SASKATCHEWAN ORCHID SOCIETY
JANUARY 2022 VOLUME 38, ISSUE #4

NEWSLETTER

Saskatchewan Orchid Society

Editor's Note: The newsletter is distributed electronically (blind copied so addresses remain private) to all members for whom we have an email address. If you do not receive an emailed newsletter please email info@saskorchids.com to update your contact information.

Future Meeting Dates:
Sat Jan 22, 2022
Sat Feb 26, 2022
Sat Mar 19, 2022
Sat Apr 23, 2022
Sun May 15, 2022

SOS Executive

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The January general meeting will be held on Saturday, Jan. 22 @ 1:00 pm CST

The guest speaker is Kelly McCracken, High Desert Orchids, presenting "Fragrant Miniature Orchids." The presentation will start at 2:00pm using the same zoom link. The Manitoba Orchid Society and the Orchid Society of Alberta will be joining us at 2pm to take in Kelly's presentation.

Please see page 2 of this newsletter for link to the Zoom meeting.

ANNOUNCEMENTS

ZOOM GENERAL MEETINGS TO CONTINUE

Due to recent surges in the omicron variant, we will continue meeting virtually for the time being. We will reevaluate as 2022 proceeds.

GENERAL MEETING AGENDA:

1:00pm SOS Business:
- Announcements
- Problem corner
- Show & Tell

2:00pm Presentation by Kelly McCracken - "Fragrant Miniature Orchids"
Shared with Manitoba Orchid Society & Orchid Society of Alberta

JANUARY GUEST SPEAKER:

Kelly McCracken, High Desert Orchids

Topic: Fragrant Miniature Orchids

Kelly McCracken, owner of High Desert Orchids, started as an avid hobbyist and, like many of you, couldn't stop buying plants. Quickly, one greenhouse became two, and now she grows plants in a unique 3,0000 square foot high-bay industrial warehouse space all under artificial lights. Kelly specializes in miniature plants, with a particular affection for miniature Cattleyas, Angraecoids, Jewel Orchids, and Dendrobiums.

This is a new topic and our societies will be the first to hear the presentation. Many orchid growers select their plants based on whether or not the plant is fragrant. For those of you who grow in limited space, but still love a nose full of floral fragrance, this is the talk for you. Kelly will go over several dozen fragrant species that will stay small (6" and smaller) and their culture. She will also describe their unique fragrances.

Saturday, January 22, 2022 @ 1:00 PM CST

Please join the Zoom SOS general meeting starting at 1:00pm by clicking on this link:
https://usask-ca.zoom.us/j/93096313423?pwd=VVdWTGUxdVorQTZUSUNkNUtVclk2dz09

Stay on this same meeting link for the presentation beginning at 2:00pm.

GARDENSCAPE

Prairieland Park has confirmed that Gardenscape will be held in Saskatoon March 25 - 27, 2022, unless Provincial Government Covid-19 restrictions are put in place. The SOS Executive would like to poll the membership to determine interest in supporting a display. We would need approximately 26 volunteers to work the 2-hour shifts at the SOS display for the 3 days of the show.

EMAIL CONTACTS

Plant orders go to: orders@saskorchids.com

General requests or queries to: info@saskorchids.com

LIBRARY

If you would like to borrow any library resources, please email Librarian Deb Huculiak **hucuh@sasktel.net** to arrange for pickup. Please include in your email message your name and a phone number for Deb to reach you. You can find a .pdf of the library holdings on our SOS website. Available are books, magazines (AOS Orchids and Orchid Digest), pH meter, light meter.

PLANT ORDER

Heather and David will take Ecuagenera orders for a 2-week period in February, for delivery at the Foothills Orchid Society Show in May. Please watch your email inbox for more details in the coming weeks.

AOS Western Canada Judging Center

On November 13, 2021, the AOS Western Canada Judging Team granted an AOS award to:

***Dracula pholeodytes* 'Kittiwake'** AM/AOS 82pts

Exhibitor: Leda Bower

NOVEMBER GENERAL MEETING MINUTES

The November, 2021 meeting was held by Zoom, beginning with the SOS General Meeting. It was followed by a presentation by Alan Koch of Gold Country Orchids, shared with the Orchid Society of Alberta.

Announcements:

- The calendar fundraiser was a huge success again this year. We had 55 calendars printed, and 53 have sold so far. If anyone wants another one, they should contact Don and Shirley Keith. [Editor's note: all calendars have been sold].
- Voting for the executive election was open for nearly a month, and the slate was elected. The only change to the executive is the addition of Tobi Fenton as Assistant Newsletter Editor, although she has been helping Tracey with the newsletter for some months now. David Schwinghamer was elected as a member of the Plant Order Committee; he has been an Acting Member of the committee for several months. Cheryl Adamson and Kathryn Hiller stepped down from the executive. We are still looking for a volunteer for the Treasurer or Secretary position and for the second Library position. (*Complete executive is listed at the end of this section.)
- Membership fees are due for the new year. This month is the cutoff. January newsletters will not be sent to anyone who hasn't renewed. If you are unsure whether you have renewed or not, contact Donna Carlson-O'Keefe or Cheryl Grummett.

Comments from the Executive:

- Heather Anderson: Cheryl Adamson has pretty much gone out of orchids. She dropped off three Phrags and a Phalaenopsis at Heather's house. Cheryl wanted the Phalaenopsis to be given to a new member, so Heather and Donna decided it should go to Karen Fletcher, who lives in Kinistino. Heather will look after it until Karen can get to the city to get it.
- Don Keith: they presently have a good inventory of supplies. There are a few calendars left to pick up.
- Donna Carlson-O'Keefe: she contacted all the members who hadn't renewed by Nov. 1, and mot have since renewed. There are a couple who are not planning to renew but might if the meetings were in person. Donna will contact them if/when we go back to in-person meetings.
- Heather Anderson: the speaker for January will be Kelly McCracken of High Desert Orchids in New Mexico. The meeting will be on Sat., January 22, 2022. Kelly grows a variety of orchid species. She has been writing a series of articles for Orchids magazine and has many topics to choose from; her newest one on fragrant miniatures sounds interesting.

Regarding plant orders, Ecuagenera has been emailing plant lists to Heather in advance of the Foothills Orchid Society show in May. The plant order coordinators, Heather and David Schwinghamer, will probably put together an order in February for delivery at the FOS show. There will be discounts if the orders' totals exceeds a certain amount ($1,000 or $2,000). There is no word yet that Ecuagenera is planning to attend the OSA show in April.

Problem Corner:

Q: *Does anyone have a suggestion on how to get rid of spider mites, once and for all?*

A: Don Keith suggested buying Merit 75 if she goes to the US. They stopped selling it in Resources because they were concerned about people misusing it and adversely affecting bees. The questioner has some but hesitates to use it in the winter when it is difficult to access fresh air.

Show and Tell:

Tobi Fenton showed *Phalaenopsis* Paradise Lost, which she got from Gold Country Orchids. It has a subtle grape-lemony scent.

David Schwinghamer showed *Dendrobium* Roy Tokunaga, which he got from Tracey. Unfortunately, he is battling scale.

Tom Kondra showed *Paphiopedilum* Voodoo Kitty 'Bold Statement' x *Paph. callosum*, which he got from Glen Decker.

Don Keith showed:

- *Masdevallia hirtzii*. It has 18-20 blooms that last a month or so. It is a member of the Saltatrices subsection of Masdevallia. He has good luck with plants from this section.
- *Masdevallia veitchiana*, which he got in June. He divided it when he got it, and both divisions have bloomed.

Don grows them in his orchidarium, watering with RO water. The orchidarium has great lighting, temperature, humidity, and ventilation control. He brings outside air in to ventilate and can cool the temperature in the orchidarium from a daytime temp of 68F to a nighttime temp of 50-51F in about 25 min with the fan on low speed. He feeds Masdevallias about once every six weeks with a fertilizer solution containing 60 ppm nitrogen, 150 ppm total nutrients. They are not heavy feeders.

GENERAL MEETING MINUTES, CONT.

Heather Anderson showed *Phragmipedium* Ecuagenera Dream, which she got from Bob Lucas. It has a second bud but she is not sure if both flowers will be open at the same time. She grows it under lights in the basement, but now that it is blooming, she has it in an east window upstairs.

Tracey thanked members for joining the meeting, for participating and for continuing to send photos for the newsletter. Participants will need to leave this meeting and access the second Zoom link for Alan Koch's presentation at 2:00 p.m.
The first meeting adjourned at 1:31 p.m.

Presentation

Due to a misunderstanding, the presentation did not start until 3:00 pm CST. It was moderated by Dean Chesterman of the Orchid Society of Alberta, and was shared between the OSA and the SOS.
There were at least 48 participants.
Before the presentation started, Charlene Lang of the OSA reported that their show will be held April 1 - 3, 2022, with setup on March 30 - 31. She has already received some vendor applications.

Alan Koch, Gold Country Orchids

(www.goldcountryorchids.com)

Manage Your Orchids: Growing Tips for All

Managing your orchids means a lot of things. Every time you water your plants you should examine them. You should be looking for how they are growing, and for pests and diseases. This is the perfect time to see if the plant growth is proper.

Alan is going to be talking about things like proper nutrition, potting on time, etc. (There is not one orchid person he knows who pots every orchid on time!)

What should I grow?

- Novice - if you are a novice, you should start with easier plants. Often a novice will buy a more advanced, more difficult-to-grow plant, will lose the plant and lose interest. It is critical to start with plants that are easier to grow, such as hybrids that have hybrid vigour.
- Advanced - you can now progress to species.
- Expert - many experts actually prefer to grow species because they are more challenging. Buy plants that will grow under you growing conditions. For example, if you are growing under lights, don't buy something that requires an extreme temperature drop. If you are growing on a windowsill, buy plants that are adapted to lower light.

Water, Water, Water

The most important thing that we all do is water our orchids. Watering is the most critical thing. If you don't water thoroughly, you aren't flushing the salts out of the root system and the salt buildup will damage the roots.

First water: you water the surface. Second water (a few minutes later): you water the media. Third water: you flush the salts from the media. The harder your water, the longer you need to water.

Oxygenated (aerated) water is important. Mr. Koch showed a picture of water going through an aerator head when the plants were being watered. Oxygen prevents fungal buildup in the media. It encourages root tip elongation and branching of the root system. Always try to pull oxygen through the media when you water. If you take your orchids and let them sit in a sink to water them, you are not getting oxygen to the roots. In nature, the plant is attached to the side of a tree, where the roots have access to oxygen, and rain flushes it and prevents salt buildup.

If you have hard water, it will benefit you to use reverse osmosis, distilled, or deionized water. Mr. Koch showed a picture of Phalaenopsis plants that were all brought out of flask at the same time. Some were watered with well water, and some were watered with RO water. They were all fertilized with the same fertilizer at the same time. After three months, you could see a drastic difference in their growth, with the RO-watered plants being much more advanced. This shows that water quality is exceptionally important to growing a good orchid.

What should I do if I have hard water?

- Use a longer water cycle to flush out unwanted salts.
- Use lower amounts of fertilizer.
- Adjust your pH. A water pH of 6.2 is ideal for maximum uptake of nutrients, although anything in the range of 7 to 7 is alright. Most orchids prefer a slightly acidic environment. An exception is *Phragmipedium kovachii*, which prefers a basic environment.
- Leach water in the spring, summer and fall. (Water your plants for a longer period of time.) When he lived in an apartment, Alan would set his plants in the shower and let the shower run for about half an hour, leaching the salt buildup from the plants. The harder the water, the more you need to flush.

What if I have good quality water?

- You need to water less.
- You still need to pull oxygen into the media.
- You can get away with using more fertilizer.
- Always use a more complete fertilizer. The better the quality of your water, the more complete the fertilizer has to be. If you are using RO water, use a fertilizer that is made for it. You need all the micronutrients because you aren't getting them from your water source.

GENERAL MEETING MINUTES, CONT.

When do I need to think about treating my water?

Alan's well water in the Sacramento, California area varies from 250 to 650 ppm total dissolved solids (TDS). Up to about 500 or even 600 ppm, they don't worry about treating their water, but at 650 ppm, they need to start thinking about it.

All public water systems in the USA, and probably elsewhere, must provide a water quality report. In the USA and throughout the world, all water has to be delivered at a basic pH level to prevent leaching lead from the solder in copper pipes.

Do not use water that has been put through a water softener. It has too much salt, which is very bad for the orchids.

Fertilizer

Mr. Koch uses several different kinds of fertilizer. One of them his Plantex fertilizer, which is made in Canada but is known here as Plant-Prod. It is 20-20-20 with double the trace elements (micronutrients). Epiphytic plants like orchids benefit from extra trace elements. Alan showed a graphic illustrating the composition of plants. Carbon, hydrogen and oxygen comprise 89%, but the graphic also indicated primary macronutrients (nitrogen, phosphorus, potassium), secondary nutrients (calcium, magnesium, sulphur), and micronutrients (iron, manganese, zinc, copper, boron, molybdenum, sodium, chloride).

Nitrogen, phosphorus, and potassium - and also calcium and magnesium - are best absorbed through the roots, while micronutrients are generally best absorbed through the guard cells, which are mostly found underneath the leaves. These guard cells have "macropores" and this is where the micronutrients are picked up.

Stomata consist of two guard cells that open and close and, in most orchids, they open and close mostly at night. This would make one wonder how they can make use of foliar feed. However it isn't the opening and closing of the stomata that draw in the nutrients, it is all the macropores in the cells. This means, however, that if the foliar fertilizer is just landing on the tops of the leaves, it isn't getting into the plant as efficiently as it should. It needs to be on the bottom of the leaves.

Alan showed a graphic that indicated that most micronutrients are most efficiently absorbed by the plants at a pH of 5 to 5.5. This means that when you fertilize, you want to adjust the pH of your fertilizer to an acidic level.

Calcium and magnesium are part of the macro elements in the fertilizer and are critical to the growth of the plant. They, along with sulphur, are considered to be secondary macronutrients.
Magnesium is critical because it is located at the head of each chlorophyll molecule, which is necessary for photosynthesis (converting sunlight into energy in the plant).
Calcium triggers flowering, builds strong cell walls, and increases disease resistance. Orchids can only bring in as much calcium as they need. For extra calcium, you can add calcium nitrate to your fertilizer. Other excellent sources are dolomitic lime and oyster shell, which can be added to growing media when you repot. Both are also sources of trace amounts of magnesium. You always want to add magnesium when you add calcium, or else you will precipitate out other elements needed for growth.

In the summer, as the temperature or humidity increases, the need for calcium increases. A lack of calcium ion Cattleyas can be indicated by black leaf tips.
Calcium on its own can only be absorbed through the roots but, if it is tied to an amino acid, it can be absorbed through any macropore. An example of this type of fertilizer is Albion Metalose Calcium, a liquid calcium/amino acid foliar fertilizer.

Iron, a micronutrient, can be very important, especially to plants that grow on iron deposits in Brazil. Sophronitis especially benefits from extra iron. Rupiculous (growing on rocks) Laelias (now reclassified as Cattleyas) need iron sulphate. It is difficult for orchids to assimilate iron, so Alan adds iron sulphate a few times during the year to all of his orchids.

Foliar vs drench fertilizing

In drench fertilizing, the macronutrients are absorbed through the root system. In foliar fertilizing, the micronutrients enter the plant through the leaves.

The longer the day length, the more fertilizer needed

Since we have longer summer day lengths here than Alan does in California, we should be adding more fertilizer to our water in the summer than he does. Conversely, in winter, when our days are so short, we should be using less fertilizer. Our plants can't use it all, if we add too much. This doesn't apply if you are growing under lights with the same hours of light all year round.

Always water well prior to using fertilizer.

Make sure the plant roots are turgid before you fertilize, to prevent damage to the root tips from the fertilizer. Salt sensitive plants should be flushed after fertilizing and, since most fertilizer his absorbed within 25 minutes of application, Mr. Koch usually flushes salt sensitive plants with RO water about 25 minutes after fertilizing them.

Plants that stay wet in nature are very sensitive to salt buildup around the roots, e.g., *Cattleya coccinea* (formerly *Sophrronitis coccinea*) and *Dendrobium cuthbertsonii*. Theoretically, he should not be able to grow these plants in his greenhouse where the temperature gets to 102F but, if he can keep a healthy root system, that acts as an evaporative cooler, pulling moisture up from the media and out through the stomata, cooling the plant. In this way, he can grow these plants in a hot greenhouse.

Dendrobium cuthbertsonii grows in Papua New Guinea, where it receives 250 inches of rain per year and the temperature seldom exceeds 75F. However, Alan can grow this species in his 102F greenhouse because he ensures it has a good root system.

Salt buildup in plants can show up as necrotic black spots and brown tips on their leaves; the plant brings salt up from the roots so the roots don't get damaged.

GENERAL MEETING MINUTES, CONT.

What about the media?

If you tend to overwater, use more open media. If you tend to underwater, use a medium that holds water longer. Choose your media so that all plants dry out at about the same time. In his nursery, he uses seven different kinds of media, so he chooses media for individual plants so that they all dry out at the same time. He waters once or twice a week, maybe every 10 - 14 days in winter with it is foggy.

My pots must have good drainage and good airflow.

Alan wants pots with good drainage and good ventilation. The pots should be "pedestalled-up", not sitting flat on the bench.

When using moss, he almost always uses clay pots. He only chooses good quality moss: 5A or 4A from New Zealand or Tasmania, not Chile. He never fills the pots completely with moss, rather uses a technique called collaring. He puts a small ball of moss at the base of the plant, then pulls the long strands up and around the base of the plant and wedges it into the pot. The moss goes only halfway down the pot. As the plant grows, the roots pull the moss down into the pot, keeping it open so air and water can flow through. If you fill the pot with moss, it acts as a sponge and oxygen can't circulate.

Alan uses clear pots when the plants photosynthesize in the roots (roots turn green when you water).

You can tell when organic matter in the media is breaking down. The symptoms are the same as when there is salt buildup. The organic matter becomes acidic so the plant can't absorb the nutrients, resulting in salt buildup. Necrosis develops at the leaf tips.

When to mount

Some plants, e.g., *Cattleya schilleriana*, are often grown on mounts since their roots are better adapted to absorbing moisture and nutrients from the air, rather than from media in pots. It is the only Cattleya that has guard cells in its root system. Alan uses a bit of New Zealand moss when he mounts them, held in place by pantihose– it doesn't damage the plant and, as the plant becomes established, the pantihose will rot away, leaving a clean mount.

When to Basket

Plants that grow on horizontal tree limbs do not like vertical mounts and are better grown in baskets. An example is *Cattleya nobilor*.

Repotting

The best time to repot is when there are new green or bronze root tips. Move the pot up one size and you will have a happy plant. When repotting, don't push the medium down around the roots with your fingers; this can damage the roots. Instead, add a small amount of the medium at a time and gently tap the pot to distribute the medium around the roots. When finished, water the medium in.

Alan showed a picture of different kinds of clay pots and posed the question: what kind of pot dries out the fastest? His answer: tall clay pots dry out faster than short clay pots, such as bulb pots. Tall pots have a larger surface area.

More Culture Tips

Plant anatomy gives us a lot of information and how a plant grows in the wild tells us how to grow it in cultivation.

Alan showed a photo of *Cattleya cernua* (formerly *Sophronitis cerrnua*), which has thick fleshy leaves, thick roots, short compressed pseudobulbs, and a compressed growth. It is well adapted to drought. It can go 2 to 3-1/2 months without rainfall in the wild. It is a great miniature for growing in the house because it tolerates lower humidity.

Alan then showed a photo of a plant that is a twig epiphyte from the Oncidium family found growing on rocks in the mouths of caves. In such a habitat, the plant tends to dry out quickly. It tolerates low light and wants to be well-watered once a week. Even though it comes from an area of high humidity, because it is a twig epiphyte, it actually needs to dry out quickly rather than be kept moist.

Dendrobium wassellii is found growing on horizontal tree limbs in Australia. It flowers 6 or 7 times a year in California, perhaps 3 times a year in Canada, but only if grown horizontally. If you try to grow it vertically, it will just sit there and laugh at you. You have to follow how the plant grows in nature.

Orchids grow slowly. If you make a change, you have to be patient. It takes the plant time to adapt to the change.

Light Matters

Light mattress when growing plants. Cattleyas are usually high light plants but *C. luteola* grows under a dense canopy in Brazil. Alan measured the light where the plant shown in the picture was growing and blooming in the wild and found it to be 400 foot-candles, less than Phalaenopsis requires. The average light where *C. luteola* was growing was measured at 500-1000 fc. Alan has a friend in Hawaii who was growing this species in his greenhouse where it received about 4000fc of light. The plant was flowering twice a year and he was getting 3 or 4 flowers each time. Alan hung some plants of *C. luteola* underneath a bench and within a year the plants were blooming multiple times a year with 11 flowers per inflorescence.

Any plant that you are growing in light that is too bright can't save up the energy to flower because it is using the energy to cool off. Phalaenopsis, if grown in Vanda light will still grow and flower, but you won't get the beautiful large flowers and multiple inflorescences because the plant can't store enough energy.

GENERAL MEETING MINUTES, CONT.

Air Movement is Important

Alan has a friend who has a greenhouse on Maui where it never gets below 60F at night. Yet he grows orchids that require temperatures in the 40s to flower. He does this by bringing compressed air into the greenhouse that comes down the mountain off a volcano and gives the plants the feel of cool air.

Root tips tell us when a plant is in active growth

Orchid root tips tell you when the plant is in active growth and when to fertilize. The longer the root tip, the more active the growth. The shorter the root tip, the less active the growth. In spring, when days are getting longer, watch the root tips. When root tips grow faster than the velamen, it is time to start adding a little extra fertilizer. In summer, rot tips will be at their longest, but by fall, the velamen grows faster and starts to cover up the growing tips. Adjust your fertilizer by watching the root tips of your plants.

Oncidium: if you're having problems getting them to flower, the problem, 90% of the the time, is either old mix or not enough calcium.

Cattleya: let them dry out between waterings. They benefit from ample fertilizer and extra water in the summer, and dryer, cooler winters. Remember that anything with *C. luteola* in it, such as Beaufort or Luteus Forb, are adapted to lower light. *Cattleya intermedia* is not particular about temperatures; it is one of the hardiest of all orchids.

Bulbophyllum: many of them grow like Phalaenopsis. They like low to intermediate light and more constant moisture. Many are salt sensitive and hard water may inhibit flowering. Flushing them with RO or rain water 25 minutes after fertilizing may help with this problem.

Dendrobium: the most diverse genus in the world. Some grow like Phalaenopsis, others like Cattleyas. Nobile type Dendrobiums, such as *Dendrobium unicum*, need a rest period.

Paphiopedilum: this is another diverse section. Chinese Paphs, such as *Paph. armeniacum,* are found growing in limestone deposits (high calcium) so they benefit from extra calcium. The Brachypetalums can take wet summers with lots of fertilizer, but they need dry winters with low amounts of fertilizer. They are also found growing on limestone cliffs, so benefit from extra calcium. The multifloras Paphs, such as *Paph. philippinens*e and *Paph. rothschildianum*, need to be repotted on a 2-year cycle using an open mix, and like to dry out between watering.

Phalaenopsis: some grow cold and some grow warm. Alan showed one that even likes to be mounted. In Phalaenopsis, the starch for flowering is stored in the roots so it is very important to have a good root system. Alan showed photos of *Phal. pulcherrima* (formerly *Doritis pulcherrima*), growing directly on rocks in full sun with its roots exposed. Thus, this plant and its hybrids like to dry out quickly and not remain uniformly moist like many Phals.

Vanda: they photosynthesize in their roots so, in Florida, they are often grown in baskets with the roots exposed. Some grow cool, some grow in low light, some are fragrant. Hybrids of *Vanda falcata* (formerly *Neofinitia falcata*) are good for home culture as they stay small and often bloom several times a year.

Angraecum: also photosynthesize in the roots, as do Aerangis. Alan allows the aerial roots of his plants to grow wherever they want, so the plant can photosynthesize. This group should not be in a dark pot.

Miniatures: when watering miniatures, take extra time to look for scale and mealybugs. Small plants attract these pests the most and are often killed by the pests because the plants are so small.

If in doubt, ask the experts! What should you ask about? Temperature, light, humidity, rest period, fertilizer (heavy or light feeders; sensitive to salt buildup). Be sure to ask these questions of the vendor when you buy a new plant so you can keep that plant alive and flourishing.

Mr. Koch accepted questions from the participants.

Q: When you fertilize, do you make up one type of fertilizer one time, and another type the next time, or do you just make one mixture?

A: Alan has 3 different types of fertilizer that he uses on a seasonal basis. In spring, when he wants to promote root development after repotting, he uses fertilizer that promotes a better root system. When coming out of winter and the spring shows are coming, he uses a fertilizer that promotes blooms, so he has more in bloom for the shows.

For customers, he has designed a foliar food and a drench food. The foliar food is used on week 1, the drench food on week 2, foliar on week 3, drench on week 4, and then the plants are flushed with water on week 5. You can use RO or rainwater for the flush, or just a long period of running your sprinklers. When Alan's water is 250 ppm TDS, that is sufficient to leach the salts if he runs the sprinklers for 45 minutes. Another trick he uses is if hot summer weather is coming, he feeds a solution of calcium nitrate and lets it sit in the plant for about 30 minutes. Then he turns on the well water sprinklers to flush it. That freshens up the media. You get the calcium absorption, plus a clean of the media.

Q: If you are spraying from above, how do you get the trace elements to the underside of the leaves where they can be absorbed by the stomata?

A: We add silicone to the fertilizer and use a product called Kinetic, which is a silicone spreader/sticker that acts as a trans laminar; it wraps around the leaf. If I am just doing a foliar feed, sometimes I use Albion MicroMineral, applied with a 300 psi pressure sprayer. That wraps the fertilizer solution around the leaves. You could also use an electrostatic sprayer. Due to the pandemic, these have become more popular and the price has come down from $3,000-4,000 for a commercial orchid nursery. You can get small ones for $100. The sprayer adds a charge to the spray as it comes out and this causes it to stick to the plant, which has the opposite electrical charge. You can use less solution this way. You can also use the method for applying pesticides.

GENERAL MEETING MINUTES, CONT.

You can get battery-operated sprayers, so you don't have gas fumes blowing in your greenhouse.

Q: **A few years ago, you told us about leaching out the excess salts from Sophronitis after fertilizing. I've been doing that and I've had the best growth and flowering of my *Sophronitis coccinea* that I've ever had.**

A: The extra leaching makes all the difference in the world.

Q: **How do you deal with algae buildup in clear pots?**

A: We use 3% hydrogen peroxide, straight out of the bottle. Besides treating algae, the peroxide, being pure, also leaches the media. It also releases oxygen, which will kill any fungal spores and encourage root tip elongation and branching. The peroxide has to be fresh because once you open a bottle, it starts to deteriorate.

Q: **Would it be a good service to have a small tag with basic care information given out with a purchased plant?**

A: The problem with that is that there are so many different variations. You could probably do it with basic Cattleya care or basic Phalaenopsis care. But if you look at the genus Paphiopedilum, multifloras grow like Cattleyas, Brachpetalums want dry winters, and so on. The American Orchid Society tried doing that but they found that people were putting the wrong care with the wrong plants and then they were sending nasty letters to the AOS when their plants were dying. Also, the cost of labels these days really adds up. One big producer in California puts out 6 million plants a year. Even at 3 cents per label, that adds up to a big chunk out of his bottom line. For the most part, people who are buying an orchid at the supermarket just don't care. I got my society to put a rule in the show rules that says "no plant may be sold without a name tag." Every vendor must have the name of their nursery and contact information on the tag.

Q: **How much calcium do you apply in your fertilizer?**

A: We use a derivative of CalMag fertilizer, but find that in the summer that isn't enough calcium. So we add roughly a teaspoon of calcium nitrate per gallon of water once a month. The good news its that we've tried to get a calcium toxicity in orchids, to find out the limiting factor for too much calcium: we've never been able to get a toxic level of calcium, even using 1000 times the recommended strength. It seems that orchids will only pick up as much calcium as they need.

Q: **Do you also add magnesium when you add calcium?**

A: We use a magnesium sulphate injector. I recommend calcium and magnesium in a 2:1 ratio. If you don't add them in approximately that ratio, then you will get zinc and iron precipitating out; then you get zinc and iron deficiency. With my hard well water, I acidify down to a pH of 4.7 now and then. I then add magnesium sulphate. I also adjust the media and add calcium and magnesium at the same time. I recommend a series of articles written by water scientist Bill Argo of Blackmore Co., on water quality and nutrition. The articles can be downloaded from the St. Augustine Orchid Society's website, www.staugorchidsociety.org

Dean thanked Alan for his interesting presentation.

Meeting Adjournment: 4:00 pm

*2021-2022 SOS Executive:

President	Tracey Thue
Vice-President	*Asking for volunteer*
Past President	Bob Lucas
Secretary	Donna Carlson-O'Keefe
	Asking for volunteer
Treasurer	Cheryl Grummett
	Asking for volunteer
Social	Shirley Keith
Plant Orders	Heather Anderson
	David Schwinghamer
Resources	Don Keith
	Tom Kondra
Library	Deb Huculiak
	Asking for volunteer for 2nd librarian
Newsletter Editor	Tracey Thue
Newsletter Assistant	Tobi Fenton
Speaker Coordinator	Heather Anderson
Webmaster	Calvin Lo
Facebook Page	Sara Thue
Member at Large	Lynn Campbell

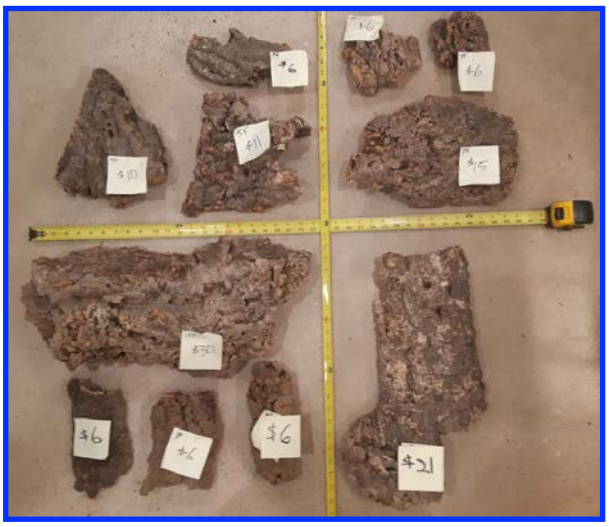
ORCHID MARKET

Plant Products from Sherida Gregoire's Greenhouse

If you are interested, please email Bob Lucas at robert.lucas@usask.ca

Products are offered on a first-come, first-served basis.

- One Sunblaster 24" T5 HO bulb and ballast, new in the box @ $25.00.
- Greenearth concentrate horticultural oil, 500ml, new & unopened, 2 @ $5.00 each.



Don Keith will provide orchid supplies to SOS members, **orders to be placed by 8:00 pm Saturday, Jan. 22, 2022.** Orders will be ready for **pick up after 10:00 a.m. Sunday, Jan. 23, 2022.** Please pay with exact cash, by cheque made out to the SOS, or pay Don by e-transfer. Email Don at donkeith@sasktel.net

ITEM	DESCRIPTION	PRICE
Fir Bark	3L bag fine or medium (please specify)	$6.00
Orchiata Pine Bark	3L bag fine, medium or med-coarse (specify)	$6.00
Orchiata Pine Bark	40L bag, fine, medium or med-coarse (specify)	$52.00
Perlite	4L bag medium/coarse	$4.00
GrowStones	3L bag, 1/4 - 3/8" or 1/2 - 3/4"	$6.00
Sphagnum moss, N.Z.	8L compacted 12L compressed	$12.00 N/A
Grodan Grow Cubes	3L bag, 0.4" cubes 7L bag 0.4" cubes	$5.00 $10.00
MSU fertilizer	1 cup 13-3-15 for tap or RO water	$5.00
Oyster shells	1 cup bag	$0.25
Marphyl Soil Enhancer	500 ml bottle	$11.00

ITEM	DESCRIPTION	PRICE
Cork slabs	Various shapes, sizes (see photo above)	$6 - $32.00
Inflorescence clips	Small, brown or green	10 for $1.00
Rhyzome clips	Small Med/Large	$1.00 $1.25
Clear Pots	2 1/4 x 2 1/4 square	$0.50
	2 1/2 x 2 1/2 round	$0.50
	2 3/4 x 2 3/4 round	$0.75
	4 x 4	$1.25
	4 1/2 x 4 1/2 slotted	$1.50
Net Pots	3"	$1.25
	3.5"	$1.25
	5"	$1.50
	6"	$1.75

PLANTS FOR SALE by SOS MEMBERS

For sale by Heather Anderson

heather.jane.anderson@gmail.com

***Phragmipedium schlimii* 'Wilcox'**

[Editor's Note: *Phrag schlimii* 'Wilcox' is actually *Phrag* Cardinale 'Wilcox' (*Phrag* Sedenii x *schlimii*); despite this naming mixup made decades ago, this is a lovely, vigorous Phrag, popular with beginner and experienced growers!]

Photo #1 (left) shows mother plant in bloom. It bloomed for 22 months with between 2-4 bloom stems at all times. It has recently been divided. There are 5 divisions for sale.

Photo #2 (middle) shows one division with a bloom stem. **$20**

Photo #3 (right) shows the other divisions. Each has 2-3 fans. **$15 each.**

***Phragmipedium* Sedenii (*Phrag. schlimii* x *longifolium*)**

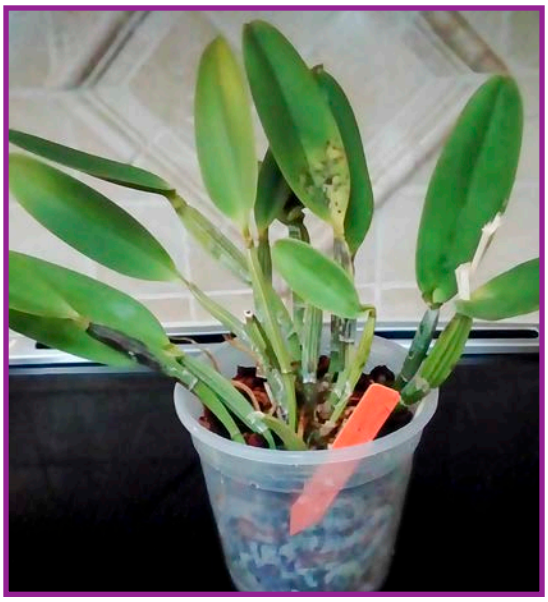
Photo #1 is an image of the flower from the Ecuagenera website. I purchased it from them 5 years ago but didn't take a picture of my own plant when it last bloomed.

Photo #2 (middle) shows a division in spike. It has been recently repotted. **$20**

Photo #3 (right) is another division. Recently repotted. **$15**

For sale by Pat Randall

pat.randall@sasktel.net



***Cattleya lueddemanniana* ('Clarines' x 'Morelia')**

A Cattleya species that I bought from Ecuagenera in 2011 at the Calgary Orchid Show. On the right is a picture of the division for sale. I divided the plant in late December. It has good roots and is a blooming size division. It is potted in a $5^{1/2}$ inch pot in medium bark. The bloom photo (on left) is of the blooms this past April. Bloom expand to between 6 and 7 inches across and are stunning. Asking $24.00.

SHOW AND TELL

Grown by Lynn Campbell

***Cattleya* Fire Fantasy *x Sophrolaelia* Polestar**

This was a nice surprise this morning (December 13). I just bought it from Gold Country. A miniature.

Grown by Don Keith

Lepanthes tsubotae

Native to Columbia. A micro-miniature. Puts out a flush of little flowers twice a year. Intermediate to warm grower, but I grow it cool.

Masdevallia rex

Native to Ecuador. Blooms twice yearly. Hot to warm grower, which is rare for a Masdevallia. I grow it cool.

Grown by Tom Kondra

***Phalaenopsis* Black Butterfly**

The oldest orchid in my collection. Purchased from a Taiwanese grower at the last Saskatoon-hosted orchid show. Grown hydroponically.

Masdevallia xanthina (left)
Masdevallia xanthina lago (right)

Cool growing miniatures. Similar in appearance; *M. xanthina* has a hint more yellow.

From Ecuagenera.

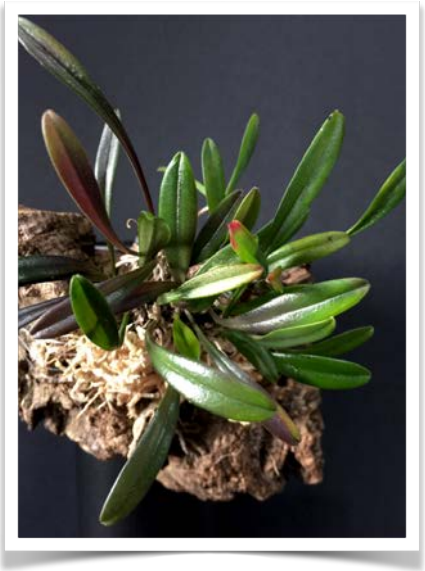
Lepanthes simjii

Warm grown, medium orchid, long stalks with continuous bloom. With six or more stems, the long spikes with blooms look like fruit blossoms.

From Ecuagenera.

Lepanthes gargoyla

Cool grown. Reddish leaves. Consecutive bloomer with multiple blooms at once. From Ecuagenera.



Dryadella simula

Plant (left) and flower (right). Cool growing miniature with green 3” long oblong leaves. Flowers are hidden low by the base of the leaves. From the Orchid Species Preservation Foundation.

Lepanthes tentaculata

Warm grown in terrarium for humidity. Large dollar-sized round mottled leaves. Small multi-level red flower. Ecuagenera.

Masdevallia discoidea

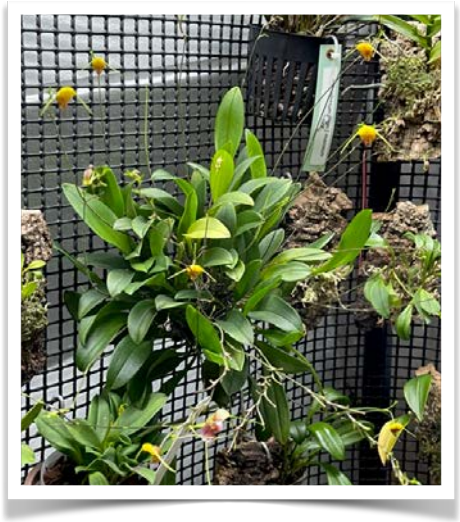
Cool growing small miniature with larger than expected blooms. Stays closed like a

***Masdevallia xanthina* red**

Cool miniature with red blush petals. From Ecuagenera.

Platystela umbellata

Miniature, cool growing. Tiny spike with ball of cluster blooms. The whole cluster is half the size of a pen tip. Ecuagenera.



Scaphosepalum breve

Miniature. On long spikes, continuous blooming. Yellow moustached bees hover with the air flow in the terrarium. Currently has about a dozen bees. I've seen as many as three times that number on this plant. Purchased from Don Keith.

Paphiopedilum King Arthur

One of the oldest hybrid Paphiopedilum, developed in 1915. Warm grown. Light green, lightly mottled leaves; beautiful flower with light purple and green shades. A division from Tracey Thue.

Paphiopedilum Voodoo Kitty 'Bold Statement' x *callosum* 'PA1435-1'

Alternate light and dark green mottled leaves. Flower is very dark purple with rays and halo of pinkish tones. An easy grower. From breeder Glen Decker.

Grown by Heather Anderson

Phragmipedium Ecuagenera Dream

This is grown under lights but once it started blooming it was moved to an east window in the living room. It's watered every 6-7 days and sits in a saucer of water.

Cattleya maxima

This was a very large specimen plant and when it bloomed in 2020 it had 11 blooms. It was divided in 2020 and three divisions were sold. I kept the largest division. It is grown under lights. It has a lovely fragrance.

Grown by Bob Lucas

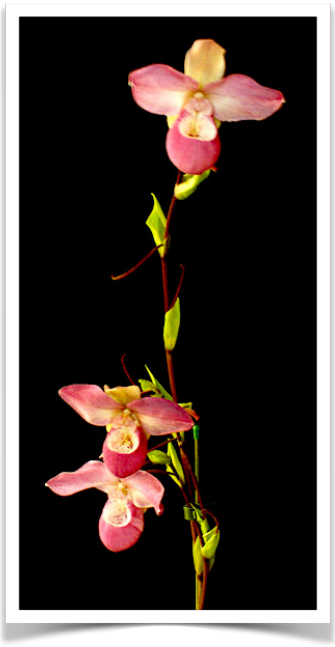
Phragmipedium Belle Hougue Point

I purchased this plant from Lynn Kasper in 2001. I almost lost it once and am glad I did not, as it keeps getting better. The blossoms now have a 10.0 cm natural spread and the plant colour is very striking.

I grow my Phrags under lights in plastic pots with a two-inch water reservoir in the bottom. The medium is a mixture of coir fibre, large perlite and diatomaceous rock. I water twice a week and fertilize at at about 125 ppm once a week.

Phragmipedium QF Red Wing

A recent addition in 2018 from Piping Rock Orchids. It is an Eric Young cross and is much larger, with a 12.0 cm natural spread.



Closeup photo by Sara Thue

Phragmipedium Ecuagenera Dream

I purchased a flask of this *kovachii* cross in 2014 from Ecuagenera and this is the second bloom for me with a branching inflorescence. It has been in bloom since mid-November and has dropped seven blossoms. The only drawback is the inflorescence is now 33 inches high.

Phragmipedium Seymour 'Red Dancer' x *Phrag. kovachii* 'Full Moon'

Photo by Sara Thue

***Paphiopedilum* Vanda M Pearman**
Photo by Sara Thue

Grown by Donna Carlson-O'Keefe

***Epilaeliocattleya* Magic Wand**

(*Epicattleya* Kyoguchi 'M. Sauno' Mutation x *Laeliocattleya* Trick or Treat 'SVO' 4N)

This is a 4N hybrid that I got from Sunset Valley Orchids in 2017. It is a delightful little plant with a branching inflorescence. The flowers are about 1.5" across. SVO describes it as compact, fragrant, and easy to grow. Sadly, this one is not fragrant, or at least not when I am around to smell it, but I love it anyway.

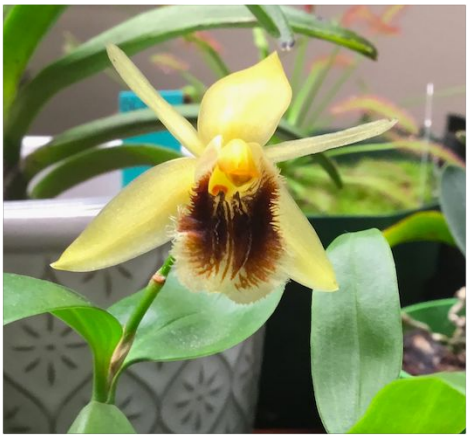
Grown by Sherry Fensom

Miltoniopsis roezlii xanthina

This was one of my wish plants so when it came in bud from Ecuagenera I risked letting the bloom open before I removed it, just to make sure it was the plant I hoped for. It is as far as I can tell. I removed the flower as soon as it opened to let the plant reserve its energy and acclimatize.

Coelogyne trinervis

This has long lasting blooms for a Coelogyne but, for me, the scent is not something to be desired.



Coelogyne fimbriata

Grown under my LED grow light. It pushed up two blooms sequentially this fall. I obtained it from TG Orchids in 2020.

***Potinara* Shin Shiang Diamond x *Sophrolaeliocattleya* Hsinying Little Mary**

Dendrobium normanbyense

***Dendrobium* Red Senator 'Maxim'**

Grown by Tracey Thue, photos by Sara Thue

Phragmipedium Don Wimber

This is one of my favourite *Phrag. besseae* hybrids, purchased in 2014 from John M, based in Ontario via the slippertalk forum. It grows under lights, intermediate temperature in a clear plastic cup with layers of clay pellets and sphagnum moss. It is watered with rain water every week, and flushed well with tap water every month or so.

Aerangis luteo-alba var rhodosticta

Purchased from J&L Orchids in 2018, this plant has flowered every year for Sara, happy in her orchid tank with cool-intermediate temps and high humidity. The plant hangs near a small fan for air movement, and is given bright light. It is watered with rain water and infrequently fertilized with MSU fertilizer.

Paphiopedilum Fairly Galaxy

(*Paph farrieanum* 'Matrix' x *Paph* Icy Galaxy 'Over the Top')

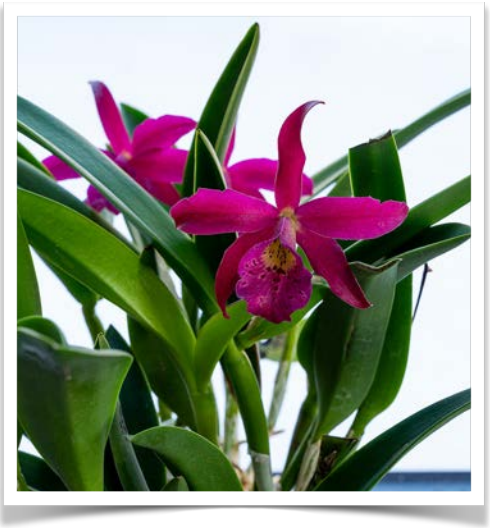
I'm in love with *Paph farrieanum* and any of its hybrids. This Orchid Inn hybrid was registered in 2015 after I ordered it in 2014 as an unnamed seedling. It has flowered 3 times for me, and tried to die countless times. It seems to be managing with the fine Orchiata bark and kept relatively moist at all times.

The parent Icy Galaxy, registered by Orchid Zone in 2007, has a fascinating pedigree dating back to 1893!

Neolauchea (syn Isabelia) pulchella

I purchased this plant from Terry Letendre in 2017 and have struggled to find a place where it is happy. The information online says the species is found in southern Brazil in cool, damp mountains with moderate shade. My plant is attached to a cork slab and finally flowered when placed under the LED lights of my plant stand in intermediate temperatures. It gets watered regularly with rain water and fertilized with MSU or K-lite fertilizer. I suspect it would do better with higher humidity.

Grown by Pat Randall



(*C.* Florence Lin *x Bsn* Maikai)

I got this the fall of 2017 when Fred Clarke of SVO was our guest speaker. It blooms winter and summer. I grow it in medium bark under a light, but I think it needs more light as it is not a very robust bloomer. My New Year's resolution is to give this plant more light and see if it can do better. Blooms last a long time.

Eplc. Volcano Trick 'Orange Fire'

I got this plant from Ching Hua in 2012 at the Edmonton Orchid Show. It has faithfully bloomed every fall for many years. It's a bit late this year. Blooms are long lasting (3-4 weeks). I grow it in medium bark under lights.

Cattleya walkeriana var. semi-alba

I got this from Ten Shin Gardens in 2016 at the Edmonton show. This is its first bloom. This species prefers to be mounted, but I don't grow mounted ones very well and I think it was being stubborn. In the past year I moved it to a plastic basket which likely made it happier. The scent is strong and very nice. It is in medium bark and under lights year round.

NOID Cattleya

I got this in our order from Ecuagenera last spring. It was supposed to be Ric. Caesar's Head 'Carolina Autumn' which is bright yellow with red flared petals and reddish lip. So obviously it was mislabelled. It is a lovely bloom and lasted fairly long but I had no luck obtaining a name for it. I grow it in medium bark under lights.

THE ROOT TIP

Mid-winter Musings

by Tobi Fenton

A floral gift is always a delight, but especially when it arrives in the depths of a frigid winter. I find myself, while arranging the hothouse flowers in a vase, meditating on the miracles of botanica. Snow covers the world in a hillocky white monotone that seems to make it difficult to concentrate; my mind slides across the white, looking for details of the summer landscape. A chickadee outside the window draws my attention to the intricate pattern of a twisted branch and suddenly I can feel the twig he's sitting on in the piece of cedar in my hand. I can smell the sharp willowy resin of spring, even though it's really winter cedar that I'm smelling. This swift, potent connection between imagination, memory, touch and smell is one that I often contemplate. It's a crossroad of human experience that anchors us in a moment, past or present, and reminds us that we are *alive* in this world. Animals, plants, insects, fungus, bacteria, virus - we are all connected. It's easy to forget, bound up as we are in the frantic technological imperative of our modern human lives, that we are as physically connected to the world as the chickadee in the forest and the tree in which he shelters. Maybe that's why we grow orchids. To reforge our animal connection with Earth. To smell. To touch. To imagine. To remember.

A floral gift of another sort arrived unexpectedly this week. An article in The Guardian announced the discovery of dozens of new species, their names and formal descriptions published in 2021. The plants on the list are among 205 new species named by scientists around the world, including sixteen new orchids from Madagascar. Five of these species are described in the March, 2021 issue of Kew Bulletin and it was into this publication that I dove with the full need of my early January ennui.

Two of the new orchids are angraecoids (Subtribe Angraecinae): *Aerangis bovicornu*, and *Angraecopsis lemurelloides*. Both are epiphytes. *Angraecopsis lemurelloides* grows in humid forest of northeast Madagascar; *Aerangis bovicornu* on small moss and lichen-covered trees in remnant forest on inselbergs in south-central Madagascar. Inselbergs. Yes. These are remarkable isolated mountain formations that rise up from the surrounding plains and forest like mythological beasts - or dreams of another world. Biologically, they could be on another world. The diversity of endemic plants being discovered on these granite monoliths speaks to the ecological isolation from surrounding habitats.

An inselberg, Madagascar

Photo:https://www.traveltomtom.net/destinations/africa/madagascar/madagascar-itinerary

Aerangis bovicornu
Photos: Johan Hermans

Angraecopsis lemurelloides
Photo: Patrice Antilahimena

Despite being of interest to botanists and ecologists since the early 19th Century, the vegetation on inselbergs in Madagascar has only just begun to be formally explored and studied. Tragically, many of these plant communities are already under threat from quarrying, grazing, Pelargonium cultivation (for essential oils), fire, and collection. Both of these orchids, having just been identified and described, are already assessed as critically endangered.

Habenaria crocodilium is a terrestrial orchid of wet, humid evergreen forest along rivers. Its species epithet refers to the similarity of its column and dorsal sepal to a crocodile's head. And to the many tiny teeth on the edges of the flower parts. And because the "type locality" was near a crocodile enclosure! (Type locality is the location where the type specimen was found. Type specimen is the specimen chosen to serve as a reference point when a species is first named.) I am particularly charmed by the extreme formation of the petals into two deeply divided (bifid) horns that are attached at the base (adnate) of the dorsal sepal and curved up and back towards the dorsal sepal. Very dramatic. You can't see this well from the photo, but the drawings show it beautifully. Zoom in on the "B" detail of the flower in the illustration below.

Habenaria crocodilium
Subfamily Orchidoideae, Tribe Orchideae
Photos: Mag Izouard

Habenaria crocodilium
illustrations.
Drawn by: Judi Stone

Polystachya siederi
Subfamily Epidendroideae, Tribe Vandeae
Photos: Anton Sieder

As you can see from the photo above, *Polystachya siederi* is a lithophytic orchid, growing on rock in riverine forests. It is named after Austrian explorer and grower of Madagascan orchids, Anton Sieder. The species is known only from the type locality in northern Madagascar and this habitat is under threat from fire and agriculture. It has been assessed as critically endangered.

The fifth orchid newly described is *Didymoplexis stella-silvae*. The species epithet is one of those exquisitely poetic names that perfectly describes the flower and its habitat: a "bright white star on the forest floor." A common name is "ghost orchid" referring to the fact that it grows in the deepest shade of the forest. Incidentally, this is also the common name for the endangered species *Dendrophylax lindenii*, an endangered moth-pollinated orchid of mangrove swamps in Florida, Cuba, and the West Indies. It, too, is bright white and seems to float in the air like a ghost.

Another similarity between the two ghost orchids is that they are leafless. Similarities end there. *Dendrophylax* roots have chlorophyll and so they are able to photosynthesize. *Didymoplexis stella-silvae* roots have no chlorophyll. Ergo, the plant does not photosynthesize at all. How, then, does it acquire carbon for

Didymoplexis stella-silvae
Subfamily Epidendroideae, Tribe Gastrodieae
Photos: Johan Hermans

Dendrophylax lindenii
Subfamily Epidendroideae
Photo: Mac Stone

The star of the forest (I boldly name it here, amongst ourselves, to distinguish it from the other ghost orchid) is holomycotrophic. I know! Isn't that the most gorgeous word? It means that the orchid acquires all of its carbon and other nutrients from fungus, in a mycorrhizal symbiosis. This is a powerful, important relationship, one that most of us are unaware of as we hurry along, above-ground. Many of us are only aware of the presence of fungus when it produces mushrooms in our lawns, and then we tend to tear out our hair as we try and get rid of them. Unless you are cultivating turf grass for a quality golf course, embrace the mushrooms! For they are the fruiting bodies of fungus in the soil and demonstrate that your soil is healthy.

The bulk of the fungus, the vegetative part, exists mostly under ground as a massive spreading web of thin white filaments, or mycelium. The mycelium secretes enzymes that break down organic matter in the soil (or rotting tree stumps) into nutrients like nitrogen, phosphorus and potassium. Which is why your garden soil is healthy if you have soil fungus!

Fungi do not photosynthesize. They are heterotrophs, meaning they need to acquire carbon from an outside source for their own energy and growth. They do this by either breaking down dead plant matter, such as wood or fallen leaves (saprotrophs); invade and kill the cells of a plant host and then absorb the nutrients saprophytically (necrotrophs); or invade cells of a plant host to absorb nutrients but do not kill the host (biotrophs). *Pythium* and *Fusarium* are both necrotrophic fungi. *Ascomycota*, which causes Dutch elm disease, is another. Powdery mildew, potato late blight and black stem rust are plant diseases caused by biotrophic fungi. As you can see, even if a biotroph doesn't kill its host, it can cause damage. However -

Mycorrhizal symbiosis is a crowning achievement of the botanical world and scientists are still discovering the extent of its influence. It has been suggested that there may be as many as 10,000 fungal species and 8,000 plant species involved in mycorrhizal networks globally. Including our little star of the forest that lives in deep shade and can't get any energy from the sun. Instead, its roots absorb the nutrients from the soil provided by the mycelium network.

This is where the botanical magic expands. In most mycorrhizal associations, the vascular plant (for example, a tree) is an active participant in the relationship. It supplies sugars (carbon) - of which it has a vast supply via photosynthesis - to the fungus which, as we have seen, needs to get it from an outside source. The fungus in turn supplies the plant partner with nutrients, especially nitrogen and phosphorus. Because the mycelium network is so vast, it can extend far beyond the "nutrient depletion zone" surrounding plant roots and so is much more efficient at mining the soil for these elements.

But how do achlorophyllous orchids like the star of the forest contribute to the association? Simply put, they don't. They cheat the system. They rely on fungi that function in truly symbiotic mycorrhizal networks with other vascular plants, such as trees. The fungi get the sugars they need from the tree roots; the tree roots gather up the nutrients that the fungi extract from the soil; and the star of the forest lives in close proximity to both (with its roots in the leaf litter) and "steals" the nutrients it needs without contributing anything to the system. A sneaky and highly evolved solution.

Everything is connected. Plants, animals, insects and, at the heart of it all, fungus.

References:

Bayer, Eben. "The mycelium revolution is upon us." Scientific American (2019). https://blogs.scientificamerican.com/observations/the-mycelium-revolution-is-upon-us/

Carrington, Damian. "Ghost orchid that grows in the dark among new plant finds." The Guardian. https://www.theguardian.com/environment/2022/jan/06/ghost-orchid-that-grows-in-the-dark-among-new-plant-finds

Finlay, R.D. Ecological aspects of mycorrhizal symbiosis: with special emphasis on the functional diversity of interactions involving the extra radical mycelium. *Journal of Experimental Botany* **59**, 1115-1126 (2008). https://academic.oup.com/jxb/article/59/5/1115/541125

Hermans, J., Rajaovelona, L. & Cribb, P. New species in Orchidaceae from Madagascar. *Kew Bull* **76,** 39–56 (2021). https://doi.org/10.1007/s12225-021-09923-w

Houlihan, P.R., Stone, M., Clem, S.E. *et al.* Pollination ecology of the ghost orchid (*Dendrophylax lindenii*): A first description with new hypotheses for Darwin's orchids. *Sci Rep* **9,** 12850 (2019). https://doi.org/10.1038/s41598-019-49387-4

"How do mycorrhizae work?" Untamed Science. https://untamedscience.com/biology/ecology/mycorrhizae/

Myco-Heterotrophs: Hacking the Mycorrhizal Network. MykoWeb. https://www.mykoweb.com/articles/Myco-Heterotrophs.html

Teaching the Fungal Tree of Life. http://www2.clarku.edu/faculty/dhibbett/tftol/content/3folder/

Hydnellum nemorosum (Tooth fungus)
Photo: Martyn Ainsworth/RBG Kew
A mycorrhizal fungus discovered in 2008 growing in moss under a chestnut tree in the UK. Described in 2021.