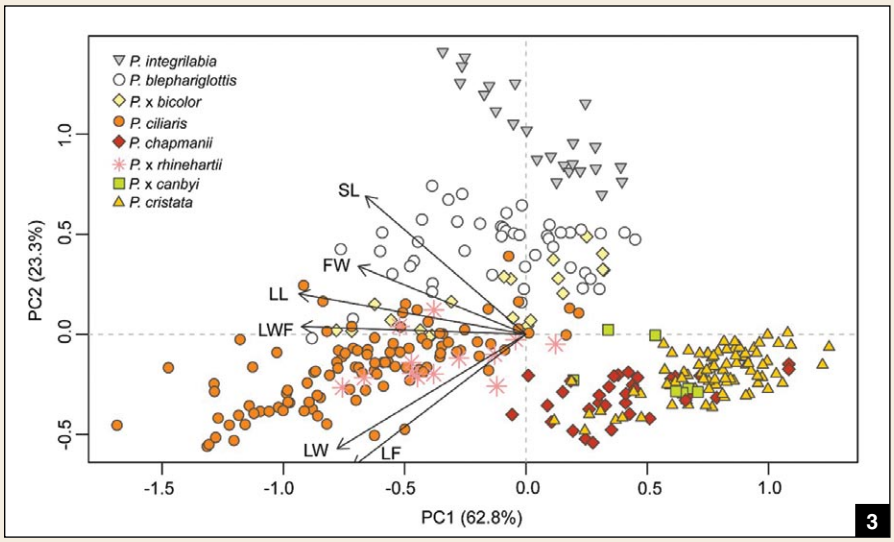
covered an area from Pennsylvania to northwestern Florida, while the study populations of *P. integrilabia* were from Tennessee, Georgia and Alabama, reflecting its more restricted distribution area. The sampling of *P. chapmanii* covered well its limited occurrences in Florida, Georgia and Texas (Sheviak 2003, USDA 2022). We only found the putative hybrids in a few localities for each, *P.* x *canbyi* in eastern shores of New Jersey and Maryland, *P.* x *bicolor* from central Pennsylvania and coastal North Carolina, and the tentative hybrid *P.* x *rhinehartii* in Kentucky and Alabama.

The eight taxa differed significantly in floral morphology (permanova on all traits combined, $p < 0.001$), and a PCA scatterplot generally grouped individuals according to their designated taxon, albeit with some overlap. The dispersal of trait values also differed among taxa ($p < 0.001$), mainly driven by less variation within *P. cristata* compared to the rest of the taxa (pairwise analyses and Figure 3). Pairwise comparisons showed that most species pairs differed significantly ($p < 0.01$), with the exception of *P.* x *rhinehartii*, which did not differ from *P. ciliaris*, *P. bicolor* or *P. blephariglottis*, and *P.* x *bicolor,* which was not significantly different from *P. blephariglottis* (results not shown).

With its long spur, large inflorescence and lack of fringes on the lip, *P. integrilabia* is the most morphologically distinct taxa in the complex (Table 1, Figure 3). *Plantanthera blephariglottis* and *P. ciliaris* are clearly differentiated species, differing most significantly in longest fringe, lip length and spur length (Table 1), but still share an overlap in traits (Figure 2). The individuals found in the trait overlapping zone between *P. ciliaris* and *P. blephariglottis* clusters were from both sympatric and allopatric populations. The overlap in trait values is thus at least partly due to true overlap in traits between the two species, although cryptic hybrids in mixed populations could also contribute to the pattern. *Platanthera cristata* has a distinct combination of traits compared to the larger-flowered group, but shows significant overlap with *P. chapmanii* (Table 1, Figure 3). The mean character values of the recently described *P. chapmanii* differ significantly from those of its proposed parent species, *P. cristata* and *P. ciliaris* (Table 1), with the exact values and the PCA scatterplot showing a closer resemblance to *P. cristata* than to *P. ciliaris*.

Hybrid *P.* x *bicolor* individuals have intermediate values of, for example, SL, LF and IW, between its presumed parent taxa, *P. blephariglottis* and *P. ciliaris*, and also appear in the overlap zone between these taxa on the PCA. The tentative hybrids of *P.* x *canbyi* likewise show mean values of SL, IW and LWF that are intermediate between the presumed parents, *P. cristata* and *P. blephariglottis*, but closer to *P. cristata*. Examination of the PCA plot shows that some individuals fall within the character space between the parents, while others fall within the variation observed within *P. cristata* (Figure 3). The tentative *P.* x *rhinehartii* hybrids all fall within the variation observed for *P. ciliaris* (Figures 3, 4), and none of the measured traits show any tendency to be skewed toward values observed for *P. integrilabia* (Table 1), for example, spur length or length of fringes.

Each of the measured floral traits was significantly different across the taxa ($p < 0.0001$ for all traits, MANOVA). The LL



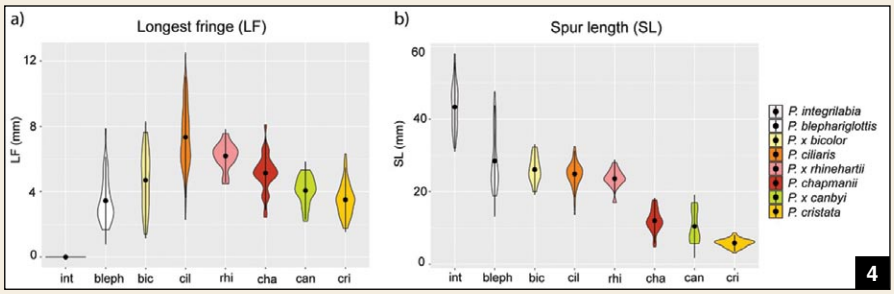
[3] Principal Component Analysis (PCA) scatterplot illustrating morphological variation among individuals across eight *Platanthera* taxa. Arrows represent morphological variables: SL, spur length; FW, flower width; LL, lip length; LWF, length of lip with fringes; LW, lip width; LF, longest fringe. See Methods section for details. Inflorescence width (IW) data is not included as it was not measured in *P.* x *rhinehartii*.

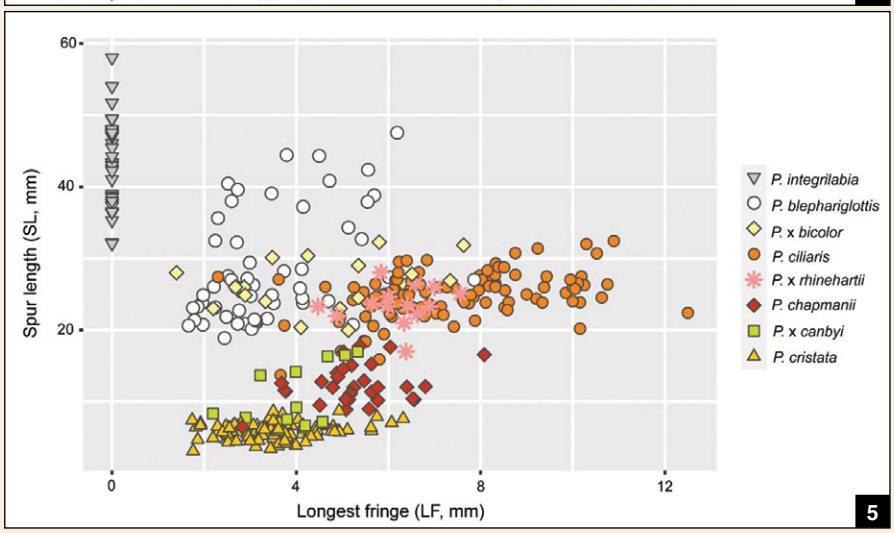
Table 1: Mean values ± standard deviation for seven floral traits in eight taxa of *Platanthera*. All measurements in mm. See Methods section for detailed description of measurement of traits. Inflorescence width was not measured in *P.* x *rhinehartii*.

Species	# flowers measured (# pops)	Lip width (LW)	Lip length (LL)	Lip with fringe (LWF)	Longest fringe (LF)	Spur length (SL)	Flower width (FW)	Infl. width (IW)
integrilabia	35 (7)	3.2 ± 0.9	14.2 ± 1.4	NA	0.0 ± 0.0	43.3 ± 6.1	8.7 ± 4.2	60.2 ± 6.7
blephariglottis	55 (9)	6.2 ± 1.6	11.5 ± 2.1	9.4 ± 1.9	3.4 ± 1.3	28.5 ± 7.6	12.5 ± 1.7	54.7 ± 11.9
× *bicolor*	20 (2)	7.6 ± 1.9	11.4 ± 2.1	9.6 ± 1.9	4.7 ± 1.8	26.1 ± 3.5	10.8 ± 1.4	57.3 ± 10.0
ciliaris	109 (18)	11.7 ± 2.8	14.2 ± 2.2	12.1 ± 2.0	7.3 ± 1.9	24.9 ± 3.2	11.2 ± 1.9	62.7 ± 10.9
× *rhinehartii*	15 (2)	10.4 ± 2.3	12.1 ± 1.6	10.9 ± 1.5	6.2 ± 0.8	23.6 ± 2.6	10.1 ± 1.7	NA
chapmanii	34 (6)	8.1 ± 1.5	7.5 ± 1.6	7.9 ± 1.7	5.1 ± 1.1	12.0 ± 3.1	5.9 ± 1.3	41.7 ± 7.6
× *canbyi*	13 (2)	7.3 ± 1.9	7.0 ± 1.6	6.7 ± 1.2	4.0 ± 0.9	10.5 ± 4.3	8.7 ± 2.0	31.6 ± 3.1
cristata	96 (15)	5.9 ± 1.5	6.0 ± 1.1	5.2 ± 1.5	3.5 ± 1.0	5.9 ± 1.1	7.1 ± 1.3	28.2 ± 4.5

and IW traits as representatives of size differences in flowers and inflorescences, separated the smaller-flowed taxa *P. cristata*, *P.* x *canbyi* and *P. chapmanii* from the other five larger-flowered taxa (Table 1, Figure 3). Spur length showed the greatest variation among taxa, with mean values from 5.9 mm in *P. cristata* to 43.3 mm in *P. integrilabia* (Table 1, Figure 4). We also observed considerable variation in length of fringes, varying from none and little in *P. integrilabia* and *P. blephariglottis*, respectively, short fringes in *P. cristata* and *P. canbyi*, and longest fringes in *P. ciliaris* (Table 1, Figure 4). Factor analysis with two factors showed that SL had the best correlation with the first factor explaining the dataset (0.98), and as second factor, LF had the highest correlation (0.96), indicating that these two traits, combined, explained the majority of the variation in a two-dimensional system. A plot using these two traits alone improves discrimination among *P. chapmanii* and its proposed parents (Figure 5), but shows more overlap between *P. ciliaris* and *P. blephariglottis*, indicating that the defining traits differ between species comparisons.

We observed considerable variation of the traits within each taxon, particularly within *P. ciliaris* and *P. blephariglottis*, and less variation within *P. cristata* (Figures 3 and 4). The intraspecific variation in *P. blephariglottis* and *P. ciliaris* was significantly correlated with latitude of the sampled population (Figure 6), such that individuals in the south of the sampling area had longer spurs, lips and fringes, and larger inflorescences than in the northern part of the sampling area. The variation in *P.* x *bicolor* showed the same trend, but nonsignificant, likely due to smaller number of samples and fewer populations. The picture was somewhat different for *P. cristata*, which also showed a trend for larger inflorescences in the south, but no significant effects on spur length and lip length, and the opposite trend for fringes, with shorter fringes in the south (Figure 6). Traits also varied within populations of the same species, exemplified by spur length variations in populations of *P. blephariglottis* (Figure 7), which shows both large variation in the trait within populations, and relatively continuous variation along the north–south gradient.





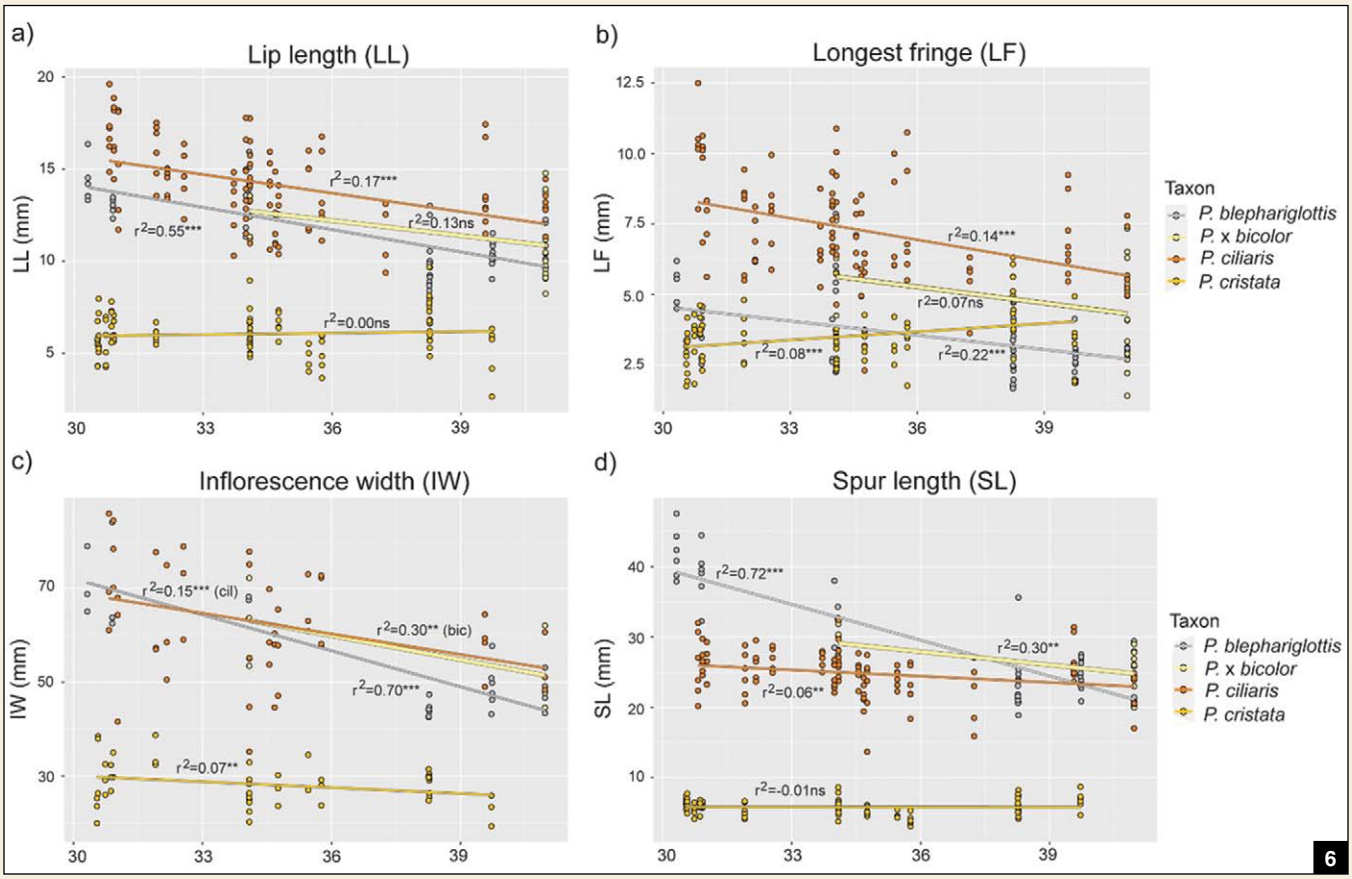
[4] Variation in two representative morphological traits, longest fringe and spur length, within and among eight *Platanthera* taxa in section *Blephariglottis*. Dots represent mean values, vertical bars represent ±1 SD.

[5] Separation of eight *Platanthera* taxa using only two floral traits, longest fringe and spur length.

DISCUSSION Accurate field identification of closely related orchids is critical for estimating species distributions, conducting surveys of protected species and broadly for understanding evolutionary patterns in species complexes. In this study, we tested whether a limited number of quantitative traits that can be assessed by nonexperts are able to discriminate among closely related species of white and orange fringed *Platanthera* orchids in eastern US and also aid in the identification of putative hybrids that are frequently reported in the group.

Quantitative floral traits can ease identification of fringed orchids and reveal differences in intraspecific variation

We chose a limited number of quantitative floral traits for easier standardization of data and comparison among taxa, and did not evaluate other traits, like color or column shape, that have been applied as diagnostic traits (Folsom 1995, Sheviak 2003). Despite this limitation, we achieved a reasonable level of discrimination among taxa (Figure 2), showing that the chosen traits are quite efficient as quantitative field identification tools for nonexperts. Specifically, we found that a combination of only two floral traits, spur length and length of fringes, can be used as a quick and approximate identification method to distinguish among the five species-level taxa in sect. *Blephariglottis* of *Platanthera* (Figure 5). The observed overlap in character values is not unexpected given that the species are closely related, and also highlight that exact values used in determination keys often do not reflect the entire variation observed in a species across its distribution area. The large intraspecific variation in *P. ciliaris* and *P. blephariglottis* compared to *P. integrilabia* likely relates to their larger distribution areas and thus assumed higher number of populations and larger overall population size, where *P. integrilabia* has a much more restricted distribution area and an overall smaller population size. The lower degree of variation in *P. cristata* could be an artifact of smaller overall size in this taxon, compared to others in the section, but the lack of latitudinal trends (Figure 6) corroborates that this species is narrower and more well defined than the larger ones. Our data support the distinct nature of *P. chapmanii,* even without considering its diagnostic character, the downward curved rostellum lobes (Folsom 1995). Considering only spur length and length of longest fringe (Figure 5), the species



[6] Variation along latitude in four floral traits for *P. blephariglottis*, *P.* x *bicolor, P. ciliaris* and *P. cristata*, respectively. (a) Lip length, (b) Longest fringe, (c) Inflorescence width and (d) Spur length. Adjusted squared regression coefficients (r^2) included for each regression line, ***: $p <$ 0.0001, **$p < 0.01$, ns: not significant.

falls nicely intermediate between its proposed parent species, *P. ciliaris* and *P. cristata*. It is, however, important to note that we did not sample the extant hybrid between *P. cristata* and *P. ciliaris*; *P.* x *channelii*, which would assumedly be difficult to distinguish from *P. chapmanii* without considering shape of rostellum lobes. The data in this study fit with *P. chapmanii*'s hypothesized origin as a hybrid that eventually developed into a species with distinct rostellum characters that largely prevent cross-pollination with each of its putative parents (Folsom 1995). *Platanthera chapmanii*, though, appear morphologically closer to *P. cristata*, when considering all traits as well as the specific rostellum shape (see Folsom 1995). An alternative hypothesis of its origin could be that *P. chapmanii* developed from a sub-pool of *P. cristata*, or at least from a hybrid gene pool more dominated by *P. cristata* than *P. ciliaris*, before diverging into its distinct lineage. The ultimate evaluation of the hybrid hypothesis will depend on comparative genetic and genomic investigation of all three taxa, which is ongoing, but extant hybridization may complicate the situation further.

Hybrids have floral characters that are intermediate between putative parents species

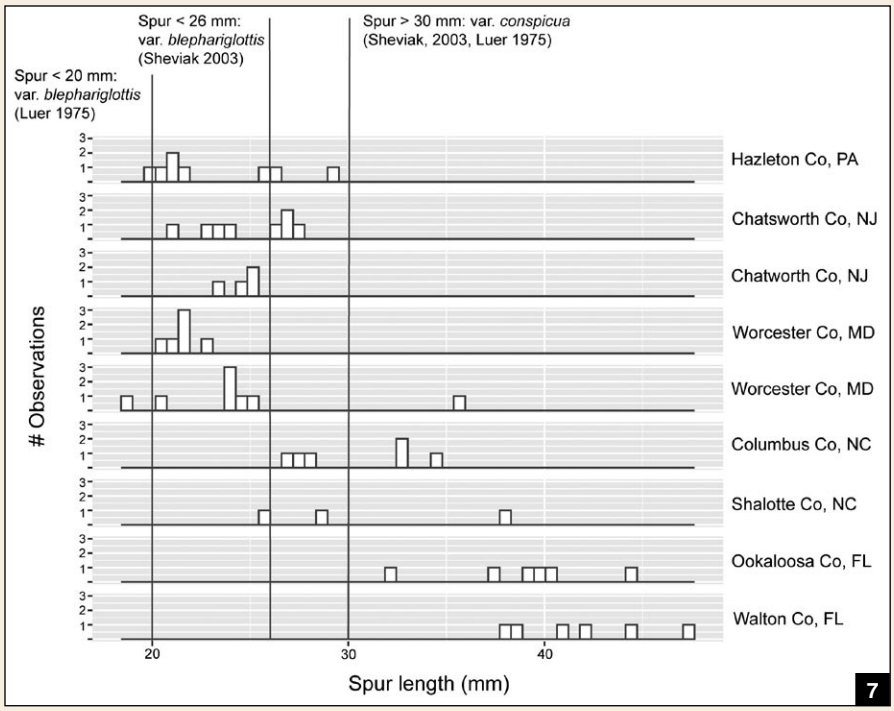
While hybrids in the section are quite frequently reported in the literature, they are somewhat uncommon to witness in the field. The sampling of putative hybrids was rather limited in this study, and only covers two localities each for *P.* x *bicolor*, *P.* x *canbyi* and *P.* x *rhinehartii*. The sampling thus might not be representative of hybridization across the distribution area. The available data set suggests that while hybrids display floral trait values that are intermediate between parent species, some putative hybrids seem to display values that fall within the morphological variation of their parent species. We speculate that these putative *P.* x *canbyi* and *P.* x *bicolor* hybrids that group with individuals from one parent, could either represent the result of backcrossing between first generation hybrids and the parent species, or be color variants and not true hybrids. As the *P.* x *canbyi* and *P.* x *bicolor* were sampled from populations that also contained putative hybrids that were intermediate between the parent species, we consider it most likely that these individuals were the result of backcrossing. A definite confirmation of hybrid status of such individuals as well as those more clearly displaying intermediate values is awaiting the ongoing genomic studies. We observed a hybrid seed set comparable to that of parent species, suggesting that backcrossing is frequent, although we do not know about potential post zygotic barriers.

The putative *P.* × *rhinehartii* individuals in both Alabama and Kentucky were, as for the other hybrids, identified by intermediate color between assumed parents. Based on the traits measured here, though, there is no morphological evidence that confirms these specimens as hybrids between *P. ciliaris* and *P. integrilabia*, as the variation fell completely within the variation expressed by *P. ciliaris*. The most distinct traits from *P. integrilabia*, a long spur and lack of fringes, were not apparent in the presumed hybrids. As the other hybrids in the complex generally expressed values approximately intermediate between parents, one would expect segregation of these traits in first generation hybrids between *P. integrilabia* and *P. ciliaris* to

behave similarly. Thus for these particular individuals we cannot confirm their proposed hybrid status as *P.* x *rhinehartii*. We consider it more likely that they are color variants of *P. ciliaris*, or potentially the result of several generations of backcrosses, in which only the color is retained. However, our ongoing genetic assessment of these samples will reveal whether there is hybridization in the background of these samples.

Continuous variation in floral traits along a north south gradient does not warrant splitting P. blephariglottis *into distinct subspecies and indicates common adaptation to pollinators*

Our data confirm the high level of intraspecific variation in morphological traits such as spur length and fringe length described for *P. blephariglottis* across its distribution area (Sheviak 2003). The variation appears continuous across the north–south gradient, and is also considerable within populations, in some cases overlapping with values described for both varieties (<20–25 mm for variety *blephariglottis* and >30 mm for the southern variety *conspicua,* Figure 7*).* Our data thus do not support the division of *P. blephariglottis* into two distinct taxa, and certainly not the species rank suggested by Brown (2002). More data from both the northern part of the distribution area (e.g., in the Great Lakes area and eastern Canada) would be informative, as the current sampling does not seem to cover the variation in spur length described for var. *blephariglottis* by Luer (1975). Sheviak (2003) acknowledged that characters vary within and between varieties, but considered spur length to be the discriminating factor dividing the two varieties, as far as it might reflect adaptation to different pollinators. If true subspecies do coexist, and retain reproductive barriers by being adapted to different pollinators at the same localities, a genomic analysis would reveal whether relatively long- and short-spurred individuals at the same locality represent separately breeding entities, but with the available data the most plausible explanation seems to be that variation is considerable within populations, and along a north–south gradient, and rigid distinction into short- and long-spurred variants is not warranted. With this level of variation documented, discussing the geographic extent of each variety also becomes superfluous. Interestingly, a similar situation exists in the widespread Eurasian *Platanthera bifolia*, where long and short spurred varieties correlate with



[7] Variation in spur length within and among populations of *P. blephariglottis*, ordered from north to south. Lines indicate separation into intraspecific varieties as described by Sheviak (2003) and Luer (1975).

differences in pollinator fauna, and also have different distribution areas (Boberg et al. 2013; Pedersen and Lange 2021). As is the case with *P. blephariglottis*, there is considerable overlap between the *P. bifolia* varieties in the defining characters, which does not support the separation into subspecies, but only variants with a considerable degree of overlap (Pedersen and Lange 2021).

The observed correlation between spur length and latitude in *P. blephariglottis* and *P. ciliaris* could be related to a slightly different pollinator fauna in the different regions of the distribution area, as pollination ecotypes with differing spur lengths have been described for *P. ciliaris* (Robertson and Wyatt 1990). It seems plausible that floral morphological differentiation in the complex is related to adaptation to different pollinators, as described in Folsom (1995) and Smith and Snow (1976), and common trends in floral traits across species could represent a convergent adaptation to shifting pollinator faunas across the distribution area. The same trends in floral traits were not found in *P. cristata*, which may be due to different primary pollinators than the morphologically similar *P. blephariglottis* and *P. ciliaris*. If *P. cristata* is primarily pollinated by bees throughout the distribution area, as suggested (Folsom 1995), it might experience less variation in pollinator morphology across the distribution area than *P. ciliaris* and *P. blephariglottis*, which may be responding to butterfly species with variable proboscis lengths. Whether the pattern found in *P. blephariglottis* and *P. ciliaris* could eventually lead to speciation of distinct long- and short-spurred variants will depend on the strength of selection for differing spur length relative to amount of gene flow among sites with differing pollinator fauna.

Part of the observed variation could also be an effect of size of the plants. It appears that both individual flowers and inflorescences are generally larger in the southern part of the sampling area, as measures of IW, LL and SL also increased with decreasing latitude, potentially reflecting more favorable growing conditions supporting larger individuals

CONCLUSIONS While we acknowledge that the morphological traits investigated in this study do not cover several traits described to be discriminating among the taxa, such as shape of column and orifice, we advocate that a quantitative approach to morphological variation as used here is needed to adequately evaluate species descriptions and delimitations. We demonstrate that several morphological traits vary considerably with geography, which shows that range-wide variation

needs to be taken into account when delineating species, and that broad variation within a species does not always warrant division into subspecies if the variation is continuous. This study highlights the need for continuous sampling on a geographic scale to minimize false detection of distinct taxa. A final evaluation of hybrid status and intraspecific varieties will depend on data from ongoing genomic studies, which will give a clearer pattern of hybridization events and species boundaries, as well as how genetic composition corresponds to the morphological variation in the section.

Acknowledgments

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References

Baguette, M., J.A.M Bertrand, V.M. Stevens, and B. Schatz. 2020. Why Are There so Many Bee-Orchid Species? Adaptive Radiation by Intra-Specific Competition for Mnesic Pollinators. *Biological Reviews* 95(6):1630–1663. doi:10.1111/brv.12633

Bersweden, L., J. Viruel, B. Schatz, J. Harland, R. Gargiulo, R.S. Cowan, J. Calevo, A. Juan, J.J. Clarkson, A.R. Leitch, and M.F. Fay. 2021. Microsatellites and Petal Morphology Reveal New Patterns of Admixture in Orchis Hybrid Zones. *American Journal of Botany* 108(8):1388–1404. doi:10.1002/ajb2.1710

Boberg, E., R. Alexandersson, M. Jonsson, J. Maad, J. Ågren, and L.A. Nilsson. 2013. Pollinator Shifts and the Evolution of Spur Length in the Moth-Pollinated Orchid *Platanthera bifolia*. *Annals of Botany* 113(2):267–275. doi:10.1093/aob/mct217

Brandrud, M.K., J. Baar, M.T. Lorenzo, A. Athanasiadis, R. Bateman, M.W. Chase, M. Hedren, and O. Paun. 2020. Phylogenomic Relationships of Diploids and the Origins of Allotetraploids in Dactylorhiza (Orchidaceae). *Systematic Biology* 69(1):91–109. doi:10.1093/sysbio/syz035

Brown, P. 2002. Revalidation of *Platanthera conspicua*, the Southern White Fringed Orchis. *North American Native Orchid Journal* 8:3–9.

Brown, P. 2020. North American Orchid Hybrids — Fascinating or Frustrating? *McAllen International Orchid Society Journal* 21(2):2–24.

Cole, F.R. and D.H. Firmage. 1984. The Floral Ecology of Platanthera-Blephariglottis. *American Journal of Botany* 71(5):700–710. doi:10.2307/2443367

Cope, J. S., D. Corney, J.Y. Clark, P. Remagnino, and P. Wilkin. 2012. Plant Species Identification Using Digital Morphometrics: A Review. *Expert Systems with Applications* 39(8):7562–7573. doi:10.1016/j.eswa.2012.01.073

Efimov, P.G. 2016. A Revision of Platanthera (Orchidaceae; Orchidoideae; Orchideae) in Asia. *Phytotaxa* 254(1):1–233. doi:10.11646/phytotaxa.254.1.1

Fay, M.F. 2016. Orchid Conservation: Further Links. *Annals of Botany* 118(1):89–91. doi:10.1093/aob/mcw147

Folsom, J. 1995. The Real Identity of *Platanthera chapmanii*. *North American Native Orchid Journal* 1(3):211–238.

Galtier, N. 2019. Delineating Species in the Speciation Continuum: A Proposal. *Evolutionary Applications* 12(4):657–663. doi:10.1111/eva.12748

Geiger, D.L., B.J. Crain, M.K. McCormick, and D.F. Whigham. 2020. Studies on Oberonia 7: Ten New Synonyms of *Oberonia equitans* (G. Forst.) Mutel Indicated by Morphology and Molecular Phylogeny. *Lindleyana* 89(8):656–667.

Givnish, T.J., D. Spalink, M. Ames, S.P. Lyon, S.J. Hunter, A. Zuluaga, W.J.D. Iles, M.A. Clements, M.T.K. Arroyo, J. Leebens-Mack, L. Endara, R. Kriebel, K.M. Neubig, W.M. Whitten, N.H. Williams, and K.M. Cameron. 2015. Orchid Phylogenomics and Multiple Drivers of Their Extraordinary Diversification. *Proceedings of the Royal Society B–Biological Sciences* 282(1814):171–180. doi:10.1098/rspb.2015.1553

Hapeman, J.R. and K. Inoue. 1997. Floral Diversification, Pollination Biology, and Molecular Evolution in *Platanthera* (Orchidaceae). *In:* T.J. Givnish and K. Sytsma, editors. *Molecular Evolution and Adaptive Radiation*. Cambridge University Press, Cambridge, UK. p. 433–454.

Hijmans, R. 2021. raster: Geographic Data Analysis and Modeling. R package version 3.5-2. https://CRAN.R-project.org/package=raster.

KEW. 2022. *Plants of the World Online*. https://powo.science.kew.org/. Royal Botanic Gardens, Kew, UK. Accessed March, 2022.

Koutecký, P. 2015. MorphoTools: A Set of R Functions for Morphometric Analysis. *Plant Systematics and Evolution* 301(4):1115–1121. doi:10.1007/s00606-014-1153-2

Łobas, Z., A. Khapugin, E. Żołubak, and A. Jakubska-Busse. 2021. The *Epipactis helleborine* Group (Orchidaceae): An Overview of Recent Taxonomic Changes, with an Updated List of Currently Accepted Taxa. *Plants (Basel)* 10(9):1839.

Luer, C. 1975. *The Native Orchids of the United States and Canada*. New York Botanical Garden, Bronx, New York.

Mallet, J. 2008. Hybridization, Ecological Races and the Nature of Species: Empirical Evidence for the Ease of Speciation. *Philosophical Transactions of the Royal Society B–Biological Sciences* 363(1506):2971–2986. doi:10.1098/rstb.2008.0081

McGrath, R. 2008. Contributions to the Status and Morphology of *Platanthera pallida*, Pale Fringed Orchis. *Long Island Botanical Society 18*(1):1, 3–6.

Oksanen, J., F. Blanchet, M. Friendly, R. Kindt, P. Legendre, D. McGlinn, P.R. Minchin, R.B. O'Hara, G.L. Simpson, P. Solymos, M.H.H. Stevens, E. Szoecs, and H. Wagner. 2020. vegan: Community Ecology Package. R package version 2.5-7. https://CRAN.R-project.org/package=vegan.

Pedersen, H.Æ. and M. Hedrén. 2010. On the Distinction of *Dactylorhiza baltica* and *D. pardalina* (Orchidaceae) and the Systematic Affinities of Geographically Intermediate Populations. *Nordic Journal of Botany* 28(1):1–12. doi:10.1111/j.1756-1051.2009.00450.x

Pedersen, H.Æ. and C.B.A. Lange. 2021. Biosystematics of *Platanthera bifolia* s.l. (Orchidaceae): Inferences from Analysis of Scandinavian Population Samples. *Nordic Journal of Botany* 39(10):XXX–XXX. doi:10.1111/njb.03199

Rieseberg, L.H., T.E. Wood, and E.J. Baack. 2006. The Nature of Plant Species. *Nature* 440(7083):524–527. doi:10.1038/nature04402

Robertson, J.L. and R. Wyatt. 1990. Evidence for Pollination Ecotypes in the Yellow-Fringed Orchid, *Platanthera ciliaris*. *Evolution* 44(1):121–133. doi:10.1111/j.1558-5646.1990.tb04283.x

Schneider, C.A., W.S. Rasband, W. S., and K.W. Eliceiri. 2012. NIH Image to ImageJ: 25 years of Image Analysis. *Nature Methods* 9(7):671–675. doi:10.1038/nmeth.2089

Sheviak, C. 2003. Platanthera. *In:* Flora of North America Editorial Committee, editors. *Flora of North America North of Mexico*, Vol. 26: Magnoliophyta: Liliidae: Liliales and Orchidales. Oxford University Press, New York. p. 551–571.

Smith, G. and G. Snow. 1976. Pollination Ecology of *Platanthera* (Habenaria) *ciliaris* and *P. blephariglottis* (Orchidaceae). *Botanical Gazette* 137(2):133–140.

SRTM. 2013. *Shuttle Radar Topography Mission (SRTM) Global*. Retrieved from: https://doi.org/10.5069/G9445JDF

Sun, Y.S., R.J. Abbott, Z.Q. Lu, K.S. Mao, L. Zhang, X.J. Wang, D.F. Ru, and J.Q. Liu. 2018. Reticulate Evolution Within a Spruce (Picea) Species Complex Revealed by Population Genomic Analysis. *Evolution* 72(12):2669–2681. doi:10.1111/evo.13624

USDA. 2022. The PLANTS Database. United States Department of Agriculture, Natural Resources Conservation Service. Retrieved from http://plants.usda.gov.

Wettewa, E., N. Bailey, and L.E. Wallace. 2020. Comparative Analysis of Genetic and Morphological Variation within the *Platanthera hyperborea* Complex (Orchidaceae). *Systematic Botany* 45(4):767–778. doi:10.1600/036364420x16033962925303

Wickham, H., R. François, L. Henry, and K. Müller. 2021. dplyr: A Grammar of Data Manipulation. R package version 1.0.7. https://CRAN.R-project.org/package=dplyr.

Zettler, L., N. Ahuja, and T.J. McInnis. 1996. Insect Pollination of the Endangered Monkey-face Orchid (*Platanthera integrilabia*) in McMinn County, Tennessee — One Last Glimpse of a Once Common Spectacle. *Castanea* 61(1):14–24.

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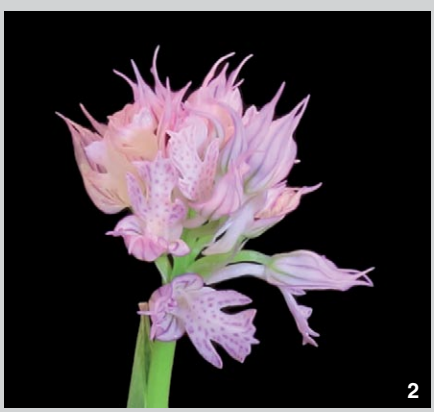
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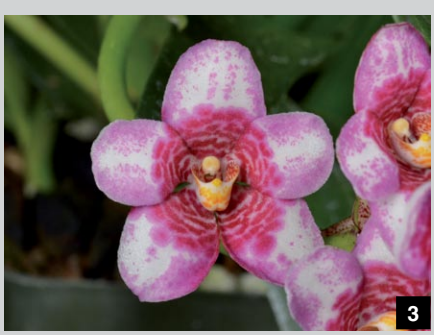
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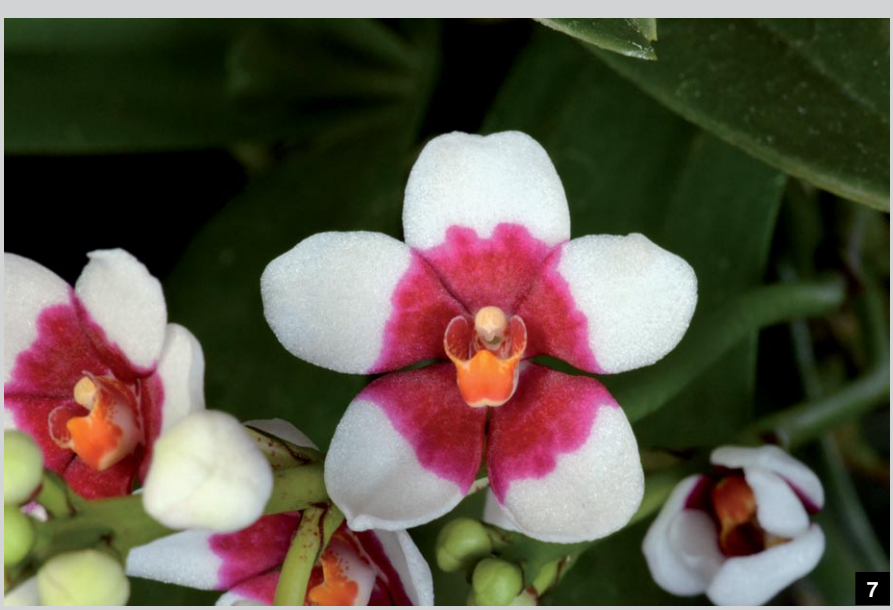
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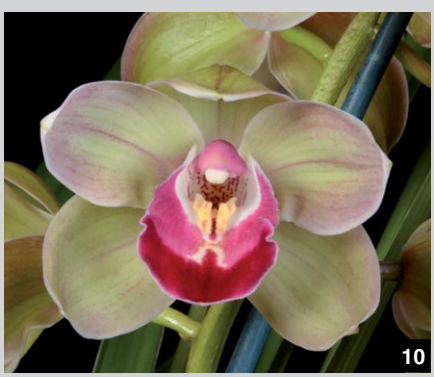
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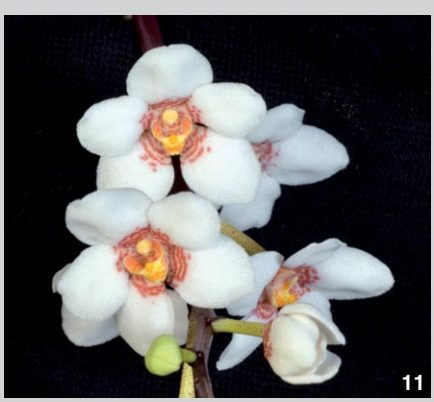
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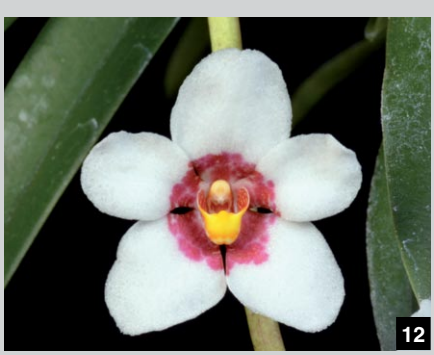
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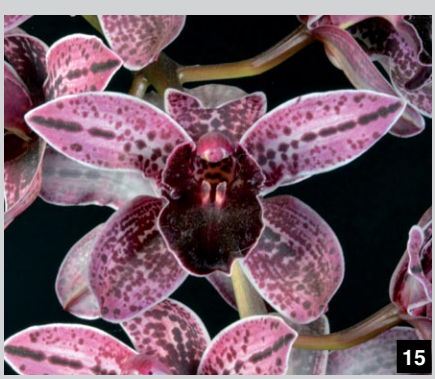
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[1] *Bulbophyllum purpureorhachis* 'Leaping Lizards' HCC/AOS 78 pts. Exhibitor: Nathan Bell; Photographer: Matthew Nutt. Mid-America Judging

[2] *Neotinea tridentata* 'Neptune' CBR/AOS. Exhibitor: Doug and Beth Martin; Photographer: Matthew Nutt. Mid-America Judging

[3] *Sarcochilus* Kulnura Warmer 'Gracie' AM/AOS (Rosella x Kulnura Sweetie) 82 pts. Exhibitor: Amy and Ken Jacobsen; Photographer: Chaunie Langland. Pacific Central Judging

[4] *Neotinea ustulata* 'Burnt Ends' CBR/AOS. Exhibitor: Doug and Beth Martin; Photographer: Steve Marak. Mid-America Judging

[5] *Dendrobium jenkinsii* 'Windy Hill's Sunball' CCM/AOS 82 pts. Exhibitor: Marilyn LeDoux; Photographer: Matthew Nutt. Mid-America Judging

[6] *Cattleya* Maui Springtime 'Joeboy' HCC/AOS (Irene Finney [1964] x Sierra Doll) 78 pts. Exhibitor: Kathy Barrett; Photographer: Chaunie Langland. Pacific Central Judging

[7] *Sarcochilus* Kulnura Treasure 'Bentley' HCC/AOS (Kulnura Dragonfly x Kulnura Festival) 76 pts. Exhibitor: Amy and Ken Jacobsen; Photographer: Chaunie Langland. Pacific Central Judging

[8] *Cymbidium* Hazel's Dragon AQ/AOS (Hazel Tyers 'Santa Maria' x Satin Dragon 'Cinnabar'). Exhibitor: Weegie Caughlan; Photographer: Ken Jacobsen. Pacific Central Judging

[9] *Cymbidium* Hazel's Dragon 'Rose Cloud' HCC/AOS (Hazel Tyers x Satin Dragon) 75 pts. Exhibitor: Weegie Caughlan; Photographer: Chaunie Langland. Pacific Central Judging

[10] *Cymbidium* Hazel's Dragon 'Cinnabar' AM/AOS (Hazel Tyers x Satin Dragon) 80 pts. Exhibitor: Weegie Caughlan; Photographer: a Langland. Pacific Central Judging

[11] *Sarcochilus* Baika 'Mume' HCC/AOS (Royale Red x Camira) 77 pts. Exhibitor: Japheth Ko; Photographer: Chaunie Langland. Pacific Central Judging

[12] *Sarcochilus* Kulnura Arya 'Gracie' AM/AOS (Iris x Kulnura Sanctuary) 83 pts. Exhibitor: Amy and Ken Jacobsen; Photographer: Chaunie Langland. Pacific Central Judging

[13] *Cymbidium* Hazel's Dragon 'Magic Rainbow' HCC/AOS (Hazel Tyers x Satin Dragon) 78 pts. Exhibitor: Weegie Caughlan; Photographer: Chaunie Langland. Pacific Central Judging

[14] *Lycaste* Rakuhoku 'Third Time's the Charm' AM/AOS (Auburn x Shoalhaven) 80 pts. Exhibitor: Japheth Ko; Photographer: Chaunie Langland. Pacific Central Judging

[15] *Cymbidium* Dancing Spots 'Elkhorn' AM/AOS (First Dance x Shanghai Spots) 83 pts. Exhibitor: Robert A. (Andy) Cameron; Photographer: Chaunie Langland. Pacific Central Judging

[16] *Sarcochilus* Kulnura Twist 'Gracie' AM/AOS (Kulnura Rusty x Kulnura Firemist) 81 pts. Exhibitor: Amy and Ken Jacobsen; Photographer: Chaunie Langland. Pacific Central Judging


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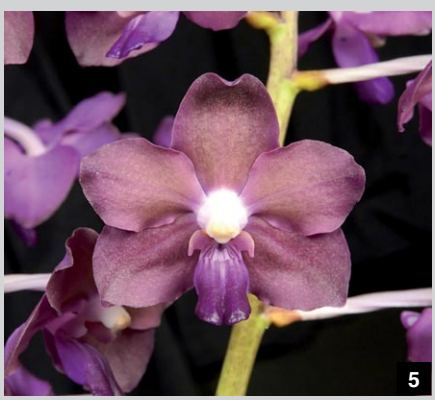
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[1] *Cymbidium* Jacqueline Hatfield 'Elegant' HCC/AOS (David Teuschler x Memoria Amelia Earhart) 78 pts. Exhibitor: Hatfield Orchids; Photographer: Jim Sloniker. Pacific South Judging

[2] *Cattleya* MJ Quintal 'Springwater' HCC/AOS (*nobilior* x *praestans*) 76 pts. Exhibitor: Springwater Orchids and Thanh Nguyen; Photographer: Wes Newton. Florida North-Central Judging

[3] *Cattleya violacea* (Flamea) 'Winter Haven' HCC/AOS 79 pts. Exhibitor: Keith and Dina Emig - Winter Haven Orchid Nursery; Photographer: Wes Newton. Florida North-Central Judging

[4] *Vandachostylis* Orchidkraft's Sapphira 'Ponkan' AM/AOS (Sasicha x *Vanda tessellata*) 81 pts. Exhibitor: Krull-Smith; Photographer: Wes Newton. Florida North-Central Judging

[5] *Vandachostylis* Orchidkraft's Sapphira 'Krull-Smith' AM/AOS (Sasicha x *Vanda tessellata*) 83 pts. Exhibitor: Krull-Smith; Photographer: Wes Newton. Florida North-Central Judging

[6] *Cymbidium* Conni Ferrusi 'Lemonade League' AM/AOS (Via con Dios x Memoria Dick Swain) 82 pts. Exhibitor: George Hatfield Orchids; Photographer: Jim Sloniker. Pacific South Judging

[7] *Cattleya pygmaea* 'Tiny Button' AM/AOS 83 pts. Exhibitor: Kelly McCracken; Photographer: Mark Van der Woerd. Rocky Mountain Judging

[8] *Dendrobium* Chocolate Antlers 'Julio David' AM/AOS (*gouldii* x *tangerinum*) 83 pts. Exhibitor: Julio David Rios; Photographer: Julio D. Rios. Puerto Rico Judging

[9] *Cymbidium* Golden Elf 'Machiavelli' AM/AOS (*ensifolium* x Enid Haupt) 80 pts. Exhibitor: René E. Garcia; Photographer: Julio D. Rios. Puerto Rico Judging

[10] *Cattleya* Fran's Fuchsia Flash 'HDO Pink' HCC/AOS (*milleri* x *sincorana*) 78 pts. Exhibitor: Kelly McCracken; Photographer: Mark Van der Woerd. Rocky Mountain Judging

[11] *Paphiopedilum* Macabre Mothra 'Louisiana' AM/AOS (Montera Moth x Macabre Grace) 80 pts. Exhibitor: Alan Taylor; Photographer: Susan Hathorn. Louisiana Judging

[12] *Paphiopedilum* Wössner Black Wings (syn. Johanna Burkhardt) 'Louisiana' AM/AOS (*rothschildianum* x *anitum*) 82 pts. Exhibitor: Alan Taylor; Photographer: Susan Hathorn. Louisiana Judging

[13] *Dendrobium* Kaila Quintal 'Nancy Marie' HCC/AOS (Spring Snow Storm x *atroviolaceum*) 75 pts. Exhibitor: Nancy Dempsey; Photographer: Susan Hathorn. Louisiana Judging

[14] *Papilionanda* Redland Magic 'Michael D. Gibson' HCC/AOS (Amy Glynn Creekmur x *Vanda* Violeta) 75 pts. Exhibitor: Naoki Kawamura; Photographer: Wes Newton. Florida North-Central Judging

[15] *Dendrobium trigonopus* 'BLM' CCM-AM/AOS 85-81 pts. Exhibitor: Jeremy Oversier and Lylah Brudos; Photographer: Mark Van der Woerd. Rocky Mountain Judging

[16] *Sarcochilus* Susie 'Catahoula Charm' HCC/AOS (Maria x Kulnura Absolute) 79 pts. Exhibitor: Eron Borne; Photographer: Susan Hathorn. Louisiana Judging


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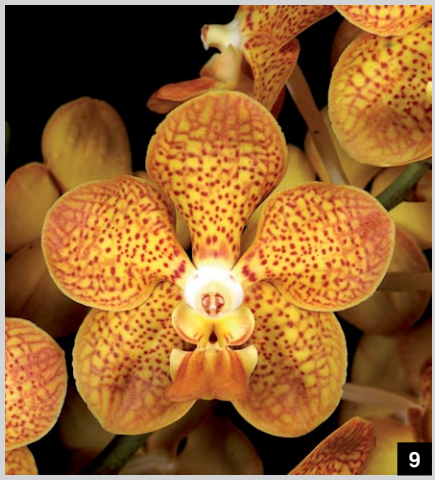
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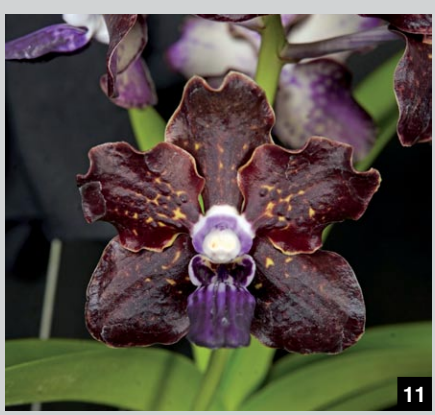
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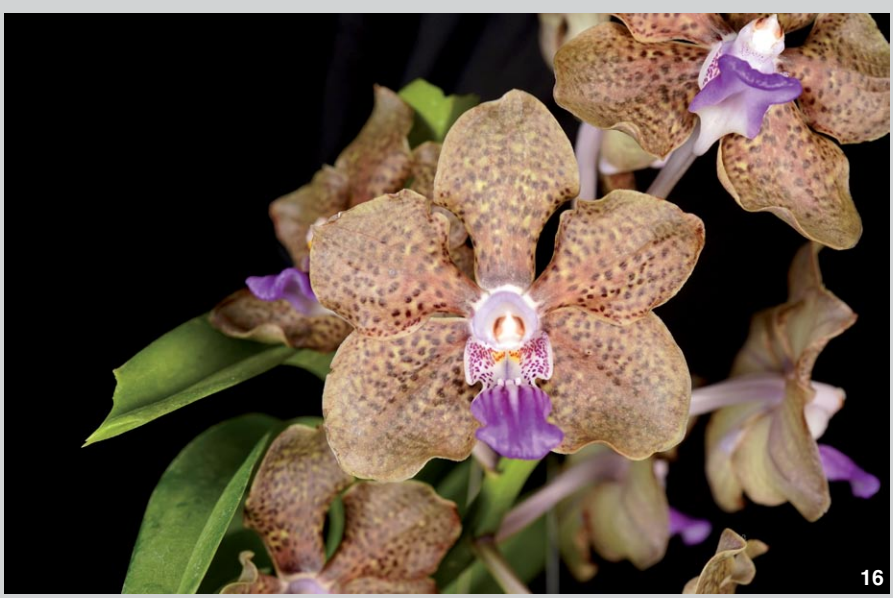
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[1] *Cattleya* Cherry Splash 'Garrett's Spot On' HCC/AOS (Cherry Chip x *aclandiae*) 79 pts. Exhibitor: Sharon and David Garrett; Photographer: Wes Newton. Florida North-Central Judging

[2] *Paphiopedilum* Joseph R Biden Jr 'Crystelle' AM/AOS (Yang-Ji Diamond x *rothschildianum*) 86 pts. Exhibitor: Krull-Smith; Photographer: Wes Newton. Florida North-Central Judging

[3] *Vanda* Kultana Indian Incense 'Krull's Black Passion' AM/AOS (Kultana Oriental Aroma x Kultana Fragrance) 81 pts. Exhibitor: Krull-Smith; Photographer: Wes Newton. Florida North-Central Judging

[4] *Vanda* Arucha 'Krull's Raspberry Beret' AM/AOS (Somsri Pink x Kulwadee Fragrance) 85 pts. Exhibitor: Krull-Smith; Photographer: Wes Newton. Florida North-Central Judging

[5] *Dendrobium* Baby Dolphin 'Pippen's Porpoise' AM/AOS (Singapore White x Memoria Ellison Onizuka) 81 pts. Exhibitor: Cheryle Daniel; Photographer: Wes Newton. Florida North-Central Judging

[6] *Papilionanda* Paksorn Fragrance 'Garrett's Bright Spring' AM/AOS (Mimi Palmer x *Vanda insignis*) 84 pts. Exhibitor: Sharon and David Garrett; Photographer: Wes Newton. Florida North-Central Judging

[7] *Vandachostylis* Luke Thai 'Garrett's Another Little Green Thing' AM/AOS (*Vanda* Vieng Ping x *Rhynchostylis coelestis*) 80 pts. Exhibitor: Sharon and David Garrett; Photographer: Wes Newton. Florida North-Central Judging

[8] *Cleisostoma birmanicum* 'Whisper Perplexingly Persistence Pays Off' AM/AOS 84 pts. Exhibitor: Laura and Wes Newton; Photographer: Wes Newton. Florida North-Central Judging

[9] *Papilionanda* Ben Fragrance 'Garrett's Sunburst' AM/AOS (*Vanda* Memoria Thianchai x Mimi Palmer) 85 pts. Exhibitor: Sharon and David Garrett; Photographer: Wes Newton. Florida North-Central Judging

[10] *Vanda* Blue Eyes 'Garrett's Purple Vision' AM/AOS (Peggy Foo x Gordon Dillon) 87 pts. Exhibitor: Sharon and David Garrett; Photographer: Wes Newton. Florida North-Central Judging

[11] *Vanda* Kultana Indian Incense 'Krull's Black Passion' AM/AOS (Kultana Oriental Aroma x Kultana Fragrance) 81 pts. Exhibitor: Krull-Smith; Photographer: Wes Newton. Florida North-Central Judging

[12] *Dendrobium lindleyi* 'Krull's Julien' AM/AOS 84 pts. Exhibitor: Krull-Smith; Photographer: Wes Newton. Florida North-Central Judging

[13] *Vanda* Matthew Majewski 'Garrett's Ruby' HCC/AOS (Onomea x Peggy Foo) 79 pts. Exhibitor: Sharon and David Garrett; Photographer: Wes Newton. Florida North-Central Judging

[14] *Vandachostylis* October Twenty Second 'Julien Baruch' AM/AOS (*Vanda tessellata* x Pine Rivers) 85 pts. Exhibitor: Krull-Smith; Photographer: Wes Newton. Florida North-Central Judging

[15] *Vandachostylis* October Twenty Second 'Krull's Evelyn' AM/AOS (*Vanda tessellata* x Pine Rivers) 81 pts. Exhibitor: Krull-Smith; Photographer: Wes Newton. Florida North-Central Judging

[16] *Papilionanda* Arjuna 'Jim Krull' AM/AOS (Mimi Palmer x *Vanda tessellata*) 87 pts. Exhibitor: Krull-Smith; Photographer: Wes Newton. Florida North-Central Judging


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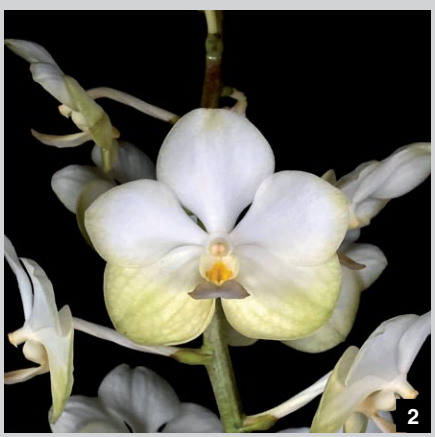
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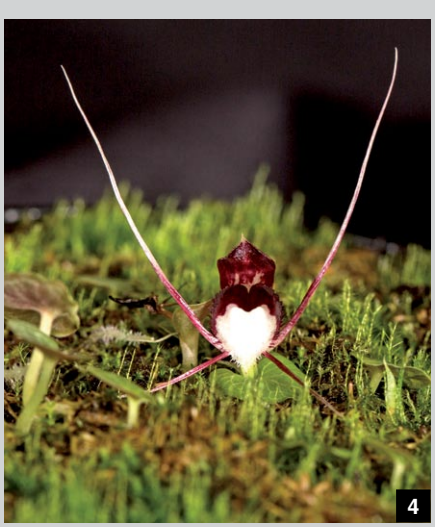
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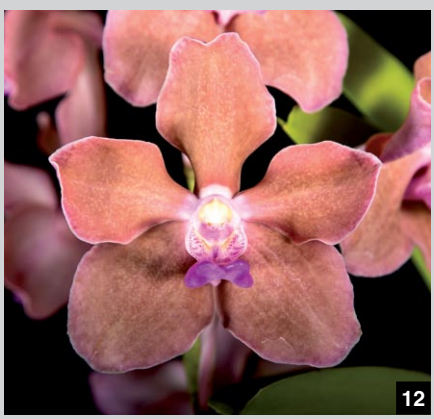
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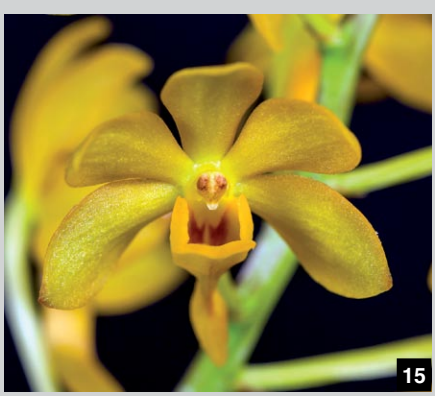
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[1] *Vandachostylis* Sri-Siam 'Garrett's Grapeade' AM/AOS (*Vanda tessellata* x *Rhynchostylis gigantea*) 83 pts. Exhibitor: Sharon and David Garrett; Photographer: Wes Newton. Florida North-Central Judging

[2] *Vandachostylis* Golden Child 'Crystelle' AM/AOS (Luke Thai x *Vanda* Suzanne Mullane) 87 pts. Exhibitor: Krull-Smith; Photographer: Wes Newton. Florida North-Central Judging

[3] *Dendrobium lasianthera* 'Krull's Raging Bull' AM/AOS 83 pts. Exhibitor: Krull-Smith; Photographer: Kay Clark. Florida North-Central Judging

[4] *Corybas geminigibbus* 'Neblina's Little Cloche of Horrors' AM/AOS 80 pts. Exhibitor: Adeljean Ho (Neblina Orchids); Photographer: Kay Clark. Florida North-Central Judging

[5] *Vandachostylis* Sagarik 'Crystelle' AM/AOS (*Rhynchostylis coelestis* x *Vanda curvifolia*) 84 pts. Exhibitor: Krull-Smith; Photographer: Wes Newton. Florida North-Central Judging

[6] *Bulbophyllum* Lindsey Paris 'Golden Girl' AM/AOS (Grace Thoms x Manchind) 83 pts. Exhibitor: Lindsey Paris; Photographer: Kay Clark. Florida North-Central Judging

[7] *Dendrobium* QF Makani 'WingDreams' AM/AOS (Dawn Maree x Peng Seng) 85 pts. Exhibitor: Julio and Eileen Hector; Photographer: Kay Clark. Florida North-Central Judging

[8] *Paphiopedilum thaianum* 'Fajen's Hat Trick' AM/AOS 81 pts. Exhibitor: Fajen's Orchids; Photographer: Kay Clark. Florida North-Central Judging

[9] *Paphiopedilum* Booth's Sand Lady 'Fajen's Orchids' AM/AOS (Lady Isobel x *sanderianum*) 80 pts. Exhibitor: Fajen's Orchids; Photographer: Kay Clark. Florida North-Central Judging

[10] *Gastrochilus japonicus* 'MV Pikachu' CCM-HCC/AOS 84-77 pts. Exhibitor: Stuart Henderson; Photographer: Kay Clark. Florida North-Central Judging

[11] *Paphiopedilum* Chou-Yi Rookie 'Fajen's Orchids' AM/AOS (*thaianum* x *rothschidianum*) 86 pts. Exhibitor: Fajen's Orchids; Photographer: Kay Clark. Florida North-Central Judging

[12] *Vanda tessellata* 'Krull's Rose' AM/AOS 86 pts. Exhibitor: Krull-Smith; Photographer: Kay Clark. Florida North-Central Judging

[13] *Vanda* Motes Tangelo 'Naoki Kawamura' AM/AOS (*denisoniana* x Motes Mandarin) 80 pts. Exhibitor: Naoki Kawamura; Photographer: Kay Clark. Florida North-Central Judging

[14] *Vanda* Greg Scott 'Jim Krull' AM/AOS (*merrillii* x *tessellata*) 84 pts. Exhibitor: Krull-Smith; Photographer: Kay Clark. Florida North-Central Judging

[15] *Vanda* Jeric Bengco Ayanke 'Little Sunshine' AM/AOS (*vietnamica* x *garayi*) 86 pts. Exhibitor: Naoki Kawamura; Photographer: Kay Clark. Florida North-Central Judging

[16] *Bulbophyllum* JM Guilloty 'A-doribil' AM/AOS (*annandalei* x *frostii*) 86 pts. Exhibitor: Bill Thoms and Doris Dukes; Photographer: Kay Clark. Florida North-Central Judging


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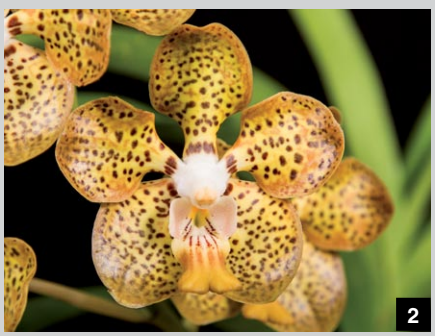
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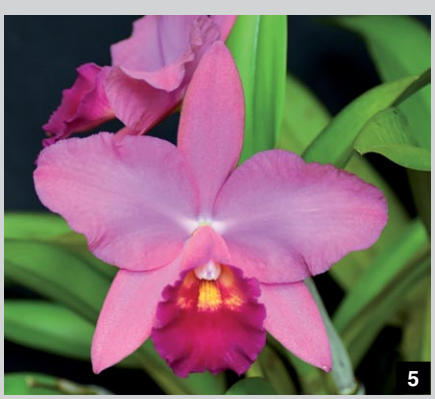
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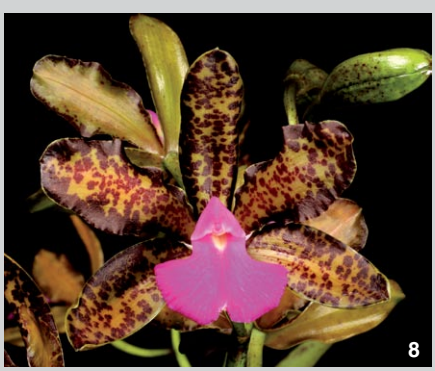
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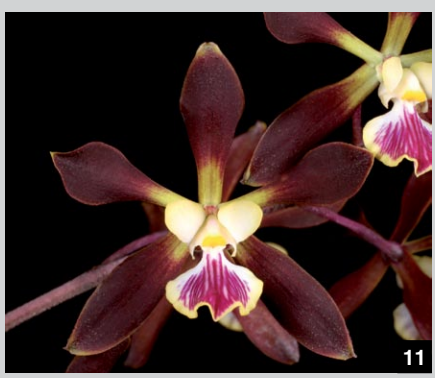
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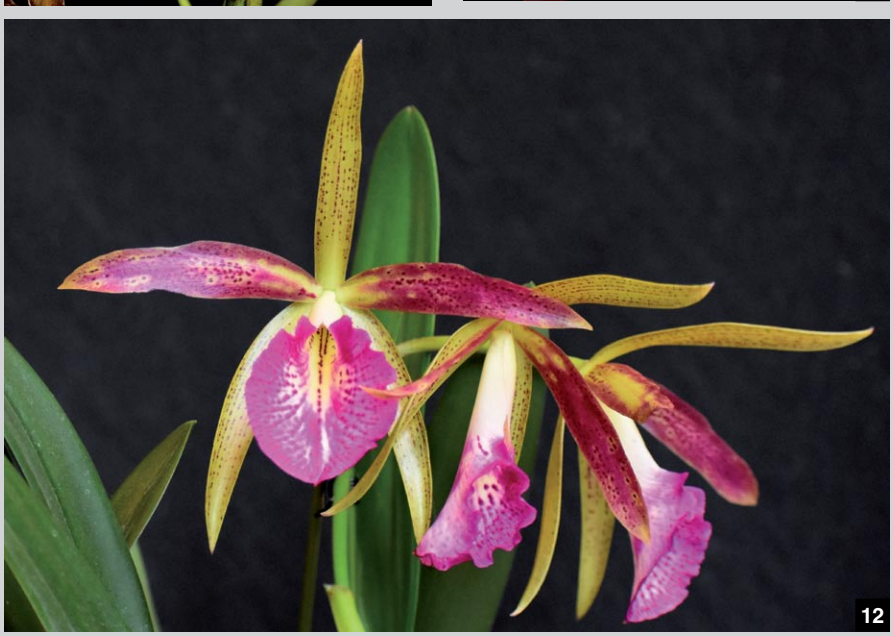
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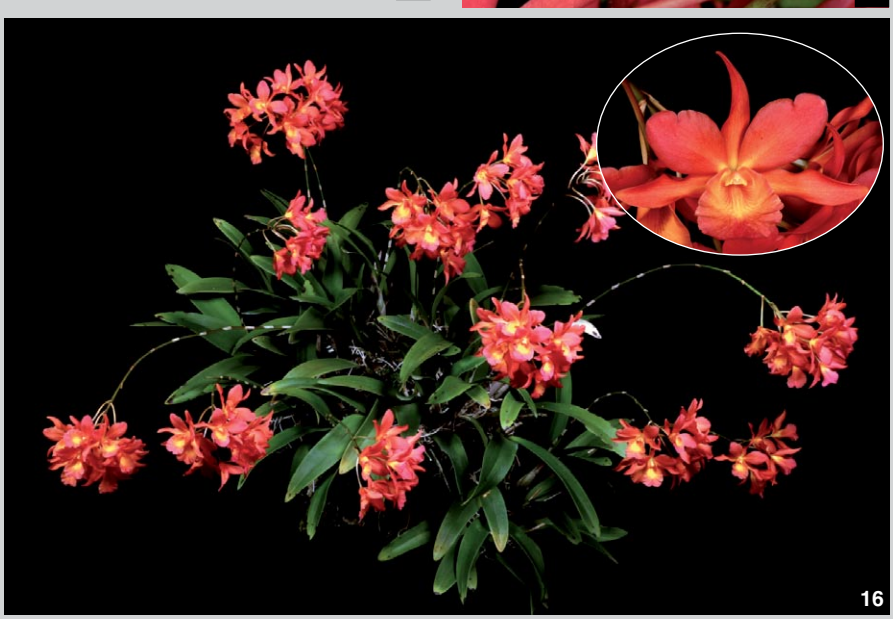
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[1] *Paphiopedilum* Nathaniel's Spectra 'Fajen's Fourth' HCC/AOS (*thaianum* x *godefroyae*) 79 pts. Exhibitor: Fajen's Orchids; Photographer: Kay Clark. Florida North-Central Judging

[2] *Papilionanda* Ben Buttercup 'Gramling's Cheetah' HCC/AOS (*Vanda* Xena x Batram) 78 pts. Exhibitor: Heather Gramling; Photographer: Kay Clark. Florida North-Central Judging

[3] *Vandachostylis* Orchidkraft's Sapphira 'Krull's Silver Dollar' AM/AOS (Sasicha x *Vanda tessellata*) 84 pts. Exhibitor: Krull-Smith; Photographer: Kay Clark. Florida North-Central Judging

[4] *Paphiopedilum* Hilo Black Eagle 'Crownfox' AM/AOS (Johanna Burkhardt x *rothschildianum*) 84 pts. Exhibitor: R. F. Orchids, Inc.; Photographer: Tom Kuligowski. West Palm Beach Judging

[5] *Rhyncholaeliocattleya* Inspiration 'Coral' AM/AOS (Goldenzelle x *Cattleya* Mahalo Jack) 80 pts. Exhibitor: Doug Hartong; Photographer: Charles Wilson. Atlanta Judging

[6] *Vanda tessellata* 'Tammy Sue Flanagan' AM/AOS 84 pts. Exhibitor: Angie and Mike Pitiriciu; Photographer: Tom Kuligowski. West Palm Beach Judging

[7] *Aerides rosea* 'Adam Marks' AM/AOS 85 pts. Exhibitor: Juraj Kojs; Photographer: Tom Kuligowski. West Palm Beach Judging

[8] *Cattleya* Tai Rose 'Toby' AM/AOS (Maui Plum x Landate) 84 pts. Exhibitor: Jim Longwell; Photographer: Tom Kuligowski. West Palm Beach Judging

[9] *Cattleya nobilior* 'Pixie Dust' AM/AOS 80 pts. Exhibitor: Jim Longwell; Photographer: Tom Kuligowski. West Palm Beach Judging

[10] *Paphiopedilum* Berenice 'Nike' AM/AOS (*lowii* x *philippinense*) 81 pts. Exhibitor: Ernie Barham; Photographer: Tom Kuligowski. West Palm Beach Judging

[11] *Encyclia* Crownfox Chocolate Star 'Luna' AM/AOS (*guatemalensis* x Judy Russ) 83 pts. Exhibitor: R. F. Orchids, Inc.; Photographer: Tom Kuligowski. West Palm Beach Judging

[12] *Brassocattleya* Tigrinodosa 'JonFi' HCC/AOS (*Cattleya tigrina* x *Brassavola nodosa*) 77 pts. Exhibitor: Jon Crate and Firelli Alonso; Photographer: Charles Wilson. Atlanta Judging

[13] *Encyclia* Crownfox Chocolate Star 'Sweet Dreams' CCM-AM/AOS (*guatemalensis* x Judy Russ) 85-85 pts. Exhibitor: R.F. Orchids, Inc.; Photographer: Tom Kuligowski. West Palm Beach Judging

[14] *Catasetum uncatum* 'Memoria Marcus Beightol' CBR/AOS. Exhibitor: Mark Margolis; Photographer: Tom Kuligowski. West Palm Beach Judging

[15] *Renantanda* Pamela Frederick 'Crownfox' HCC/AOS (*Renanthera matutina* x *Vanda miniata*) 76 pts. Exhibitor: R. F. Orchids, Inc.; Photographer: Tom Kuligowski. West Palm Beach Judging

[16] *Bromecanthe* Jamaica Fire 'Lola's Love' CCM-AM/AOS (*Guaritonia* Why Not x *Myrmecophila brysiana*) 85-84 pts. Exhibitor: Jim Longwell; Photographer: Tom Kuligowski. West Palm Beach Judging


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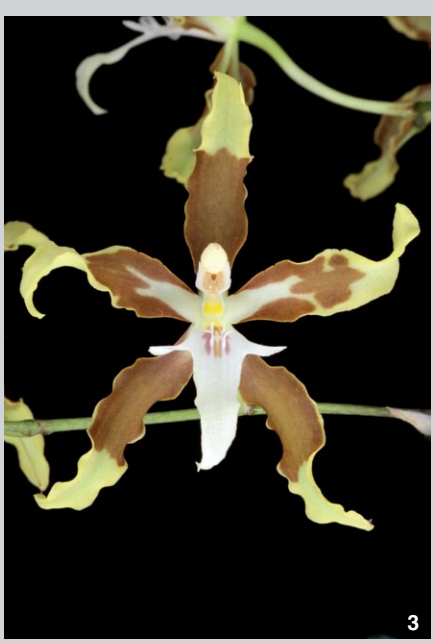
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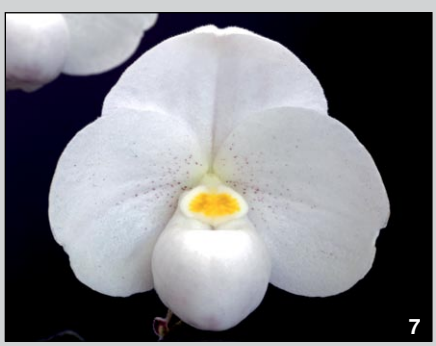
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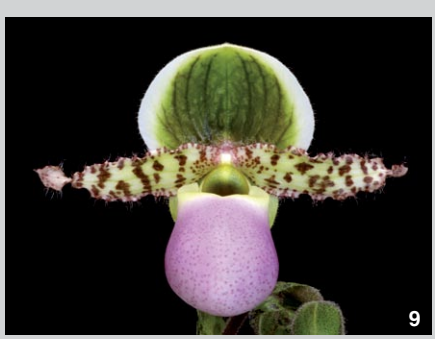
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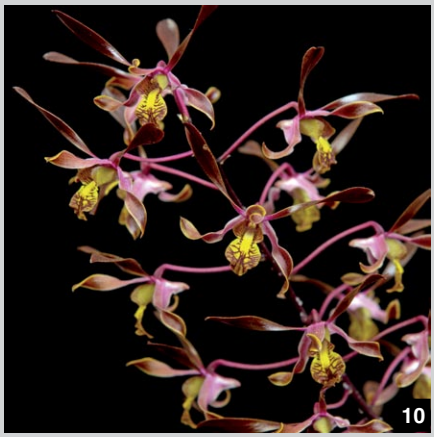

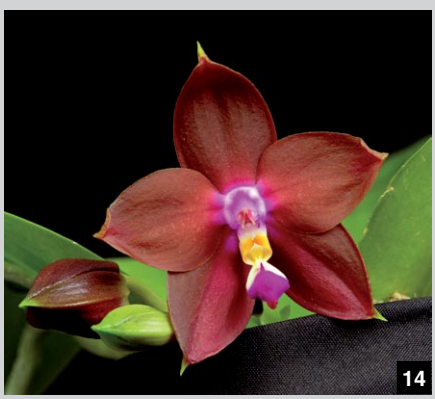

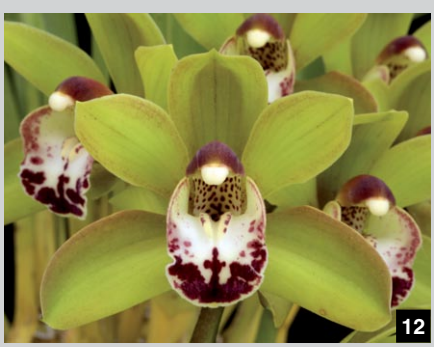

[1] *Cattleya schilleriana* (1857) 'Chunky' AM/AOS 83 pts. Exhibitor: Ramon de los Santos; Photographer: Ramon de los Santos. California-Sierra Nevada Judging

[2] *Sarcochilus* Kulnura Loyalty 'Paparazzi' HCC/AOS (Kulnura Absolute x Kulnura Ballerina) 78 pts. Exhibitor: Kevin Hill; Photographer: Ramon de los Santos. California-Sierra Nevada Judging

[3] *Oncidium aurarium* 'Stars in the Sky' HCC/AOS 78 pts. Exhibitor: Tyler M. Albrecht; Photographer: Ramon de los Santos. California-Sierra Nevada Judging

[4] *Sarcochilus* Kulnura Leppard 'Monster' AM/AOS (Kulnura Sanctuary x Kulnura Gifted) 81 pts. Exhibitor: Ramon de los Santos; Photographer: Ramon de los Santos. California-Sierra Nevada Judging

[5] *Cymbidium* Rainbow Warrior 'Tygr Jade' HCC/AOS (Hazel Tyers x Vogelsang) 76 pts. Exhibitor: Ed Dumaguin; Photographer: Ramon de los Santos. California-Sierra Nevada Judging

[6] *Dracula wallisii* 'Sangre' HCC/AOS 77 pts. Exhibitor: Tyler M. Albrecht; Photographer: Ramon de los Santos. California-Sierra Nevada Judging

[7] *Paphiopedilum thaianum* 'Melencia' AM/AOS 84 pts. Exhibitor: Ramon de los Santos; Photographer: Ramon de los Santos. California-Sierra Nevada Judging

[8] *Sarcochilus* Kulnura Snowflake 'Melencia' AM/AOS (Kulnura Vision x Heidi) 85 pts. Exhibitor: Ramon de los Santos; Photographer: Ramon de los Santos. California-Sierra Nevada Judging

[9] *Paphiopedilum* Magic Paradise 'Good Choices' AM/AOS (*liemianum* x Avalon Magic) 82 pts. Exhibitor: Anne Kimmerlein; Photographer: Ramon de los Santos. California-Sierra Nevada Judging

[10] *Dendrobium* Tiny Twister 'Jazzy Star' AM/AOS (*carronii* x *mirbelianum*) 85 pts. Exhibitor: Sara Gallis; Photographer: Jeremy Losaw. Carolinas Judging

[11] *Phalaenopsis* Mituo Princess 'Red-2' AM/AOS (LD Double Dragon x LD's Bear King) 82 pts. Exhibitor: Mike Mims; Photographer: Jeremy Losaw. Carolinas Judging

[12] *Cymbidium* Sensible Tiger 'Jaybee' HCC/AOS (Online Tiger x Langleyense) 77 pts. Exhibitor: Ed Dumaguin; Photographer: Ramon de los Santos. California-Sierra Nevada Judging

[13] *Dendrobium* Blue Seas 'Little Man' AM/AOS (Blue Twinkle x *antennatum*) 80 pts. Exhibitor: Sara Gallis; Photographer: Jeremy Losaw. Carolinas Judging

[14] *Phalaenopsis* Dragon Tree Eagle 'Red Eagle' AM/AOS (Penang Girl x Black Eagle) 81 pts. Exhibitor: Ben Belton; Photographer: Jeremy Losaw. Carolinas Judging

[15] *Phalaenopsis* Chienlung Happy Queen 'Blue Ridge' AM/AOS (KS Happy Eagle x LD's Bear Queen) 84 pts. Exhibitor: Mike Mims; Photographer: Jeremy Losaw. Carolinas Judging

[16] *Cymbidium* Parish Laird 'June Bug' HCC/AOS (Memoria Geoff Laird x *parishii*) 76 pts. Exhibitor: Ed Dumaguin; Photographer: Ramon de los Santos. California-Sierra Nevada Judging


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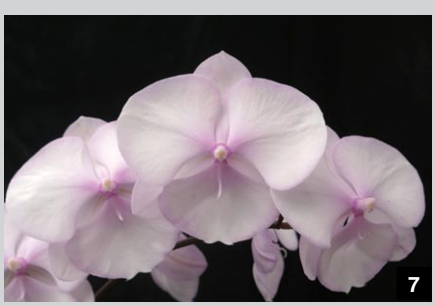
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[1] *Phalaenopsis tetraspis* f. *brunneola* 'Rom' AM/AOS 82 pts. Exhibitor: Bryan Goddard; Photographer: Jeremy Losaw. Carolinas Judging

[2] *Encyclia seidelii* 'Dusty's Serene' CBR/AOS. Exhibitor: Nile and Lois Dusdieker; Photographer: Nile Dusdieker. Chicago Judging

[3] *Phalaenopsis* I-Hsin Yellow Leopard 'Iowa' AM/AOS (Leopard Prince x Yellow Chimera) 83 pts. Exhibitor: Robert B. Bannister, MD; Photographer: Nile Dusdieker. Chicago Judging

[4] *Phragmipedium* Stairway to Heaven 'Hayden' HCC/AOS (*warszewiczianum* x *humboldtii*) 77 pts. Exhibitor: George A. Bogard; Photographer: David Gould. Dallas Judging

[5] *Cypripedium* Gisela 'Island View' CCE/AOS (*parviflorum* x *macranthos*) 92 pts. Exhibitor: Andrew Coghill-Behrends; Photographer: Nile Dusdieker. Chicago Judging

[6] *Encyclia cordigera* 'Kathleen II' AM/AOS 81 pts. Exhibitor: William Rogerson; Photographer: Nile Dusdieker. Chicago Judging

[7] *Phalaenopsis* Lioulin Diana Lip 'Iowa Too' HCC/AOS (Lioulin Thick Lip x KS Big Diana) 78 pts. Exhibitor: Robert B. Bannister, MD; Photographer: Nile Dusdieker. Chicago Judging

[8] *Graphorkis concolor* var. *alphabetica* 'Nicola' CCM/AOS 82 pts. Exhibitor: Richard Fulford; Photographer: Carmen Johnston. Florida-Caribbean Judging

[9] *Paphiopedilum niveum* 'Deerwood #1' AM/AOS 81 pts. Exhibitor: Ross Hella; Photographer: Nile Dusdieker. Chicago Judging

[10] *Paphiopedilum* Shirley Amundson 'Memoria Patty Ware' AM/AOS (*acmodontum* x *hookerae*) 80 pts. Exhibitor: Oakwood Orchids; Photographer: Richard Noel. Cincinnati Judging

[11] *Aerides maculosa* 'Mary Motes' CHM/AOS 80 pts. Exhibitor: Motes Orchids, Inc.; Photographer: Carmen Johnston. Florida-Caribbean Judging

[12] *Cattleya purpurata* (Semi-Alba) 'Michael' CCM-AM/AOS 89-83 pts. Exhibitor: William Rogerson; Photographer: Nile Dusdieker. Chicago Judging

[13] *Coelogyne nitida* 'Penny' CCE/AOS 92 pts. Exhibitor: University of MN College of Biological Sciences Conservatory; Photographer: Nile Dusdieker. Chicago Judging

[14] *Cattleya warscewiczii* 'Michael' CCM/AOS 82 pts. Exhibitor: William Rogerson; Photographer: Nile Dusdieker. Chicago Judging


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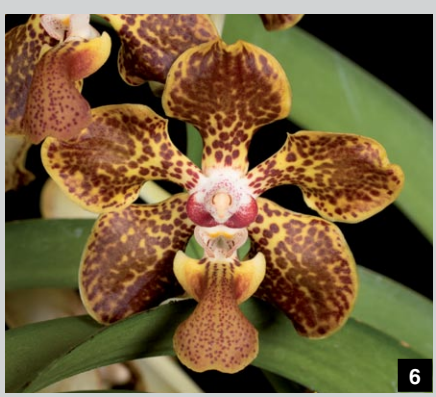
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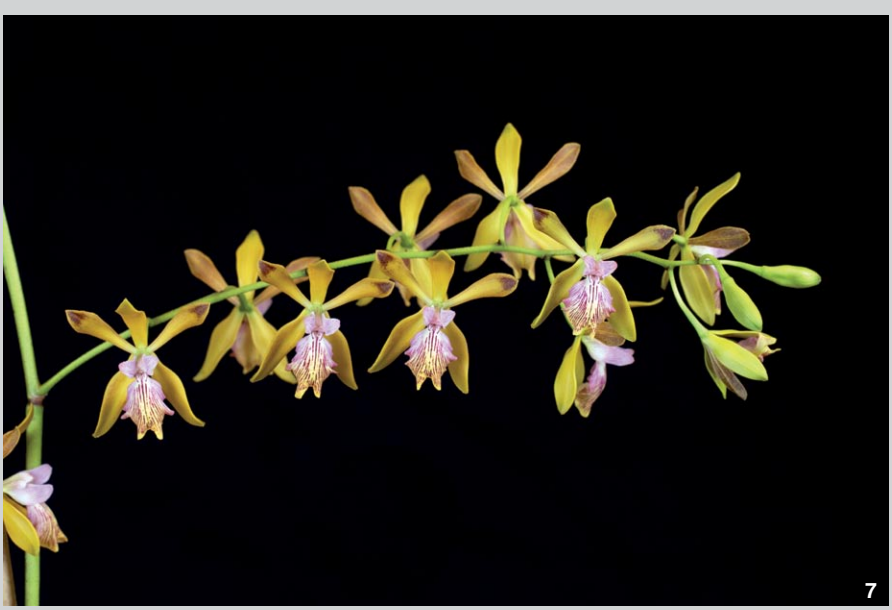
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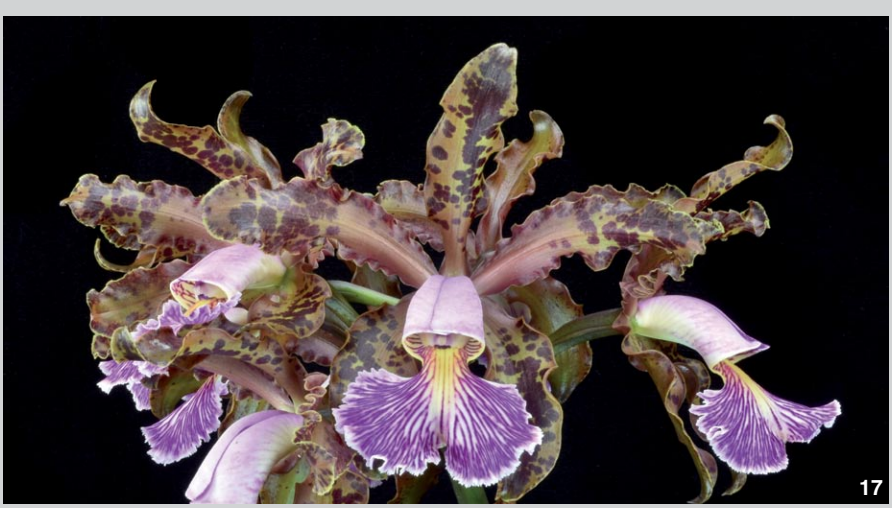
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[1] *Phragmipedium* Inca Embers 'David Michael' AM/AOS (Andean Fire x *longifolium*) 80 pts. Exhibitor: George A. Bogard; Photographer: David Gould. Dallas Judging

[2] *Dendrobium crumenatum* 'Paloma Picasso' CCE/AOS 97 pts. Exhibitor: Daisy Wortel; Photographer: Carmen Johnston. Florida-Caribbean Judging

[3] *Papilionanda* Motes Wise Women 'Karina Motes' AM/AOS (Bruce's Evelyn x *Vanda* Mary Motes) 84 pts. Exhibitor: Motes Orchids, Inc.; Photographer: Carmen Johnston. Florida-Caribbean Judging

[4] *Papilionanda* James Craig Adamson 'Jim-Jim' AM/AOS (Arjuna x *Vanda insignis*) 81 pts. Exhibitor: Motes Orchids, Inc.; Photographer: Carmen Johnston. Florida-Caribbean Judging

[5] *Vanda* Greg Scott 'Motes Ruby' AM/AOS (*merrillii* x *tessellata*) 81 pts. Exhibitor: Motes Orchids, Inc.; Photographer: Carmen Johnston. Florida-Caribbean Judging

[6] *Vanda lombokensis* 'Rapturevine Bromine' AM/AOS 83 pts. Exhibitor: Ernest Ivan Romero; Photographer: Carmen Johnston. Florida-Caribbean Judging

[7] *Encyclia* Douglas Breholtz 'Irene' HCC/AOS (*rufa* x Orchid Jungle) 77 pts. Exhibitor: Mark Margolis; Photographer: Carmen Johnston. Florida-Caribbean Judging

[8] *Paphiopedilum* Stoned Bernice 'Wacousta' AM/AOS (*stonei* x Berenice) 81 pts. Exhibitor: Dorothy Potter Barnett; Photographer: Lynn O'Shaughnessy. Great Lakes Judging

[9] *Pescatoria cerina* 'Bryon' AM/AOS 82 pts. Exhibitor: Bryon K. Rinke; Photographer: Bryon Rinke. Great Plains Judging

[10] *Stelis cylindrica* 'Sanborn' CCM/AOS 86 pts. Exhibitor: Max Thompson and Bryon Rinke; Photographer: Bryon Rinke. Great Plains Judging

[11] *Tolumnia* Walnut Valley Queen 'M & B Spotty' AM/AOS (Calypso Queen x Walnut Valley) 81 pts. Exhibitor: Max Thompson and Bryon Rinke; Photographer: Bryon Rinke. Great Plains Judging

[12] *Habenaria* Mayfly 'Windswept's Trident' AM/AOS (Conure x *lindleyana*) 84 pts. Exhibitor: Windswept in Time Orchids; Photographer: Lynn O'Shaughnessy. Great Lakes Judging

[13] *Paphiopedilum thaianum* 'Jan's Gift' HCC/AOS 79 pts. Exhibitor: Doug and Beth Martin; Photographer: Bryon Rinke. Great Plains Judging

[14] *Himantoglossum calcaratum* subsp. *jankae* 'Red Lizard' CBR/AOS. Exhibitor: Doug and Beth Martin; Photographer: Bryon K Rinke. Great Plains Judging

[15] *Vanchoanthe* Rainbow Prism 'Velvet's Purple Ribbon' HCC/AOS (*Vandachostylis* Memoria Clem Crosbie x *Papilionanda* Mimi Palmer) 77 pts. Exhibitor: Susan Tompkins; Photographer: Bryon Rinke. Great Plains Judging

[16] *Rhyncholaeliocattleya* Gabrielle de Lioncourt 'Bitten' HCC/AOS (Hisako Akatsuka x *Cattleya bicolor*) 78 pts. Exhibitor: Ben Oliveros and Orchid Eros; Photographer: Glen Barfield. Hawaii Judging

[17] *Cattleya schilleriana* (1857) 'Terpsichore' AM/AOS 82 pts. Exhibitor: Ben Oliveros and Orchid Eros; Photographer: Glen Barfield. Hawaii Judging

JULY

8-10—Baton Rouge Orchid Society Show, LSU Botanic Garden at Burden – Conference Center, 4560 Essen Lane, Baton Rouge, LA; Contact: Jim Morrison, 225-247-1543; jwmorrisoniii@msn.com

23—Central Iowa Orchid Society Speaker's Day, Johnston Lions Club Community Center, 6401 Merle Hay Road, Johnston, IA; Contact: Carson Whitlow, 515-993-4841; slipperguy@aol.com

29-31—Hilo Orchid Society's "Orchid Ohana – Blending Beauty and Aloha," Edith Kanaka'ole Stadium, 350 Kalanikoa St, Hilo, HI; Contact: Karl Mendonca, 808-217-7078; karlsandi@comcast.net

AUGUST

5-6—International Phalaenopsis Alliance Symposium, Hilton Garden Inn, Apopka City Center, 580 E Main Street, Apopka, FL; Contact: Eileen Hector, 813-368-7353; ipa.eileen@gmail.com

6—*Houston Orchid Society Summer Workshop (Outreach Judging), First Christian Church, 1601 Sunset Blvd, Houston, TX; Contact: Randy Johnson, 225-205-8181; randy.johnsonian2000@gmail.com

27-28—"Ohio Valley Orchid Fest," Emmanuel Lutheran Church, 4865 Wilmington Pike, Dayton, OH; Contact: Eric Sauer, 937-212-0462; eric@rvorchids.com

SEPTEMBER

16-18—Alabama Orchid Society's 38th Show & Sale, Birmingham Botanical Gardens, 2612 Lane Park Rd, Mountain Brook, AL; Contact: Beverly VonDer Pool, 205-821-0689; bvonderpool@yahoo.com

17-18—Wisconsin Orchid Society's "Fall in Love with Orchids," Mitchell Park Horticultural Conservatory, 524 S Layton Blvd, Milwaukee, WI; Contact: Richard Odders and Bil Nelson, 262-632-3008 and 414-467-6642; odders2445@gmail.com and qorchids@att.net

17-18—Ridge Orchid Society's Diamond Jubilee "60 Years of Orchids," WH Stuart Center, 1702 US Hwy 17 S, Bartow, FL; Contact: Keith Emig, 863-412-4762; dkemig@gmail.com

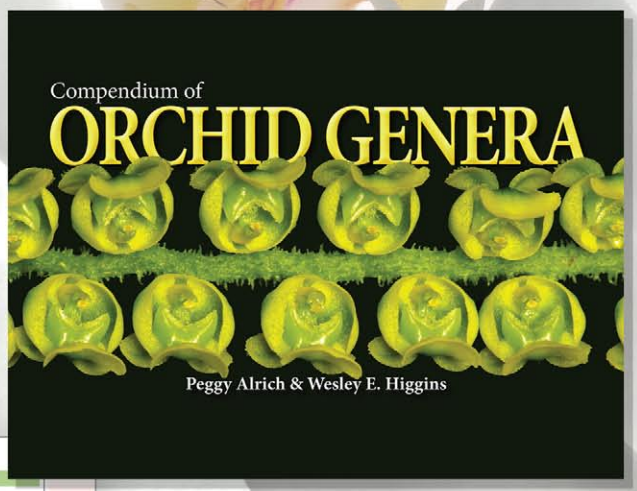
17-18—Foothills Orchid Society "Orchids For Everyone," Deerfoot Inn & Casino, 11500 35 St SE #1000, Calgary, AB, Canada; Contact: Marguerite Salsberry, 403-973-2687; msalsberry@telus.net

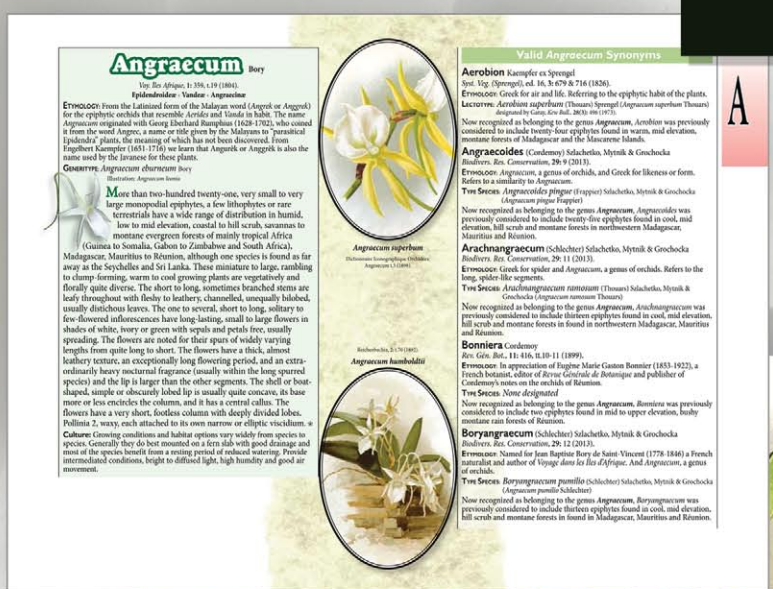
23-24—Great Divide Orchid Society Show and Sale, Wingate of Helena, 2007 N Oakes, Helena, MT; Contact: Nancy Horn & Cheri Bergeron, 406-459-9252; nancylhorn@outlook.com

30-2—Kentucky Orchid Society Show, St Mathews Episcopal Church, 330 N Hubbards Lane, Louisville, KY; Contact: Jan Smith & Stephen Benjamin, 502-893-0500 & 502-348-1787; jansmithroberts@gmail.com & stephenb@oakknob.com

Presenting

The Compendium of Orchid Genera by Peggy Alrich and Wesley Higgins





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Classified ads are $55 for five lines (45 characters/spaces per line) and $15 for each additional line. $25 for first three words in red. $25 to include logo. The first three words can be in all caps, if requested.

AD INDEX

Submission of articles for *ORCHIDS* magazine

The AOS welcomes the submission of manuscripts for publication in *Orchids* magazine from members and non–members alike. Articles should be about orchids or related topics and cultural articles are always especially welcome. These can run the gamut from major feature–length articles on such topics as growing under lights, windowsills and thorough discussions of a species, genus or habitat to shorter, focused articles on a single species or hybrid to run under the Collector's Item banner. The AOS follows the World Checklist of Selected Plant Families with respect to species nomenclature and the Royal Horticultural Society Orchid Hybrid Register for questions of hybrid nomenclature. The AOS style guide and usage guides can be downloaded from http://www.aos.org/about–us/article–submissions/style–guide–for–aos–publications.aspx Articles as well as inquiries regarding suitability of proposed articles should be sent to jean.ikeson@gmail.com or the editor at rmchatton@aos.org.

The American Orchid Society, in congruence with its stated conservation aims and with the full approval of the AOS Trustees, prohibits advertisements for wild–collected orchids and orchid–collecting tours in the pages of *Orchids*. By submitting advertisements for orchid species, vendors are thereby asserting that plants advertised are either artificially propagated (from seed or meristem) or are nursery–grown divisions of legally acquired stock. While *Orchids* endeavors to assure the reliability of its advertising, neither *Orchids* nor the American Orchid Society, Inc., can assume responsibility for any transactions between our advertisers and our readers.

Tiny Tim Rides Again

Maybe?

TEXT BY LEON GLICENSTEIN/PHOTOGRAPHS BY LEON GLICENSTEIN UNLESS CREDITED OTHERWISE

TOLUMNIA TINY TIM was an early hybrid (when *Tolumnia* was still part of *Oncidium*) made by W.W. Goodale Moir (the father of tolumnia hybridization) and registered in 1957. It became one of the building blocks of tolumnia breeding. It is a hybrid of *Tolumnia triquetra* × *Tolumnia guianensis*.

As with many other orchid species, the parents came a long way before they ultimately reached Moir. For example, what we know as *Tolumnia guianensis* was originally described in 1775 as *Ophrys guianensis*, then in 1862 it became *Oncidium intermedium.* Following that, in 1967 it was described as *Oncidium desertorum*; whereupon, in 1973 Leslie Garay at Harvard University's Ames Herbarium found the original description and changed the name, once again, to *Oncidium guianensis*. In 1986 Guido Braem transferred the species to *Tolumnia* and it became, today's *Tolumnia guianensis*. Taxonomists must have their fun.

Tolumnia triquetra did not have as convoluted a history to travel. In 1788 it was described as *Epidendrum triquetrum*, in 1813 it became *Oncidium triquetrum*, and then in 1994 it was renamed as *Tolumnia triquetra*.

The *Tolumnia guianensis* that Moir used to make the original hybrid was the common, mostly yellow flower with some touches of red. In 1979 the red-and-yellow flowered form (f. *aureorubrum*) and the red-and-white flowered form, (f. *alborubrum*) were found. They, too, were originally described as oncidiums.

Knowing how important *Tolumnia* Tiny Tim was to tolumnia breeding, I wondered what would happen if one crossed the mostly red-and-white *Tolulmnia triquetra* with the red-and-white form of *Tolumnia guianensis*, so I remade the hybrid using these parents and waited. When I finally received the seedlings, I distributed them to people who were doing tolumnia hybridization, as well as a few others interested in the

[1] *Tolumnia* Tiny Tim 'Carol's Valentine' AM/AOS from the original cross. Left insert: typical flower color form of *Tolumnia guianensis*. Right insert: *Tolumnia triquetra* flower.

[2] Flower of *Tolumnia guianensis* f. *aureorubrum.*

[3] Flower of *Tolumnia guianensis* f. *alborubrum*. This is from the plant that was used to make the author's remake.

[4] Typical flower that came out of the remake. Photograph by Wade Hollenbach.

genus.

The results were very disappointing. All the seedlings that flowered were various hues of yellow with some red or orange, like the original *Tolumnia* Tiny Tim. Eventually someone flowered the plant I was hoping for. Shawn Wood, of Pennsylvania, sent me a picture of a red-and-white (well, cream, because it has a little yellow in the white) *Tolumnia* Tiny Tim from my seedlings. He brought the plant to me so that I could take some pictures. To my knowledge at the time, this was the only one that came out of the cross this way.

Finally, Edgar Stehli of Windswept in Time Orchids in Ohio sent me some pictures of the seedlings of the cross that he had flowered. There was an even better one from his plants — a fuller flower, a redder lip and, unexpectedly, the reverse side of the petals had a nice rosy pigmentation.

Oops! After receiving Edgar's image, I received one from J&L Orchids in Connecticut that while having a lot of orange-red in the lip, also has it in the petals. The color is not as red as Edgar's, but worth using.

If we can tissue-culture these cultivars and distribute them to breeders, will this give rise to a whole new line of beautiful red tolumnia hybrids?

Stay tuned.

P.S. This also shows the importance of remaking some hybrids utilizing newer forms (plant habit, flower shape, flower color, marking pattern, etc.) of older species. I wonder what would happen utilizing the splash-petaled form of *Cattleya intermedia* with *Encyclia cordigera* var. *roseum*.

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[5] Typical flower that came out of the remake. Photograph by Wade Hollenbach.

[6] Very pale-yellow flower that came out of the remake. Photograph by Edgar Stehli.

[7] Hoped for color form from this remake. Photograph by Shawn Wood.

[8] Close-up of the flowers in [7].

[9] Better flower from the remake with a redder lip. Inset: reverse side of petals. Photographs by Edgar Stehli.

[10] *Tolumnia* Tiny Tim flower from J&L. Photograph courtesy of J&L Orchids.

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