

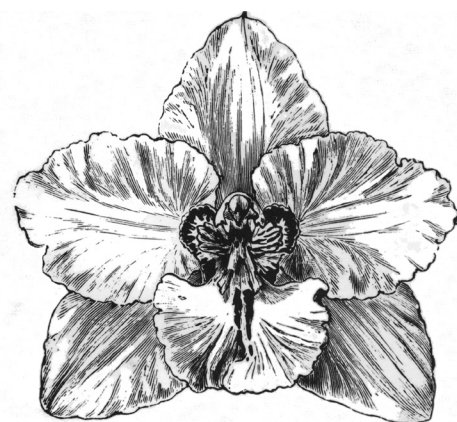
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Odontoglossum luteopurpureum, alias *Odontoglossum sceptrum*

Stig Dalström

Odontoglossum luteopurpureum Lindl., is really a widely distributed and variable complex, or “super-species”, that due to geographic isolation in some areas have developed a degree of sub-speciation, which makes taxonomic handling rather difficult and sometimes controversial. *Odontoglossum luteopurpureum* also tends to hybridize naturally with several other sympatric species, which makes the picture even more blurry. It may therefore be preferable to have a broader and more tolerant species concept in this particular case, unless you really want to punish yourself and the world by opening the “Pandora’s Box” filled with indefinable “sub-taxa”.

Plants of *Odm. luteopurpureum* were first collected and brought to Europe by Jean Linden during his third expedition to the New World tropics in 1841–1844. He collected the type plant in February 1843, somewhere in the deep forests of Quindío at about 2600–2700 m, along the central cordillera in Colombia. A dried

specimen was sent to John Lindley at Kew who described it in *Orchidaceae Lindenianae* (1846), and again in *Folia Orchidacea* (1852). Lindley chose the name based on what he interpreted as the yellow and purple colors of the flowers. No flowers of this species have since shown any purple coloration on the sepals and petals other than as an ingredient in the brown spots and blotches, which often covers much of the flower segments. Due to the high variability of the flowers of this species it was subsequently described under different names by several different authors. These names have since commonly been treated as synonyms, or as natural hybrids, except for *Odm. sceptrum* Rchb.f. & Warsz., which is still recognized by many as a distinct species. That is not correct, however, and the reason why is explained here.

Odontoglossum sceptrum was based on a collection by Josef von Rawiez Warszewicz (No. 37, sheet 48124-W) and described by him together with

Heinrich Gustav Reichenbach *filius* (1854a). There are six inflorescences of various lengths mounted on this particular sheet. An isotype in the herbarium at Kew has two separate inflorescences carrying flowers of different sizes. The locality given on a label mounted on the type sheet says “Central America”, which I cautiously interpret here as “Central Cordillera”, since that is where what is known as “*Odm. sceptrum*” occurs today. It is assumed by us that Warszewicz collected these specimens somewhere in the department of Antioquia, but it is also possible that the collection was made farther to the south and in the department of Tolima. We simply don’t know for sure. When comparing the type flowers of *Odm. sceptrum* with the type flowers of *Odm. luteopurpureum*, however, they appear so similar that the logical conclusion is that they represent the same taxon.

Leonore Bockemühl (1989) treats *Odm. sceptrum* as distinct from *Odm. luteopurpureum* based on a 12 mm long column, versus “18–20 mm” for *Odm. luteopurpureum* (Bockemühl, 1989). When the columns on the type specimens of *Odm. luteopurpureum* (Linden 1284) and *Odm. sceptrum* (Warszewicz 37) are measured, however, we find that they are 12–14 mm long for both taxa. We have to keep in mind here that they both most certainly came from the central cordillera and as the crow flies, probably not that far from each other. So where does the longer measurement come from? It turns out that plants from the eastern cordillera to this day have been erroneously treated as “typical” *Odm. luteopurpureum*, and they appear to have a longer column, *ca* 18–20 mm (excluding the anther). This is most likely what Bockemühl referred to in her treatment. Perhaps this subtle mistake is behind why Reichenbach described *Odm. sceptrum* as a distinct species in the first place? He may have compared it with plants from the eastern cordillera, which most likely were commonly seen in cultivation at the time. This appears to be the main reason why the name “*Odontoglossum sceptrum*” still is used for plants from the central cordillera, and plants from the eastern cordillera are considered as “typical” luteopurpureums. If we decide to treat the form(-s) of this variable taxon from the eastern cordillera as distinct from the typical *Odm. luteopurpureum*, based on a longer column primarily (hence following Bockemühl but in a reversed order), we probably

need to select another name from the list of already published but considered synonymous epithets. This is not something I am willing to do at this point for a variety of reasons, mainly due to a lack of understanding of how the various populations of this taxon in general may differ from each other. It is therefore safer to lump them together as a “super-species” until more specific information is available.

If we still decide that it is justified to treat plants from the eastern cordillera in Colombia as a distinct species, separate from the typical *Odm. luteopurpureum* (alias *Odm. sceptrum*), and use the oldest validly published name, then *Odm. hystrix* Bateman would probably be it. James Bateman writes in the original description: “*Habitat in montibus prope Santa Fé de Bogota, 8-9000 ped.—Weir.*”, “This is another of Weir’s remarkable discoveries in the vicinity of Bogota.” (Bateman, 1864). So we can assume that this plant came from the eastern cordillera.

In support of a “super-species” concept, however, Bateman (1874) writes in his “A Monograph of *Odontoglossum*”: “The vicissitudes which the name of this species has had to undergo within the last three years are full of instruction both to botanists and the public. It was first described by Lindley from wild specimens gathered by Linden in the neighbourhood of Quindio. Mr. Weir was the next to meet with it, and he succeeded in sending to the Horticultural Society several living plants that had been obtained about 100 miles to the south of Bogotá. He also sent wild specimens in admirable condition which, not agreeing with Lindley’s description, and being profusely furnished both at the base of the lip and in the apex of the column with long bristle-like appendages, led to my calling it *O. hystrix* (*i. e.* the Porcupine *Odontoglossum*). Messrs. Low also received the plant, through their collector Mr. Blunt, from the same locality as that where Weir met with it, and one of their plants produced flowers which—neither agreeing with Lindley’s *O. luteo-purpureum* nor with my *O. hystrix*—received from Professor Reichenbach the name of *O. radiatum*. Subsequently many specimens flowered, no two of which were alike, though they all maintained a sort of distant family resemblance to *O. luteo-purpureum* of which—as the Professor himself was the first to point out—there can now be no doubt that they are all varieties.”



Odontoglossum luteopurpureum (most likely the eastern form), erroneously as “*Odm. atropurpureum*” in Bateman’s “A monograph of *Odontoglossum*”.

As pointed out by Bateman, Reichenbach eventually realized that something was questionable with the current classification and therefore “sank” *Odm. sceptrum* into a “variety” of *Odm. luteopurpureum* in *Xenia Orchidacea* (1874). Later he back-pedaled somewhat when he wrote about *Odm. sceptrum* in *Gardener’s Chronicle*: “When degrading this fine thing to a variety of *luteopurpureum*, I may have been guided by some hybrids between the two varieties or species. At all events, it well deserves to rank as a distinct garden form. It is very fine in its clear colours, finest dark-lemon yellow, with well marked blackish-purple rich spots—no hue of that light copper colour one is tired of seeing.” (Reichenbach, 1882). The color description of “well marked blackish-purple rich spots” sounds strange for this taxon and is unknown to me. The flower that Reichenbach described so vividly was sent by James O’Brien, who in turn had received it from a R. P. Percival, of Cleveland, Lancashire. No specimen that matches this description has been

identified in the herbarium of the Museum of Natural History in Vienna, Austria, where Reichenbach’s preserved collection is deposited, or elsewhere by me.

Bockemühl (1989) cites *Odontoglossum schlimii* Linden & Rchb.f., as a synonym of “*Odm. sceptrum*” (= *Odm. luteopurpureum*) in her treatment. This is only half-true as we will see when we examine this case more closely. *Odontoglossum schlimii* was described in 1854 by Reichenbach and is based on a collection by Louis-Joseph Schlim, at ca. 2300–2600 m elevation in the forests near Ocaña, Colombia (Reichenbach, 1854b). The type specimen (*Schlim* 405, W) consists of a single unifoliate pseudobulb and a short inflorescence carrying the scars of three flowers of which only one remains (sheet 48465, W). A second specimen of the same collection (isotype) can be seen on sheet 48398 (W), where one flower remains on the inflorescence and one in an envelope mounted above it. When a close analysis is made of these flowers, it becomes clear that *Odm. schlimii* is the same as *Odm. tripudians* Rchb.f., also described by Reichenbach in *Bonplandia* 1854, but 78 pages earlier, which therefore takes nomenclatural priority.

Bockemühl’s treatment of *O. schlimii* as a synonym of “*Odm. sceptrum*” may be based on a couple of Gustav Wallis’ collections (W), which were originally labeled “*Odm. schlimii*”, but re-determined as “*Odm. sceptrum*” by Bockemühl. These specimens do not represent the type of *Odm. schlimii*, however, and are quite different from the *Schlim* 405 specimens. I have only seen a single collection of *Odm. luteopurpureum* from the Ocaña area, but several collections of *Odm. tripudians*, so the latter species seems to be more common there. Why Reichenbach did not recognize the similarity between the types of *Odm. schlimii* and *Odm. tripudians* is puzzling. Perhaps it can be explained by the fact that the original locality for *Odm. tripudians* was believed to be “Peru”, which certainly is a mistake. No collections of anything similar to *Odm. tripudians* have ever been documented from Peru or Ecuador to my knowledge.

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All photos by the Author



Odontoglossum luteopurpureum. A small-flowered form from Antioquia, the central cordillera



Odontoglossum luteopurpureum. A large-flowered form from Antioquia, the central cordillera.



Odontoglossum luteopurpureum
(*Odm. hystrix*), from Cundinamarca, the
eastern cordillera.



Odontoglossum luteopurpureum (*Odm. hystrix*), from Putumayo,
the eastern cordillera.



Odontoglossum luteopurpureum (*Odm. hystrix*), from Putumayo, the eastern cordillera.

Reflections of a Hybridizer

James McCully

Thirty Years of Breeding in the Oncidium Alliance

Photographs by James McCully unless otherwise credited

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In 1984, I took a class focusing on orchids at the University of Hawaii–Hilo. A longtime orchid grower and enthusiast, Earl Dunn, taught this class. Earl and I were having a casual talk one day and I asked him, “From which genera do you think the most successful type of orchid for the pot-plant market will come from?” Without much delay, he responded, “The oncidiums, they have such a wide range of attributes.” This comment stuck.

At the time, phalaenopsis hybrids were preparing to explode as the preeminent pot-plant orchid. Significant breeding programs in Europe, the United States and especially Taiwan were beginning to make great improvements. The commercially important capacity to force flowering through lowering of temperature was being perfected. This particular innovation would turn out to be the game changer. The market grower has to be able to make and meet scheduled deliveries, and must also be able to predict costs and cash flows. When phalaenopsis became programmable year-round, they immediately became the number one floriculture crop and that has increased for 20 consecutive years.

But without the benefit of foresight, I had by then posed the question to myself, “Do I stay in phalaenopsis (I had more than a million plants growing at the time) and breed with the three to four important species in that genus, or do I switch to oncidiums with more than 10 important genera and at least 30 important species?” Furthermore, the *Oncidium Alliance* was reputed to have more than 800 species stretching from Mexico to Brazil and from sea level to 10,000 feet (3,048 m) in the Andes. The answer seemed obvious to me at the time: Earl Dunn was right; I would replace phalaenopsis with a better alternative, oncidiums.

Little did I know I was seeking to be the premier buggy-whip maker at the dawn of the automobile age.

My breeding goals required me to match phalaenopsis characteristics, which would require:

- Improve inflorescence habit to an ideal height c. 20–30 inches (50–75 cm), flower arrangement and promote multiple inflorescences (two inflorescences minimum per pseudobulb);
- Improve speed of growth and time to flower;
- Improve vigor and ease of growth;
- Improve shelf life, longevity of flowers;
- Improve flower size and color;
- Try to establish fragrance as a component; and
- Breed or determine how to control selective initiation of flowering.

I knew that this would be a multigenerational breeding program and I needed to operate my business with immediately available selections. Prior to this time, the key to success in the traditional orchid market was the size and the color of the flower, qualities important to collectors and orchid society judges. However, in the middle of this selection process, there were clones that seemed suitable to larger production and to meet consumer requirements. An example of a successful show plant that could be utilized as a pot plant was *Aliceara Marfitch* (aka *Beallara*), bred by Robert Dugger in 1983. The desirable clone ‘Howard’s Dream’ was selected by Howard Liebman and mericloned by Stewart Orchids. This was a huge purple flower on a strong branching inflorescence. It flowered slowly and growers accepted it. Other popular selections at that time were *Oncidium*



Aliceara Marfitch ‘Howard’s Dream’ AM/AOS.
Photograph from the AOS award archives.

Jungle Monarch (aka *Colmanara*), *Oncidopsis* (Beall) Bartley Schwarz and *Oncidium* Sharry Baby.

ONCOSTELE WILDCAT. Then came *Oncostele* (*Colmanara*) Wildcat, registered by the Rod McLellan Co. in 1992. The breeder and grower at that time, Jeff Britt, was interested in having production plants available for their wholesale and retail markets. In



Oncostele Wildcat 'Bobcat' AM/AOS. Photograph courtesy of Norbert Dank.

1989, he made what was to me the unpromising cross of *Oncidium* Crowborough (1965) × *Oncostele* Rustic Bridge. I say unpromising because I owned the same parent plants that he used. The Rustic Bridge in particular was a quite difficult plant to appreciate, to put it charitably. It sported an elongated, top-heavy inflorescence with poorly

formed flowers and foliage that was especially prone to necrosis. The fact that it came from the problematic genus *Rhynchostele* was also of concern. Its only redeeming virtue was its lip. The 'Mephisto' clone in particular had a lip that caught your eye from across the greenhouse. When I told Jeff Britt that I would never use either Rustic Bridge clone as a parent, he replied with some sardonic comment about the gift a breeder must have "to see the gold amidst the dross."

So much for my powers of observation. Jeff Britt's instincts gave him the most highly awarded *Oncidium* Alliance cross of all time. At this time *Ons.* Wildcat has received 72 awards from the AOS. This was the perfect example of why to make a cross based on your instinct rather than your brain.

Jeff tried this cross with three pollinations using two cultivars of Rustic Bridge. He surprisingly achieved a highly homogeneous population of fast-growing, early-flowering, well-branched and well-colored, pot-plant candidates. I speculated that the Crowborough (1965) he used, 'Spice Island', must have been one of the chance tetraploids from mericlone (mutagenesis).

Britt selected more than a dozen clones for further testing and some of those clones are still produced today. Moreover, individuals of the grex have shown significant somaclonal variation (variations produced by plant tissue culture) with many favorable traits offered through this selection process. A passing observation: all the success I have had with breeding with Wildcat has come from using red-colored forms (from the 'Mephisto' line), in particular *Ons.* Wildcat 'Bobcat', which alone has six AOS awards. What a great legacy for any breeder to have created a plant that has been so widely appreciated by growers, enthusiasts and breeders. Aloha to my friend, Jeff, too soon gone.

ONCOSTELE CATATANTE. I have by now made more than 4,000 crosses in this alliance. The 1,249th cross I made reflected my interest in developing a pot plant that nearly met all the criteria that I had set forth in my breeding plan in a single cross. That cross is *Oncidium* Sphacetante × *Ons.* Wildcat, which I named *Oncostele* Catatante, conflating the parental names. I registered it in 2002 after I used the 'Evelyn Extra' clone of Sphacetante as the seed (female) parent and Wildcat 'Chocolate Danish' (Mephisto been receptive to a wide range of pollen donors as well as an excellent pollen parent itself. It easily expresses the color of the other parent, no doubt in part because it has so much color in its own background. While it could be superficially categorized as a "brown,"



Oncostele Catatante 'Pacific Sunspots' AM/AOS.

line) as the pollen (male) parent. *Oncostele* Catatante is my continuation of, as well as homage to, the pivotal oncidiinae-hybrid *Ons.* Wildcat.

The cross was fast growing, homogeneous, and early to flower. The selection ‘Pacific Sun Spots’ is a bit of a misnomer as it has no visible spotting. I have obtained Plant Breeder Rights for the European Union and it has shown utility as a pot plant due to a strong inflorescence habit, easy blooming, good color and it frequently has two or more inflorescences per pseudobulb.

The parentage of the plant includes a range of species. Phenotypically, it is what can be observed as superficial expression of the various genotypes, suggesting that the species *Oncidium sphacelatum*, *Oncidium fuscatum*, and *Oncidium leucochilum* played significant roles in the grex. I believe the *Onc. sphacelatum* was key for floriferousness, warmth tolerance and multiple inflorescences. The *Onc. fuscatum* contributed the structure of the inflorescence, floral arrangement and the shape of the flower. The *Onc. leucochilum* contributed the scale of the inflorescence and the shape and size of the pseudobulb, which is no small thing in an attractive pot-plant cultivar.

I considered *Ons.* Catatante to be an ideal basis for further breeding; a canvas if you will. It has indeed. I would argue its pigments are likely an overlay of red anthocyanin on a base of yellow carotenoids. It has an orange glow, especially from the sheen on the lip. This is a key color distinction as compared to a “brown” from red anthocyanins overlaying green chlorophyll. There is no more definitive test of a pot plant’s color than to take a daylight-selected “red” into a home and, under a fluorescent or incandescent light, have it express its inner “brown.” *Oncostele* Catatante, on the other hand, looks good indoors.

Here are a number of crosses I have made using *Ons.* Catatante as one of the parents. Note the names of the other parent invariably evoke or describe a “hot” color.

Oncostele Firecat (Catatante ‘Pacific Sun Spots’ × *Oncidium* California Fire ‘Full Fire’) (2009). This hybrid had a range of multi-spiking, productive selections, from the well-branched inflorescence and sharp, contrasting lip of ‘Harmony’ to the large scale and sunset colors on an extended raceme of ‘Simple Pleasures’.



Oncostele Firecat ‘Harmony’

Oncostele Rising Sun (2009) (*Oncidium* Scarlet Pattern ‘King Crimson’ × *Oncostele* Catatante ‘Pacific Sun Spots’). The richest, most-saturated red I had achieved up to this point was the clone ‘Red Sun’.



Oncostele Rising Sun ‘Red Sun’ AM/AOS
Photograph courtesy of Floricultura.

Oncostelopsis Sunkissed (2009) (*Ons.* Catatante ‘Pacific Sun Spots’ × *Oncidopsis* Living Fire). There were two distinct clones selected: the compact, floriferous, clear butter-yellow of ‘Buttercup’ and the two-toned, taller ‘Butterscotch’.



Oncostelopsis Sunkissed ‘Buttercup’ AM/AOS

Oncostele Hilo Firecracker (Aloha Sparks × Catatante) (2010). My good friend, James Fang, is the owner of Hilo Orchid Farms here on the Big Island of Hawaii. He is the best grower of orchids on the island and does a smattering of crosses as well. He and I almost simultaneously made the same cross using different clones of *Ons.* Aloha Sparks.



Oncostele Hilo Firecracker ‘Lucky Strike’

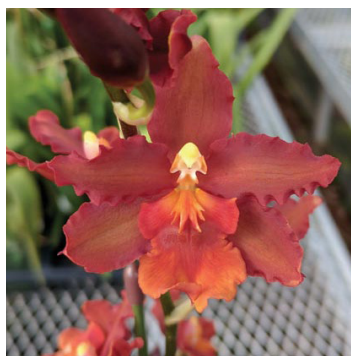
He used the large-flowered ‘Pele’s Glow’, which had a bronze sheen to its color, while I went with the more elongated, rich red, ‘Edna’s Flame’. He registered the cross first, otherwise we would be discussing *Oncostele* Aloha Cat, which was my proposed grex name. I like his name better. The best choices are ‘Lucky Strike’, which is a taller, multi-spiking, well branched two-toned gold and white (!) and ‘Sangria’, which is a deep carmine red.

Oncostele Warm Memories (2010) (*Oncidium* California Merlot ‘Strong Heart’ × Catatante ‘Pacific Sun Spots’) ‘Martian Dawn’. My breeding focus is for clear colors. I had spent my early years in hybridizing trying to achieve vigor and structure without concern for color expression. My observation is that



Oncostele Warm Memories

when selecting for a single trait there are invariably correlated traits that can negatively affect the next generation. Therefore, I prefer to have confirmed, line-bred characteristics (phenotype) dominant for floriferousness, inflorescence structure and vigor. Then, with the current population, I seek color expression as the single trait to be added to that confirmed phenotype. This multihued selection is an exception: it shows a classic range of sunset colors. The carotenoids, flavonoids and anthocyanins overlap and, under varying light, show a range of intermixed colors. I include it here because of its significance in my future breeding lines, and, well, I like it.



Oncostele Tom Cat ‘Cayenne’

Oncostele Tom Cat (2012) (Catatante ‘Pacific Sun Spots’ × *Oncidium* Geneva Red ‘Ruby Red’). I have used the *Onc.* Geneva Red grex many times as a parent. The *Onc.* Firecracker parent of Geneva Red provides

great structural influence from its *Oncidium hastatum* parent. *Oncidium* Geneva Red was named after the Geneva Avenue location of Golden Gate Orchids by its owner Tom Perlite. Thus, this plant became *Ons.* Tom Cat. Two excellent selections, initially labeled ‘A’ and ‘B’, were selected for well-branched inflorescences, a propensity for double spiking and strong colors.

Oncostele Solari (2014) (Catatante ‘Pacific Sun Spots’ × *Oncidium* George McMahon ‘Elvish Gold’). Although Solari fails to fit the model of a pot plant for the European market, there are other markets in the world. I have a good friend, Miriam Yokoyama in Brazil who is devoted to introducing the *Oncidiinae* to consumers in what is the home country for many



Oncostele Solari ‘Coronal’

of the species I use in my breeding program. The Brazilian market desires large flowers on taller inflorescences, and the large scale and intense color of the *Onc.* George McMahon doubled the flower size of the *Ons.* Catatante. Concentric rings of dark barring add contrast.

More than half the listed crosses would never have occurred without Tom Perlite, a superb grower and breeder, of Golden Gate Orchids. He was always generous with his plants. It goes without saying that while you can envision any cross you choose, unless you have a piece of pollen and a stigmatic surface to affix it upon, you have nothing to work with. I have

never been successful growing odontoglossums here in Hawaii, so a continuous supply of well-grown, well-bred odontoglossums from Tom allowed me to continuously replace my breeding stock with his next generation of seedlings. I was also able to reach back into his benches and acquire a selected plant or a classic division as well. Orchid breeding requires a lot of luck, especially regarding the opportunity to acquire your breeding plants. While building a base for my breeding, I was lucky to have Tom as a source of the finest odontoglossums then extant. Mahalo Tom.

My primary goal moving forward is to create an array of intense colors in the hot range, reds through yellows, of a clear nature. By trying to breed only to clearer colors in either color direction, I hope to provide a better light-reflecting surface (texture) on the flowers and to accentuate the drama of the color for which orchids are most appreciated. I have relied almost exclusively on my own breeding lines for the last few generations using line-breeding techniques in an attempt to select for the desired traits. In my earliest crosses I made a high percentage of heterogeneous crosses (parents with widely differing genetic backgrounds). I was trying to shortcut through brute force volume the breeding process (i.e., to “get lucky” in the first generation). Results were as expected with little to show for it until Catatante came along.



Oncidopsis Nelly Isler

Sidenote: Serendipity seems to occur more often when I select F2 parents who share in common the species, *Onc. fuscatum*.

ONCIDIOPSIS NELLY ISLER. Mrs. Isler, a Swiss, was a breeder of oncidiums who was focused on commercial varieties. She made a number of crosses that were in production in the 1990s including *Oncidopsis* Stefan Isler, *Oncostele* Linda Isler, and *Oip.* Nelly Isler. All her selections were available only from Floricultura in the Netherlands. Her best result, still

the most successful variety, is *Oip. Nelly Isler* (syn *Burrageara*). This cross, registered in 1995 with various clones protected under European Plant Breeders Rights (similar to our plant patents) continues to provide a license-based income stream to Mrs. Isler's estate.

It is a compact plant, a thrifty but somewhat slow grower that maintains clean foliage. This is an especially important attribute in this group. Neither growers nor consumers will tolerate disease spots and blemishes on the foliage. Most importantly, Nelly easily makes multiple inflorescences, a trait from the *Miltoniopsis* parentage.

The cross comes from *Oip. Stefan Isler*, a mix of *Onc. leucochilum* and the bright-red *Oncidopsis* Edna 'Stamperland' (originally known as a *Vuykstekeara*), which has *Oncidium* (*Cochlioda*) *noezlianum* to thank for its color and *Miltoniopsis vexillaria* for its ability to provide multispiking, size and shape. Mrs. Isler crossed Stefan Isler to the large, linebred *Miltoniopsis* Kensington. I must say I have attempted that same cross many times without any fertility resulting.

To my eyes, it offered an obvious path forward in intergeneric breeding, one that incorporates *Miltoniopsis* for floriferousness, size, color, ease of growth and potential fragrance with *oncidiums* that can provide structure, longevity, branching inflorescences and perhaps fragrance.



Oncidopsis Francine [Floricultura]

So I tried to rebuild Nelly Isler using similar selections. In one of my attempts, (cross MKO2806) I decided to simplify the initial mix by going from *Oip. Edna* straight to the *Miltoniopsis* parent, skipping the *Onc. leucochilum*. My plan was to then bring back the *oncidium* genes using future pollen parents to this platform. The best result was *Oncidopsis* Francine (*Miltoniopsis* Maui Titan × *Oip. Edna*), named for my

wife. It was fast to flower as a seedling, and the clone 'Roseglow' first flowered 19 months from deflasking. The clone 'Red Devil' flowered at 21 months with two inflorescences. When I see homogeneous (similar) seedling populations with quick, initial flowering times, my experience is that the clones will flower easily and early.

The Maui Titan parent is a primary hybrid of *Miltoniopsis bismarckii* × *Miltoniopsis santanae*.

By the way, the clonal epithet, 'Red Devil', in no way characterizes any aspect of the grex honoree's personality. Instead, it was an unthinking homage

to the football club Manchester United, whose home jersey color is of a similar hue!

Oncostelopsis Mayor Billy (*Oncostele* Warm Memories × *Oncidopsis* Francine). I am optimistic that this is a breakthrough hybrid in my development of a red *oncidium* pot plant to equal or exceed *Oip. Nelly Isler*. The cross was made reciprocally and selections were made from both approaches. The most vivid, deep scarlet color on a well-branched inflorescence of 29.5 inches (75 cm) is the clone 'Vosne Romanee' using Warm Memories as the seed parent. When using Francine as the seed, the inflorescences are shorter in the 20-inch (50-cm) range, branched and with



Oncostele (Sunup x *Onc. Two Alarm Fire*)

a brighter cerise red. The Francine progeny are particularly floriferous. Growers of first-generation trials report double inflorescences on double pseudobulbs at less than two years total growth from flask.



Oncostelopsis Mayor Billy

Particularly long lasting with strong color persistence, this hybrid has everything except a fragrance.

NOTABLE TRIAL PLANTS CURRENTLY UNDER EVALUATION.

Oncostele (Sunup x Two Alarm Fire) The seed parent, Sunup, is proving to be a good breeder and providing clear color intensity from its *Oncidium* Remembrance lineage and great structure from the Catatante parent. This is crossed with a highly selected *Oncidium*



Oncidopsis Oranje

schroederianum hybrid, *Oncidium* Two Alarm Fire. I use *Onc. schroederianum* for its multispiking characteristic, its light-reflecting capacity and its scent. It can branch and it shows good vigor as a parent. However, this selection of Two Alarm Fire does not branch, lacks fragrance

and is somewhat dull. So, why use it as a parent? Its vigor and consistent double spiking per pseudobulb are highly desirable traits, and it once again passed them on here, while receiving the color from the seed parent.

Oncidopsis Oranje (*Oncidopsis* Francine x *Oncidium* Sanguine). I am not sure this will be a successful pot plant in Holland, but the color should certainly appeal to the Dutch. A true orange, bred from the red Francine with a linebred xanthic, odontoglossum-type *Oncidium* Holiday Gold. Unlike the pollen parent, the foliage is clean and vigorous.



Oncidopsis Onolicious

Oncidopsis Onolicious (Francine x *Miltoniopsis* Pearl Ono). *Oncidopsis* Francine once again shows great breeding characteristics, this time back to a *Miltoniopsis* as the seed parent. Francine has miltoniopsis lineage on both sides, making the genotype more than 75- percent “pansy orchid,” while the selection bias went to the oncidium characteristics (the phenotype). The rationale for this is that just a dollop



Oncostelopsis Brazilian Sun

of *Oncidium noezlianum* and a bit of *Oncidium harryanum* add both structure and flower longevity. The selection process here, from the Francine through the Onolicious, was for a flower with great substance that would provide extra days in the market and a resistance to handling damage in transit.

Oncostelopsis Brazilian Sun (*Oncidopsis* Pacific Waters x *Oncostele* Sunup). This is a truly serendipitous expression of the miltoniopsis clear color on the seed side with rich carmine red from the Remembrance genes on the pollen side. The grex produces an excellent inflorescence, long lasting quality, and bags of eye-catching contrast.

BREEDING GOALS VERSUS ACCOMPLISHMENTS: THE FIRST 30 YEARS. My breeding goals were previously listed in this article to meet the demands of the consumer market. As I reflect on the original state of cultivar pool for potted orchid production in 1990, I believe I have accomplished a number of my goals. A predictable, uniform inflorescence height of no more than 30 inches (76 cm) is common. The speed to flower is uniformly less than 24 months from flask. Vigor and resistance to edema expression (blistering of the foliage under high humidity) is the norm. The longevity of the flowering with good culture is two-to-three weeks, which is acceptable to the market. Flower size and color are improving and meet consumer expectations. Fragrance is still elusive outside of the *Onc. Sharry Baby*-type, an *Oncidium sotoanum*- (*ornithorhynchum*-) based fragrance. My work incorporating *Onc. schroederianum* as an alternative is still in progress.

What is now known is that fragrance as a pollinator attractor is not a common feature in oncidiums. There are only a few species in which that pollinator attraction is featured. In my breeding history, the genes that enable fragrance in orchid breeding seem recessive or else linked to features that I seem to be selecting away from. In any case, the vast majority of the hundreds of crosses I have made for fragrance have had a complete absence of this trait in the first generation; adding insult to injury, subsequent breeding from this generation has never resulted in fragrance reappearing in later generations.

I have been able to produce clean foliage and fragrant analogs to *Onc. Sharry Baby* but have not been able to meet the market demand for a heavily fragrant, 20-inch (50-cm) plant with bright colors that produces multiple inflorescences. My current interest is to take a key breeding plant that is fragrant, such as *Oncidium Heaven Scent* (*Ruffles* × *Sharry Baby*) (2005) or *Oncidium Sweet Sixteen* (*Ron's Rippling Delight* × *Sharry Baby*) (2005), and convert it to a tetraploid. I would prefer to use the latter plant since it incorporates all preferred sources of fragrance in the oncidiums: *sotoanum*, *leucochilum* and *schroederianum*.

A breeding approach to controlled flowering has been elusive. What has been learned in the past 20 years is that when sufficient starch is formed in an oncidium pseudobulb, then the plant can support flowering

(Blanchard and Runkle 2008). A change is required in the apical meristem (think “stem cells”) with the new development then becoming an inflorescence rather than another pseudobulb. Usually oncidiums can flower twice a year, and the assumption has always been that an environmental factor, either day length or change in temperature, induced this transition. It is now known that regardless of the environmental trigger to sexually reproduce (flower), oncidiums must convert the existing starch in the pseudobulb to a particular form of sugar known as “mannan.” In this flowering mode, the sugar mannose is over 95 percent while glucose, arabinose and galactose together are less than 4 percent (Hsiao et al. 2011). This understanding provides the commercial grower with a clear-cut path forward to control flowering once it is determined how to trigger this conversion. Some research (Chin et al. 2014) shows that prolonged, elevated temperature treatment induces this transition. This technique will not likely be adopted by commercial growers since thermal stress of the plant can be counterproductive. However, the knowledge that the AsA redox ratio is the “master switch” to mediate the phase transition from the vegetative to the reproductive is an important understanding and was the basis for continued research (Chin et al. 2016) that tested exogenous applications (sprays) of various compounds, which did in fact affect the AsA redox ratio and did have an effect on early flowering of oncidiums. So we do seem to be getting closer to the final and most important improvement of oncidiums as modern pot plants: predictable year-round flowering.

Orchids should continue to increase in total production in the world market. From 2000–2015, phalaenopsis increased from 8 to 129 million just in Europe. In 2014 over 22 million phalaenopsis were grown in the United States. Orchids have long since replaced poinsettias, chrysanthemums, roses, begonias, etc. because growers prefer profitability to tradition. Phalaenopsis offer more money per square foot than any other floriculture crop, exceeding \$25 per square foot (929 cm²) per annum. However, in interviews with significant players at the world level, a common thread runs through their predictions of future production trends. Other types of orchids need to catch up with phalaenopsis. Oncidiums, second in production over the last 25 years to phalaenopsis, have been declining in acreage in the European market as

phalaenopsis have reached higher percentages of total production area. Your banker will want to know why you are producing an orchid that yields only \$20 per square foot (929 cm²) (oncidiums), if you can produce another orchid that produces greater income. The logic is inescapable, however: the genetic base is available in many tropical and subtropical genera besides oncidiums to match phalaenopsis programmability. Miltoniopsis and nobile-dendrobiums are currently in demand by growers since they can already approach or match phalaenopsis efficiency. Both growers and consumers demand something new and it is a breeder's dilemma as to how to deliver it.

The predicted demand in the European market for alternative types of orchids to phalaenopsis is 25 percent of the current market, which is to say 35 million plants. Current European oncidium production is estimated to be less than 5 million plants. The lack of programmability is the immediate hurdle. Once this problem is solved, the obvious upside for these producers is that any increase in alternative orchid demand is likely to be accretive in total sales of orchids. It is not likely that demand for phalaenopsis would drop, but begonia growers better be looking over their shoulders!

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— James McCully of Mauna Kea Orchids in Hawaii has been a farmer since 1976. Beginning in the 1980s he saw the future of orchids as the preferred replacement for the potted plants of the day and his entire professional life since then has been focused on providing source material for professional growers. Although the future of plant breeding (as with current taxonomic theory) is no doubt molecular, with specific gene editing allowing for targeted and rapid improvement, he is admittedly deeply mired in his past. He is an empiricist who relies solely on classical plant-breeding techniques, deliberate interbreeding, backcrossing and rigorous selection at all stages.

His operating principal in determining whether to use a plant in the breeding program is, “if I were to stumble across this in nature, does this plant have any single characteristic superior to what I currently have in flower at this time” and if so, game on. He has made thousands of crosses and grown out millions of plants to look back on just a few. None of his current endeavors to improve the cultivars used for oncidium pot plants would be possible without the services of a loyal and talented grower, Leopoldo Ancheta, (Edna's Flame / Paul's Pride) who has worked with McCully since the beginning

(email: jwmcully54@gmail.com).

How I Became Addicted to Odontoglossums

Norbert Dank

Recently, I came across a definition of “Dependency” in the internet. While reading it, I realized that, somehow, this translates well to my addiction to *Odontoglossum*. Several criteria need to be fulfilled to determine whether you are dependent, as for example:

1. A strong wish or compulsory behavior to consume the substance

My self-diagnosis: I have always had a strong wish to be surrounded by my odontoglossums and, when at home, I visit my greenhouse as often as I can, even if there is nothing special to be done – just looking how they are doing and checking for new buds

2. Reduced ability to control the amount consumed

My self-diagnosis: when I go to orchid exhibitions or to visit orchid growers, I always tell myself not to buy any new odontoglossums, but I always end up with new plants

3. Withdrawal symptoms after stopping consumption

My self-diagnosis: when I am separated from my beloved odontoglossums, I am grumpy and bad tempered (my wife can tell)

4. Increasing tolerance for the substance, more substance is needed to achieve the same effect

My self-diagnosis: my greenhouse is always too small and creating more space inevitably leads to the need to have more plants to feel satisfied, and the greenhouse is too crowded again

5. Reduced interest in other activities in favor of consuming the substance

My self-diagnosis: I neglect other activities like family meetings or gardening to spend as much time with my odontoglossums as possible

6. Continuous consumption of substance despite known negative effects

My self-diagnosis: by looking at my bank account, I can confirm that there definitely are some negative effects from my odontoglossum addiction, but yet, I cannot stop the consumption.

Now looking at the result of this checklist, I can see that it is true and I admit to being truly addicted to odontoglossums! So, you may now ask: how could this happen? As a child, I was always interested in plants, whether it would be in my parents’ garden or cultivating plants on my windowsill. When I was 15 years old (and this was in 1980), I had a book about house plants, and under “C” there was a description of *Cattleya* and a picture of some pink and yellow cattleya hybrids. What amazing flowers – very tropical and weird! I had never seen something like this, so I wanted to know more about orchids.

I was thrilled when I then found a book about orchids in the local book store – a book describing the most important genera, where these came from and so on. I read it over and over again and was completely fascinated by this group of plants. The next step was of course to



This is me with *Rossioglossum williamsianum* in June 1981

find an orchid grower in my home town, which was Nürnberg in Bavaria, Germany. Looking through the yellow pages (yes – there was no internet at that time), I found there was one nursery close to where I was living, which advertised orchids. I went there with my mother and grandma, and they sponsored my first two orchids – both *Phalaenopsis* (as recommended by the orchid grower, who found it interesting that a young boy would have a passion for orchids) -- one in pink and one in yellow with red spots. Now I could start growing orchids!

I read a lot and kept a diary in which I described my observations and how I cared for the plants. It was a



Miltonia Goodale Moir “Golden Wonder”

serious business to me. I visited the local orchid grower often (who was also selling other garden plants and pot plants) and began a good relationship with him. At the age of 16, I even worked for two weeks in his nursery during the school holidays and learned about orchid re-potting and earned a bit of money. It was a great experience!!

My next plant would become the cornerstone of my addiction: I saw a plant labelled as “*Miltonia* Golden Wonder” with wonderful flowers in yellow, white and pink. I needed to have one – later I found out that this plant actually was *Miltonia* Goodale Moir “Golden Wonder”. It

was my first love (really!) and I grew it for some time on the windowsill, but the plant was not growing as well as I would have liked it to grow. The next step was that my father kindly offered to build me an indoor conservatory for the windowsill. It

allowed me to grow the plants better with higher humidity and thus more successfully.



Miltassia Aztec

Meanwhile, I was a member of the German Orchid Society (DOG). One article in their magazine, which was another turning point for my interest, was an article by Milton Carpenter, owner of Everglades Orchids. In this article, which was a translation of an English article into German and published in the DOG journal in 1982, there were pictures of *Miltassia* Aztec, *Odontocidium* Big Mac and many other warm-tolerant Oncidiinae hybrids registered by Everglades Orchids. This boosted my interest in *Miltonia*, *Odontonia*, *Miltassia* and other Oncidiinae hybrids. At that time, there were great offers of such hybrids from various orchid nurseries in Germany and, together with the local orchid grower, I ordered several plants. I wanted him to broaden his portfolio of odontoglossum intergenerics, as he was mostly invested in *Cattleya*, *Phalaenopsis* and *Cymbidium* in his greenhouses. I encouraged him to order several oncidinae hybrids as well. I remember that I had received a *Vuylstekeara* Edna ‘Stamperland’ (would I just still have it – it is a great breeding plant), *Odontocidium* Crowborough (same here), and a *Milioniopsis* Lyceana ‘Stamperland’.

Additionally, I had acquired a book about sowing orchids in vitro at home using a pot of boiling water to provide a sterile working environment and sowing media autoclaved in my grandma’s pressure cooker. I was 17 at that time, and my mother helped me a lot during these sowing activities. I received phalaenopsis seed pods from the local orchid grower and sowed these. They germinated!! He got many of them to flower some years later even though the seedlings were small when deflasked. He was really a good grower (considering how small the plantlets were that I produced)!

My other passion started around the same time as my interest in orchids – photography. I always liked to take pictures of plants – during that time, of course, with the good old analogue cameras using real film. Soon, I focused my interest on photographing orchids. What a great thing – I could combine two hobbies! We were going to visit United Kingdom for a family holiday. I was able to convince my parents to stop in Leeds (although my sister was not thrilled by this kind of activity) so I could take some great pictures at Mansell & Hatcher. I bought an *Odontoglossum bictoniensis* ‘alba’ for my windowsill! This visit increased my interest in odontoglossum hybrids – what

a great mix of pictures and patterns on wonderfully shaped flowers arranged on arching spikes.

During my time in the civil service and later while studying biochemistry in Bayreuth, Germany, I had less time to cultivate orchids, so focused more on taking orchid pictures. I used every opportunity to visit orchid nurseries and check for odontoglossum hybrids. I was privileged to visit such wonderful nurseries as Vacherot & Lecoufle in Boissy St. Leger in 1991 and saw some of their famous odontoglossum hybrids. I also visited many German orchid growers and attended many orchid shows in Germany and France. My collection of orchid photographs was growing, and I have pictures of plants which I have not seen in flower over the last 20 years like *Vuyl. Edna 'Stamperland'*. Most of the pictures in my collection were of odontoglossum hybrids.



Vuylstekeara Edna 'Stamperland'

After finishing my studies and PhD thesis, I started working in the pharmaceutical area. My wife and I acquired a little flat in 1998 with an attached small backyard. I had a chance to build a little greenhouse of 10 ft × 13 ft! It was – with considerable help of my father – completed in 2001. What a little paradise for me! Finally, I could grow orchids in an environment that would suit my little treasures.

And treasures there were – *Odontoglossum*, *Odontocidium*, *Adaglossum*, *Gomada*, *Miltonia*, *Rossiglossum*, *Odontoretia*, *Vuylstekeara*, *Oncidium*. But I also had *Encyclia*, *Maxillaria*, and *Cattleya*. As you can see I was not yet completely addicted to odontoglossums, but at least restricted to orchids from Central America and South America.



Burrageara Living Fire

This first greenhouse was well equipped – I even had a high-pressure misting machine to fog my greenhouse during the hot days. The odontoglossums were growing ok, but they did not like the heat and did not flower every year. I had a nice *Odontoglossum harryanum* – what a plant! What flowers – large, perfumed, showy. I wanted more of that type – but before I could do so, there was another big change. I got a new job,

so we moved away from Nürnberg in 2003 and I gave up my greenhouse. Most plants were auctioned on Ebay – a painful process, as my greenhouse was just two years old and I had to give away my little treasures. However, I could not build another one at the place where we lived after our move. I still miss a lot of plants now that I sold – but they would not have survived on the windowsill of my new home in Krefeld (close to Cologne).



Odontoglossum harryanum

During the following 10 years, I suffered from serious withdrawal symptoms – the few plants which I kept faded away one after the other during my time in Krefeld. I am not at all good at cultivating orchids on a windowsill. Very few plants survived – but there was one plant which I loved, as I have had it since I was 15 years old: an *Oncidium ornithorhynchum*,

which I received as a gift. I have it still – it has accompanied me in the last 38 years.

I still visited orchid shows whenever and wherever possible – in Germany and in the USA. My new job



Odontoglossum crispum '#3'

made it necessary to travel to North Carolina one or two times a year, so I visited the Asheville Orchid Exhibition in Charlotte (North Carolina), the Pacific Orchid Exhibition in San Francisco (California) several times, as well as the Miami International

Orchid Exhibition in Miami (Florida). I was still attracted to odontoglossum hybrids – so there was no cure in sight for my dependence on odontoglossums. I also became member of the International Oncidiinae Alliance, which published a newsletter, and started writing articles – another way to satisfy my addiction. Of course, I was writing about Oncidiinae species and hybrids. My first article was about *Ada aurantiaca* hybrids in the International Oncidiinae Alliance Newsletter. I translated this into German, where it became my first article for the German orchid journal of the DOG. This was in 2008 – since then I have written many articles for the journals *Die Orchidee* of the DOG and for the *OrchideenZauber* (another German orchid journal), as well as (starting in 2014) for the American Orchid Society journal, *Orchids*. I had always written only about Oncidiinae – as this is the area which is of great interest to me. So, I could, even without growing

plants, ensure a certain level of feeding my addiction to odontoglossums besides reading a lot about hybrids and writing articles. But at the same time it was painful, as I could not cultivate any plant other than my little *Oncidium ornithorhynchum*.

After 10 years, there was another turning point in our lives – my wife and I bought our own house in 2012, and moved there in 2013. I immediately checked on the option to build my own greenhouse in our backyard. And – it was possible!! Using my knowledge that I had acquired with my first greenhouse and the advice and support from several befriended orchid hobbyists and orchid growers, I designed my 10 ft x 16.5 ft greenhouse to allow me to grow odontoglossum species and hybrids. And started collecting odontoglossums! I also keenly wait for each issue of the IOA Journal, as it gives me so many ideas around *Odontoglossum* species, breeding, and cultivation. So, I relapsed and my odontoglossum dependency gained full traction again. I am steadily increasing the dose (at least I try to) and consuming as much as I can. I think I will soon order more plants to satisfy my addiction. As I could not find a way to cure my addiction, I think I have to live with it for the rest of my life. And you know what? It does not feel wrong and even makes me happy!

Acknowledgement: Thank you to Bob Hamilton and John Leathers for inspiring me to write “my story”. And thank you to Jean Ikeson for editing the article.



New Greenhouse Oct 2014



First plants in my new greenhouse June 2015



Greenhouse January 2018

Hybridizers Notes

Andrew Easton

Oda. Juliana #2 4n (*Oda* Brewii x *Odm nobile*)
Charlesworth 1924

It's always encouraging when you take a punt on a first-blooming seedling and make crosses on it, only to find that the second flowering, even after carrying pods, is superior to the first one. I will confidently predict that this grex will be a great parent in its tetraploid edition. As a diploid registration early last century, Charlesworth crossed it to *Odm. crispum* and then nothing! A particularly appealing parent to me with 50% *Odm. nobile* (*Odm. pescatorei*) and near-



ly 40% *Odm. harryanum* (or maybe *wyattianum*!!). Here we see size, shape and well-defined markings in a very simple hybrid. It opens up all sorts of opportunities to breed a new strain of Vuylstekearas plus some really colorful regular Odontiodas. Some people bemoan the decline in the Odont Alliance while I can only see opportunities stretching forward for the rest of my life and far beyond. True, we need to rejig the product slightly to add in better growability and warmth-tolerance, but these tasks are well along already. Maybe they won't ever grow in Bangkok in my lifetime but Texas, Florida and Queensland are a slam dunk!

Odm. bictoniense 'sulphureum' ×
Odm. candidulum album

Have you ever seen a pot-plant type orchid that says "buy me" better than this little number? It is now blooming a second time in a 4" pot since last July. Carrying one pod from then and three more made this month. Not an alba which of course doesn't surprise me at all as *Odm. bictoniense* 'sulphureum' has never yet produced any alba offspring for me in any com-



ination at all! We will certainly treat any seedlings we get with Oryzalin as I think this type of product is mana to Floricultura. You have to be careful when you use *Odm. bictoniense*. Firstly, the *Odm. bictoniense* 'album' has brown segments with only a white lip. And all *bictoniense* progeny can get dirty foliage in slightly cooler Odont environments. Now I have no idea what *Odm. candidulum* will add or subtract to the mix but it's going to be fun to see just where this line may lead us.

Vuyl. Insignis (Lambeau) 1914

Once again, we have those horse's asses at Kew to thank for a massive confusion in the nomenclature. There are at least three *Insignis* odonts thanks to their inept consolidations. But this one, *Mps. Bleuana* × *Oda. Charlesworthii*, will really set some fires in future Odont Alliance hybridizing. One smart step leads to another.... a few years ago, I remade *Mps. Bleuana* in its alba iteration and took the pod to Bob Hamilton



for Oryzalin treatment. Now we have literally several hundred mature plants with a goodly percentage of oryzalin-induced tetraploid conversions. Bob took one of the 4n alba *Mps. Bleuanas* and crossed it to his *Oda. Charlesworthii* 4n thus remaking *Vuyls. Insignis* in a tetraploid version. Talk about an invaluable parent! The original edition went absolutely nowhere, probably fertility issues and so this tetraploid version is set for prime time and in an even greater stroke of good fortune, it will be carrying alba genes so we can expect some alba *Vuylstekearas* in the next generation. It has long been my ambition to breed alba *Vuylstekearas* and the race is now on!

(*Odm. Roy Wittwer* 6n ×

Odm. Splendidum 2n) '#1' 4n

A most interesting Bob Hamilton cross, the Roy Wittwer had *Odm. Jim Mintsiveris* crossed to a *Odm. Venilia* which was diploid. Here we see a hybrid where *Odm. crispum* was overshadowed 2:1 by *Odm. nobile* (*Odm. pescatorei*) and then a substantial level of *Odm. cirrhosum* added through the diploid *Venilia*. We crossed the *Odm Splendidum* (*Odm. Ardentissimum* × *Odm. nobile*) diploid with the 6n Roy Wittwer and got a rather surprising result. OK, the segments lost a bit of their bold markings, but the



white lip appeared out of nowhere and the size is quite amazing, more than 5" diameter on a first bloom. The whole cross are extremely strong growers and carry tall, branched inflorescences. I've decided to at least try and make one *Odontonia* from it and may also work on a *Vuylstekeara* if the right parent opens in the next week or two. Getting back close to species' vigor is always a wise option in Odont hybridizing!

Odm. Rolfeae 'White Knight' 4n

This primary hybrid between *Odm. harryanum* and *Odm. nobile* (*Odm. pescatorei*) has been a foundational influence in the Odontoglossum hybrid line. Only recently has Bob Hamilton's tetraploid version been seen widely. And they vary greatly in quality too, mainly keeping quality. Some are significantly short-lived which belies their overall plastic-like substance. The shown flower is one of the best both for



flower longevity and keeping. You can see that it has the main inflorescence carrying 11 large flowers while it also has a significant branch as well. I will also add in a picture of another particularly well-shaped selection, *Odm. Rolfeae* 'South Coast' 4n. One of the exciting avenues that Colomborquideas is pursuing is the creation of green Odonts. There is a significant greenness in some Rolfeae selections and we hope to intensify green in the next couple of generations by exploiting things like *Maclellanara* Serenade and some of the greenish alba Odont lines in a two-step developmental process. Never a dull moment hybridizing here!

Odm. Robert Strauss × *Odm. nobile* (*pescatorei*) 4n

What an intriguing flower with a particularly interesting back-story! First the genetics..... the registration is an old one for *Odm. Robert Strauss*, Charlesworth, 1947. I was barely a twinkle in my parent's eyes at that time! But it is a hybrid dominated by just the two species, *Odm. crispum* and *Odm. nobile* (*pescatorei*) with a big unknown component furnished predominantly by the fabled *Odm* Georgius Rex. Really the line has survived and thrived through just one epic breeder, *Odm. Stropheon*, a hybrid between Robert Strauss and *Odm. Opheon*. This flower has all the color aspects of Stropheon with the added usefulness of regular tetraploidy. This plant must be a potentially very useful parent both in traditional and modern



26 flowers ~80mm spread, 110cm branching spike

innovative warmer-growing Odont Alliance breeding avenues. With this group, a line seven-decades old in character can bounce forward today with absolutely top-level hybrids!

Sometimes it is a back-story that really spices things up. Thankfully I never met Mr. Strauss though our lives did intersect. By the early 1970's he was infirm and all my interactions with Stonehurst Orchid Nursery were through Bert White, the head orchid grower. Stonehurst, at Ardingly in Sussex was particularly famous for its rhododendrons with orchids coming in second. Strauss was of course appointed by the RHS as a judge of both families, the RHS has a long tradition of sucking up to landed gentry! It was said, probably accurately, that Bert White never sat in Strauss' presence! When orchids from Stonehurst were to be sent up to London for RHS judging, Strauss would plop his fat ass in a First Class train seat while Bert White struggled with the boxed plants in the Second Class carriage. Bert White was a very talented man, one of the first to successfully figure out Cymbidium cloning and also a talented hybridizer, particularly of Odonts. Strauss took all the credit but in reality, was just a figurehead. Eric Young loved a bit of orchid gossip and his comments on Strauss were legendary. He hated the man! In Eric's words, he was "an obnoxious, fat, homosexual with a sullen demeanor and large, unattractive purple lips". Wow, how's that for a total put-down? Now Eric was gay too, so obviously his dislike for Strauss was rooted in a deeper distrust and the feeling that Strauss was essentially riding on the skills of his key horticulturalists. Of course, inevitably Strauss croaked. Apparently, there is some weird English tradition that the key servants receive free title to their small home when the big cheese dies. Partial recompense for a life of low wages and semi-serfdom. In the Strauss will however, that did not happen so Bert White and his more feisty wife, Mitzi White, were turfed out and had to rent a house nearby in their declining years. Mitzi was furious (Bert never raised a squeak) and gave Strauss a serve any time she had the opportunity! Of course, he left no direct heirs. The Rhododendrons are apparently still flourishing but the orchids are lost in the mists of time. I am rather glad our paths never crossed. Orchids are often most interesting in ancillary aspects!

Odm. crispum 'Peter'

Andrew Easton

I am so sick of seeing hybrids passed off as the species *Odm. crispum* and so it is perfectly reasonable for readers to look askance at this little beauty. But it more than passes the authenticity test being the product of two jungle-collected *Odm. crispums* that Peter Wullner sib-crossed and flaked for distribution. Peter has been at the forefront of conserving Colombian Odonts and restoring treasures like *Odm. nevadense* to cultivation. He is German in his



dedication and precision but very Colombian in his love of the Colombian species. These plants are just coming into bloom and this is the second to flower at Colomborquideas. They both are very similar. Now many of us were resigned to seeing these just in color plates of books from the 19th Century but some hitherto inaccessible areas have opened up in Colombia during the past decade and collectors are finding plants like this in rare instances. The challenge is of course to conserve by propagation and these efforts are well in motion with the added impetus of a little ploidy conversion as an added bonus!

Orchid Chromosome Doubling

Robert Hamilton

This narrative serves as an introduction to my protocol for doubling the chromosome numbers of orchids using the antimetabolic herbicide Surflan whose active ingredient is Oryzalin. The term “antimetabolic” refers to interrupting normal cell division. Timed exposures of orchid protocorms in vitro results in doubling an orchid’s normal complement of chromosomes.

The artificial doubling of orchid chromosomes has visible and invisible effects; the invisible ones are easy to overlook. The conspicuous changes follow the axiom “bigger is better”. Doubling a plant’s chromosomes, i.e. its ploidy usually increases a plant’s size, the thickness of its parts, the diameter and sphericity of its flowers and usually intensifies colors. The downside of doubling up the chromosome is it often reduces flower count and doubled-up plants, depending on genera, can be slow growers. The good news for the Oncidinae is doubled-up plants generally grow faster with seedlings easier to grow.



Odm.nobile 4n

The invisible or hidden values of doubling chromosome numbers are increased fertility, particularly for intergenerics and a duplicate set of chromosomes which mirror the originals. Doubling also provides the ability to manipulate the ratio of a parent. An example is a tetraploid (4n) *Odontoglossum crispum*

crossed to a normal, diploid *Cochlioda noezliana* (2n) does not produce the same results as crossing a diploid *Odm crispum* with a diploid *C. noezliana*. (Note, the normal complement of most plant’s is designated as 2n meaning they have a chromosome set from their male parent and a chromosome set from their female parent. We humans are 2n and any deviation from this number causes severe problems; however, plants do not behave the same way.



Milt phalaenopsis 'John Leathers' AM/RHS 4n

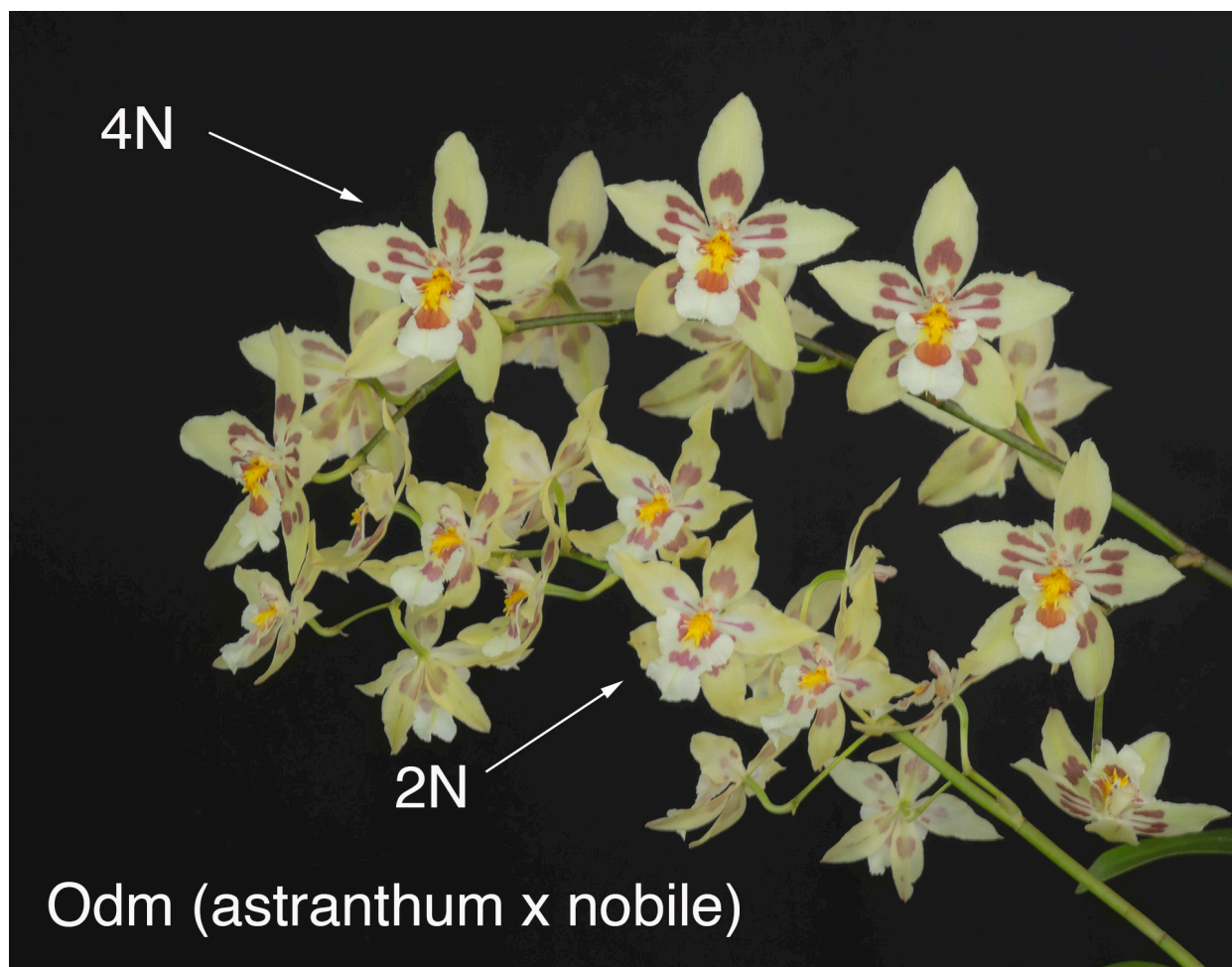
In terms of breeding, the sex cells produced from a doubled-up plant, which is to say its gametes, (pollinia being male and ovules being the female gametes), all will have identical traits, i.e. be homozygous. Such artificially doubled-up plants have great value in breeding. Japanese and Hawaiian growers were pioneers in using such plants; quick to capitalize on this effect. I will not further elaborate on breeding using artificially doubled-up plants; there are others more qualified to do so. In this edition of our IOA Journal appears a reprint of an article, originally published in *The Orchid Digest*, by Professor of Genetics Henry M. Wallbrunn, Ph.D. in which he elaborates on various aspects of breeding using doubled-up plants. Prof Wallbrunn was well-known all over the world for his orchid hybrids.

The appended technique evolved from my earlier work with the alkaloid, colchicine. The use of colchicine is an established, tried and true method of doubling plant chromosomes. Colchicine has some issues, the most obvious is it is highly toxic to humans. This was never much of a concern for me as in my professional career I routinely worked with chemicals and gases far more toxic than colchicine. The biggest obstacle for me was getting the stuff. Because of product liability issues and illicit drug, manufacturing chemical suppliers are reticent to sell to someone without significant laboratory credentials.

Shortly before the end of the 20th Century I began to read about other antimitotics being used to double up plants. The famed orchidist and African plant expert Harold Koopowitz, currently Professor of Ecology at the University of California at Irvine, proposed the use of an ingredient in the herbicide Surflan, (oryzalin) for chromosome doubling of daffodils. This led me to explore the work of Dutch lily growers who used oryzalin to double up lilies. In applying Dutch

techniques, I quickly learned the obvious, orchids are not lilies. The rate of cell division (mitosis) in orchids is much lower than in lilies. I had to modify lily protocols to suit orchids. For reference, the term that describes the rate cells divide is called the “mitotic index”. Most orchids have a low mitotic index relative to other plant families. The advantages of working out a doubling protocol using oryzalin was its easy availability in the form of the herbicide Surflan, Surflan’s low mammalian toxicity, short lifetime in the environment and chemical stability. I have found it equally as effective as colchicine. There are other antimitotic pre-emergent herbicides being used to double plant chromosome numbers. I am aware of Amiprophos-methyl (APM) of trifluralin; however, I have not experimented with these agents.

I look forward to sharing my results in a future IOA Journal and invite input from other growers who have experience in the field of orchid chromosome doubling.



Odm. (astranthum x nobile 4n and 2n)

More photos of 2n vs 4n



Odontoglossum halli 4n and 2n



Masdevallia coccinea 4n and 2n

A Protocol for the use of Oryzalin to Double Orchid Chromosomes

Robert Hamilton

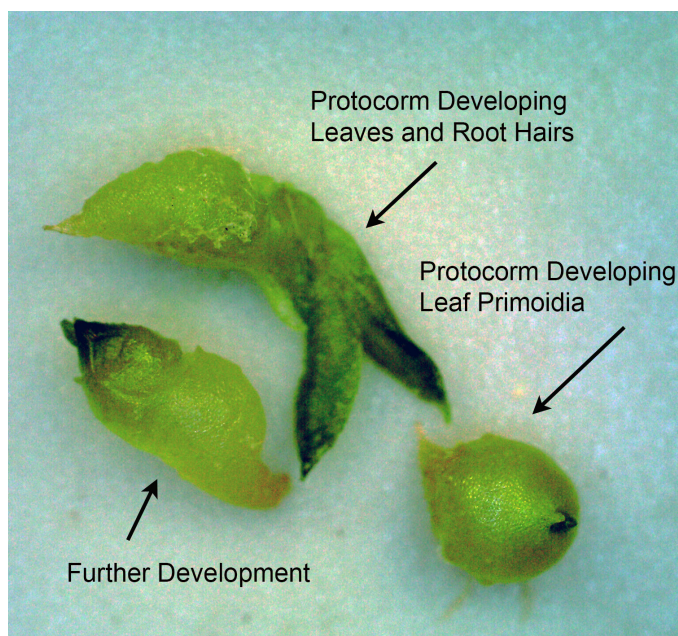
The following steps outline the use of the herbicide Surflan (40.4% oryzalin, balance glycerides) to double the chromosome numbers of orchid plants. The room temperature solubility of oryzalin in water is ~ 2.5 mg/liter which results in a sufficient concentration for effective orchid doubling. Oryzalin's low solubility simplifies using this chemical as a saturated solution is ideal for the effort. The preemergent herbicide Surflan is considered one of the more environmentally safe herbicides.



Oryzalin

- 1) Add ~5-6 ml of Surflan to one liter of distilled water. This amount will exceed at room temperature the solubility of its active ingredient, oryzalin. Oryzalin is a vivid orange chemical giving Surflan its vivid orange color. Surflan is also a viscous liquid.

- 2) Autoclave the solution at 15 psi (103.5 kPa) for 30 minutes. I preheat the solution to ~90C before placing its container in a pressure cooker to assure the solution reaches the 121 C of an autoclave at 15 psi in a reasonable amount of time and remains at that temperature for the duration of the sterilization cycle.
- 3) Allow the solution to cool to room temperature being careful not to agitate the container. Within a few days a precipitate will form at the bottom of the container. This is because the solution's content of oryzalin exceeds its room temperature solubility. Be careful not to agitate the solution. It is important not to disturb the precipitate. This becomes the stock liquid. When the bottle becomes about ½ used add more water and re-autoclave. I find I can do this 2-3 times before all of the Surflan is dissolved.
- 4) Store the sterile solution in an amber colored bottle to prevent disassociation from ultra-violet (UV) light. Oryzalin is UV sensitive. I wrap the area of the bottle cap with aluminum foil to keep the area sterile.



All three of these plantlets are from the same cross, "mother" flask and stage of development. This is the stage I typically select for immersion with oryzalin. I cannot say which stage is best to treat since plantlets get treated en masse, spread on new media, grow on and then get visually sorted and selected for the final replant.

- 5) Select a “mother” bottle of germinated orchid embryos at the proper stage of development, i.e. protocorms which have developed into small spheres, typically 2-4 mm in diameter for Oncidinae, and which have begun to show the emergence of a leaf primordia, i.e. a small “tit”. The leaf primordia is the most active growing part of a protocorm. The primordia has a high mitotic index.
- 6) Carefully pour precipitate-free oryzalin solution into the mother bottle adding enough volume to approximately equal the volume of germination media, i.e. if the germination media is ~1 cm in height add enough liquid for a total of ~2 cm height. Note: within 24 hours the salts and sugars of the germination media will equilibrate with the Surflan solution.
- 7) Expose the protocorms from 8 - 16 days. The effectiveness of exposure seems to vary with the cross and the protocorm stage of development. It is difficult to state an optimum exposure time of conversion versus mortality. Longer exposure increases conversion rates; however, it also increases mortality. I have treated different crosses for the same durations with virtually no kill of one (*Odm. naiveum* × *Coch. noezliana* v. *xanthina*) and complete kill for the other (*Odm. wyattianum*) (16 days). I recommend 10-12 days.
- 8) Carefully sterilize the outer area of the mother bottle and its lip before tilting and decanting the exposed protocorms into a sieve. I use a tea strainer perched on top of a beaker to capture the protocorms. Be careful not to tip so far as to spill out the mother media. The reason for sterilizing the lip of the container is the invariable “roll back” of liquid from the outside of the container that can introduce contamination.
- 9) Rinse the protocorms with ~ 100 ml of sterile water.
- 10) Transfer them to a container with replate media.

The recovery time from exposure can vary from weeks to months. After a subsequent growing period from this “spread” select plants for the final replate. I empty plants ready for final replates into a sterile stainless-steel pie container and search for plants that have obvious tetraploid (4n) morphology, i.e. thicker



Replating seedlings

roots and leaves, leaves that end in an obtuse rather than acute point. I discard a lot of material as I do this.

When I am asked about my conversion rate, I point out that my final replates are done from plants visually selected as probable 4n’s. Because of this selective replating it is difficult to estimate a conversion rate. I can say the final yield rate is 25 – 50% are converted plants. I add the caveat that one never really knows the ploidy of a plant unless they count its chromosome numbers. However, an experienced grower can do a fare job of identifying the likely 4n’s.

Over the decades I have treated many orchid families, first using colchicine and now the above protocol. These include ada, cattleya, cochlioda, coelogyne, cymbidium, dendrobium, dracula, laelia, lycaste, masdevallia, maxillaria, Neocogniauxia hexaptera, odontoglossum and oncidium. I plan to continue using the above methods. My email is roberthamilton@berkeley.edu. I am available by email for those who have further information or questions.

Robert Hamilton

The Art and Science of Orchid Hybridizing

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At the outset I feel that the distinction that I make between art and science should be clarified. It is sometimes said that the practice of medicine in the past was an art and that today, in part at least, it is a science. What we mean is that at first it was largely intuitive but it is now based on a reasoned way of proceeding. The important connection between the two is that after a successful intuitive approach to a problem, which we call an artistic solution, careful study often reveals a logical reason for the result. This has become science; what is more, similar problems and their solution are no longer designated art because they cannot be said to have been solved intuitively.

A trend in orchid breeding is the unrestrained attempts to produce larger and larger flowers with wider and wider segments. It can be argued that closing the gap between a petal and the dorsal sepal is aesthetically pleasing and a laudable goal. But it can just as easily be argued that when the 2 petals overlap one another with the consequent disappearance of the dorsal sepal, the cause of beauty has not been served. This, however, is unusual and difficult to produce. Everyone following trends in orchid breeding knows that these monsters are more likely to win awards and therefore bring higher prices than their more beautiful ancestors or siblings. Consequently the hybridizer's goal is to produce still more monstrous and therefore commercially rewarding crosses.

In science we distinguish between goal-oriented or practical research and what we call basic research. A breeding program initiated with a particular end in view is an example of practical research. This may result in the very achievement that was desired and it often is a fairly direct and relatively short pathway. On the other hand, the goal may be unattainable with any rational breeding program and in this case a long and arduous pathway leads only to frustration or self-deception. The case I have in mind is that of trying to produce blue cattleyas.

I suppose that the blue one would want is of the nature of a *Zygopetalum* or *Rhynchostylis coelestis* lip color. Some who have embarked on this quest point to the grey-blue flowers that have been produced and proclaim success or at least partial success. Above I referred to this as self-deception. Others have been realistic and called it a frustrating failure.

It may be that the clear blue that is desired is unattainable in the genera *Cattleya*, *Laelia* and *Sophronitis* or any combinations thereof without one or perhaps several new mutations. Now, some mutations are certainly not impossible, but no long-term breeding program should be based on a mutation that has not yet occurred.

Mutations are not uncommon since each cell has many genes so that perhaps 5 or 10% of the cells will have its own new mutation. But we are looking for a particular change at a particular locus or maybe worse, several mutations at several specific loci. In this situation the probability is that of finding the proverbial needle in the haystack.

The genus *Epidendrum* including *Encyclia* is so large that I cannot say for certain that the true blue is not to be found therein. (Perhaps *E. schumannianum* will do.) If the blue is found and can be used to make an F_1 , with a large *Cattleya* or *Brassocattleya* there may be a methodical way of achieving the desired result although it would take several more generations. Because of anticipated sterility of the F_1 , shortly after the F_1 seeds have produced protocorms, they should be treated with colchicine to double the chromosomes, thereby assuring pairing partners for a normal meiosis. The generations that follow, although time consuming, are fairly obvious.

With the new technique of genetic engineering or somatic cell hybridization, genes or sections of chromosomes from an unrelated species or hybrid such as a *Zygopetalum* or *Ascocenda* might be incorporated into a *Cattleya*, but that is something for the future. Even that might not give a clear blue unless certain genes already in the *Cattleya* are eliminated. Obviously prior to any such attempt, careful analyses of the pigments, pigment precursors, inhibitors, and pH of variously colored forms must be obtained so that we know what we have, what we need, and how we change from one to the other.

The advantage of basic research, as compared with applied, is that it has greater potential because it often leads in unexpected or serendipitous directions besides acting as a basis for applied research. Examples in orchid hybridizing of this dichotomy are given by deciding to produce a large yellow *Phalaenopsis* rather than making a cross of small-flowered, highly colored species to other small or large forms, then inbreeding to find out what will develop and letting the results give both information and determine the new direction or directions for the next round of hybridizing.

The inbreeding of the first generation can be back-crossing or producing an F_2 . Both are regularly used in most genetic research and even in practical plant and animal breeding but they have been largely avoided by orchid breeders (Lenz & Wimber, 1959). Often the reason for eschewing the techniques that have been invaluable elsewhere is that inbreeding leads to inferior forms or a depression in vigor. Undoubtedly individual seedlings may be poor but in the long run for every inferior specimen there is one that is superior. If one is content with a large number of mediocre or intermediate progeny then one should refrain from inbreeding, but if one is willing to discard a number of undesirable specimens in order to obtain some which are much better and with new complexes of traits unavailable by any other means, then self the F_1 and cross one's fingers.

Actually a distinction should be made at this time between a simple back-cross of the F_1 to one of the parent species or varieties and the true inbreeding of the F_1 to a parent clone. The same is true of selfing an F_1 rather than sib-mating although the latter may be all that is available if self-sterility turns up. If we are merely trying to recover some trait such as alba that is lost in the F_1 , crossing back to any of the parent strain should be enough to accomplish this. What is more, any inbreeding depression in vigor will, in general, be avoided. But we may unfortunately be throwing away some potentially desirable traits that have never been given a chance to make themselves known because they are dependent upon homozygosity of recessive alleles that have mutated within the last few generations and have not yet spread in the population. In order to take advantage of this potential that is hidden away in recessives, actual selfing or crossing back to the parent clone is necessary. Of course, the F_2 rather than a back-cross gives a chance for making recessives from both parents become homozygous; it does not, however, increase the probability of finding new homozygotes. This is due to the fact that any particular new recessive in either parent has a probability of only one half of being in the F_1 . All of this discussion is based on diploids. If tetraploids are involved, the problem becomes considerably more complicated not just because of more genes that could have mutated and more ways of segregating but also different degrees of dominance with various doses of alleles.

Before proceeding to other aspects of inbreeding, however, some evidence should be presented to show that selfing or back-crossing generation after generation does not necessarily lead to depression of vigor or deterioration of desirable traits. The long continued inbreeding of *Phal. sanderana* started off by Burgeff is a famous example of long continued upgrading leading eventually to superior clones, at least one of which in the seventh generation received an F.C.C. In *Cymbidium*, because of the very few tetraploids in the early days, *C. Alexanderi* 'Westonbirt' F.C.C. was both selfed and used for back-crossing over and over. In both cases flowers far superior to the original developed. Also, *P. Hellas* 'Westonbirt' F.C.C. was selfed and this produced better clones than the awarded parent.

There have been innumerable cases in which flowers with different desirable traits are crossed where the F_1 turns out to have neither of those for which the parent were chosen, and it is summarily discarded. This is

hybridizing entirely according to phenotype without regard for the genotype and its potential. Certainly an F_2 should be made if the original goal was worthy of raising an F_1 . So that this will not seem pure fantasy let me give a recent concrete example, although in this case the desired trait was the same in the 2 parent species. *Paphiopedilum fairrieanum* 'alba' was crossed to *P. bellatulum* 'alba' in the expectation of producing a very desirable 'alba' *P. Iona*. Since a typical colored form of *Iona* developed instead this was considered a failure and the end of the breeding program. From the above information it is obvious that one of the parents was a C alba and the other an R alba. (Wallbrunn, 1984). This means that *P. Iona* was doubly heterozygous since there is little doubt that the parents and F_1 were diploids. Inbreeding the F_1 should have given an F_2 of which 7/16 or almost 1/2 would be expected to be alba. Of course the forms of the second generation *P. Iona* would be quite variable but that gives more choices which I assume is a desirable situation. If the F_1 had been back-crossed to either alba parent, one half of the progeny should have no anthocyanin. The F_1 was never used for either type of inbreeding. The same type of missed opportunity occurred some years ago when *Laelia purpurata* 'Werkhauseri' was used, in the hopes of obtaining blue-purple labella in the *Cattleya* hybrids.

Sometimes the biochemistries that lead to the 2 desirable traits in the two parent forms are mutually exclusive so that the combination of traits in the hybrid is not possible. From such a commercial failure we have at least learned something about their breeding characteristics that may be useful for future work. Sometimes, however, the very combination that was originally being sought and not found in the first generation turns up in some small fraction in the second. How small the fraction is depends upon the following:—the number of segregating allele pairs or sets of 4 in tetraploids; whether or not loci are linked, and if linked, the distance apart on the chromosome; the amount of synapsis if the parent species' chromosomes have diverged during evolution: the ploidy, and if polyploid the distance of the loci from the centromere; too many variables to be determined by one datum, i.e. the size of the fraction. But along with other information such as a chromosome count this can be whittled away.

Let us return to those early attempts to produce a large round yellow *Phalaenopsis*. One parent had to be a large, well-formed white, a tetraploid. The larger the white the better since it had to be mated to a small species and this invariably drastically decreases the size of the offspring. The first 2 small species used were *P. mannii* and a yellow *P. lueddemanniana*.

The yellows obtained from *P. mannii* were hailed as a great achievement but by today's standards they are poor in color and shape. Worse yet, they held little hope for further development, being triploids with almost complete sterility. With the recent development of a polyploid *P. mannii* through the use of colchicine, the sterility problem should be overcome. I now have seedlings of a tetraploid white crossed to the polyploid *P. mannii*. How this will affect color and segment shape will be most interesting. Usually as the ploidy increases so does the width of petals. But in this case we are adding a set of chromosomes that make for very narrow petals.

The polyploid *P. mannii*, whose chromosomes have not been counted for fear of losing the plant upon cutting the few good roots, has a very fine form as compared with a normal diploid *P. mannii*. This, however, is very different from a comparison of it with the overlapping petals of the whites now available.

If the polyploid *P. mannii* is a tetraploid and if the width of petals of the hybrids follows the rules of calculating quantitative traits by using the geometric mean of the parents' measurements (Mehlquist 1946, 1974), this F_1 tetraploid will actually have a somewhat poorer form than the original triploid *P. mannii* hybrids but the sterility problem will have been overcome.

If we are merely trying to get a fine yellow color then the early attempts ought to be forgotten since by using *P. fasciata* that goal has been achieved a few times. There are, however, various yellows from other species, each somewhat different, and with other traits that make them all worth using, although not always with large whites for the other parent.

Some forms of *P. cornu-cervi* have excellent color but it is with other members of the *Stauroglottis* subgenus that this is best utilized. *P. venosa*, *P. fuscata*, *P. cochlearis*, *P. amboinensis* all have potential, but once again the choice of the second parent is very important if one is not to conclude that these are no value (Compare with Moir & Moir 1980 p. 49). One must not believe that traits, even if they seem to come from one parent, are not also dependent on what the other parent contributes.

Both *P. cornu-cervi* and *P. cochlearis* when crossed to large whites give washed-out, poor flowers. Since *P. sumatrana*, for example, crossed to the same whites will produce superior hybrids, the common belief has been that *P. cornu-cervi* and *P. cochlearis* have nothing to offer the hybridizer. *P. cochlearis* × *amboinensis* is superior to either parent and *P. cornu-cervi* crossed to *P. sumatrana*, *P. Samba*, and *P. mariae* have all been excellent.

The important principle that I am trying to establish is that traits as such are not necessarily passed on from parent to offspring. It is genes, not traits that are parts of chromosomes. We can follow a gene from one generation to the next but the phenotypes are the results of interactions of many genes and the environment. We can usually rule out consideration of the environment's contribution because we keep it constant, but as we produce new gene combinations we are often astonished and delighted by entirely new traits. In this case the hybridizer is considered an artist.

If the new gene combination results in something undesirable the hybridizer really has 2 choices, one is to follow Brahm's example of discarding work that he did not feel was up to his standards and the other is to carefully analyze and describe the results so that others may avoid making the same type of poor flowers and so that the mechanism leading to undesirable traits can be understood. The former choice is that of an artist; the latter a scientist.

Let us look at several of these unexpected gene interactions. Many years ago I crossed *V. cristata* to *P. Dos Pueblos* and produced *Vandaenopsis* Mem. Mari Decosta. *V. cristata* has longitudinal maroon lines on a light background-color in the labellum. *P. Dos Pueblos* has a typical white lip with a few tiny dark red marks. The hybrid much to my amazement had a large solid maroon lip. No one could have predicted that the lines would be replaced by a solid color that extended part-way on to the underside of the lip.

If we had known exactly how the various genes controlling pigment production and distribution function, and this includes the promoters, operators, and repressors, we might have been able to predict the outcome of this cross. When we have learnt that much, production of such a spectacular hybrid will be commonplace and the term artist will no longer be applicable to the breeder.

The point is, of course, that with enough basic knowledge, prediction is child's play but obtaining the necessary information and analyzing it is very difficult and time consuming and we are far from having completed this task for most genes in most organisms. There are, however, a few logical procedures that lead to an occasional unexpected but gratifying result and these are the ones that I have been using and that I want to present at this time.

The hybrid between *P. fuscata* and *P. violacea* is a deep rhubarb color with segments somewhat curled along their long axes. This is *P. Bee Ridge*. I crossed this back to *P. violacea* and was astonished by the great range of phenotypes in the offspring. Many of the clones had what is generally considered a better form than any parent or grandparent but the most striking trait was the pure green in the first seedling to flower. Because of this color, I named the hybrid *P. Bornean Emerald*. A second one has flowered with this same green. Of course the Bornean form of *P. violacea* has green in the distal part of sepals and petals but it is nowhere near as intense and it is not found in the basal part of these segments.

Inserting genes from one species to the background genome of another species is what Edgar Anderson called introgressive hybridization which is also the title of his short book (Anderson, 1949) on the subject. To accomplish this transfer of a few genes into a different genome requires repeated back-crosses but the

case above and the 2 to follow are examples of only the start of this series of crosses. Anderson was looking at the process from the other end of the series. That is, he found traits from one species in populations of another closely related species and realized that they had been displaced by hybridization and repeated back-crosses. Had a trait been so different from those of either original parent he wouldn't have discovered its origin. In the above case, the very green *P. Bornean Emerald* would have looked like a mutant *P. violacea* since it greatly resembles that species but no one would have been able to guess that rather than a mutation, the incorporation of some genetic material from the poorly shaped yellow and brown *P. fuscata* had generated the change.

P. Princess Kaiulani is the hybrid first made and named by Oscar Kirsch, of *P. violacea* and *P. amboinensis*. When this is crossed back to *P. violacea* it makes the very variable *P. Princess Violet*. A look at a few of these confirms the assertion that gene combinations give traits outside of the range of the 2 parent species. One of the first of this cross to flower is shaped very much like a Bornean *P. violacea* but the purple is not only darker than that of the species but it covers the sepals, thus it is much more widespread than that found in even the Malayan form of *P. violacea* which in turn is much greater than that in the Bornean form that happened to be the actual parent.

Perhaps at the other extreme is the very light *P. Princess Violet 'Lace'* which from a distance looks like a very much improved Bornean *P. violacea*. The form is excellent and this might be traced back to the *P. amboinensis* grandparent. Closer examination shows that the purple area is made up of many small dashed lines of color. This design is not to be found in either species or the hybrid in its background.

One last example of the variability in back-cross progeny that exceeds the extremes in the 2 original species is found in *P. Frank McClain*, which is *P. Amblearis* × *P. amboinensis*. At one extreme is an overall mahogany flower that has a waxy sheen. Neither parent is shiny and although *P. cochlearis* is almost all one color, it is a washed-out yellowish. *P. amboinensis* has large dark blotches but the color is certainly not solid.

What I am advocating, therefore, is backcrossing F_1 hybrids to parents and perhaps second and third generation backcrosses, as well as selfing the F_1 . This system was used extensively with *V. sanderana* and its first generation hybrids. That was done not in the hope of finding new traits but rather in the hope of regaining the very fine form and size already to be found in *V. sanderiana* with perhaps a few other colors that came from the other species. Elsewhere in orchid hybridizing repeated back crossing and selfing has been sparingly used.

The more genetically dissimilar 2 parents of a hybrid are, the more infertile that hybrid is expected to be; but the progeny of such a hybrid are less variable as the parents of the hybrid are more different. At first sight this seems to contradict common sense. The more difficult it is for chromosomes to synapse in the hybrid, the fewer viable spores will be produced. This means that only certain combinations of chromosomes are going to survive and as that number decreases so does the variability of the survivors.

Perhaps the most extreme example of this lack of variability in the progeny of a hybrid whose parents were genetically poles apart is given by the various sibships traceable to *Ascps*. Irene Dobkin 'Rayna' A.M. as the female parent (Wallbrunn, 1981). *A. Irene Dobkin* is the triploid offspring of a tetraploid white *Phalaenopsis* and a diploid *Ascocentrum miniatum*. Crossing it to *P. Dos Pueblos* produced *A. Reyna Wallbrunn*, over 20 plants of which have flowered and revealed great uniformity in color, size and shape. The same is true for the 5 plants of *A. Feetz Cornwell*, which is *A. Irene Dobkin* × *P. lueddemanniana*. It is also true for plants of *Beardara Henry Wallbrunn*, the hybrid of *A. Irene Dobkin* and *Doritis pulcherrima*. Just compare this uniformity within siblings with the overwhelming variability in those backcrosses that I have been citing.

If there is some degree of infertility in primary hybrids and a back-cross is desired, it usually is more successful when the species rather than the hybrid is the pollen parent since the tube nucleus that controls synthesis and growth of the pollen tube has a normal haploid set of chromosomes whereas the F_1 pollen

may have a nucleus that has chromosome deficiencies or duplications that interfere with synthesis of certain substances.

When this cannot be accomplished because the chromosomes from the two parents will not synapse properly; the only way around this difficulty is to double the chromosomes by using colchicine or a similar drug. Unfortunately, the chemical treatment should be given to protocorms and we find out about the sterility only after the seedling has flowered. If the F_2 is desirable enough the simplest way I see is to start the original cross over again and treat the F_1 protocorms. This sets one back anywhere from 3 to 5 years, but it is better than abandoning a very promising direction and the F_1 plants that develop may in themselves be far superior to those obtained the first time with no treatment.

Almost all the genetics that most learn in school or that has been written about orchids is Mendelian in nature and that is due to the fact that it is orderly and predictable because of the marvelous precision that characterizes meiosis. This orderly aspect of the process that eventually leads to gametes made it possible for Mendel and his successors to devise laws of inheritance that are simple and that predict the frequencies of various kinds of offspring with great accuracy.

It is interesting to learn that many other scientists of Mendel's day were also attempting to discover the laws of heredity and they all failed. Their failures and Mendel's success were the results of the difference in the plants they are crossing. Mendel used different forms of one species and most of the others were crossing different species. Usually crosses of different species lead to sterility of the F_1 so the laws that Mendel found from the second generation (F_2) could not be obtained when the F_1 had no offspring. What is more, crosses between species commonly lead to an intermediate between the 2 parent species whereas often crosses between different forms of one species exhibit dominance, that is, the F_1 will be similar to one parent with respect to certain traits and perhaps the other parent concerning other traits but there may be no intermediacy. Since the prevailing idea of inheritance was that of blending of parental traits, an F_1 that was intermediate seemed to uphold this ancient belief, and with no F_2 available, it could not be shown to be false.

However, today we are often crossing different species, rather than using different forms of one species as Mendel did and so have a much greater array of possible results than simple Mendelian genetics would lead us to expect.

If we cross 2 forms of the same species, simple Mendelian laws including those related to linkage may apply very nicely. The frequencies are somewhat different if tetraploids rather than diploids are involved but that is not difficult to understand and the proper calculations to predict frequencies can be made. Even when different species are used, Mendelian laws may apply if the 2 species have not diverged in their evolution. In some cases another taxonomist might even call them 2 subspecies of the same species. This is the case with different labiate cattleyas.

However, when 2 species have diverged to the point that some of their chromosomes will not synapse properly in the hybrid they produce, what viable gametes may develop are in no way constrained to follow the Mendelian arithmetic.

In an autotetraploid with a pair of alleles that exhibit complete dominance-recessive behavior, the fractions that correspond to the $3/4:1/4$ of the diploid are $35/36:1/36$ (if the locus is fairly close to the centromere) (Burnham, 1962). If the tetraploid is of the allotetraploid (also called amphidiploid) form we may again obtain the $3/4$ and $1/4$ fractions provided the chromosomes of the 2 parent species are dissimilar throughout the genomes. But what if some of the chromosomes of species A still recognize some of those of species B as homologues and hence synapse while others have diverged to the point of no synapsis and an allotetraploid has been formed? The F_2 from this allotetraploid could conceivably have some traits that follow the $35:1$ pattern and others the $3:1$. Two and 3 factor differences could conceivably give a very confusing statistical picture.

If the locus of a gene being followed is far enough from the centromere so that there is significant crossing-over between it and the centromere, an autotetraploid will give values between 35/36:1/36 and 187/196:9/196 (Burnham, 1962).

What all this means is that those simple genetic laws we teach to classes often have little meaning to the orchid hybridizer for several reasons.

1. Commonly we are crossing species, not forms of one species.
2. Tetraploids rather than diploids are the desirable parents.
3. The strength of linkage of a gene to its centromere has no effect on frequencies in a diploid but has in autotetraploids and even in allotetraploids if some of the chromosomes of the 2 species are still alike enough to behave as homologues or partial homologues.

Every so often we find an article that attributes the occasional inability to produce viable hybrids between 2 species of the same genus to differences in chromosome number. For the first generation the number of chromosomes is immaterial since each haploid set has the complete directions for the production of all essential biochemical pathways of one of the parent species. The 2 sets of chromosomes may be incompatible with each other or one with the cytoplasm of the other and the more unlike the chromosome numbers of the 2 haploid sets are, the more likely incompatibility will be found. But this is a reflection of the greater length of time the 2 species have had to diverge from a common ancestor resulting in greater biochemical differences, thus chromosome number, *per se*, is not involved.

Now when we come to the first generation hybrids of 2 species with different chromosome numbers, sterility is to be expected especially if the difference is large. The greater the lack of synapsis of homologues, the greater the loss of fertility. In most animals and plants it would be 100% but with the hundreds of thousands of ovules in a developing orchid capsule, chance segregation of combinations of chromosomes that contain all the essential genes can occur every now and then. This undoubtedly accounts for some of the cases of partial fertility that we find.

We are left to explain, however, a number of examples of great fertility in which the first generation hybrid is between 2 species with different chromosome numbers. These are commonly found in *Paphiopedilum* and *Oncidium* and probably other genera as well. It seemed to me that to explain this, one should first look at the different chromosome numbers and suggest a mechanism whereby the differences arose.

In plants, chromosome numbers of various species within a genus are commonly multiples of some basic number for example 28 and 56 within the genus *Oncidium* or 38 and 76 within the genus *Vanda* or even 38 and 76 within the same wild species *Doritis pulcherrima*. It is obvious this increase in the diploid number started as an autotetraploid resulting from duplication of the chromosomes without the accompanying division of the nucleus. Normally the triploids that result from a cross of diploid by tetraploid whether auto or allotriploids are nearly 100% sterile because of the "imbalance" of the genetic material that ends up in a nucleus of a gamete or zygote.

In those cases in which we find a series of numbers such as 26, 28, 30, 32, 34, 36, 38, 40, 42, in *Paphiopedilum* or 40 and 42 in the equitant oncidiums, the changes from the ancestral condition must be due to a fusion of 2 telocentric chromosomes at the centromere for a reduction in number or a separation of a metacentric into 2 telocentrics with a resulting increase in number (Duncan & MacLeod 1949, Tanaka and Aoyama 1974). An increase can also have its beginnings in a trisomic as a result of nondisjunction of one pair of sister chromatids. This is a slower, more hazardous route but may well be the mode of increase occasionally.

After separation of the 2 arms of a metacentric chromosome, homology of each new chromosome to one arm of the metacentric would still allow synapses to occur in a hybrid between the original and the derived form and thus a hexad rather than a tetrad would be produced. The separation of the hexad would be into two chro

matids attached to 1 centromere and 4 chromatids containing 2 centromeres and these 2 combinations would be genetically equivalent. Of course, crossing over will complicate the picture but this type of synapsis and separation with or without crossover exchange accounts for those hybrids with fertility that otherwise would seem to defy our understanding.

That such separation of fusion at centromeres has actually taken place seems to be shown in *Paphiopedilum* by Karasawa and Tanaka (1980) using the new highly selective staining method that allows one to observe banding patterns on chromosomes other than those of the famous dipteran larval salivary glands. Unfortunately, most other orchids have chromosomes much smaller than those of the Diandrae and so identification of a particular arm in other forms would be very difficult and to my knowledge has not been done.

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Parting Shots

A new column has been added to the journal for readers to submit photos to share with other readers. You can submit photos with their names to the Editor at: jjleathers@comcast.net



Oda (Tiffany x Joe's Drum) - Tim Brydon



Odontioda Feuerglut - Norbert Dank



Vuylstekeara Cambria - Norbert Dank



Adaglossum Mandarin Klon - Norbert Dank



Oda [(Patricia Hill x (Phoenix Way x Mt. Diablo) x Tiffany)] - Tim Brydon



Odontorettia Mandarin - Norbert Dank



Mtps vexillaria May Osura Feldispino - Robert Culver



Rst. rossii Display - Norbert Dank



Miltoniopsis phalaenopsis - Robert Culver



Odontioda Memoria Ken Girard 'Black Snow'
Luke Callaghan

Odontioda Memoria Ken Girard 'Black Snow'

(*Odontoglossum Jim Mintsiveris* x
Odontioda Nichirei Beugo)

Hybridized by Golden Gate Orchids

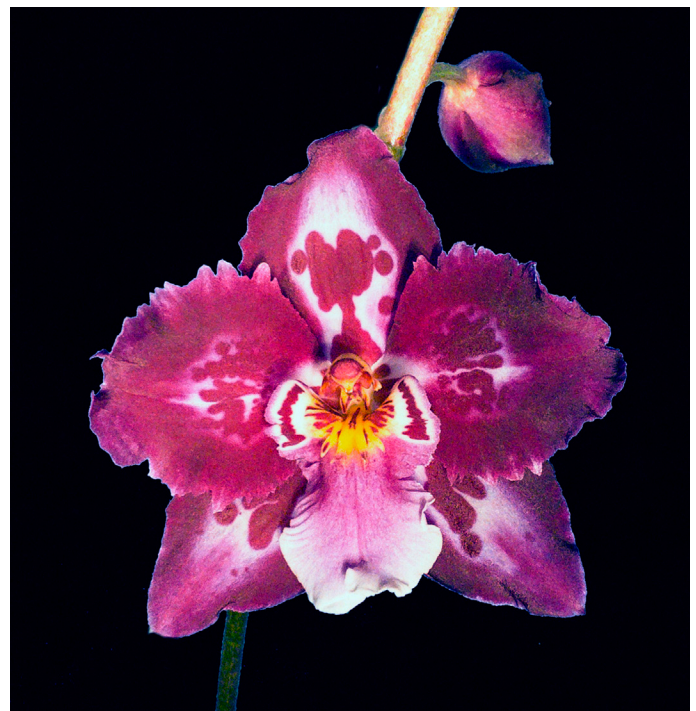
Editor's Note, there's a back-story to this grex (cross). While the cross is labeled as *Odontioda (Oda.) Memoria Ken Girard*, it is correctly an *Odontoglossum (Odm.)*. Alan Moon, former Curator of Orchids at the Eric Young Foundation shared the following story.

Eric Young had purchased stud plants from Charlesworth & Company when they closed their doors of the Haywards Heath Nursery in the mid 1970s. Alan was tasked with retrieving the plants. He travelled to Charlesworth and on picking up the plants discovered, in a mean-spirited move, someone had removed all the identifying nursery tags. Coincidentally, on his leaving the nursery, he spotted a cabinet of slides. Charlesworth pioneered the use of photographs, specifically Kodachrome slides to keep track of their finest plants. The slides were kept in envelopes and annotated with the names of the various customers who showed an interest in purchasing plants and divisions – a chronology of the Who's Who of Odonts those days. The slide collection was offered to Alan for £80 and he purchased it for Eric.

The Charlesworth unnamed stud plants were grown on and a white bloomed of extraordinary quality. Not knowing its name but wanting to put it before the Royal Horticultural Society's Orchid Committee Eric Young randomly selected a cross from the orchid registry, *Oda. Jumbo*, a 1962 Charlesworth registration.

Alan made and the Eric Young Foundation registered in 1986 the extraordinary cross, *Oda. Gorey Castle*. Subsequent to registering *Gorey Castle*, Alan was gradually going through and comparing the Charlesworth slides with the stud plants Eric had purchased in an attempt to identify them. He came across *Odm. Stroperry* and immediately recognized it as *Oda. Jumbo*. He remade *Gorey Castle (Odm. Nicky Strauss x Oda. Jumbo {sic})* and named a new cross, *Odm. Mont Fallu*. *Oda. Gorey Castle* and *Odm. Mont Fallu* have identical parents.

Progeny from *Oda. Gorey Castle* are genetically odontoglossums which makes sense given the morphology and the black-on-white color of the flowers.



Odontioda Joe's Drum x sib - Tim Brydon

President's Message - Fall/Winter 2019

Dresden 2020

A link to the 2020 Dresden International Orchid Event is appended. A number of International Odontoglossum Alliance Journal (IOAJ) readers have indicated they plan on attending the 2020 event. Several of us attended the 2019 event; it is a terrific orchid event. Those of us who attended had a great time. The IOA will work with and encourage the organizers of this event to once again allow the IOA to present a program; details forthcoming. Assuming we receive an invitation we'll work to organize an informal, no-host dinner for those interested in rubbing elbows with IOAJ colleagues. In 2019 we had an impromptu dinner and it was terrific with lots of conversation and laughs. There's no doubt those who attended had a memorable evening. If a no-host 2020 Dresden dinner becomes a reality, and I expect it will, I will post my e-mail in the next Journal to compile a list of those who plan to participate. For more information: <https://www.expodatabase.de/en/expos/12510-dresdner-ostern-mit-internationaler-orchideenwelt-dresden-germany>

The Odontoglossum Story

Regrettably, we do not yet know the publication date or availability for this forthcoming tome, *The Odontoglossum Story*, by Stig Dalström, Wesley E. Higgins Ph.D., and Guido Deburghgraeve M.D. A debut of the book was presented at the 2019 Dresden Exhibition. It got a two thumbs up. It appears robust and visually stunning, surely a must-have reference for the library of any serious orchidist. For an update Stig Dahlstrom provides, "the book is currently under review by a publisher".

Odontoglossum Greges Registrations

There is serious work in progress on an alternate hybrid registration system which preserves the past naming conventions for Odontoglossums and hybrids which contain Odontoglossum: "WikiRegistration Website". As noted in past editorials, nomenclature changes adopted by the RHS Advisory Subcommittee on Orchid Hybrid Registration (ASCOHR) impair the value of RHS registration data for horticulturalists. From what has been shared so far, this new registration system will be extraordinary and robust; an effort to correct a blunder and reestablish

functionality. With the exception of genus, naming conventions and data will conform to past RHS standards in such a way new grexes can be duplicated in the current RHS system for those who wish to do so. Ultimately, this web application can be expanded to include other genera, e.g. the Cattleya alliance. Many cattleya growers share similar frustrations with ASCOHR, equally frustrated by the confusion resulting from recent refashioning.

American Orchid Society – *ORCHIDS Magazine*

IOA Secretary John Miller wrote a succinct insert for the American Orchid Society's, *ORCHIDS Magazine* to bring awareness of the existence the IOAJ to the readership. Suggestions for similar advertisements in other orchid magazines is welcomed. Outreach remains a goal of the IOA. If you have suggestions for outreach send them to IOAJ Editor-in-charge John Leathers, jjleathers@comcast.net

Editor-In-Charge Comments

John Leathers

As 2019 comes to a close it is important to recognize our Contributing Editors, Andy Easton, Jean Ikeson, Norbert Dank and Juan Felipe Posada for their sustained editorial support of the International Odontoglossum Journal. Volunteering for editorial duties, our contributing editors make corrections, add coherence, offer revisions and contribute articles. Their efforts make the IOA Journal fluent, informative and relevant. Of note are the contributions of Juan Felipe Posada who regularly translates the English version of the Journal to Spanish.

And a special thanks to Stig Dalstrom for his inexhaustible series of articles illuminating the genera Odontoglossum and allies.

Beginning with this edition a new section is added; PARTING SHOTS, a photo montage from reader contributions. We invite and encourage readers to send photos of favorite Odonts and associated images to share with our alliance. You can send them as email attachments to: jjleathers@comcast.net or via Dropbox™

We are always seeking new articles for the Journal. Readers wishing to contribute should submit articles to me, John Leathers, Managing Editor, jjleathers@comcast.net