A HOBBYIST'S GUIDE TO GROWING ORCHIDS FROM SEED

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ORCHIDS HAVE BEEN a part of my life since childhood. I recall the first orchid that I ever found growing in the wild—the yellow fringed orchid (*Platanthera ciliaris*)—that I accidentally stepped on. When I realized what I had done, I put everything on pause to take the broken flower stem back to the house and show it to my grandmother, much to the consternation of my companions that day. My grandmother had a wonderful greenhouse filled with orchids. She delighted in showing off her prized plants whenever I visited. She gifted me my first book on the subject: *The Golden Guide to Orchids*. That was the beginning of a lifelong obsession.

During high school, I secured a job as a laborer at the local orchid grower, potting up orchids and general greenhouse and plant maintenance. With this experience, I delved further into the mythos of orchids: the incredible diversity of species, their habits, and quirks of cultivation. I also learned about the process of flasking, a method for growing orchids from seed. I approached my boss, Lou, and asked if he was interested in starting a flasking operation. His father had grown orchids from seed (flasking) years before, but after he passed away, the flasking stopped. Lou liked the idea of getting back into flasking and had much of the equipment—so there I was, a high school senior in charge of the orchid flasking operation for a greenhouse!

Platanthera ciliaris

People often say to me: "you do orchid flasking at home? That is such an elaborate process!" Surprisingly, flasking at home is not nearly as difficult as people seem to think. I have been flasking in my kitchen and basement (much to my partner's chagrin) for nearly 30 years. Please keep in mind that I am not a professional grower but an overgrown hobbyist with an obsession for growing orchids from seed. I have no professional laboratory training nor background, and as such, all that I have learned I acquired through study, experimentation, and failure. Although some growers may not agree with all my methods, they have worked for me, and with modification, they can work for you as well. Flasking is both an art and a science where one learns from their mistakes and builds on their successes. I will touch on everything the home grower needs, from equipment to seed sterilization, seed sowing, and replating seedlings. Let us get down to business, shall we?

Equipment

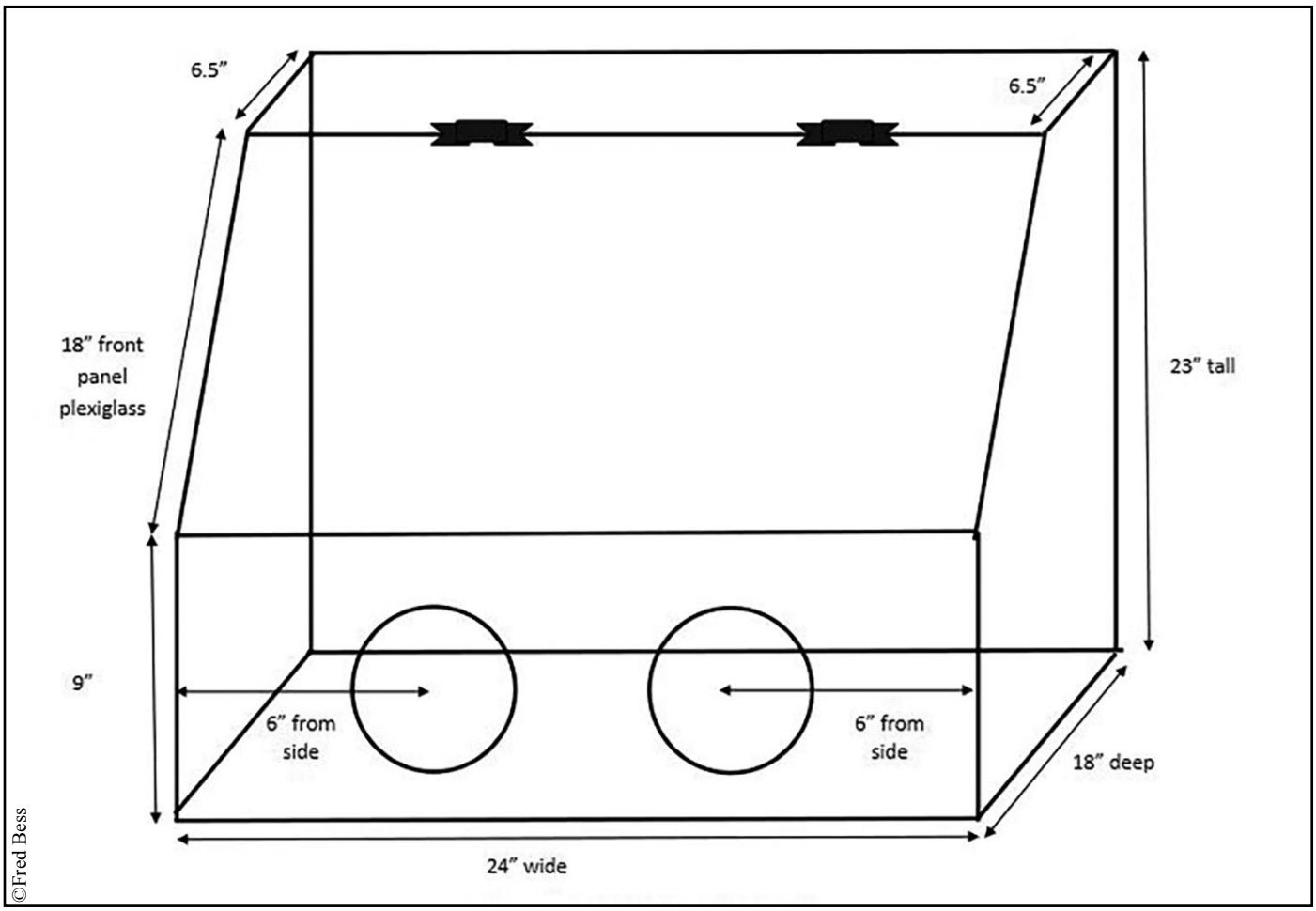
Depending on your budget, flasking can be inexpensive and simple or as expensive and elaborate as one can afford. I started with the former route and have gradually added more advanced equipment based on the number of species I am flasking. Sourcing most equipment needs has become very easy with online dealers as eBay and Amazon. The following is a list of items that I feel are indispensable when getting started flasking:

- **Pressure Canner**
  The canner sterilizes the media and your equipment. It is probably one of the more expensive items—I located one at a local garage sale for $10—but you can buy a decent pressure canner for around $100. *Presto* is a quality brand and should last for years. I have found that a standard water bath canner is not sufficient, nor will an instant pot-type cooker work
- **Flasks**
  Flasks are the vessels used for harboring sown seeds. I will use the term flask to refer to most of the vessels used here. You can use various materials, but here are the ones I recommend:
  - Glass bottles and jars work well, although you

can use polyethylene plastic ones. When using a plastic flask, test it in the canner to ensure that it does not melt. At work, I started with antique milk bottles laid on their side. When I was getting started at home, I found glass *Snapple* bottles (sadly, no longer made of glass) that friends saved for me worked equally well. It was easy to find rubber stoppers that fit the Snapple bottles and could withstand the pressure of the canner. They do tend to roll, but this is a minor inconvenience. Additionally, canning jars or most any other clear vessel can be used. I have even seen liquor bottles used effectively.

- Pre-sterilized Petri dishes are another excellent way to sow seeds as they are both easy to work with and time-saving. They are found on eBay when laboratories cannot use them because the outer carton is damaged, and they are often sold at a much-reduced price. So long as the provided inner sleeves are intact, they remain sterile.

- **Scale**
  An accurate scale that will weigh to a hundredth (0.01) of a gram is sufficient. While accuracy is important for the home flasker, it is not generally critical unless you're obsessed and decide to make your media from scratch. Scales are easy to find on eBay or Amazon, generally for under $20.
- **Glove Box**
  A glove box is used for seed sowing and replating under sterile conditions when you don't have a flow hood. A homemade glove box can be easily fashioned out of an old aquarium or plastic box, while you can make a more durable one from plywood and plexiglass. We used a big wooden box at the greenhouse with a beveled glass front and coated with waterproof paint. If you make a glove box, I strongly recommend adding an ultraviolet (UV) sterilizer to the unit because it greatly improves the effectiveness of the glove box. I had a similar glove box made from plywood and greenhouse glazing at home until I was gifted a retired ultraviolet (UV) hood from the local university. As one becomes more proficient, a Laminar flow hood is a great investment if within the budget. Flow hoods pull air through HEPA filtration and blow the cleaned air out through the opening of the box, allowing one to work freely while almost eliminating contamination from the surrounding air. These can be purchased on eBay and other sources starting at around $500.



Homemade glove box plan.

Tools used: left to right: Dissecting needle, Micro-spatula, Inoculating needle, Eyedropper, 6 -inch tweezers, Centrifuge tube for seed sterilization.

- **Miscellaneous Tools**
  - *Exacto* knives
  - Purchased from a company selling scientific tools:
    - Inoculating needles
    - Long-handled tweezers (6 or 8-inch work great)
    - Micro spatulas (handy but not essen tial)
    - Dissecting needles
  - Glass eyedroppers
  - Test tubes and/or centrifuge tubes with lids
  - Propane torch (for flame sterilizing tools)
  - Rubber gloves
  - Rubbing alcohol and hydrogen peroxide (both standard 3% household peroxide and 6%, sold as a liquid developer at beauty supply stores).
  - Parafilm, a laboratory film/tape used to seal Petri dishes and deli containers.
- **Media**

  The genera one wishes to flask determines the best media. Places like PhytoTech labs (United States) and Western Orchid Labs (Australia) offer a wide range of flasking media, but these are by no means the only sources. Many types of media are now available through many sources like eBay and Amazon.

Ultraviolet hood

Flasks on the left, cooling after sterilization, on the upper right, in the pressure canner, and lower right ready to load into the canner.

Media Preparation

Once you have gathered all the equipment, the next step is to prepare the media for seed sowing. Each media type requires different additives based on the genera that one wishes to grow. I will assume that you will use bottles with stoppers, but this method holds true for most flasks.

Prepare the flasks, ensuring that they are clean and undamaged. Prepare the rubber stoppers and have squares of aluminum foil available. The foil covers the stopper and top of the bottle and helps prevent fungal spores and bacteria from entering the flasks.

The media typically comes in pre-measured packs of one, five, or ten liters. If the packet contains more than one liter, it will state the amount in grams to use per liter of distilled water.

To prepare one liter of media:

1. Add the liter of distilled water to a stainless-steel pan and add the appropriate amount of powdered media.
2. The use of additives such as pineapple juice, coconut water, ripe banana, or sucrose depends on the genus. Some research will need to be done to determine what additive you will want to use. Many media formulations already include some or all of these additives, and the information is found on the label.
3. Wisk this together to incorporate the media and dissolve the agar.
4. Bring just to a boil and hold for a few minutes while continuing to stir to prevent sticking.

Once the media is ready, pour the media into the flasks. The amount in each depends on the flask size and the genus. Genera that are heavy feeders will require more media or additional replating. If using deli containers or Petri dishes, you can sterilize the media in larger vessels. If laying them on their side (e.g., milk bottles), take care when adding the agar media. The media should not touch the lid or stopper as this can result in contamination later. Place the lid on and cover the top with the aluminum foil squares.

Load the flasks into the pressure canner, taking care not to overfill. Bring the canner up to pressure (15 pounds per square inch (PSI)) and sterilize for 15-20 minutes. Let the pressure release of its own accord. Remove the vessels and allow the agar to cool and set. If transferring to Petri dishes or deli containers, allow the agar to cool, so it does not melt the plastic. However, it should still be a liquid when you pour it into the container.

I recommend allowing the flasks to sit a week to ten days to ensure that no contamination occurred during the process. If contamination has occurred, it will manifest itself in the form of fungal or bacterial colonies (sometimes in beautiful colors!) growing on your media, and those contaminated should be discarded. If there are no signs of contamination, it is now time to sow!

Preparation for Sowing the Seed

Sterilizing the Equipment

Seed sowing can be performed on the kitchen or bathroom counter, but you must carefully prepare your working area to prevent contamination. A bathroom works well since you can turn on the shower and create steam that, as it settles, will sequester many airborne contaminants. Clean all surfaces with a 0.5% NaOCl (bleach) solution and close the doors and windows to prevent as much air movement as possible. To make the 0.5% NaOCl solution from household bleach, use 1 part bleach for 9 parts water. A good amount to start with is 1/4 cup bleach and 2¼ cups of water. Carefully pour the bleach into the spray bottle or jar first, then add the water. Mixing the solution in this order will prevent the bleach from splashing on you.

Add all the equipment and flasks you will require to the glove box except the inoculating needle and eye dropper and spray the inside of the glove box and the equipment with the bleach solution you have prepared. If the box is equipped with an ultraviolet (UV) sterilizer, it may be turned on for additional sterilization. Note: when using a UV lamp, it is important to shield your eyes and protect your skin while the UV light is on. Always turn the lamp off while working in the box.

Next, soak the eyedropper in hydrogen peroxide for ten minutes and heat an inoculating needle with a propane torch until it is red hot to assure sterility. Place them in the glove box after you have finished spraying the glove box and its contents with the bleach solution. If you don't, the chlorine in the bleach will react with the metal of the needle and the hydrogen peroxide.

Sterilizing the Orchid Seed

Now you will sterilize the orchid seed. The objective of this process is to sterilize the outside of the seed coat without killing the embryo within. Unfortunately, there are no standards for seed sterilization. Since the orchid family is so large and research is ongoing, you, the home flasker, will need to research the species you are flasking. There are numerous forums and Facebook groups that are willing and happy to offer advice on specific genera.

To sterilize terrestrial species, I use the same bleach solution used to prepare the area and equipment for flasking. For epiphytic species, I use 6% hydrogen peroxide as a sterilizing agent. Terrestrial orchid seed tends to float in the seed sterilizing solution while the seed of epiphytic species generally sinks.

Place a small quantity of seed in a vial (5ml centrifuge tubes work well) and add the sterilizing solution. Close the lid of the tube and shake the seed and sterilizing solution. Because the orchid family is so large and many genera require different protocols, it is important to know the background of the genera and/or species being worked with to determine the best sterilant and shake time for maximum success.

- I typically shake terrestrial species for 7 to 10 minutes as these species (especially those with dark seeds) can have significant germination inhibitors. Longer shake times act as chemical scarification to erode the germination inhibitors. If working with species sensitive to the bleach solution, use shorter shake times or use 6% hydrogen peroxide instead.
- Epiphytic species seeds are typically shaken for 10 to 12 minutes.

Green Podding is used when the seeds are still inside the unripe seed capsule. The outside of the seed capsule is sterilized rather than the individual seeds. Place the seed capsule in a centrifuge tube or test tube with the sterilizing solution (you can use either the bleach solution or hydrogen peroxide—my preference is hydrogen peroxide with this method) and shake a bit. Because the seed is inside the capsule and safe from possible harm by the sterilizing solution, there is no specific time for it to remain in solution, so a longer shake time is preferred.

While many commercial growers rinse the seed in sterile distilled water before sowing, this is asking for trouble for the hobbyist. Contamination can occur. After sterilization, I have never rinsed orchid seed and have had few issues, achieving an acceptable germination rate on even difficult and sensitive species.

Sowing the Seed

Keep in mind the diminutive size of orchid seeds. A volume of seed, not much larger than a pinhead, may have many more seeds than one realizes—so take care not to over sow! I have sown flasks so thickly that when they germinated, it appeared to be a suburban lawn. If this happens, the protocorms (newly germinated seedlings) need to be quickly separated as they will either grow together and become impossible to untangle or, as is often the case, perish from being overcrowded.

For sowing terrestrial species, I prefer using an inoculating needle. After the seed has been properly sterilized, take the inoculating needle and scoop out a small quantity of seed from the tube, open the flask, and spread the seed as evenly as possible on the agar surface. After sowing, the terrestrial flasks should be placed in a dark place since many of these species require darkness for germination.

I use an eyedropper for epiphytic species. I suck up a bit of seed and the sterilant solution (hydrogen peroxide) and squirt it into the flask. Swirl the flask to distribute the seeds on the agar evenly. Place the flasks in strong light (but not direct sun) for a few hours. This degrades the hydrogen peroxide into water and oxygen. These flasks can now be placed under grow lights for germination.

If the seed is still in the capsule, sterilize the outside of the capsule as noted above and use a sterile *Exacto* knife or a similar tool to slice open the capsule. The seed can then be sprinkled directly from the capsule onto the agar or scooped out with a sterile inoculating needle or micro spatula and spread on the agar surface. This method is preferable as the seed never comes into contact with the caustic sterilization solution, and you get better results.

Diligence is required after having sown your orchid seed. Newly sown flasks should be inspected at least daily—if not twice daily—to watch for contamination. If contamination does occur, it can be managed in several ways, depending on the severity of the problem. If the flask becomes moldy or develops a bacterial infection, you can remove the spots with a flame sterilized micro-spatula. After the spot is removed, place a drop or two of 3% hydrogen peroxide on the area of contamination. However, if multiple spots occur, either the seed was not sterilized long enough, or mold may have invaded the seed coat before the sowing was done. If the latter is the case, no measure of soaking will clean the seed sufficiently. Plants in flasks with multiple contamination spots are generally not salvageable and should be thrown away.

Replating

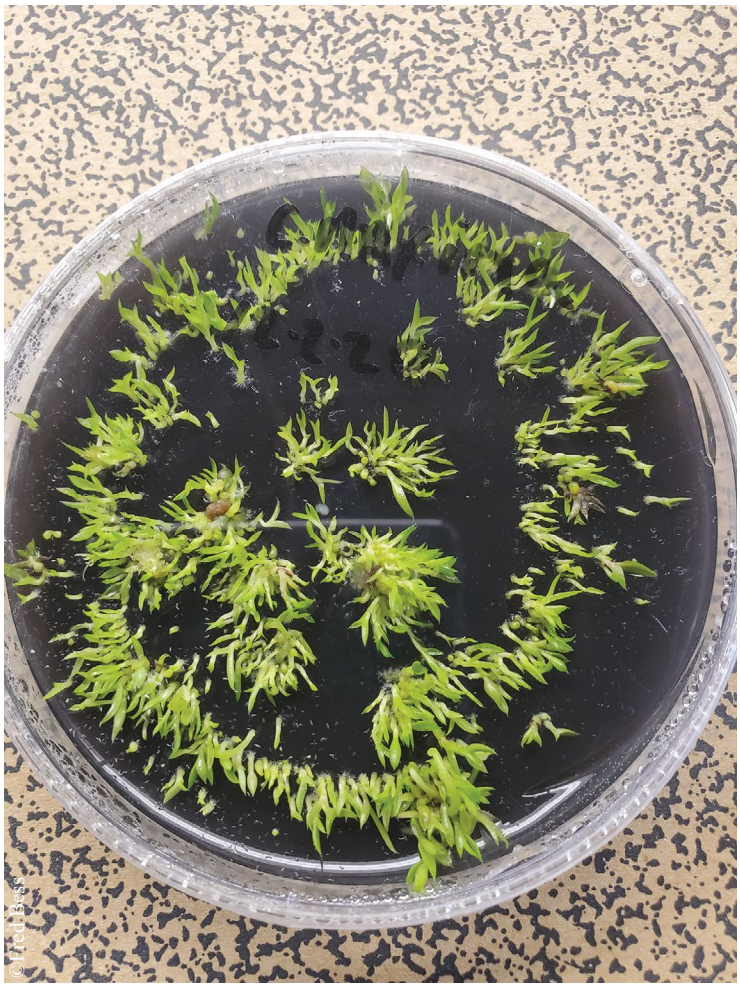
Replating is the process of transferring your seedlings from the mother (the original) flask to a larger flask for continued growth. Depending on the species, replating may need to be done within a couple of months, or perhaps even a year or more. This IS a hobby of patience and delayed gratification.

Seedlings are ready for replating when they have overgrown the mother flask or if they are too crowded. In some species with extensive root systems, it is best to replate while they are still small. Intertwined roots will make replating difficult to near impossible. The actual replating process is relatively easy; however, this is the stage where contamination can be the greatest risk.

It is important to have replate flasks ready—these can be larger bottles, deli containers, or even canning jars. It is also preferable that the replate flasks have a thicker layer of agar media than the mother flasks to give the plants an abundance of nutrients and the roots plenty of room to grow.

Place the flasks in the glove box and spray down everything with the bleach (0.5% NaOCl) solution. Flame the tweezers or tools used to transfer seedlings and place them in the glove box as well. If using a UV sterilizer, turn it on and let the glove box and contents sit for 20 to 30 minutes. Meanwhile, spray the outsides of the mother flasks with bleach solution. Place them in the glove box and let them sit for another 5 to 10 minutes. Be careful when opening and closing the glove box to let in as little outside air as possible.

Next, open the mother flask and transfer the seedlings to the new replate flasks, spacing them out to give them ample room to grow. Take care not to touch the tools to any surface other than the plantlets and the agar. Remember the game "Operation?" It was a test of players' eye-hand coordination and fine motor skills. When your tweezers touch the sides, a buzzer sounds.



Disa uniflora seedlings ready for replating.

Replating seedlings.

Growing area.

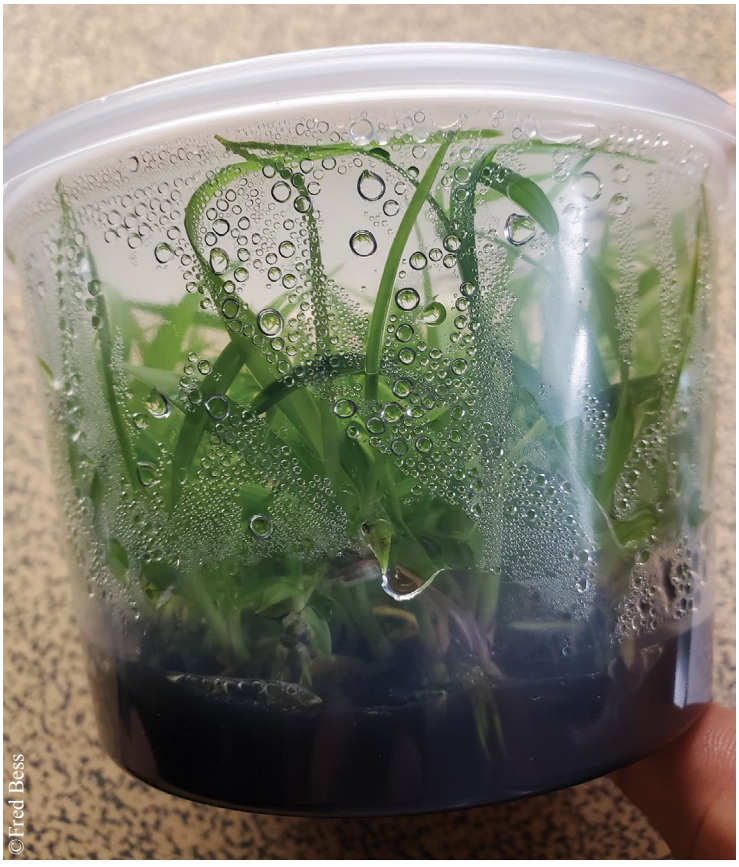
Pretend it's like that! If you do touch another surface, stop, re-sterilize your tweezers and continue. Better to re-sterilize than contaminate flasks.

Until you have suitable protocols in place and are used to replating, I strongly recommend placing only one mother flask at a time in the glove box and re-sterilizing everything between each replating. I recommend this after I have lost too many flasks to contamination. Once a tool becomes contaminated, every flask you use after that will be ruined, and there is no way to know about the contamination until it is too late.

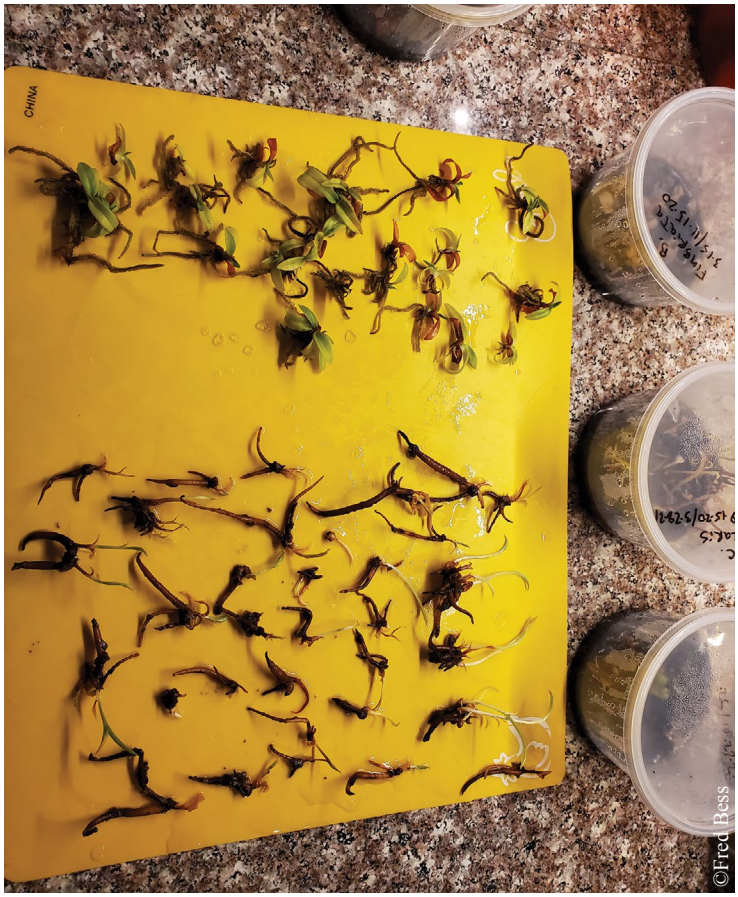
Once replating is complete, once again diligently watch the flasks daily for contamination. If contamination occurs, take steps to remove it or rescue the seedlings that are not affected.

Maintaining Your Flasks

As mentioned earlier, keep terrestrial flasks in the dark until germination occurs. Epiphytes can be placed under lights right after seed sowing. Standard LED 4-foot shop lights from the local big box or hardware store make ideal grow lights for both mother flasks and replated flasks of seedlings. The containers can be stacked under the lights to save space. Remember, you need to keep a close watch for contamination. Rotate the containers when you check for contamination, so they receive equal light exposure. I have also found that placing the containers in zip bags before placing them



Arundina graminifolia ready to be planted into community pots.



Deflasking seedlings.

Disa spathulata in a community pot.

under the lights helps keep out contamination. This is very helpful if your work area is a basement like my flasking area. Temperature or pressure fluctuations can also affect your flasks. As these conditions change, the flasks will "breathe," this can draw mold spores into the flasks so, try to keep these variables as stable as possible.

Deflasking

When the plants have grown sufficiently and have well-developed root systems, or in the case of some terrestrials, tuberoids, it is time to remove the seedlings from the flask. Tropical species are generally planted into community pots to grow to a size that they can be individually potted up. Terrestrial tuberoids may also be potted in this manner. These recommendations are rather general—with the incredible number of species and hybrids in the orchid family, there are no tried-and-true rules for deflasking. You will need to research each genus or species you are growing for the best protocols and results.

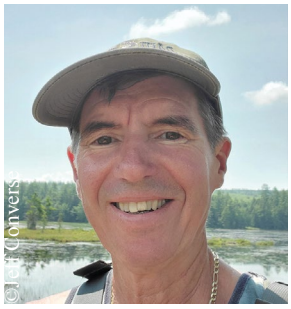
Growing orchids from seed at home can be a fun and rewarding hobby. It does not require a vast monetary investment in lab equipment. You can proliferate a prized species, create your own hybrids, or grow rare plants, like *Bonatea*, *Disa spathulate*, and *Chloraea*, that are not sold with any regularity if at all. A relatively small investment and careful planning can become a lifelong obsession as it has been for me, or just a fun way to increase your collection. Give it a try, and you too may get hooked!✾

Disa uniflora, from seed to an adult.

Acknowledgments

I would be remiss if I did not thank my grandmother Mary Bess (no, the *Phragmipedium* that bears the same name was not named after her, although I like to think so) and my good friends Lou Borlin and Dr. Warren Stoutamire for mentoring and providing guidance through the years. I would also like to thank Dr. Michael Graziano for providing insight for this article.

About the Author



Fred got his start growing orchids from an early age, thanks to his grandmother. By trade, he is a certified arborist and horticulturist. In addition to flasking, Fred has a passion for the rare, hard to grow, and weird! His collection includes such things as *Dendrophylax* (the Ghost Orchid), a nice collection of *Disa* species and hybrids, carnivorous plants, and one of the world's most endangered conifers, *Torreya taxifolia.* All his plants and the conifers are found at his suburban Cleveland, Ohio, home.

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