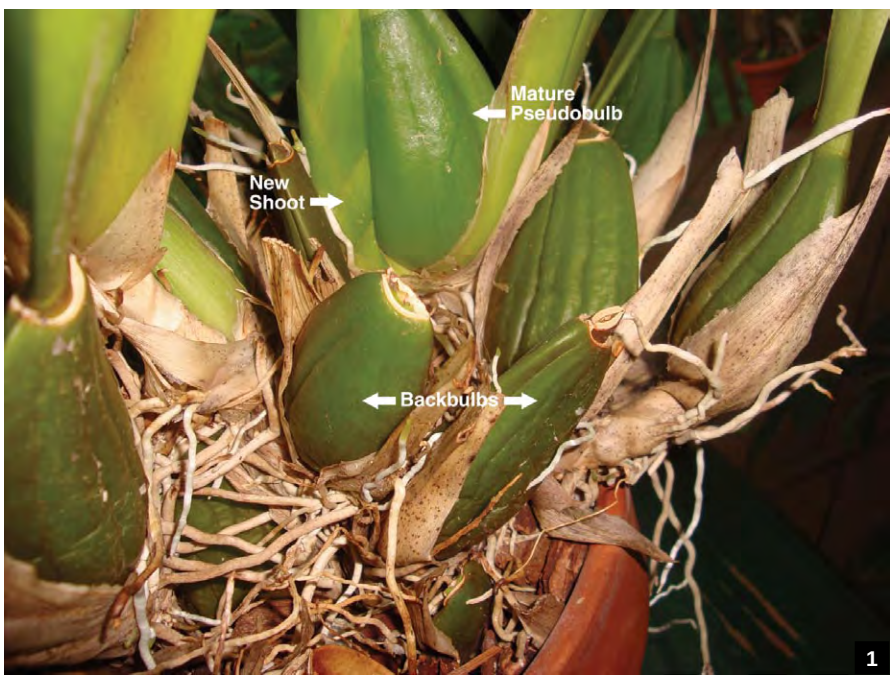
Propagating Orchids



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[1] New, mature and old pseudobulbs (backbulbs) of a *Degarmoara*. Plants propagated by division should contain at least two or three mature or old pseudobulbs.

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[2] Bare-root cattleyas, purchased locally at a plant sale or greenhouse or through the mail, offer an economical way to increase a collection.

BECAUSE OF THE REALIZATION THAT orchids could be successfully cultivated outside of their natural habitat, they have grown in popularity immensely. They represent one of the most admired plant families grown and now are the most valuable floriculture crop produced in the United States and many other countries. Their exotic aura and broad spectrum of appearances and varieties, with more than 25,000 species in the orchid family and 148,460 registered hybrids,[1] attract commercial and hobby growers alike. Unfortunately, some orchids are among the most difficult plants to propagate. This problem inhibited production for years until methods for successful mass production were developed. The ability to successfully propagate orchids on a large scale has contributed greatly to conserving germplasm for future generations.

DIVISION This is perhaps the simplest method of propagation, as the relatively straightforward procedure requires little to no special training or equipment. The process involves splitting an existing plant into two or more parts so that each new section contains at least one new shoot or vegetative bud. Those that are new to growing orchids may be a bit apprehensive about cutting their valuable plants into pieces; however, the division process not only multiplies plant numbers, but can also promote more vigorous shoot growth. The new propagules are clones that are genetically identical to the parent plant and will thus exhibit the same characteristics given the same cultural and environmental conditions. As with other asexual propagation techniques, viruses and usually other pests are transferred with the new propagules.

Propagation by division should be done just before or just as the plant's growth period begins. This helps ensure that each new division will have ample time to become established so flowering will occur the following year. Sympodial orchids that possess pseudobulbs, such as cattleyas or cymbidiums, can be divided easily. The first step is to determine where to make the separation. The standard recommendation is to leave a minimum of two or three pseudobulbs per division. Otherwise, the

[1]As of July 5, 2011.

Multiplying and Sharing Helps Conserve Species and Hybrids

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new plants may not have enough stored energy to flower the following season and may even take a few years before they are able to support flowers.

Division involves severing the rhizome joining the pseudobulbs that are to be separated into groups. The separation of pseudobulbs can be done by hand, sometimes requiring a fair amount of strength, or with a sterilized knife or razor blade. The leading pseudobulb in each group should have a "live eye" (dormant bud), so that growth can continue. If the eye on the leading pseudobulb is not viable, then that pseudobulb must be removed, as must each subsequent pseudobulb until the leading one has a viable live eye. If no pseudobulb on the section has a live eye, the section will likely not develop new shoots and should thus be discarded. Although division and repotting can take place in the same session, some growers recommend cutting the rhizome without repotting the sections immediately. They are allowed to sit until the dormant eyes begin to break and new growth begins, at which point the plant is separated and the divisions repotted. Alternatively, the sections could be immediately potted. Although it is not usually recommended to divide plants into groups

[3] Keikis (plantlets) offer an easy way to multiply some orchids. Here, a *Renanthopsis* Shalimar (Dana × *Phal*. Zada) plantlet with roots established in a moss-filled plastic pot is ready to remove and pot alone.

[4] Mature pseudobulbs (or canes) of dendrobiums are placed on sphagnum moss and intermittently misted, allowing for new vegetative shoots to develop.

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of less than two or three pseudobulbs, if the goal is to achieve as many new plants as possible, each pseudobulb with a live eye can be severed and repotted separately. Even a leafless pseudobulb can be planted if the bud is viable.

Orchids without pseudobulbs can also be propagated vegetatively through division, although at times by different methods. Sympodial orchids without pseudobulbs, such as paphiopedilums, can also be divided by cutting the rhizome, with the same considerations being taken to keep a live eye on each section.

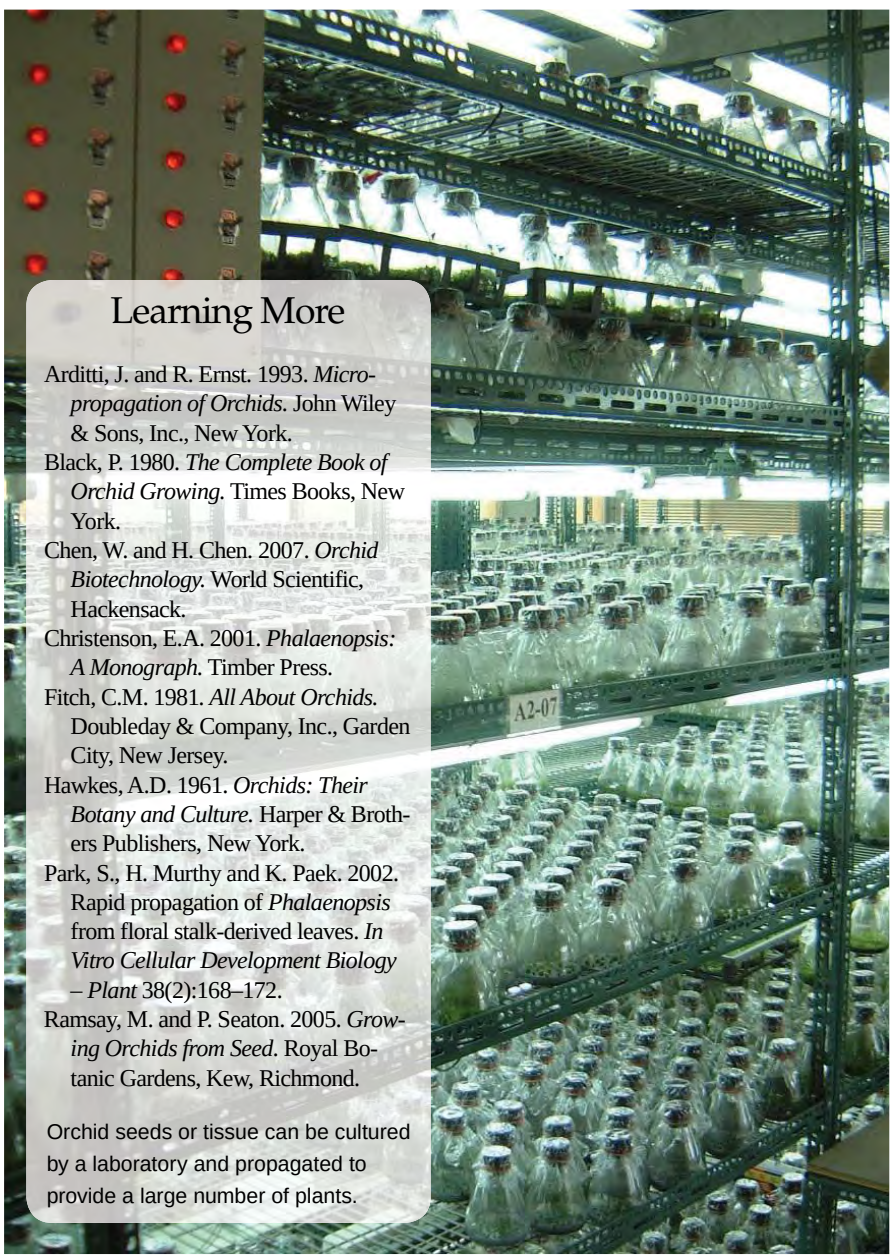
BACKBULBS As a pseudobulb ages, it loses its leaves and becomes dormant and new pseudobulbs develop. The old pseudobulb is known as a backbulb. Although not actively growing, backbulbs possess energy reserves that can be utilized by the growing plant and may possess dormant eyes that can be forced into active growth. Propagating orchids by backbulbs involves severing the pseudobulbs from the parent plant. This process can potentially be stressful for the parent plant, so generally at least two backbulbs and a growing shoot are desirable. Utilizing backbulbs is an effective way to increase plant numbers, but the resultant plants can take several years to flower from a single backbulb.

Detached backbulbs can then be planted in pots or communal trays containing a well-drained and porous medium, such as one that contains moderate- to fine-grade composted Douglas fir bark. The base of the pseudobulb should be planted taking care to ensure that the eyes are above the soil level. If kept in a humid environment out of direct sun, shoots and roots should start growing in three to four months. Then they should be potted in a coarser medium and by the following spring can be planted in pots large enough for two years of growth, at which time they should be near flowering.

OFFSHOOTS Some orchids, such as phalaenopsis, dendrobiums and vandas, can produce offshoots or plantlets at the nodes along the stem. Once mature, these offshoots, called "keikis," can be separated from the parent plant and potted similarly to backbulbs. With care they will develop into adult plants. In some orchids, such as phalaenopsis, old flower stalks can sometimes be induced to produce keikis when cut from the parent plant and placed in a moist, warm, dark environment. This can be accomplished by cutting the flower spike just above one of the nodes after the plant has flowered. A new shoot will develop in roughly six months and can then be removed by severing the stem 1 or 2 inches (2.5 or 5 cm) below the node. Keikis can also develop in phalaenopsis if an emerging inflorescence is exposed to a prolonged period of high temperatures (above 85 F [29 C]). In this situation, the reproductive inflorescence reverts to vegetative growth and a new plantlet forms at a node of the inflorescence.

TISSUE CULTURE Meristem culture, a type of micropropagation by tissue culture, is the standard method for mass propagation of the most popular orchids. The ever-popular phalaenopsis, for example, are normally propagated through tissue culture, because vegetative propagation of these orchids is slow, variable and difficult. Micropropagation allows for fast multiplication of plants and meristem culture has the added benefit of producing virus-free plants because the lack of vascular tissue in the meristem tissue prevents spread of viruses to those cells. However, due to the totipotency of plant cells, virtually any plant tissue can be used for micropropagation. Shoot tips and meristems are perhaps the easiest to use because of their unique qualities and undifferentiated cells, and are therefore used most frequently.

To begin propagation through this method, the plant must be removed from the potting medium and cleaned thoroughly to remove contaminants. Next, the selected portion of tissue is removed. Care must be taken to avoid damaging the young tissues. The excised tissue is then placed in the appropriate growing medium, normally an agar-based mixture, and sealed into a sterile container. This procedure requires a sterile environment to avoid contamination and thus, a laminar-flow bench (fume hood) is almost always used. Introduction of viruses or bacteria will make the entire process a



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Orchid seeds or tissue can be cultured by a laboratory and propagated to provide a large number of plants.

Learning More

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failure; viruses and bacteria must not be propagated along with the desired orchid tissues. Because of the absolute need for sterile conditions, propagating by tissue culture is nearly impossible for the home enthusiast. Also, due to the small size of the resultant plants, it can take tissue-cultured orchids up to five years to flower.

As with any form of asexual propagation, the resultant plants are normally genetically identical clones of the parent plant. However, the tissue-culture process increases the likelihood of mutations, especially when hormones are used to accelerate the process. Growers must take this into account when propagating orchids. To create genetic variation without sexual reproduction, accelerated cell division can be used, although the results will be rather unpredictable and uncontrolled. There may be many mutations, or there may be none at all, and the results may not be seen until the plants flower.

SEED Flowers that are pollinated, either by hand or by insect, can develop seed capsules. The time from pollination until seed is mature is usually several months. If seed is collected, it should be harvested either just before or at the time of its release from the capsule. Seeds of orchids are extremely small and there may be up to a million seeds per capsule. Placing a bag around a maturing seed capsule can prevent loss of seed if the capsule ripens and releases the seed before the anticipated time. When the capsules are ready, they should be removed from the plant using a sterilized cutting instrument. If the capsules have already begun to split, seeds can be collected by gently tapping the capsule over a piece of paper or foil; if the capsules are still whole, they will have to be cut into several pieces lengthwise to remove the seeds.

Seeds can either be sown immediately after harvesting or stored until a more convenient time. If seed is to be stored, it must be dried. This can be done using several methods, ranging from combinations of chemical compounds to oven-dried rice. Storage in a Mason jar with a rubber seal provides a more-than-sufficient seal to protect the seeds from contamination and moisture, although the seals should be replaced about every 10 years to avoid deterioration. These dried seeds, when refrigerated, remain viable for years, as long as moisture is not introduced.

Before sowing the seeds, preparation of medium, choice and preparation of container, and several other steps must be taken. The sowing process should be done under sterile conditions to avoid contamination. In a laboratory setting, a fume hood can be used; in the absence of that, covers can be made to reduce air movement. Maintaining sterile conditions is vital; sterilizing the work surface and tools and avoiding air turbulence are two crucial parts of this effort. Seed can then be sterilized through exposure to a disinfectant and introduced to the containers. Several methods of sterilization and application of seed to the media are available; the best choice depends on the situation. Germination time depends on the type of orchid, with epiphyte seeds typically germinating long before terrestrial seeds. The requisite environment for germination differs as well; tropical epiphyte seeds should be placed in light, whereas terrestrial orchid seeds germinate best in darkness.

[5] Developing seed capsules on a phalaenopsis hybrid.

An alternative method of seed propagation is green-pod culture, or embryo culture. In this method, seed capsules must be harvested before the seed reaches full maturity. Utilizing this method makes it possible to produce plants more quickly because the seed does not need time to reach full maturity and there is no need to overcome months of seed dormancy and vernalization requirements. As a rule of thumb, seeds in capsules are collected before they dehisce and tissue culture techniques must be used as described above.

Germinating the seeds in vitro allows the grower to circumvent the constraints that hinder natural germination and growth of seeds, most of which require a specific type of fungus to germinate and grow. Because the minute seeds lack an endosperm, in their natural environment they must rely on a symbiotic relationship with mycorrhizal fungi in order to provide nutrients for germination. Growth in aseptic conditions allows seeds to germinate without exposure to the fungus, making in vitro seed propagation immeasurably easier than open-air propagation. Like tissue culture, germination of seeds is much better suited for a laboratory than the home or greenhouse. Therefore, instead of germinating seed yourself, consider contacting a laboratory to see if it would be willing to germinate your collected seed and grow them as seedlings, and at what price. When the seed has germinated and the plants have grown to a certain size, the laboratory will ship flasks to you with plantlets.

Although propagation of orchids by seed can be difficult and expensive for the nonprofessional grower, one benefit is the variation in seedlings from the genetic recombination that occurs through pollination. Although mutation does occasionally occur through tissue culture or in an individual flower, the most variation comes about through hybridization, which can only be done through sexual reproduction and therefore pollination. Not all new plants have desirable characteristics, but some do, making the process exciting and worthwhile.

Since the development of practical orchid propagation techniques, especially meristem tissue culture, the popularity of growing orchids has increased significantly. Although some orchids are difficult for novices to propagate, division, backbulbs and offshoots offer successful methods for the home orchid enthusiast.

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