The
Slipper Orchid Alliance Newsletter

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Inheritance in Paphiopedilum and Phragmipedium

It should be stated at the outset that almost no formal work has been published on the genetics of slipper orchids. The discussion that follows is divided into two parts. The first is based on work performed on other plant groups and the second deals with personal observations of the results of several hundred different slipper orchid crosses.

Genetic Control of Flower Color

There are many levels of genetic control as far as flowers are concerned. These range from the season when flowers are initiated and produced to the shapes of the flowers and their color patterns.

Flower induction.

The decision whether or not to flower is often under the control of a substance called Phytochrome. There are two forms of Phytochrome, P_r and P_{fr}. One absorbs red light and the other far-red. On absorption of the light the Phytochrome is converted to the other form. When the correct balance of Phytochromes has been achieved, the growing apex of the shoot is changed from one growing leaves to the production of a flower bud. This process is called "evocation." There are many different nuances for flower induction and they differ depending on the species and sometimes even the clone.

In Paphs there are several distinct patterns of induction and evocation.

1. Strictly seasonal. Among the seasonal varieties are the *Paph. insigne* based hybrids which flower in the autumn and winter and the multifloral hybrids, especially the anotopetalum or multiflorals that tend to flower in the summer. In a few species such as *Paph. hirsuitissimum* and *Paph. tigrinum*, there can be an extended delay, sometimes lasting several years between the formation of the flower bud and its emergence from the sheath. This also may be the case with reluctant flowering plants such as *Paph.* Delrosi.
2. Maturity based. We see the maturity based pattern in those types where there appears to be little or no seasonality. Many clones of the Maudiae-type hybrids but also many of the Cochlopetalum species have this behavior. As soon as enough leaves have been produced (8 – 10?), a sheath and bud are initiated. Such plants may flower several times a year.

Floral Organ Differentiation.

The shape of the flower and its various organs are under a variety of genetic controls. The floral apex itself must undergo a series of cell divisions. It is the orientation of the cell divisions and cell expansions which determines the shape of each sepal and petal, etc. Sometimes one can get clues about orientation of the cell divisions by examining color streaks in the flowers. Usually, but not always, streaks will parallel the long axis of the tepal suggesting that most of the cell division is at right angles to the long axis. Increases in length of petals or sepals are probably also due to increased numbers of cell divisions at right angles to the long axis of the structure. Observation suggests that when one mates two slippers together, one does not get the average of the two parents. Instead one gets the geometric mean of the two parents. This is especially true of the *Paph. sanderianum* hybrids that one sees. If one mated a 9-inch petalled *Paph. philippinense* with a *Paph. sanderianum* whose petals were 25 inches long, one can only hope for petals that are 10 to 11 inches long rather that the average of 17 inches. *Paph.* Landmark (*glaucophyllum var. moquettianum x*

SOA Mission Statement

Promote broader understanding of all genera and species of slipper orchids including paphiopedilum, phragmipedium, and cypripedium, as well as their conservation in natural habitats and under cultivation. Promote member's exchange of information at regional, national and international forums or seminars and advance scientific and horticltural studies of slipper orchids and their hybrids.

sanderianum) has petals that are only 6 inches or less in length. For similar reasons when a Brachypetalum is bred with an ultra-tall stemmed *Paph. maliopense*, one usually tends to get flowers that are on short stems. Presumably this has been one of the reasons why it has been difficult to breed standard reds with long stems. All the *Paph. bellatulum* genes are holding them back.

Colors in Paphs fall into three catagories:

Green to yellow.

These are presumed to be chlorophylls for green and carotanoids for yellow which are usually contained in discrete packages within the cells. There are several kinds of chlorophylls and carotenoids. Both pigments are produced in the chloroplasts. Usually one does not see yellow colors because they are masked by the green. Chloroplasts can be converted to chromoplasts which can be filled with carotenoid pigments. Most flower buds have chloroplasts in them but they tend to be converted into chromoplasts as soon or shortly after the flower opens. Most yellow slipper orchids have systems that cause chromoplast formation. Green flowers are able to maintain their chloroplasts intact.

Pink to purple pigments.

We know quite a lot about these colors. We know how they are formed. They are the result of a chain of enzymic reactions. The kinds of pink-purple pigments in slippers are called anthocyanins. The color that is finally produced can vary depending on the actual end product, the presence and type of co-factor and the environment inside the cell such as pH, presence of metallic ions, etc.

White.

This has received relatively little attention. There are several ways one can achieve white.

1. Structural color. White can be achieved by trapping air bubbles between the cells of the petals. This works the same way that egg-albumen becomes white when it is beaten up to make meringue. Air gets trapped in it and the bubbles scatter, reflect and mix light so it appears to look white.
2. Leucoplasts. Small packages which actually contain a white pigment. These have received very little attention from scientists.
3. Blocked anthocyanin production. If the chain reaction of the anthocyanin is blocked early on, one does not produce the final product and it looks white. In addition, if there is no co-factor, one might end up with a white flower. Finally, there can be the absence of a factor in a particular region of the flower that turns on the anthocyanin producing gene and thus one might end up with a white part to the petal. Such genes are called regulatory genes. In snapdragons, for example, there is a gene called *delila* (del) that produces a factor that regulates the expression of a series of alleles that in turn results in the expression of anthocyanin pattern in the flower (Almeida, *et al.*,1989).

By changing the position of cells that make pigment and overlaying different cell layers, one can produce a variety of different colors and patterns.

Specific controls in slipper orchids

The Suppression of Yellow and Green.

Two species of Paphiopedilum, *Paph. delenatii* and *Paph. niveum*, and one species of Phragmipedium, *Phrag. schlimii*, appear to transmit genetic controls that hasten degradation of chlorophylls and carotenoids. All first generation hybrids made with these species tend to be white with a variable overlay of pink depending on the types of anthocyanin controls which are inherited from the other parent. The controls in the two Paphiopedilum species are not equivalent. As far as we have been able to ascertain all *Paph. delenatii* hybrids eventually become clean white although it may take a variable amount of time to reach that condition. But a few *Paph. niveum* hybrids may retain green patches as can be seen in some clones of *Paph.* Ron Williamson (*Paph. primilinum x Paph. delenatii)*. Hybrids made from *Paphiopedilum Greyii* and *Paph.* Psyche tend to have all of their offspring inherit white backgrounds. This suggests that there may be multiple genes for producing white colors, otherwise one could expect half of their progeny to have green or yellow backgrounds when the appropriate cross is made. Likewise, white complex hybrids after several generations of breeding can often display blends of white-yellow-green. One of the easiest ways of explaining that kind of dilution is if there are multiple controls.

Phragmipedium schlimii appears to work identically to *Paph. delenatii.* The cross between *Phrag. schlimii* and *Phrag. besseae*, called *Phrag.* Hanne Popow, has flowers in varying shades of pink-purple. Here the yellow pigments of *Phrag. besseae* are not expressed in *Phrag.* Hanne Popow.

The green pigmentation of *Paph. malipoense* appears to be fairly resistant to the effects of both *Paph. delenatii* and *Paph. niveum.* Both primary hybrids tend to be off-white or greenish-white with very few of the progeny being pristine white. When mated with *Paph. emersonii* the progeny actually show even more color.

Albinism in the Maudiae Group

The Maudiae group is a large assemblage of species and hybrids mostly, but not totally, closely related to *Paph. callosum.* We tend to assume that albinism in the Maudiae group involves mutations that block a step in the chain of enzymic reactions that lead to albinism. Thus when one of these plants is crossed with a normal anthocyanin producing form, one tends to get normally colored progeny because the one normal parent is able to compensate for the aberrant allele.

Aureum-Maudiae types

Aureum forms are those which lack strong anthocyanin production, perhaps all anthocyanin production, and have flowers which may be green but are usually brushed with

Upcoming Events

November 10, 2001
4th Slipper Orchid Symposium
Ramada Plaza Hotel
Kissimee, FL
Speakers include Prof. Leonid V. Averyanov, Dr. Harold Koopowitz and Hadley Cash. There will be sales tables, auction and a champagne BBQ in the evening. Contact Jamie Lawson at 888-619-7687 or email jimorchids@aol.com.

Virginia Paphiopedilum Society
Hampton, VA
November 11, Bob Walker will speak on Orchid Propagation.
December 9, "Slipper Orchids in the Truford Greenhouse," an Orchid Digest slide presentation of the slipper orchids of Trudi and Fordyce "Red" Marsh.
All programs begin at 2 pm at the Sandy Bottom Nature Park. Call 757-825-4657 for directions.

March 9, 2002
27th Annual Cymbidium Congress at the Santa Barbara International Orchid Show
Hadley Cash, Tom Kalina and Dr. Norito Hasegawa will discuss new directions in hybridizing. Panel discussions will highlight culture. For more information contact Dr. A. C. Svoboda, 805-969-4536, email stillisch@pol.net

gold-brown honey tones. Aureum forms such as *Paph. sukhakulii* 'Paleface' and *Paph. philippinense* 'Greenlace' are two important clones. Inheritance of aureum appears to be a special case. They are not pure albinos but when selfed or crossed with pure Maudiae-type albinos can make both purely albino progeny or aureum forms.

Repressive Albinism

There are three species which appear to have albino clones that work differently. These are *Paph. insigne sanderae, Paph. hirsutissimum album* and *Paph. haynaldianum album.* Here the flowers appear to have genes that actively block the expression of anthocyanin producing genes. When *Paph. insigne* based green and white complex hybrids are bred with non-albinistic clones of the pink *Paph. charlesworthii* to produce *Paph*. Western Sky (*Paph*. Yerba Buena x *Paph. charlesworthii)* or *Paph*. Marguerite Knox (*Paph*. Via Variety x *Paph. charlesworthii),* one finds that the pink coloring is repressed in most of the offspring. Small amounts of anthocyanin can be produced in some areas of the flower but most of the dorsal sepal and petals are green or white.

Similarly when *Paph. concolor* or *Paph. Greyii* is crossed with *Paph. haynaldianum album,* flowers have a little faint pink speckling indicating that the plants are able to make anthocyanins but casual inspection suggests that the flowers are albino. The cross of *Paph. primulinum* by *Paph. hirsutissimum* makes two differently colored flowers when the album is used compared to the normally colored species.

Anthocyanin

The inheritance of anthocyanins is best known in the Maudiae-types and is expressed in four main forms: coloratums, vinicolors, flames and blends.

Coloratums.

In this case the dorsal is more or less white with a variable amount of anthocyanin production. Usually the anthocyanin is produced about halfway up the dorsal and in association with the veins. It can also occur between the veins. They can be quite dark as seen in Paph. Maudiae 'Los Osos' AM/AOS.

Vinicolors.

True vinicolors are bred from *Paph. callosum* 'Sparkling Burgundy.' Here the anthocyanin production always starts across the base of the dorsal sepal and in some vinicolors there may be a variable amount of white near the distal edge of the dorsal sepal. In the best clones the entire dorsal sepal is a dark burgundy-purple as is the pouch. Vinicoloration is expressed when the Maudiae-type vinicolors are mated with complex hybrids but shape usually leaves something to be desired.

Flames.

These are bred from *Paph. callosum* 'JAC' which itself can be considered a vinicolor. This clone of *Paph. callosum* has petals that are densely covered with black warts. When bred with a regular coloratum, 'JAC' gives a clearly defined type called a flame, most of which have heavily spotted petals. Unlike the vinicolors, flames have a portion of the base of the dorsal sepal which is unpigmented, almost transparent. The anthocyanins produced are a bright purple-red, unlike the dark burgundy of the vinicolors. When two flames are bred together a proportion of the offspring will however be true vinicolors but most will be flames. Within the second generation there is also a tendency to get spotting in the flame area at the base of the dorsal sepal. The best of these have been called 'Peacock Flames' and are considered highly desirable.

Viniblends.

Originally the best of the vinicolors and flames had uniformly dark purple pouches without the brown tints often seen in the coloratum forms. However when *Paph. mastersianum* is added to the gene pool, either as the species or one of the mastersianum-based hybrids, brown is apparent in most of the progeny. This tends to brighten the colors when combined with the vinicolored hybrids. Paph. Red Maude is a good example of one such cross.

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Harold Koopowitz
Paphanatics, unLimited

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4th Slipper Symposium

The 4th Annual Slipper Orchid Symposium under the aegis of the Slipper Orchid Study Group of Florida presents **Resurgence - Slipper Orchids Come Back.** Speakers for the event are Professor Leonid V. Averyanov from Russia, Hadley Cash of Marriott Orchids in North Carolina, and Harold Koopowitz of Paphanatics, unLimited in California. The Symposium will be held at the Ramada Plaza Hotel in Kissimmee, FL, on November 10, 2001. Registration is $100 and includes lunch and snacks. There will be a champagne BBQ Saturday evening for an extra $10 which also includes an auction of donated plants. On Sunday, November 11, there will be an Open House at Ratcliffe Orchids, LLC.

Special arrangements have been made with the Ramada Plaza Hotel for a rate of $55 per night if you make your reservations before October 9.

For more information and registration forms, please contact Jamie Lawson at 888-619-7687, email jimorchids@aol.com.

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In Search of *Phragmipedium hirtzii*

In the decade between 1980 and 1990 two new Phragmipedium species were discovered, *Phragmipedium besseae* in 1981 and *Phragmipedium hirtzii* in 1987. Until then no new Phragmipedium species had been discovered in our lifetime, unless you were born in the late 1800's.

Phragmipedium hirtzii has been found only in a very small area in northwestern Ecuador although it probably exists in southern Columbia as well. *Phragmipedium hirtzii* was discovered by Alexander Hirtz, a well respected orchidologist from Quito, Ecuador. Mr. Hirtz has probably discovered more new orchid species than anyone alive today.

I was living in Ecuador in 1987, and I had heard rumors that a new Phragmipedium had been spotted around Lita, a small village in an area known for its high diversity of plant life. At that time the only way to reach Lita was by a scenic but perilous train ride, by helicopter, or a two to three day walk. Rating orchid collectors on a scale from 1 to 10, Alexander Hirtz was about 9 and I was about 2. I never wandered too far from the road, and I rarely ventured to any site that I couldn't return from in the same day. The first time I saw a blooming *Phragmipedium hirtzii* was in Alex's collection in Quito, after which I returned to my hotel room.

By the time I got around to searching for *Phragmipedium hirtzii* in the early 1990's a pilot road had just been completed into Lita. I convinced a small group of similarly misguided orchid adventurists to come along. We were on our way.

As you head north out of Quito on the Pan American Highway, the first five or six hours are paved road that passes through a number of fairly large cities, one being the capital of the Imbabura province, Ibarra. A short distance north of Ibarra there is a left turn off the main highway that leads to Lita. No one around could tell us how long it might take to get from here to Lita but from the few people we asked, the estimates ranged from four to ten hours. We decided to stock up on water and flashlight batteries.

The pilot road was horrendous, and it wasn't long before we experienced our first setback. Crossing a fresh landslide one of our tires was punctured by a sharp rock. Places like this typically become gravesites for vehicles and their occupants so we changed the flat as quickly as possible and moved on down the road.

In most of South America it's not prudent to drive very far once you've used your only spare tire. Another flat and you're stuck in the middle of nowhere. At the first small village we stopped to look for a 24-hour tire repair service. By now it was dark and the village had no electricity. The tire was repaired by the light of a carbide lamp but it took over two hours.

We had no idea how much farther it was to Lita. There were no road signs and no mile postings. We traveled for hours through dense fog. At about 2:30 a.m., eight hours after we exited the highway, we rounded a steep downhill curve and our headlights illuminated a church steeple. We knew this had to be Lita. The road ended here.

In didn't take long to find the only sleeping accommodations in Lita, the "Residencial Villalobos." Ringing the doorbell for fifteen minutes we finally roused the owner, who escorted us by candlelight up a narrow wooden staircase and down a long hallway overlooking a courtyard. After finally selecting the right key in the barely

lit corridor she opened the door to one of the rooms. This was going to be a long night.

At the first sign of light we went outside to catch a glimpse of the surroundings. Most of the rainforest I had seen in Ecuador until then was from the upper headwaters of the Amazon River, the eastern slopes of the Andes Mountains. That forest is a deep, rich green blanket of trees but here the coastal jungle was truly an emerald forest, breathtaking and inviting. This was surely a botanist's paradise.

We asked the owner of the *residencial* if she knew anyone who might know something about the orchid flora from around Lita and without hesitation she affirmed that of course she knew someone – only one, Pancho. She gave us directions to Pancho's house and within minutes we found him, exchanged greetings and introduced ourselves. It was apparent that he would now where to find *Phragmipedium hirtzii*. There were hundreds of them in a small garden beside his house. Pancho was twelve years old.

After breakfast Pancho helped us find horses to rent and we were soon on our way up a steep mountain, the anticipation growing as we sloshed our way up the muddy trail. After cresting the slope we crossed an open field, and Lita, which by now was just a speck in the forest below, disappeared behind us. We began a rapid descent through primary forest toward a small river. No one lived in this valley. It was the home of *Phragmipedium hirtzii.*

Lita lies on a narrow plateau at the confluence of two wide, raging rivers, the Rio Mira and the Rio Lita. A number of smaller tributaries to these rivers are the habitats for *Phragmipedium hirtzii.* The plants are found on the banks of these small rivers and also on large boulder in the middle of the rivers, their roots seemingly cemented to the rock, so as not to get washed away in the rushing water that comes with heavy rainfall.

After a long exhausting descent to the valley we tied up the horses and Pancho pointed across the river. We could see hundreds of *Phragmipedium hirtzii*, many in bloom. After the usual celebratory rituals were over, we realized the inevitable. To get any closer we would have to swim across the river.

Lita is situated at about 600 meters, or approximately 2,200 feet above sea level, which in Ecuador always indicates a warm climate. The night temperatures seldom drop below 65 degrees. Malaria-infested mosquitos, although not common, are always a concern. Poisonous snakebites are common and fatalities occur regularly. The warm temperature of the waters around Lita makes a perfect breeding ground for a variety of amoebas and bacteria. As I stepped into the pool of water in front of me the sensation was as pleasant and relaxing as a warm bath.

The flowering *Phragmipedium hitziis* on the other side seemed to be smiling, swaying in the gentle breeze, and I noticed the flowers had different colored pouches. Although most were pinkish-brown, some were more pink, others more brown. The overall appearance of the flower resembled a small *Phragmipedium longifolium.* Since the camera could not be safely transported across the river there would be no clear, crisp image of that moment, but the richness of the memory would be taken back to Lita on horseback, never to be lost or forgotten.

The following day we explored the forest around Lita and saw many other interesting orchid species. We spotted many *Lepanthes calodictyon, Huntleya citrina* and *Gongora hirtzii*. The most common species was *Pescatorea lehmannii*, some having up to eight open flowers. The trip back to Quito was long but, thankfully, uneventful. We had logged another successful orchid adventure, tired to the point of exhaustion but filled with a treasure of unforgettable memories.

I've returned to Lita many times since that first trip. Pancho is married and has gone to live in Quito. There's a second *residencial* there now, but I still sleep at the "Villalobos" just for old times sake. The whole road is paved now so you can actually drive to Lita from Quito and still return the same day. Now that sounds like my idea of a great orchid adventure.

Dennis D'Allessandro
Gypsy Glen Orchids

Judging Unifloral Paphiopedilums

Thomas F. Kalina

Introduction

This is the companion piece to an article entitled "Judging Multifloral Paphiopedilums," published by the author in the AOS Awards Quarterly , Volume 21, Number 3 – 1990, which will be printed in this newsletter in the near future. Together, they provide a broad-based foundation for the systematic evaluation of one of the most frequently encountered genera at the judging table today. Prior to the Eighth Edition of The Handbook on Judging and Exhibition ("The Hand-book"), a single point scale was used to evaluate both single flowered (unifloral) and multifloral examples of the Genus *Paphiopedilum.* The literal application of that point scale to the more and more frequently encountered multiflorals, however, was difficult if not impossible. Hence the change in point scales effective with the Eighth Edition. Today, we are faced with a similar problem due primarily to the decline in popularity of the old complex, or "Bulldog" type of *Paphiopedilum* hybrid, and an attendant increase in popularity of the unifloral species and novelty hybrids near the species. Neither the unifloral *Paphiopedilum* evaluation

criteria found in Section 6.1.6, nor the *Paphiopedilum* point scale found in Section 6.2.4 had changed significantly in many years. Unfortunately, they were originally developed to suit the most popular *Paphiopedilum* style of days past, the complex hybrid in which individual species contributions can be difficult to assess.

Today, it is not unusual to attend several judging sessions in the Mid-America Region without seeing this style of *Paphiopedilum* present for evaluation. Does this mean we are being overrun with multifloral *Paphiopedilums*? Hardly, although they have become more popular - especially with the introduction of Paph. sanderianum as a parent. Instead, we are seeing an increase in popularity of unifloral *Paphiopedilum* species and hybrids near the species (primary and secondary), which once again make the literal application of the existing *Paphiopedilum* evaluation criteria and point scale difficult to apply. This article will make several proposals concerning changes to the presently available evaluation criteria and point scales used to judge the Genus *Paphiopedilum*, in order to make the evaluation process less difficult and more in tune with the style of single flowered *Paphiopedilum* more commonly seen at the judging table today.

Text

We are seeing the result of new directions in *Paphiopedilum* breeding that have occurred over the last ten years - directions dictated by the changing tastes of the orchid growing public - directions that make the application of the traditional *Paphiopedilum* evaluation criteria in Section 7.1.6 of the Tenth Edition of The Handbook on Judging and Exhibition and the attendant point scales in Section 7.2 more difficult, if not impossible, to apply to the now popular unifloral species and their first and second generation hybrids. We are beginning to get away from judging a particular hybrid form and, instead, moving toward judging species influence and conformity. This is an important point, because it forces us to look at the factors that make modern day species and hybrids particularly charming - their color, size and conformation, rather than some arbitrary "toward roundness and fullness" form fixation.

In general, there has been a decline in popularity of standard complex *Paphiopedilum* hybrids in the United States over the past twenty years. As a result, the number of commercial hybridizers specializing in this style of breeding has declined as well. That is not to say that standard complex hybrids are a dead issue worldwide. Indeed, this style of hybrid is still most popular in Japan and the European Common Market, where the sale of standard complexes to the pot plant trade continues at an unabated pace. There is one example of a current resurgence in popularity for this type of hybrid even in the United States - the complex white hybrids. This style of breeding is illustrated by awards to such grexes as Paph. White Knight (Green Mystery x Skip Bartlett), White Queen (Via Virgenes x Skip Bartlett), Knight's Castle (Blanche Sawyer x White Knight) and Buena Bay (Yerba Buena x St. Ouen's Bay). Such complex *Paphiopedilum* hybridizing breakthroughs are rare in this day and age, as most commercial breeders tend to focus on faster growing seedlings with smaller space requirements. Because the standard complexes will be with us for many years to come (albeit in reduced numbers) we are not suggesting the elimination of the existing evaluation criteria for single flowered Paphs. - only the addition of some statements which may help in the judging of the more popular style of unifloral hybrids seen today. The real potential in standard complexes today for the most part lies in breeding them with either species or hybrids near the species to create what Koopowitz and Hasegawa call novelty slipper hybrids. Such breeding can result in some truly unique and attractive colors and forms.

Before we begin to discuss the application of existing vs. proposed evaluation criteria and point scales in the judging of unifloral *Paphiopedilums*, we should digress to review the differences between the "multifloral" and "unifloral" designation itself. Since the changes mentioned in The Eighth Edition of The Handbook to allow the use of the General Point Scale in evaluating multifloral *Paphiopedilums*, there has been some confusion regarding whether a particularly well grown Paphiopedilum species from Sections other than Coryopedilum, Pardalopetalum or Cochlopetalum exhibiting more than the customary single bloom should be considered "multifloral," and therefore evaluated using the General Point Scale. Many of us have seen particularly well-grown examples of Paph. delenatii, malipoense and concolor, among others, which present with two or three flowers per stem. These species are not normally evaluated using the General Point Scale, but perhaps they should be. The question we must ask ourselves is whether the additional characteristics of "Habit & Arrangement of Inflorescence" and "Floriferousness" have combined to produce an effect more pleasing than the more typical single flowered example. If the answer is `yes,' then the chairman of the judging team should suggest the use of the alternative point scale as it may provide for a more accurate evaluation of a particularly well-grown plant. But how about the reverse of this, when species and hybrids near the species from Sections Coryopedilum, Pardalopetalum and Cochlopetalum present with only one flower? Should we then use the Paphiopedilum point scale? Not a good idea, because the characteristics of Habit & Arrangement of Inflorescence, and Floriferousness are so important in these Sections that we would be doing a disservice to those growers who grow these normally multifloral species and hybrids to their full potential. We want to give the benefit of the doubt here to the well-grown example, not the poorly grown one. Also, some species in Section Cochlopetalum rarely carry more than one fresh flower open at a time per inflorescence, although the

blooming style is successive. When given a choice as to the correct point scale to be used in the case of a single flowered Cochlopetalum, I would suggest the point scale which we will develop later in this paper to judge unifloral *Paphiopedilum* species. Obviously, in the case of a multifloral Cochlopetalum species we should use the General Point Scale since it would most likely result in a more accurate evaluation. (We have seen as many as five flowers open at the same time on a single inflorescence of *Paphiopedilum* victoria-regina syn. chamberlainianum, for example).

We should digress here to discuss an observed tendency for many AOS judges to apply the "toward roundness and fullness" form criterion to all *Paphiopedilum* species as an example of improvement over the ancestral type which the Handbook refers to when discussing evaluation of species and those hybrids with parentage near the species. This application is correct only for species in Sections Brachypetalum and Parvisepalum - those which already exhibit varying degrees of rounded form as evidenced by the type specimens. When we apply this criterion to other Sections, we begin to truly hybridize the species - we begin to reward the creation of forms not found in nature - not necessarily ugly, but not necessarily typical for the species either. We need to award the attributes that separate the species from one another, not those things that make them similar. By applying the "toward roundness and fullness" form ideal to all *Paphiopedilum* species, we may well be on our way to creating not only similarity but mediocrity as well. Instead we should be thinking about the importance of conformity and balance. Conformity is the relationship between floral segments in a flower first established in the species type description. This characteristic is what differentiates one species from another. A good example of a lack of conformity is the recent appearance of a "bowlegged" form of *Paphiopedilum* sukhakulii, brought about by line breeding for petal width. While the petals are certainly wider, the overall form of the flower is not pleasing and should be scored down accordingly. Some clones of Paph. sukhakulii have been awarded recently which also show wider petals, while still keeping the typical cruciform shape of *Paph.* sukhakulii that is so diagnostic of this species. This is the direction we should be establishing as improvement. When we start thinking this way, the attributes of color and size become more important than the artificial application of "toward roundness and fullness" of form - in this case, petal width. We'll review the results of line breeding *Paph.* sukhakulii for wider petals in more detail when we discuss the importance of species conformity. We must also think of balance. Balance represents stability in the flower, and is a result of bilateral symmetry. Ideally, if we draw an imaginary vertical line through the dorsal sepal, staminode, pouch and ventral sepal, both halves of the flower should be identical. One side of the line should be a mirror image of the other. This is very rarely achieved, and represents a quality which must be present in our higher AOS quality awards. We ought to be looking a lot closer at the importance of geometric symmetry, and remember to give that attribute its proper position in the point scale under "General Form," since it is this characteristic more than any other that should give us the initial impression of awardability.

Excerpt from the Tenth Edition of the AOS Handbook on Judging and Exhibition (Section 7.1.6, *Paphiopedilum*)

"The great variety of paphiopedilums currently grown, from species through primary hybrids to the modern complex hybrids, makes criteria, uniformly applicable to all, impossible to define. The majority of judged paphiopedilums are those having a single flower on an upright stem; these are scored using the Paphiopedilum point scale in Section 7.2.7. Those having several flowers on an upright or arching inflorescence are commonly termed multiflora paphiopedilums and should be scored according to the General Point Scale in 7.2.1, as their floriferousness and arrangement of inflorescence are of substantial importance.

In the judging of species and those hybrids with parentage near to the species, the general criterion is improvement over the ancestral type(s). The natural spread of flowers with long pendulous petals depends on the angle at which the petals are held, and the horizontal or vertical dimensions should be recorded.

The appearance of complex hybrids is the result of many generations of selective breeding that have obscured the contributions of the many species in their ancestry. The desired form of complex hybrid flowers is round, or broadly oval, with particular emphasis upon fullness, balance, and proportion. The dorsal sepal should be large, rounded, slightly concave, and not reflexed. The petals should be broad, and their length should be in proportion to the rest of the flower. The pouch should be full, in proportion, and not protrude excessively forward. The ventral sepal should afford a harmonious background for the pouch; a split ventral is not in itself a defect if its effect on the overall appearance of the flower is pleasing. The stem should be proportionately tall and strong, holding the flower well above the foliage. The color of the flower should be clear and definite in well defined areas and patterns, harmoniously suffused, according to breeding. Due to polyploidy, substance in complex paphiopedilums is generally heavy and is now expected as a necessary feature. Texture should be waxy or varnished. Size is based on the overall spread of the flower, with emphasis on width of the dorsalsepal.

It is plain to see that most of this section was written with standard complex hybrids in mind, although some thought was given since the Eighth Edition to differences in multifloral evaluation criteria. As applied to species and

hybrids with parentage near the species, the operative phrase is "improvement over the ancestral type(s)." Have you ever thought about what this really means? How can you "improve" on the type specimen? If you asked ten judges, I'll bet they would talk about two major attributes - a round and full form, and size. Very few would mention color as a primary consideration, although it is the attribute to which our attention is first drawn at the judging table. Unfortunately, we are heading in the same direction with Paphiopedilum species today that we headed several years ago when we decided Phalaenopsis amabilis looked a lot better with broader flower segments. While the development of a large, round flower in Phalaenopsis amabilis could be considered an improvement over the type since the type is somewhat round to begin with, the development of a round Paphiopedilum sukhakulii can hardly be considered an improvement. Only an artificially induced difference in form - and not necessarily a good one. The improvement we seek in the species and hybrids near the species should be confined to a few major attributes - color, conformation, balance and size. Size and color speak for themselves. Have you ever noticed how far we as judges go out of our way to disclaim the importance of size? Over and over we tell people "it's only ten points," etc. Well, we had better quit kidding ourselves. While the literal point allocation for size is only ten, the psychological point allocation for size is closer to thirty! I remember listening to a talk several years ago by Alvin Bolt in Memphis, where he made a statement that stuck in my mind. He said that while size was only ten points, it was the *first* ten points; the implication being that unless the flower scored a nine or ten for size before even looking at the attributes of color or form, it had little chance of receiving an award. If it's true that size is minimally important, why do you suppose the first thing we do when evaluating a flower is reach for the centimeter scale? The fact of the matter is that size is important. Beyond tampering with form, size, color and conformation are about all we have to separate the good clones from the others. All things considered, a large, brightly colored flower with good conformity and bilateral symmetry is well on its way to an award. Limit your application of the round and full form ideal to Sections Brachypetalum and Parvisepalum, where the general form of the types *is* toward roundness and fullness, but don't disregard the importance of size, color and conformation in these either. Remember also that species conformity is established first in the type description. After all, one of the purposes of a type description is to express clearly what it is about a particular species that sets it apart from other species in the Genus. This is done with detailed measurement and a description of the floral and vegetative parts. When we apply an artificial form ideal to species evaluation, we begin to tamper with this conformity to type. One good case in point is the recent awards to Paph sukhakulii, among others (ciliolare and charlesworthii do not appear to be exempt from this "improvement"). Have you noticed the petals are becoming much wider? And the dorsal sepal? Interestingly enough, however, the flowers are not getting much larger in natural spread. In fact one clone, Paph. sukhakulii `Muscles' AM/AOS , has a distinctly bowlegged appearance because of the wide petals - great if you are looking for roundness and fullness, but not anywhere near as elegant as some awarded clones having a closer affinity to the segment aspect ratios presented in the original type description. (Important floral aspect ratios in *Paphiopedilum* include the mathematical relationship of petal width to petal length, sepal width to sepal length, and the overall geometry of the flower parts.) There is one aspect of form that is applicable to most unifloral species in general, and that is the aspect of flatness. Some clones in almost all Sections can exhibit a cupped or closed form caused by the forward protrusion of the dorsal sepal. When observed, such "hooding" of the dorsal sepal and clasping of the lateral sepals should be considered a fault and scored accordingly, since many examples can be found without these characteristics.

Now, let's review what it is we have to cover in the AOS judging of the Genus *Paphiopedilum*, and how we propose to modify the Handbook, Section 7.1.6, *Paphiopedilum* to encompass all of the styles seen at the judging table. We have four major divisions to consider in the judging of the Genus. They are as follows:

A) Complex Hybrids, Unifloral
B) Species and Hybrids, Multifloral
C) Species, Unifloral
D) Hybrids near the species, Unifloral

Before we go any further, let's review the *Paphiopedilum* family tree according to Cribb (Cribb, 1998, *The Genus Paphiopedilum*, Second Edition), because that will help to categorize the unifloral and multifloral species.

Orchidaceae
Cypripediodeae
Paphiopedilum

Paphiopedilum

Coryopedilum (Multifloral)
adductum
gigantifolium
glanduliferum
kolopakingii
phillipinense
randsii
rothschildianum
sanderianum
stonei
supardii
wilhelminiae

Brachypetalum (Unifloral)
bellatulum
concolor
godefroyae
niveum

Parvisepalum (Unifloral)
armeniacum
delenatii
emersonii
malipoense
micranthum

Pardalopetalum (Multifloral)
dianthum
haynaldianum
lowii
parishii

Cochlopetalum (Multifloral)
glaucophyllum
liemianum
primulinum
victoria-mariae
victoria-regina

Paphiopedilum (Unifloral)
barbigerum
charlesworthii
druryi
exul
fairrieanum
gratrixianum
helenae
henryanum
hirsutissimum
insigne
spicerianum
tigrinum
villosum

Barbata (Unifloral)
appletonianum
argus
barbatum
borgainvillianum
bullenianum
callosum
ciliolare
dayanum
hennesianum
hookerae
fowliei
javanicum
lawrenceanum
mastersianum
papuanum
purpuratum
sangii
schoseri
sukhakulii
superbiens
tonsum
urbanianum
venustum
violascens
wardii
wentworthianum

A) Complex Hybrids, Unifloral

This is the breeding style around which the original *Paphiopedilum* point scales and evaluation criteria were written. Consequently, the proposed changes to the evaluation criteria in Section 7.1.6, *Paphiopedilum* are minimal, and the *Paphiopedilum* point scale in Section 7.2.7 would remain unchanged. The evaluation criteria as proposed for judging the complex uniflorals are as follows:

"Complex *Paphiopedilum* hybrids are scored using the *Paphiopedilum* point scale in Section 7.2. The desired form of complex hybrids is round and full, or broadly oval, with an emphasis on balance and symmetry. The dorsal sepal should be large, rounded, slightly concave, and not reflexed. The petals should be broad and not excessively cupped. The pouch should be proportionately full, and not jut forward excessively. The synsepal should be full, providing a harmonious background for the pouch. A split synsepal should be considered a fault and scored accordingly. The stem should be proportionately tall and strong, holding the flower well above the foliage. The color of the flower should be clear and pleasing, with spots, color suffusion or other patterns well defined when present. Substance should be heavy, and texture waxy or varnished.

Point Scale 7.2.7 *Paphiopedilum*

Form of Flower		40
General Form	(20)	
Sepals	(10)	
Petals	(5)	
Pouch	(5)	
Color of Flower		40
General Color	(20)	
Sepals	(10)	
Petals	(5)	
Pouch	(5)	
Other Characteristics		20
Size of Flower	(10)	
Substance and Texture	(5)	
Stem	(5)	
Total Points		100

As stated previously, the changes to the evaluation criteria are minimal, and more an effort to condense some of the information than anything else. The only area of substantive change is the split ventral sepal (synsepal). The majority of split synsepals are not stable mutations, with normal (non-split) configurations seen as often as not on the same plant at different bloomings. The fact is that a split synsepal most often contributes to an unbalanced condition , and should be considered a fault when present.

B) Species and Hybrids, Multifloral

This group was responsible for the change in point scales used to judge multifloral *Paphiopedilums* and the addition of language in the *Paphiopedilum* evaluation criteria effective with the publication of the Eighth Edition of the Handbook on Judging and Exhibition. Consequently, there are no changes proposed here for either the evaluation criteria or the General Point Scale, as the previous changes to (now) Section 7.1.6 have had a positive impact on our ability to correctly evaluate this group. For more information regarding the judging of multifloral *Paphiopedilums* I would refer the reader to my previous paper entitled "Judging Multifloral *Paphiopedilums*" in Awards Quarterly, Volume 21, Number 3 - 1990. A forthcoming revision of this paper, however, will re-evaluate the issue of size and its importance in judging the multifloral.

Point Scale 7.2.1

General Point Scale (Multifloral *Paphiopedilum*)		
Form of Flower		30
Color of Flower		30
Other Characteristics		40
Size of Flower	(10)	
Substance and Texture	(10)	
Habit & Arrangement of Inflorescence	(10)	
Floriferousness	(10)	
Total		100

C) Species, Unifloral

The evaluation criteria in Section 7.1.6 concerning species and hybrids near the species states thefollowing: " In the judging of species and those hybrids near to the species, the

general criterion is improvement over the ancestral types." Unfortunately, one then goes on to use the *Paphiopedilum* point scale in 7.2.7 for scoring, which I have previously stated was designed to judge unifloral complex hybrids (unless the species is multifloral). While it is possible for a team chairman to suggest the use of whatever point scale seems appropriate to judge the entry at hand, the writer has never seen this occur in the case of unifloral *Paphiopedilum* species. It is true, however, that judges must have made mental adjustments when applying the *Paphiopedilum* point scale to unifloral species of this Genus. Otherwise we would have seen few, if any, awards to this group, since it is impossible for the great majority of unifloral species to meet the evaluation criteria in Section 7.1.6. (Such a mental adjustment regarding the judging of multiflorals must also have been made previous to the changes in the Eighth Edition, since the same problem in application existed with this group as well.)

I would suggest the following evaluation criteria be used in the judging of single flowered *Paphiopedilum* species :

"In the judging of unifloral species, the general criterion is improvement in color and size over the ancestral type, while maintaining conformance consistent with that of the type description. In Sections *Brachypetalum and Parvisepalum* only, it is also permissible to apply the "toward roundness and fullness" form criterion to establish such improvement. While it is desirable in Sections *Paphiopedilum* and *Barbata* to observe increases in petal and dorsal sepal width, such increases should be considered a fault if they occur in the absence of an attendant increase in size. Otherwise, the unique species attributes established by the ancestral type (conformance) may be compromised, and artificial forms will be created that do not exist in nature. Regardless of what Section is being evaluated, the importance of size, balance and symmetry of form can not be overemphasized. The color of the flower should be clear and distinct."

Point Scale 7.2.7a - Proposed

(Unifloral *Paphiopedilum* Species and Hybrids Near the Special

Form of Flower		30
Color of Flower		30
Other Characteristics		40
Size of Flower	(30)	
Substance and Texture	(5)	
Stem	(5)	
Total		100

The purpose of the proposed changes in evaluation criteria is to elaborate on the meaning of "improvement over the ancestral type" in the Tenth Edition. I believe this is necessary to prevent the application of a "toward roundness and fullness" criterion to every Section in this Genus, since such application could result in the creation of unnatural species forms - a true "hybridization" of the species, so to speak. It is also important to include the form attributes of balance and symmetry, for without them the flower is not awardable. How many times have we observed asymmetry in awards slides, and wondered why this form fault wasn't given proper weight?

The importance of size has been debated since the beginning of our judging system. It is much more important then we would like to admit, and I would submit that its real importance in our judging minds is closer to the 30 points I propose than the 10 points that exist. It is by increasing the size of all flower parts while retaining the unique species attributes established by the type specimen that we create truly superior species - "improvements over the ancestral type." Note that we are proposing an increase in proportional size, not just an increase in natural spread. We must avoid the imbalance that can exist when artificial form criteria are applied to the species in general. You will also note that the points associated with Form, Color and Size are equal in value. This adds weight to the importance of size in our deliberations. The inclusion of Substance and Texture at the original point value of 10 has a different significance than when applied to complex hybrids, in which these attributes are expected. In the case of species, some clones can exhibit greater or lesser degrees of Substance and Texture, and those that have them should be positively recognized. Essentially, I have modified the existing General Point Scale, 7.2.1 by removing the points for "Habit and Arrangement of Inflorescence" and "Floriferousness" (neither of these criteria apply to judging unifloral Paphiopedilums except from a cultural standpoint) and applying those twenty points to "Size of Flower," to make this attribute equal in importance to Form and Color.

D) Hybrids near the Species, Unifloral

The Handbook also includes these in its statement regarding "improvement over the ancestral type." In this immediate case, however, we should not be constrained from applying the artificial form criterion of "roundness and fullness" to these hybrids, although we should never use this attribute alone to determine awardability. Unifloral Paphiopedilum hybrids near the species represent one of the most exciting new aspects of judging today, since we are seeing new forms and colors as newly discovered species are bred to existing species and to complex hybrids as well to create a style that is new and refreshing - the Novelty Hybrid. I would propose the addition of the following statement to Section 7.1.6 of the Handbook.

"Evaluation of unifloral Paphiopedilum hybrids near the species requires a knowledge of the positive and negative characteristics of the species present in the hybrid. The extent to which positive species characteristics are present in a hybrid near the species will determine its awardability. As in the proposed unifloral Paphiopedilum species point scale

7.2.7a, form, color and size are given equal weight."

To recap, the proposed new Section 7.1.6 *Paphiopedilum* would read as follows:

"The great variety of Paphiopedilums currently grown, from species to primary hybrids to modern complex hybrids, requires the use of several different point scales and evaluation criteria. Complex *Paphiopedilum* hybrids are scored using the *Paphiopedilum* point scale in Section 7.2.7. The desired form of complex hybrids is round and full, or broadly oval, with an emphasis on balance and symmetry. The dorsal sepal should be large, rounded, slightly concave, and not reflexed. The petals should be broad and not excessively cupped. The pouch should be proportionately full, and not jut forward excessively. The synsepal should be full, providing a harmonious background for the pouch. A split synsepal should be considered a fault and scored accordingly. The stem should be proportionately tall and strong, holding the flower well above the foliage. The color of the flower should be clear and pleasing, with spots, color suffusion or other patterns well defined when present. Substance should be heavy, and texture waxy or varnished. Those *Paphiopedilums* having several flowers on an upright or arching inflorescence are commonly termed multifloral, and should be scored according to the General Point Scale in Section 7.2.1, as their floriferousness and arrangement of inflorescence are of substantial importance. In the judging of unifloral species, the general criterion is improvement in size and color over the ancestral type, while maintaining conformance to the type description. In Sections *Brachypetalum* and *Parvisepalum*, it is also permissible to apply the "toward roundness and fullness" form criteria to assist in establishing such improvement. While it is desirable in Sections *Paphiopedilum* and *Barbata* to observe increases in petal and dorsal sepal width, such increases could be considered a fault if they occur in the absence of an attendant increase in size. Otherwise, the unique species attributes established by the ancestral type may be compromised, and forms may be created that do not exist in nature. Regardless of Section, the importance of balance and symmetry of form can not be over-emphasized. Color of the flower should be clear, with markings, if present, distinct and pleasing. The unifloral Paphiopedilum species should be scored using the proposed point scale in Section 7.2.7a, since form, size and color are of equal importance in judging this group. Proper evaluation of unifloral *Paphiopedilum* hybrids near the species requires a knowledge of the positive and negative characteristics of the species present in the hybrid. The extent to which desirable species characteristics are present will determine awardability. The proposed unifloral Paphiopedilum species point scale, 7.2.7a, is used to judge this group since they share many of the same characteristics as unifloral species.

Following, then, is a recap of the suggested points scales for each of the styles of *Paphiopedilum* :

	Unifloral Complex Hybrids	Multifloral Hybrids and Species	Unifloral Species, Unifloral Hybrids Near The Species
Form of Flower	40	30	30
General Form	(20)		(15)
Sepals	(10)		(5)
Petals	(5)		(5)
Pouch	(5)		(5)
Color of Flower	40	30	30
General Color	(20)		(15)
Sepals	(10)		(5)
Petals	(5)		(5)
Pouch	(5)		(5)
Other Characteristics	20	40	40
Size	(10)	(10)	(30)
Substance & Texture	(5)	(10)	(5)
Stem	(5)	-	(5)
Habit & Arrangement of Inflorescence	-	(10)	-
Floriferousness		(10)	-
Total	100	100	100

Comments

As in all proposed changes to AOS judging criteria and point scales, this one is not expected to be without controversy. Perhaps this proposal goes too far - perhaps we can make the changes to the language in the *Paphiopedilum* judging criteria in Section 7.1.6 without changing the point scale in 7.2.7. In fact, this was one of the suggestions made by Stephen Benjamin, an accredited judge in the Great Lakes region who has a particular interest in the Genus *Paphiopedilum.* It is also possible to increase size importance to twenty points rather than thirty and to distribute the remaining ten points equally between Substance and Texture, and Stem - attributes that are more important and less expected as one approaches the species level. In any event, there is a need for change in the way we treat proportional size in *Paphiopedilum*, and it is my hope that this article might begin the process of critical review and discourse necessary to make it happen.

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©July 12, 2001
Naperville, IL

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Support for the Slipper Orchid Alliance continues to grow. Current member support exceeds 175 from eight countries: Australia, Canada, Dominican Republic, England, Japan, Germany, Jersey of the Channel Islands, and the United States.

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On behalf of the Alliance, I wish to thank you for your continuing support. Richard Grundy, Executive Director.

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