HYBRIDIZERS

SUPPLEMENT TO ORCHIDS — THE BULLETIN OF THE AMERICAN ORCHID SOCIETY OCTOBER 2022

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Hybridizer's Notebook — 1

by Frank Fordyce

The Importance of Observation

ONE OF THE by-products of aging is retrospect. To the mature orchid hybridizer, the consideration of past events is not only pleasurable but also valuable as one plans new directions in breeding. One of the keys to making quality hybrids is the knowledge gained from successful parent clones to breeding lines. The majority of orchid hybridizing today involves complex parentage, either in one parent or, most frequently, in both.

As many readers know, I began my orchid career at Stewart Orchids over 40 years ago under the guidance of Ernest Hetherington, who imbued in me the absolute necessity of observation. From the beginning I was taught that a grower or hybridizer never enters a growing area without consciously looking at specific flowers, or, as one passed through the growing area, observing the growth habits of plants. Time has convinced me that all plants talk to you, not audibly, but through sign language. Deaf mutes utilize hand motions or gestures to communicate or converse; plants indicate their good health by foliage or pseudobulb vigor, color, or healthy roots. They indicate ill health through shriveled leaves or pseudobulbs, rotted roots, yellowed leaves, smaller, less vigorous pseudobulbs and substandard blooms.

As in the case of the deaf mute, someone must teach the novice grower to read the signs the plants are expressing. That someone to you may be a person in your orchid society that you admire as a successful grower. Cultivate him or her. Most orchid folk are yearning to share their successes in growing with a friend. As Roger Rankin writes in his collection of epigrams and aphorisms, "A good orchid friend is not a person to lean on but one who will make leaning unnecessary. The object in teaching a person how to grow orchids is to enable him or her to get along without you. It is one thing to show a man how poor his culture is, and another to give him the knowledge to correct it."

As I progressed in my career, I was approached by the late Rod McLellan to join his orchid firm as the orchid department manager, a position that would become a terrific challenge, due not only to the size of the company but also the diversity of orchid genera. With some personnel changes, I suddenly found myself with the responsibility of carrying on the *Paphiopedilum* hybridizing program. At the time McLellan's was producing tens of thousands of complex *Paphiopedilum* hybrids for the cut-flower and pot-plant markets of Europe. Fortunately, past records were available, and the former hybridizers shared personal hybridizing observations with me, but I knew that somehow, I had to become involved in an in-depth crash course in *Paphiopedilum* hybridizing.

Following a lecture titled "*Paphiopedilum* Species and Their Influence in Hybridizing," presented by the renowned Dr. Gustav Mehlquist of the University of Connecticut, I asked him if I could spend some time with him discussing *Paphiopedilum* breeding. After several hours he concluded by saying, "You have just heard me lecture on the influences of *Paphiopedilum* species in hybridizing. Now forget everything I said about that aspect." Dr. Mehlquist quickly went on to say, "What you heard was information utilizing the species in combination with other species and primary hybrids. What you are asking me to validate is a reliably proven formula to hybridize very complex hybrids involving many species throughout several generations of breeding. That is impossible." You can guess how I felt. My hopes of success vanished. If this highly trained geneticist could not give me the answer, who could? Dr. Mehlquist hastened to suggest that the most probable and reliable means of discovering the answer would be to set aside one hundred seedlings of each hybrid made, watch them grow and bloom, make copious notes over several years of observing the plants as they mature and compile those notes. Then certain patterns of genetic influence would become apparent.

The sage advice Dr. Mehlquist gave me that evening is part of some of the most valid and practical truths I have learned about hybridizing. I did follow his suggestion and observed not 100 but 25 seedlings of each cross, recorded my observations weekly over a period of two blooming seasons and began to scratch the surface of complex *Paphiopedilum* hybridizing. Certain parents consistently imparted strong growth, others imparted long floral stems, some dominated with brushed dorsal color tones, even when combined with heavily spotted types. The cupping of flowers is often a problem when the more complex red parents are used, but we found that using the coloratum form of *Paphiopedilum* Maudiae greatly influenced hybrids to produce blooms with a flat dorsal stance on strong, erect stems.

The point of the illustration outlined above is that no matter what the genus might be, the more complex the hybrid, the more difficult it becomes to predict its outcome. Personal observation is the key. To a hybridizer, it is equally important to see the poor flowers in a specific cross as it is to see the awardable ones. One seeks key influences that signal certain parental dominant or recessive traits. Because it is literally impossible today for a grower to raise large quantities of each hybrid to blooming size for the sake of observation, it becomes necessary to view as many as possible as they bloom in your own collection and to observe others on plant forum tables, as well as question other growers about their results. As time passes you will become aware that certain parent clones lend specific influences to the majority of all hybrids in which they are involved.

In thinking of cattleyas, it is well documented that when *Cattleya bicolor* is used as a parent, the isthmus of the lip is a dominant factor. In the case of *Cattleya dowiana*, the molten gold veins in the labellum are transferred even though the yellow of *C. dowiana* may disappear when combined with purples. In complex hybrids, *Cattleya* California Apricot stamps its hybrids with broad petals, tending toward orange or yellow coloration. The massive, purple *Cattleya* Horace 'Maxima' AM/AOS tends to pass along superb overlapping petals to many of its progeny.

Observation and remembrance are the keys to the successful hybridizing of complex hybrids. When you look at a flower, what do you see? Does it simply please or repulse you? Perhaps that is all you require, but as a hybridizer, the flowers should speak to you — in sign language, of course.

— *Frank Fordyce. Reprinted from* The American Orchid Society Bulletin *59(8):794–796.*

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CONTENTS

THIS YEAR, WE have reached out to a variety of hybridizers to tell their story but to also create a roadmap for the next generation of hybridizers so that we may all enjoy wonderful new orchids into the future! The anchor article on Catasetinae is a dissertation on growing, species and breeding lines, and judging that has never been published in any way, anywhere previously. When the Editor, Ron McHatton, and the Editorial Board can bring the membership such a gift, publication day is always gratifying. The issue does not stop there and delivers much, much more. Stunning photography! Hybridizing secrets not revealed before! Coerulea phals, yellow *Sarcochilus*, the weird and wonderful botanicals, *nodosa* lines for cattleya lovers, and cattleya and dendrobium lines from Hawaii. We all owe the authors a debt of gratitude for taking time out of their busy lives to contribute. Is there any other horticultural group that can boast such enthusiastic donations from writers and photographers with such a high standard?

The AOS and the Editorial Board would also like to thank the donors that help make this Supplement possible. We hope all of you will remember to donate next year!

— Jean Allen-Ikeson

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COVER

Catamodes Dragons Glade 'Sunset Valley Orchids' AM/AOS photographed by Arthur Pinkers. This grex provides an impressive variation in color, improved size, color, large flat lips and many well-arranged blooms on plants about 10 inches (25.4 cm) tall. And the flowers last 3–4 weeks, and plants bloom 2–3 times a season!

Catasetinae

Growing and Judging

BY FRED CLARKE/PHOTOGRAPHS BY FRED CLARKE UNLESS OTHERWISE CREDITED

MOST OF US recall our first orchid experience, the moment when our lives changed forever. The doorway opened, and you willingly stepped through it, leading you to the best hobby: growing and flowering orchids. Many years ago, the beautiful swan-shaped flowers of *Cycnoches warszewiczii* caught my attention and played an important role in sparking my interest in *Cycnoches* and, shortly thereafter, catasetums and their close relatives. As time went on and my sophistication with the Catasetinae developed, so did my growing skills and interest in breeding, exhibiting and judging these remarkable plants.

First, let us look at how to grow them! Understanding proper growing techniques might just make the rest of this article much more interesting, as you will be better able to envision yourself growing, blooming and getting these beautiful orchids awarded!

The easiest way to understand how to grow orchids is to learn about how they grow in their natural habitat. This group has an astonishingly broad geographic distribution that ranges from Mexico through Central America and South America. For the most part, Catasetinae grow in areas with a hot, wet summer and a much dryer, cooler winter. These plants have evolved to thrive under these very specific seasonal growing conditions. In the spring, with the lengthening daylight and just before the onset of the rainy season, they begin growing and start sending out their roots. Well into late spring the rainy season starts, and moisture and nutrients become plentiful. The newly developed roots are able to take advantage of these seasonal resources, assuring the new growths develop into large, healthy pseudobulbs with luxurious leaves in summer and into the early fall. By midfall, the plants detect the shortening day length that signals the end of the wet season and cooler temperatures ahead. This seasonal change indicates that it is time for the plants to prepare for winter dormancy. The leaves yellow and finally drop off, leaving bare bulbs that await the return of the spring and the onset of another growth cycle.

To grow and bloom Catasetinae successfully, you need to mimic the cultural conditions they experience in nature! New growths emerge in spring at the base of the previous year's pseudobulbs (this happens prior to the rainy season in nature). You should NOT be watering these plants at this time!!! Let the new growths produce roots. Once the roots reach 3–6 inches (7.6–15.2 cm), start watering and fertilizing (this simulates the start of the rainy season). Your summer conditions should be warm and humid with the long days providing ideal conditions for rapid pseudobulb and leaf development. Water at least 2–3 times a week and provide ample fertilizer (1/2 teaspoon [2.5 ml] of fertilizer to a gallon [3.8 L] of water works well). Make sure the plants have good air movement. In the fall, most of your plants should be at peak bloom production. As in nature, daylength should be shortening and temperatures dropping. This is the end of the rainy season, and you should cut back on water and stop fertilizing. During early winter, the dry season begins in nature, and watering should be stopped or nearly so. This will trigger your plants to complete dropping their leaves and finish hardening off the pseudobulb as they enter dormancy. Your plants will generally be dormant for 1–3 months, after which time their cycle will again start up with the onset of the longer and warmer days of spring. I prefer to grow my plants in plastic pots, but clay pots or baskets are both acceptable.

The subtribe Catasetinae is comprised of various genera: *Catasetum*, *Cycnoches*, *Mormodes* and *Clowesia*. Each has a different bloom period: catasetums bloom in July–January, *Cycnoches* bloom in November–January, *Mormodes* bloom from December to February and *Clowesia* includes summer bloomers that flower from June to September and winter bloomers that flower from January to February.

As of now, there are nearly 200 *Catasetum*, 35 *Cycnoches*, 90 *Mormodes* and seven *Clowesia* species, including a variety of flower shapes, colors and forms. This tremendous variety creates many opportunities for breeding. In this article, we will cover the parent species most frequently used in hybridizing, the hybrids and their appearance, and how American Orchid Society judges evaluate these plants when considering them for awards. These perspectives will help the grower to buy better plants

[1] *Cycd.* Spotted Hornet 'SVO II' AM/AOS; photograph by Arnold Gum.
[2] Start of the growing season. The plant on the far right shows when watering begins.
[3] End of the growing season. The plants illustrate the stages of leaf drop.

[4] Male and female (inset) flowers of *Cycnoches cooperi* 'SVO III" FCC/AOS.
[5] *Ctmds.* Dragon's Tail 'Dark Tail'
[6] *Morm. hookeri* 'Fuzz'
[7] *Fdk.* Doubtless 'Sunset Valley Orchids'
[8] *Cl.* Rebecca Northen 'Grapefruit Pink'
[9] *Cycd.* John Naugle 'SVO Select'
[10] *Clo.* Pierre Couret 'Flamingo Spot'
[11] *Fdk.* Gemstones 'Plum Perfect'
[12] *Ctsm.* Orchidglade 'Davie Ranches' AM/AOS
[13] *Mo.* Painted Desert 'Cordovan'

and perhaps even get AOS awards. The main genera treated here are *Cycnoches* (*Cyc.*), *Mormodes* (*Morm.*), *Cycnoches* × *Mormodes* = *Cycnodes* (*Cycd.*), *Catasetum* (*Ctsm.*), *Catasetum* × *Mormodes* = *Catamodes* (*Ctmds.*), *Clowesia* (*Cl.*), *Clowesia* × *Catasetum* = *Clowesetum* (*Clo.*), *Clowesia* × *Mormodes* = *Mormodia* (*Mo.*) and *Fredclarkeara* (*Fdk.*) = *Catasetum* × *Clowesia* × *Mormodes*.

The American Orchid Society judging system establishes a standard for expected quality based on previous awards and relies on the training and experience of the judges. This standard is fluid, as breeding programs progress and flower quality continues to improve. There are no specific judging criteria at this time for Catasetinae, and plants display an extraordinary diversity of flower shapes and colors. We have chosen to use a modified version of the judging criteria for cattleyas, which describes features that are considered desirable. Although not ideal, this judging standard does establish a starting point.

1) The general flower form should be round and full like a good *Cattleya* but to a slightly lesser degree.

2) Fine cultivars should have full, round shapes or an open star-like appearance, whereas other good forms may be slightly cupped. Excessive cupping or reflexing is a fault.

3) The lip can vary considerably with type and breeding.

4) The petals should be broad and arranged in a nearly equilateral triangle with the lip. The sepals should make an inverted, broadly based isosceles triangle.

5) The color should be clear and well-defined. Suffusion of one color over another should be regular and harmonious.

6) Spotting and other markings should be clear and distinct.

7) The lip should be prominent and distinctly colored.

8) The size of the flowers should be greater than those of the parents, and the substance and texture of the flowers should be equal to or better than those of the parents.

9) The inflorescence should be graceful, arching or pendent according to the ancestral species, with the flowers well spaced and well displayed.

10) The number of flowers will vary according to the variety and breeding.

When judging *Cycnoches*, it is important to understand the two sections into which this genus is divided, because each has distinctive floral qualities:

1) In the section *Eu-Cycnoches*, male and female flowers look alike, and a careful examination of small differences in flower morphology are needed to determine the flower sex. Male flowers are produced in large numbers, have shield-shaped lips, long slender columns (necks), an anther cap protecting two pollinia and no stigmatic surface. Female flowers are produced in smaller numbers, typically a few per inflorescence, have heavy substance and shield-shaped lips, with a short, broad column, a stigmatic surface and no pollinia.

2) In plants belonging to section *Heteranthae*, male flowers are produced in large numbers, have small lips with various numbers of fingerlike appendages or horns, long slender columns and an anther cap covering two pollinia. Female flowers are few per inflorescence, have shield-shaped lips, heavy substance, a short broad column, a stigmatic surface, and no pollinia.

The flowers of all cycnoches species are nonresupinate (flowers are upside down with the lip pointed upward) and fragrant, many having a pine-like scent. Bloom longevity is generally 3–4 weeks.

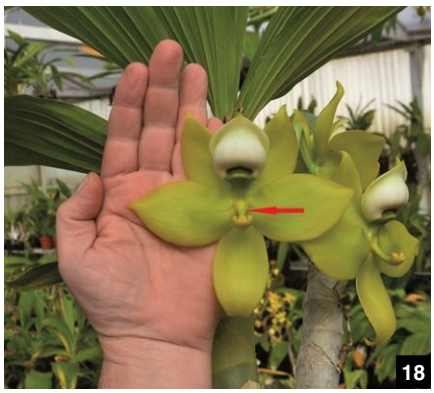
Cycnoches warszewiczii is a beautiful, well-balanced, full-flowered species in section *Eu-Cycnoches*. This species is distinctive because it has a horizontal petal stance, making it possible to draw a straight line through the center of the flower from one petal tip to the other. The

[14] *Cyc. warszewiczii* 'Sunset Valley Orchids' AM/AOS

[15] *Cyc. warszewiczii* 'Giant Swan'

[16] *Cyc. warszewiczii* 'Sunset Valley Orchids' AM/AOS full inflorescence showing excellent arrangement of the flowers.

[17] Full inflorescence of *Cyc. warszewiczii* 'SVO Swan'.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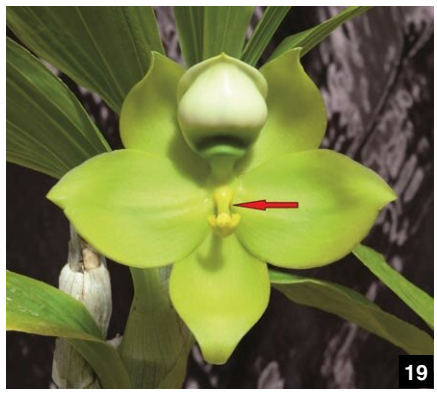
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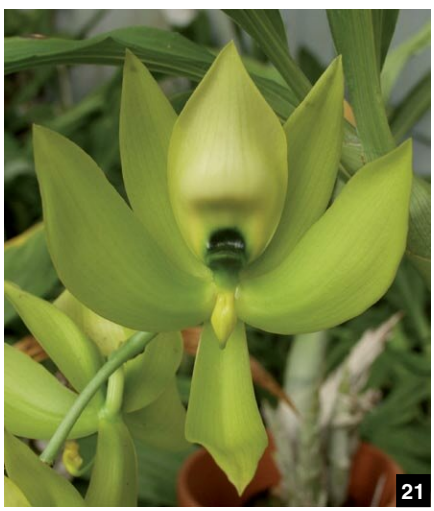
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[18–19] Examples of *Cyc. warszewiczii* female flowers. Note the thick columns (arrows).

[20] *Cyc. lehmannii*

[21–22] *Cyc. chlorochilon* is characterized by its clearly upswept sepals and petals.

[23] *Cyc. haagii*

[24–25] Two examples of *Cyc. loddigesii*, the most darkly colored flower in the section.

lip is in good proportion to the rest of the flower, and there should be 7–12 well-arranged flowers per inflorescence.

A good *Cyc. warszewiczii* today is full and flat. Line breeding has improved flower shape, filling out the petals at the attachment point. This feature contributes to the new standard of quality for this species, and the expectation is high for awards to mature, well-grown plants arising from this line breeding.

Female flowers of *Cyc. warszewiczii* have decidedly short, broad columns compared to the male flowers. Female *warszewiczii* flowers are well formed, like male flowers, and have heavy substance. Only 2–3 female flowers are produced at one time, possibly explaining why there have been fewer awards compared to plants with male flowers. Female flower size is truly amazing.

Cycnoches chlorochilon is another species in section *Eu-Cycnoches*. This species is identified by its upswept petal stance, large lip in proportion to the rest of the flower, and squarish shape. This species has not received any recent AOS awards, as it does not have the round form preferred by judges. However, flowers are still impressive, as their large size is commanding.

Cycnoches loddigesii has the darkest flowers in Section *Eu-Cycnoches*. Most are spotted or blotched in light burgundy with some nearly solid, burgundy-colored varieties in cultivation. Flowers have narrow, acutely upswept petals and generally number 5–9 per inflorescence. This species is not often seen in cultivation, and because of its shape, few awards have been given.

Cycnoches haagii, also in section *Eu-Cycnoches*, is unusual in that it has scattered red spots and two raised, digit-like appendages from the shield-shaped lip. *Cycnoches haagii* is quite floriferous, with many small flowers up to about 2.6 inches (6.6 cm) flowers and can produce multiple inflorescences per pseudobulb. *Cycnoches haagii* is rarely seen in cultivation and has few AOS awards as a


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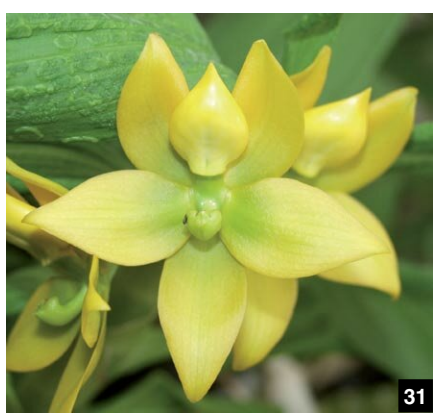
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[26] *Cyc. peruvianum* is rarely seen in collections.
[27] *Cyc. pentadactylon* 'Sunset Valley Orchids' male flowers.
[28] *Cyc. herrenhusanum* 'SVO Best' male flowers.
[29] *Cyc. barthiorum* female flowers.
[30] *Cyc. barthiorum* 'Fishing Creek' male flowers. Photograph by Stephen Male.
[31] *Cyc. herrenhusanum* female flowers.
[32] *Cyc. cooperi* 'Memoria Pat Worthington' AM/AOS carrying both female (upper, full fleshy flowers) and male flowers on the same pseudobulb.
[33] *Cyc. cooperi* subsp. *ayacuchoensis* 'SVO Green Emerald'


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[34] *Cyc.* Jean E. Monnier 'Big & Bold'
[35] *Cyc.* Jean E. Monnier 'Dark Swan'
[36] *Cyc.* Jean E. Monnier 'Bill Tse'

result.

Also in section *Eu-Cycnoches*, *Cycnoches lehmannii* is similar to both *chlorochilon* and *warszewiczii.* When flowers first open they are quite flat, but with time reflex acutely. Because the flower is not held flat, this species has received few AOS awards. *Cycnoches lehmannii* is overshadowed by the superior, awardable qualities of *Cyc. warszewiczii*.

Cycnoches peruviana is in section *Heteranthe*. These usually go unawarded, as individual flowers have irregular shapes with lots of recurving and undisciplined form, and the lips have complex digits. This gives the appearance that not all flowers look alike. In addition, this species is rarely available for sale and thus not commonly grown.

Cycnoches pentadactylon has my favorite orchid name. The term "pentadactylon" means "five-fingered," and the lips of this species have exactly five digits. The flowers of *Cyc. pentadactylon* have better shape than many of the other smaller-flowered *Heteranthe* species. This is an interesting species for breeding, as the spots have a reddish cast to them, which may be a good way to get red color in cycnoches hybrids.

Cycnoches herrenhusanum comes from a more recently discovered group of species in section *Heteranthe* that are native to Colombia and Peru. Unlike the previously known *Heteranthe* species, the male flowers of *Cyc. herrenhusanum* and others in this group have excellent flower shape, with wide petals, good color, and large numbers of well-arranged flowers. Counts of 25–40 per inflorescence are not uncommon. One judging fault is the tendency for the petal tips to recurve, creating the appearance that the tips were cut off. However, the overall floral qualities fit nicely into the AOS judging standards.

The female flower of *Cyc. herrenhusanum* is quite different from the male flower and somewhat reminiscent of female *Eu-Cycnoches* blooms. Because the flower is female, there is a stigmatic surface and no pollinia. As expected, these have heavy substance and low flower count.

Cycnoches barthiorum is the section *Heteranthe* species with the most colorful and complex color. Just imagine trying to write a good description of the complex hues that each flower displays — it is nearly impossible. *Cycnoches barthiorum* is also quite floriferous and can produce 2–3 inflorescences simultaneously. The dense, floriferous clusters often obscure most of the plant! On a well-grown plant, inflorescences can be 10–14 inches (25–35 cm) long with 30–40 flowers each. *Cycnoches barthiorum* does have some noteworthy judging faults: the dorsal sepal juts forward, and the flowers show a bit of cupping. Nonetheless, this is an impressive species. Female *Cyc. barthiorum* flowers are completely different in form than male flowers but still show some cupping.

Cycnoches cooperi is another spectacular *Heteranthe* species. It is extremely floriferous, and plants often produce 2–3 inflorescences per growth. Inflorescences are up to 2 feet long (60 cm), with more than 30 well-arranged flowers on each. Typical flower color ranges from dark chocolate to light bronze. There is a rare green form, which has been identified as a subspecies called *ayacuchoensis* after the town of Ayacucho in northern Peru where it was first found. The male flowers of *Cyc. cooperi* are well-balanced flowers with good form, a pleasing horizontal petal stance, broad lateral sepals, and a fairly straight dorsal sepal that frames the flower well. There have been many awards to *Cyc. cooperi*, as it fits judging ideals quite well.

Cycnoches cooperi 'Sunset Valley III' received an FCC/AOS in 2003. It is an outstanding plant that carried 41 flowers on a pendulous 28-inch-long (71 cm) inflorescence with broad, full petals and almost no pinching of the dorsal and lateral sepals. The female flowers are hard and waxy with good shape and presentation and generally 2–4 are produced per inflorescence.

Sometimes plants will flower with both male and female flowers simultaneously, a highly unusual occurrence. The male flowers have a long slender column with pollinia on the end. The female flowers are large and shield-shaped with short, stocky columns. How would you judge such plants? When *Cycnoches cooperi* 'Memoria Pat Worthington' AM/AOS was awarded in 2000, it produced only male flowers; what award might female flowers get? Can a single plant receive two concurrent awards? This situation is

discussed later in the article.

How does one judge *Cycnoches* flowers?

1) Form should tend toward full-shaped stars, and extra points should be given for more fullness.

2) Slightly cupped flowers are awardable but give more points to flat flowers.

3) Color should be clear and bright with well-defined markings. The better this is achieved, the higher the score the plant should get.

4) Size is variable, but judge against known species and previous awards.

5) Substance should be good with more points awarded for heavier substance. Female flowers should have an extremely heavy cardboard-like substance.

6) Arrangement is quite important and should be good.

7) High flower count should be awarded more points.

In scoring *Cyc. warszewiczii,* the general scale could be used. However, because Catasetinae belong to the subtribe Cymbidinae, the cymbidium scale might be a better option. The cymbidium scale allows for an appropriate breakdown of the flower characteristics, providing a higher level of detail in arriving at a final score. A circle circumscribed around the flower should include the tips of all segments, reflecting a round and full flower form. The ideal arrangement of the sepals and petals would form two intersecting triangles. Such a flower exhibits good balance in both shape and form with a horizontal petal stance. *Cycnoches warszewiczii* 'Sunset Valley Orchids' AM/AOS is an example of such a flower. It received an 86-point Award of Merit in 2003. The award description includes relevant details pertaining to the quality of the flowers. The description written by the judges for this plant reads: "Seven nonresupinate, evenly arranged male flowers on one inflorescence; sepals and petals evenly chartreuse; lip white with contrasting dark green claw; long green column with distal end widened and shaded to canary yellow; substance firm; texture waxy."

This description was based on a clone that was awarded 19 years ago. *Cycnoches warszewiczii* 'Giant Swan' is an excellent example of the current standard for quality awards. Note the extent to which petal width has expanded at the base, and the broader, flatter sepals on the more recent cultivar.

In AOS judging, preventing the intrusion of bias is an important concept in keeping a fair and open mind when evaluating a flower for an award. The term "bias" implies an unreasoned or unfair distortion of judgment in favor of

DATE _____ PLACE/SHOW _____

NAME OF PLANT *Ctsm. pileatum*

PARENTAGE _____

X _____

CIRCLE POINT SCALE USED	GENERAL 1	CATTLEYA 2	CYMBIDIUM 4	PAPHIOPEDILUM 5	DENDROBIUM 6	MILTONIA 7	ODONTOGLOSSUM 8	PHALAENOPSIS 9	VANDA 10	PLEUROTHALLIDS	POINTS SCORED
FLOWER FORM											
GENERAL FORM		15	15	20	15	15	15	15	15	20	12
SEPALS (*DORSAL SEPAL)		5	5	10	5	6	5	5	7	4*	3
PETALS (*LATERAL SEPALS)		5	5	5	5		5	6	5	8*	3
LABELLUM (*POUCH)		5	5	5*	5	9	5	4	3		4
CAUDAE										3	
TOTAL	30	30	30	40	30	30	30	30	30	35	22 73%
COLOR OF FLOWER											
GENERAL COLOR		15	15	20	15	15	15	15	15	20	12
SEPALS (*DORSAL SEPAL)		7	8	10	5	6	5	10	7	5*	6
PETALS (*LATERAL SEPALS)				5	5		5		5	10*	
LABELLUM (*POUCH)		8	7	5*	5	9	5	5	3		6
TOTAL	30	30	30	40	30	30	30	30	30	35	24 80%
OTHER CHARACTERISTICS											
SIZE OF FLOWER	10	10	10	10	10	10	10	10	10	10	8
SUBSTANCE AND TEXTURE	10	20	10	5	10	10	10	10	10	7	7
HABIT AND ARRANGEMENT OF INFLORESCENCE(S)	10		10		10	10	10	10	10	5	8
FLORIFEROUSNESS	10		10		10	10	10	10	10	8	8
FLORIFEROUSNESS AND STEM		10									
STEM				5							
TOTAL	40	40	40	20	40	40	40	40	40	30	31 78%

COMMENTS – PLEASE PRINT OR WRITE LEGIBLY, USE OTHER SIDE

TOTAL POINTS 77

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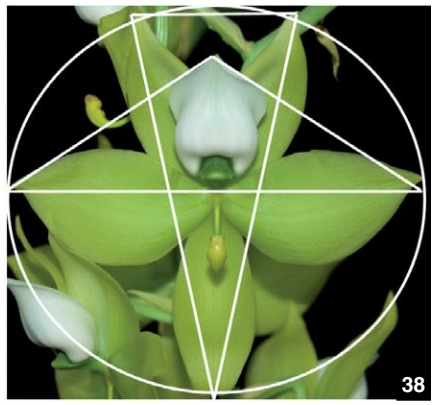
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[37] AOS score sheet selection for *Cyc. warszewiczii.*

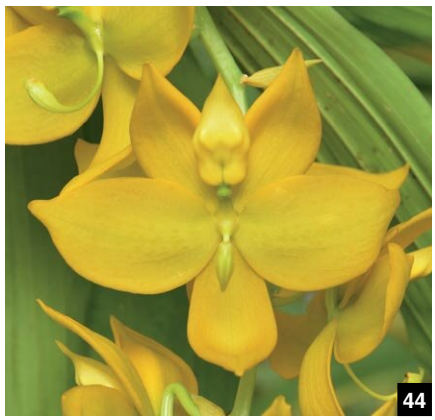
[38] *Cyc. warszewiczii.* Note the two intersecting triangles and the flower inscribed in a circle.

[39] *Cyc.* Martha Clarke 'SVO' (*herrenhusanum* × *barthiorum*)

[40] *Cyc. warszewiczii* 'Giant Swan' with very full sepals and petals and flat conformation.

[41] *Cyc.* Martha Clarke 'Solid Gold'

[42] *Cyc.* Martha Clarke 'Outstanding'



[43] *Cyc.* Maren Gleason 'Best Yet' (*warszewiczii* × Martha Clarke)
[44] *Cyc.* Kevin Clarke 'Gold Spots' (*warszewiczii* × *herrenhusanum*)
[45] *Cyc.* Martha Clarke 'Garland Hanson' (*herrenhusanum* × *barthiorum*); one of the best shaped clones.
[46] *Cyc.* Jumbo Cooper 'Sunset Valley Orchids' AM/AOS (*warszewiczii* × *cooperi)*. Photograph by Arthur Pinkers.
[47] *Cyc.* Super Cooper 'Mark's Joy' (Jumbo Cooper × *warszewiczii*); photographer: Mark Prout.
[48] *Cyc.* Anne-Kathrin Berger (*pentadactylon* × *herrenhusanum*)
[49] *Cyc.* Swan Cascade 'Theo' (*cooperi* × Jean E. Monnier)
[50] *Cyc.* Swan Cascade 'Daniella' AM/AOS. Photograph by Greg Allikas

or against a thing. Bias can be influenced by many factors. Experienced AOS judges are aware of bias and that it can be either unintentional or intentional. As judges, we need to be aware of the potential for making biasing statements or being biased by statements made by someone else. For instance, if I were on a judging team and, before scoring, I made the comment, "look at the terrible notch on the petal of this *Cyc*. *cooperi*," you are focused on that detail, and it can be difficult to take your eye off that annoying fault! By making this strong statement, I have biased you toward noticing this detail and away from other, perhaps positive, attributes of this flower. But what if I had stated, "look at that magnificent, rich, deep-chocolate color?" Would you view this flower more favorably? Very possibly yes. Staying impartial requires us to stay aware of how bias can creep into judging experiences. It takes a conscious and conscientious effort, both as listeners and as speakers, to reduce the influence of bias.

The primary hybrid *Cyc. barthiorum* × *Cyc. cooperi* = *Cycnoches* Jean E. Monnier. This grex has been very successful, with 29 AOS awards, including 18 AM/AOS. In this hybrid, faults have been minimized and positive attributes amplified. The grex produces many beautifully colored flowers, arranged well and with a pleasing shape.

Cycnoches Martha Clarke is *Cyc. herrenhusanum* × *Cyc. barthiorum*. *Cycnoches herrenhusanum* has added its yellow color, and *barthiorum* provides the spots. Both parents add a high flower count and pleasing arrangement. These qualities combined to produce a noticeable improvement over both parents, providing great color, broad segments, high flower count, and good arrangement. A fault still evident is slight cupping in the dorsal sepal.

The breeding of *Cycnoches* Jumbo Cooper (*warszewiczii* × *cooperi*) combines an *Eu-Cycnoches* with a *Heteranthe*. This grex is showing the best of the influence from both parents: broad horizontal petal stance and flat flowers with many well-presented blooms.

The hybrid of *Cyc.* Jumbo Cooper × *Cyc. warszewiczii* makes *Cyc*. Super Cooper. The doubling up of *warszewiczii* adds broad lip shape, large flower size and flat presentation. The positive *warszewiczii* characteristics are evident in this next-generation hybrid. Looking at this from an AOS judging perspective, the flowers are well-formed and flat with broad horizontal petals, arranged nicely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on a long cascading inflorescence. Best of all, the flowers have a cocoa color! Is this First Class Certificate (FCC) quality?

Cycnoches Anne-Katrin Berger (*pentadactylon* × *herrenhusanum*) is a successful grex when it comes to flower quality. The *pentadactylon* parent has flat, spotted, smallish flowers, and, crossed with the reflexed, yellow, full-formed flowers of *herrenhusanum*, the result is an attractive combination that exemplifies the best of both parents.

Cycnoches Swan Cascade (Jean E. Monnier × *cooperi*) was one of the first complex hybrids. This cross contains a double dose of *cooperi* and produces impressive inflorescences carrying many flowers with great color and nice spotting.

Currently, one of the most influential parents is *Cycnoches* Richard Brandon, whose offspring have set new standards in *Cycnoches* breeding. This cross is *Cyc. warszewiczii* × *Cyc.* Jean E. Monnier (*cooperi* × *barthiorum*), and plants carry many full-shaped, large, colorful flowers, with spotting from *barthiorum,* shape provided by *warszewiczii*, and flower count from *cooperi.*

Understanding the breeding characteristics of the species that make up the background of a hybrid is important to evaluate the results. The back cross of

[51] *Cyc.* Richard Brandon 'Sunset Valley Orchids II' AM/AOS (*warszewiczii* × Jean E. Monnier)

[52] *Cyc.* Richard Brandon 'SVO Swan Song' AM/AOS

[53] *Cyc.* Richard Brandon 'Very Select'

[54] This cultivar of *Cyc.* Richard Brandon has the widest sepals and petals yet.

[55] *Cycnoches* Mary Mancini (Richard Brandon × *warszewiczii*)

[56] *Cyc.* Cryminy (Kevin Clarke × Richard Brandon)

[57] *Cyc.* Chloronge 'Everglade' (*chlorochilon* × *loddigesii*)

Cyc. warszewiczii to *Cyc.* Richard Brandon makes a newly registered grex named *Cycnoches* Mary Mancini. Reinforcing the qualities of *warszewiczii* leads to evident improvements over Richard Brandon. These include improved segment width and shape, and increased size of the lip. Interestingly, the flower colors are similar to those of Richard Brandon. The green callus of *warszewiczii* reappeared, and the flower count was reduced. Overall, this is an eye-catching hybrid with an impressive shape.

Cycnoches Cryminy (Kevin Clarke × Richard Brandon) gave surprising results. The complex nature of the grex brought forth a color combination not believed possible, thus the name Cryminy! The burnt-orange base color with bold, deep-burgundy spotting and contrasting white lip had never before been seen! The flower shape, conformation and proportions of the segments also made for an attractive appearance. Although never exhibited, it appears to have all the attributes needed for an AOS award. An important feature of this grex is the coalescing of dark spots on the dorsal and lateral sepals. This characteristic indicated the possibility of developing a flower completely covered with coalesced dark spotting. Black Swans — how awesome would that be?

Cycnoches Dark Swan comes from the cross of *Cyc.* Richard Brandon × *Cycnoches* Chloroge.

Cycnoches Chloroge is a hybrid of *Cyc. warszewiczii* × *Cyc. loddigesii*. Both species have an upward sweep to the petal stance, and 'Everglades' exhibits this trait, as well as diffuse spotting that coalesces, creating an overlay effect. This grex revealed the potential to develop coalesced spots that darken and spread out over the petals and sepals. The result is a dark-colored *Cycnoches*, and the potential to one day develop a flower as dark as those of a *Fredclarkeara*.

Concurrently with the development of the sensational *Cyc*. Dark Swan, this unregistered grex (*Cyc*. Richard Brandon × *Cyc*. Cryminy) made a striking impression on its first blooming. The coalescing spot phenomenon blacked out the background color of the petals, resulting in bold blotching/spotting on the burnt orange sepals and petals with lip spots plus good flower shape. Okay — who is ready to score this plant?!

Cycnoches Pineapple Popcorn (Kevin Clarke × *warszewiczii*) introduced a new spin on flower color in *Cycnoches*: yellow flowers with golden spots. The ancestry of this cross includes one instance of *herrenhusanum* and two of *warszewiczii*. The size and shape are outstanding, strongly influenced by the double dose of *warszewiczii* and the addition of color and spots from *herrenhusanum.* Interestingly, the spots were not red, as expected. This is a great example of nearly perfect *Cycnoches* flower shape in modern breeding.


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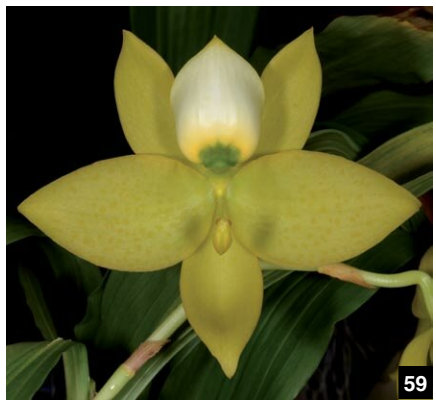
Exploring new color combinations has long driven my passion for breeding with cattleyas. At Sunset Valley Orchids we developed several successful breeding lines of yellow flowers with burgundy spots. So how about doing the same with *Cycnoches*? *Cycnoches* Martha Clarke (*herrenhusanum* × *barthiorum*) was the first step in making this happen.

The follow-up grex, Maren Gleason (*warszewiczii* × Martha Clarke), allowed for the expression of color and spotting from Martha Clarke with improved shape from the *warszewiczii* parent, making a hybrid with the desirable qualities that hobbyists and AOS judges are looking for.

The pinnacle of today's breeding for *Cycnoches* with yellow flowers and burgundy spots is expressed in *Cycnoches* Providence (Richard Brandon × Martha Clarke). The outstanding flower color — clear yellow with random bold, dark-burgundy spotting — cannot be ignored, and the excellent overall shape with wide petals and sepals creates a full-shaped, pleasingly formed flower. Add to that the production of 10 well-arranged flowers and an award looks to be forthcoming!

Over the last 20 years, the rapid pace of development in *Cycnoches* breeding has brought significant improvements and opportunities for hobbyists, exhibitors and AOS judges. The swan-shaped flower is truly beautiful, and there are many new objectives still to achieve in their development. I hope that more people will discover the joys of growing and flowering these beauties. They are truly magnificent!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[58] *Cyc.* (Richard Brandon × Cryminy 'Black Wings')
[59] *Cyc.* Pineapple Popcorn 'Sunset Valley Orchids' (Kevin Clarke × *warszewiczii*)
[60] *Cyc.* Providence 'Sunset Valley Orchids' (Richard Brandon × Martha Clarke)

Judging *Mormodes* species and hybrids.

The genus *Mormodes* is a diverse group of orchids with many unusual flower shapes, colors and forms. All have asymmetric blooms. Generally, the petals project forward, and the lateral sepals reflex. The lip is saddle-shaped and can have side lobes that are acute and recurved. The column twists up to 90 degrees relative to the lip, presenting the anther cap and stigmatic surface to the left or right of the lip. The primary focus in judging should be on the overall effect of the inflorescence and its flower color, quantity, arrangement and size. It is important in judging to remember that these flowers are naturally asymmetrical, and they should not be more difficult to evaluate than *Dendrobium* sections *Spatulata* and *Latouria*, which also possess different and asymmetric shapes and forms. Using a judging scale like that for *Dendrobium* when judging *Mormodes* may be beneficial, as the scale is weighted toward the color of the petals and sepals.

With *Mormodes*, color is important for both AOS judging and collectors of Catasetinae. *Mormodes sinuata* has bright, vibrant-red flowers with red veins and a classic asymmetric form. The lip curls up and touches the dorsal sepal and both petals. The side lobes of the lip jut down, creating a saddle-shaped lip, and the lateral sepals are horizontal. Despite being crowded on the inflorescence, the individual flowers look the same. This is desirable, and an important parameter to keep in mind during judging.

Mormodes horichii is a very showy and floriferous species. Flowers are quite large with nice mauve coloration and have unique symmetry, with the dorsal sepal vertical and the lateral sepals and lip are more horizontal.

Mormodes elegans is named for its beautifully colored flowers, produced on long, slender, upright inflorescences. This photo shows the saddle-shaped lip and the 90-degree twist to the column, exposing the pollinia to the side.

The flowers of this *Mormodes buccinator* f. *aurea* 'Golden Green' are excellent examples of how individual flowers can be asymmetric yet identical. It is important when judging *Mormodes* that each flower looks the same on the inflorescence. The lip color is an exceptionally vibrant yellow, set off by the green petals and sepals, which creates an appealing combination.

Mormodes rosea is a quite floriferous species, with a high flower count on each individual inflorescence and many inflorescences per pseudobulb. The "rosea" name refers to the pink cast of the flowers.

Mormodes hookeri, with its dramatic dark fuzzy lip, is unique within the genus. The burnt-orange flowers are overlaid with faint bronze spotting, and the classic twist to the column is evident. This is a flower of wildly contrasting textures: sparkling petals and sepals with a velvety


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[61] *Morm. horichii* 'Sunset Valley Orchids'
[62] *Morm. buccinators* 'Golden Green'
[63] *Morm. elegans* (Alba) 'Sunset Valley Orchids'
[64] *Morm. rosea* with, count them, eight inflorescences! The inset flower photograph is *Morm. rosea* 'Sunset Valley Orchids'
[65] *Morm. revolutum* 'Sunset Valley Orchids'
[66] *Morm. morenoi* 'Yellow Stripes'
[67] *Morm. ignea* 'Orange Blaze'
[68] *Morm. sinuata* 'Sunset Valley Orchids ' HCC/AOS
[69] AOS score sheet selected for judging *Mormodes*.

lip. *Mormodes hookeri* has been an important parent in making mormodes and cycnodes hybrids.

Mormodes revolutum is notable for its beautifully contrasting flower colors and patterns. The yellow base color overlaid with coalesced lines and spots, combined with a white lip peppered with red spots, create an overall appeal. The clam-shaped lip shows the degree to which the side lobes of *Mormodes* flowers can reflex and accentuates the variability of lip presentations in the genus.

Mormodes ignea has great lip color — almost neon orange. The asymmetry of the flowers is evident, with forward-leaning petals and strongly reflexed sepals.

Rarely seen in cultivation, *Mormodes morenoi* has a limited distribution in nature, and no plants have yet been awarded by the American Orchid Society. The variable flower color is unique: every plant has a different combination of reds, yellows and oranges, typically with stripes. This variety creates a veritable smorgasbord of patterns and potential uses in making new hybrids.

Mormodes should be judged by the following criteria:

1) Overall appeal: The whole effect of the inflorescence should be dramatic and appealing.

2) Form: uniform presentation and orientation of the asymmetric segments (sepals, petals and lip) should look the same from flower to flower. The better the form, the higher the point count.

3) Color: distinctive bright colors and patterns should be rewarded with higher point totals.

4) Size: research and compare to previous awards and give more points for improvements in size.

5) Substance: firm is expected. Give more points for improvement here.

6) Arrangement: reward uniformness and good arrangement with extra points.

7) Floriferousness: reward higher flower count with more points.

For judging *Mormodes sinuata*, the *Dendrobium* scale was selected, as it emphasizes petal and sepal color. The uniformity in flower shape is quite high; each flower is nearly identical to the other flowers. Flower color is strong, clear and distinctive with its bold stripes, which makes an attractive combination that is highly awardable in this section of the score sheet. However, the arrangement of these flowers is crowded on one side of the inflorescence. This is a scoreable fault and is reflected in the score sheet under


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"Habit and Arrangement of Inflorescence." The final score of 78.5 points is a Highly Commended Certificate (HCC).

Mormodes Jumbo Bacia is a primary hybrid (*badia* × *uncia*) that inherited the best qualities from both parents. The cultivar, 'Sunset Valley Orchids' received an Award of Merit (AM/AOS) for its outstanding color, a great spiraling arrangement with flowers nearly identical, and 36 blooms on a single inflorescence!

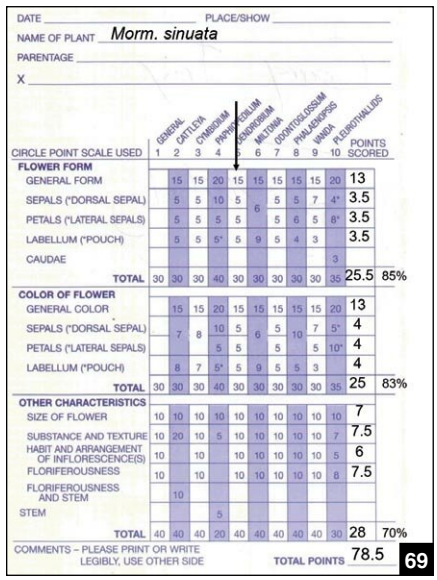
One of the most noteworthy is a hybrid bred by Exotic Orchids of Maui: Mormodes Exotic Treat (*sinuata* × *tuxtlensis*). It has received five AOS quality awards. This hybrid has increased the flower size, intensified coloration and created a beautiful patterning. Plants of this grex grow vigorously, produce bright-orange to yellow flowers with bold burgundy spotting and are capable of carrying 20+ blossoms per inflorescence.

Mormodes Nitty-Gritty (Exotic Treat × *rolfeana*) is a complex mormodes hybrid and a consistent producer of larger-than-average flowers in orange with bold burgundy spotting. It shows some irregularity in asymmetry from blossom to blossom, typically resulting in lower scores.

The judges awarded *Morm.* Nitty-Gritty 'SVO Ripper' JC/AOS a Judges' Commendation (JC) for its exceptional, exotic color and pattern.

The grex *Mormodes* Midnight Hooker (Midnight × *hookeri*) has been producing beautifully colored flowers on vigorous and floriferous plants. The flowers are well displayed on a sturdy, upright inflorescence carried by leafless plants.

The parents of *Mormodes* Virgen Del Valle are *Morm. sinuata* × *Morm. hookeri.* The flowers along the inflorescence are nearly identical with the same amount of twisting on each flower. The color from the *sinuata* and fuzzy lip from *hookeri* make an attractive combination. This


DATE _____ PLACE/SHOW _____
NAME OF PLANT Morm. sinuata
PARENTAGE _____
X _____

CIRCLE POINT SCALE USED	GENERAL 1	CATTLEYA 2	CYMBIDIUM 3	PAPHIOPEDILUM 4	DENDROBIUM 5	MILTONIA 6	ODONTOGLOSSUM 7	PHALAENOPSIS 8	VANDA 9	PLEUROTHALLIDS 10	POINTS SCORED	
FLOWER FORM												
GENERAL FORM	15	15	20	15	15	15	15	15	20		13	
SEPALS ("DORSAL SEPAL)	5	5	10	5	6	5	5	7	4*		3.5	
PETALS ("LATERAL SEPALS)	5	5	5	5		5	6	5	8*		3.5	
LABELLUM ("POUCH)	5	5	5*	5	9	5	4	3			3.5	
CAUDAE									3			
TOTAL	30	30	30	40	30	30	30	30	30	35	25.5	85%
COLOR OF FLOWER												
GENERAL COLOR	15	15	20	15	15	15	15	15	20		13	
SEPALS ("DORSAL SEPAL)	7	8	10	5	6	5	10	7	5*		4	
PETALS ("LATERAL SEPALS)			5	5		5		5	10*		4	
LABELLUM ("POUCH)	8	7	5*	5	9	5	5	3			4	
TOTAL	30	30	30	40	30	30	30	30	30	35	25	83%
OTHER CHARACTERISTICS												
SIZE OF FLOWER	10	10	10	10	10	10	10	10	10	10	7	
SUBSTANCE AND TEXTURE	10	20	10	5	10	10	10	10	10	7	7.5	
HABIT AND ARRANGEMENT OF INFLORESCENCE(S)	10		10		10	10	10	10	5		6	
FLORIFEROUSNESS	10		10		10	10	10	10	8		7.5	
FLORIFEROUSNESS AND STEM		10										
STEM				5								
TOTAL	40	40	40	20	40	40	40	40	30		28	70%

COMMENTS – PLEASE PRINT OR WRITE LEGIBLY, USE OTHER SIDE

TOTAL POINTS 78.5

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primary hybrid has been proving itself as a successful parent. Notice its influence in the next four crosses.

In the hybrid *Mormodes* Roehampton's Charcoal (Virgen Del Valle × *hookeri*), only two species are represented: *Morm. sinuata* once and *Morm. hookeri* twice. You can see in the picture the hirsute lips that result from the influence of *hookeri*.

Mormodes Mark Mills (Jumbo Bacia × Virgen Del Valle) incorporates the influence of four species: *badia*, *uncia*, *hookeri* and *sinuata*. This grex has proven to be one of the easiest *Mormodes* hybrids to grow and flower. This ease of culture has improved the odds for getting American Orchid Society awards and *Morm*. Mark Mills now has four awards. The plants produce sturdy upright inflorescences with many dark-burgundy blooms and deep-red lips, an attractive presentation.

Breeding *Mormodes* can be surprising, and *Mormodes* Aftermath is the most complex yet produced with five species in its background. The parents are *Morm*. Midnight Hooker and *Morm*. Mark Mills, which were described earlier in this article. It is hard to believe that the amazing flower color of 'SVO Nuclear Fallout' resulted from those parents! The color inspired the name of the grex as well as the name of the first cultivar to be awarded. As expected, not all Aftermaths were orange, and some favored the color of the parents, as seen in 'Sunset Valley Orchids' HCC/AOS.

Mormodes (Virgin Del Valle × Nitty-Gritty) has great appeal. The striped petals and sepals combined with the pink-veined lips make for great color contrast. What a spectacular cultivar this is — it truly has the "wow factor"!

***Cycnodes* Hybrids**


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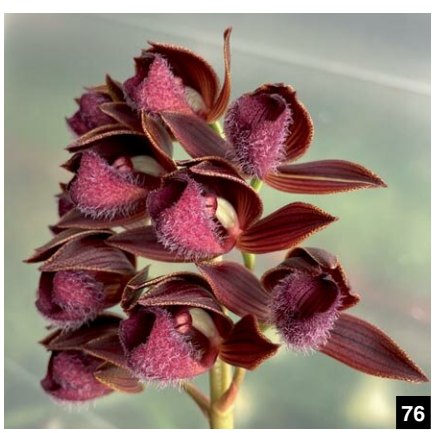
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[70] *Morm.* Jumbo Bacia 'Sunset Valley Orchids' AM/AOS (*badia* × *uncia*); photograph by Arnold Gum.

[71] *Morm.* Exotic Treat 'SVO Orange' (*sinuata* × *tuxtlensis*)

[72] *Morm.* Virgen del Valle 'SVO Dark Horse' AM/AOS (*sinuata* × *hookeri*); photograph by Arnold Gum.

[73] *Morm.* Midnight Hooker 'Dark Night' HCC/AOS (Midnight × *hookeri*)

[74] *Morm.* Mark Mills 'Hot Lips' (Jumbo Bacia × Virgen del Valle)

[75] *Morm.* (Virgen del Valle × Nitty-Gritty) 'Peppermint Stripes'

[76] *Morm.* Roehampton's 'Charcoal Purple Fuzz' (Virgen del Valle × *hookeri*)

[77] *Morm.* Aftermath 'SVO Nuclear Fallout' AM/AOS (Midnight Hooker × Mark Mills)

[78] *Cycd.* John Naugle 'Sunset Valley Orchids' AM/AOS (*Morm. andicola* × *Cyc warszewiczii*)

[79] *Cycd.* Wine Delight 'JEM' FCC/AOS (*Cyc lehmannii* × *Morm. sinuata*)

[80] *Cycd.* Midnight Magic 'Stripes' HCC/AOS (*Morm.* Midnight × *Cyc. chlorochilon*); photograph by Richard Clark.

Cycnodes (*Cycd*.) result from crossing *Cycnoches* and *Mormodes.* This hybrid genus is quite remarkable, as the best qualities of each genus dominate and the poor qualities are not passed to the offspring. The large, well-formed flowers of *Cycnoches* are dominant for shape and recessive for color, and the *Mormodes* is dominant for its brightly colored flowers and recessive for the twisted, asymmetrical flower shape. Thus, the best qualities of each dominate — it is a match made in heaven! High flower quality results from this type of breeding, as evidenced by the 80 registered hybrids that have received 99 AOS awards to date, including four highly coveted First Class Certificates (FCC).

Registered in 1980, *Cycnodes* Wine Delight (*lehmanii* × *sinuata*) has been around for more than 40 years and was only the fourth *Cycnoches* hybrid registered! The FCC to the cultivar 'JEM' was awarded in 1984. This plant was cloned and distributed worldwide. It was a huge success! Nobody had seen an orchid like it before. It set the standard of quality for AOS judging at the time and, more importantly, provided important insights into the breeding characteristics of *Cycnoches* and *Mormodes*. Looking at the shape and form of Wine Delight 'JEM' flowers and comparing these to more recent awards reveal how AOS judging standards have evolved over time.

One measure of success is the number of AOS awards given to a grex. Registered in 1999, *Cycnodes* Midnight Magic (*Cyc. warszewiczii* × *Morm*. Midnight) led a new wave of *Cycnodes* hybrids in which the positive influence of *Cyc. warszewiczii* was realized. Note the improved petal width, flattened flower form, and sturdy stem. It received eight awards plus a coveted Award of Quality (AQ), defined by the AOS as: "Awarded once to a cross exhibited by a single individual as a group of not less than 12 plants or inflorescences of different clones of a hybrid or cultivated species. At least one of the inflorescences must receive a flower quality award and the overall quality of the group must be an improvement over the former type." This honor is granted unanimously without scoring by the judging team.

A good example of breeding traits can be seen in this simple primary hybrid between *Cyc. warszewiczii* and *Mormodes frymirei.* The good shape of the *warszewiczii* combines with *frymirei* and its asymmetrical flowers with a light-pink lip and petals and sepals bearing lines made up of coalesced spots.


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[81] *Cycd.* JEM's Dragon 'Sunset Valley Orchids' FCC/AOS; photographer: Richard Clark.
[82] *Morm.* Nitty-Gritty 'SVO Ripper' JC/AOS (Exotic Treat × *rolfeana*); photograph by Arnold Gum.
[83] *Cycd.* Opalina 'Baker's Green Goblin' AM/AOS (*Cyc. warszewiczii* × *Morm. horichii*)
[84] *Cycd.* Spotted Hornet 'Sunset Valley Orchids' FCC/AOS (*Cyc. warszewiczii* × *Morm.* Exotic Treat); photograph by Arthur Pinkers.
[85] *Cycd.* Chiriqui 'Sunset Valley Orchids' FCC/AOS (*Cyc. warszewiczii* × *Morm. hookeri*); photograph by Arnold Gum.
[86] *Cycd.* John Naugle 'SVO II' AM/AOS; photographer: Arthur Pinkers.
[87] *Cycd.* Troublemaker 'Flat Out Excellent' (*Cyc.* Spotted Hornet × *Cyc. warszewiczii*)

Remembering that *Cycnoches* dictates shape and *Mormodes* dominates color, how will the outcome look? The result, *Cycnodes* JEM's Dragon 'Sunset Valley Orchids' FCC/AOS, looks like a pink *Cycnoches* covered with spots! Color from *Mormodes* and shape from *Cycnoches* are truly a match made in heaven. In the Royal Horticultural Society orchid hybrid database, *Cycd*. JEM's Dragon is recorded as *Cyc. chlorochilon* × *Morm. frymirei*, but according to Gene Monnier, who registered this cross, the capsule parent was *Cyc. warszewiczii*.

Crossing *Cyc. warszewiczii* × *Mormodes horichii* gives us *Cycnodes* Opalina. The improvement of overall flower shape imparted by the *Cycnoches* parent is evident. Although the flower shape is still starry, lips are flattened, overriding the form of the *Mormodes*. Unlike the *Cycnoches* parent, the flowers of *Cycnodes* are resupinate with the lip pointed downward. The *Mormodes* predictably added color and an impressive flower count on the long, arching inflorescences. As you can see from this photo, the result made me very happy!

Cycnodes Chiriqui is a primary hybrid (*Cyc. warszewiczii* × *Morm. hookeri*), and the breeding characteristics of each parent species are well displayed. When *Cycd*. Chiriqui 'Sunset Valley Orchids' FCC/AOS was awarded, the judges on the team wrote this description: "Thirteen large flowers beautifully arranged on one arched inflorescence; sepals and petals deep-velvet red-brown; lip vibrant red-orange; substance heavy; texture matte, lip waxy." This plant also won the 2012 Merritt Huntington AOS award for the best FCC of the year.

The grex *Cycnodes* John Naugle (*Cyc. warszewiczii* × *Morm. andicola*) further demonstrates the high-quality flowers produced from the pairing of *Cyc. warszewiczii* and a *Mormodes*. This simple primary hybrid shows outstanding color, form and flower arrangement.

The hybrid *Cycnodes* Spotted Hornet (*Cyc. warszewiczii* × *Morm.* Exotic Treat) produced these two outstanding examples. An informal survey has indicated that most people like the look of 'SVO II' AM/AOS over 'SVO' FCC/AOS. It seems that the red lip coloration and distinct spotting on a yellow background make the flowers appear more dramatic.

Taking cycnodes breeding to the next level resulted in the grex *Cycnodes* Troublemaker (Spotted Hornet × *Cyc. warszewiczii*). The reintroduction and influence of *Cyc. warszewiczii* continues

to improve flower form and shape, while allowing the color from the *Mormodes* to show itself without any of the *Mormodes* faults. 'Flat Out Excellent' was the only name I could think of when I saw this plant flower for the first time.

Criteria for judging *Cycnodes* (*Cycnoches* × *Mormodes*)

1) Form: slightly cupped flowers are awardable, but flatness and fullness get extra points. Uniform and symmetrical proportions are expected. Give points for flat lips and straight columns.

2) Color: clear, bright and bold colors get more points. Score bright contrasting lips higher.

3) Size: should be better than the average of the parents.

4) Substance: expect heavy substance and award higher points for this.

5) Arrangement: reward well-arranged inflorescences.

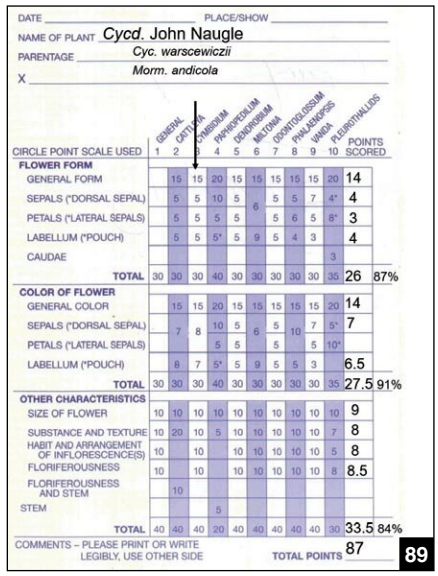
6) Floriferousness: reward higher flower counts.

How would you score a plant of *Cycnodes* John Naugle (*Cyc. warszewiczii* × *Morm. andicola*)*?*

Here is one way to look at it: I have selected the *Cymbidium* scoring scale, as it allows for a breakdown of the points by category, permitting a higher level of detail in arriving at a final score. This flower has wide, well-arranged floral segments. The flower colors have a wow factor to them. Note that each spot on the petals has a small ring of yellow around it, making the color pop. Also note how the lip has a beautiful color that transitions from dark to light with darker spots adding to the overall beauty. The flowers have a wide natural spread, heavy substance and good arrangement, and the plant is quite floriferous. My score totaled 87 points, an AM/AOS.

Judging Catasetums

The criteria for judging catasetums are complicated. There are hundreds of species, and floral characteristics show a wide range of variation. Here, I have provided a general guideline based on the influence of several important species


DATE _____ PLACE/SHOW _____
NAME OF PLANT *Cycd.* John Naugle
PARENTAGE *Cyc. warscewiczii*
X *Morm. andicola*

CIRCLE POINT SCALE USED	GENERAL 1	CATTLEYA 2	CYMBIDIUM 3	PAPHIOPEDILUM 4	DENDROBIUM 5	MILTONIA 6	ODONTOGLOSSUM 7	PHALAENOPSIS 8	VANDA 9	PLEUROTHALLIDS 10	POINTS SCORED	
FLOWER FORM												
GENERAL FORM		15	15	20	15	15	15	15	15	20	14	
SEPALS ("DORSAL SEPAL)		5	5	10	5	6	5	5	7	4*	4	
PETALS ("LATERAL SEPALS)		5	5	5	5		5	6	5	8*	3	
LABELLUM ("POUCH)		5	5	5*	5	9	5	4	3		4	
CAUDAE										3		
TOTAL	30	30	30	40	30	30	30	30	30	35	26	87%
COLOR OF FLOWER												
GENERAL COLOR		15	15	20	15	15	15	15	15	20	14	
SEPALS ("DORSAL SEPAL)		7	8	10	5	6	5	10	7	5*	7	
PETALS ("LATERAL SEPALS)				5	5		5		5	10*		
LABELLUM ("POUCH)		8	7	5*	5	9	5	5	3		6.5	
TOTAL	30	30	30	40	30	30	30	30	30	35	27.5	91%
OTHER CHARACTERISTICS												
SIZE OF FLOWER	10	10	10	10	10	10	10	10	10	10	9	
SUBSTANCE AND TEXTURE	10	20	10	5	10	10	10	10	10	7	8	
HABIT AND ARRANGEMENT OF INFLORESCENCE(S)	10		10		10	10	10	10	10	5	8	
FLORIFEROUSNESS	10		10		10	10	10	10	10	8	8.5	
FLORIFEROUSNESS AND STEM		10										
STEM				5								
TOTAL	40	40	40	20	40	40	40	40	40	30	33.5	84%

COMMENTS – PLEASE PRINT OR WRITE LEGIBLY, USE OTHER SIDE — TOTAL POINTS 87

89

[88] *Cycd.* John Naugle 'SVO Select'

[89] AOS score sheet selected for judging *Cycnodes*.

commonly used in today's hybrids. Included in the development of these criteria are *Catasetum pileatum*, *Ctsm. expansum*, *Ctsm. tenebrosum*, *Ctsm. fimbriatum*, *Ctsm. denticulatum*, and *Ctsm. tigrinum*.

1) Form: flowers should tend toward full form; however, there are many different flower types that should be referenced when arriving at a score. Slightly cupped flowers are awardable, but flat flowers should be highly rewarded.

2) Color: clear, bright colors and well-defined markings should receive more points.

3) Size: flower size is variable, thus the need to compare against known species.

4) Substance: expect fair substance

5) Arrangement: good arrangement is important and should be rewarded with a higher point score.

6) Floriferousness: expect and reward high flower count.

Catasetum pileatum has the largest flowers in the genus, with a lip as big as the palm of your hand and inflorescences that carry up to 16 blossoms. These characteristics make *Ctsm. pileatum* an important parent in breeding, with admirable flower qualities well suited for judging. Flower life is usually 6–10 days, and well-grown plants can produce 2–4 inflorescences from a newly matured pseudobulb. The cultivar 'Dinner Plate' has some good qualities, with a large, broad lip and well-formed lateral sepals and petals. Low flower count would be a fault.

Catasetum pileatum var. *imperiale* is a unique color form of *pileatum*, recognizable by the red pigmentation expressed on the flowers. This variety was collected many years ago in Venezuela and is found only in a specific area of Apure state. Some people feel that it might represent a natural hybrid. One theory for the red color is that *Catasetum* × *tapiriceps* (the natural hybrid of *pileatum* and *Catasetum macrocarpum*) was backcrossed to *pileatum* in nature many times over the years, resulting in the creation of a complex natural hybrid that favors the attributes of *pileatum* and shows the red flower color of *macrocarpum*. The real nature of this special cultivar may never be known. What is amazing about a well-flowered *Ctsm. pileatum* 'Pierre Couret' HCC/AOS is the flower arrangement. Notice how these two inflorescences have produced flowers in a symmetrical helical arrangement. In figure 91, note the superimposed lines that clearly show this pattern. This symmetrical helical arrangement deserves a very high point count when judging such plants.

Catasetum flowers are sexually dimorphic. Male flowers are showy and have a wide variety of shapes, colors and sizes. They are highly fragrant, short-lived (5–10 days), and have a pollen-ejecting trigger below the column. Female flowers are helmet-shaped, generally green, lightly fragrant, and generally long-lasting (4–6 weeks). The column has a narrow slit to allow access to the stigmatic surface. Female flowers have similar shapes among species, and, as a result, female flowers cannot be used reliably for species identification. In judging, female-flowered plants are rarely awarded, as you also need some male flowers on the same plant to know what species you are judging. It is rare to have both flower forms on a single plant simultaneously. This lack of floral diversity among female flowers has led to breeding being focused on the showy male flowers. This sexual dimorphism can make breeding catasetums challenging, as both male and female flowers are required to set seed.

What causes a *Catasetum* to produce male or female flowers?

The development of male or female flowers is dependent on environmental conditions. Female flowers are most likely produced by large robust plants. These plants have experienced long periods of favorable growing conditions with respect to light, moisture and nutrients. These conditions result in plants with sufficient moisture and nutrient reserves carrying seed capsules through the dry winter dormant period, surviving to disperse their seed. Male flowers are generally produced when growing conditions are less optimal. When plants are young, do not get as much light or get too much light, are stressed from lack of moisture or nutrients, and so on, the result is a plant suitable for producing pollen but not the more challenging task of carrying a seed capsule to maturity.

When judging *Ctsm. pileatum*, there are multiple things to note, such as the good arrangement of flowers in a helix; a nice, broad expanded lip; and an acute vertical presentation to the petals. As for the other catasetum examples, here we are using the *Cymbidium* scale for judging.


90


91


92

[90] *Ctsm. pileatum* 'SVO Best'

[91] *Ctsm. pileatum* var. *imperiale* 'Pierre Couret' HCC/AOS. The black lines point out the perfect arrangement of the flowers on the inflorescence.

[92] *Catasetum* female flowers are remarkably different from their male counterparts, exhibiting fleshy sepals and petals and helmet-shaped lips. From left to right: *pileatum* (compare to the male flowers in [90], *lucis* (compare to the male flowers in [102] on page 21, and *tenebrosum* (compare to the male flowers in [95] on page 20.

I find the form of the clone pictured in figure 93 to be a little cupped (caused by the lateral sepal and petals), color and flower size good, and substance typical. This plant is fairly floriferous. My score ended up as a 77-point HCC/AOS.

Catasetum expansum is named for its broad "expanded" lip. This species comes in many different color forms, making it quite collectible. One of the challenges in judging *Ctsm. expansum* is that the flower is quite short-lived (around 5–7 days). Two days after the flowers open the dorsal and lateral sepals begin to wilt, which provides only a brief opportunity to exhibit plants for judging. This may explain why there are so few awards to *expansum.*

Catasetum tenebrosum was once called the Black Orchid. The striking flower color and shape have helped this become a popular species with hobbyists, and it has received over 35 AOS awards. It is also one of the first *Catasetum* species to bloom each season. Inflorescences emerge from the newly developing growth in early spring, and this species also will produce a second flowering in the fall from mature pseudobulbs.

Catasetum spitzii is a recent introduction to growers in the northern hemisphere. This species develops a strong inflorescence that supports an impressive flower count of up to 48 well-arranged blooms. Individual flowers have well-shaped, waxy lips, and the petals are held high in a classic catasetum flower presentation. *Catasetum spitzii* is also one of the last catasetum species to flower each year.

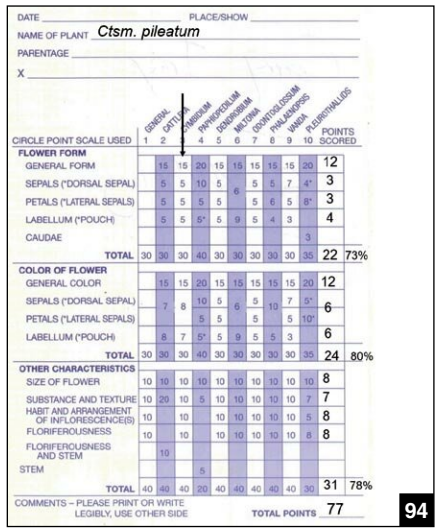
Catasetum denticulatum is a relatively new discovery, described by Francisco Miranda in 1986. This small-growing *Catasetum* produces pseudobulbs not exceeding 6 inches (15 cm) tall, and its blooms come in a wide array of colors. This species has recently revolutionized catasetum breeding as an important parent in the development of mini-catasetums. It imparts many desirable qualities that are appreciated by hobbyists and AOS judges alike. Inflorescences typically carry 20–25 blooms, and well-grown plants have produced up to 42 flowers per inflorescence! The flowers are well arranged in a densely packed helical pattern, and are produced 2–3 times a year. When judging this species, it is appropriate to remove points for crowding. However, points could be added for flowers that are held in a symmetrical helical arrangement. The balance between these two factors (and others) could be the topic of a robust discussion within a judging team.


93


95

Catasetum tigrinum is a magnificent species with a similar plant stature to *denticulatum*, making it a good parent in breeding mini-catasetums. Besides its small size, it is also noteworthy for producing long, many-flowered inflorescences from mature pseudobulbs two or three times each season. The wide petals fill the gap between the dorsal and lateral sepals, creating a full form that is appreciated by both hobbyists and orchid judges. The broad petals have helped *tigrinum* distinguish itself as a parent. The potential is high for *tigrinum* to create hybrids with exceptionally well-formed flowers.

Catasetum saccatum 'Brooklyn Botanic Garden' FCC/AOS is the highest-awarded example of the species. Here is what the AOS judges wrote about it when the award was given: "Twenty-five male flowers of excellent form and color beautifully arranged on one 90-cm inflorescence; sepals and petals olive green heavily overlaid cordovan, base


DATE _____ PLACE/SHOW _____
NAME OF PLANT *Ctsm. pileatum*
PARENTAGE _____
X _____

CIRCLE POINT SCALE USED	GENERAL	CATTLEYA	MASDEVALLIA	PAPHIOPEDILUM	DORITIS	MILTONIA	ODONTOGLOSSUM	PHALAENOPSIS	VANDA	PLEUROTHALLIDS	POINTS SCORED	
	1	2	3	4	5	6	7	8	9	10		
FLOWER FORM												
GENERAL FORM		15	15	20	15	15	15	15	15	20	12	
SEPALS ("DORSAL SEPAL)		5	5	10	5	6	5	5	7	4*	3	
PETALS ("LATERAL SEPALS)		5	5	5	5		5	6	5	8*	3	
LABELLUM ("POUCH)		5	5	5*	5	9	5	4	3		4	
CAUDAE										3		
TOTAL	30	30	30	40	30	30	30	30	30	35	22	73%
COLOR OF FLOWER												
GENERAL COLOR		15	15	20	15	15	15	15	15	20	12	
SEPALS ("DORSAL SEPAL)		7	8	10	5	6	5	10	7	5*	6	
PETALS ("LATERAL SEPALS)				5	5		5		5	10*		
LABELLUM ("POUCH)		8	7	5*	5	9	5	5	3		6	
TOTAL	30	30	30	40	30	30	30	30	30	35	24	80%
OTHER CHARACTERISTICS												
SIZE OF FLOWER	10	10	10	10	10	10	10	10	10	10	8	
SUBSTANCE AND TEXTURE	10	20	10	5	10	10	10	10	10	7	7	
HABIT AND ARRANGEMENT OF INFLORESCENCE(S)	10		10		10	10	10	10	10	5	8	
FLORIFEROUSNESS	10		10		10	10	10	10	10	8	8	
FLORIFEROUSNESS AND STEM		10										
STEM				5								
TOTAL	40	40	40	20	40	40	40	40	40	30	31	78%

COMMENTS – PLEASE PRINT OR WRITE LEGIBLY, USE OTHER SIDE — TOTAL POINTS 77

94


96


97

[93] *Ctsm. pileatum* 'SVO Best'
[94] AOS score sheet selected for judging *Catasetum.*
[95] *Ctsm. tenebrosum* 'Two Tens' male flowers.
[96] *Ctsm. spitzii* 'SVO Amber'
[97] *Ctsm. denticulatum* 'Yellow Lip'
[98] *Ctsm. tigrinum* 'Sunset Valley Orchids'
[99] *Ctsm. saccatum* 'Brooklyn Botanic Garden' FCC/AOS
[100] *Ctsm. barbatum* 'Sunset Valley Orchids' HCC/AOS
[101] *Ctsm. fimbriatum* 'Golden Horizon'
[102] *Ctsm. lucis* male flowers.
[103] *Ctsm. callosum* 'Sunset Valley Orchids' AM/AOS
[104] *Ctsm. sanguineum* 'Excellent Shape'

color nearly obscured; lip yellow-green heavily spotted cordovan brown, basally coalesced, sinus glossy, ringed milky white; strikingly contrasting column and trigger yellow-green; commended for significantly larger flowers, exceptional balance, and conformation."

Catasetum fimbriatum has an eye-catching color scheme and unusual shape, with a fimbriate lip and bright yellow flowers randomly spotted in burgundy. The flower shape is open. Where are the lateral sepals? They are acutely reflexed, and not visible from the front of the flower.

Unusual flower shapes and forms are common in the genus *Catasetum*, and learning how to judge them takes some experience and lots of research. *Catasetum barbatum* is named for the bearded-looking lip structure. This unusual feature is transmitted to its offspring, though the lip dentation is less pronounced than in the parent species.

This *Catasetum callosum* has some of the wow factor from the striking contrast between the beautiful green lip and the dark-colored petals and sepals. Flower symmetry and arrangement are also very appealing, creating a stunning overall effect.

The first plants of *Catasetum lucis* were discovered growing in the borderlands between Colombia and Venezuela. Because of limited access to this area, this species was described only recently and has not been widely distributed. *Catasetum lucis* is a large-growing plant, and the robust pseudobulbs reach heights of 14–16 inches (35.6–40.6 cm) tall, perhaps the largest pseudobulbs among all *Catasetum* species. *Catasetum lucis* is also unique in that its inflorescences are up to 3 feet (91.4 cm) long and fully upright. The flowers have upright, narrow, recurved petals that fit within the width of the dorsal sepal, and the distal portion of the lip recurves up and behind the central portion of the lip! The form of the *Ctsm. lucis* flowers surely do not fit well into the AOS judging standard, but you cannot deny the impressive plant stature and flower presentation.

Catasetum sanguineum has super flowers! They are nonresupinate, with the lip in the upward position. Some have likened the shape of the lip and column to a monkey face. The plant habit is similar to *Ctsm. lucis*, but smaller growing and with erect inflorescences about 24 inches (61 cm) long, holding 10–15 blooms well above the foliage.

Catasetum roseo-virens has flowers that are very different in form compared to some of the flat-lipped species. When judging *Catasetum* species, it is useful to bear in mind the tremendous variation in flower shape within this genus.

What about this *Catasetum globiflorum*? What a great genus. Within *Catasetum*, there are about 180 species representing an impressive diversity. This diversity is what makes *Catasetum* so special and popular with hobbyists and judges. Some species fit nicely into the AOS judging standards, and others are hard to judge by "normal" rules.

Every now and then a *Catasetum* species really captures your attention. *Catasetum ivaneae* has done just that, and it looks like it will have tremendous potential in breeding. The plants are small growing, the flowers have great color and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104

a broad lip, and are produced on a densely flowered inflorescence with up 53 blooms in an almost perfect helical arrangement. Almost sounds too good to be true!

Catasetum hybrids

Catasetum Orchidglade (*pileatum* × *expansum)* dates back to the early 1970s. The floral qualities of each species are evident in the colorful, broad showy lips, large flower size, and good arrangement. The faults are also evident, with the tips of the petals and sepals already showing signs of wilting. Orchidglade has been an important breeder and continues to produce exceptional hybrids today. One desirable feature of this type of breeding is the tendency to flower twice a season.

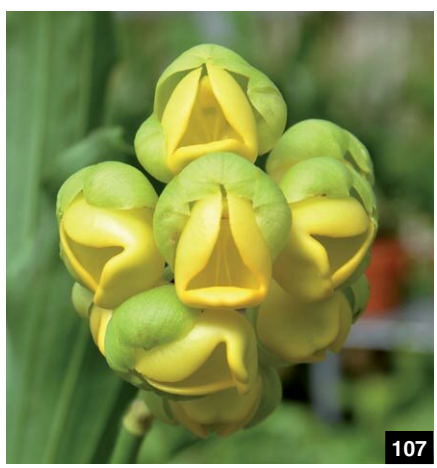
Catasetum Susan Fuchs (Orchidglade × *pileatum*) 'Burgundy Chips' FCC/AOS received the highest accolade of flower quality from the AOS judges. The lip is spectacular, flat and colorful, and no doubt contributed strongly to the award. In this picture, you can see the beginnings of wilt on the tips of the petals and sepals. This phenomenon, inherited from the *pileatum* and *expansum* in its background, is a fault and can make catasetums with this type of lineage hard to submit for judging, as they are only at their prime for 3–4 days. When judging catasetums, be aware that it is common to have accidental discharge of pollinia when plants are transported, and missing anther caps or pollinia should not be considered a substantial problem.

Catasetum Penang (Susan Fuchs × *pileatum*) is one-eighth *Ctsm*. *expansum* and seven-eighths *Ctsm*. *pileatum*! An amazing range of color, large lips, and that pesky petal and sepal wilt are all present in this hybrid.

The grex *Catasetum* John C. Burchett comes from crossing *Catasetum* João Stivalli × *Ctsm*. Susan Fuchs. In the background of this cross, the species composition is 50% *pileatum*, 37.5% *expansum* and 12.5 % *socco*. This flower has an outstanding color: check out the huge, flat, almost-black lip! In addition to the rich, dark color of the petals and sepals, there is no evidence of petal and sepal wilting.

The continued reintroduction of *Ctsm. pileatum* is evident in *Catasetum* Jamie Lawson XOXO (John C. Burchett × *pileatum*). The species composition of this cross is 75% *pileatum*, 19% *expansum,* and 6% *socco*. The flowers are starting to look like an exceptionally colorful *Ctsm. pileatum* on steroids! As an additional benefit, this type of selective breeding has reduced the problem of petal and sepal wilt.


105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109

Selective breeding can result in significant improvements. *Catasetum* Fong Cing (Jose Abalo × Orchidglade) is a fine example of this. The cultivar 'Lonely Heart' shows it all. Note the broad lip, the dorsal sepals overlapping and filling the


106


108

[105] Some species of *Catasetum*, such as this *Ctsm. roseo-virens*, have similar fleshy male and female flowers.
[106] *Ctsm. ivaneae* 'Purple Fantasy'
[107] The aptly named *Ctsm. globiflorum*.
[108] *Ctsm.* Susan Fuchs 'Burgundy Chips' FCC/AOS (*expansum* × Orchidglade)
[109] *Ctsm.* Penang 'Sweethart' (Susan Fuchs × *pileatum*)
[110] *Ctsm.* John C. Burchett 'Ursa Major' FCC/AOS (João Stivalli × Susan Fuchs)
[111] *Ctsm.* Jamie Lawson XOXO (*pileatum* × John C. Burchett)
[112] *Ctsm.* Fong Cing 'Lonely Heart' (José Abalo × Orchidglade)
[113] *Ctsm.* Richard Fulford 'Sunset Valley Orchids' (Orchidglade × *lucis*)
[114] *Ctsm.* Melana Davison 'Red' (*denticulatum* × Penang)
[115] *Ctsm.* Melana Davison 'Summer Snow'

gaps between the lip, wide lateral sepals and great color to boot! It is a little cuppy, but there is not much else to criticize.

Catasetum Richard Fulford (Orchidglade × *lucis*) has just three species in its background: *pileatum*, *expansum* and *lucis*. The influence of *Ctsm. lucis*, with its long upright inflorescence, is strongly evident in this grex. The Orchidglade parent added flower size and, in some cases, color. Pictures do not do the impressive flowers justice. So far, this grex has received six AM/AOS and two FCC/AOS awards!

With nine AM/AOS and one HCC/AOS to date, *Catasetum* Melana Davison (*denticulatum* × Penang) will forever be recognized as a landmark *Ctsm. denticulatum* hybrid. Plants produce pendulous inflorescences with up to 35 (and sometimes more!) well-arranged, closely spaced flowers. The flower color is variable, ranging from red to white! You can see why these have earned so many high awards for their owners. This type of mini-catasetum breeding capitalizes on the free-flowering nature of *denticulatum*, and it is not uncommon for these hybrids to bloom three times a season.

Catasetum Chuck Taylor (*denticulatum* × Portagee Star) is another important mini-catasetum hybrid. The cultivar 'SVO Sunshine' shows a stunning color combination of pink, white and yellow. Of particular note is the beautifully rounded lip from the *denticulatum* parent.

The primary hybrid *Catasetum* Dentigrianum (*denticulatum* × *tigrinum)* is magnificent! It exhibits the best traits of both parents. *Catasetum denticulatum* contributes dense flower arrangement, and *tigrinum* adds wide petals that help fill the gap between the sepals. This is a "home run" hybrid. These three cultivars show the petals filling the gap between the sepals, the fimbriate lip with its beautiful light-yellow color and bold spotting, and the great overall form and symmetry. These are small-growing plants that flower three times a year!

Catasetum denticulatum proved itself as an important first-generation breeder. Now, we are beginning to see the results of second-generation breeding with *denticulatum* hybrids. The flowers of *Ctsm.* Dark Odyssey (Karen Armstrong × Darkness) show the influence of *pileatum* with larger lips. Note the differing positions and widths of the petals in 'Select A' and 'SVO Yellow Odyssey.' In both cases, the petals fill the sepal gap better than with the awarded 'SVO Black Cherry' AM/AOS.

Catasetum Dreamboat (Penang ×


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113


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Chuck Taylor) has produced quite a variety in flower form and especially color. Its genetics are one-quarter each *Ctsm. expansum* and *denticulatum* and nearly half *Ctsm. pileatum.* This combination has yielded flower colors from red to pink, some with yellow lips, and at least one with a white lip! Which do you think is most awardable?

Catasetum Extravaganza (Karen Armstrong × Louise Clarke) is another fine example of a second-generation *denticulatum* hybrid. This grex shows improved flower size and arrangement, as well as lip shape. As a bonus, note the variety of colors and spotting patterns across different cultivars.

The grex *Catasetum* Memoria Dorothy Wells (Chuck Taylor × Dentigrianum) has *denticulatum* in the background of each parent. You can see the effect of this heritage in the lip shape. There is also *tigrinum* in the breeding, and its influence on the shape of the petals can be seen in 'Silver and Gold.' This is what I consider nearly perfect form for *Catasetum* petals. In both, the color is "off the charts," as they say.

Catasetum Diana's Dots (Orchidglade × *tigrinum*) shows the influence of *Ctsm. tigrinum*. The broad petals of this species are a rarity in catasetum flowers and will slowly change the perception of how a well-formed advanced catasetum hybrid flower should look. For collectors and judges, the form of Diana's Dots 'SVO' should be filed away in your memory. This is top-quality form in a *Catasetum* hybrid, and when seen on an exhibited plant, point up!

Clowesia Species and Hybrids

Clowesia rosea and *Clowesia warczewitzii* are the two species most commonly used in breeding. The flowers of both species are a little cuppy, particularly the dorsal and lateral sepals. The lips have the tendency to curl up in *rosea* and curl down in *warczewitzii*. Both species are extremely floriferous and can have 3–4 inflorescences per leafless pseudobulb blooming at the same time. It is not uncommon for multiple-growth plants to have hundreds of flowers cascading over the side of the pot. This is quite a sight! One quality not considered for judging but important to hobbyists is the pine/lemon scent of *Cl. warczewitzii.*

Clowesia russelliana is one of the first *Clowesia* to bloom each spring. This species develops impressive inflorescences, and it is not uncommon to have 40 or more flowers on each! These are challenging to award, as the flowers are undisciplined in their shape. They do command attention with their impressive floriferousness, and a number of Certificates of Cultural Merit (CCM) have been awarded.

Clowesia Grace Dunn (*rosea* × *warczewitzii*) shows a strong influence from its parents, with the hooded dorsal sepal and cupped lateral sepals. One notable improvement can be seen in the lip, which is relatively straight. A strong fragrance of lemon/pine is noteworthy.


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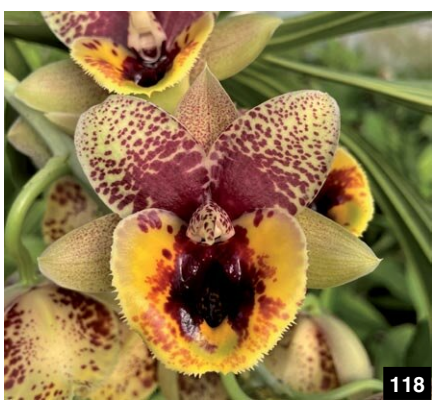
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[116] *Ctsm.* Chuck Taylor 'SVO Sunshine' (Portagee Star × *denticulatum*)

[117] *Ctsm.* Dentigrianum 'SVO Excellence' (*denticulatum* × *tigrinum*)

[118] *Ctsm.* Dark Odyssey 'Select A+' (Karen Armstrong × Darkness)

[119] *Ctsm.* Dark Odyssey 'SVO Black Cherry' AM/AOS; photographer: Arnold Gum.

[120] *Ctsm.* Dark Odyssey 'SVO Yellow Odyssey'

Perhaps the most recognizable of the clowesia hybrids is *Cl.* Rebecca Northen (Grace Dunn × *rosea*). The second dose of *rosea* has created a nice, warm-pink color and a well-fimbriated lip, but the shape has returned to being a bit more cupped. This cross is quite floriferous and has a desirable lemon/pine scent.

Clowesetum Hybrids

Clowesetum Black Jade (*Cl. russelliana* × *Ctsm. expansum*) combines the floriferousness of the *Clowesia* and the size of the *Catasetum*. The high flower count and unusual color combination make this grex impressive. The use of *russelliana* in breeding has been limited, as its dominance for flower shape generally produces offspring outside the current judging standards. One of the benefits of *Clowesetum* breeding is improved flower longevity, and individual blooms can last as long as three weeks in perfect condition. This extended flower life is a very nice benefit of this type of intergeneric breeding.

Some of the best pink colors in Catasetinae breeding come from crosses between catasetums and clowesias. *Clowesia* Abigail Parsons (*Cl*. Grace Dunn × *Ctsm*. John C. Burchett) is a good example of this phenomenon, and also demonstrates how the *Clowesia* parent improved the overall shape of the flowers. High flower count is another great attribute in this type of breeding, again thanks to the clowesia influence.

Clowesetum Maeve (*Cl.* Rebecca Northen × *Catasetum* Mark Dimmitt) shows intensified pink color, dense spotting, improved shape of the segments and high flower count. There are still opportunities to improve petal width. How about incorporating *Ctsm. tigrinum* into this style of breeding? The influence of this species on petal width has the potential to fill in the space between the dorsal and lateral sepals, producing a full, rounded flower!

Clowesetum Alexandra Savva comes from crossing *Cl.* Rebecca Northen × *Ctsm. denticulatum*. This hybrid is another good example of dense pink spotting, high flower count and good arrangement thanks to the influence of *Ctsm. denticulatum*. As for *Clo*. Maeve, crossing this grex with *Ctsm. tigrinum* could lead to markedly wider petals in the offspring.

Clowesia breeding can incorporate colors other than pink when the proper *Catasetum* is selected. In the grex *Clo*. Afterglow (*Cl*. Rebecca Northen × *Ctsm. spitzii*), the yellow form of *spitzii* was used. This color was predominant in the offspring, producing a great combination of green, yellow and white with good shape, high flower count, and good arrangement. The award says it all (figure 133).!


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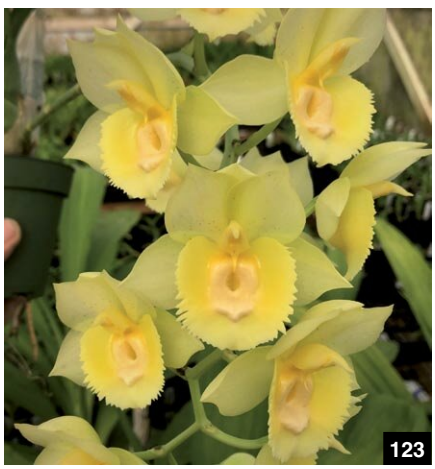
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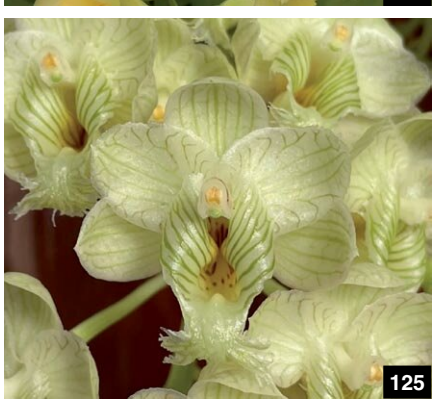
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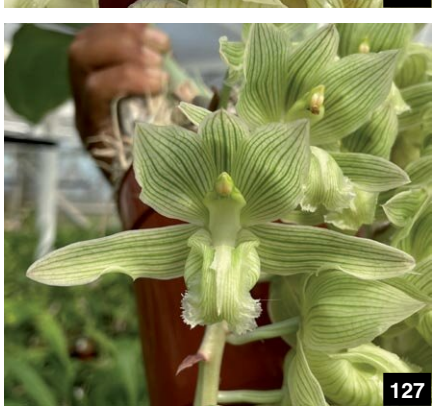
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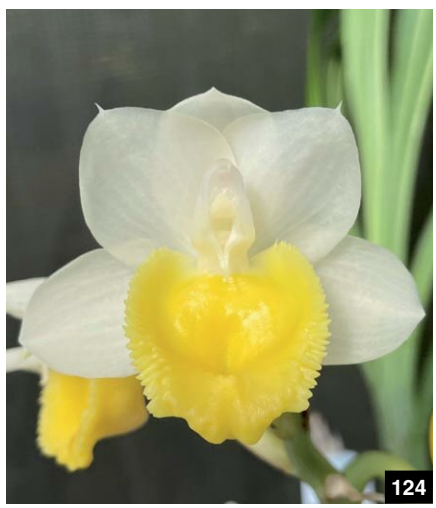
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[121] *Ctsm.* Dream Boat 'Yellow Lips' (Penang × Chuck Taylor)
[122] *Ctsm.* Extravaganza 'Mint Chip' (Karen Armstrong × Louise Clarke)
[123] *Ctsm.* Diana's Dots 'Sunset Valley Orchids' (Orchidglade × *hoehneri*)
[124] *Ctsm.* Memoria Dorothy Wells 'Silver and Gold' (Chuck Taylor × Dentigrianum)
[125] *Cl. warczewitzii* 'Sunset Valley Orchids'
[126] *Cl. rosea* collected from the wild.
[127] *Cl. russelliana* 'Sunset Valley Orchids'

Clowesetum Donna Ballard (*Cl*. Rebecca Northen × *Ctsm*. *kleberianum*) has garnered five AOS awards to date. The yellow lip and boldly striped petals and sepals of *Ctsm. kleberianum* produced a beautiful color combination with *Cl*. Rebecca Northen.

Clowesetum Diane Drisch (*Cl*. Grace Dunn × *Ctsm. tigrinum*) demonstrates the valuable influence of *Ctsm. tigrinum* in this type of breeding. The full-shaped petals of this grex almost occupy the space in between the sepals. The pink flower color and bold burgundy spots are set off by the contrasting white lip. Expect the next generation of *tigrinum* hybrids to show even more improvement in petal shape.

Clowesetum Memoria Yim Fong Yu (*Cl*. Grace Dunn × *Ctsm*. Dentigrianum) may best be described in one word: "floriferous." However, when evaluating this plant, it is important not to overlook the flower shape. Thanks to the influence of *Ctsm. tigrinum*, the petals are wide, and the dense spots are inherited from *Ctsm. denticulatum*. This is a fine example of how strategically combining different species with specific characteristics can result in noticeable improvements in shape, color, flower count and arrangement.

This is a good example of how flower qualities can be improved in the breeding of clowesetums. *Clowesetum* White Magic (*Cl. warczewitzii* × *Ctsm*. Orchidglade) produces flowers with outstanding full-shaped fimbriate lips. Notice how they cover most of the lateral sepals. The icy-green and yellow color combination is attractive, and the petals and dorsal sepal are broad and fill out beautifully above the lip, which also is an icy green. Combine all this with large, well-arranged flowers that last three weeks, and you have a winner on the judging table as well as a great hobby plant.

Hybrids with *Cl. russelliana* in their breeding like *Clowesetum* Black Jade have often produced poorly formed flowers. In the grex *Clowesetum* Takarazuka White (Black Jade × *Ctsm. pileatum* f. *album*), the addition of *Ctsm. pileatum* introduced a number of good qualities. The well-formed lip and icy-green petals that are wide and flat are highly desirable.

Clowesetum Lou Lodyga 'SVO' is a clowesetum hybrid in which a clowesetum, *Clowesetum* Jumbo Lace, has been crossed back to a catasetum (*Ctsm*. Susan Fuchs). This grex is characterized by its yellow color, bold burgundy spotting, broad petals and full-shaped lip. It satisfies the requirements of


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[128] *Cl.* Grace Dunn 'Live Oak' HCC/AOS (*warczewiczii* × *rosea*)

[129] *Clo.* Black Jade 'JEM' HCC/AOS (*Cl. russelliana* × *Ctsm. expansum*)

[130] *Clo.* Abigail Parsons 'SVO Mauvelous' HCC/AOS (*Cl.* Grace Dunn × *Ctsm.* John C. Burchett); photographer: Arthur Pinkers.

[131] *Clo.* Alexandra Savva 'Sunset Valley Orchids' (*Cl.* Rebecca Northen × *Ctsm. denticulatum*)

[132] *Clo.* Afterglow 'B-C II' AM/AOS (*Cl.* Rebecca Northen × *Ctsm. spitzii*); photographer: Chuck Lefaive.

[133] *Clo.* Maeve 'SVO Freckles' AM/AOS (*Cl.* Rebecca Northen × *Ctsm.* Mark Dimmitt); photographer: Arthur Pinkers.

the AOS judging standards for color and form. The inflorescence can carry up to 14 well-arranged flowers.

Clowesetum Pierre Couret (*Ctsm. pileatum* var. *imperiale* × *Cl.* Rebecca Northen) has flower color that is off the charts. The glossy red coloration is breathtaking and unusual in this type of breeding. The flower size is over twice that of Rebecca Northen, and the segments are flat and full, courtesy of the *pileatum* parent. Here is how the award description reads: "One hundred six round, flat flowers and no buds on seven well-arranged pendent inflorescences; flower base color cream; sepals overlaid candy apple red, distal margin picotee cream, reverse similar in coloration; petals very flat, overlaid candy apple red, distal margin picotee cream, reverse similar in coloration; lip saccate, overlaid very dark maroon, vibrant yellow centrally, margin fimbriate, reverse overlaid very dark maroon distally; column spotted maroon; substance firm; texture glossy."

Mormodia Hybrids

Mormodias are crosses between *Mormodes* and *Clowesia*. Like clowesetums, they have good flower life, usually lasting 4–5 weeks. *Mormodes* is dominant for color (as they are when bred with *Cycnoches*), and, when crossed with clowesias, you can expect to get flowers with color from the mormodes and shape from the clowesia. *Mormodia* Painted Desert (*Cl*. Rebecca Northen × *Morm. sinuata*) exemplifies this principle. Note the rich color and full shape of the blooms. Flowers are small, about 1.5 inches (4 cm) across, and are produced in profusion from mature, almost leafless pseudobulbs that typically hold 2–3 cascading inflorescences with 15 or more flowers on each.

Mormodias can come in almost any color, depending on the color of the *Mormodes* used in the cross. This *Mormodia* Jumbo World (*Cl*. Grace Dunn × *Morm. buccinator* f. *aurea*) was made with the yellow form of *Morm. buccinator*. Can you identify the good qualities imparted by its parents?

Mormodia Regine Viard (*Cl*. Grace Dunn × *Morm*. Jumbo Bacia) has flowers with exceptionally full petals and wide lateral sepals. The flower color is equally impressive. The cultivar 'Fuchsia Rose' particularly caught my eye as having potential for hybridizing rose-pink fredclarkearas — more about this later.

The spotted and striped flowers of *Mormodia* Susan Wilson (*Cl*. Rebecca Northen × *Morm. revolutum*) are as


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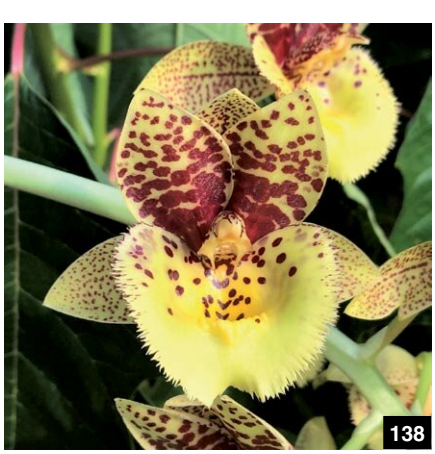
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[134] *Clo.* Donna Ballard 'Bernie' (*Cl.* Rebecca Northen × *Ctsm. kleberianum*); photographer: Chuck LeFaive.

[135] *Clo.* Diane Drisch 'SVO Best' (*Cl.* Grace Dunn × *Ctsm. tigrinum*)

[136] *Clo.* White Magic 'Sunset Valley Orchids' (*Cl. warczewitzii* × *Ctsm.* Orchidglade)

[137] *Clo.* Memoria Yim Fong Yu 'Sunset Valley Orchids' (*Cl.* Grace Dunn × *Ctsm.* Dentigrianum)

[138] *Clo.* Lou Lodyga (*Cl.* Jumbo Lace × *Ctsm.* Susan Fuchs)

charming as can be, with excellent shape and color on 2–3 cascading inflorescences of 15–20 flowers each.

Mormodias are very floriferous, exceptionally so in some cases. This *Mo*. Barnabas Collins (*Cl*. Grace Dunn × *Mormodes tapoayensis*) produced eight inflorescences from a single pseudobulb carrying a total of 136 flowers! How many points can be given for floriferousness?!

Fredclarkeara Breeding

The hybrid genus, *Fredclarkeara,* is derived from the combination of *Catasetum*, *Clowesia* and *Mormodes*. The first *Fredclarkeara* grex, After Dark, was a significant breakthrough, setting a new standard for quality in Catasetinae breeding and opening a new direction in breeding high-quality plants and flowers. The best qualities from the three genera were incorporated in its makeup. *Mormodes* is dominant for color and a strong inflorescence; *Clowesia* is dominant for shape, multiple inflorescences, and flower longevity; and *Catasetum* is dominant for flower size and lip shape and is known to complement or intensify bloom color. Plants of *Fdk*. After Dark have flowers with a wide range of beautiful colors, some as black as any orchid flower ever seen with full shape and amazing fragrance. Plants are easy to grow and produce a high flower count with amazing flower longevity — up to six weeks. These qualities make them excellent hobby plants and very judgeable. At present, there are 80 registered *Fredclarkeara* hybrids.

Fredclarkeara After Dark is *Mo.* Painted Desert × *Ctsm.* Donna Wise. *Mormodia* Painted Desert has a red flower striped in burgundy with a deep cherry-red throat. Combined with the dark-brown petals and large flower size of *Ctsm*. Donna Wise, the result was flowers with full shape in a range of rich colors. Some flowers are spotted, and others are nearly black, all with heavy substance and excellent longevity.

This photograph by Charlie Rowden beautifully captures the color of *Fdk.* After Dark 'SVO Black Night' FCC/AOS. It is not easy to photograph flowers with such deep color.

Not all *Fdk*. After Dark came out black. Several cultivars were red or spotted, including 'Sunset Valley Orchids' FCC/AOS, and one was even green! The benefits to flower quality imparted by breeding with these three genera include wide petals that naturally close the gap between the dorsal and lateral sepals. This type of breeding also yields many well-arranged flowers, hard substance, and a nice spicy fragrance. Fredclarkearas fit naturally into the established AOS judging standards!


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Fredclarkeara After Dark 'SVO Black Cherry' FCC/AOS has full well-rounded flowers. They are mostly flat but still show some slight dorsal sepal hooding from the *Clowesia* parent. Inflorescences produce flowers in a spiral arrangement, and one of the four inflorescences had 35 flowers, with a total count of 108 blooms from a single pseudobulb.

Fredclarkeara After Dark 'Crazy Good' AM/AOS is a noteworthy meristem mutation that appeared in the cloning of *Fdk*. After Dark 'Black Pearl'. As the mutation was significantly different from the original, it was given the cultivar name 'Crazy Good' and received an AM/AOS. The picotee feathering around the perimeter of each floral segment is quite attractive!

Fredclarkeara breeding took a large step forward with the hybrid *Fredclarkeara* Enter Light (After Dark × *Ctsm. pileatum* var. *imperiale*). The *pileatum* parent added its considerable size and color, flattening the lip and increasing natural spread and petal width. The well-arranged flowers are a rich, burgundy red with a heavy, waxy substance.

Fredclarkeara Enter Light 'Grasshopper' AM/AOS was made with the green *Fdk*. After Dark 'Morning After' and a green *Ctsm. pileatum* 'Dinner Plate.' The


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[139] *Clo*. Pierre Couret 'SVO Candy Apple' AM/AOS (*Cl*. Rebecca Northen × *Ctsm. pileatum*); photographer: Arthur Pinkers.

[140] *Clo*. Takarazuka White (*Clo*. Black Jade × *Ctsm. pileatum* var. *album*); photographer: H. Sugiyama.

[141] *Mo*. Susan Wilson 'Sunset Valley Orchids' (*Cl*. Rebecca Northern × *Morm. revolutum*)

[142] *Mo*. Jumbo World 'Olympic Gold' (*Cl*. Grace Dunn × *Morm. buccinator*)

[143] *Mo*. Regine Vivard 'Fuchsia Rose' (*Cl*. Grace Dunn × *Morm*. Jumbo Bacia)

[144] *Mo*. Barnabas Collins 'Sunset Valley Orchids' FCC/AOS (*Cl*. Grace Dunn × *Morm. tapoayensis*) with eight inflorescences. Inset flower closeup of 'Select'.

result was a new and completely different flower color in a *Fredclarkeara*. Note the excellent overall flower shape, wide petals and clear green color.

Fredclarkeara After Midnight 'Sunset Valley Orchids' AM/AOS (After Dark × *Ctsm*. Mark Dimmitt) has deep-red flowers with dark-burgundy spots. The broad petals, good arrangement and high flower count make a nice combination.

Awarded a prestigious Gold Medal from the Japan Orchid Growers Association, *Fredclarkeara* Beverly Danielson 'Midnight' topped the judging standards with its broad segments, flat flowers, large full lip, and incredible black color! This is a third-generation fredclarkeara hybrid and the re-introduction of the *pileatum/expansum/tenebrosum*–based hybrids *Ctsm*. Mark Dimmit and *Ctsm*. Orchidglade played an important role in the notable floral improvements.

Fdk. After Dark = (*Mo*. Painted Desert × *Ctsm*. Donna Wise)

Fdk. After Midnight = (*Fdk*. After Dark × *Ctsm*. Mark Dimmitt)

Fdk. Beverly Danielson = (*Fdk*. After Midnight × *Ctsm*. Orchidglade)

The flower quality of fredclarkearas continues to improve with the backcrossing of *Ctsm*. Donna Wise onto *Fdk*. After Dark, making the grex *Fredclarkeara* Dark There After. Of particular note are the flat, wide segments, broad lip and fine arrangement.

With growing awareness of the high level of flower quality possible within the genus *Fredclarkeara*, a new area of focus has been to develop a wider range of options for flower color. *Fredclarkeara* Gemstones (*Mo*. Painted Desert × *Ctsm*. Orchidglade) was one of the first in a series of crosses to explore new color possibilities. The cultivar 'SVO Amazing' was just that — a new amazing color combination — along with the positive qualities described for fredclarkeara breeding.

Fredclarkeara Gemstones produced many outstanding progeny, but the cultivar 'Plum Perfect' is my favorite. The purple-and-black combination commands your attention. On the score sheet, the points allocated for color should be 28 to possibly 30 — yes, all the points possible. Complementing the outstanding color are great form, arrangement, substance and flower count.

The color and shape of *Fredclarkeara* Desert Tenor (*Mo.* Painted Desert × *Ctsm. tenebrosum*) supply that wow factor. The flowers have excellent symmetry, wide rounded petals, and broad lateral sepals,


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creating an overall fullness for each bloom. The flower color has a luminescent quality that almost glows. Excellent arrangement and high flower count complete the list of positive qualities. The slight cupping and smaller flower size should be considered faults.

The grex *Fredclarkeara* Doubtless (No Doubt × *Ctsm.* Orchidglade) added new flower colors to the genus. Check out the three photos. Flower shape is equally noteworthy, and the broad petals of 'SVO' are particularly impressive, as are the large, broad lip and good flower arrangement in all of these examples.

One color not previously seen in fredclarkeara breeding is yellow. This was first achieved in the grex *Fredclarkeara* Upgrade (*Mor.* Jumbo World × *Ctsm. spitzii*). A solid-yellow–flowered *Ctsm. spitzii* was combined with the yellow-and-red spotted flower of *Mo*. Jumbo World. The flowers are all yellow with fine red spotting. The arrangement is good, and the flowers are almost flat. The conformation of the segments leaves a gap between the lip and petals. I find this feature a little distracting, detracting from the overall appearance. What do you think?

Fredclarkeara Providence (*Mo*. Jumbo World × *Ctsm. pileatum*) produces


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[145] *Fdk.* After Dark 'Crazy Good' AM/AOS (*Mo.* Painted Desert × *Ctsm.* Donna Wise)

[146] *Fdk.* After Dark 'SVO Black Cherry' FCC/AOS

[147] *Fdk.* After Dark 'SVO Black Pearl' FCC/AOS

[148] *Fdk.* After Dark 'SVO Black Night'; photographer: Charles Rowden.

[149] *Fdk.* After Dark 'Sunset Valley Orchids' FCC/AOS; photographer: Charles Rowden.

flowers with excellent shape. The wide, overlapping petals, large flat lip, and icy-green color make a pleasing combination. How much fuller can fredclarkearas become? The bar continues to be raised.

The exploration of new plant habits was tested with *Fredclarkeara* Desert Davison (*Mo*. Painted Desert × *Ctsm*. Melana Davison). The intention of making this grex was to reduce plant size using the small, floriferous *Ctsm*. Melana Davison. Besides a reduction in plant size, this grex blooms with an impressive flower count and well-arranged, shapely blooms. In the cultivar 'SVO Obsidian', *Mo.* Painted Desert has once again shown the ability to produce offspring with black flowers.

The latest development in Catasetinae breeding is the creation of *Catamodes* (*Ctmds.*) (*Catasetum* × *Mormodes*). For many years, it looked like fredclarkearas were going to be the pinnacle of Catasetinae quality, but then came *Catamodes* Dragons Tail (*Ctsm. denticulatum* × *Morm. lawrenceana*). The offspring had densely spotted flowers, flat lips and petals with a strong, upward presentation. The spotting reminded me of the scales on the tail of a mythical dragon, hence the name.

In *Ctmds.* Dragons Tail 'Wow' the spots coalesce into a nearly solid color on the petals and give them a "warty" appearance. There was one disappointment with this grex: the plant is large and the flowers are small. As a hybridizer, I do not really want big plants with small flowers, and this issue slowed my interest in further breeding. However, the color was compelling, and I decided to keep a couple of plants in the gene pool.

The reintroduction of *Catasetum* genes to *Ctmds*. Dragons Tail was intended to correct this fault. *Catasetum* Orchidglade 'Davie Ranches' AM/AOS has been an important parent and has sired many fine hybrids. I decided to cross *Ctmds.* Dragons Tail with *Ctsm.* Orchidglade in the hope that this second generation *Catamodes* hybrid would show improved flower size and shape. This produced the grex now named *Catamodes* Dragons Glade, which was a huge success. The flowers show an impressive variation in color, improved size, great color, large flat lips and many well-arranged blooms on plants about 10 inches (25.4 cm) tall. If these developments were not enough, the flowers last 3–4 weeks, and plants bloom 2–3 times a season!

A year later, a second cross was made with *Ctmds*. Dragons Tail and *Ctsm.* John C. Burchett, now named *Catamodes*


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[150] *Fdk.* Enter Light 'Grasshopper' AM/AOS (After Dark × *Ctsm. pileatum*)

[151] *Fdk.* Enter Light 'SVO Dark Beauty' FCC/AOS; photographer: Arnold Gum.

[152] *Fdk.* After Midnight 'Sunset Valley Orchids' AM/AOS (After Dark × *Ctsm.* Mark Dimmitt); photographer: Arnold Gum.

[153] *Fdk.* Beverly Danielson 'Midnight' GM/JOGA (After Midnight × *Ctsm.* Orchidglade); photographer: Hisakazu Sugiyama.

[154] *Fdk.* Dark There After 'SVO Winter's Night' FCC/AOS (After Dark × *Ctsm.* Donna Wise); photographer: Arthur Pinkers.

[155] *Fdk.* Gemstones 'Plum Perfect' (*Mo.* Painted Desert × *Ctsm.* Orchidglade)

[156] *Fdk.* Doubtless 'Sunset Valley Orchids' (No Doubt × *Ctsm.* Orchidglade)

[157] *Fdk.* Doubtless 'Best Yet'

[158] *Fdk.* Doubtless 'Angel'

[159] *Fdk.* Providence 'Sunset Valley Orchids' (*Mo.* Jumbo World × *Ctsm. pileatum*)

[160] *Fdk.* Upgrade 'Yellow Gold' (*Mo.* Jumbo World × *Ctsm. spitzii*)

[161] *Fdk.* Desert Tenor 'Sunset Valley Orchids' FCC/AOS (*Mo.* Painted Desert × *Ctsm. tenebrosum*); photographer: Arnold Gum.

[162] *Fdk.* Desert Davison 'Dark Amethyst' (*Mo.* Painted Desert × *Ctsm.* Melana Davison)

[163] *Fdk.* Desert Davison 'SVO Obsidian'


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Darkonium. Its offspring are perhaps even more impressive than *Ctmds*. Dragons Glade.

Catamodes Darkonium 'Ebony Beauty' FCC/AOS has a gorgeous, broad, flat lip and wide flat petals. This plant produces flowers twice a year, first in late summer, which is when this plant was awarded, and again in early winter. Notice the flowers that developed under cooler conditions are black.

Catamodes Darkonium continued to impress; see 'SVO Plutonium' and 'Base Element' as examples. Nearly every plant to flower is of award quality — it is hard to find a fault!

Nearly black is not the only color to come out of this impressive grex. 'New Element' has a rich brown color with a yellow lip spotted and blotched in brown, and 'Scalding' shows surprising orange colors. With only two second-generation catamodes hybrids registered so far, what does the future hold? And what about third-generation hybrids? Will we see improvements in color and shape as we did with fredclarkeara breeding? I can hardly wait!

Being able to identify high-quality Catasetinae plants takes some practice and time: visiting growers, studying nursery offerings and photos posted by others who grow these plants and, of course, reviewing AOS award photos and information. All these are important tools in developing your eye and sophistication with this group. I find that time and time again I am drawn to these flower qualities: first color, then shape and finally arrangement and count. My passion for breeding Catasetinae has evolved over the years, and a big part of what motivates me is discovering how


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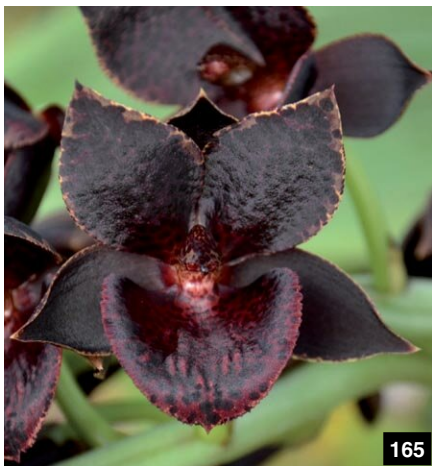
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new genetic combinations can raise the bar of quality to levels unimaginable just a few years earlier. As a hybridizer, I am also looking for plants that grow quickly, produce many flowers at a young age, and flower multiple times a year. These attributes are as important as flower quality, because plants must grow well and flower easily so they can be exhibited and judged! Many hobbyists have received AOS awards on their plants, and the joy of having your plant awarded is unforgettable. I will always remember my first award! If you are new to growing Catasetinae, this article should give you a good start, and if you are already on the path, I hope this information will increase your momentum and enthusiasm.

Acknowledgments

My thanks to Larry Sexton, Ron Kaufmann, Sue Bottom, Tim Culbertson, and Jean Allen-Ikeson.

—Fred Clarke owns and operates Sunset Valley Orchids, dedicated to developing hybrids and producing select species for the orchid enthusiast. He has been growing orchids for over 40 years and hybridizing for 38 of those years. He is committed to the education of orchid hobbyists around the world in the culture of their plants. Fred is an accredited American Orchid Society judge in the Pacific South Judging Region. His hybrids have received hundreds of quality awards for orchid enthusiasts from the American Orchid Society and other orchid societies worldwide (website: www.sunsetvalleyorchids.com; email: fred.clarke@att.net).


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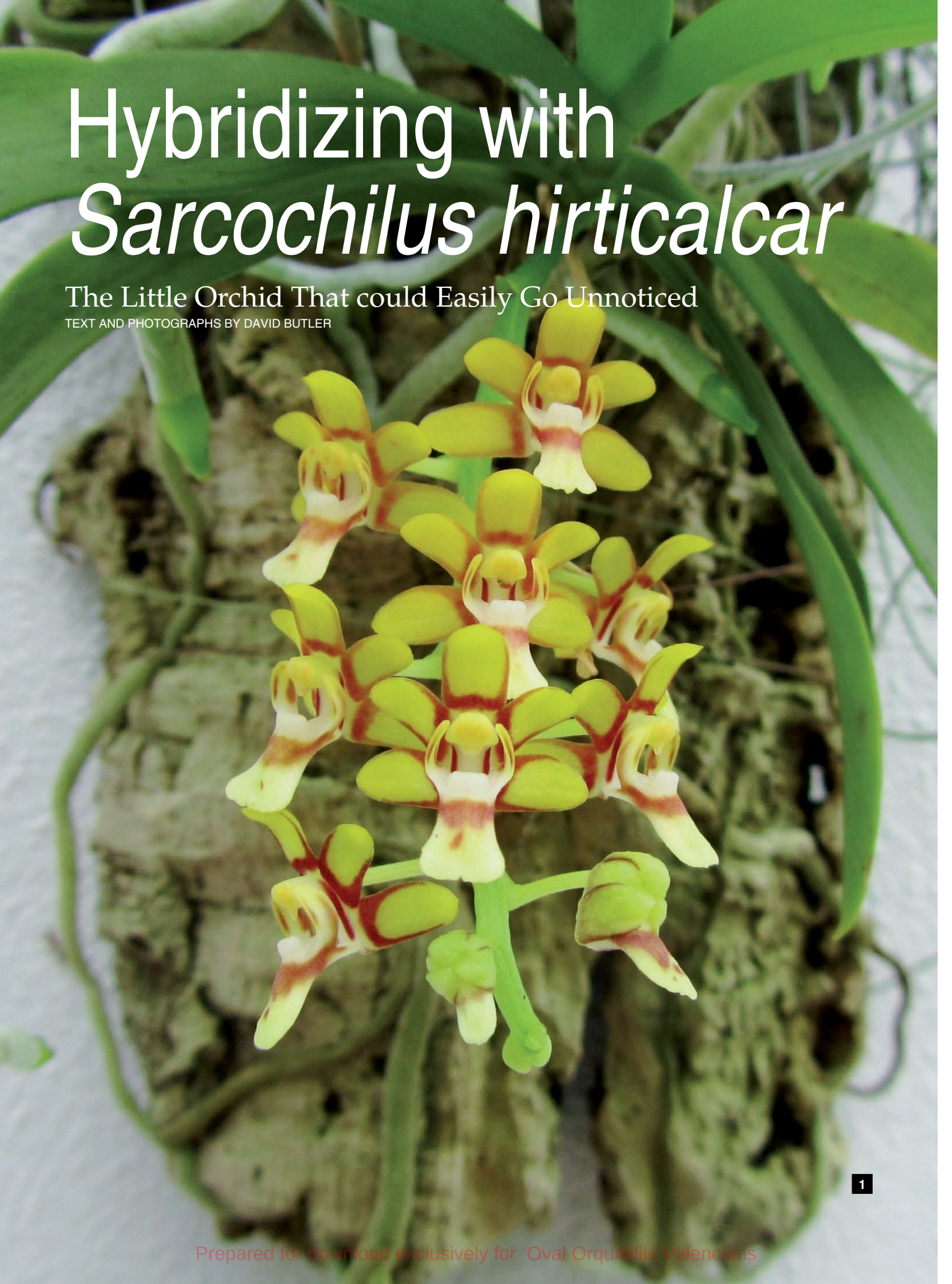
[164] *Ctmds.* Dragons Tail ‘Dark Tale’ (*Ctsm. denticulatum* × *Morm. ignea*)
[165] Another *Ctmds.* Dragons Tail.
[166] *Ctmds.* Dragons Glade ‘Pure Gold’ (Dragons Tail × *Ctsm.* Orchidglade)
[167] *Ctmds.* Darkonium ‘Ebony Beauty’ FCC/AOS (Dragons Tail × *Ctsm.* John C. Burchett); photographer: Arnold Gum.
[168] *Ctmds.* Dragon Glade ‘Black Dragon’
[169] *Ctmds.* Darkonium ‘Base Element’
[170] *Ctmds.* Darkonium ‘New Element’
[171] *Ctmds.* Darkonium ‘SVO Plutonium’
[172] *Ctmds.* Darkonium ‘Scalding’

Hybridizing with *Sarcochilus hirticalcar*

The Little Orchid That could Easily Go Unnoticed

TEXT AND PHOTOGRAPHS BY DAVID BUTLER



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WHO KNEW THAT the gift of a plant of *Dendrobium kingianum* to a 12-year-old boy would spark a lifelong enthusiasm for growing Australian native orchids and see me still as keen 70 years later? For the last 30 years under the banner "Green Vista Orchids," I was actively engaged in breeding and flasking native dendrobiums and *Sarcochilus,* only recently giving it up. My interest in the Australian natives remains strong and I am shown as registrant in 92 *Sarcochilus* hybrids and a few attractive intergenerics, and as originator of others. My registrations appear as the registrant or originator being "D.F. Butler."

I have followed many lines of breeding over the years and will outline one that has been particularly rewarding as it has produced outstanding Aeridinae hybrids with flowers of classic shape in bright-red and yellow colors. In nature, such colors are mainly confined to the small-flowered epiphytic Australian native Aeridinae, locally known as "twig epiphytes," and which, when displayed, are relegated to the "Novelty" class.

My line of breeding began by combining these with larger-flowered *Sarcochilus* to eventually create new *Sarcochilus* hybrids in a vastly improved range of vibrant colors and flower quality. One species that particularly caught my attention was *Sarcochilus hirticalcar* and, despite its small size, it was introduced into my breeding program at the start. It went on to become a cornerstone in the development of a line of classic red-and-yellow *Sarcochilus* flowers when this genus was mostly known for white flowers or those with a white background with red overlays. Other hybridizers that I know were also seeking to breed classic red-and-yellow-flowered hybrids, but their breeding programs were not so focused around *Sarco*. *hirticalcar* or the other small, colorful members of the Aeridinae.

Sarcochilus hirticalcar was only discovered in 1966 and is confined to a small part of Queensland, Australia. It is a diminutive epiphyte that carries rigid, flat, relatively long-lasting flowers and with a total raceme length of 2 inches (5 cm), developing progressively as the raceme extends. Flower color is in shades of greenish-yellow with strong red-brown markings in the center carried up the edges of the sepals and petals. Compared with the overall flower size, it has a huge labellum. The flowers open flat in comparison to most *Sarcochilus hartmannii* and its hybrids that tend to be somewhat cupped.


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[1] *Sarco. hirticalcar*

[2] *Sarco.* Aussie Dawn, a primary hybrid of *Sarco. harmannii* and *Sarco. dilatatus* registered by Phil Spence in 1987.

[3] *Sarco.* Duno Nicky's Twin 'Mel', a complex hybrid of *Sarco.* Nicky and *Sarco.* Fitzhart registered by Down Under N.O. in 1998.

I obtained a plant of *Sarcochilus* Aussie Dawn (*hartmannii* × *dilatatus*) over 25 years ago and, although its flowers were small and of poor shape, I was attracted to its yellow color. I crossed it with *Sarcochilus* Riverdene (*hartmannii* × *hirticalcar*) to give *Sarcochilus* Misty. From this beginning, I continued to favor parent plants that contained *Sarco*. *hirticalcar* as parents or grandparents in my breeding program resulting in two fine hybrids, *Sarcochilus* Duno Nickys Twin 'Eloise' AM-AD/AOC (Nicky × Fitzhart) (reds) and *Sarcochilus* Galaxy (Misty × *hartmannii*) (yellows). The supplement to *Orchids* magazine titled *Sarcochilus*, in August 2011, featured many flowers of my breeding, and *Sarco*. Duno Nickys Twin 'Eloise' graced the cover. Since that time, my *Sarco. hirticalcar* breeding line has produced many strongly and interestingly colored *Sarcochilus* hybrids, many of which flower two or three times a year. The Galaxy seedlings had good form and many were surprisingly bright yellow. With perhaps a grateful glance heavenward, I named the hybrid Galaxy and viewed it, even at that early stage, as a key parent in yellow hybridizing. Interestingly, the color of the foliage and racemes ranged from normal green through to a strong burgundy. Dark-colored plants are often kept solely for their foliage, although it became clear that the color of the foliage was often unrelated to that of the flowers.

One downside of the Galaxy that I bred is that it cannot be selfed as it only breeds as the capsule parent. The answer was to cross it with albinistic versions of species such as *Sarco. hartmannii*. Even with this restriction, apart from *Sarcochilus* Fitzhart (*hartmannii* × *fitzgeraldii*), it is the *Sarcochilus* hybrid with the most registrations (as of 2020) as a seed parent in *Sarcochilus*, and its popularity continues even through the hybridizer needs to own or have access to a parent plant. Additional hybridizing

has followed using Galaxy with a wide range of differently colored hybrids to produce rich reds, red–yellow bicolors, and autumn tones, with many flowers splashed or edged in contrasting colors.

This range can be seen in *Sarcochilus* Surprise (Galaxy × Velvet), which flowers throughout the year and often has one raceme finishing as another begins to open its first flowers. The parent, *Sarco*. Velvet, is another important parent in its own right. Velvet's grandparents feature a cross of *Sarco. hirticalcar* to *Sarco. fitzgeraldii* and *Sarco. hirticalcar* to *Sarco. hartmanii* through Nicky (parent of Duno Nicky's Twin) and Riverdene, respectively.

While first-generation hybrids of *Sarco. hirticalcar* frequently lack the size or shape desired for shows or awards, crossing again to suitably colored, large flowers (occasionally *Sarco. hartmannii* cultivars or hybrids, which are albinistic and have yellow or gold markings rather than red) can overcome this. One way I found to maintain shape and keep the yellow color is to introduce two or more different yellow species into the mix at some point. I look for nonfading yellows and often end up with a whole range of pleasing tones and splashes without a purple touch in sight. *Sarcochilus* Misty used the combination of hybrids made from a *Sarco. hartmanii* parent with yellow markings with each of *Sarco. dilatatus* and *Sarco. hirticalcar* in combination to produce bright, unfading yellows. *Sarcochilus hirticalcar* provides strong yellow with glossy texture for color while *Sarco. hartmannii* contributes full, round form, increased floriferousness and size, and vigor. However, there is the ever-present drawback that many fine flowers can only be used as the capsule parent and the hybridizer is continually seeking out a suitable yellow, pollen parent. As noted, this role can be filled by choosing the albinistic forms of *Sarco*. *hartmannii* and its later albinistic hybrids. These are full-shaped yellows that cross readily with *Sarco.* Galaxy and its offspring.

There are pros and cons of breeding yellows based on *Sarco*. *hirticalcar*:

- Yellow-flowering hybrids developed from *Sarco. hirticalcar* (and often with help from *dilatatus*) have clear-yellow flowers with a degree of red in the center.
- Crossing them with the albinistic flowers mostly produces clear-yellow offspring, despite the color of the albinistic types being a close marbling.
- The large labellums are a dominant feature and give balance to the increased size of modern hybrids.

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• Flowering times often occur through the year.

• Unfortunately, plants often grow monopodially rather than producing side growths reflecting their twig epiphytic origins.

• Flowers have shown a tendency to act only as the capsule parent making it difficult to cross my yellows among themselves.

• Flowering can be a bit sequential with only a few flowers open at once, but this tendency lessens with each generation.

Pros and cons of crossing *Sarco*. *hirticalcar* yellows with albinistic types include the following:

• The plants produce plenty of side growths and quickly form "clumps" (considered desirable).

• For me, they breed readily as a pollen parent and less so as the capsule parent, although other hybridizers do not seem to have this problem.

• The yellow-flowering hybrids derived from albinism do not have clear colors but, on close inspection, have tightly packed yellow markings on a pale background.

• They are predominantly spring flowering whereas the *Sarco. hirticalcar* hybrids may flower throughout the year.

Because *Sarco*. *hirticalcar* and its hybrids breed strong reds through to yellows, it is not unusual for the color of siblings to be quite different. However, whatever the color of the flowers of individual seedlings, the flower quality within each cross is usually consistently

[4] *Sarco*. Velvet 'Warm Brown' (Nicky × Riverdene)

[5–6] *Sarco*. Shining Star (Galaxy × Amelia) cultivars.

[7] *Sarco*. Sweet Allure (Maria × Allure). Group of first-bloom seedlings.

[8] *Sarco*. Autumn 'Rustic' (Nicky's Twin × *hartmannii*)

[9] *Sarco*. Amelia 'Dramatic' (Duno Nicky's Twin × Velvet)


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high. The hybrid *Sarcochilus* Shining Star (Galaxy × Amelia) has given both bright yellows and bright reds as shown in the photographs, while the consistent quality of the latest crosses is shown in the seedlings of *Sarcochilus* Sweet Allure (Maria × Allure). Of note, too, is that the sequential flowering of *Sarco. hirticalcar* is no longer evident to any extent.

Photographs illustrate a range the possibilities when breeding with *Sarco. hirticalcar*. These indicate a wide range of flower colors and characteristics together with the approximate percentage of the main species in each hybrid's make-up. All contain *Sarco. hirticalcar*, often not readily evident other than in the large labellum, which becomes an attractive focal point and gives balance to the flower.

We all like a good challenge and, from the beginning, a particular goal of mine was to breed yellows of good quality, sufficient to see them regarded as classics, and have them shown the respect of other show- or award-quality orchids. Careful hybridizing over five generations has achieved the sought-after superior flowers of good size that are round, with a full shape and a rich, even yellow color highlighted by a red center, and, for an added bonus, a prominent yellow labellum. Along the way, the richly colored reds and albinistic yellow classics so evident today also emerged.

Not unlike fishing, hybridizing within *Sarcochilus*, as with hybridizing other genera, can be a most rewarding activity where the listener is regaled with stories of successful ventures and amazing results. While there may certainly be highlights, the reality is that, like fishing, there can be a lot of water between each fish. Or put more simply, patience and perseverance pay dividends, especially when crossing two complex hybrids or using species such as *Sarco. hirticalcar* that others may reject but that ultimately change the look of what we grow and what season we grow them in. As with almost any breeding program, there are dead ends. Some crosses simply will not breed. It can take time to determine whether the seedling simply needs to mature more or if it actually will breed but only as the capsule or pollen parent. Siblings from the same capsule may differ in fertility as well.

My overall Aeridinae breeding activities have resulted in many plants receiving awards both within Australia and internationally. These include the following:

An FCC/AOS was awarded to *Sarcochilus* Fiery Twin 'Fran Weaver' in the USA.


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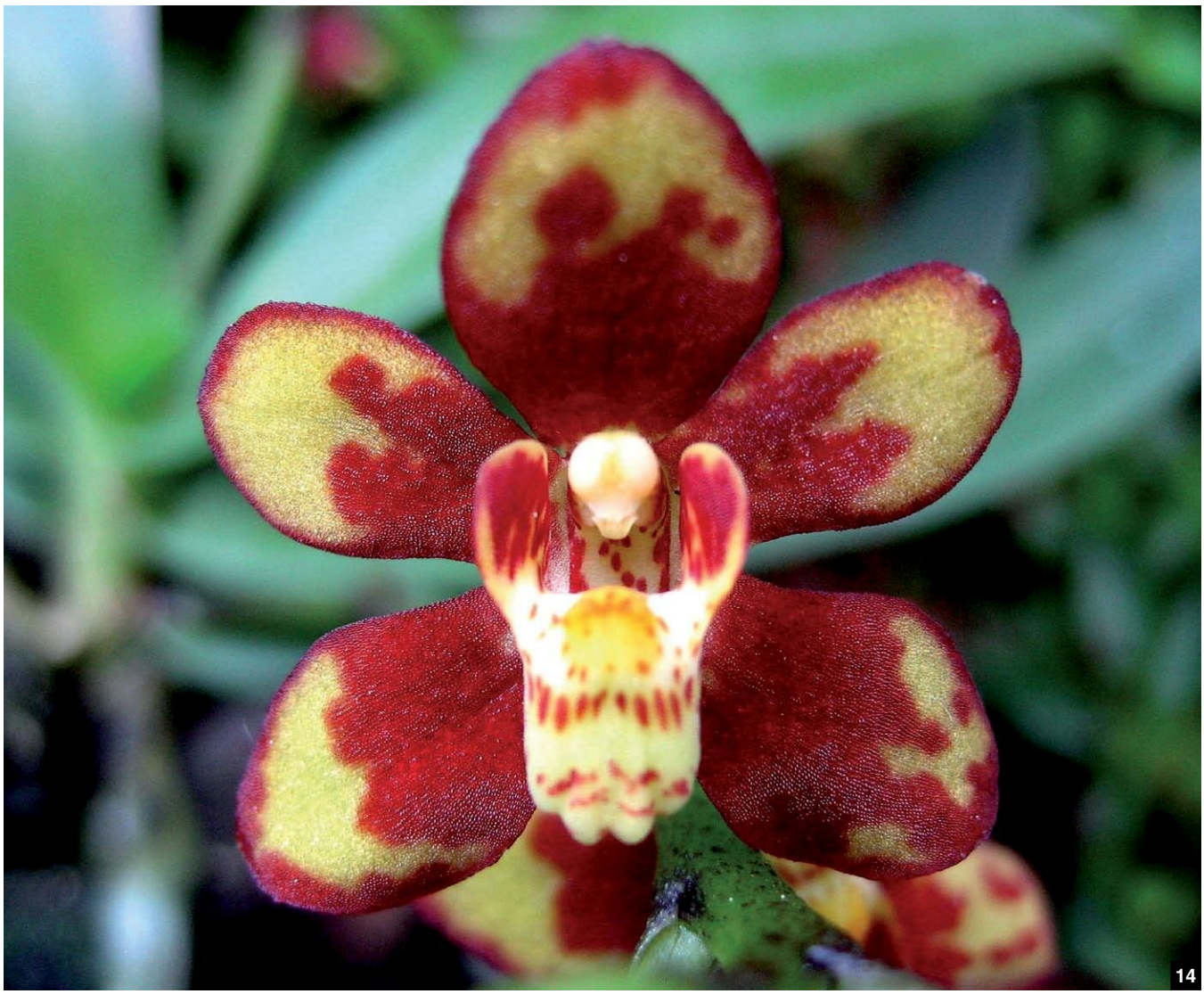


Australian awards include 13 HCC/AOC, nine AM/AOC, eight AD/AOC, two HCC/ Australasian Native Orchid Society (ANOS), one AM/ANOS, two HCC/OSCOV, one AM/OSCOV, seven AD/OSCOV.

Other Awards include AOC/AD of the Year 2005 for *Sarco*. Duno Nicky's Twin 'Eloise' AM-AD/AOC, OSCOV Australian Native Hybrid Orchid of the Year 2008 for *Sarco*. Patricia Abell 'Missy' AM/OSCOV, and OCNZ Orchid of the Year 2013 for *Sarco*. Bessie 'Buttermilk' AM/OCNZ (George Colthup 'Divine' × Velvet 'Cool Dude').

As noted previously, I have now stopped my hybridizing but still maintain a small collection of Aeridinae species and hybrids, most of which contain a touch of *Sarco*. *hirticalcar*!

I have used some extracts from parts of my articles previously published in *The Orchadian*, the journal of the Australasian Native Orchid Society, https://anos.org.au, and listed them as further reading.

Further Reading

Butler, D. 2015. *Sarcochilus hirticalcar* —A Little Orchid That Packs a Big Punch. *The Orchadian* 18(1):112–115.

Butler. D. 2016. Yellow *Sarcanthinae* Breeding—An Update. *The Orchadian* 18(9):398–401.

Butler, D. 2018. Reflections on *Aeridinae* (*Sarcanthinae*) Hybridising and Discovering Good Parents. *The Orchadian* 19(6):246–251.

Butler, D. 2020a. Some Thoughts on *Sarcochilus* Velvet. *The Orchadian* 20(1):22–26.

Butler, D. 2020b. The *Sarcochilus* Galaxy Story. *The Orchadian* 20(2):37–41.

— David Butler has been a successful breeder and prolific photographer of Australian orchids, particular Sarcochilus *and related genera. Until retirement, he operated a commercial orchid business under the name Green Vista Orchids near Sydney. His articles have regularly appeared in the* Orchadian*, the publication of the Australasian Native Orchid Society. (email david.greenvista@gmail.com).*

[10] *Sarco*. Evening Star 'Bold Red' (Galaxy × Duno Nicky's Twin)

[11] *Sarco*. Evening Star 'Red Yellow' (Galaxy × Duno Nicky's Twin)

[12] *Sarco*. Lustrous 'Nice' (Elegance × Velvet)

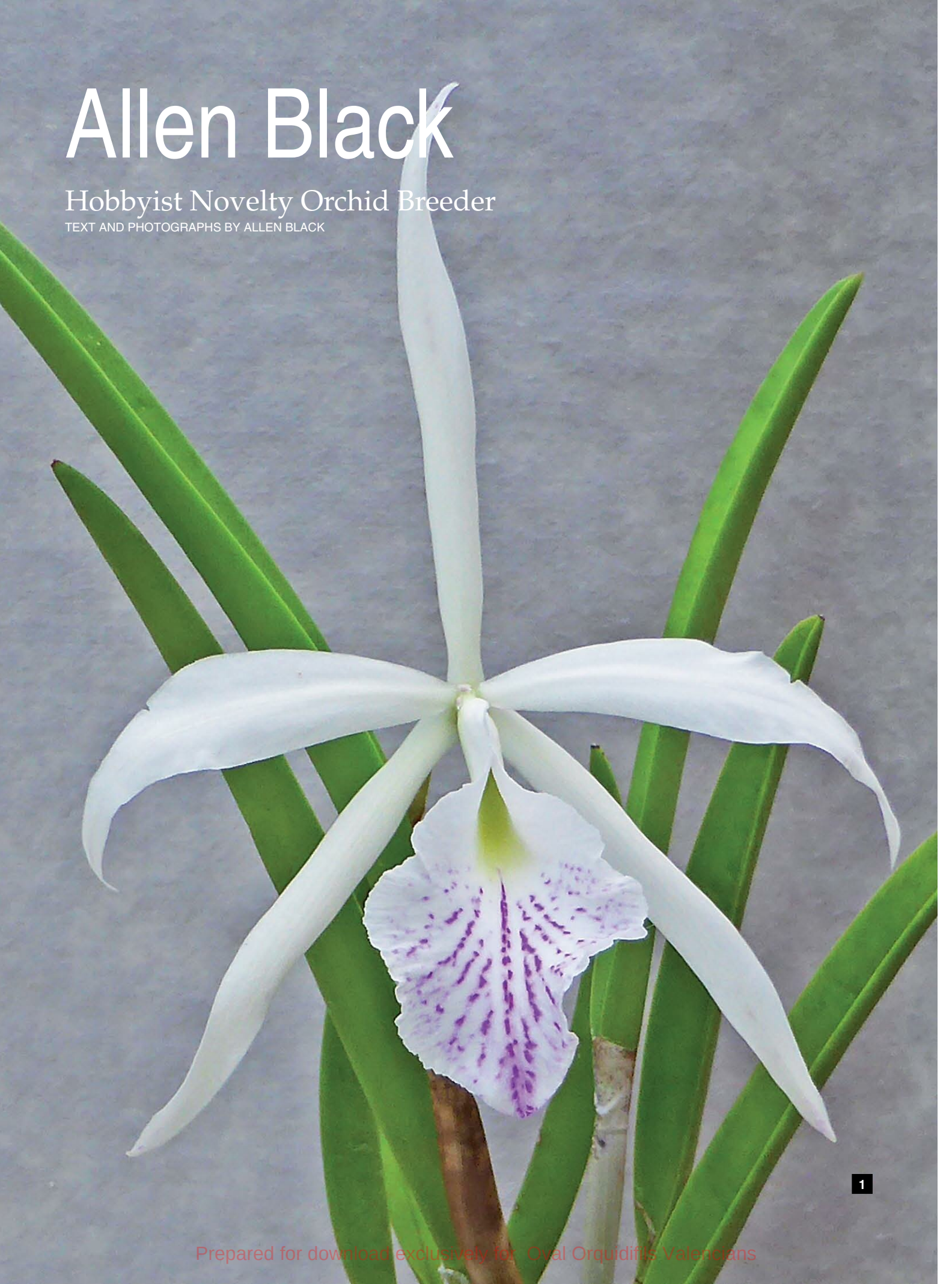
[13] *Sarco*. Superb 'Tough' (Amelia × *hartmannii*)

[14] *Sarco*. Velvet Dawn 'Smartie' (Aussie Dawn × Velvet)

Allen Black

Hobbyist Novelty Orchid Breeder

TEXT AND PHOTOGRAPHS BY ALLEN BLACK



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I AM NOT your typical orchid breeder. I am a hobbyist (i.e., noncommercial) novelty orchid breeder focused on the Brassavola–Cattleya Alliance. I do the whole orchid-growing process (from pollination to flowering) at home. This process includes pollinating the flowers to produce seed, preparing the sterile growing media, sowing the orchid seeds, germinating the seed, transferring the small seedlings under sterile conditions to replate flasks, growing seedlings in the greenhouse, and finally flowering the seedlings.

My two main breeding goals are to have FUN and, hopefully, to produce some interesting, unique, or beautiful orchids. Early in my orchid addiction, I envisioned a multitude of "novelty" orchid hybrids, most of which were not available in the marketplace. The unavailability of these novelty hybrids started me on my orchid-breeding adventure.

How do I decide on what hybrid to make? Unlike many hybridizers, I do not agonize or overthink whether to make a cross. Much of the time it comes down to me liking two flowers and wanting to see the outcome if they were bred together. I do use previous experience, intuition, imagination, some research, and luck to make hybrids. I like to make hybrids that have not been registered or hybrids that are not available in the marketplace (registered or nonregistered). I use *OrchidWiz* software and the AOS's internet-based *OrchidPro* awards search to research prospective crosses. If I am uncertain about making a cross, I will usually make the cross anyway to find out the result. My approach here is just like the Nike tag line: "Just Do It."

I have always been fascinated with *Brassavola nodosa* and its progeny, so it was natural that this would become a focus of my hybridizing endeavors. *Brassavola nodosa* is an easy species to grow and bloom. This species has evening-fragrant, cream-white-greenish, star-shaped (i.e., stellate) flowers, not the full and round shape so desired by the judging system.

Early on in my hybridizing efforts, I made primary crosses between *B. nodosa* and other *Brassavola* species that typically produced more of the same cream-white-greenish, star-shaped flowers. More recently, I have been breeding to produce progeny that have a wider variety of colors, fuller flower segments, flat presentation, and larger flower size. The *B. nodosa* parent commonly transmits varying amounts of veining, spotting, or blushes to the flowers, especially to the lip. Other positive characteristics that can be transmitted include hybrid vigor, compact growth habit, long-lasting flowers, increased flower count, evening fragrance, and multiple blooming cycles per year.


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My favorite cultivar for breeding is *B. nodosa* 'Off The Wall'. I selected this plant at Merritt Huntington's Kensington Orchids early on in my hobby. It was in a large group of various-sized *B. nodosa* plants that were hanging on a wall of the greenhouse. I looked and looked at them, contemplated, and then just selected one "off the wall"; this is how it got its cultivar name! It was not in bloom at the time, but when it bloomed, it had nice, large, floppy flowers. It turned out to be an excellent grower and bloomer. The mother plant can be in bloom from June through December. It tends to pass on the purple-burgundy spotting, veining or blushing to its progeny.

My other favorite cultivar is *B. nodosa* 'Susan Fuchs' FCC/AOS that Robert Fuchs collected in the wild when it was still legal to do this. 'Susan Fuchs' FCC/AOS was the largest of the population of *B. nodosa* specimens where he was visiting. Like 'Off The Wall', 'Susan Fuchs' has nice, large, floppy flowers. Both cultivars tend to pass on the large flower size to the offspring, but fortunately, the flower floppiness characteristic is not passed on or is greatly reduced.

Another cultivar that I use in my breeding is *B. nodosa* '#2' which I got from Mark Werther of Sentinel Orchids. It has medium-sized flowers with good flower presentation (i.e., flat) and lots of spotting in the lip throat. It produces progeny that have good spotting and presentation, although the flowers are medium sized.

I have started using some other *B. nodosa* cultivars to explore their potential as parents by making *B. nodosa* outcrosses. Hopefully with these outcrosses, larger, better-shaped flowers will be produced. I have produced *B. nodosa* seedlings from outcrosses by using the cultivars 'Florida Suncoast Orchids' and 'At Attention'. *Brassavola nodosa* 'O'Whimsey' HCC/AOS is a large-flowered cultivar with an interesting, long flower spike. It is a reluctant breeder, although I have produced a few seedlings with it.


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[1] *Brassocattleya* Mikayla Black (*B. nodosa* × *Cattleya mossiae*)
[2] *Brassavola nodosa* 'Off The Wall'
[3] *Brassavola* Yaki 'Black's Best' (*nodosa* × *appendiculata*)

Hybrids

My 1996 remake of *Brassavola* Yaki (*nodosa* × *appendiculata*) has been my landmark hybrid. Two outstanding cultivars were produced that have dark purple-burgundy sepals and petals with a pure-white, elongated lip, in which the dark petal and sepal color has not been seen on other Yaki. My cultivar 'Black's

Nova' received an HCC/AOS. *Brassavola* Yaki 'Black's Best' is my "lottery winner" cultivar. It has the darkest color, but I have never taken it to AOS judging. With both of these cultivars, like many *B. nodosa* hybrids, the flower color fades over time until they are basically cream-white color. Where does the fantastic purple-burgundy color come from? Look at *B. nodosa* and note the purple spotting in the lip throat and the light burgundy on the backs of the sepals. Also, it is not uncommon for *Brassavola appendiculata* to have purple spotting on the back side of the sepals. Over the years, I have received requests for divisions from all over the world, and I finally had to stop dividing it so often because dividing it was weakening the plant. Now, I occasionally donate a division for auction at special groups like the Cattleya Symposium in Florida. Until recently, *B*. Yaki seedlings have not been readily available in the marketplace. Peter T. Lin (Diamond Orchids) and Thanh Nguyen (Springwater Orchids) have been able to produce seedlings for sale. To my knowledge, none of their Yakis have bloomed out as dark as either of my two cultivars.

Brassocattleya Mary Dodson (*B. nodosa* × *Cattleya schilleriana*) is named in honor of my grandmother, who was one of my horticultural mentors. My original cross produced green-based flowers that were heavily blushed with purple burgundy and a white lip that was heavily covered in purple-burgundy blushing, veining, and spotting. This hybrid has apparently been remade by others since it is readily available in the marketplace. Some of the more recent plants have green flowers with less purple-burgundy blushing, veining, and spotting. This has turned out to be a really nice and interesting hybrid.

Brassocattleya Mikayla Black (*B. nodosa* × *Cattleya mossiae*) is named for my niece in honor of her graduation from high school a few years ago. I used a semialba *C. mossiae* in the original cross. Since then, I have remade this hybrid several times with different lavender *C. mossiae* plants, but none of these have bloomed yet. This hybrid is a good example of where *B. nodosa* exhibits its influence with the purple-burgundy-lavender spotting and veining on the lip.

Brassocattleya South Miami (*B. nodosa* × *Cattleya harrisoniana*) is named in memory of my visits to the Miami area. There is also a hybrid called *Brassocattleya* North Miami, but it uses *Cattleya loddigesii* as a parent instead of

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C. harrisoniana. The nicest cultivars from my original cross have nice, light-pink, fuller-segmented, star-shaped flowers.

I remade *Brassoepidendrum* Sylvia White (*B. nodosa* × *Epidendrum ciliare*) because I was curious to see what happens when breeding with *Epi. ciliare*, which has an unusual-shaped, frilly lip with a long, "sword-shaped" central rib. My remake produced thin-segmented green flowers with an elongated, white lip. This is the nonconventional type of breeding that I am known for and for which I have been referred to as the "Dr. Frankenstein of orchid breeding."

Prosavola Nodoprismo (*B. nodosa* × *Prosthechea prismatocarpa*) is a speculative cross of mine that produced interesting and beautiful multifloras. The flowers have narrow petals and sepals and a large, white lip blushed in lavender at the tip. This hybrid has unique flowers not typically seen in the marketplace.

Brassocatanthe Exuberance (*B. nodosa* × *Cattlianthe* Cherry Treat) is another one of my attempts to get more red color into nodosa hybrids. I used pollen parent *Ctt*. Cherry Treat 'Layla Black' HCC/AOS with its small, vivid-red flowers and yellow lip. The hybrid produced small, flat, star-shaped flowers in the color range of light lavender, purple to red.

Brassocattleya East Freedom (*B. nodosa* × *Cattleya* Seagulls Apricot) is a hybrid named in honor of my Pennsylvania hometown. Incorporating this hybrid, I was hoping to get the orange color of the *Cattleya coccinea* into the hybrids. The pollen parent, *C*. Seagulls Apricot is a cross of *Cattleya* California Apricot × *Cattleya coccinea*. The cultivar that I used in the cross had round-shaped, strong-orange-colored flowers. My hybrid produced small, light-yellow and light-peachy-orange flowers.

Brassocattleya Virginia Earthquake (*B. nodosa* × *Cattleya* Latona) is my hybrid that first bloomed in 2011 around the time when a 5.8 magnitude earthquake occurred in central Virginia, thus its hybrid name. The quake was felt from Florida to Maine. This hybrid produces lots of color variations and various amounts of spotting and veining. From one blooming to the next, the color, spotting, and veining can change significantly. This color variation makes for an interesting hybrid that you should not get bored with. The *C*. Latona parent is a cross between *Cattleya cinnabarina* and *Cattleya purpurata*.

Cahuzacara So Called Facts (*Rhynchovola* Jimminey Cricket × *Cattlianthe* Netrasiri Waxy) is a second-generation


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[4] *Brassocattleya* Mary Dodson (*B. nodosa* × *C. schilleriana*)
[5] *Brassocattleya* South Miami (*B. nodosa* × *C. harrisoniana*)
[6] *Posavola* Nodoprismo (*B. nodosa* × *Prosthechea prismatocarpa*)
[7] *Brassocatanthe* Exuberance (*B. nodosa* × *Cattlianthe* Cherry Treat)
[8] *Brassoepidendrum* Sylvia White (*B. nodosa* × *Epidendrum ciliare*)


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nodosa hybrid and my most recently registered hybrid. The hybrid name comes from the current state of world affairs where stated "facts" may not really be facts at all, but distortions or lies. *Rhynchovola* Jimminey Cricket, the capsule parent, is a hybrid of *B. nodosa* × *Rhyncholaelia digbyana*. *Cattlianthe* Netrasiri Waxy, the pollen parent, is a hybrid of *Cattlianthe* Netrasiri Doll × *Cattlianthe* Netrasiri Fireball in which both share a common parent, *Cattlianthe* Chocolate Drop. In this cross, I was hoping to get flowers with good burgundy-red color and a large, "brasso-type" lip. What I got in the first-blooming plant was green-cream flowers with a white, "spade-shaped" lip with a lavender tip. The "spade-shaped" lip most likely comes from the strong influence of the double-dosed *Ctt*. Chocolate Drop in the pollen parent's background.

Rhyncholaeliocattleya Market Crash (*Brassavola Little Stars* × *Rhyncholaeliocattleya* Murray Spencer) is another second-generation nodosa hybrid which first bloomed around the time of the 2008 stock market crash, thus its hybrid name. *Brassavola* Little Stars, the capsule parent, is a primary hybrid of *B. nodosa* and *Brassavola subulifolia*. The wonderful, full-shaped, deep purple-burgundy *Rhyncholaeliocattleya* Murray Spencer 'Armroy's Dark Star' FCC/AOS was used as the pollen parent in hope of producing large-segmented, nicely colored flowers, and it worked. These flowers hold the burgundy-red color and do not fade with time.

Brassocattleya Craig de Trini (*B.* Little Stars × *Cattleya maxima*) is another second-generation *B. nodosa* hybrid; it is named for the orchid enthusiast from Trinidad who first bloomed this hybrid. This hybrid can bloom for much of the winter and is an easy, vigorous grower. The flowers have a varying amount of lavender blush and spotting, but the color tends to fade rather quickly.

PRACTICAL CONSIDERATIONS FOR THE WOULD-BE HYBRIDIZER The process of producing flowering orchids from seed has several phases. Each phase has ample opportunities for failure. From my experience in Cattleya–Brassavola Alliance breeding, here are some flower pollination suggestions to help increase your chances of producing orchid seeds

- Use a healthy, vigorous plant as the mother plant. The production of a seed capsule can stress the mother plant. Do NOT use a weak-growing plant as the mother plant. I have mainly used *B. nodosa* as the capsule parent since I am able to grow big, healthy plants that are in bloom a large part of the year.
- Pollinate fresh flowers (i.e., flowers that have been fully open for one to three days).
- If the mother flower is fragrant, this is an excellent

[9–10] Two different clones of *Brassocattleya* Virginia Earthquake (*B. nodosa* × *C.* Latona).
[11] *Brassocattleya* East Freedom (*B. nodosa* × *C.* Seagulls Apricot)
[12] *Cahuzacara* So Called Facts (*Rhynchovola* Jimminey Cricket × *Cattlianthe* Netrasiri Waxy)
[13] *Brassocattleya* Craig de Trini (*B.* Little Stars × *C. maxima*)
[14] *Rhyncholaeliocattleya* Market Crash (*B.* Little Stars × Murray Spencer)

indication the flower is ready for pollination.

• Even though brassavola flowers are night fragrant, I pollinate them in the morning after the sun has risen. I do this because I go to bed early—no kidding!

• If the pollinations are unsuccessful, try pollinating a flower at times other than the early morning.

• If possible, pollinate the first flower that opens on a flower spike. If this attempt is unsuccessful, pollinate another recently opened flower.

• Use fresh pollen or pollen that has been stored in the refrigerator (i.e., do NOT use pollen that is moldy or has deteriorated).

• The flower's lip may be carefully positioned down or removed to make easier viewing of the flower's stigmatic surface and to optimize pollen placement.

• If the stigmatic surface of the mother flower is sticky, this is a good sign that the flower will accept the pollen. If the stigmatic surface is not sticky, wait another day or two for it to become sticky before attempting pollination.

• Use a new toothpick to place the pollen on the stigmatic surface of the mother flower. Touch the toothpick tip into the flower's stigmatic surface and get some of the sticky substance; this will greatly help keep the pollen on the toothpick tip when you try to place it on the flower's stigmatic surface. To prevent the spread of disease, do not reuse the toothpick on other plants.

• Place the pollen into the stigmatic surface closest to where the flower stem is located. Gently push the pollen down into the stigmatic surface.

• Avoid damaging the stigmatic surface with excessive toothpick manipulation.

• Do not attempt to pollinate a flower when the stigmatic surface is wet. (This can lead to pollen rot).

• The mother flower pollen does not need to be removed. For some orchids, if the mother flower pollen is removed, the flower will begin to wilt (thus reducing the amount of time available for a successful pollination). If the mother pollen is removed, the pollen can be stored for future use. If the mother pollen is left in place, there is a slight chance that the flower could self-pollinate, although I have only experienced this once breeding with *Barkeria*.

• Use pollen that fits completely within the stigmatic surface. If the pollen is larger than the stigmatic surface, cut the pollen down to a size so that it fits completely within the stigmatic surface. Use a clean razor blade to cut the pollen.

• Once the flower is pollinated, avoid exposing the mother plant to extreme temperatures. High temperatures (>95 F [35 C]) for multiple days can cause the seed capsule to abort. This has been a problem for me during the hot months of July and August.

• It is easy to forget what cross was made. When you pollinate a flower, be sure to document (e.g., written log or electronic document) what parents were used, assign a cross number (e.g., 2022-01), the date of the pollination, and projected capsule harvest date (I use a "ball-park" value of 150 days for harvesting *Brassavola–Cattleya* crosses). Also, tag the flower with at least the cross number.

• A visual sign that the pollination may be working is that the flower ovary begins to enlarge after several weeks.

• A visual sign that the capsule is nearing maturity is yellowing of the capsule ribs and ends.

• As usual, there are exceptions to these items.

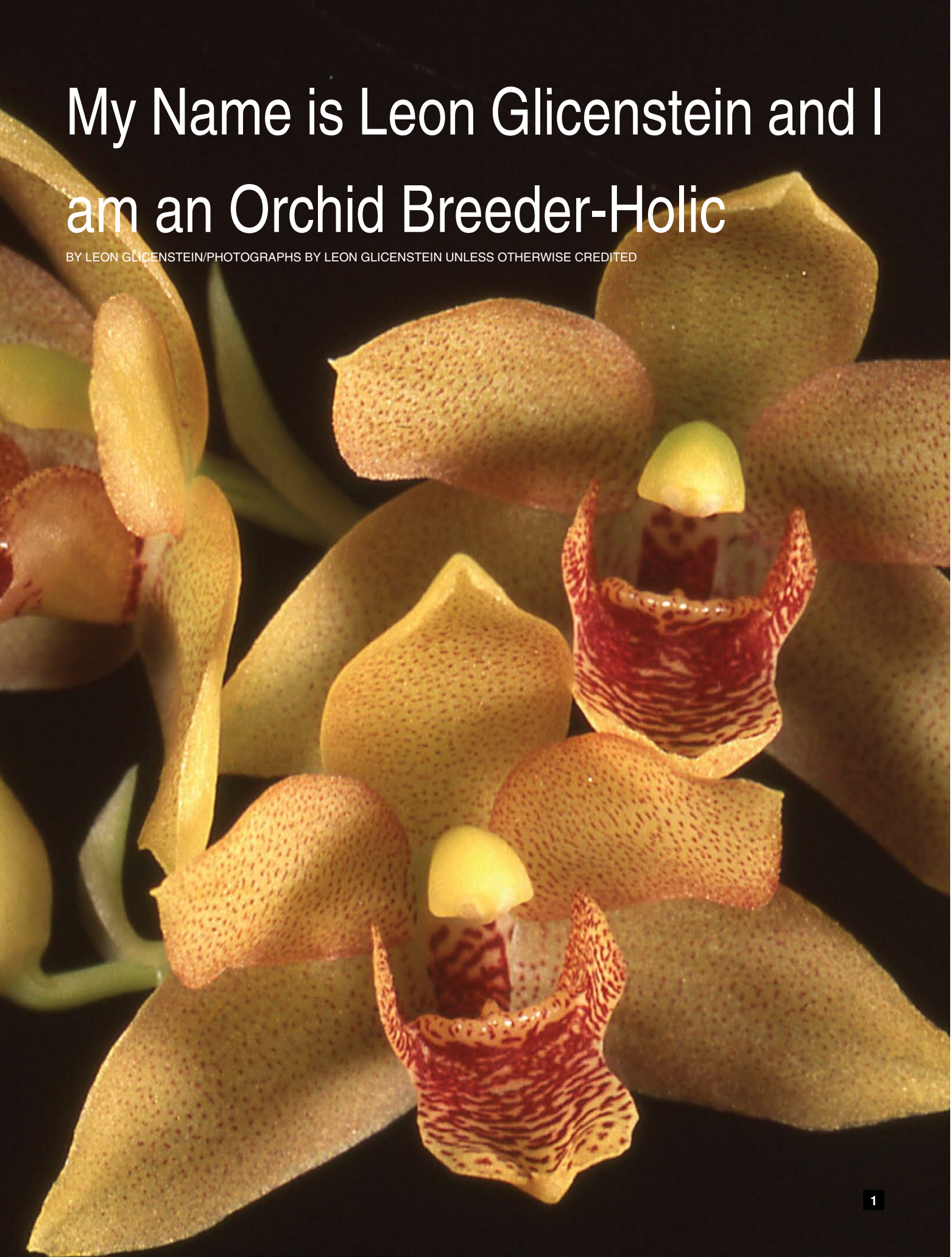
• Feel free to break the "rules." You may discover a better way of doing it!

• Finally, if you plan to do more than casual orchid breeding, you really should learn how to do the "orchid lab" procedures (i.e., preparing the sterile orchid media, sowing orchid seed, and transferring seedlings under sterile conditions). By being able to do the orchid lab procedures, you will have greater freedom, certainty, and control of your crosses. A big benefit is knowing in real time whether or not a cross has germinated. If you have to rely on someone else doing your orchid lab work, you should be prepared to be in the dark on the status of your crosses. If you have a kitchen and know how to cook, you can learn to do the orchid lab procedures, it is not rocket science. It is actually fairly easy.

—At an early age, Allen started his lifetime love of plants. He has been growing orchids for over 30 years and breeding them nearly 30 years. He is the originator of 91 orchid hybrids. He does the whole orchid process, including the orchid laboratory type of work, in his home and his 10- × 16-foot (3.0- × 4.9-m) greenhouse.

My Name is Leon Glicenstein and I am an Orchid Breeder-Holic

BY LEON GLICENSTEIN/PHOTOGRAPHS BY LEON GLICENSTEIN UNLESS OTHERWISE CREDITED



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I BEGAN BREEDING orchids in the late 1950s. My first cross, registered by Dr. Carl Withner, unbeknownst to me, as *Epicattleya* (now *Catyclia*) Leon Glicenstein (*Encyclia cordigera* [*Epidendrum atropurpureum*] × *Cattleya intermedia*), was in 1972. I did not find out about this until the 1990s when someone asked me if I was the person the orchid plant had been named for, and I said, "What plant?" At that time, like many people making crosses, I was crossing things just because they were in flower at the same time without really thinking about what I was doing.

I am going to plagiarize myself: "…It was not until I began to work at Hoosier Orchid Company in 1998 that I really started breeding orchids. Hoosier Orchid Company had a fantastic collection of orchid species and hybrids, and I was given *carte blanche* to make any hybrids I desired as well as reproducing orchid species from seed. Wow! I was like a kid with a sweet tooth in a candy store, with unlimited money" (Glicenstein 2020).

One of the things I like to do is to breed with groups of plants that no one to very few are working with. It is exciting because you can find relationships that were unknown beforehand, and it allows you "to boldly go where no one has gone before." A commercial orchid company often does not have the latitude to do "weird" exploratory crosses all the time, but an amateur breeder can play and come up with amazing results.

I liked promenaeas because they were small plants with relatively large flowers and because I grew under lights in an apartment, plant size was important. At that time, late 1960s, no one was really working with this genus, and there were perhaps only a few interspecific promenaea hybrids.

I made my first promenaea intergeneric cross in 1974 or 1975. It was in the greenhouse of Dr. Benjamin C. Berliner, where I had a reputation as a "deadbeat orchid dad;" I would make crosses and leave the fruits for him to deal with. I really had to talk my way into him letting me make a cross of a *Zygopetalum* with a *Promenaea* in his greenhouse. (Such a cross became a *Propetalum*. This was before *Propetalum* Mathina, the first propetalum hybrid, had been registered by Neville Orchids in 1976). "Why?" he asked. I gave him all sorts of reasons, and he finally relented (deadbeat orchid dad strikes again). I remember the *Zygopetalum* was *Zygopetalum* Helen-ku, I am almost sure that the promenaea was *Promenaea stapelioides*. He did not register the cross; however, when it flowered, he was surprised and impressed because it had large star-shaped flowers on a small plant, chocolate-colored sepals and petals and a bright fuchsia-colored lip. So started his whole breeding project of propetalums and other promenaea hybrids. He registered a number of them and more are now being made commercially. Started by an amateur breeder who was curious and thought what if…?

I have continued playing with *Promenaea*, even though today I am mainly breeding habenarias — another group that had been underutilized, until now.

I am asked, "How do I decide upon my crosses? Where do I get my ideas?"


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[1] *Promenopsis* Nutmeg (*Promenaea* Chameleon × *Eriopsis sceptrum*).

[2] *Promenaea* Chameleon 'Beam Me Up Barry' HCC/AOS; grower: Barry Jones; photographer: James McCulloch. Inset: 'Marsh Hollow' CCM/AOS; grower: Mario and Conni Ferrusi; photographer: Jay Norris.

[3] *Eriopsis sceptrum*.

[4] *Promenaea* Joan Rosenfeld 'Mila' CCM/AOS grown and photographed by Alexey Tretyakov.

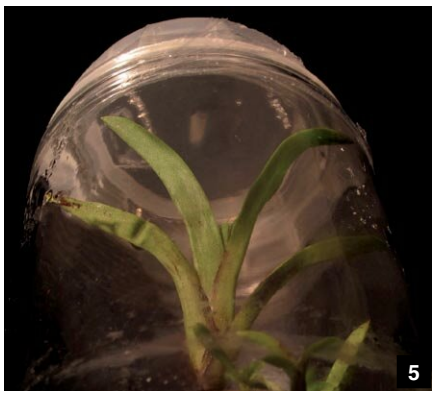
That is a problem. Knowing relationships helps, and for that I will look in Dr. Robert Dressler's books to see what might be related. Not everything related can be hybridized and sometimes distantly related plants can be. One has to test out the crosses. All one loses is the time with a toothpick.

I will describe five unexpected crosses I have made with *Promenaea*. Tom Mirenda, who writes columns for *Orchids*, has described my hybrids as "Glicenstein's monsters." I kind of like that.

At Hoosier Orchid Company, I just wondered if one could cross a *Promenaea* with a *Cymbidium*. So, I tried it. Why I thought it might work I cannot really say; it just felt right. Intuition? Perhaps. Unfortunately, Hoosier closed and while a fruit did develop, the seed had been sown and germinated, it was left behind and relegated to oblivion. So, I convinced cymbidium breeder John Dunkleberger to try it.

I always use the *Promenaea* as the seed parent, because one can easily see if the seedlings are promenaeas or the hybrid. He crossed *Promenaea xanthina* × *Cymbidium devonianum*. He obtained a fruit, seeds developed and were sown, plants formed. They were difficult to grow and eventually perished without flowering. However, I think if we had made polyploids out of them, they may have been growable and flowered. Jeanne Kaeding, in Rochester, New York, was able to grow a plant for a while, and it definitely grew and looked more like a *Cymbidium* than the promenaea seed parent.

Since I determined that *Promenaea* could cross with a *Cymbidium*, I began to wonder with what else it could be hybridized. My next idea was to attempt a cross of the yellow-flowered *Promenaea xanthina* (one flower per inflorescence) by the yellow-flowered, floriferous *Cyrtopodium andersonii*. This came to me as I admired a flowering plant of the *Cyrtopodium* at an orchid show. I just imagined what the end product of that hybrid would look like if the cross was successful, grew and flowered — of course, one's imagination can be very wrong! The cross took, it grew, and by the shape of the plants was definitely the hybrid, and then disaster struck: spider mite attack!!! I was gone at the time and the spider mites destroyed all the plants in the community pot that I had. Humph! But it did take — who would have thought that a *Promenaea* would actually cross with a *Cyrtopodium*? I have recently remade this type of hybrid with two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different cyrtopodiums, and am waiting to see if anything germinates this time. They grew well enough last time, perhaps I will even get to see them in flower.

Something said to me, "Why not try a cross of *Promenaea* Meadow Gold × *Oncidium ampliatum* (now *Rossioglossum ampliatum*)?" In the early days of orchid breeding, in the late 19th and early 20th centuries, there were many crosses with *Zygopetalum mackayi* (now *Zygopetalum maculatum*) × Oncidiinae. To my knowledge, all of the progeny were apomictic (asexual reproduction of the mother plant) *Zygopetalum mackayi*, but perhaps not, because this cross took. It does not want to grow well, and does not want to flower, but the plant is definitely the cross, judging by the morphology of the seedlings. Once again, I cannot help wondering if it had been made into a polyploid, would it have grown and flowered; well, at least grown. Not all distantly related orchid crosses flower.

Did I have any luck with these types of promenaea hybrids?! I flowered a plant of *Eriopsis sceptrum* at Hoosier's greenhouse. I did look it up to see what it was related to, and at that time its relationships were unknown. Lying in bed, just about asleep, an idea popped into my head to try crossing it with a *Promenaea*. I had not been thinking of promenaeas. Externally I had no reason for this idea. But I did it. The next day I crossed *Promenaea* Chameleon with *Eriopsis sceptrum*. And it took! In this case, I grew plants to flowering. It was registered as *Promenopsis* Nutmeg. The *Eriopsis* species is large with a tall, many-flowered inflorescence, but the hybrid is a promenaea-sized plant with more flowers than usual for a *Promenaea*, and the individual flowers are the size of a typical promenaea flower. The front surface of the flower is finely spotted and there is a partial fine-red border to the petals, both features of the *Eriopsis*. Further, while neither parent was fragrant, the hybrid was. Even though we did flower a few seedlings, once again they were difficult to grow, and I think, in retrospect, that the polyploid route would have been smart.

Ideas can lead to complex hybrids. The cross of *Hamelwellsara* June × *Promenaea Winelight* produced a plant that was registered as *Berlinerara* Ben to honor Dr. Berliner. It has six different genera in it. The plant is about 7 inches (17.8 cm) tall, and, when first flowered, had three 2-inch (5.1-cm) flowers with deep-purple sepals and petals, and a red lip. One never really knows where one's breeding will lead when one is starting out.


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When Hoosier finally closed in December 2008, I had crosses in bottle between *Promenaea* and *Dichaea* (the plants looked and grew like a leafy dichaea, with no pseudobulbs), *Paradisanthus*, *Ansellia*, *Catasetum* (the leaves of seedlings in the bottle were long and thinly textured, not at all like promenaeas), and a few other genera, as well as complex hybrids. I do not know what happened to them after we closed.

So, ideas can come from submerged knowledge, dreams (after all, supposedly the chemist Kekule's daydream led to the elucidation of the puzzling molecular structure of benzene), scientific thought, intuition, observations, curiosity, and who knows where else. The more knowledge and experience one has with orchids, the more relationships one sees or imagines.

Take the step. Take orchid breeding in a completely new direction, you can do it. Often you get nothing but information about relationships, which can be very important; other times you may make interesting new hybrids, or sometimes you can hit the jackpot and create a whole new group of beautiful, often commercial, hybrids, like Dr. Berliner did. The commercial part is not necessary, but it is nice to see your ideas recognized, for sale in sales booths at shows, and knowing that you started it.

Reference

Glicenstein, L. 2020. Playing with Orchids. *The Orchid Review* 128(1330):76–83.

— Leon Glicenstein is an international lecturer who speaks to orchid and plant societies. He has grown orchids for more than 59 years and was a breeder of novel orchid hybrids for the former Hoosier Orchid Company, especially in the Gongorinae, Zygopetalinae, Pleurothallidinae, angracoids, jewel and painted-leaf orchids; Orlando Avenue, State College, Pennsylvania, 16803 (email glicenstein33@msn.com).


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[5] First ill-fated attempt to make a *Promenaea* × *Cymbidium* hybrid.

[6] *Promenaea* × *Cymbidium* hybrid seedling grown by Jeanne Kaeding clearly indicating its hybrid nature.

[7] *Promenaea xanthina* × *Cyrtopodium andersonii* clearly exhibiting pseudobulbs of more than one internode, characteristic of the *Cyrtopodium* parent. Unfortunately, the seedlings were destroyed by spider mites.

[8] Unbloomed seedling of *Promenaea* Meadow Gold × *Rossioglossum ampliatum* photographed by the author. Inserts: *Prom.* Meadow Gold 'Roseanne Bird' AM/AOS; photographer: Craig Plahn (left); *Ross. ampliatum* 'Colleen' AM/AOS; photographer: Claude W. Hamilton (right).

[9] *Dichaea obovatipetala*

[10] *Paradisanthus micranthus*

[11] *Berlinerara* Ben (*Hamelwellsara* June × *Prom.* Winelight)

Hybridizing Orchids

Past, Present, Future

BY ROY TOKUNAGA

MY INTEREST IN orchids began in 1972 while I was attending the University of Hawaii Manoa. My first mentor, Dr. Yoneo Sagawa, introduced me to the cloning and hybridizing of orchids. The aseptic culture of orchid seeds and the new cloning technology were both advancing rapidly. It was an exciting period. I had the opportunity to learn everything. In the same building, Dr. Haruyuki Kamemoto was conducting his ground-breaking discoveries in cytology and genetics. I was introduced to the most active hybridizers in Hawaii.

My first tip for anyone interested in hybridizing: all the information you need is summarized in Dr. Joseph Arditti's *Orchid Biology* series, in addition to the hundreds of articles and books from other authors that go back for more than a hundred years.

"*Orchid breeding is still a mixture of art, luck, intuition, and perseverance. It is also necessary to keep in mind that successful breeders, like other virtuosi, many have talents which simply defy explanation and are beyond the reach of others. Another point to keep in mind is that some breeders attribute their success to factors which are unreasonable, unrealistic, unscientific, and sometimes silly.*" (Arditti 1992)

In the 1970s, all the major hybridizers maintained a small laboratory to do their own seed germination. Many were converted bedrooms with just a few flasks. My second tip for serious hybridizers is to consider building a small seed-germination laboratory. All you need is a spare room and kitchen, a clean box to work in with a HEPA filter, a small pressure cooker, and a few flasks (Butler 2015; Maples 2015).

I attribute most of my success to the many old timers that were kind enough to help me. They gave me this great advice:

• Start young. It takes at least 25 years of hard work before a hybridizer becomes good at this craft (M. Miyamoto, B. Kodama, R. Mizuta and R. Fukumura, pers. comm.).

• Take up photography. Use the photos to give lectures. There was and still is a shortage of speakers on dendrobiums (R. Mizuta, pers. comm. in 1974). I am amazed at how technology has changed everything I knew. My cell phone can now take photos that rival my $1,000 Nikon N90, which needs outdated slide film. Digital cameras do a better job, and computers allow you to surf the web. Most of our young judges now have virtual collections stored in their cloud accounts.

• Study all the books and AOS magazine articles on hybridizing as per advice by Roy Fukumura and Alice Iwanaga. For the latter, use the Search function in AOS magazine archives (http://www.aos.org/about-us/orchids-magazine.aspx).

• Others suggested areas that needed the attention of hybridizers: *Dendrobium* section *Formosum* (R. Fukumura and H. Kamemoto, pers. comm.) and *Dendrobium* section *Latouria* (R. Mizuta and P. Spence, pers. comm.).


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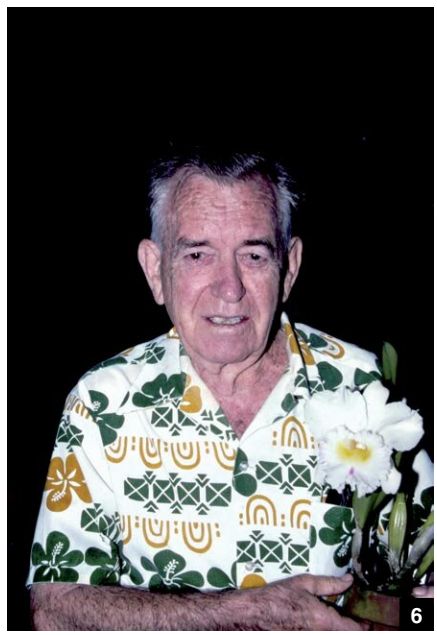
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[1] *Dendrobium* Blue Twinkle 4n
[2] Dr. Haruyuki Kamemoto
[3] Keven McFarlane, center.
[4] Masatoshi Miyamoto (left); Alice Iwanaga (right).
[5] Phil Spence
[6] Milton Warne
[7] Left to right: Robin, Richard and Stella Mizuta.
[8] Richard Mizuta in 1974.
[9] Left to right: Ruth Chun, Wilbur Chang, Roy Fukumura, Violet Yamaji and Elizabeth Lee.

• Breeding *Cattleya intermedia* (Aquinii) hybrids. Milton Warne pointed out, "Did you notice that the genes in the lip are interacting with the genes in the petals and vice versa? Use it!"

• Miyamoto gave me advice on how to make art-shade and reddish cattleyas with and without *Cattleya coccinea*. "Avoid lavender cattleyas that are dominant over yellow. Look for hybrids [where] both the purple genes and yellow express themselves together to make reddish colors."

• On breeding miniature cattleya hybrids, Reverend Yamada and Alan Koch said, "when orchid hobbyists run out of room, they can always find room for a miniature cattleya."

• Genome breeding using amphidiploids is the future of orchid hybridizing (advice from H. Kamemoto and Dr. Donald Wimber). Many articles are available on treating freshly germinated orchid seeds with colchicine or oryzalin in-flask to induce doubling of chromosomes. Genome breeding is in everything I created. There are few exceptions. A genome is one complete set of a species' chromosomes. We are all composed of two sets of our chromosomes. In humans, there are two sets of 23 chromosomes. They are categorized and numbered 1–23. One of the most amazing events in life going back at least 300 million years is meiosis. We studied it in biology class and quickly forgot it. The chromosomes with the blueprint of life are copied. To start the process of replication, the long strands of chromosomes condense. The 46 chromosomes line up on a plane and must find their corresponding pair. If the chromosomes cannot find their partner, meiosis is usually canceled, resulting in infertility. If all goes well, the first separation is made with fibrils that attach to the chromosomes and pull them apart to create two groups. The second separation is again made by the fibrils to separate the two replicates from each other. The result is four groups with 23 chromosomes (1–23) with no errors. They are then made into four gametes, each with a complete genome. The loss or addition of even one chromosome can be detrimental. The concept of genome breeding is to keep the genomes intact as we hybridize. The minimum for good growth and flowering is two complete genomes.

In the mid-1980s, I attended the Santa Barbara show for a number of years. I was attracted to the miniature and compact cattleyas that Frank Fordyce and Alan Koch were displaying, which had vibrant reds and oranges. The first step in obtaining these results was identifying the key primary hybrids that needed to be treated with colchicine to start an amphidiploid hybridizing program. Doubling of the chromosomes is a common mutation in cloning (H. Kamemoto, pers. comm.). I quickly found tetraploids in several miniatures that were cloned. *Cattleya* Beaufort and *Cattleya* Orpetii were

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[10] Frank Fordyce display, 1987.
[11] Alan Koch, Gold Country Orchids, display, 1987.
[12] *C.* Beaufort 'Yellow Lip'
[13] *Bc.* Richard Mueller 4n

the first two. These were followed by *Cattleya* Tangerine Jewel, *Cattleya* Jungle Elf, *Brassocattleya* Richard Mueller, *Cattleya* Bright Angel, and *Guaritonia* Why Not. That discovery saved me seven years or more. If you cross a miniature amphidiploid to any large unifoliate cattleya, you often have a compact cattleya of high quality. If the unifoliate cattleya was erratic in its breeding, the tetraploid miniature guaranteed you ended up with *two complete genomes*, a variety of colors and shapes, and good growing habits. Hobbyists prefer variety whereas commercial growers prefer uniformity.

Another line of breeding that interested me was the flared-cattleya breeding. I wondered if you could make something yellow or red. *Cattleya intermedia* (Aquinii) is dominant in making purples and pinks. If you cross any yellow cattleya with *C. intermedia* (Aquinii) you will get lavender to purples. A breakthrough in colors came with diploid *Cattleya* Hawaiian Fantasy: a flared hybrid that might breed yellows. The clue was that the yellow in the lip showed up clearly on the petals and little pink. It was cloned in large numbers and a tetraploid appeared. The tetraploid was not in good condition when I purchased it. Sometimes Mother Nature throws you a curve ball and you have to make tough decisions. Richard Takafuji, who ran the Orchid Center, had just purchased tetraploid *C. coccinea* plants from Japan. Several were in flower and he gave me the pollen. As luck would have it, the only plant flowering at the time was the poorly grown *C.* Hawaiian Fantasy (4n). So, I placed all the pollen into one flower. The mother plant held the capsule and died shortly thereafter. I got five seedlings. Only two flowered. I named the cross *Cattleya* Fire Fantasy. The two genomes supplied by *C. coccinea* allowed the *C.* Fire Fantasy (4n) to be quite fertile. The resulting hybrids made were variable and vigorous. So, luck sometimes has a lot to do with hybridizing. Many of my best yellow-and-red flared miniature cattleyas were made with *C.* Fire Fantasy (4n), for example, *Cattleya* Dream Weaver (Fire Fantasy × Beaufort).

Using the tip from Miyamoto, I use miniature and compact stud plants that are color recessive in that the pigments overlay each other. To keep the line yellow to red, the other parent cannot be dominant for purple. If you chose stud plants like *Rhyncholaeliocattleya* Toshie Aoki, you could maintain yellows and oranges. See photo of *Rlc.* Toshie Aoki and *Rhyncholaeliocattleya* Little Toshie (Toshie Aoki × *C.* Beaufort).


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[14] *C.* Fire Fantasy 'Hihimanu' AM/AOS
[15] *C.* Fire Fantasy 'H&R'
[16] Three clones of *C.* Dream Weaver: unnamed clone (upper left), 'Heart Thumper' (upper right), and another unnamed clone(lower center).
[17] *Rlc.* Toshie Aoki 'Pizzaz' AM/AOS
[18] *Rlc.* Little Toshie 'H&R' AM/AOS

Using the tip from Warne, I choose plants with the yellow lip color and shape that I want. See award photos of *Cattleya* Angel's Fantasy (Fire Fantasy × Bright Angel) and *Cattleya* Fire Magic (Fire Fantasy × Tokyo Magic). The intense yellow in the petals is coming from the yellow throat of *C. coccinea*.

Another interesting line of breeding is the use of the dominant yellow *Cattleya briegeri* (4n) against a dominant purple as in *Cattleya* Irene Finney (1964) (4n). They repress each other and the resultant flower is white. The lip genes are not affected. See the photo of *C.* Tokyo Magic (4n). Most flowered white with a purple lip. One cultivar, labeled '6-1', from Dogashima Orchids of Japan was the only yellow I know of. I decided to cross the white form to a nice flared hybrid

called *Cattleya* Mari's Song. The goal was to eliminate the lavender background color of the petals and sepals. Being a *C. intermedia*-type flared hybrid, I expected the lip color to remain on the petals. It worked well and it was named *Cattleya* Mari's Magic. I also crossed the *C.* Tokyo Magic '6-1' AM/AOS (4n) to *C.* Fire Fantasy 'H&R' and 'Hihimanu' AM/AOS. See the photos of *C.* Fire Magic. In orchid judging, a clear contrast of colors scores more points.

Today, the most important compact breeding plant to acquire is *Cattleya* Circle of Life (4n) (Culminant × *coccinea*), created by Fordyce. It is still available and will set records as the most important compact breeding line for all colors. H&R Nurseries is no longer selling miniature and compact cattleya hybrids. The best nursery to follow is Sunset Valley Orchids. Fred Clarke is doing a wonderful job creating the yellows, oranges, and reds that are so difficult to make.

Several lines of dendrobium breeding are special to me: striped dendrobiums, latouria dendrobiums, and Sect. *Formosae* dendrobiums. In creating striped dendrobiums, I started with an advanced hybrid named *Dendrobium* Nida (Queen Southeast × Candy Stripe). *Dendrobium* Candy Stripe is a poor-breeding diploid and not readily available. *Dendrobium* Queen Southeast (Tommie Drake × Hawaiian Beauty) is a tetraploid pink, mostly in Section *Phalaenanthe*. *Dendrobium* Nida (3n) was cloned 20 years ago. It turned out to be infertile. A common mutation in cloning is a doubling of the chromosomes. A few poor-growing plants appeared several years after the first release. They were slow growing and had flowers with heavy substance that were slightly crippled. I immediately recognized them as a 6n chromosomal doubling of the 3n Nida. After a few test crosses, I confirmed *Den*. Nida as a dominant fertile parent. By using *Den*. Nida, I saved myself 35 years of hybridizing. The stripe gene comes from the tiny flowers of *Dendrobium bifalce*. However, line breeding to the larger Section *Phalaenanthe* dendrobiums for several generations is necessary to increase the flower size (mahalo Kevin McFarlane). Fortunately, the stripe gene is dominant over multiple generations. The challenge then was to keep the flower size large and keep the background color as white as possible with pink-to-magenta stripes. I test crossed *Den*. Nida (6n) with Section *Phalananthe* types. The result was uniform and well-shaped progeny, but the main problem was that the background color remained different shades of pink. A pink flower with pink stripes is not very impressive. I then used the white *Latouria* types to see if it could remove some or all the background color. It worked well. See *Dendrobium* Hawaii Stripes (5n) (Roy Tokunaga [4n] × Nida [6n]). If a latouria has purple spots on the back of the


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[19] *C.* Angel's Fantasy 'Solar Flare' FCC/AOS
[20] *C.* Tokyo Magic 4n
[21] *C.* Fire Magic '012809'
[22] *C.* Fire Magic 'H&R'
[23] *C.* Fire Magic 'Solar Flare' AM/AOS
[24] *C.* Fire Magic 'Nora'; to the author's knowledge, the only pink clone.
[25] *C.* Mari's Song
[26] *C.* Mari's Magic 'Hihimanu'
[27] *C.* Circle of Life
[28] *Den.* Hawaii Stripes
[29] *Den. spectabile*

flower, it enhances the pink in the flower. The best of the striped hybrids came from pure-white latourias.

In my lines of latouria dendrobiums, genome breeding was critical in creating wonderful hybrids in a short period: 10–15 years instead of 30. In the 1960s and 1970s, Kamemoto and others had established that most of the awarded and breeding plants were polyploid. The 3n to 5n plants were the best polyploids. Kamemoto had also established that amphidiploid tetraploids composed of two species were uniform in their breeding. Amphidiploid *Dendrobium* Jaquelyn Thomas (*gouldii* × *phalaenopsis*) (4n) sibling crosses were distributed and grown by the acre for the cut-flower industry in Hawaii. They were inexpensive, virus-free, and uniform as clones. I remember spending three fruitless hours in a large field hoping to find one individual with any mutation.

If I had to describe my hybridizing style, I would call myself a hybrid of my mentors. I succeeded because of their timely advice. It gave me the tools to survive the invasion of the cheap, high-quality clones from Southeast Asia. The cloning technology made it difficult for hybridizers to compete in the marketplace. The overall quality of clones and low prices made hybrids obsolete. In Hawaii, we may have fewer than five hybridizers left. The future is bleak and there are no replacements. In the mid-1970s, Southeast Asian clones beat out my cloning business for cut-flower dendrobiums. That stayed in the back of my mind as I started to hybridize in the mid-1980s creating different combinations of latouria hybrids, colchicine treating each and testing each tetraploid against other species and amphidiploids. Within 15 years, every hybrid was triploid (3n) to pentaploid (5n) and winning awards.

I think I have found a path to success for anyone willing to follow in my footsteps.

To compete with cheap high-quality clones and hybrids from Southeast Asia, you have to analyze the strengths and weaknesses of the industry. They have cheap labor and huge labs to supply the existing market. Where do hybridizers fit in? Hybridizers are necessary to create new things. The cloning labs do not give any royalty for our creations. That left few choices for any commercial hybridizer in the United States.

I hybridize in areas that cannot be cloned or are at least difficult to clone. Paphiopedilums and phragmipediums have resisted cloning. I started my career in the cloning business and after 15 years, I knew which genera were difficult. Section *Latouria* and *Formosae* dendrobiums are difficult to clone. So are miniature cattleyas and most species of all genera. Clones have a long start-up time and labor cost. Their advantage is in producing large numbers of the same clone. Being able to produce 5,000, 10,000, and more of the same thing is its strength. If only 500 are needed per year, the cloning costs go up exponentially. The Oncidium Alliance is the easiest to clone. So, I refuse to waste any of my talents in that area.


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The largest market for hybridizers and seed germinators is the hobby sector. Hobbyists need species in small numbers, about 500 units per year. Seeds have an advantage in that small production and start-up costs are low. If you plant mature, dry seeds, Kamemoto and others showed that Cymbidium Mosaic Virus and Odontoglossum Ringspot Virus are not transferred by seed. I test different combinations of my breeding plants by growing a group to flowering size. Ninety-five percent useable plants and the ability to sell them are the standards established by Kamemoto.

I remake the best hybrids every year. I have hybrids like *Brassavola* Little Stars and *Brassocattleya* Yellow Bird that have been in continuous production since 1984. Today, I have more than 400 hybrids that I trust and can be remade on demand. Orchid seeds can be stored in the refrigerator for up to seven years according to Fukumura. Orchid seed capsules may have tens of thousands of seeds in each capsule. There is one

[30] *C. amethsytoglossa* **'41409' 4n**
[31] *C. amethsytoglossa* **'Super Spots'**
[32] *C. amethystoglossa* **4n**
[33] *C. amethystoglossa* **6n**
[34] *C. walkeriana* **4n**
[35] Original blush *C. walkeriana* **4n.**
[36] Modern blush *C. walkeriana* **4n.**
[37] *C. walkeriana* **semialba 'Snow White'**
[38] A 4n albescent form of *C. walkeriana.*
[39] This wonderfully colored clone of *C. walkeriana* **came from a cross of an albescent and coerulea form.**
[40] A 4n cultivar of *C. walkeriana* **f.** *alba.*

example in which I germinated a small batch of seeds from one capsule for five years in a row.

There is a need for more active selection and hybridizing within a species. *Dendrobium spectabile* is physically one of the largest plants of the *Latouria* section. It has been my best-selling species in Florida since the 1990s. Its grotesque, curly flowers and wonderful fragrance are irresistible to any orchid person. We produce several thousand and flower more than 100 every year. I noticed a few individuals that would flower in a 4-inch (10.2-cm) pot whereas most flowered in a 6-inch (15.2-cm) pot for the first time. I tagged these outliers and tracked their progress. A few performed really well and became the pollen for the next generation. Now, after 30 years, I have reduced the physical size of the plant by 30 percent. Half of the plants (many with double spikes) will flower in a 4-inch (10.2-cm) pot. It remains my best-selling plant at all the Florida shows. This is a good example of line breeding to shape a species to hobbyist and commercial needs.

Another project I started after 1994 was collecting species and selectively breeding within each. The goal was to create new triploid, tetraploid, and color forms. If you think about the problem with the overcollection of jungle plants, seed production can make jungle plants obsolete. Line breeding better forms and unusual colors in the Cattleya Alliance is a good goal. Orchid seeds are easy to ship in a tiny packet and there are organizations already sharing the seeds of species around the world. Higher ploidy and rare colors will be the norm. Jungle-collected plants should be frowned upon.

In the Cattleya Alliance, I started line breeding new color forms of 4n *Cattleya amethystoglossa*, *Cattleya walkeriana,* and *Broughtonia sanguinea*. I started with a 4n *C. amethystoglossa* 'Orchidglade' AM/AOS purchased from Jones and Scully and *C. amethystoglossa* 'El Camino' AM/AOS from Rod McLellan Orchid Nursery. Several generations later, I have 4n plants with distinctly more spots and wider petals. A Google search of photos shows that most of the beautiful, well-shaped forms are 4n seedlings. In the population of 4n *C. amethystoglossa*, we flowered a 6n individual. It probably came from a rare, unreduced 4n gamete pairing with a normal 2n gamete. Together they make a 6n hexaploid. Slow growing, but fertile.

Wilbur Chang, an old friend, and mentor gave me a rare white-and-flared form of *Bro. sanguinea*, which he called star-splashed. It was weak and inbred. I crossed it to a light-pink form that also had flares in hopes of some vigor. I got both vigor and a small number of whites with a purple lip and flares on the petals. I proceeded to cross the best of this new color form and treat the protocorms with colchicine to create 4n individuals. At the same time, I also colchicine-treated the alba and pink forms. It took about 20 years to achieve the 3n population that received an Award of Quality. Today I have 3n yellows with red flares that are real show stoppers. The *C. walkeriana* 4n specimens were mostly found in the cloning of 2n plants. The rubra forms were from Brazil and Japan. We cloned the semialba forms in Hawaii. The tetraploids came from varieties 'H&R' AM/AOS and 'Puanani'. Most of the best seedlings came from the sibling cross of these tetraploids. I have been line breeding the semialba form to create a whiter-background flower with a darker lip. I am getting close to creating an alba form.

Since I am near the end of my career, I decided to leave behind a few gems for future hybridizers. For example, did you know that all the *Dendrobium* Roy Tokunaga plants are tetraploids? I have been sibbing 4n *Den*. Roy Tokunaga for 15 years to create new color forms. I selected for near-white backgrounds, a darker lip, more spots, and a pink blush; for example, *Den*. Roy Tokunaga 'HR Blush'. I am not sure where the pink blush came from but it was a nice surprise.

Another gem worth a lifetime of study: how to find tetraploids. Earlier I mentioned that a common mutation in cloning is a doubling of the chromosomes. These are rare mutations in a single cell


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[41] *Bro. sanguinea* 'Splash 61509'
[42] *Bro. sanguinea* var. *aurea* '52610'
[43] *Bro. sanguinea* var. *aurea* 'Splash'
[44] Wilbur Chang
[45] *Den.* Roy Tokunaga 'Spots'
[46] *Den.* Roy Tokunaga 'Blush', a very unusual color form.


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[47] *Den.* **Dawn Maree 4n**
[48] *Den.* **Frosty Dawn**
[49] *Den.* **Lori's Star**
[50] *Den.* **Nida Stripes 6n**
[51] *Den.* **Formidable 4n**
[52] *Den.* **Peng Seng**
[53] *Den.* **Green Lantern**
[54] *Den.* **Thomas Warne 4n**
[55] *Den.* **(Micro Chip × Nida)**

and impossible to find. In the cloning process, these rare individual cells can divide enough times to create a mass large enough for one or more individuals. Just by chance, if the mutation had occurred early in the cloning, you could end up with many individuals that have double the number of chromosomes. They have the superior substance and shape that lead to awards. More important to me is a return of fertility. These doubled individuals tend to produce uniform 2n gametes that are valuable in hybridizing. Studies by Kamemoto and Wimber confirmed this return of fertility. To find these valuable tetraploids, you need to see the plants bloom. You need to know the original flower shape; most critically, the column and pollen cap. At the University of Hawaii, Dr. Kenneth Leonhardt characterized the differences, with the column being 70 percent wider. That is what I used to see in a 4n individual. Tetraploids are slower growing, so I search for them in the back end of a cloning run. They normally flower one or two years after the first flowering. The larger the cloning run — usually 5,000 or more — the higher are the odds of finding a doubled individual.

I tried many times to choose individuals before flowering by looking at the shape of the stem, leaves, and roots. They were tagged and, years later, I decided to discontinue the project. I was zero for several hundred attempts. If the orchid cloned was triploid, the hexaploid is slow growing with thick leaves. They look crippled and are usually discarded because they do not flower well. If the orchid cloned was tetraploid, I can confirm that the 8n individual cannot grow outside of the flask. The exception is the genus *Phalaenopsis*.

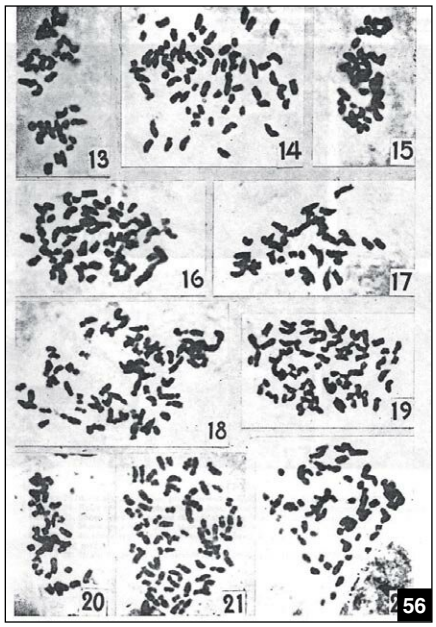
I find my tetraploids at places in which there are a lot of plants in flower and for sale. Show and sales booths are good places to search. For 40 years, I kept my knowledge and strategy a secret. If everyone starts to look for tetraploids, my chances will definitely be poor.

Another way to find tetraploids is to treat the newly germinated seedlings with colchicine, which is a dangerous mutagenic chemical and systemic neurotoxin. At very low doses, it is used to treat gout. This is another reason why a small lab would be useful. After treating the young germinating seeds with colchicine, you need to find the doubled seedlings. It takes about an hour to attempt a count of the chromosomes.

While I was in Sagawa's and Kamemoto's labs, I volunteered to help graduate students count chromosomes. It required collecting root tips in the greenhouses at 8–9 am. We fixed the root tips in acetic acid and returned to the lab to complete the process. Even if you staged several samples at a time, each count averaged about 30 minutes. You need a good microscope with ×1,000 magnification and excellent resolution. A $3,000 microscope did not have the resolution to count the individual chromosomes. You could guess by the size of the condensed mass that it was 4n. At the University of Hawaii, I priced their best microscopes with camera mounts at $25,000 each. I bought a $1,000 student microscope that allowed me to scan for 4n masses. At H&R Nurseries, I did about 20 counts. I now find my tetraploids visually on first flowering.

I posed a question to both Wimber and Kamemoto. If a tetraploid is identified by a visual flowering, is it necessary to count the chromosomes to confirm? Both said the visual identification is good enough. The plant's breeding behavior and a return of fertility are the most important factors. Several educated hybridizers told me that colchicine creates strange mutations and aneuploids. There are no reports in the research records that colchicine creates aneuploids. That was the second question I asked. Both said about the same thing: Colchicine interferes with the fibril formation that separates the chromosomes during mitosis. It doubles the chromosomes precisely. There was another experience in the University of Hawaii labs that was recorded in the back of my head. I helped graduate students count chromosomes of seedlings in flask that had been treated with colchicine at various concentrations and durations. It was rare to find a fully converted individual. Most of the cells were diploid and only a few were tetraploid. The graduate students called them "mixaploids," chimeras with two distinct cell types: 2n and 4n. It was rare to find a plant with 50 percent or more 4n chromosome masses. So, what stuck in my head is that most of the colchicine-treated seedlings are mixaploids. In time, the mixaploids could revert to a diploid state.

In the early 1990s, I started my colchicine project. After treating the young seedlings, I put the pseudobulbs in a liquid medium and partially cloned them into multi-plant clusters. This simple technique worked the best for me in creating stable 4n breeding plants. I did have several begin to revert to the 2n



level. I started selfing and making sibling crosses of these mixaploids to reestablish stable tetraploids. This technique is not recorded anywhere. If you think about the problem, how do you clean up a mixaploid? You could clone and select 4n individuals. A less expensive way would be to self the mixaploid. If the mixaploid is 50–50 in its mixture, it would produce 2n and 1n gametes. From Mendelian genetics, you could predict a selfing to have 25 percent 2n, 50 percent 3n, and 25 percent 4n individuals. Flowers that are 3n and 4n look quite similar. So, I selfed the potential 4n candidates, and only the 4n is really fertile. Since each seedling started as a single cell, it is no longer a chimeral mixaploid. I have about six breeding plants that went through this lengthy process.

Kamemoto also writes about the pure-breeding tetraploids composed of two genomes of two different species. These special tetraploids are called amphidiploids and act like species with uniform 2n gametes. I started line breeding several of them to create new traits. The most extensive result of this line of breeding spanning 15 years is 4n *Den*. Roy Tokunaga (*atroviolaceum* × *johnsoniae*). The first sibbing was an attempt to reestablish a pure 4n. As I flowered hundreds of these 4n seedlings, several new color types started to emerge: larger, well-shaped, whiter, and more spots on the reverse side of the flower. As pictured earlier, the latest color is the pink *Den*. Roy Tokunaga 'HR Blush'.

A third gem: Did you know all triploids have the potential to create hybrids? Fertility is low but in orchids, low fertility

might mean 10 flasks. Kamemoto and others studied the behavior of triploids in Vanda, Dendrobium, and Cattleya Alliance hybrids. They counted the chromosomes of the gametes in the buds. They reported the chromosome numbers varied from 1½n to 3n, with 3n gametes accounting for 10 percent to 100 percent of the total gametes, with 100 percent being quite rare. I used this information to create hybrids that were variable but which grew well by making sure the other parent was an amphidiploid. During the time that H&R Nurseries made clones, a good source of high-quality plants could be found in these hybrids. Even if 10 percent of the seedlings were good, all you needed was one plant to clone. As we abandoned cloning as a source of plants, hybridizing uniform hybrids became important.

I have a list of plants that I regret not pursuing more aggressively. In the 1980s, I ranked paphiopedilums and phragmipediums as the number 1 and number 2 most important genera for colchicine treating. We invested over $5,000 in breeding species to start a genome breeding program. In Hawaii, at sea level in a low-humidity environment, it was not possible to grow them. I slowly killed the plants. It was not going to happen without a humidified environment using wet pads. This remains the area that could best use a series of tetraploid amphidiploids to anchor hybrids. Wimber showed it can be done with the tetraploids he created and sent to the Eric Young Foundation in England.

The number of tetraploids from colchicine-treated *Cattleya* species was fewer than expected. So, I started selfing and sibbing the tetraploids. In a few years, the world should be full of *Cattleya dowiana* var. *aurea*, *Cattleya labiata* (Rubra), *Cattleya lueddemanniana*, *Cattleya gaskelliana* (Coerulea), and *Cattleya jenmanii* tetraploids. I also selfed tetraploid, amphidiploid *Cattleya* Triumphans (*dowiana* × *rex*), and *Cattleya* Luminosa (*dowiana* × *tenebrosa*). These tetraploids will anchor future hybrids for years to come. I saved someone seven to 10 years in their lines of development. I hope they think of me as they take over the future.

References

Arditti, J. 1992. *Fundamentals of Orchid Biology*. John Wiley & Sons, New York. 135–157, 243–278, 571–585.

Butler, D. 2015. My Method of Flasking in a Small Way. *Orchids*. https://secure.aos.org/digital-library/201512orch_84-12S1/index.html. Accessed August 6, 2022

Maples, D. 2015. The Nitty Gritty of Flasking. *Orchids*. https://secure.aos.org/digital-library/201512orch_84-12S1/index.html. Accessed August 6, 2022.

Additional Reading

Kamemoto, H. 1985. Breeding with Amphidiploid Dendrobiums. p. 220–223. *In: Proceedings of the 11th World Orchid Conference*. World Orchid Conference, Miami.

_. 1987. Four Decades of Research on Orchid Cytogenetics and Breeding. 59–73. *In: Proceedings of the 12th WOC, Tokyo*. World Orchid Conference, Tokyo.

Kamemoto, H. and R. Tanaka. 1974. List of Chromosome Numbers in Species of Orchidaceae. 411–483. *In:* C. Withner, editor. *The Orchids: Scientific Studies*. John Wiley & Sons, New York.

Kamemoto, H., T. Amore, and A. Kuehnle. 1999. *Breeding Dendrobium Orchids in Hawaii*. University of Hawaii Press, Honolulu.

McHatton, R. 2017. Amphidiploids, Di-Diploids, and Allotetraploids. *Orchids* 87(7):521.

Mehlquist, G.A. 1974. Some Aspects of Polyploidy in Orchids. p. 393–409. *In:* C. Withner, editor. *The Orchids: Scientific Studies*. John Wiley & Sons, New York.

Nakasone, H.Y. and H. Kamemoto. 1961. Artificial Induction of Polyploidy in Orchids by the Use of Colchine. *University of Hawaii Technical Bulletin No. 42*.

Northen, R. T. 1990. Genetics and the Breeding of Hybrids. 61–85. *In: Home Orchid Growing*. Simon and Schuster, New York.

Spence, P. 1994. The Species and Hybrids of Dendrobium Section Latouria. 115–119. *In: Proceedings of the 14th World Orchid Congress*. H.M.S.O., London.

Tokunaga, R. 1996. Amphidiploid Breeding in Miniature Cattleyas. p. 00–00. *In: Proceedings of the 15th World Orchid Congress*. World Orchid Conference, Rio de Janeiro.

_. 2008. Summary of Latouria Dendrobium Hybrids. 312–314. *In: Proceedings of the 19th World Orchid Congress*. Miami.

_. 2010. Latouria Dendrobiums: Culture in Hawaii. *Orchids* 79(10s).

_. 2017. New Dendrobium Spectabile Hybrids. *Orchids* 86(7):518–521.

Truex, G. and R. Tokunaga. 2004. Dendrobium: Section Latouria Hybrids. *Orchid Digest* 68(1):19–23.

Wimber, D.E., S. Watrous, and A. J. Mollahan. 1987. Colchicine Induced Polyploidy in Orchids. 65–69. *In: Proceedings of the 12th World Orchid Conference*. World Orchid Conference, Tokyo.

Withner, C.L. 1959. *The Orchids: Scientific Studies*. Ronald Press, New York. 189–314.

[56] Counting chromosomes of colchicine-treated cuttings of *Papilionanthe* Miss Joaquim under the direction of Dr. Kamemoto.

[57] *C. lueddemanniana* 4n

[58] *C.* Luminosa 4n

[59] *C.* Peckhaviensis 4n

[60] *C.* Jocasta 4n

[61] *C. aclandiae* 'Black Tetra' 4n

— Roy is a judge Emeritus for the AOS as well as the Honolulu Orchid Society. At the University of Hawaii, his favorite mentor, Dr. Yoneo Sagawa, introduced him to orchids and the emerging technology of orchid seed germination and cloning. He worked at an orchid cloning laboratory, E&R Orchids, for seven years. In 1981, Roy partnered with Harry Akagi to start H&R Nurseries in Waimanalo, Oahu. H&R Nurseries maintains a laboratory for seed germination and grows 7000 sq. ft. (650 sq m) of shade houses. He is refocusing on species culture plus providing Dendrobium and Cattleya Alliance hybrids. His passion has been the proper nutrition of orchids. (email greenthumb808@aol.com).

Disa Breeding at Longwood Gardens, 2022

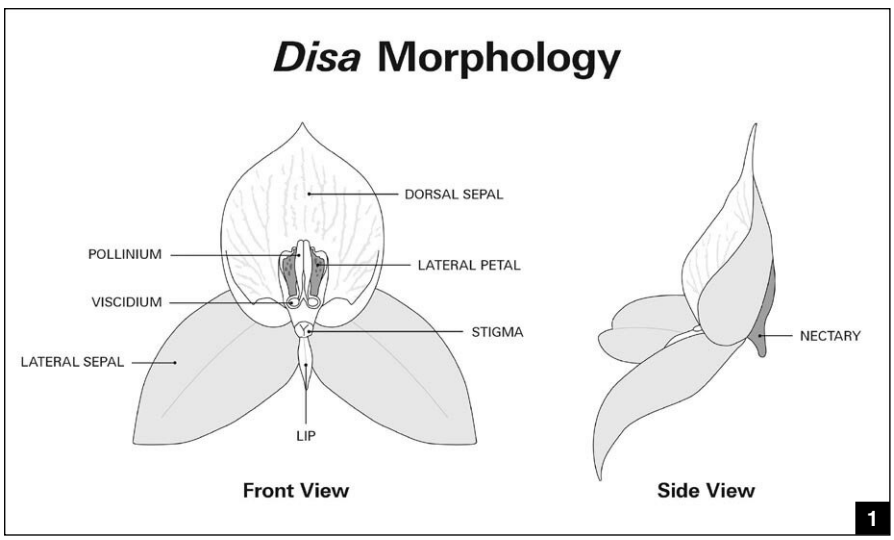
BY GREGORY GRIFFIS

DISA IS A genus with around 200 species, primarily found in South Africa, belonging to the subfamily Orchidoideae. General flower structure is fairly consistent with the most noticeable flower parts — the sepals (the dorsal sepal generally bears a nectary) and a centralized stigma with the rest of the flower parts tucked up inside the dorsal sepal. The species are primarily deciduous, perennating through terrestrial tuberoids, with leaves that are generally arranged in a basal rosette that clasps the stem with its terminal leaves (Cywes et al. 2013).

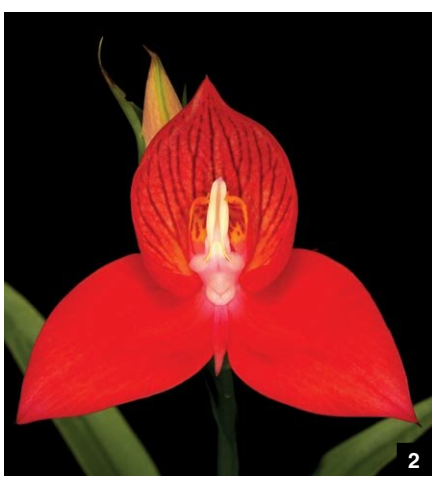
The approximate 200 species can be broken into two pragmatic groups: the streamside *Disa* (seven species, often called the "evergreen" species), and all the rest. Obviously, there are meaningful divisions of the other c. 190 species, but this article will be concerned with only the streamside disas.

These seven species come from primarily the same habitats and are best characterized as dwelling streamside. Most species are often found growing in stream banks, which usually consist of mostly sand and silt (*racemosa* and *venosa* have slightly different habitats, but they are lumped here for pragmatism). These seven species are, in approximate order of importance for hybridizing: *uniflora* (106 offspring, 443 total progeny), *racemosa* (14 offspring, 390 total progeny), *tripetaloides* (26 offspring, 276 total progeny), *cardinalis* (17 offspring, 113 total progeny), *aurata* (14 offspring, 53 total progeny), *caulescens* (5 offspring, 7 total progeny) and *venosa* (4 offspring, 5 total progeny). For more information about these species themselves, see the excellent synopsis by Orchard (2013).

A full history of the breeding of *Disa* would be a book unto itself, so for the sake of brevity and expediency here, I will discuss the general trend of *Disa* hybridizing. There are somewhere around 460 registered *Disa* hybrids, so no generalization can by any means be comprehensive, but, by and large, there is at least one clear trend in *Disa* hybridizing.



MORGAN CICHEWICZ



BAYARD SARADUKE

BAYARD SARADUKE

This is to continually backcross to *uniflora*, and this is not without cause. Therefore, it should not be a surprise that when looking into the records, while *uniflora* has 286 second-generation offspring (meaning that *uniflora* is a grandparent of the hybrid in question), it has only 52 third-generation offspring and only two fourth-generation offspring. With 103 first-generation offspring, over 87 percent of *uniflora*'s offspring have it as a parent or grandparent. What this means is that most of the hybrids we see, especially with the dearth of *Disa* in modern collections and a relative paucity of recent photographs,

[1] *Disa* flower morphology.

[2] *Disa uniflora* 'Longwood's Carmine Firestorm' AM/AOS is a good example of a typical *Disa uniflora* in the collection.

[3] *Disa uniflora* 'Longwood's Golden Dawn' AM/AOS is the result of a cross using a typical *Disa uniflora* as the capsule parent and an albinistic form as the pollen parent.

[4] *Disa uniflora* growing in the air-conditioned greenhouse at Longwood Gardens in the 1960s.

look altogether similar to *uniflora*. This is not a bad thing! *Disa uniflora* is a beautiful flower and is by far the showiest of the streamside species. But, as in the Longwood Gardens hybridizing program discussed later in this article, it begs the question: "What happens if we venture into more complex hybrids with *uniflora* farther back in their lineage?"

Longwood's foray into *Disa* began in 1963, when then-director, Russell J. Seibert, traveled to South Africa for the Golden Jubilee of Kirstenbosch Gardens, which at that time and for many years to come would have one of the premier *Disa* collections in the world. Seibert returned from South Africa with about a dozen small plants of *Disa uniflora*. By May 1969, Longwood's orchid grower, Clarence Deckman, had successfully grown, flowered and displayed plants of *Disa uniflora* allowing guests to see them in person for the first time in the US. Since that time, Longwood's orchid growers have been growing *Disa* from seed in an air-conditioned greenhouse. Different species and hybrids have come and gone from the collection, but, by and large, the collection has previously consisted of *Disa uniflora* and its primary and secondary hybrids.

Seven years ago, when I arrived at Longwood as the orchid grower, we began to develop a hybridization program that realized its first success in 2021 when Longwood registered three new hybrids. Up until that point, Longwood had been collecting plants and seeds with different genes from other growers and using those plants and ones already in the collection to remake some earlier hybrids. Big breakthroughs for those remakes came from two plants, both given to Longwood by our Associate Director of Conservation, Plant Breeding, and Collections, Peter Zale, PhD: *Disa* Diores 'Inca Princess' and a *Disa* Kewdior (which I subsequently named 'Peter'). With these plants in hand, we were able to remake *Disa* Suzette James (Kewdior × *uniflora*), Constantia (Kewdior × Betty's Bay) and Betty's Bay (Diores × *uniflora*), along with many more. Observing these hybrids helped to develop our sense of possibility and the opportunity for improvement in the streamside-species hybrids.

This led to a few guiding goals:

First, the plants had to perennate (grow like a perennial) far more successfully than they currently did, even under the best of care. Often, first-bloom seedlings would fail to grow a new tuberoid, essentially turning them into annuals. Or sometimes, even with good culture, the main stem is lost to rot. Selecting only vigorous and perennating individuals for breeding helped to solve this problem, but the biggest breakthrough was realized with the help of *Disa* Suzette James. Nearly all the seedlings from the crosses we flowered, regularly and as a matter of habit, generate multiple basal keikis during their growing season, which, because they are immature, do not go dormant when the mother rosettes do. Rather, they persist through the winter season, only going dormant in the following winter. One of our goals is to integrate this trait into all of Longwood's hybrids so that the grower is essentially guaranteed the survival of the plant from season to season, regardless of small cultural aberrations or poor happenstance. This also rapidly increases plant size and floriferousness as well!

GOTTLIEB HAMPFLER

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Second, flower shape and arrangement are always tricky in the streamside *Disa* hybrids. The best hybrids are flat with perhaps the slightest recurve in the sepals and essentially form an equilateral triangle (Vogelpoel 1985). When one attempts to breed hybrids that have wider sepals, they often begin to cup inward as the excess tissue bunches at the base of the sepal creating a subtle pinch that causes them to cup. Creating wider sepals that approach a more circular rather than an oblong shape and continue to be flat is one of Longwood's main goals in flower shape. Along with that, flower arrangement and spacing can be quite terrible in hybrids of *uniflora*, as the flowers tend to bunch up at the top of an inflorescence. Better-spaced, better-arranged flowers are always an important goal as well.

Third, colors. Most of the hybrids are red, orange, pink, rarely yellow or some combination of those. There are some interesting patterns that appear here or there (such as yellow splashes in the lateral sepals or spotted dorsal sepals). By and large, there is a lot of similarity among (especially the more complex) hybrids. This goal started out as more of a question: What colors are possible while still creating good size, shape and habit? The answer it seems, especially as far as unachieved colors go, is to create gradient sunset tones and new bicolors.

Some sunset tones have appeared in the past, such as *Disa* California Gold 'Sidmar' AM/DOSA, which is along the lines of the colors and gradients we are imagining here (Vogelpoel 2001a, 2001b). *Disa* Longwood Renaissance Horizon created some decent flowers with lovely sunset tones in them or, at least, has laid the groundwork for further development of those colors. Hopefully, better gradients of those tones can be coaxed out of future offspring. Some *Disa* Constantia that we have bred here may help too. As for bicolors, while they do exist, it is possible that we can increase the number of different color combinations and add new color contrasts as well.

With those goals in mind, our breeding program is rapidly expanding, as we seek to create meaningful hybrids to advance the ease of culture and availability of *Disa*, as well as to create better forms and shapes, all the while creating and finding newer, exciting colors and patterns. To do this, we are crossing more complex hybrids together and will continue to do so in the future to try to isolate and highlight traits that may be dominated and suppressed by continual backcrossing to *uniflora*. It may be that this will diminish the viability of these crosses in time, which will necessitate some creative problem solving if we are to continue to avoid backcrossing to *uniflora*. We believe it can be done.

Our first three registered hybrids are only the beginning:

Disa Longwood Renaissance Horizon (Sea Lord × Kewdior) has created valuable sunset tones, although many of the flowers lack great shape. Some do have decent form though, which gives hope for fixing the sunset genes in future generations, all the while improving shape. These plants freely create basal keikis as well. The name signifies the rising of a new age of orchid hybridization at Longwood, especially in the *Disa* collection.

Disa Longwood Dawning Ever New (*uniflora* × Sandra Parkinson) is essentially a typical play on reintroducing *uniflora* back into its offspring. The goal here was to improve and increase flower size and shape while creating vigorous plants. It may not seem like an imaginative hybrid, but the Sandra Parkinson used in most of the crosses, 'Longwood's Lovely Lady', was a phenomenal, large, flat pink flower, which has been reflected impressively in the offspring. Now that more seedlings have flowered, we are discovering some incredible outcomes with flowers producing not only beautiful corals, peaches and oranges, but also sunset gradients and yellow flares on the lateral sepals. A few plants have produced lavender dorsal sepals. The flowers have increased significantly in size, and the shape of many is also improved. Six plants were awarded AOS quality awards, with three receiving HCCs and two receiving AMs and one receiving a JC, in recognition of the consistent yellow flares presented by this cross. Since judging, about five or six more plants of comparable or better quality have flowered. The name of the hybrid represents the character of Longwood, continuing to innovate while always revering and honoring our legacy; the dawn comes every day, yet each day is new.

Disa Longwood Advancing Excellence (Betty's Bay × Sandra Parkinson) is a parallel play on *uniflora* line breeding, except in this case, it is Betty's Bay that has been reintroduced. While Betty's Bay was and still is one of the most populous hybrids in our collection, our remakes of Betty's Bay have created some varying and valuable outcomes that differ from the traditional outcomes of earlier times. These have had rounder shapes, better flower arrangement, and an array of colors, from peach to pink, with yellow flares and sunset-toned blushes. These traits have appeared in this cross, and we are finding some exciting bicolors, as well as a few flowers with sunset tones, yellow flares and even the color lavender in the dorsal sepal. Most of the offspring are an improvement in size from Betty's Bay and, while some do not have an ideal shape, a few, like 'Longwood's Coral Circle' AM/AOS, are a good intermediary of both parents and possess a pleasingly round shape, which, while not perfect, will be useful in further breeding. The name signifies the onward march of (hoped for) excellence in this cross as it creates new opportunities in our breeding program.

With the advent of these three crosses, new possibilities for hybridization have opened up in our breeding program. Convergent phenotypes have appeared in both *Disa* Longwood Dawning Ever New

DUANE ERDMANN

[5] A nice example of *Disa* Longwood Renaissance Horizon shows subtle yellow flares in the lateral sepals and sunset tones.

[6] *Disa* Longwood Dawning Ever New 'Longwood's Neon Rose' AM/AOS

[7] *Disa* Longwood Dawning Ever New 'Longwood's Starfire Dream' JC/AOS

[8] *Disa* Longwood Dawning Ever New 'Longwood's Pastel Wonder' AM/AOS

and *Disa* Longwood Advancing Excellence. By crossing these plants to one another and to other complex hybrids, our goals of fixing traits like good form, size and new colors seem well in hand. Of the 20-something new crosses made last year, only one was a backcross to *uniflora*, and of the nine new crosses made this year and 40-something seed capsules set, again, only one was a backcross to *uniflora*. In two-to-three years' time, we should start to see the offspring of these crosses flower, some of which will be fourth-generation *uniflora* hybrids. At that time, we will be able to make some of the first fifth-generation *uniflora* hybrids. One can only guess at what those future crosses hold, but the potential to discover something great seems inevitable!

The streamside *Disa* have been known in cultivation to be essentially tricky *if* one is left unaware of the specific requirements of these plants and a few key pointers. Without proper culture, they are prone to rots and are easily lost. They require cool temperatures around the roots especially, usually between 50–70 F (10–21 C). The plant material above the roots can handle temperatures into the 80s F (26.7–32 C) without a problem, but the roots are sensitive to high temperatures and must remain cool. The plants also need constant access to moisture, and they cannot be allowed to dry significantly. Many have satisfied this cultural requirement by setting the plants in a saucer of water or growing them in flood or ebb-and-flow tables. These and a number of clever solutions have been proposed by other authors, and the suitability of each depends entirely on your situation (Orchard 2000a, 2000b). However, I would suggest that you only water from the bottom. Watering from overhead, even in good conditions (and especially in less-than-ideal conditions) can leave water trapped in the basal leaves clasping the stem and provide the opportunity for rots to easily set in. Likewise, good air movement is essential for these disas and helps to protect them from pathogens. They also need bright light, at least 1500 to 2000 footcandles, although they can take much more, and, in nature, are found in nearly full sun in some locations.

The most complex aspect of streamside *Disa* culture in cultivation is not any one of these factors in isolation, but the balancing of them as a whole. Each one affects the other, and the interplay between them cannot be ignored. If controlling ambient air temperature is


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BAYARD SARADUKE 8

Grouping of *Disa* Longwood Dawning Ever New (*uniflora* × Sandra Parkinson). Photograph by Bayard Saraduke

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your challenge (as it will be for most of us), you will need better air movement and a method of keeping the roots cool. In this case, the use of unglazed terra cotta pots with their wicking effect may help to keep the roots cooler. Again, many solutions have been proposed by other authors (Crous and Duncan 2006). While this may sound complicated, growing streamside *Disa* is not difficult once you compensate for your environment and balance your cultural factors. There is a plethora of good literature in existence to offer cultural ideas, so more need not be said here, except that it is the balancing of all these cultural factors that is the key to success.

At Longwood, we grow our *Disa* in an air-conditioned greenhouse, which never exceeds 75 F (24 C) and does not regularly exceed a high of 72 F (22 C). It goes down to 50 F (10 C) in the winter as a low. We utilize about 65 percent shade, which means the plants receive about 2000–2500 footcandles at the peak of the summer day. Air movement is constant and quite vigorous, coming from two six-fan air-conditioning units and four HAF fans. They are watered about once a week or less from underneath by means of a manually operated ebb-and-flow table, and the water is not recycled. Our water is currently well water, which starts at a pH of about 5.5 and about 250 parts per million of total dissolved salts. We fertilize about once a month from below, using Jack's Professional Orchid Fertilizer and supplement alternatingly with Mag-Trate and Cal-Trate. Our parts per million of total dissolved salts from the fertilizer mixture are around 300, with 100 ppm of nitrogen. Accumulation of salts in the medium has not been an issue due to the low level of fertilization and regularity of repotting. Adult plants are grown in 4-inch (10 cm) unglazed terra cotta pots in straight sphagnum moss and repotted annually. I am always experimenting with different media, however, and may have different preferences for an ideal medium in time!

One of the most inviting and exciting features of the streamside *Disa* are its seeds. While most orchids have seeds that do not possess an endosperm (food storage for the embryo), *Disa* seeds *do* have a residual endosperm. This is enough to allow the seed to germinate when in contact with a moist medium (such as sphagnum moss). The beauty of this aspect of *Disa* seed is that it allows the average home grower to grow their own *Disa* from seed and to hybridize them at home too! No lab is needed. The seed can be sown directly on the surface of a pot of sphagnum moss, and germination begins within about a month. Streamside *Disa* typically grow from seed to the first flower in three years, occasionally two years for a vigorous seedling.

Our method of sowing seed is as follows:

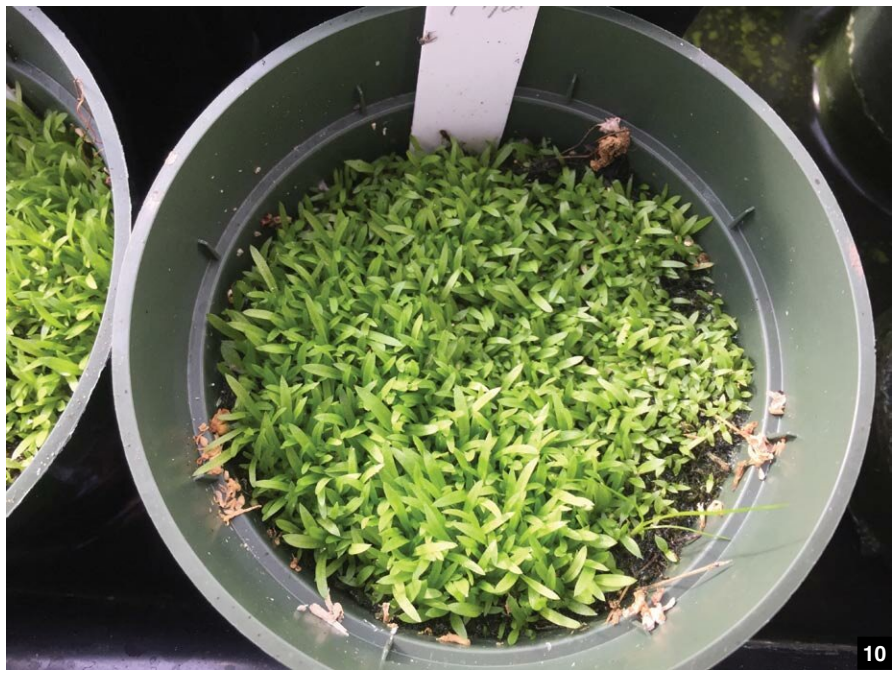
- Fill a 4-inch (10 cm) pot with plain sphagnum moss and tamp it as flat as possible with the surface about 0.6 inches (1.5 cm) below the rim of the pot.
- Wet that moss thoroughly and tamp flat again.
- Grind some sphagnum up through a strainer to create fine granulated moss particles.
- Pour the fine moss on top of the pot, creating a layer about 0.24 inches (0.6 cm) deep.
- Gently water over the surface of the pot; the fine moss should have filled in any bumpy parts of the regular moss and created a flat surface.
- Gently sprinkle the seed on the moss and set the pot in a tray with some water in it. We change the water at least once a week and begin to add very small amounts of dilute fertilizer to the water once the seedlings are growing.
- Once the seedlings are about 0.4 inches (1 cm) in diameter, we plant them

out into a compot to give the biggest ones room to grow.

• From there, they are potted out into individual plugs once their leaf span is about 1.2–1.6 inches (3–4 cm), usually about six months later.

We have been growing *Disa* from seed at Longwood this way for almost 60 years. The ease of seed germination for the streamside *Disa* opens up incredible possibilities. Imagine what beautiful and wonderful hybrids could be created if hobbyists and professionals across the country and even across the world began growing and breeding *Disa*!

It is my personal conviction that the streamside *Disa* has something beautiful, wonderful and exciting to offer the hobbyist and professional grower alike. They are an easy group to cultivate once you have figured them out and created the right conditions and can easily become sizable plants with many flowers. The possibilities for flower shape, size and color are still great, and a new age of *Disa* discovery could lie right around the corner. As it is, we have doubled the size of the *Disa* collection at Longwood and will continue to work diligently to create and discover excellent new hybrids, as well as to make *Disa* more accessible to the home grower. There are hundreds of seedlings growing up in the greenhouses at Longwood as I write, and who can imagine what wonderful plants will emerge in time! What we can say, with certainty, is that the streamside *Disa* have been, are now, and will continue to be a significant part of our collection, and a joy to behold in the summer months in our Orchid House.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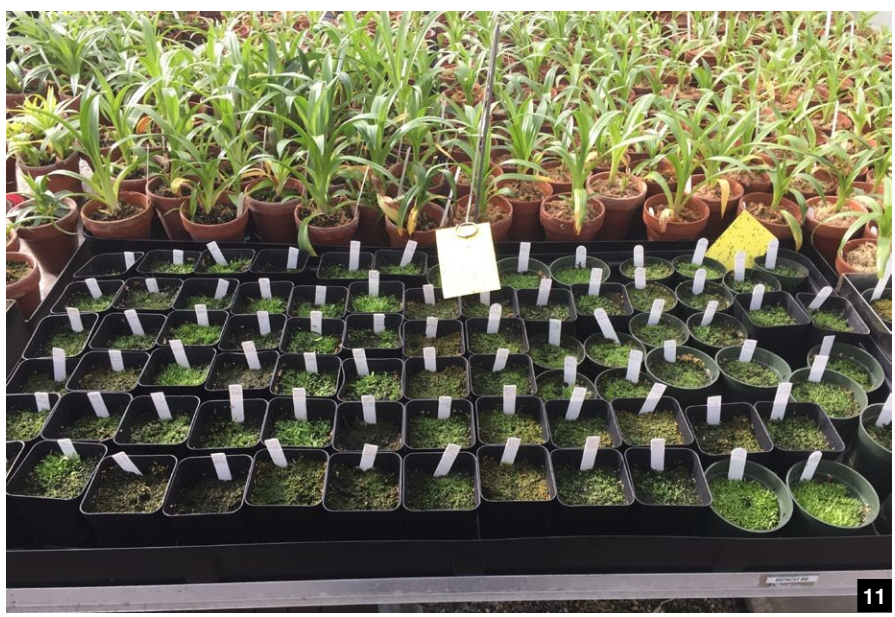
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Dedication

This article is dedicated to Karin Congello, a faithful volunteer at Longwood and a dear friend, who, for over a decade, has safeguarded the *Disa* collection at Longwood and has sown, compotted and transplanted nearly every *Disa* seedling in that time. Without her, both the *Disa* and I at Longwood would be much poorer and we all owe her our sincere gratitude and thanks.

Acknowledgments

I am deeply indebted to Wally Orchard for his insightful review of this article and for sharing his vast knowledge and many seeds over the last seven years; to Leon Glicenstein for reviewing this article, his kind mentorship and endless generosity of plants, knowledge and inspiration; to Peter Zale for his constant encouragement, support, collaboration and review of this article; and to our in-house editor, Katie Mobley, whose skill with the pen is formidable and who always makes my writing better.

References

Crous, H. and G. Duncan. 2006. *Grow Disas*. South African National Biodiversity Institute, Claremont, South Africa.

Cywes, S., Harley, E., and P. Linder. 2013. *A Disa Companion: The Art and Science of Disa Cultivation*. AuthorHouse UK Ltd., Bloomington, Indiana.

Orchard, S.W. 2000a. Disas. *Orchids* 69:634–644.

Orchard, S.W. 2000b. Growing Disas Using Hydroponics. *Orchids* 69:645–647.

Orchard, S.W. 2013. Disa in Cultivation: An Update. *Orchid Digest* 77(3):124–129.

Vogelpoel, L. 1985. Recent *Disa* Hybrids. *American Orchid Society Bulletin* 84:294–305, 449–454, 588–593, 739–754, 855–858.

Vogelpoel, L. 2001a. Disa Breeding in the Western Cape, South Africa, Part I. *Orchid Digest* 65:52–62.

Vogelpoel, L. 2001b. Disa Breeding in the Western Cape, South Africa, Part II. *Orchid Digest* 65:122–131.

[9] *Disa* Longwood Advancing Excellence 'Longwood's Coral Circle' AM/AOS

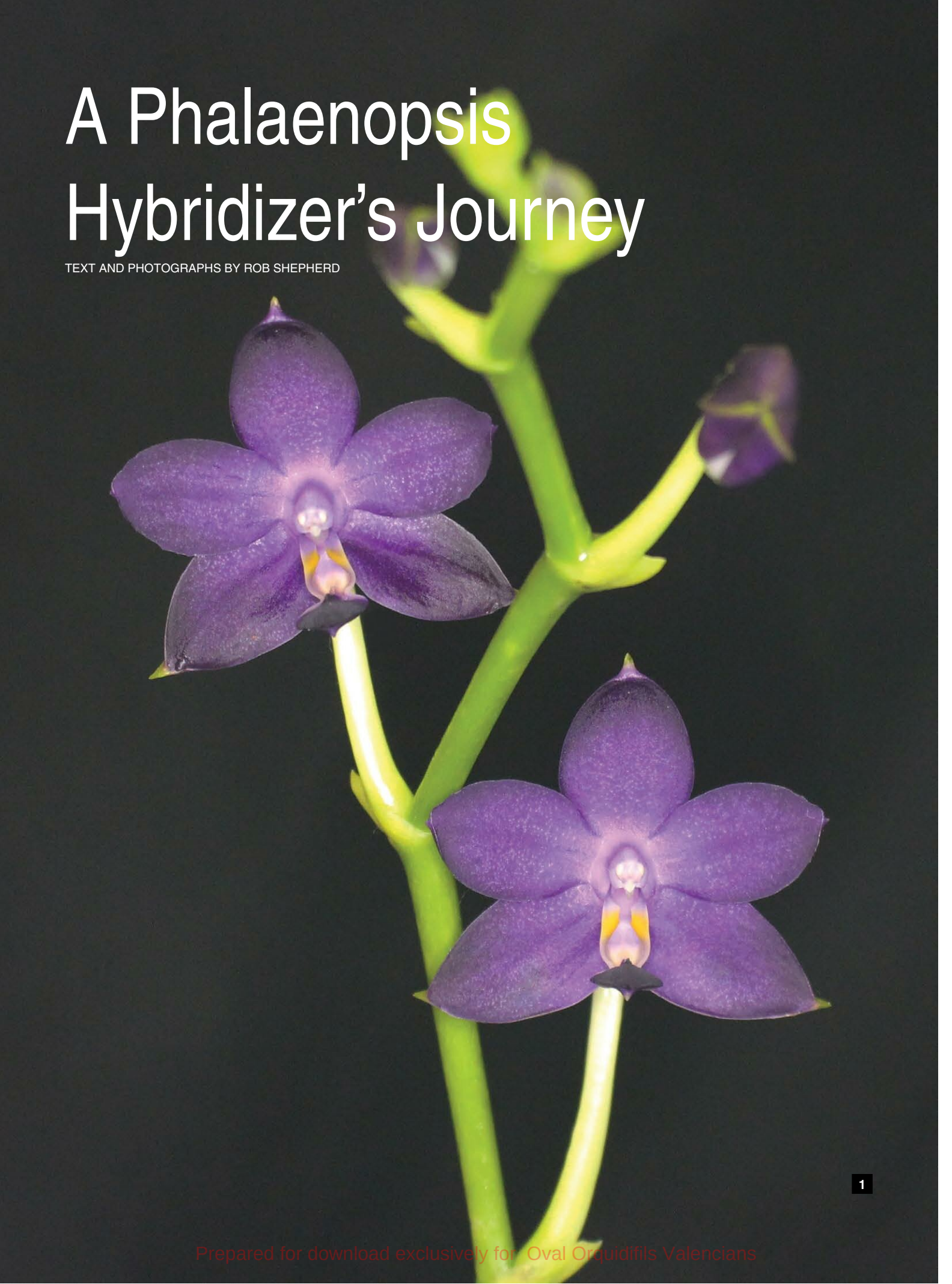
[10] A "mother" pot of *Disa* seedlings, nearly large enough to be spaced out into a community pot.

[11] In the foreground, an entire year's worth of "mother" pots grow, while in the background, three-year-old seedlings mature to flowering size.

— Greg Griffis is the Orchid Grower and Curator at Longwood Gardens, where he cultivates a diverse collection of about 5,000 orchids, has initiated multiple breeding lines, and oversees the displaying of hundreds of orchids daily (email ggriffis@longwoodgardens.org).

A Phalaenopsis Hybridizer's Journey

TEXT AND PHOTOGRAPHS BY ROB SHEPHERD



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ORCHID HYBRIDIZING IS like walking a winding, branching path through the mountains with only a hand-drawn map and, if you are lucky, a compass. You may get lost along the way, you may change direction more times than you can count, you will probably find many scenic spots along the way so do not forget to enjoy the journey. Often the path is steep and you are almost ready to give up, but then you reach that amazing summit, and the beautiful view was all worth it; then you see that next peak out in front of you that you just cannot help but climb. That journey to the next highest peak never really ends, and orchid hybridizing is just that: a journey.

I am the owner and hybridizer of Sapphire Dragon Orchids. My primary focus is on coerulea *Phalaenopsis* and that work is heavily indexed on coming up with approaches that will allow us to move past some of the breeding challenges inherent to the coerulea (aka "blue") color form. I spend a lot of time trying to work through how to make coerulea crosses more predictable and successful, and how to really push the boundary of quality coerulea hybrids that we create.

I started growing orchids in 1984 when I was 11 years old and became an orchid addict almost immediately. By the time I got into high school, I had a greenhouse and fairly large orchid collection with a mix of genera. Eventually, I started focusing on *Phalaenopsis* and, in 2001, I started getting more serious about hybridizing. By 2004, I was so heavily focused on the coerulea color form that I founded Sapphire Dragon Orchids. Almost two decades later, my current breeding program is heavily focused on increasing flower size and flower count and improving the form of coerulea *Phalaenopsis*. As a result, I am doing a great deal of experimental work trying to move the coerulea color form onto a standard-size *Phalaenopsis*. Unfortunately, I picked the most difficult path possible, and it gets extremely frustrating at times. It also means I am producing more experimental crosses and fewer commercially viable crosses. But as I look back, we have come a long way over the last two decades and have a much stronger understanding of the inheritance of the coerulea color form. It has taken a focused approach with patience, collaboration with other hybridizers and dedication to make progress over the years.

As a result, my own hybridizing approach has turned out to be a more goal-oriented, planned and systematic one.

The framework for my own hybridizing program is structured but, certainly, I still make random crosses that begin with little more than walking through the greenhouse and picking two parents that I think would be fun or interesting. Still, for the most part, I have a general direction that is planned out, often over multiple generations of crosses. With that in mind, I am going to write about techniques for planning a thoughtful breeding program and specific approaches that I use. Most of this is not overly *Phalaenopsis* specific, but I am going to use examples from my own experience hybridizing coerulea *Phalaenopsis*.

It is probably important to give a quick overview of what I mean and why I say "coerulea" color form in *Phalaenopsis*. There was a period of time when what we now call a coerulea orchid was always referenced as being the color blue. In truth, it was not just in orchids; it is a common, commercial, horticulture practice to reference the bluest form of a flower as being blue. You see it across many different flowers in the horticultural trade and, to this day, it is still much of a standard practice. The reality is the coerulea form in *Phaelaenopsis* is more of a violet color, it is not blue and it is not purple. Violet is the best description for the color. But many people will still refer to them as blue and given the precedent to do so in horticulture, I am not terribly bothered when coerulea orchids are called blue. But in the interest of being accurate and reducing the angst that so often comes along with seeing a violet flower called blue, you will almost always hear me talk about the color as being violet. Having said that, taxonomists will usually call the color form coerulea and I will generally refer to it as such in this article.

From a functional hybridizing viewpoint, the coerulea color form is

[1] *Phalaenopsis* Purple Martin 'Sapphire's Pride' AM/AOS (Kenneth Schubert × *violacea*)

[2] A selection of coerulea forms of some *Phalaenopsis* species and hybrids. Top row, left to right: *equestris*, SDO Blue Heaven, *lueddemannia*, *tetraspis* f. *livida*, Penang Violacea. Bottom row, left to right: *tetraspis* f. *brunneola*, Yellow Angel, a second Yellow Angel, Penang Jewel.

[3] *Phalaenopsis tetraspis* f. *brunneola*

the absence of the two anthocyanin pigments that produce pink, lavender and fuchsia colors and the presence of the third anthocyanin pigment and related copigments that produce the violet color we know as coerulea. It is important to think about it this way, especially for the hybridizer, because visually a coerulea form may look violet, black, purple, brown and even orange depending on what other green, yellow and orange pigments are also expressed in the flower. No matter the visual perception of the color, those orchids are still going to breed as a

coerulea form. The best example of this is the *brunneola* form of *Phalaenopsis tetraspis*. All of these that I have seen are functionally a coerulea and will breed as such in other hybrids.

How I think about planning my hybridizing program has evolved some over the years. It is designed to ensure that previous knowledge and experience is taken into consideration at the beginning. It is also designed to be able to get clear deductions along the way to answer open questions and help facilitate future planning for a long-term hybridizing program.

I have to state upfront there really is no right or wrong approach to hybridizing orchids. There are certainly steps you can take to improve your chances of getting the results that you want, but it is also just as valid to have fun and pair two orchids that you really like. Many happy accidents have come about from somewhat random experimentation and just being free with a toothpick. Yes, we hybridizers love our toothpicks. You will find them stashed in notebooks, strewn about the greenhouse, containers of them sitting on desks. Beware the orchid grower walking around a greenhouse with a toothpick, especially in your greenhouse!

This is an outline of my hybridizing framework with some tips for applying it to your own hybridizing:

1. Document, document, document EVERYTHING.

a. Even if you think you will remember something, write a little of it down for future reference.

b. Keep a place for parentage/genealogy trees, reference photos and notes on existing hybrids.

c. Keep a physical or digital hybridizer's notebook with all the pollinations that you do, including dates and parents used.

d. Keep a record of all lab work that is completed.

e. Keep a record of all your crosses and separate record of individual cultivars from those crosses.

f. Come up with a hybrid-naming convention that will be easy to maintain and write on labels. I do the following:

i. SDHYYMMDD_cultivar number (for example, SDH220217 would be an original hybrid cross made on Feb 17, 2022) and;

ii. SDSYYMMDD_cultivar number (SDS080714_001 would be the first seedling to bloom from a species cross I made on July 14, 2008).

2. Set clear goals about what you want to accomplish.

a. Keep enough detail to break down different sets of hybrids including specific traits that are important to you.

b. I started with five high-level goals and, even now, I only have eight high-level goals that I work from.

3. Do lots of research.

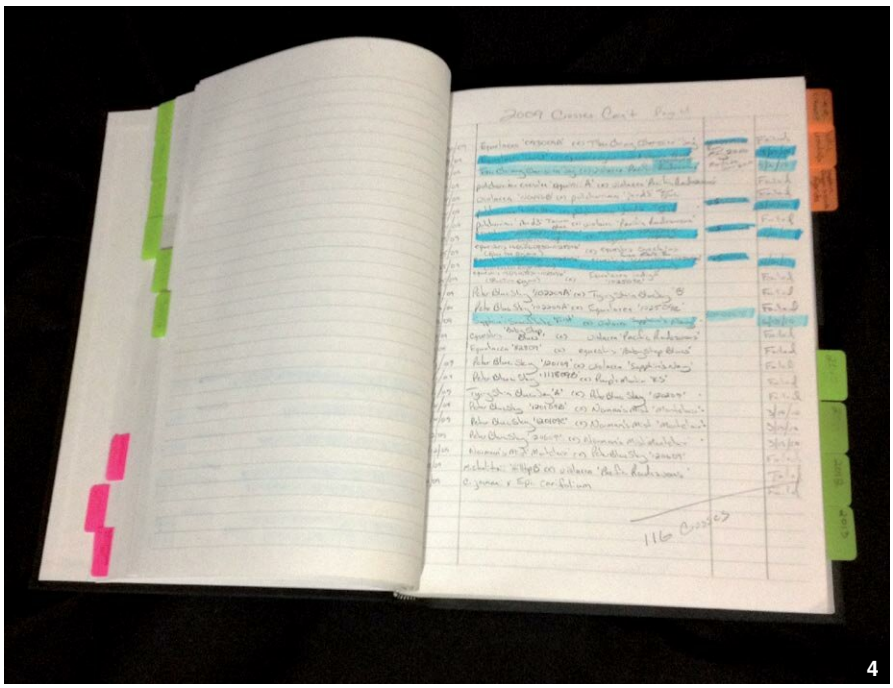
a. Keep reference photos. Start with finding reference photos of crosses that are similar or as close as possible to what you want to accomplish. I keep an ever-growing library of orchid-hybrid reference photos.

b. Research hybrids that are similar to your goals.

i. Spend time understanding the parents and why the hybrid has the characteristics that you like.

ii. I do this by spending time looking at the parentage for at least four-to-five generations back, often cross-referencing many similar hybrids

iii. If possible, try to find out what specific cultivars were used in an individual cross. With time and practice you will start to see patterns and can use that knowledge to inform how you might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[4] The author's notebook used to record his hybrids.

[5] A standard coerulea cultivar of *Phalaenopsis* Purple Martin, 'Sapphire's Pride' AM/AOS — an indigo form (left insert), and an intensely colored normal form (right insert).

approach new crosses. I do so much of this that I spent the time building this functionality into the database that I use.

iv. Take advantage of tools such as the Royal Horticultural Society's Orchid Hybrid Registry database to look up parentage of specific crosses and the AOS's *OrchidPro* database to find awards and photos of specific hybrids and cultivars.

c. Research inheritance of traits you want in your hybrids.

i. Talk with other hybridizers and find as many articles as you can on the inheritance of different traits and characteristics that you are interested in. Inheritance in orchids is often not going to work the way you might logically think it would.

4. Map out crosses you might want to make based on your goals.

a. Thinking about your goals, start mapping out individual crosses that you think will help you accomplish those goals. This often requires multiple steps of crosses (generations) to reach your goals.

b. I keep a backlog of all the crosses that I eventually want to make. This helps me plan out crosses that I may need to make first and remember the ones I want to make later.

c. Constantly reference back to your goals. Ask yourself, "Are the crosses that I want to make really going to further the goals I have identified?" If not, you have to ask yourself, "Am I choosing the right crosses to make or do I need to re-evaluate my goals?" It could be one, the other or a little bit of both.

5. Start planning out what crosses you would like to make initially and over time. Some things to consider when doing that include the following:

a. How many crosses can you handle a year?

b. Do you have a lab or are you going to do your own flasking? What volume can you either afford to have produced or have time to process.

c. Identify how many seedlings you want to grow out and assess how much room you have to grow them out.

d. Keep in mind not every cross will make it from pollination to seedlings coming out of the lab.

e. Once you know how many crosses you can realistically handle each year, then you can start blocking out which crosses you want to make when.

6. Update your future cross lists; as I get crosses into the lab, I revisit the list of crosses I want to make and map out what I am going to make next.


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7. Revaluate both your goals and your future crosses after new crosses bloom out.

a. This is the time to be introspective. Ask what worked and did not work. Use any insights to adjust your strategy for future crosses based on your goals.

b. Update and adjust your goals. I rarely change my goals. What often changes is the approach that I was planning to use to achieve them. But you may realize that one or more of your goals are no longer the direction you want to go.

Again, this all sounds simple, but as you start to really dive into it, you will find that there are many different options and approaches to accomplish a given goal. As your lists start to grow, try to keep focused on what you want to accomplish and narrow that down as much as you can. Once you think you know what your hybridizing goals are and have a starting point with crosses you want to make, the real fun begins.

When you are getting started, you will have to decide if you only want to use orchids you already have or if you want to consider adding more stud plants to your


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[6–7] Early coerulea form of *Phalaenopsis pulcherrima* [6] and a corresponding early hybrid [7].

[8–9] A modern tetraploid coerulea form of *Phalaenopsis pulcherrima* [8] and a corresponding modern hybrid [9].

[10] *Phalaenopsis* Tzu Chiang Sapphire (Tzu Chiang Lilac × *pulcherrima*)

collection. At some point you may also need to decide if you want to use existing hybrids or if you need to make some new foundation hybrids that are designed to meet your goals. Ultimately, if you are OK continuing to purchase additional orchids to breed with, it will open the opportunity space for you. Even with a large collection of quality orchids, it is fairly common to realize part of the way through that you need some new orchids to achieve your goals.

Start with the highest quality orchids that you possibly can, it will help improve the outcome of your hybrids. We are extremely lucky during this time to have a large number of high-quality species and hybrids available at reasonable prices.

When you start thinking about quality for your stud plants, you will need to break down different characteristics and look at them individually. It is extremely important to remember that quality is not just about the flower. *Vigor and plant size are important characteristics*. Most people do not want orchids that are difficult to grow and, as a hybridizer, you want your crosses to flower out as quickly as possible. Choosing parents that exhibit strong vigor will help you stay ahead of the curve. If you know that you are trying to create compact plants for windowsill and home growing, it may also be important to pick plants that stay a bit smaller. Spike length quickly becomes a consideration, and you may want to start with parents that both have shorter spikes or pair one orchid with longer spikes with another one that produces much shorter spikes. For instance, a *Phalaenopsis pulcherrima* hybrid paired with a short-spike novelty hybrid is likely to help keep the spike length shorter.

Phalaenopsis Purple Martin and similar *Phalaenopsis pulcherrima* hybrids are great examples of breeding to a shorter spike length orchid to get the best traits from both parents. Even going back to *Phalaenopsis pulcherrima* still resulted in relatively shorter spike lengths. Understanding these traits can help you plan out how you want to approach a specific cross.

Orchid flower quality gets a bit more subjective; there are many different aspects to consider depending on your breeding goals. Flower form, size, color, patterns, number of flowers and spacing of the flowers on the spike are all potential considerations. But how do you know if you have a quality flower in the first place? Some of this comes down to the eyes of the beholder and can be highly subjective. The first step is to compare other flowers from the same species or grex. Pick a species that you really like to start honing your eye to pick out the differences. Compare jungle-collected plants with early line breeding and then with more modern breeding.

Also look at awarded cultivars from the species or grex you are considering. As line breeding evolves and new hybrids are produced, many of the traits will improve over a period of years. Not all changes are good, but in general hybridizers are going to pick higher and higher quality parents as they are making crosses, so quality tends to go up over time. The other thing to look for is a trend of higher quality crosses coming from parents out of a specific line. This can help you understand which specific cultivars are giving good results.


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[11] *Phalaenopsis* Tying Shin Blue Jay (Purple Martin × *pulcherrima*)

[12] *Phalaenopsis* Equalacea 'Dragon Jewel'

[13] *Phalaenopsis* Equalacea 'Anacapa Beryl'

[14] *Phalaenopsis* Memoria Laela and representatives of its parents — *Phalaenopsis aphrodite* (lower left insert) and *Phalaenopsis violacea* (upper right insert).

[15] A tetraploid cultivar of Phalaenopsis Louise Burns and for comparison (inset), a normal diploid form.

One challenge with breeding for quality is really understanding which stud plants are more likely to pass on the characteristics that you want. If you compare three different cultivars from one hybrid, it is likely that specific ones are going to be better for breeding than others and it does not always correlate with the most highly awarded plant. An example I will give is from my line of tetraploid *Phalaenopsis* Equalacea. My best stud plant, 'Dragon Jewel' has never been awarded despite being shown a couple of times. One of its siblings, 'Anacapa Beryl' received an AM/AOS but it is a horrible stud plant.

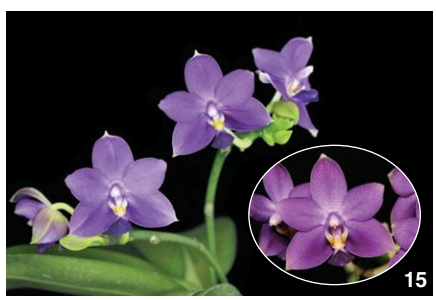
I wish there was a magic bullet here that would help you figure this out before making new crosses. Unfortunately, it takes experimentation, blooming out several hybrids and/or knowing the breeding history of specific cultivars to really work this out. If you are working with a completely new hybrid line, it is frequently helpful to make several crosses using different siblings from the one hybrid and then breed them all to the same cultivar to start to understand which orchid is going to be the best breeder.

The flowering time of different orchids you may want to breed with adds another layer of complexity and often requires that you do more planning. *Phalaenopsis* is a rather diverse genus, and unfortunately the flowering time of different types of species and hybrids frequently does not overlap. This sometimes limits what crosses can realistically be made.

Everyone always jumps to saving and storing pollen. This is less effective than it sounds because pollen from many orchids drops in viability quickly. *Phalaenopsis pulcherrima* pollen, for instance, is almost impossible to store for any period of time. Pollen can go bad quickly if the humidity is high or there are lots of temperature swings. The technique that has worked best for me is to keep my pollen in a vacuum-sealed food-storage container. I use glassine stamp-collector envelopes to store the actual pollen in. I also include one or two desiccants like you find in a pill bottle in the vacuum container. I keep it at room temperature out of sunlight in a room where the temperature is most stable. If you are lucky, pollen can sometimes be viable over a year. But frequently viability can be as short as a month or less.

There have been some crosses that I have wanted to make where I have had to wait many years for a chance to have both plants blooming at the same time. *Phalaenopsis* (*pulcherrima* f. *caerulea* 4n × Gladys Read 'Snow Queen') is a cross that I finally successfully made this last year after having had it on my list to do for many years. My tetraploid coerulea pulcherrima blooms late in the season and *Phal*. Gladys Read is never in bloom then. About the only way I get both in bloom at the same time is to encourage Gladys Read to rebloom off a spike later in the year. Keep crosses like this on a high-priority list that you refer to often so that you can catch those chance opportunities when both plants are in bloom at the same time.


14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Fertility in crosses is a significant factor that can impact your breeding program. There are lots of different issues that can impact the potential fertility of a cross and how likely it is to be successful. How mature and healthy the orchid holding the capsule is, how old the flowers are, how compatible the two parents are, condition of the pollen being used and growing environment are all factors to consider. With *Phalaenopsis*, the prime window for pollinating the flower is usually a few days after the flower has fully opened and that viable window can last a month or longer. Some species such as *Phal. pulcherrima* and *Phal. equestris* have a much shorter period when the flower is viable, and pollen is best used during a one- to two-week period once the flower is fully open. For orchids that are reluctant to set a capsule, it is often helpful to pollinate several flowers close together on the same spike at the same time. This increases the amount of hormones present that signal the plant to develop a seed capsule. Mature and healthy orchid plants are more likely to set a capsule and grow it to maturity, and they can also handle more capsules. I have set as many as four-to-five capsules on a larger *Phalaenopsis* without causing too much strain on the plant.

One of the biggest issues with fertility in *Phalaenopsis* relates to chromosome size. The bigger the difference in the chromosome size between the two contributing parents, the more likely you are to have issues. *Phalaenopsis equestris* in particular can be a problem child as it has much smaller chromosomes than most of it is other counterparts in the genus. Sometimes it can be difficult to get primary hybrids to take in situations like this. The resulting cross is often even harder to do any breeding with. It took years and multiple pollinations to get my cross of *Phalaenopsis* (*equestris* var. *cyanochilus* 'Martel's Blue' × *violacea* var. *indigo* 'Sapphire's Navy') to successfully take. The resulting *Phal.* Equalacea is even more difficult to breed with and the fertility is low. *Phalaenopsis* Louise Burns

(Equalacea × *violacea*) has an even lower cross success rate. Crosses within this line of breeding frequently only produce a few dozen seedlings. It is the direct result of the large difference in chromosome size between *Phal. equestris* and *Phal. violacea*. Breeding with the tetraploid versions of these more difficult hybrids often increases fertility. I have both diploid and tetraploid strains of Equalacea and Louis Burns. The tetraploid strains are much easier to breed with and the fertility is easily 20 times as great.

Understanding ploidy (how many sets of chromosomes the plant has) is an important aspect of hybridizing. A diploid is normally the naturally occurring state with two sets of chromosomes. A tetraploid is usually lab induced with four sets of chromosomes, though tetraploids can occur naturally. For example, *Phalaenopsis buyssoniana* is a naturally occurring tetraploid. Horses are another example of a naturally occurring tetraploid. The horse's close relative, the donkey or burro, is a diploid.

Tetraploids generally produce larger plants, larger flowers, often more colorful flowers, are frequently easier to grow and tend to be more fertile when producing hybrids. Most large standard *Phalaenopsis* are tetraploids.

There are two important reasons for the hybridizer to be aware of ploidy. First, there are advantages and disadvantages to breeding with either diploids or tetraploids, and you may find you want to breed with one or the other in different circumstances. Second, having a ploidy outside of a diploid or tetraploid will usually cause major issues, more about that later.

I am not going to get heavily into genetics but going from a diploid cross to a tetraploid cross drastically increases the complexity and number of different possible combinations between the different traits coming from both parents. This can be a good thing if you are trying to get a lot of variety. It can be a bad thing if you are trying to work out the inheritance of a specific trait. With coerulea breeding, while I am still trying to get past a lot of inheritance limitations and am actively trying to understand the related genetics, I tend to stay with diploid crosses. Once I have a line of breeding that I like and feel confident that I understand how it is going to breed, then I will start working with the tetraploid strains of that line of breeding.

As I hinted at previously, the other place where you can really get into trouble with ploidy is crossing diploids with tetraploids. A diploid crossed with a tetraploid produces a triploid with three sets of chromosomes. Often triploids are completely sterile. When hybridizers do manage to get them to breed, they produce aneuploids that do not have anything close to an even set of chromosomes. The early days of red phalaenopsis hybridizing was fraught with many crosses like this, and some really beautiful red crosses ended up being dead ends that were often impossible to breed with. So, I always encourage hybridizers to know the ploidy of their orchids before they make a cross and avoid making triploid and aneuploid hybrids. You will save yourself some heartache in the long term, and it will help keep the genetics viable and clean for future generations. From a species-conservation perspective, this is also an important aspect to keep in mind. Often both diploid and tetraploid versions are available of many species, and this creates a high risk of triploids and aneuploid species being produced and released into our breeding populations. This is a nightmare scenario that could result in many infertile species lines that could impact us for generations to come. So, for this reason, I always ask that hybridizers clearly label their orchids as diploid or tetraploid, and this is especially important with species and primary hybrids. (Always ask about this if you do not already know when you are purchasing orchids for hybridizing). Unfortunately, the only sure way to know ploidy is a chromosome count with a high-powered microscope. There are some techniques such as guard-cell size that can also be used. But again, for most growers and hybridizers, it is best to know the existing ploidy of your plants and keep track of that.

Phalaenopsis Kenneth Schubert and representatives of its parents — *Phalaenopsis pulcherrima* (left insert) and *Phalaenopsis violacea* (upper right insert).

The inheritance of different traits can get complex and is not always what you would initially think. Color inheritance as well as how different color pigments combine does not always work the way we logically think it would. I sometimes joke that yellow plus blue makes red in orchids. Not green, but red. When it comes to combining different pigments, you frequently have to toss traditional color theory that your high-school art teacher taught you out the door.

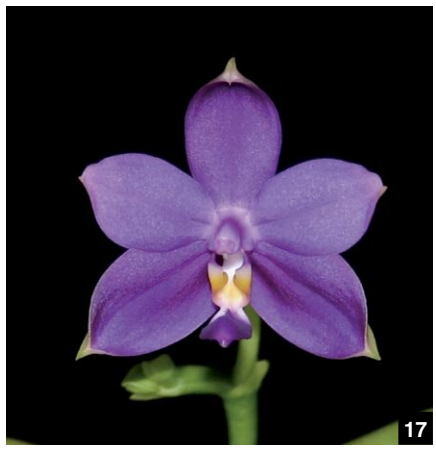
For example, it is a valid approach to use a deep-yellow and saturated coerulea to produce a fire-engine-red flower. There are cases where this will not work and, in fairness, this cross of *Phalaenopsis* (*amboinensis* × *violacea*) did produce both reds and coeruleas.

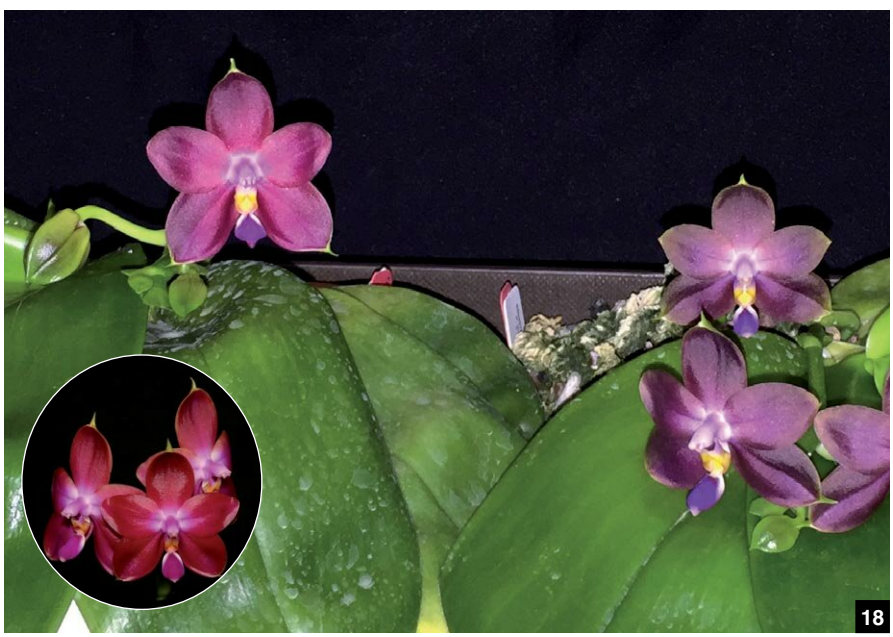
We tend to go directly to Mendelian genetics when we are thinking about inheritance. I wish color inheritance was really that simple, unfortunately it frequently is not on a couple of different levels. Nuclear DNA does tend to follow the normal dominant and recessive

inheritance that most of us understand. But some of these traits are also inherited through mitochondrial DNA, which is inherited from the maternal side. For example, some of the deep-yellow pigments in *Phalaenopsis* are inherited through mitochondrial DNA and, as a result, you will get better yellow color using the deepest-yellow flower as the capsule parent.

Alba and coerulea color forms are even more problematic. The absence of the pigments that would have created the normal color form are usually not the result of the genes for that pigment being completely deleted. Again, there are exceptions, but, in most of these cases, it is actually an error somewhere in the genetics of the pigment production pathway that has caused the other pigments to not be produced. The genetics needed to produce those pigments are usually still there. For the programmers out there, think of it as code that has been commented out. The fun part about nature is it usually has a way to fix these kinds of errors in the pigment pathway. All it usually takes is to cross one orchid that has the error with another orchid that does not, and poof!, 100 percent of the resulting progeny do not have the error anymore (example: Fig 14). This scenario is my absolute nemesis and I have been fighting with this for the last two decades. It is the reason that the previous generation of phalaenopsis hybridizers used to call coerulea breeding a dead end. For them, it literally was. I was completely clueless and had no idea at the time when I started this journey that my life's work as a hybridizer would end up being about trying to solve this problem that is inherent to coerulea hybridizing and inheritance.

In terms of documentation for inheritance of specific traits, unfortunately, there are few good references to research how different traits are inherited. The best thing you can currently do is conduct lots of research on previous crosses as well as talking with experienced breeders in specific areas to try and piece as much of it together as possible. You may also find articles on the inheritance of individual traits. It is really beyond the scope of this article to go deeply into those kinds of details, and they do vary some within different genera and tribes of the orchid family. *Cattleya* color inheritance is different from *Phalaenopsis* in some cases. The one warning I would give is to really do your research and not be fooled by something that is basically an old wives' tale. There is a lot of bad information floating around. Here are two that we have debunked over the years.





[16] *Phalaenopsis amboinensis* 'Golden Dragon'

[17] *Phalaenopsis violacea* 'Sapphire's Navy'

[18] Three color forms of *Phalaenopsis* Princess Kaiulani (*violacea* × *amboinensis*)

"Coerulea breeding is a dead end." As I mentioned previously, this was a little bit true 20–30 years ago. The hybridizers did not have much to work with and they definitely did not understand the genetics and inheritance of the form. We now know specific approaches that will produce coeruleas 100 percent of the time and are working through how to get more consistent results across a broader range of crosses. So, this is definitely not true.

"Lab-created polyploids grow like dogs." In the early days, when growers were using colchicine in the lab to create polyploids, they were using too much. A lot of the seedlings died in the process and the ones that did survive were stunted and grew poorly. Unfortunately, this myth became common knowledge and was the result of making the wrong conclusion. We have since learned how to optimize the timing and amount of colchicine treatment so that the resulting seedlings that do convert to tetraploids will usually grow extremely well.

There is a huge amount of information that you are likely going to accumulate, so coming up with an approach to keep track of all of that information and to make sure you are systematically documenting everything you are doing becomes extremely important. I keep a handwritten notebook for all of the crosses that I pollinate. I find that only a small percentage of the crosses that I make will produce a seed capsule, so it is a waste of my time to spend a lot of time entering every single cross I make

into a database. You may decide that you want everything digital and want to have everything in a database. That is perfectly OK. I start with digital records for planning, then actual pollinations are in a handwritten notebook, and, finally, once a cross goes into the lab, it is entered into my database and tracked from there.

I like to use the program Evernote (https://evernote.com) as a place to keep notes on hybrids I want to make, additional data and photos of hybrids I am researching as well as hybrid family trees. Everything in Evernote is synchronized up to the cloud and can be accessed from any computer. This gives me flexibility to easily add notes at the time and place I think of it and way to quickly capture photos for future reference from any device I am working from.

Once I start planning out sets of hybrids, I tend to make lots of lists. I started using the online program Trello (https://trello.com) to create sets of lists of hybrids I want to make over time. It allows me to easily prioritize and move around different hybrids on a quick view. I make a lot of hybrids each year and really do not have the time or resources to grow them all out, so I will frequently use Trello as a tool to prioritize which ones I want to work on next at different stages. I could get most of this functionality out of my database, but Trello has been more convenient to use and I can easily access it from my phone while I am in the greenhouse. Within Trello, I have the following sections of lists: Crosses To Be Done (TBD; my backlog); Goals and Strategies; Strategic Priorities; TB Harvested ASAP; Crosses TBD This Week; Crosses TB Registered; Orchids to Buy; In Progress (Crosses Pollinated); TB Stem Propped; TB Colchicine Treated; Currently in the Lab; In the Lab, High-Priority First Replate or Spread; In the Lab, High-Priority Final Replate; In the Lab, Priority High Volume; Deflasking Priorities; and Needs Photo Taken. I know that is a long set of different lists, but it helps me organize what to do when and be able to see if visually. I still make handwritten lists, but it is usually a list on a sticky pad of crosses I want to make that day that I can just stick on the working page of my hybrids notebook to take in the greenhouse.

Once I harvest a seed capsule, I immediately make an entry in my database. I created the database My Orchid Vault (http://myorchidvault.com) specifically for the purpose of tracking the orchids I have in the greenhouse, what is in the lab, all my hybrids and all the related dates and data that I needed to keep.

[19–20] Screenshots of the author's database program — My Orchid Vault.

I cannot stress this enough: keep lots of records and do it with tools that you like to use. It will really help you long term. If you are working with digital records, just make sure you have backups or, even better, use tools where the data are stored in the cloud and accessible from any device that you are on. There are lots of options, so take the time to try out different ways of organizing and keep the information handy.

OK, so we need to fast-forward. You have made a cross and a nice fat, green seed capsule has developed. Now what do you do? You are going to need a way to either grow the seeds out yourself or get a friend or commercial lab to grow them for you to a large enough size to be potted out into a community pot. Then you are going to need space to grow out all those wonderful orchid seedlings to maturity so that you can reap the rewards of all this work that you have done.

There are advantages to doing the lab work yourself, but it is a lot of work and requires a lot of equipment. I personally chose to do my own lab work and have invested both in the equipment and the time to learn how to do it myself. The advantage is it is cheaper than paying a lab to do it for you and gives you more options during the process. It gives you the ability to more easily time the harvesting and sowing of your orchid seeds. Then you can also choose which seedlings you want to grow out, choose to grow out more or fewer seedlings and control the timing of replates, which can help you grow the seedlings faster.

There are two approaches for harvesting orchid seed capsules: it can be done using green capsules or dry capsules. There are advantages and disadvantages to both approaches.

Most labs want to work with green capsules. The tiny seeds inside the

capsule are still sterile, and it is easy to get them into a sterile flask without damaging the orchid seeds. Complex novelty phalaenopsis crosses and some of the more difficult crosses that tend to have low fertility are best grown out from green capsules. You have the best chance of getting viable embryos into the flask from a green capsule and sometimes you can get seedlings that way that otherwise would not have been viable in a dry capsule. There are three downsides: timing of harvesting the green capsule is critical, you have a short amount of time to get a green capsule to a lab once harvested and, if the mother plant has any viruses, that virus will likely be transmitted to the seedlings. The harvest time for green capsules varies depending on the time of year, the weather, and the type of orchid. The time can range from a few months to eight months or longer.

Dry capsules give more flexibility on the timing. You do not have to exactly time the harvesting of the capsule; you just need to harvest the seed capsule as soon as it starts to open. The other advantage is if one or both parents were carrying any viruses; usually the virus is not transmitted to the seedling when you use a dry capsule. This is an important technique to have as an option if you have a stud plant that is impossible to replace but carries a virus.

At some point in the process, you will need to decide how many final flasks you want from a cross. This is where the tradeoff of growing enough seedlings to see your results and having enough space comes into play. For experimental crosses, I usually try to grow out 20 to 40 seedlings. For crosses that I am confident that they will be of good quality, are of commercial value, or both, I will grow out 100 to 200 seedlings. If I had more greenhouse space, I would grow out even more. This is really where the dilemma based on how much growing space you have kicks in.

Remember, those seedlings are not going to stay small. Many of them will eventually have to go into a 4-inch (10.2-cm) pot or larger before they bloom for the first time. For more compact orchids, sometimes you can bloom them in the community pot or in a 2.25-inch (5.7-cm) pot, which does save some bench space. Then you can decide how many you really want to grow out based on their quality.

If you are doing your own lab work, you can sometimes fast track one or two flasks by replating them often with lots of room in the flask to get the seedlings to grow faster while keeping a larger batch of seedlings growing more slowly. This will allow you to flower out the seedlings that were fast-tracked sooner and then decide how many of the other seedlings you want to grow out. This can be a huge advantage when doing your own lab work.

The author's coerulea remake of *Phalaenopsis* Yungho Gelb Canary and representatives of its parents — *Phalaenopsis* Gelblieber (left insert) and a blue form of *Phalaenopsis* Princess Kaiulani (right insert).

If you are making crosses every year, remember that after a few years, you will have new seedlings coming out of the lab that will take up bench space as, all the while, your older seedlings are still growing out. You will need more and more bench space over time if you are producing crosses every year. The two big limiting factors for me are having enough lab space for all those flasks and then having enough bench space to grow out the seedlings. Every nook and cranny in my greenhouse is currently filled with seedlings, and I feel like I never have enough bench space for new crosses. So just keep that in mind when you start planning how many crosses you want to make. There is nothing worse than realizing you do not have space to grow out the crosses you labored over for the last few years.

When you do really start flowering out your crosses, just remember not everything is going to work out the way you planned. Some crosses will be horrible, some will just be OK and, of course, some will surpass all your expectations. I personally live with this constant frustration of thinking I have worked out a breeding problem, having waited for years to flower a new cross, only to then have 100 percent of the seedlings bloom out the wrong color. Even now, I was hoping at the time of writing this article that I would have some new cross successes to share. This year started off with a couple of new crosses blooming based on the last two decades of work I have been doing. Unfortunately, both crosses bloomed out the standard color form and none are coerulea. I really try not to let this get to me, because overall I am still making progress and continuing to learn from a single cross. But it does get hard at times to keep up the energy, push past the setback and keep going forward. All I can really say is to just not give up.

Luckily, last year I had great success blooming out a planned remake of *Phalaenopsis* Yungho Gelb Canary. This was the first seedling to flower, and it is the first coerulea *Phalaenopsis* Yungho Gelb Canary.

I used previous results to design this

multigenerational cross by first creating a set of new foundation hybrids with the intent of making a coerulea Yungho Gelb Canary. I literally started over from scratch, choosing specific cultivars of each species building the foundation for this cross. Key conclusions that came out of producing a coerulea Princess Kaiulani allowed me to carefully choose which *Phalaenopsis amboinensis* to use. It took many sets of different Princess Kaiulani crosses to eventually find a combination that would work to produce coeruleas.

It does not stop here. I have a much longer-term plan with a series of crosses for four and five generations. For example, once I flower out a coerulea *Phalaenopsis* Buena Jewel, I will then use that and one of these coerulea Yungho Gelb Canary plants to create a coerulea line Joy Spring Canary.

One other tip about growing out seedlings: some crosses will not produce their best flowers until the plant is fully mature. This can be several years after each seedling first flowers. Many novelty phalaenopsis hybrids are notorious for having bad form and even not-so-great color the first time they bloom. Then they get better and better each year until the orchid is fully mature. My coerulea Yungho Gelb Canary will likely follow this pattern.

No matter what results you do get, try not to get discouraged or give up if the initial outcome is not what you wanted. Some of your goals may have been extremely challenging to produce in real life. It takes time and practice to become good at hybridizing. So again, if you get frustrated, try not to give up. Find other people that can encourage you and give you tips for getting better future results. I have hit that wall more times than I would like to admit and there are days and months where I need to vent to my hybridizing friends to get the encouragement to keep pushing forward. That has mostly been true the last few months, even as I am writing this article. Just as there will be crosses that you do not like, there will be successes and fantastic surprises. Take the time to enjoy those moments of success and use them to maintain your motivation as you go forward. For those that are really interested in learning more about phalaenopsis hybridizing and participating in a community focused on those topics, we do have a Facebook group called Phalaenopsis Hybridizers that can be a great resource of information and encouragement. I also maintain some articles, reference materials, lab protocols, and a *Phalaenopsis* confirmed-ploidy list on my Sapphire Dragon Orchids website.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[21] First-bloom seedling of the author's cross named to honor his mother, *Phalaenopsis* Memoria Martha Shepherd (Princess Kaiulani × Emeraude) using a tetraploid coerulea form of *Phalaenopsis* Princess Kaiulani. Note the bluish-violet coloration encircling the base of the column in the inset photograph.

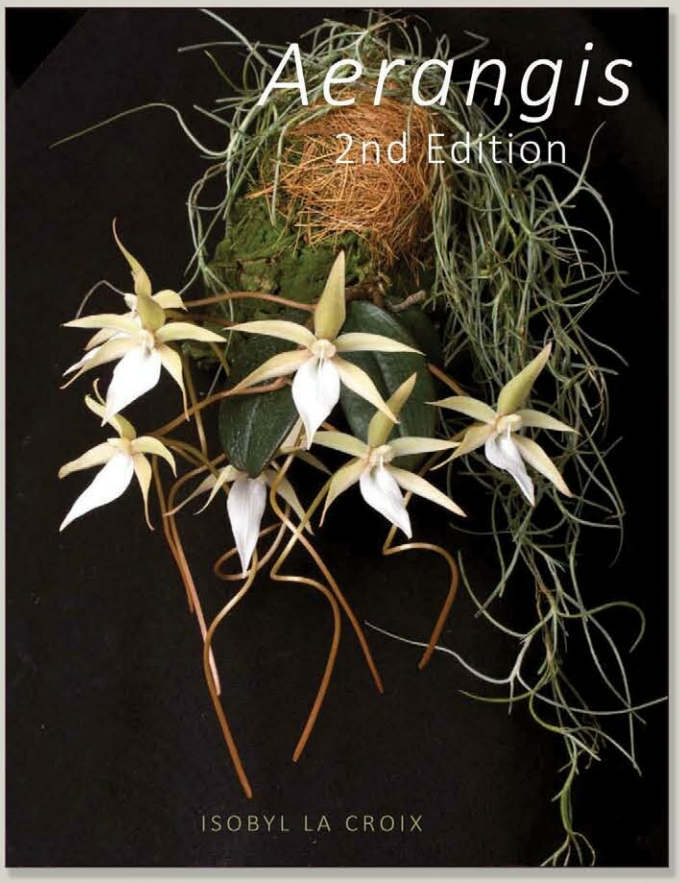
It is the first week of March and as I am putting the final touches on this article, I had a pleasant surprise bloom out in the greenhouse. This is a first-bloom seedling from what was a speculative tetraploid cross using a large standard *Phalaenopsis*. It has a coerulea center on a light yellow-green flower. It is a bit hard to see, but this is a great incremental step toward successfully getting the coerulea color into a large tetraploid *Phalaenopsis*. It is also a great example of the many steps to achieve a large-form coerulea *Phalaenopsis*.

One of the rewarding things we have the opportunity to do as hybridizers is naming orchids after our loved ones. I lost my mother a year ago and March 9, 2022, would have been her 76th birthday. She loved the color yellow, so it was only appropriate to name this new orchid after her. I am proud to introduce *Phalaenopsis* Memoria Martha Shepherd (Princess Kaiulani × Emeraude) in honor of my mother and all the support both my parents gave me so many years ago as a young orchid grower.

This cross brings me one step closer to achieving one of my highest priority goals: to eventually produce a large, standard full-form, coerulea phalaenopsis. There will undoubtedly be many more steps along the way, but for the moment I am delighted knowing I am still moving forward. Just remember as you pick up your toothpick to go on your own hybridizing journey, there is no single right or wrong path. Remember to have fun with it along the way. After all, what we all really want is to grow and flower beautiful orchids. Do not ever lose sight of that. Happy greenhouse tooth-picking to you all!

— Rob Shepherd is the owner and hybridizer of Sapphire Dragon Orchids in Canyon Country, California at Rolling Rock Ranch with his husband Michael James. Professionally, Rob is an executive in the game industry having spent 25 years as a video game producer. Rob started growing orchids in 1984 when he was 11 years old in Tyler, Texas and has been a member of the AOS since 1985. By 2001, he started spending more time hybridizing and developed a passion for the coerulea color form. During that time his focus has been on understanding the inheritance of this color form and using that information to make coerulea hybridizing more predictable. His current breeding program is focused on increasing the flower size, flower count, and form of coerulea Phalaenopsis species and hybrids (email rob@sapphiredragonorchids.com)

AERANGIS 2nd Edition



Author: Isobyl la Croix
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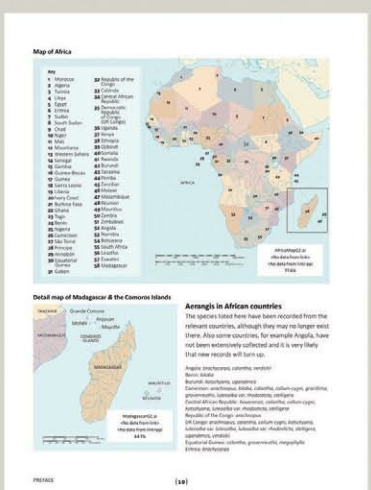
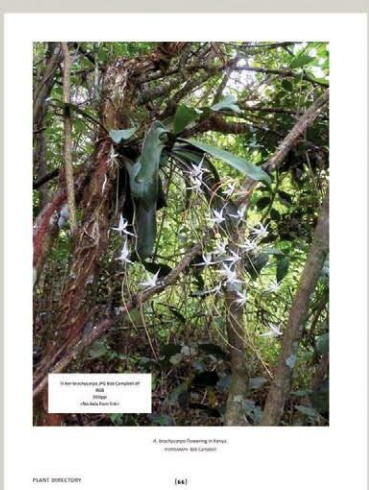
Images: 270
Page size: 7.5 x 10 inches (190 x 255 mm)
Cover format: Hardcover

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 delight orchid lovers.





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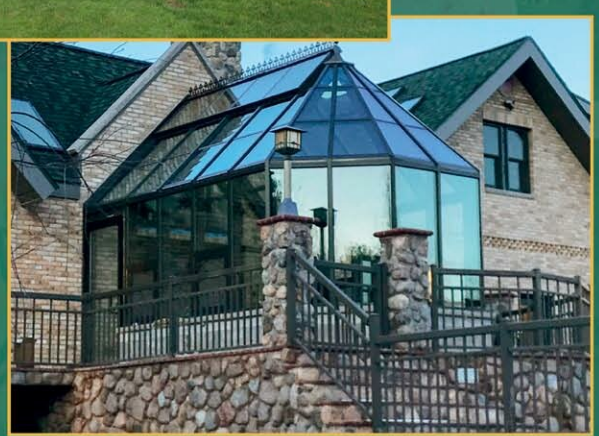

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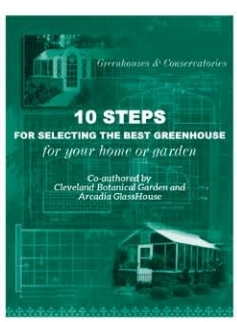

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