

Division of Agricultural Sciences
UNIVERSITY OF CALIFORNIA

S
39
E92
NO.18

Orchids

for THE CALIFORNIA AMATEUR

H. M. BUTTERFIELD



CALIFORNIA AGRICULTURAL
Experiment Station
Extension Service

MANUAL 18



THE LIBRARY
OF
THE UNIVERSITY
OF CALIFORNIA
DAVIS

Orchids

for THE CALIFORNIA AMATEUR

H. M. BUTTERFIELD

TABLE OF CONTENTS

Information for the beginner	1
Propagation of orchids	2
Potting and potting materials	5
General care of orchids	8
Control of pests and diseases	11
Descriptions of varieties	17
Hints to the breeder	55
Tables of varieties	58

A P R I L 1 9 5 5

THE AUTHOR: H. M. Butterfield is Agriculturist in Agricultural Extension, Berkeley.

UNIVERSITY OF CALIFORNIA

COLLEGE OF AGRICULTURE

Agricultural Experiment Station and Extension Service

LIBRARY
UNIVERSITY OF CALIFORNIA
DAVIS

Or



chid Culture . . .

is so clearly defined in present-day references that amateur gardeners of moderate means can successfully grow many of the popular varieties. Most of these orchids come from the tropics or subtropics. A number of native orchids do grow in the United States and Canada—usually in cool bogs and moist grasslands—but they are not of primary interest to amateur growers in California.

The exotic orchids fall into two general groups: terrestrial, living in soil and leafmold; or epiphytic, living on other plants or on rocks where leafmold and other organic matter have accumulated.

Information for the beginner who hopes to grow orchids at home

Orchid requirements

Moisture, light, temperature, ventilation, air conditioning, and air humidity are important. Most of the popular orchids are exacting of moisture, light, and temperature, needs that are best met and controlled by a suitable greenhouse or some other type of cover. A few of the hardier orchids, such as the cymbidiums and cypripediums, do very well under lath or similar protective covering during most of the year, except on cold winter nights, when even the sturdy varieties may need extra protection. Most orchids have specific needs in ventilation and air conditioning in hot weather; and some orchids are exacting of air humidity, while others are not. These problems are discussed in this manual under the selection and general care of orchids.

The highly variable oncidiums (at left) are interesting in color and form. Flowers usually are small, with several on a stem.

After a decision is made on the kinds of orchids to plant, and suitable quarters are provided, the techniques of potting and propagation should be learned. In addition, something must be learned about the control of serious pests and diseases.

Cost of investment

Orchid plants of the best quality are costly. Their purchase represents an important investment which should be protected with necessary information on culture and growing conditions. These requirements met, the grower can anticipate success with some of the superior kinds, even those classed as difficult to grow. Fortunately, not all of the superior new varieties are necessarily hard to handle.

The chances are that many of the varieties of cattleyas and cymbidiums, for example, will be no more difficult to grow than common species of mediocre quality. However, the very fact that they

are expensive to buy should be sufficient caution to the beginner to wait until he has learned the essentials of orchid culture before purchasing them. As experience is gained and interest is expanded, the more difficult orchids can be tried.

Names of orchids

It is essential for the beginner to be acquainted with the names of good orchids. This means access to sources of information.

Organizations of orchid fanciers offer helpful information through handbooks and reports. Available, too, are periodicals that will keep the orchid grower up to date on information in the field. Advertisements in such publications call attention to new varieties and to better cultural practices. A list of references

and publications is appended to this manual for readers who are seeking additional information.

Growers who are interested in the exhibition of superior specimens at flower shows should find very helpful the *Handbook on Judging and Exhibition*, published by the American Orchid Society, Incorporated, Botanical Museum of Harvard University, Cambridge, Massachusetts.

Other helpful sources are dealers, who can furnish information on listed varieties and species, and members of orchid societies, who have an interest in superior varieties. By comparing notes with other growers, a beginner in time will come to know which orchids are considered superior and where such superior varieties can be purchased.

Orchids may be propagated by any of three different methods

Orchids are increased by seed, by cuttings, and by dividing the mother plant. The method of dividing often is slow; many commercial growers therefore depend largely upon seed for propagation, even though the seedlings may show some variation.

Orchid seed usually is planted during the spring months. Germination should take place within four to six weeks for the popular kinds, where the temperature is held at 58° to 86° F. A seedling orchid normally takes from four to six years to reach blooming size.

By seed

Germination method. The process most often used in germination is known as the Knudsen method, which employs certain soluble mineral compounds and agar. Orchid seedlings differ from most other kinds of seedlings in requiring sugar in the nutrient solution or soon dying without it. Claims have been made

that orchid root mycorrhiza improve the growth of seedlings germinated by the Knudsen method, but these claims have not been substantiated by some commercial growers.

The agar solution used in the Knudsen method is made up by the following formula, then is sterilized before use:

Calcium nitrate,		
Ca(NO ₃) ₂ ·4H ₂ O	.....	1.00 gram
Monobasic potassium phosphate, KH ₂ PO ₄	..	0.25 gram
Magnesium sulfate,		
MgSO ₄ ·7H ₂ O	.....	0.25 gram
Iron sulfate,		
FeSO ₄ ·7H ₂ O	.....	0.025 gram
Manganese sulfate,		
MnSO ₄ ·4H ₂ O	.....	0.0075 gram
Ammonium sulfate,		
(NH ₄) ₂ SO ₄	.....	0.50 gram
Distilled water	.....	1.00 liter
Cane sugar (sucrose)	..	20.00 grams
Agar (powdered)	.....	15.00 grams

Acidity test. The acidity of the nutrient solution is very important. It should be fixed at about pH 5 (pH 4.8

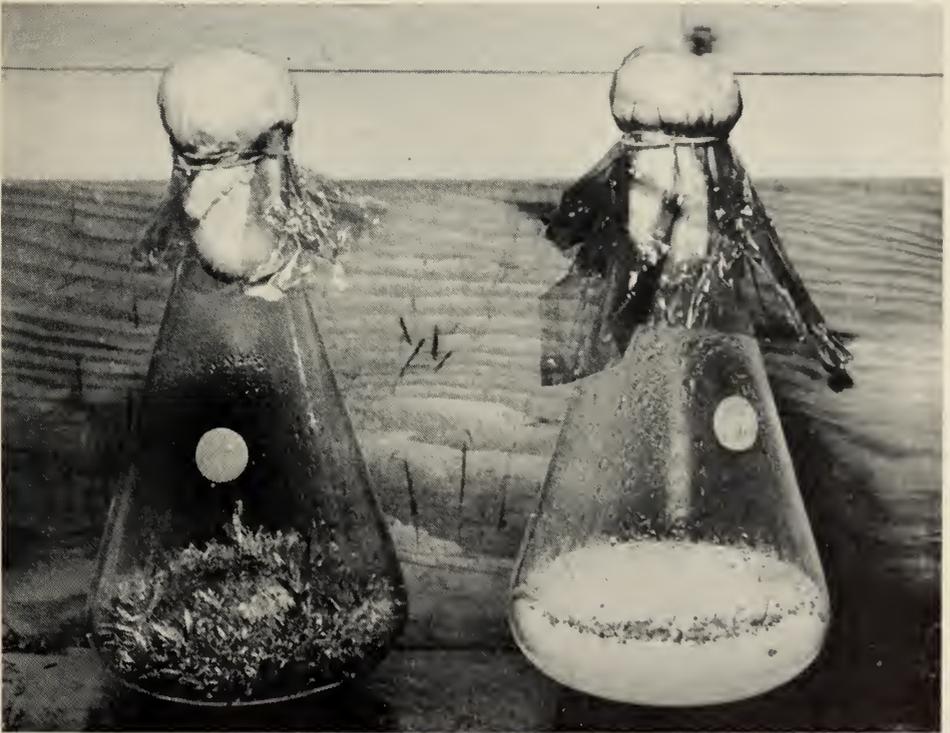
to 5.2). Since the nature of the chemicals in the solution varies somewhat, it is impossible to be exact about the amounts of each in order to give the desired acidity. The ease of testing for acidity, however, should make possible the proper regulation of the acidity in the nutrient agar. Since the agar serves as a buffer in the acid reaction, testing the sample is done after the agar has been added. If much testing is to be done, a small testing plate should be purchased.

Bromcresol purple, either the ordinary dye solution or test paper immersed in the dye solution, is used to test a sample of the formula for acidity. The purple color of the acid indicator changes sharply to yellow as the acidity increases. Bromthymol blue is another indicator used. It turns green when the reaction is neutral (pH 7), and yellow when the reaction is acid (pH 6).

The acidity may be increased by adding about one drop of concentrated phosphoric acid and stirring until pH 6 is reached. As many as three drops may be more than enough to insure the proper acidity. Phosphoric acid normally is sterile. The acidity of the agar solution is adjusted appropriately after the solution is heated gently until the agar dissolves.

Plant container. The Erlenmeyer flask (below) is the container most often used for growing orchid seedlings. Into each flask is poured 120 to 130 cubic centimeters of the agar solution. The opening of the flask is plugged with cotton.

Sterilizing the solution. The solution must be sterilized—in an autoclave, if one is available—at 15 pounds' pressure for 20 minutes. During this process be very careful not to caramelize the



Orchids are being grown from seed in these flasks. On the right, seedlings are beginning to appear on the surface of the agar. On the left, seedlings are ready for transplanting.

sugar (sucrose) by excessive heat. If an autoclave is not available, sterilize the solution with flowing steam in an Arnold sterilizer at 100° for one hour a day for three successive days. Failure to sterilize the culture medium unfailingly will lead to trouble. As soon as the material is sterilized, remove the flask and set it in an upright position.

Sterilizing the seed. Orchid seed also is sterilized. This may be done with a solution of chloride of lime (calcium hypochlorite)—19 grams to 120 cubic centimeters of distilled water. Shake the chloride of lime and distilled water vigorously for a few minutes, then filter the mixture. Moisten the seed thoroughly in this disinfectant for four to five minutes. (A longer exposure for *Cattleya* and *laelia* seed does not seem to cause any harm.) Successful results have also been obtained by using bromine water diluted at the rate of 1 part bromine to 10 parts distilled water. The sterilized seed should be drained for 5 to 10 minutes, away from any possible means of contamination.

Planting method. All objects used in the planting processes must be sterilized: flask plug, seed, nutrient-agar solution, and wire loop. Carefully remove the plug from the flask. Scatter the seed over the surface of the nutrient-agar solution with a wire loop. About 2,500 to 3,000 seeds are placed in each liter flask. This amount of seed is equal in size to half a grain of rice and should produce about 1,000 seedlings to a flask. Where the germination is known to be low, use enough seed to equal in size a whole grain of wheat.

Sealing the flask. As soon as the seed is planted, reinsert the sterilized cotton plug in the flask and seal by any one of three methods: 1) By coating the flask top with melted paraffin, and covering the top with tinfoil, cellophane, or a clear plastic wrapping. Hold this in place with a rubber band, then seal the edges with paraffin. 2) By covering the open-

ing with white tobacco paper—a method used in some culture work—which favors a greater exchange of air. First, smear the rim of the flask with gelatin containing a little copper sulfate, then cover the rim with the white tobacco paper, the projecting edges of which are singed. With this method, also, cap the entire top with tinfoil, cellophane, or clear plastic to prevent contamination through the plug under humid air conditions. 3) By inserting a piece of glass tubing in a rubber stopper in the flask, and placing in this tubing an ordinary absorbent cotton filter. This method is a substitute for filling the entire opening of the flask with a cotton plug. It eliminates the necessity of further capping the neck of the bottle with some material to help prevent aerial contamination.

Planting the seedlings. Seedling orchids usually are large enough in 8 to 12 months for their first transplanting. By that time they should have the third leaf and several strong roots $\frac{1}{4}$ to $\frac{1}{2}$ inch long. The entire planting process must be handled with great care. The seedlings are removed from the flask with a pointed knife or a dibble, and are dropped into a shallow receptacle of water for a few minutes to dissolve the gelatinous material in which they were growing.

The small seedlings are first planted in $2\frac{1}{2}$ - or 3-inch pots, about 25 to each pot. The pots are half filled with charcoal and small pieces of broken crock, and are topped with finely cut osmundine. The small fibers of the osmundine are firmly packed around the roots of the seedlings during the planting process. The pots should be placed in a box, which is glass lidded to keep the atmosphere moist at approximately 70° to 80°. *Cattleya* seedlings are grown first in standard 3-inch pots, then are shifted to 4-inch fern pots.

Twice a day the seedlings are watered with distilled water or rainwater applied in a thin, mistlike spray with a hand atomizer. Do not water them too often

if ventilation is poor; this may lead to damping-off.

After growing in the 2½- or 3-inch pots for 6 to 10 months, the seedlings are transferred to individual, 1½-inch pots and placed on benches in the open greenhouse. The seedlings must be transferred before they become crowded.

By cuttings

Orchids with aerial roots, such as vanda, may be increased by a cutting, including some of the roots. New shoots may also develop on the remaining old plant. That is why some growers place the older pieces on the ground under a bench until buds develop and then pot the growing pieces in the usual way or in small pots filled with gravel. Plantlets form on old stems of oncidium after the flowering season; these can be removed and planted when the roots are well developed.

When the stems of the basket or crib orchid begin to creep over the edge of

the container, after the season's flowering is past, it is time to divide the rhizome.

By dividing the mother plant

Orchids that have been given a variety name may be increased by division or by cuttings. If the plant develops pseudobulbs, as in species of *Cattleya*, a notch is made in the rhizome back about three pseudobulbs from the tip to encourage new growth. Some growers plant the tip, with three healthy pseudobulbs attached, then lay the old stem or back bulbs in a moist location for the development of dormant buds. When the developed buds are removed for planting, the older part also may be planted. Orchids, such as cypripedium, are divided just before new growth starts. The divisions are planted in a mixture consisting of ½ fibrous loam, ¼ leafmold, and ¼ coarse, sharp sand or pea gravel. A division will be exactly the same genetically as the parent plant.

Potting and potting materials . . . orchid types vary in their needs

Potting orchids is more a subject for demonstration than for discussion. However, there are specific characteristics in type of pots, potting materials, and methods required by the different varieties of orchids that can be described in detail.

The terrestrial orchids require less skill in processes but some familiarity with suitable potting mixtures. The epiphytic orchids vary greatly in their requirements of potting materials and methods.

Repotting is normally done after the flowering season and before new growth has pushed out very far. *Cattleya* orchids may have two rooting seasons, one in the spring and another in summer (see

page 6 for photograph of summer roots on a young *cattleya* plant). Repotting of these orchids is best done just before the flush of new growth. Reference books on orchids usually emphasize habits of growth in order to point out the best time for potting.

Types of containers

Clay pot. The standard clay pot or fern pot (two thirds the height of the standard pot) is commonly used by commercial growers for such epiphytic orchids as *cattleya*, *laelia*, and their hybrids.

Preparing pot. Tap the pot to see that it is free from cracks. The sound of a crack-free pot is solid; that of one

cracked is hollow. In a pot used for a cattleya even a small crack may spread, when the final crowding takes place, and cause the pot to fall apart. This would necessitate repeating the entire potting process.

If old pots are used again, first wash them thoroughly inside and out. Cleaning is easy if the pots are soaked in water for a day, then are scrubbed with a steel-wire brush. If soil-borne diseases are suspected, steam-sterilize the pots. The standard-sized hole in the bottom of the pot may need to be enlarged for epiphytic orchids, which usually require good drainage.

Size of pot. It is necessary that size of pot be in keeping with size of plant. If the pot is only slightly larger than the roots of the plant, potting will not be required oftener than every other year. Orchids with a large root system may require a 6-inch pot. Many of the smaller cattleya plants are grown first in 3-inch standard pots, then shifted to 4-inch fern pots. The smallest-sized pot is used for cymbidium orchids, the larger pots for fleshy-rooted terrestrial, and semiterrestrial orchids.

If too large a pot is used, the roots may not be able to get sufficient air or may receive too much water, either result leading to rapid decline. If the pot is only a little too large, the difficulty may

be overcome partially by adding a large amount of broken pot or brick, commonly called potsherds, shards, or crocks. Pieces of broken clay pots should be kept on hand for the purpose. Place as many potsherds in the bottom of the pot as the particular kind of orchid requires. These requirements may range from just a few in the bottom or enough to half fill the pot. About a quarter potful is sufficient for young cattleya plants.

Other containers. Wooden baskets, cribs, rafts, and occasionally blocks and pieces of tree fern are used for orchids needing plenty of air and humidity. The floor of these containers may be raised slightly to aid in providing a maximum amount of air. Slabs or blocks, such as those used for staghorn ferns, may be used for a few kinds of orchids whose many aerial roots object to being confined to pots.

Composts and potting materials

Osmunda. Osmunda fern fiber (sometimes called osmundine peat or orchid peat) is the potting material most often used for the popular epiphytic orchids. In fact, fine-textured osmundine is used as the culture medium for the commoner kinds of epiphytic orchids.

Osmunda fiber is chopped into inch lengths for use in small orchid plants. It is simply pulled apart to eliminate hard lumps when used for larger plants. Fresh osmunda is to be preferred since age diminishes its acidity. The fern fiber should be moistened the day before it is used or long enough ahead of potting to be moist but not wet. This is essential if the osmundine is to be packed tightly around the orchid roots.

Beginners often fail to crowd in enough osmunda, although orchids differ in the amount of room they require at the roots. For example, dendrobium and oncidium require little room and need



Young cattleya being transplanted from 3-inch standard pot to 4-inch fern pot. Note crock fragments or potsherds in bottom of pot.

ample potting material, while aerides, angraecum, cyrtopodium, huntleya, dwarf laelia, maxillaria, phaius (phajus), phalaenopsis, pleione, and rodriguezia (burlingtonia) require plenty of room and thus need less potting material.

Where seedlings are left in a pot for only a year, the fern fiber may still be in good condition, so that only a small amount of additional fiber will be required in the new pot. The old fiber should be removed from around the older plants after about two years.

Polypodium fern fiber. This fiber has been used to some extent for seedlings or small plants. It is finer textured than other fern fibers.

Most of the fern fiber used in this country comes from Florida, New Jersey, and Indiana. Different grades of fiber are on the market. Commercial growers of orchids occasionally supply osmunda to amateur growers at a reasonable price.

Sphagnum moss. Orchids with very fine roots usually do better if some sphagnum moss is added to the potting mixture, but sphagnums need a neutral or alkaline condition in order to live.

Charcoal. This is sometimes used to insure better drainage. A mixture of chopped live sphagnum and charcoal is used for such groups as aerides, phalaenopsis, saccolabium, and vanda. Some *Oncidium* species do well in a mixture of chopped osmunda, live sphagnum, and broken charcoal.

Terrestrial orchids may be placed in a single potting mixture, consisting of $\frac{2}{3}$ coarse oak-leaf mold and $\frac{1}{3}$ small gravel. Another mixture consists of $\frac{1}{2}$ fibrous loam, $\frac{1}{4}$ leafmold, and $\frac{1}{4}$ sharp, coarse sand or small gravel. For some kinds of terrestrial orchids, rich loam soil may be sufficient.

Potting methods

Position of plant. The proper position in which to plant the orchid differs with the species. Certain orchids, such as calanthe, coelogyne, cymbidium, cypripedium (paphiopedilum) epidendrum, phalaenopsis, and vanda, which do not creep, are planted in the center of the pot. Other kinds of orchids, such as cattleya and laelia, are planted near one side of the pot, with the growing tip toward the center; enough room is left for the growing plant to last for two years if large or for one year if small. *Cattleya* species may require a space of 2 or 3 inches in which to grow toward the edge of the pot.

The potting method must be related to the kind of orchid grown. *Odontoglossum* and other kinds of orchids with soft roots, such as phalaenopsis, should be planted lightly. Such orchids as cattleya and dendrobium need to be potted as firmly as possible. The rule of giving greater drainage to the poorer plants is worth considering.

Packing the roots. A hard planting stick sharpened to a wedge, or a narrow piece of metal is used to work in pieces of osmunda from the edge of the container, always crowding them in from the edge toward the center until no more fiber can be wedged in. If the osmunda has the proper degree of moisture, it will

Small cattleya replanted with fern fiber crowded in from edge with metal planting tool. Plant at right has been trimmed and labeled.



remain firm; if it is too wet, it is likely to shrink and leave the plant loose. The potting mixture for terrestrial orchids, such as cymbidium and cypripedium (paphiopedilum), is packed about the roots with the fingers and a planting stick. All growing tips finally should rest near the surface of the fiber.

Staking. Very tall pseudobulbs may require staking. Small bamboo stakes are cut to a point and inserted into the fiber beside each leaf. The leaves then are tied to the stakes with raffia or plant bands. New leaves appearing do not need to be tied.

Repotting. Orchids grown in baskets or cribs are repotted by pulling away old potting material and replacing it with new. This work is done as gently as possible to avoid injuring the roots. Old pseudobulbs that are badly yellowed and shriveled no longer are useful. Their stems may be severed and the old part set aside to develop eyes. The good part of the plant should be set as required and the pot then entirely filled in with potting material.

When dividing large clumps of cymbidiums, separate the older back bulbs—which have lost their leaves—from the leafy pseudobulbs as gently as possible without injuring the roots of the younger parts. In pots large enough to permit continued growth for at least two growing seasons replant the young, healthy pseudobulbs that have leaves. The pot may need to be as large as 6 inches or more in diameter.

Set the oldest part of the plant against the side of the pot, with the growing point toward the center of the pot. Place the old, leafless back bulbs in individual pots containing mostly gravel until they have had time to send out new growth. Perhaps as many as 90 per cent of these old back bulbs will produce new plants. As soon as the new plants have developed a few good roots, transfer them to the regular potting mixture used for cymbidiums. Do not keep the back bulbs too wet while they are developing new growth, and do not expose them to excessive heat. Give them a moderate amount of light.

Here are some suggestions on the general care of orchid plants

Irrigation

Types of watering. These include damping-down, spraying or sprinkling, and soaking. Damping-down means wetting the benches and supports to increase humidity. Spraying or sprinkling means using a fine overhead spray, which also helps to control insect pests. The overhead system is safe only when the temperature is high and ventilation is good. Ordinary watering is given to potted orchids when the roots are active. Most orchids require frequent and thorough watering during the period of active growth.

Greenhouse watering. Weather is the gauge of greenhouse irrigation. In very rainy weather, for example, many cattleya plants can go without water for two or even three weeks. In very hot weather, watering is done daily after the hottest part of the day. In very hot weather, also, the greenhouse floor should be dampened down several times a day to keep the atmosphere cool.

Some orchids thrive in a moist atmosphere. Correct air humidity can be attained by humidifiers which are available on the market. For orchids which do not thrive in too moist an atmosphere,

more ventilation may be needed to overcome frequent damping-down or sprinkling. Water splashing should be avoided where foliage is likely to be injured, such as that of *Dossinia*; in fact, to favor keeping qualities the blooms of many orchids should be reasonably dry at all times.

Amounts of water. Orchids without pseudobulbs should never lack water. These include such genera as *Aerides*, *Cypripedium* (*Paphiopedilum*), *Masdevallia*, *Phalaenopsis*, and *Vanda*. Orchid genera such as *Cypripedium* (*Paphiopedilum*), *Phaius* (*Phajus*), and *Sobralia* should be watered as soon as the surface of the pot becomes dry.

Cultural suggestions already given for specific genera have called attention to the watering of certain kinds of orchids. These may be summarized briefly as follows:

1. Genera that require liberal watering at all seasons: *Dendrobium* (ever-green species), *Cypripedium* (*Paphiopedilum*), *Lycaste*, *Masdevallia*, *Odontoglossum*, *Oncidium*, *Phalaenopsis*, and *Vanda*. (*Phalaenopsis* may be injured by water on new growth or on leaves.)

2. Genera that require liberal watering during the growing season: *Aerides*, *Ansellia*, *Brassavola*, *Brassia*, *Chysis*, *Coelogyne*, *Cymbidium*, *Dendrobium*, *Disa*, *Grammatophyllum*, *Maxillaria*, *Miltonia*, *Oncidium*, *Pescatorea*, *Phaius* (*Phajus*), *Pleione*, *Rodriguezia* (*Burlingtonia*), *Schomburgkia*, *Scuticaria*, *Sobralia*, *Stanhopea*. (*Phaius* may be injured by water on new growth or on leaves.)

3. Genera that should not be overwatered: *Cattleya*, *Catasetum*, *Cyrtopodium*, and *Dossinia*. (*Cattleya* may be sprayed overhead on bright days. *Cyrtopodium* and *Dossinia* may be injured by water on new growth or on leaves.)

4. Genera that need a rest period: Deciduous orchids should not be watered much during the rest period. Rest periods are needed: a) after flowering for

Anguloa, *Bletilla* (*Bletia*), and *Calanthe*; b) in winter for *Cycnoches*, *Dendrobium* (deciduous species), *Habenaria*, and *Laelia*; c) after growth for *Oncidium* species from Mexico and Central America. *Pleione*, and *Stanhopea*.

5. Genera that need especially good drainage: *Ansellia*, *Calanthe*, *Cattleya*, *Cymbidium*, *Grammatophyllum*, *Oncidium*, *Renanthera*, *Rodriguezia* (*Burlingtonia*), and *Trichopilia*. (In potting, allow $\frac{1}{3}$ shards in pot for *Maxillaria* and $\frac{1}{2}$ for *Odontoglossum*.)

Ventilation

Requirements. Genera that thrive with high humidity require less ventilation than those which do well with only moderate humidity. *Dossinia*, for example, requires little air, while *Aerides* and *Angraecum* are often referred to as air plants. Genera that do best with plenty of ventilation include *Aerides*, *Angraecum*, *Cattleya*, *Odontoglossum*, and *Phalaenopsis*.

The amount of ventilation needed is naturally influenced by outside temperature and air movement. In cold weather, the greenhouse ventilators may be opened fairly wide for a short time, then closed. In hot, dry weather, more ventilation is needed to maintain the proper temperature for cool-house orchids. A small amount of bottom ventilation—in addition to top ventilation—keeps air from becoming stagnant. Good ventilation is necessary if foliage must be wet on bright days.

Shade and light

Amount. Several orchid genera require protection from strong sunlight, including *Calanthe*, *Cattleya*, *Laelia*, *Lycaste*, *Masdevallia*, *Maxillaria*, *Miltonia*, *Odontoglossum*, *Rodriguezia* (*Burlingtonia*), and *Stanhopea*. *Vanda* does best with some shade from February to November. *Miltonia* needs shade during the rest period. *Cypripedium*, *Masdevallia*, and *Maxillaria* usually should have some

shade with less than 50 per cent sunlight, but most of the other popular orchids need only semishade or more than 50 per cent sunlight.

Other orchid genera need considerable light, such as *Aerides*, *Brassavola*, *Catasetum*, *Grammatophyllum*, *Renanthera*, and *Schomburgkia*.

Temperature

Variation in requirements. Orchids are often divided into groups according to temperature requirements. One group does best with a cool temperature of about 50° or above (see table 10). Another group of intermediate orchids should have a temperature of about 65° as a minimum (see table 12).

Beginners should not overlook the fact that temperature is often much more difficult to hold down to a safe maximum than to keep up to a safe minimum. The hardier cool-house orchids, such as cypripediums and cymbidiums, often grow better outside than inside a warm greenhouse during most of the warmer months. On the other hand, unless these hardy orchids are grown in a shaded greenhouse, they may need artificial shade for their individual needs, such as lath or filtered tree light.

Even though there may be only a few days of frost danger in the mild areas of California, usually it is best to have some place—a heated greenhouse, room, or similar enclosure—to house the orchids in winter so they will not be damaged by low temperatures.

Fertilizing

If a good potting mixture is used at planting and if repotting is done every other year, there should be little need for fertilizing. The great majority of orchids thrive with osmunda fern fiber.

Commercial fertilizers. The beginner is advised not to experiment with fertilizers, although experienced commercial growers have had success with

them. If fertilizing is attempted, use a weak solution. The Cookson formula calls for 2 ounces of monoammonium phosphate and 3 ounces of potassium nitrate in 3 gallons of tap water. This stock nutrient solution is used for watering orchid plants at the rate of 1 ounce to each gallon of tap water. It may be acidified with 12 to 14 drops of phosphoric acid. Some growers alternate the use of tap water and the nutrient solution.

Organic fertilizers. Certain genera of orchids, including *Bletilla* (*Bletia*), *Calanthe*, *Coelogyne*, *Cymbidium*, *Cyrtopodium*, *Phaius* (*Phajus*), *Pleione*, and *Sobralia* do well with a good loam potting mixture. Weak liquid cow manure has been used for such orchids as *Calanthe*, *Coelogyne*, *Cymbidium*, *Cypripedium* (*Paphiopedilum*), *Odontoglossum*, *Phaius* (*Phajus*), and *Sobralia*. Chimneysoot water containing a little nitrogen has been used for *Cattleya*.

Nutrient culture

Specialist's hobby. Orchids have been grown in gravel and similar media with the aid of a nutrient solution to furnish the necessary plant foods. Persons interested in experimenting with special cultural methods, who are also willing and able to supply the proper equipment and attention, can be successful. It should be emphasized, however, that in many instances it is much easier to grow orchids in fern fiber or in a good compost mixture than by special methods. Many orchid growers who have tried the nutrient cultures finally return to the usual methods simply because less work and expense are involved.

Persons interested in growing orchids in nutrient culture may consult local libraries for references that give formulas for preparing the nutrient solution and illustrate suitable equipment. The ordinary amateur orchid grower is rarely interested in these special methods.

Measures to take for the control of pests and diseases

Pests

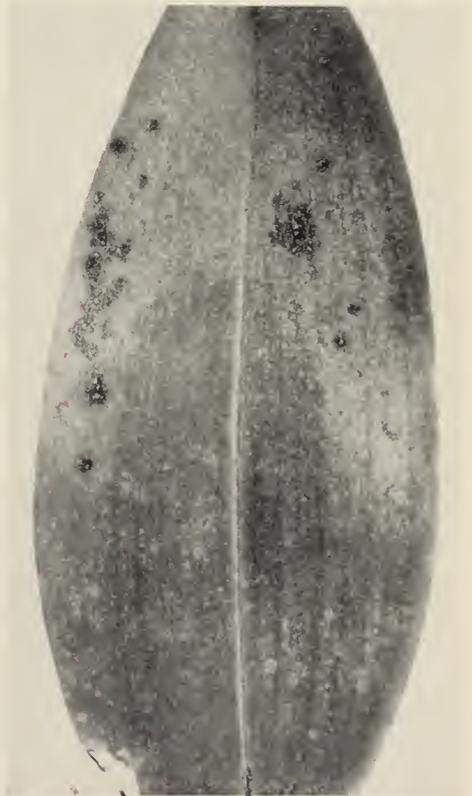
Orchids are subject to infestation or attack by many kinds of insects and other pests. The more important of these include mites, thrips, aphids, scale insects, weevils, cattleya flies, slugs, and snails. Ants are also troublesome at times, although they do not attack the plants directly. Fortunately, most of these pests are controlled satisfactorily with modern spray materials and techniques. Good sanitation will still be necessary, however, as well as a start with pest-free plants.

Aphids. Aphids or plant lice attacking orchids include the latania aphid and occasionally the green peach aphid. The latania aphid somewhat resembles the young whitefly, and occurs on orchids, ferns, and palms. Control is possible with nicotine sulfate and soap, used in light applications to avoid injury to the orchid plants. Nicotine dusts usually leave an objectionable residue. A teaspoon of Black Leaf 40 to a gallon of water plus slightly more than 1 fluid ounce of liquid fish-oil soap are suggested. Lindane is also effective.

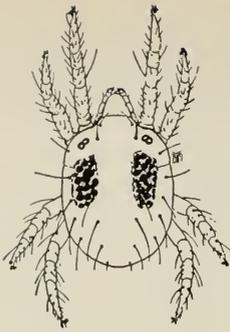
Cattleya flies. This pest occurs within the small flower buds or pseudobulbs of cattleya orchids. The infested buds never bloom. DDT sprays have been effective against cattleya flies as well as thrips and weevils. Allow about $\frac{1}{3}$ ounce of 50 per cent wettable DDT per gallon of water.

Mealybugs. The long-tailed mealybug and the palm mealybug sometimes attack phalaenopsis orchids. Hosing off the plants helps to control mealybugs. Removing them with a brush is feasible only where there are a few. Light summer-oil sprays may be used safely on some orchid plants (see scale insects, p. 12).

Mites. Two kinds of mites (page 12) attack orchids: these are the common two-spotted spider mite, on cymbidium orchids; and the false spider mite, of which the phalaenopsis mite, known for pitting the upper surface of phalaenopsis leaves, is one of the most important. Light oil may be used on tolerant plants. Syringing may control the two-spotted mite; a product known as Aramite has also been effective. Dinité has been recommended as a most satisfactory control for false spider mites. Dilute the 25 per cent emulsion at the rate of 1 teaspoon per gallon of water.



Deep pitting and silvering of this leaf were caused by the phalaenopsis mite.



The adult female of the two-spotted spider mite.

Scale insects. The several kinds of scale insects attacking orchids include Boisduval scale, cottony orchid scale, cymbidium scale, false parlatoria scale, noxious scale, Mackie scale, orchid soft scale, and proteus scale (see below). The Boisduval scale occurs mostly on cattleya and cymbidium orchids, but also attacks some other kinds. The cottony orchid scale is found occasionally. The false parlatoria scale attacks phoenix palms and cypripedium orchids. The Mackie and noxious scales are found on dendrobium orchids. The cymbidium scale closely resembles oystershell scales and is found only on cymbidium orchids.

Wettable DDT sprays are effective against the crawlers of such scales as Boisduval, cymbidium, and Mackie. If growers have adequate facilities to fumigate their potted orchids with methyl bromide they will have highly effective control, but most small growers do not have facilities for the safe use of this gas. Cyanide fumigation has been tried in some instances, but cyanide is so dangerous that not many orchid growers care to run the risk of injury to themselves or the orchid plants. Low humidity—as well as adequate facilities—is essential to the safe use of cyanide fumigation. Light oil sprays are effective and may be used on plants that are tolerant. One

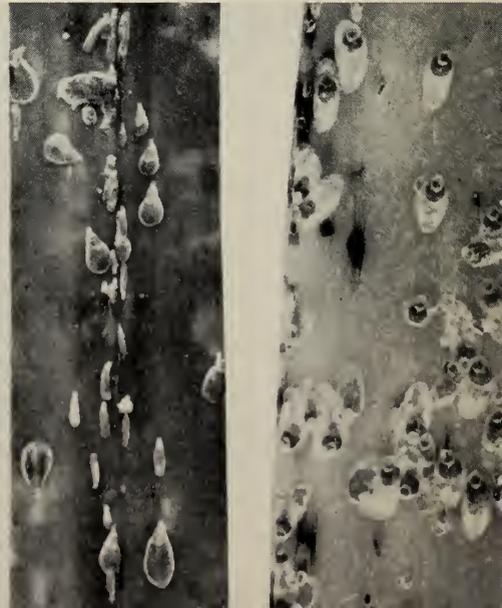
per cent of a summer oil amounts to 1¼ ounce per gallon of water. Hardy plants may stand twice this amount.

Badly infested orchid plants should be segregated until they can be cleaned up. If DDT is used, 1 pound of actual DDT should be allowed per 100 gallons of water. For example, if a 50 per cent wettable DDT powder is used, allow a minimum of about ⅓ ounce per gallon of water.

Slugs and snails. The gray garden slug and the bush snail are sometimes pests on orchids. The popular poison baits containing metaldehyde are most effective. Handpicking of these pests at night also may help in control.

Sowbugs. These are troublesome on very tender petals or buds. Finely ground poison baits aid in the control of sowbugs. DDT and lindane also have been used.

Thrips. At least three kinds of thrips attack orchids, including the California orchid thrips, the English orchid thrips, and the yellow orchid thrips. The California orchid thrips is found on various kinds of orchids in greenhouses. The English orchid thrips may also attack several kinds of orchids. The yellow orchid thrips feeds on the upper surface of cattleya leaves. These thrips may be



Left, cymbidium scale on cymbidium orchid; right, proteus scale on vanda.

controlled by spraying with about $\frac{1}{2}$ ounce of wettable 50 per cent DDT per gallon of water. DDT in benzol also has been used. The grower using DDT should carefully follow the directions on the package.

Weevils. Three kinds of weevils have attacked orchids in California. The cattleya weevil is a large, black-snouted insect with conspicuous white markings on the wing covers. It may puncture pseudobulbs or buds, and the larvae feed within the pseudobulbs, stems, and leaves. Fortunately, the cattleya weevil is not often found here. The black diorymerellus orchid weevil is smaller than the cattleya weevil and is shiny black. The adults feed on flower buds, petals, and young leaves at night. They hide at the leaf bases or in the potting material during the day. The grubs feed inside the roots, causing them to blacken and die. This weevil once was a destructive pest of cattleya and dendrobium orchids in California, but is now almost entirely controlled by the wettable DDT spray used for the control of scale insects and thrips.

Black vine weevil. This insect, also known as the *Brachyrhinus* beetle (*Brachyrhinus sulcatus*), is sometimes a serious pest in gardens; it may even enter greenhouses, where it attacks the flower buds of orchids, spoiling the flowers for exhibition. The weevil eggs are dropped in the soil, usually in summer. The eggs hatch in about two weeks, and the grubs feed on plant roots. The larger grubs often girdle shrubs and other plants below the ground level. The grubs finally transform into beetles which emerge in the spring. They may live for two years above ground, each laying several hundred eggs. The pest may be brought into the greenhouse with infested soil, or the adult beetles may crawl in slowly from the garden near the greenhouse.

Control should start in the garden where the eggs are dropped. A 50 per

cent wettable DDT may be used to spray benches or plants, as in the control of other weevils. Benzine hexachloride and chlordane have proved effective in controlling the grubs that can be reached, but should not be applied to garden soils used to produce food plants because they impart an objectionable flavor.

Miscellaneous pests. Ants can be held in check with chlordane used at the rate of 1.6 to 3.2 ounces of a 40 to 50 per cent emulsion in $2\frac{1}{2}$ gallons of water, or about 2 to 4 teaspoons per gallon. Where a 50 per cent wettable powder is used, allow 0.8 to 1.6 ounces per $2\frac{1}{2}$ gallons of water. The popular arsenical cups also may be used to control ants.

The foliar nematode has attacked the *Vanda* orchid Miss Joaquim, in Hawaii, but is not known to have attacked orchids in California. This nematode is present here, however, and should be kept away from susceptible plants by proper sanitation. Growing plants close together, where water splashes from infested leaves to healthy plants, favors the spread of this pest once it is brought into a greenhouse.

Springtails are sometimes a nuisance. These are controlled with lindane sprays. Directions on the package should be followed carefully.

Virus diseases*

These are disease entities whose ultimate nature is still rather obscure. They are so small they cannot be seen through the light microscope, but particles which are believed to represent virus are visible in the electron microscope. Viruses may produce serious diseases in some hosts but be symptomless in others.

Symptoms. Several different virus diseases have been described from orchids. The range of symptoms they produce includes mosaic mottle, chlorosis

* D. D. Jensen, who prepared this section, is Associate Professor of Entomology and Parasitology and is Associate Entomologist in the Experiment Station, Berkeley.



Cattleya flower breaking shows typical symptoms.

Cymbidium mosaic, or black streak, is the most common virus disease known in orchids.



or yellowing of the leaves, spots, streaks, and rings of dead tissue, malformation of the leaves and flowers, and “breaking” or variegation in the color of the flowers. In severe cases, plants may be killed outright or markedly stunted.

Spread. Virus diseases spread in several ways. After gaining entry into a previously healthy orchid, the virus invades all parts of the plant from roots to flowers. All new plants derived from a diseased orchid by division or by back-bulb propagation are almost certain to carry virus with them. This practice of vegetative propagation in orchids thus is a major means by which the incidence of virus diseases increases in commercial and private plantings.

Means of infection. At the present time the available evidence indicates that orchid viruses are not carried through the seed. Therefore, seedlings should be free of virus until they become infected from some outside source. The most probable means by which previously healthy orchids become infected are virus-carrying insects (particularly aphids) and cutting knives and shears contaminated with infective juice from diseased plants. Aphids usually feed very little on the leaves of orchids, but they feed readily and reproduce on the flowers and flower buds.

Control. The following measures are recommended to prevent or reduce the spread of orchid viruses: 1) Maintain an effective program of insect control; 2) clean cutting tools between use on different plants; and 3) segregate diseased and healthy plants whenever practicable. For example, when facilities permit, keep healthy plants together in a separate greenhouse or in one portion of the greenhouse and diseased plants in another. This reduces the danger of virus spread by infective insects or by contaminated knives.

There is no means known by which a diseased orchid plant can be freed of virus infection. However, in some cases

the symptoms may be inconspicuous or absent during part of the year, or after the plant has recovered from the shock effect of initial infection.

The most common and widespread virus in orchids is cymbidium mosaic virus which causes mosaic and black streaking in cymbidium. The same virus produces dead streaks and rings in the leaves of cattleya, sometimes even killing entire leaves. Virus diseases occur in most of the common genera of orchids grown in California.

Bacterial and fungus diseases*

Glass-house-grown orchids are subject to many diseases caused by bacteria and fungi but only four diseases have been observed to cause serious losses. These are the *Pythium* black rot of *Cattleya*, and the bacterial diseases, brown spot of *Phalaenopsis* and *Cattleya*, brown rot of *Cypripedium*, and the bacterial leaf scorch and pseudobulb rot of *Miltonia* orchid hybrids. In general, these diseases first appear as water-soaked spots either in the leaves or the pseudobulbs. These spots enlarge, causing either dead spots in the leaves or rotting of the pseudobulbs and rhizomes.

The bacterial diseases are spread by the splattering of water, and the progress of the organisms in the plant is favored by high humidity. When these diseases are suspected, the affected plants should be isolated. The spread can largely be prevented by avoiding overhead irrigation and providing good aeration to promote drying. Benches should be kept clean. They may be disinfected with copper naphthanate (this is also effective as a wood preservative).

A brief description of the commoner orchid diseases and suggestions for their control are given below. The results of research on these diseases and others usually appear in the journals devoted to orchid culture.

* C. Emlen Scott, who prepared this section, is Agriculturist, Agricultural Extension, Berkeley.

***Pythium* black rot of *Cattleya*.**

This is an important disease of seedlings and mature plants. It starts as a water-soaked leaf spot and spreads through seedlings in community pots, or it starts on leaves or pseudobulbs of mature plants. Follow suggestions on sanitation and aeration. Drench community pots or mature plants at three- to seven-day intervals with sodium salt of 2-hydroxy diphenyl (Natriphene) or 8-hydroxyquinoline benzoate (or sulfate), 1 teaspoon to 2½ gallons.

Brown spot of *Phalaenopsis* and *Cattleya*. This bacterial disease is especially severe on *Phalaenopsis* seedlings in community pots. The soft, water-soaked spots which later become brown or black may kill *Phalaenopsis* plants. The disease is not fatal on *Cattleya* and is confined to older leaves. The treatment is the same as for *Pythium* black rot.

Brown rot of *Cypripedium*. This is a bacterial disease quite similar to brown spot of *Phalaenopsis*. Methods of control are the same as for *Pythium* black rot.

Bacterial leaf scorch of *Miltonia*. Spots in leaves spread rapidly under warm moist conditions and extend to the growing point and pseudobulb. The plant is killed rapidly by spread of the bacteria through the rhizome. Use a dip of sodium salt of 2-hydroxy diphenyl (Natriphene) or 8-hydroxyquinoline benzoate (or sulfate) as given above but cut out affected parts before treatment.

Air pollution

Smog control. Certain gases, which include ethylene gas, may be so injurious to the sepals of orchids, especially some of the commercial varieties, that they are of little value. Occasionally leaves also are damaged.

Prevention consists of locating where there is freedom from such troubles or else going to the expense of air treatment within a greenhouse. Further studies of this problem are being conducted in commercial establishments.

The



The cattleya group is highly popular because of large blooms (left) in many colors and pleasing forms. A stem may have one to several blooms. *Pleurothallis marmorata* (below) has many sprays of small flowers, and well illustrates the extreme variation in sizes of orchid flowers.



Orchid Family . . .

includes more than 500 widely distributed genera, characterized by very irregular flowers with three sepals and three petals. The two lateral petals are alike, while the third is modified into a lip, which may either be spurred or formed into a pouch. Bulbous or thickened stems are often a characteristic of orchids.

Orchid descriptions to aid the beginner's selection

Many species of orchids have been brought under cultivation with considerable success. Breeders have produced hybrids between species in the same genus and also hybrids between different genera. Where plants are produced from a certain cross, the breeder will make selections of superior seedlings and perhaps attach a varietal name to each worthy new development. This is why it is necessary to use the full name in selecting fine orchids by name. For example, orchid growers may have a cross known as *Laeliocattleya Queen Mary*. This name covers a certain group in general, but a more definite name should be applied to a superior form, such as *Westonbirt variety of Queen Mary*. This is only a single example of many such choices that should be made to get superior varieties from the given cross. Many of these hybrids will be mentioned in this manual.

The orchids with large flowers and good colors that keep well in flower shops are often known as commercial orchids. The genera include *Cattleya*, *Coeloglyne*, *Cymbidium*, *Cypripedium*, *Dendrobium*, *Miltonia*, *Odontoglossum*, *Phalaenopsis*, and *Vanda*. Amateur orchid growers in California no doubt will be interested in both the popular com-

mercial orchids and the many others that are not seen in the ordinary flower shop.

Many beginners think of the *Cattleya* orchid (page 16) as representing their idea of a real orchid. However, as acquaintance with different species increases, interest will probably spread to many other orchids which are not of interest to commercial growers. The flowers may be inconspicuous or too small to meet the demand of a retail florist, or their keeping qualities may be poor. Sometimes the plants are too tall or too large for commercial purposes. The fancier who does not have to depend on the financial outcome is primarily interested in flowering plants that have attractive flowers, irrespective of size or keeping quality. Some orchids may be very rare yet are not available to the ordinary florist for this reason.

Since color, size, form, season of bloom, cultural requirements, and similar factors are important in selecting orchids, the following descriptions point out differences to aid the beginner. No short list of orchid species, hybrids, or varieties can possibly mention all of the orchids found in collections or in reference books, but those named may be of wide interest and suggest possibilities. Many other orchids of equal importance

can be added as experience is gained. Dealers can offer further suggestions, especially after it is known under what conditions the plants are to be grown and what particular type or types of orchids interest the individual. Cost will sometimes be a limiting factor, yet some of the less expensive orchids are also among the best. Cost and rarity are not necessarily the only guides in selecting the best orchids.

Among the orchid genera of primary interest to fanciers aside from the commercial orchids are *Aerides*, *Angraecum*, *Anguloa*, *Anota*, *Ansellia*, *Batemannia*, *Bifrenaria*, *Bletilla* (*Bletia*), *Brassavola*, *Brassia*, *Bulbophyllum*, *Calanthe*, *Catasetum*, *Chysis*, *Cochlioda*, *Cynoches*, *Cyrtopodium*, *Disa*, *Dossinia*, *Epidendrum*, *Eriopsis*, *Grammatophyllum*, *Hae-
maria*, *Houlletia*, *Laelia*, *Lycaste*, *Mas-*

devallia, *Maxillaria*, *Pescatorea*, *Phaius* (*Phajus*), *Pleione*, *Renanthera*, *Rhynchos-
tylis*, *Rodriguezia*, *Saccolabium*, *Schom-
burgkia*, *Scuticaria*, *Sobralia*, *Sophro-
nitis*, *Stanhopea*, *Trichopilia*, and *Zygo-
petalum*.

Hybrids. The many hybrids between species and genera are of wide interest. Among the commoner hybrid groups of interest to amateur orchid growers will be *Brassocattleya*, *Brassocattlaelia*, *Bras-
solaelia*, *Epicattleya*, *Epilaelia*, *Epiphro-
nitis*, *Laeliocattleya*, *Miltonioda*, *Odon-
tioda*, *Odontonia*, *Odontocidium*, *Oncid-
ioda*, *Sophrocattlaelia*, *Sophrocattleya*,
and *Sophrolaelia*. Such intergeneric hy-
brids may be of interest to all orchid
growers, although some may interest
only the fancier. They are mentioned
here to give a better picture of the wide
choice open to the amateur.

Aerides

The epiphytic *Aerides* orchids do best in a moist atmosphere with liberal water, light, and air, and a minimum winter temperature of 65°F. The stems form roots, which should not be injured or checked in growth. Aerial roots should not be confined in pots or baskets. The roots are very active, even in winter, and are difficult to replant in new baskets

without being damaged. Old material should be carefully removed and replaced gently.

The plants have thick, two-ranked leaves. Flowers are in lateral pendulous racemes. Two lateral sepals are attached to the base of the column. The three-lobed lip forms a hollow, usually up-
turned spur.

- | | |
|--|--|
| <i>A. crassifolium</i> | native to Burma; flowers up to 1½ inches on drooping spikes; rose purple; blooms in May and June. Has been called the King of All <i>Aerides</i> . |
| <i>A. falcatum</i> | native to Burma; amethyst lip, white sepals, and petals spotted with purple. Variety <i>Houlletianum</i> has a whiter lip and yellowish brown sepals and petals; blooms in May and June. |
| <i>A. fieldingi</i> | native to India; flowers white dotted and suffused with rose, about 1½ inches across; spur white; racemes longer than leaves; blooms in May and June. |
| <i>A. odoratum</i>
(<i>suavissimum</i>) | native to India, China, and the Philippines; free flowering with many flowers up to 1 inch across; white, with a purple spot at the tip of the sepals; flowers last two weeks or more; blooms from July to September |

Angraecum

The epiphytic *Angraecum* orchids are similar to *Aerides* in culture. The plants should be kept in the warmest corner of a warm greenhouse and never allowed to become chilled. They are almost air plants and need frequent spraying with water. Practically no compost is used at the roots. The flowers usually appear in

winter and last well. Most varieties given here are natives to Madagascar.

The plants have very thick leaves. The flowers are usually borne in racemes, with sepals and petals similar, the lip with side lobes small or lacking and the middle lobe entire with a long slender spur.

- A. articulatum* native to Madagascar; pendulous racemes with numerous white flowers, pedicels pale orange; spur $\frac{3}{4}$ inch long; blooms in spring.
- A. citratum* native to Madagascar; pendulous racemes with 12 or more flowers with a slender spur; white or pale straw color; blooms in spring.
- A. eburneum* native to Madagascar; stems to 4 feet and leaves to 2 feet; flowers to 4 inches across; sepals and petals green, lip ivory white with green spur 3 inches long; about eight to 15 flowers on racemes longer than leaves; blooms from December to March.
- A. falcatum* three to five fragrant white flowers about $\frac{3}{4}$ inch across; lip three-lobed; spur curved; blooms in summer; native to Japan.
- A. sesquipedale* native to Madagascar; flowers up to 7 inches across, with spur about 12 inches long; borne in two- to four-flowered racemes; white; blooms from November to March. One of finest species of the genus.

Anota

The epiphytic *Anota* species are sometimes referred to the genera *Vanda* and *Saccolabium*. The culture is much like that of *Aerides*.

The plants have leafy stems and flowers in racemes, the lip being entire and spurred. Two varieties are described below in some detail.

- A. densiflora* native to Burma; free flowering; flowers to 1 inch across on drooping racemes to 16 inches long; white spotted with violet, and base of lip purple; blooms about November; flowers last six weeks.
- A. violacea* native to the Philippines; similar to *A. densiflora*, with flowers on racemes 12 to 15 inches long; blooms from December to March.

Ansellia

The African epiphytic *Ansellia africana* requires a warm greenhouse and a good supply of water for the young growth. The plants are naturally dry half the year and ripen growth after flowering is completed.

A. africana native to Sierra Leone; flowers to 1 inch in diameter with nearly 100 on a terminal panicle to 16 inches long; yellow, spotted with chocolate brown; blooms from December to July.

Bletilla (Bletia)

This is one of the terrestrial orchids which grow fairly well outside in California. It has tuberous rhizomes, rather thin leaves, and small flowers in terminal racemes, with the sepals and petals similar, and the lip free and three-lobed.

B. striata
(*hyacinthina*) native to China and Japan; flowers 1½ inches long in three- to seven-flowered racemes on a 1-foot scape; purple; blooms in June outside, or as early as March in heated greenhouse. Plants tolerate a temperature as low as 20°.

Brassavola

The *Brassavola* orchids are epiphytes from tropical America. They are of easy culture when watered liberally during the growing season and kept at a temperature of 70° to 75° by day and 60° to 65° by night. In general, the culture of this group is the same as that for the *Cattleya* and *Laelia* orchids. Most brassavolas should have plenty of sun to mature the young growth and reduced humidity during the rest period, which follows the blooming season. Some species grow very well suspended on blocks. The leaves are fleshy. The flowers are solitary or in short racemes with the flowers attached singly at intervals by short stems to the flower stalk. The sepals and petals of the flowers are small and spreading. The lip is entire, having a margin that is continuous, unbroken by teeth or serrations, and is attached to the column at the base.

B. cucullata native to Mexico, Honduras, Venezuela, Colombia, and the West Indies; flowers usually solitary; petals orange, yellow, or white, with white lip; blooms from May to December.

B. digbyana native to Mexico and Honduras; fragrant greenish-white flowers about 5 inches in diameter; blooms from May to August. This species has been crossed with *Cattleya* to produce the fringed lip of the hybrids.

B. glauca native to Mexico and Guatemala; blooms from February to March.

B. nodosa native to West Indies, Central America, Colombia, and Venezuela; solitary flowers with sepals and petals of greenish yellow or white to 3 inches long; lip white; blooms from January to December.

Brassia (Spider Orchids)

The epiphytic *Brassia* orchids are seldom grown now. They are treated much like *Oncidium* or *Cattleya* in an intermediate greenhouse with liberal watering in the growing season. They should never be allowed to shrivel.

The plants have one or two leaves and flowers in racemes, the sepals and petals narrow and long pointed, often tail-like, the lip entire and shorter than the sepals. The racemes may be from 2½ to 3½ feet in length.

B. brachiata

sepals and petals yellowish green with a few purple basal spots; lip light yellow with dark green warts; blooms in summer; native to Guatemala.

B. verrucosa

native to Mexico, Guatemala, Honduras, and Venezuela; a curious orchid with the upper part of the flower pale green and the lip white marked with green warts; petals to 4 inches long; six to 13 flowers to a raceme; blooms from April to June.

The strange flowers of *Brassia* bidens last only a short time.



Bulbophyllum

The epiphytic *Bulbophyllum* species require good drainage with liberal watering and a steaming atmosphere during the period of growth. They need a temperature of at least 60° to 65°. They are often grown on wood or on tree-fern stems.

B. lobbi

native to Borneo, Java, Sumatra, and Burma; flowers solitary; 2 to 4 inches across; sepals and petals yellow spotted or lined outside with red; lip golden yellow; blooms from May to June and in November.

Calanthe

The terrestrial or occasionally epiphytic species of *Calanthe* are popular and of easy culture. They may be grown in pots with loam and a little well-rotted cow manure. The drainage should be good. They like heat, shade, and moisture. A temperature of 70° to 75° by day and 65° to 70° by night is suggested. Water new plants sparingly until roots start; also water sparingly during the dormant season.

C. furcata
(*veratrifolia*)

native to Malaya, India, and Australia; snow-white flowers about 2 inches in diameter on many-flowered racemes on scapes 3 or more feet high; lip lobed and with a slender spur; blooms from January to December.

C. masuca

flower scape to 2 feet; flowers 1 inch across, overlapping, deep violet fading to lilac, and lip deep violet purple; blooms from July to September; native to northern India.

C. sanderiana

native to tropical Africa; leaves about 1 foot long; many-flowered racemes; sepals and petals pale lilac edged with purple; lip dark purple with brown on spur; flower often listed as rose colored.

C. Sedeni Bella

hybrid between *C. Veitchi* and *C. vestita* (*turneri*); similar to *C. vestita* with crimson blotch on lip.

C. Veitchi

hybrid between *C. rosea* and *C. vestita*; rose-colored flowers with white spot at base of lip. Variety *Sandhurstiana* has crimson flowers in winter, the flower scapes beginning to form in late summer.

C. vestita
(*turneri*)

native to India and Malaya; leaves about 1½ feet long; white or creamy flowers 2½ inches in diameter in six- to 12-flowered racemes on scapes up to 2½ feet high; four-lobed lip marked with orange yellow at base and with a slender spur; blooms in November and December; deciduous.

Cattleya

The epiphytic *Cattleya* species are native to tropical America. They include perhaps the most popular commercial orchids. Most cattleyas do well with an intermediate winter temperature, as low as 60° to 65° by day and 55° to 60° by night. Early-blooming species, such as *C. trianae* and *C. skinneri*, should be placed at the warmest end of the greenhouse, with later-blooming species, such as *C. mossiae* and *C. warscewiczii* var. *gigas*, at the cooler end. Overhead sprinkling is permissible on bright days, although the flowers should not be wet.

There should be little moisture at the roots until the weather is favorable. In rainy weather watering may be required only once a week or less often. When the plants are in active growth, they should be watered about three times a week.

There is an almost bewildering number of *Cattleya* species, varieties, and hybrids. They have from one to three very thick leaves. The flowers (page 16) usually occur in terminal clusters and rarely in solitary form. Some of the cattleyas which have remained highly popular for many years include:

- C. Amabilis* hybrid between *C. labiata* and *C. warscewiczii*; blooms in summer from spring growth.
- C. amethystoglossa* native to Brazil; sepals and petals white suffused rose and spotted with violet; lip with whitish side lobes and bluish-violet middle lobe; five to eight flowers together, about 4 inches across; blooms from November to July.
- C. bicolor* native to Brazil; flowers 3 to 4½ inches across and two to eight in cluster; sepals and petals bronze green; rose-purple lip sometimes edged white; blooms from January to April and September to November.
- C. bowringiana* native to Central America; flowers about 3 inches across and five to 13 together; sepals and petals rose violet; lip rose and lilac; throat white, edged with chestnut brown; blooms from October to December. Not a commercial variety but good for amateur growing.
- C. citrina*
(tulip cattleya) native to Mexico; citron-yellow flowers usually solitary on drooping stalks; lip white and wavy on edges; blooms from April to June.
- C. dowiana*
(queen cattleya) native to Costa Rica; flowers 7 inches across and two to five together; yellow sepals and petals; lip with yellow tube striped with purple and wavy purple limb lined with gold; blooms from July to September. Variety *aurea* has lip with more and deeper yellow lines.
- C. eldorado* native to Brazil; flowers 6 inches across and pale rosy lilac shading to white; lip crisped and centrally blotched with orange and purple; fragrant; blooms from summer to early autumn.

- C. gaskelliana*
(summer cattleya) native to Venezuela; flowers 7 inches across and two to three together; petals and sepals purple violet suffused with white; wavy lip purple violet with yellow-streaked throat; blooms from June to November.
- C. guttata* native to Brazil; flowers 4 inches across and four to six together; sepals and petals green spotted red purple; side lobes of lip are rose or white and middle lobe violet purple; blooms from April to October.
- C. Hardyana* hybrid between *C. dowiana* and *C. warstewiczii*; blooms in August; strongly scented.
- C. harrisoniana* native to Trinidad and Brazil; flowers to 6 inches across and two to five together; rose lilac, the middle lobe of lip purple with yellow spot; blooms from July to October.
- C. intermedia* native to southern Brazil; flowers to 5 inches across and three to five in a group; pale rose with middle lip purple and crisped; blooms in April to June and September to November.
- C. labiata*
(autumn cattleya) native to Trinidad and Brazil; flowers to 6 inches across and two to five together; rose lilac, the very wavy limb of lip violet purple with deeper streaks and yellow throat; blooms from October to March; many varieties.
- C. lawrenceana* native to British Guiana and Venezuela; free flowering, with flowers to 5 inches across and five to seven together; rose purple, the limb of the lip purple with a maroon band; blooms from February to April.
- C. loddigesi* native to Brazil; flowers about 4 inches across, rose lilac; three-lobed lip has white inside and yellow at the base, margins crisped; blooms in summer.
- C. lueddemanniana* native to Brazil and Venezuela; flowers to 6 inches across and two to five in a group; rose purple; lip has amethyst-purple limb; throat spotted with yellow or white; blooms from July to September. Color forms are listed.
- C. mendeli*
(virgins cattleya) native to Colombia; similar to *C. trianae*; flowers to 8 inches across and two to three together; white or rosy, the limb of the lip very wavy, purple with yellow throat; blooms from April to September.
- C. mossiae*
(spring cattleya) native to Venezuela; free-flowering, popular species, with flowers to 8 inches across; rose, the very wavy lip with purple limb variegated with violet and edged with white, the throat yellow; blooms from March to August.
- C. percivaliana*
(Christmas cattleya) native to Venezuela; similar to *C. mossiae* but with smaller and darker flowers; blooms from January to March.

- C. schilleriana* native to Brazil; flowers to 4 inches across and one to two on a stem; wavy sepals and petals green spotted with brown; lip purple crimson above and yellow inside near base; blooms in April to May and September to October.
- C. skinneri* native to Guatemala; free flowering with flowers to 4 inches across and four to six together; rose purple with yellow throat; blooms from January to August.
- C. trianae* native to Colombia; flowers 6 to 8 inches across and two to three together; rose, the lip with dark purple, wavy limb and yellow throat; blooms from December to March. Variety *schroederiana* (Easter cattleya) has fragrant pink flowers with very wavy limb. Several color forms exist; a popular species.
- C. warneri* native to Colombia; large flowers to 8 inches across and two to three together; sepals and petals violet rose, lip deep purple with two yellow spots in throat, wavy; blooms from May to August. Variety *gigas* has larger white flowers. Not very free blooming; needs warmth and light to do well.
- C. warscewiczii*
(*gigas*) native to Colombia; flowers to 9 inches across and two to three in a group; sepals and petals violet rose; lip deep purple with two yellow spots in throat and wavy; blooms in May to August. Color forms listed.

Some of the better *Cattleya* **hybrid varieties** include:

- | | |
|---|--|
| Amabilis (<i>labiata</i> × <i>warscewiczii</i>) | Hardyana (<i>warscewiczii</i> × <i>dowiana</i>)—
natural hybrid |
| Barbara Billingsley—fine white | |
| Barbara Dane (<i>labiata</i> × Phoebe Snow)
—white | Joan Manda (white seedling of White
Empress) |
| Bow Bells (Edithae × Susanne Hye)—
very fine white | Lord Rothschild (<i>dowiana</i> × <i>gaskelliana</i>)
—red |
| Dr. C. E. Wilson (Gravesian alba ×
Nathalie Dekens) | Luegeae (<i>dowiana</i> × Enid)—rose with
crimson lip |
| Dupreana (<i>warneri</i> × <i>warscewiczii</i>)—
blooms in summer | Maggie Raphael (<i>dowiana</i> × <i>trianae</i>) |
| Edithae Alba (Susanne Hye × <i>trianae</i>
<i>alba</i>)—white with a little yellow | Monarch (Empress Frederick × <i>trianae</i>
Grand Monarch)—which is an orchid
color |
| Empress Frederick (<i>dowiana</i> × <i>mossiae</i>)
—dark orchid; strong grower | Nebo (<i>percivilliana</i> × <i>intertexta</i>)—deep
lavender; orange lip, which is veined
in purple |
| Enid (<i>mossiae</i> × <i>warscewiczii</i>)—variable
orchid color; blooms mostly in winter | Rosita (Anetta × Enid) |
| Fabia (<i>dowiana</i> × <i>labiata</i>) | St. Petersburg—good white |
| Gimar (<i>warscewiczii</i> × Queen Mary)—
blooms in winter to early spring | Trimabilis (Amabilis × <i>trianae</i>)
White Empress (Irene × <i>trianae</i>) |

Coelogyne

The *Coelogyne* orchids are terrestrial in habit of growth, and are native to the eastern hemisphere. Some, such as *C. cristata*, do well under temperate conditions, with a night temperature of 55° to 60°. Others, such as *C. massangeana*, require tropical conditions. A rest period before flowering helps such species as

C. cristata. The addition of a small amount of liquid manure or fertilizer insures the best growth.

The coelogyne have one or two leaves and produce showy flowers in racemes, with the sepals and petals similar. The lip is three-lobed and keeled. The flowers of the species listed are mostly white.

- C. barbata* native to the Himalayas; fine white flowers, 2 to 3 inches across; blooms from October to February; does well in a cool greenhouse.
- C. corrugata*
(nervosa) native to India; three to six flowers in a raceme; white with lip marked yellow; blooms from August to September.
- C. cristata* native to the Himalayas; large, snow-white flowers in drooping racemes; lip with five yellow keels; fragrant; blooms from February to April. Color forms listed.
- C. dayana* native to Malaya; drooping racemes of many flowers and to 40 inches long; flowers about 2½ inches across, whitish or pale yellow; lip blotched with chocolate brown and crossed with six white keels; blooms from May to August.
- C. massangeana* native to Assam, Malaya, and Java; vigorous and free flowering, with drooping racemes to 2 feet long of cream-white flowers, the lip marked with yellow and brown and white keels; blooms from March to June and October to November.
- C. mooreana* native to Cochin-China; racemes to 16 inches long with three to eight flowers of snow white; lip spotted golden yellow; blooms in December.
- C. pandurata* native to Malaya, Borneo, and Sumatra; arching racemes to about 24 inches long; up to nine large, pale green flowers; warty lip marked with blackish brown or black; blooms from January to March and May to July.
- C. sandariana* native to Sunda Islands and Borneo; racemes to 15 inches long with about nine large, white flowers; side lobes marked brown and middle lobe with yellow; blooms in summer.
- C. speciosa* native to Java; very large flowers greenish or yellowish brown; lip yellowish white marked dark brown; racemes less than 15 inches long; blooms from February to July and in September.
- C. tomentosa* native to Malaya; pendulous racemes to 18 inches long with large orange-red or red-brown flowers; side lobes streaked with brown and yellow; middle lobe has brown margins; blooms in May.

Cycnoches

The epiphytic *Cycnoches* or swan orchids are treated as is *Dendrobium*, in a warm house. These need a well-marked rest period.

The plants have plaited leaves and

C. chlorochilon
(swan orchid)

flowers of two sexes, sometimes similar, with narrow sepals and petals and entire lip, and often quite different, the male flowers with clawed lip and fingerlike projections.

native to Central America, Venezuela, British Guiana, and Colombia; large fleshy flowers to 6 inches in diameter in three-flowered racemes; yellow green with a darker spot at the base of the lip; blooms from July to December.

Cymbidium

The *Cymbidium* species are mostly terrestrial orchids, and do best with an intermediate temperature of 50° to 60°, with 55° considered best. They have been very popular among California amateurs. Sometimes they are planted outside, in areas with mild winters, but should be kept in a heated greenhouse where winters are cold. From spring to autumn the plants will probably thrive best outside of a greenhouse where the temperature is not above 78° to 80° and where there is plenty of light. The plants do not bloom well unless they have adequate light.

Cymbidiums thrive in a porous mixture of coarse leafmold and small gravel or decomposed granite. One formula calls for two parts by volume of well-rotted, coarse oak leafmold to one part of small gravel or decomposed granite. Various materials may be added to such a simple mixture. Some growers substi-

tute acid peat moss for part of the leafmold; others add a little aged manure. As much as 1 tablespoon of bone meal or cottonseed meal may be mixed with the compost used in a 6-inch pot. Granulated charcoal also has been added to the mixture. A more complex mixture used for cymbidiums consists of 25 per cent acid peat moss, 12.5 per cent coarse oak leafmold, 12.5 per cent well-rotted steer manure, 25 per cent good loam soil, and 25 per cent pea gravel. In any case, see that good drainage is provided in the bottom of the pot. Drainage gravel or shards should be placed in the bottom of the pot. The plants will not stand wet feet. Manure water may be applied if the plants need extra food.

Cymbidium flower spikes are sometimes 2 or 3 feet or more in length. The individual flowers (page 28) may be as much as 3 inches or more across. Some of the outstanding cymbidiums are:

C. aloifolium

native to India, Indo-China, and Malaya; many-flowered pendulous racemes to about 24 inches long; sepals and petals brownish yellow with purple medium stripe; lip brownish red with yellow center; blooms in July and August.

C. eburneum

native to the Himalayas and Indo-China; handsome ever-green plant; large snow-white flowers with yellow in center of lip to 4 inches across; blooms from March to June.

C. ensifolium

native to India, Indo-China, China, Japan, and Malaya; racemes to 20 inches long with three to 12 flowers of greenish yellow with red-brown veins; lip with red-brown spots; blooms from October to February and from May to August.

- C. erythrostyllum* native to Indo-China; arching racemes to 18 inches long with four to seven flowers; sepals white and about 1¾ inches long with shorter white petals; lip yellowish white, lined or dotted red purple; blooms in November.
- C. giganteum* native to the Himalayas, Indo-China, and China; seven to 13 fragrant flowers to 4 inches across on arching racemes; sepals and petals green or brownish, lined with red brown; lip yellow marked red; blooms from September and October on into winter.
- C. grandiflorum* native to the Himalayas and China; flowers to 5 inches across in racemes to 2 to 4 feet; sepals and petals olive green; lip yellow dotted purple brown; blooms from September to December.
- C. Iansonii* hybrid (*lowianum* × *tracyanum*) with tawny yellow flowers 4 to 6 inches across, with as many as 15 to 20 on a stem.
- C. insigne*
(*sanderi*) native to Indo-China; 10 to 15 flowers on racemes up to 5 feet long, the individual flowers up to 3½ inches across; sepals and petals rose, lip rose spotted with purple red; blooms from February to March.
- C. lowianum*
(*lowi*) native to Burma; drooping racemes with 10 to 20 flowers, the individual flowers up to 4 inches across; sepals and petals greenish yellow; blooms from February to July.
- C. tracyanum* native to Burma and Indo-China; similar to *C. giganteum* and *C. grandiflorum* with flowers to 6 inches and darker colored, the prevailing color being yellowish brown; blooms in October to November.
- C. Winnianum* hybrid between *C. giganteum* and *C. mastersi* (*Cyperorchis mastersi*), a novelty in white spotted with crimson.



Cymbidiums have become popular in milder parts of California, where they can be grown outside most of the year.

Fanciers of cymbidiums will doubtless grow some of the popular hybrids, most of which flower from spring until late in the summer. The following list of some of the named varieties offered does not include several of the excellent new hybrids, but will suggest some of the superior kinds to which the fancier may add as his interest and finances dictate. All those listed flower in March or April, except Doris, which flowers about Christmas. The prevailing color is indicated.

Balkis (white)

Blue Smoke (green)

Bodmin Moor (varies from white to chartreuse)

Carisbrook (pink)

Desdemona (varies from white to dark green)

Dorchester (white)
 Doris (brown)
 Erica Sander (green)
 Ethel Ward (yellow)
 Faye Wilson (white to pink)
 Fearnley Sander (green)
 Hugh Evans (greenish gold)
 Ispahan (yellow)
 Louis Sander (pink)

Miranda (white)
 Pauwelsi (creamy yellow to brown)
 Peri (chartreuse)
 Pres. Wilson (chartreuse or white)
 Redshank (red)
 Redstart (red)
 Shina Black (dark red)
 Swallow (white)
 Yellow Hammer (yellow)

Cypripedium (including Paphiopedilum and Cordula)
(lady-slipper orchids)

The tropical genus *Cypripedium* includes both epiphytic and terrestrial species, which are sometimes listed under *Paphiopedilum* or *Cordula*. Most of these orchids need a temperature of 65° to 70° at night and 70° to 75° by day. They do not have distinct rest periods. The hardier kinds are grown without heat. A good supply of moisture is important, and overpotting should be avoided. These orchids are of easy culture if given the requirements specified. The plain-leaved hardy kinds tend to bloom in winter, while the warm-house kinds with spotted leaves (at right) bloom in summer.

The plants have leathery leaves and flowers in racemes or panicles (page 30). The lateral sepals are united, the lip being sac-like, with the edges reflexed or turned in. Many species are grown; the flowers are moderately popular. The following species and hybrids are popular kinds.



The cypripediums (including *Paphiopedilum*) are popular with beginners because of hardiness, interesting color, and form. Shown here is the lady slipper orchid.

- C. bellatulum* (*Paphiopedilum bellatulum*) native to Burma; flowers to 2 inches across; white spotted with purple; blooms from April to May and again from August to September.
- C. callosum* native to Siam and Cochin-China; whitish-green flowers about 4 inches across on stems to 15 inches; blooms in winter. Several color forms are listed.
- C. Cardinal* hybrid between Cardinal Mercier and Carola; blooms several times, one set of flowers following another.
- C. caudatum* greenish-white flowers about 6 inches across, one to four flowers to a stem, appearing in spring.

- C. charlesworthi* native to India; solitary flowers 2½ to 3½ inches across; rose colored veined purple; petals and lip greenish veined brown; blooms from August to December. (Below.)
- C. concolor* native to Burma and Indo-China; flowers 2 to 3 inches across, solitary or two to a stem; pale yellow finely spotted with violet; blooms from April to September.
- C. curtisi* native to Sumatra; flowers to more than 4 inches across on stems to 12 inches; prevailing color greenish white lined with purple; petals finely spotted dark purple; lip greenish brown; blooms from April to September.
- C. fairieanum* native to the Himalayas; flowers to 2 to 2½ inches across, solitary on stems to 6 inches; prevailing color whitish green but with violet stripes in sepals and violet streaks in petals; lip brownish green with some purple; flowers in winter.
- C. godefroyae* native to Indo-China; one to two flowers on short stems; mostly creamy yellow but spotted with red purple; lip similarly covered; blooms in summer.
- C. holdeni* Westonbirt variety is one of the warm greenhouse cypripediums that blooms in summer (below); white with green stripes.
- C. insigne*
(*Paphiopedilum insigne*) native to the Himalayas; solitary flowers last well; yellow green with brown; blooms from October to March. A very common and popular species that does well in a cool greenhouse. Variety Sanderi is yellowish green with brown spots; large winter blooms.
- C. lawrenceanum*
(*Paphiopedilum lawrenceanum*) native to Borneo; stemless with 3-inch flowers of interesting whitish-green color combinations; blooms in spring and summer, April to August and again in November.

C. holdeni, Westonbirt variety, is one of the warm-house varieties with spotted foliage and summer blooms.

C. charlesworthi, one of the popular summer-flowering lady slipper orchids, also is grown in a warm house.



- C. Morganiae*
(*Paphiopedilum morganiae*) hybrid between *C. stonei* and *C. superbiens*; one of the finest of the terrestrial orchids.
- C. rothschildianum*
(*Paphiopedilum rothschildianum*) native to Sumatra and Borneo; handsome flowers to 5 inches across; blooms from January to April and again in August.
- C. sanderianum*
(*Paphiopedilum sanderianum*) native to Malaya; petals linear to 18 inches, yellow tipped with red and brown and edged with red; lip purple brown; blooms from September to October.
- C. spicerianum*
(*Paphiopedilum spicerianum*) native to India; stemless with solitary flowers to 2 inches across; petals greenish brown with wavy margins; blooms from November to December.
- C. stonei*
(*Paphiopedilum stonei*) native to Borneo; flowers to 5 inches across on scapes to 2 feet long; sepals white striped with purple; petals yellow spotted with brown; blooms from May to August.
- C. superbiens*
(*C. veitchi* or *veitchianum*, *Paphiopedilum superbiens*) native to Malaya; flowers to 3½ inches across, solitary on 10-inch stalks; variegated foliage; good habit of growth; blooms from January to July.
- C. venustum* native to the Himalayas; flowers 3 to 3½ inches across, usually solitary on stems to 9 inches; prevailing color greenish white but with blackish warts at the base of the petals; lip yellow green ringed rose and veined green; blooms from November to March.
- C. Vexillarium*
(*Paphiopedilum vexillarium*) hybrid between *C. barbatum* and *C. jairieanum*; dwarf habit; summer flowering.
- C. villosum* native to Burma; large flowers to 6 inches across, solitary on stems almost 18 inches long; petals yellowish brown with brown-purple midvein; dorsal sepal green above and purplish brown at base; lip brownish yellow; blooms in winter.

Many named varieties of the lady-slipper orchids are being produced, and fanciers will be interested in the best of these. High cost may be a limiting factor. Just to illustrate the sort of varieties in mind, we may mention Balaclara (Gwen Hannen × Warrior), dark green with dark spots, and Mildred Hunter (Atlantis × Everest), deep red to dark green with red spots.

The strong color and firm texture of *Laeliocattleya* Mme. Helene-Ammenheuser give it unusual lasting quality (or fog resistance). (From Kodachromes of C. E. Wilson, Jr.)



The range in color, form, and size



Odontoglossum grande is a highly popular orchid among amateurs. It is fairly easy to grow. (From Kodachromes of Miss Bobbie Johnson.)



As many as twelve flowers may appear on a single spray of *Cymbidium* Jason—Alexander Westonbirt. (From Kodachromes of C. E. Wilson, Jr.)



Cypripedium Chrysostum var. *Richard Fort* has a well-proportioned flower of fine contrasting color. It is an excellent stud plant. (From Kodachromes of C. E. Wilson, Jr.)

of orchids intrigues the fancier.

The sepals and petals of *Brassocattleya Elaine* are broad and strong, contrary to most brassocattleyas. (From Kodachromes of C. E. Wilson, Jr.)



The vandas and their hybrids are in most amateur collections. They usually produce many blossoms. (From Kodachromes of Miss Bobbie Johnson.)



Dendrobium

The epiphytic *Dendrobium* species are variable in habit. Some are evergreen, others deciduous. Some are drooping in habit. The Australian evergreen species do well in a cool house, while others do best with a temperature of 70° to 75° by day and 60° to 65° by night. The roots of the evergreen species, such as *D. brymerianum*, must be kept moist at all times. They need plenty of heat, humidity, and water. The deciduous dendrobiums, such as *D. nobile*, need a rest period during which the temperature may be as low as 45°. A cool temperature may be used to retard the blooms of this group.

The flowers are in racemes or sometimes solitary. The dorsal sepal and petals are similar, with the lateral sepals forming a sac or spur. The lip is entire or three-lobed. The leaf form varies.



Flower cluster of *Dendrobium dearei*.

- D. aureum* see *D. heterocarpum*
D. bensoniae native to Burma and Thailand; flowers white and yellow; lip yellow orange at base; purple spots in throat; flowers about 2 inches across and one to three in a group; blooms in May and June; leafless when in bloom.
- D. brymerianum* native to Burma and Indo-China; evergreen; flowers 2½ to 3 inches across on lateral racemes up to 3 to 5 feet in length; golden yellow, the lip fringed; blooms from October to May.
- D. chrysotoxum* native to Burma, Indo-China, and China; pendulous racemes to 6 to 9 inches long with eight or more flowers; golden-yellow flowers about 2 inches across; lip orange in throat and fringed; blooms from March to July.
- D. dearei* native to the Philippines; large white flowers yellowish green in center of lip and about 2½ inches across (see above); blooms from December to May.
- D. densiflorum* native to the Himalayas; evergreen; showy flowers about 2 inches across in many-flowered, drooping racemes to 10 inches in length; golden yellow or white with orange lip; blooms from March to May.
- D. falconeri* native to the Himalayas, Burma, and Indo-China; evergreen; flowers about 3 inches across, solitary on leafless stems; white tipped with violet; lip orange red in center and throat dark purple; blooms from March to May.

- D. farmeri* native to the Himalayas and Burma; many 2-inch flowers on a pendulous stem; flowers usually straw yellow, but may have pale rose tinge; lip golden yellow tipped rose; blooms in April to June.
- D. fimbriatum* native to the Himalayas and Burma; pendulous racemes to 6 inches long with six to 12 orange-yellow flowers; orange-yellow, fringed lip; blooms from March to April.
- D. formosum*
var. *giganteum* native to the Himalayas and Burma; evergreen; flowers to 5 inches across in two- to four-flowered clusters; white with center of lip orange yellow; blooms from January to May. Needs a cool house.
- D. Hawaii* pleasing hybrid of *D. superbiens* × *D. phalaenopsis* (below); reddish flowers; flower stems are very long and flowers are loosely placed on stem; blooms in summer.
- D. heterocarpum*
(*aureum*) native to the Himalayas and Ceylon to Java and Philippines; flowers 2½ to 3 inches across and in clusters of two to three; prevailing color amber yellow; lip marked with red or reddish purple; blooms all the year but mostly in spring.
- D. infundibulum*
var. *jamesianum* native to Burma; white flowers with lateral lobes of lip roughened and disk cinnabar; flowers 3 to 4 inches across; blooms from May to August.
- D. moschatum* native to the Himalayas and Burma; pendulous racemes to 12 inches long with eight to 15 yellowish-rose flowers with a pair of red-brown spots near base of lip; flowers 3 to 4 inches across; blooms from May to August.

Flower spray of *Dendrobium Hawaii*, hybrid of *D. superbiens* × *D. phalaenopsis*.



- D. nobile* native to the Himalayas, Burma, and China; deciduous; flowers to 3 inches across in two-flowered clusters; sepals and petals rosy purple; blooms from January to June. Popular and showy species; can be forced. Sometimes attacked by mosaic disease. Variety *Sanderianum* good; petals intense rose purple.
- D. ochreatum*
(*cambridgeanum*) native to the Himalayas and Burma; deciduous; flowers about 2 inches across in two-flowered clusters; golden yellow with crimson throat; blooms from March to May, and flowers last well.
- D. phalaenopsis* native to Australia, New Guinea, and Timor; four to 18 flowers on 2-foot stems; flowers to over 3 inches across; rose purple or whitish rose with dark purple throat to the lip; blooms from May to November, but mostly in August. Color forms listed.
- D. pierardi* native to the Himalayas, Burma, and China; 2-inch flowers, with two to three or many to a stem; sepals and petals pale rose; lip whitish yellow with carmine or purplish lines at base; blooms from February to May, but mostly in winter. A graceful spray orchid.
- D. sanderae* native to the Philippines; white; similar to *D. dearei* but with larger flowers with throat striped purple; blooms from May to August, but varies.
- D. speciosum* native to Australia; many white or straw-colored flowers on stems to 30 inches long; white lip spotted with red or violet; blooms in February and March.
- D. superbiens*
(*goldiei*) native to Australia; evergreen; flowers to 2 inches across, with as many as 15 to 25 on a stem in drooping terminal racemes; crimson purple; blooms from September to November and in April profusely on both old and new stems, and flowers may last three months. Most of the Australian dendrobiums are short lived, so are not very popular.
- D. thyrsiflorum* native to Burma; similar to *D. densiflorum* with white sepals and petals.
- D. wardianum* native to the Himalayas and Burma; deciduous; resembles *D. falconeri* but is stouter and is reported to be easier to grow; flowers 3½ to 4 inches across in two-flowered clusters; white tipped with rose purple; lip has yellow throat with two dark purple spots; blooms from February to May.

Epidendrum

The *Epidendrum* epiphytic orchids include some of the "weeds" of the orchid family. However, some of the species are easily grown and worthy of including in a collection. The plants do well in the cattleya house. The stem-rooting epidendrums need plenty of sun to flower well. The species with pseudobulbs grow well with medium heat, the temperature ranging between 60° and 65° at night.

The plants have leafy stems or one leaf. The flowers are mostly in terminal racemes, the sepals and petals similar, the lip usually deeply three-lobed and with a distinct claw partly united with the column. *Epidendrum cochleatum*, *E. evectum*, and the hybrid *Obrienianum* are almost perpetually in bloom, the latter being very common in California. Other epidendrums should also be tried.

- E. atropurpureum* native to Mexico, Panama, the West Indies, and northern South America; racemes rarely branch; four to 13 flowers, each 2 to 3 inches across; sepals and petals greenish brown, often tinged purple; lip white or yellowish with purple stripes; blooms from December to March on into summer.
- E. brassavolae* native to Central America; 4-inch yellow flowers with three to 12 on loose raceme; lip white or pale yellow tipped with violet red; blooms from April to September, but mostly in summer.
- E. ciliare* native to tropical America; greenish-white flowers, 3 to 4 inches across and two to seven to a stem; two yellow spots at base of three-lobed lip; side lobes deeply fringed and mid-lobe very narrow; blooms all year but mostly in winter.
- E. cochleatum*
(clam-shell or spoon orchid) native to tropical America; loosely flowered scapes of yellowish-green flowers 2 to 3 inches across; lip spiral or cochleate in form, dark purple with yellow veins radiating; five to 10 flowers to a raceme; blooms all the year.
- E. fragrans* native to Central America, the West Indies, and South America; three to seven fragrant, creamy-white flowers on short racemes; lip white lined with purple; blooms all the year but mostly in summer. Popular with amateurs.
- E. nemorale* native to Mexico; many rose-mauve flowers 3 to 4 inches across in raceme or panicle to 40 inches; whitish midlobe of lip lined with violet; blooms from April to July.
- E. prismatocarpum* native to Costa Rica and Panama; 10 to 20 creamy yellow flowers on racemes to 14 inches long; lip yellow green at base, violet above; blooms in December and February and from May to August.
- E. radicans*
(*rhizophorum*) native to Central America; a scandent species that is offered in California; sepals and petals cinnabar red; lip orange yellow; blooms from November to August.
- E. skinneri* native to Guatemala; 15 to 30 rose flowers about 1 to 1½ inches across; lip with yellow ridges; blooms from October to January.

- E. stamfordianum* native to Central America, Venezuela, and Colombia; many yellow flowers on loose, leafless panicles to 24 inches long; yellow petals spotted purple; white lip with yellow-toothed midlobe; blooms from November to June but mostly in spring.
- E. vitellinum* native to Mexico and Guatemala; 10 to 15 cinnabar-red flowers to 1½ inches across in loose raceme to 18 inches long; blooms from May to October but mostly in August.
- E. wallisi* many golden-yellow flowers about 1½ inches in diameter; blooms at various times during the year.

In addition to the above species of epidendrums, there are several fine named varieties. Among these are:

- | | |
|---|--|
| Apricot Glow | Mrs. W. J. Boyle, Jr. (rosy lavender; hardy) |
| Ben Bracey (scarlet orange) | |
| Burtoni (red orange; blooms the year around) | Obrienianum (red on long stems; blooms all year; hardy) |
| Copper Wonder (copper flowers; habit similar to Obrienianum) | Orpetianum (<i>Epicattleya</i>) (a cross between <i>Epidendrum</i> and <i>Cattleya</i> with rosy-purple flowers larger than true epidendrums; suitable for cool greenhouse or lathhouse) |
| Golden Sunset (orange-red flowers and habit of Obrienianum) | |
| Lavender Beauty (lavender flowers and habit of Obrienianum) | Purple Majesty (purple flowers in clusters most of the year; best in a greenhouse) |
| Marias Ames (flower green with white fringed lip; flowers in spring; Guatemala). Compare with <i>E. atropurem</i> , <i>E. cochleatum</i> , and Tampenses for green color. | Tampenses (many small yellow and green flowers with purple and white lip; flowers in spring) |

Grammatophyllum

The *Grammatophyllum* genus has thick, strap-shaped leaves and showy flowers in loose, many-flowered racemes. The sepals and petals are nearly equal, the lip is smaller. The tall scapes of this genus bear many flowers.

- G. speciosum* native to Burma, Indo-China, Malaya, and the Philippines; flowers 3 to 6 inches in diameter on scapes of 5 to 6 feet with as many as 100 to a stem; deep yellow spotted with reddish brown; blooms several times a year. This species requires good drainage, liberal watering, and plenty of heat and light, and should be allowed to rest occasionally. Flowers last well if kept dry. Infrequent blooms may be a fault.

Houlletia

This epiphytic genus is native to tropical America. The plants have one leaf. The flowers are in racemes, the sepals and petals similar, the lip clawed.

H. odoratissima native to Colombia; allied to *Stanhopea*; handsome flowers 2½ to 3½ inches on 18-inch scapes with five to 10 flowers to a raceme; chocolate brown with white lip; blooms from August to September. The plants grow well in a cool greenhouse with *Odontoglossum* or with intermediate heat, but should be kept dry in winter.

Laelia

The epiphytic *Laelia* species are closely related to the *Cattleya* orchids. They thrive under similar intermediate conditions, with a winter temperature of about 50°. The dwarf species require shallow pans near the roof. The flowers of some kinds are smaller than many cattleyas, but the color range is very satisfactory, and the plants are fairly easy to grow.

The plants have one or two leaves. The showy flowers are solitary or in racemes, the sepals and petals nearly equal, the lip three-lobed.

L. albida native to Mexico; three to nine flowers on racemes to 20 inches long; fragrant white flowers tinged rose with primrose fragrance; blooms from November to January.

L. anceps native to Mexico; flowers 3 to 4½ inches across in two- to five-flowered clusters, which last a month; violet rose with yellow throat veined with purple; blooms from November to February. Needs copious watering. Sometimes attacked by Etch virus disease.

L. autumnalis native to Mexico; showy flowers to 4 inches across in three- to six-flowered racemes up to 20 inches high; rose, the lip striped with purple; powerful perfume; lasts about two weeks; blooms from October to April.

L. cinnabarina native to Brazil; six to 15 cinnabar-red flowers on stems to 20 inches; flowers 2 to 3 inches across; blooms from March to May and in November, but mostly in spring.

L. crispa native to Brazil; four to nine white flowers 4 to 6 inches across; lip yellow in throat, purple edged with white in front; petals much crisped; blooms from July to August and in December, but mostly summer.

L. flava native to Brazil; golden yellow flowers 2 to 3 inches across and five to 15 to a stem; lip crisped; blooms from August to February but mostly in summer.

L. gouldiana native to Mexico; three to nine rose-purple flowers on stems over 1 foot high; flowers about 4 inches across; lip white or yellowish white near base; blooms in December and January.

- L. grandiflora* native to Mexico; one to two rose-colored flowers to a stem; flowers to 6 inches across; blooms in summer.
- L. harpophylla* native to Brazil; flowers to 3 inches across in three- to six-flowered racemes shorter than the leaves; orange red, the lip yellow edged with white; blooms from October to April.
- L. monophylla* native to Jamaica; flowers usually solitary, orange scarlet, to 2 inches across; stems to 3½ feet; blooms from August to November but mostly in August.
- L. pumila* native to Brazil; one to two rose-purple flowers 3 to 4 inches across on a stem to 3½ feet; lip deep purple in front; throat yellow; blooms from August to October.
- L. purpurata* native to Brazil; flowers to 6 inches across in three- to five-flowered racemes; white sepals and petals, the lip purple red; blooms from May to July. This has been called the King of Orchids, and is often used in hybridizing. The flowers last three weeks.
- L. rubescens* native to Central America; flowers white to rose purple with dark purple base to lip; four to eight flowers to 2 inches across in a cluster; blooms from September to March and in July but mostly in winter.
- L. superbiens* native to Mexico and Guatemala; the flower scape 3 to 9 feet high with 12 to 18 blossoms often 5 to 7 inches across; rose with a purple lip yellow at base; fragrant; blooms from December to February.
- L. tenebrosa* reddish-brown flowers 6 to 9 inches across and two to five in a group; sepals and petals are broader than in *L. grandis*; lip deep purple; blooms in summer.
(*grandis* var. *tenebrosa*)

Lycaste

The *Lycaste* species are semiterrestrial in habit. They grow well at an intermediate temperature, and should be shaded from direct sun at all times because the foliage is thin and easily burned. Light overhead syringing is recommended in summer. Some kinds do well in chopped sod and decomposed leaves with a little chopped sphagnum added. The compost may be allowed to nearly dry out at times, although they

need liberal watering during the growing season, as in the case of *L. skinneri*. The group is well known by this species and by *L. aromatica*. *L. cruenta* is sometimes grown locally.

The plants have one to several plaited leaves and solitary flowers, the lateral sepals united with the column to form a spurlike body, the lip three-lobed. *L. aromatica* is sometimes attacked by *Lycaste* mosaic.

- L. skinneri* native to Mexico, Guatemala, and Honduras; flowers up to 6 inches across; white or rose sepals, rose petals, rose or crimson-carmine lip; free flowering, having as many as 50 blooms; blooms from January to May and again in November.



Lycaste longisepala, a new species flowering in November. The flowers are of interesting shape.

Masdevallia

The epiphytic *Masdevallia* species are treated about the same as *Odontoglossum*. They should have good ventilation and shade from the direct sun. They need much water at the roots, since they have no pseudobulbs in which to store water. They may be hosed down twice daily to maintain a surrounding cool atmosphere, but should not be syringed overhead in the heat of the day. Artificial heat may be dispensed with early in the

spring on mild days. They should be re-potted in November or December in peat fiber and finely chopped sphagnum, with the lower third of the pot filled with shards for good drainage.

The flowers are mostly solitary but sometimes there are eight to a stalk, with the sepals united, and the lobes often prolonged into long tails, the petals small, and the lip small and united with base of column.

- M. bella* native to Colombia; solitary flowers with tails 3 to 4 inches long; yellow spotted with brown; blooms from May to July and again in November.
- M. chimaera* native to Colombia; flower tails to 11 inches long; yellow spotted with crimson purple, the tails purple brown; blooms from January to September.
- M. coccinea*
(*harryana*) native to Colombia; 4-inch flowers of rose pink to violet red with dorsal sepal prolonged into a tail; petals and lip white; blooms from April to June.
- M. houtteana* native of Colombia; solitary flowers are whitish yellow and about 2 inches across with long reddish-purple tails; blooms in summer.
- M. veitchiana*
(*veitchi*) native to Peru; flowers with short tails; orange-scarlet, large flowers, generally in pairs; blooms from May to July.

Maxillaria

The epiphytic *Maxillaria* orchids are not widely grown at the present time, partly because the small flowers and dull coloring count against the genus. A few, such as *M. sanderiana*, may be of some interest. The cultural techniques used for the plants are the same as those for *Lycaste*. These orchids thrive in a cool, moist, shaded location at all seasons. The

winter temperature should be about 58° at night and 60° to 65° by day. A considerable amount of water should be applied, even when the plants are at rest.

The small, dull-colored flowers are sometimes fragrant and mostly solitary, the lateral sepals united to the foot of the column, forming a chin, the lip mostly three-lobed.

- M. grandiflora* native to Peru and Ecuador; solitary white flowers 3 to 4 inches across, sometimes larger and among the largest of the genus; lip buff yellow; side lobes streaked wine purple; blooms in spring.
- M. picta* native to Brazil; solitary flowers 1½ to 2 inches across; tawny yellow; blooms in winter.
- M. sanderiana* native to Ecuador and Peru; has been described as a giant *M. grandiflora*; nodding 4- to 6-inch flowers; white blotched with purple at base, with a yellow lip marked with red and darker purple outside; blossoms from May to July and again from October to December.
- M. tenuifolia* native to Central America; has creeping rhizomes; solitary small flowers 1 to 2 to 3 inches across; dark red; blooms in spring.
- M. venusta* native to Colombia and Venezuela; solitary large white flowers 4 to 5 inches or more across; short yellow lip bordered with red; blooms in spring.

Miltonia

The epiphytic *Miltonia* genus is best known for such species as *M. vexillaria*, one of the prized orchids, with flowers lasting a month. Most of the miltonias need about the same treatment as *Odon-toglossum*, with plenty of shade and a liberal water supply during the growing season. Species, such as *M. vexillaria*,

need plenty of sun in winter, which is the growing period, with a short rest period after flowering.

The plants have one or two leaves, with sheathing leaves at the base. The flowers are solitary or in loose racemes, the sepals and petals nearly equal, the lip expanded and not three-lobed.

- M. Bleuana* hybrid between *M. vexillaria* and *M. roezli*; a splendid summer-flowering orchid.
- M. candida* native to Brazil; flowers to 3½ inches across, three to seven on a raceme; greenish yellow with brown spots; blooms from July to October. Considered very beautiful.

- M. phalaenopsis* native to Colombia; compact plant with two or more flowers to 2 inches across in two- to four-flowered racemes to 6 inches in height; white with lower part of lip purple; blooms from April to August.
- M. roezli* native to Colombia; white flowers to 4 inches across; purple blotch at the base of each petal and yellow at base of lip; one to four flowers to a stem; blooms in August and September and March to July, but mostly in August. Sometimes infected with Miltonia diamond spot virus.
- M. spectabilis* native to Brazil; creamy-white flowers to 4 inches across; lip rose purple with darker center; one to two flowers to a stem; blooms in summer to September and sometimes in February.
- M. vexillaria* native to Colombia; flowers with a depth of about 4 inches and a diameter of 3 inches, three to four to a raceme; sepals and petals rose; lip rose with white base and edges; blooms from May to July. Among the best of all orchids.

Odontoglossum

These epiphytic orchids, mostly native in high elevations, should interest many California fanciers who are able to maintain a uniform, cool greenhouse temperature ranging between 45° and 55°. The temperature should not vary more than 10 degrees, winter or summer. The winter temperature should not go above 65° but may fall as low as 48° to 50° at night for most varieties. In the warmer districts the summer temperature should be kept as low as possible. Shade and top ventilation help maintain the proper range in temperature. Unless the plants can be kept cool in summer, do not select this group, even though the flowers are beautiful. *Odontoglossum pendulum* (*citrosum*) will stand 10 degrees higher temperature than the other species.

Repotting should be done in about October, never in summer. Provide sufficient drainage by half filling the pot with shards. The top of the pot may be left convex after potting firmly. Species like *Odontoglossum crispum*, *O. cirrhosum* and *O. luteopurpureum* need a plentiful supply of moisture.

The plants have one or two leaves. The flowers are borne in racemes or panicles, the sepals and petals nearly equal, the lip with claw parallel to column and spreading midlobe.



Odontoglossum crispum is prized for its light-colored flowers with undulate-crisped petals.

- O. cervantesi* native to Mexico and Guatemala; white sepals and petals with chocolate streaks near the base; flowers about 2 inches across and three to five to a stem; blooms in spring.
- O. cirrhosum* native to Ecuador; flowers star shaped and 3 to 5 inches across in many-flowered drooping panicles to 2 to 3 feet long; white spotted with red brown; blooms from April to July. One of the best of the genus.
- O. cordatum* native to Central America; flowers up to 5 inches across and three to five to a stem; greenish yellow with brown bars; petals yellowish spotted brown; lip white with brown spots; blooms mostly in spring.
- O. crispum*
(*alexandrae*) native to Colombia; flowers to 3 inches across in many-flowered panicles; white spotted with brown; blooms from February to April. One of the most beautiful orchids. *O. crispum* var. *andersonianum* (*O. andersonianum*) has creamy white flowers 2 to 3 inches across and from five to 15 to a stem; flowers are spotted brown in this variety.
- O. Denisonae* hybrid with yellow flowers 3 to 5 inches across and many to a stem in spring. *O. crispum* is one parent.
- O. grande* native to Guatemala; flowers 5 to 7 inches across in three- to six-flowered racemes to 16 inches in length; yellow spotted with brown; blooms from October to March. A fine species, the flowers lasting three to four weeks. Sometimes attacked by ringspot virus.
- O. halli* native to Ecuador and Peru; long racemes to 5 feet; flowers 3 to 5 inches across; many to a raceme; yellow; blooms in spring.
- O. harryanum* native to Colombia; flowers 3 to 5 inches across and four to six on 3-foot racemes; dark-brown veined and spotted with lighter brown; lip violet at base and veined with yellow, white at tips; wavy; blooms from July to August. Flowers of fine shape and color.
- O. insleayi* native to Mexico; similar to *O. grande* with pale yellow flowers 4 to 5 inches across and eight to 10 to a stem; blooms in August and September and sometimes in December and January.
- O. luteopurpureum* native to Colombia; flowers 3 to 5 inches across and many to a stem; chestnut brown; blooms mostly in spring to early summer.
- O. pendulum*
(*citrosimum*) native to Mexico; flowers to 3 inches in diameter in many-flowered racemes to 1 foot long; white or rosy with rose lip; lemon scented: blooms from April to July; flowers last four weeks. Stands higher temperature than most other species.

- O. pescatorei*
(*nobile*) native to Colombia; flowers 2 inches across in 3-foot panicles with as many as 100 flowers; white, the lip often spotted with red purple; blooms from March to May. Very choice species with many varieties.
- O. pulchellum* native to Central America; flowers 1 to 2 inches across, sometimes larger, and five to 10 to a stem about 1 foot long; white; blooms mostly in spring.
- O. rossi* native to Mexico and Guatemala; flowers to 2 inches across in one- to three-flowered racemes; sepals yellow spotted with red brown, petals white spotted with brown at base; lip white with yellow claw; blooms from February to April and from August to October. The variety *majus* has fragrant flowers to 3 inches across.
- O. schlieperianum* native to Costa Rica and Panama; flowers 4 to 5 inches across or less and three to eight in a raceme on stems to 1 foot long; yellow; blooms in summer.
- O. triumphans* native to Colombia; racemes to 3 feet high; flowers 3 to 4 inches across and many to a raceme; golden yellow; blooms from March to May.
- O. uroskinneri* native to Guatemala; greenish flowers to 2 inches across; nine to 20 in a raceme; lip pale rose mottled with white; blooms mostly in spring but may flower in summer.

O. grande floret with basal half of petals reddish brown and anterior half yellow.
The sepals are barred with cinnamon brown.



Oncidium

The epiphytic *Oncidium* orchids represent perhaps the widest range of conditions in the orchid genera, varying from alpine to tropical types. The genus as a whole requires liberal heat and moisture in the growing season and good drainage. Most oncidiums thrive in a cool greenhouse with a night temperature of 55° to 60°. The cool-tolerant varieties take a temperature of 50° to 60° at night and 60° to 65° by day. Sun and air have been recommended, although some shade from March to October is permissible. Overhead sprinkling once or twice a day is advisable, but the roots should not be too wet. The plants do best with restricted roots in a mixture of chopped fiber and live sphagnum

in equal parts, with broken charcoal added to the mixture. Species with long flower racemes need to be trained away from the glass, as in the case of *O. macranthum*. The Mexican and Central American species need a decided rest period with less heat and water.

The plants have one or two leaves. The flowers (page 47) are usually in lateral racemes or panicles, the sepals and petals nearly equal, the lip three-lobed and crested or tubercled at the base. *Oncidium varicosum* var. *rogersi* is one of the best known of this group and has been popular as a winter florist orchid. The plants of the tropical epiphytic *Oncidium* orchids can be grown in trees in tropical areas.

- O. altissimum* native to the West Indies; many flowers about 1½ inches across on nodding racemes with stems to 4 feet long; yellow barred with brown; blooms in summer.
- O. bicallosum* native to Guatemala; flowers 1½ inches across and many to a stem; yellow; blooms in winter.
- O. carthaginense* native to Central America, the West Indies, and northern South America; many flowers to 1 inch across placed loosely in a panicle to 5 feet; creamy white spotted purplish rose; crisped; blooms all the year but mostly in summer.
- O. cavendishianum* native to Guatemala; many flowers to 2 inches across on stems to 4 feet long; yellow; sepals and petals spotted with red brown; blooms mostly in spring.
- O. crispum* native to Brazil; flowers 2 to 3 inches across and 50 to 60 on 1½-foot panicles; yellow barred and edged with red brown; blooms from May to August and from November to December.
- O. flexuosum* native to Brazil, Paraguay; flowers about 1 inch across and many to 3-foot stems; yellow spotted red brown; blooms in summer.
- O. incurvum* native to Mexico; flowers about 1 inch across and loosely arranged on 5-foot stems; rose pink; blooms mostly in August.
- O. lanceanum* native to British and Dutch Guiana and Trinidad; flowers to 2 inches across on stems to 2 feet; yellow; lip violet purple at base and rose above; blooms in summer.



A flower of *Oncidium papilio*, the butterfly orchid, borne on a long, slender stem.

- O. leuochilum* native from Mexico to Honduras; flowers about 2 inches across and loosely arranged along stems to 7 feet high; yellowish green; lip white with lavender dots at base; blooms from March to August and in November.
- O. longipes* native to Brazil; flowers 2 to 3 inches across and two to five to a stem; reddish brown; blooms in summer.
- O. luridum* native to Florida, the West Indies, Central America, and South America; flowers 1 to 2 inches across on spectacular sprays and larger than those of *O. carthaginense*; yellowish green; sepals and petals sometimes tinged with violet; blooms in summer.
- O. macranthum* native to Colombia, Ecuador, and Peru; very handsome flowers 3 to 4 inches across in climbing panicles to 9 feet long; sepals olive, petals golden yellow; blooms nearly all year, but especially from May to July.
- O. ornithorynchum* native to Mexico to Salvador; many flowers in a drooping panicle to 1½ feet long; rose lilac with yellow crest on lip; blooms in winter.
- O. papilio*
(butterfly orchid) native to Trinidad, Venezuela, Brazil, and Peru; butterfly-shaped flowers with petals to 3 inches long on 2 to 3-foot scape; petals and sepals brown spotted with yellow; blooms all year, one flower following another on the spike.

- O. sphacelatum* native from Mexico to Honduras; many flowers loosely placed on racemes to 5 feet long; yellow; blooms in spring.
- O. tigrinum* var. *splendidum* native to Guatemala; handsome flowers to 2 inches across in many-flowered panicles; yellow spotted with brown; blooms from December to February.
- O. varicosum* native to Brazil, Paraguay, and Bolivia; beautiful 1-inch flowers on panicles to 2 to 5 feet; greenish yellow spotted with red brown; lip golden yellow; blooms from September to July. The variety *rogersi* has a densely branched, nodding panicle with as many as 170 flowers to 2 inches across; at times is affected by oncidium mosaic. Flowers resemble large butterflies and appear mostly in winter.
- O. wentworthianum* native to Guatemala; flowers about 1 inch across on loose 12-foot panicles; yellow; blooms in summer.

Pescatorea (Zygopetalum, Bollea)

The epiphytic *Pescatorea* species require much heat and moisture. They should be grown in the warmest end of the warm orchid house. They need plenty of water at all times, since they do not have a rest period. *P. cerina*, *P. dayana*, and *P. klabochorum* are some of the species.

- P. klabochorum* (*Bollea klabochorum*) native to Ecuador and Colombia; flowers up to 3 or 4 inches across on drooping stalks up to 2½ feet long, white tipped with purple; lip veined with purple and with purple hairs; blooms from May to August.

Phaius (Phajus)

The terrestrial *Phaius* orchids are of easy culture. Plant them in large pots with loam rich in organic matter. Liberal feeding when in full growth will help. The plants need a cool greenhouse, with a temperature between 55° and 65°. They should have plenty of moisture all year, with perfect drainage. When irrigating, do not allow water to touch the new growth.

- P. wallichii* native to tropical India northward to lower Himalayas; from 10 to 20 flowers, 3 to 4 inches across on a stem; white and buff; blooms in winter.

Phalaenopsis (Moth Orchids)

The epiphytic species of *Phalaenopsis* require the warmest temperature in orchid culture, with a minimum of 65° in winter. A day temperature of 70° to 75° has been recommended. Good ventilation is needed, and the air should be moist, but there should be no drip, and the center of the plants should not be wet. Since there are no pseudobulbs, the plants should never lack moisture. Very

little potting material is needed about the roots, since the roots like to escape. This group does well in California.

These orchids have short, leafy stems, thick, leathery leaves, and flowers in racemes or panicles, the sepals and petals equal or the petals larger, the lip three-

lobed and united with the base, sometimes with appendages at the apex. The plants are often grown in 5- or 6-inch pots. Growers may leave part of the stem when cutting a spray, so that another set of flowers will develop from dormant buds lower down on the scape.

P. amabilis native to Malaya; flowers 3 to 4 inches in diameter, two ranked in long, drooping, six to 15 flowers on racemes; white (Queen of the Orchids) with the lip marked with yellow and red; blooms from October to January.

P. aphrodite native to Malaya; many flowers to 4 inches across on a drooping raceme to 3 feet long; white; blooms in August. (*amabilis* var. *aphrodite*)

P. lueddemanniana native to the Philippines; three to eight flowers about 2 inches across on stems to 1 foot long; whitish; lip amethyst purple with white side lobes; blooms nearly all the year.

P. sanderiana native to Malaya; considered by some to be about the same as *P. aphrodite*, but the flowers are rose pink, 3 to 4 inches across, and appear mostly in winter.

P. schilleriana native to the Philippines; flowers to 3 inches across in many-flowered, branched scapes to 3 feet long; rose purple; blooms from February to May. One of the finest of all orchids.

P. stuartiana native to the Philippines; similar to *P. schilleriana*; flowers to 2 inches across in panicles to 2 feet long; white spotted with red brown, lip yellow spotted with red brown; blooms from January to February and again in May.

Pleione

The terrestrial genus *Pleione* has not been very popular, because the plants are deciduous and the flowers appear after the foliage dies down. The flowering plants may be grown with ferns to cover the bare stems.

The common species are dwarf, and these have been known as "crocus" in the East Indies. They may be grown in

the cattleya house with considerable heat, and are treated about the same as *Calanthe*, a rest being given after growth is completed. They are best grown in shallow compost in pans, and demand plenty of water.

The flowers are usually solitary, the sepals and petals similar, the lip with fringed keels.

P. lagenaria native to Burma; the flowers about 3 inches in diameter; brilliant rose violet, with the lip yellow at base and spotted dark red; blooms from October to November.

Renanthera

The epiphytic *Renanthera* genus is similar to *Vanda*, doing best in a warm greenhouse with good drainage and plenty of light. The plants are too tall to be of interest to commercial growers.

The flowers are borne in many-flow-

ered racemes or panicles, the sepals and petals spreading and usually unequal, the lip small. Two specimens of the epiphytic *Renanthera* genus—*R. coccinea* and *R. imschootiana* are described in the paragraphs below.

R. coccinea

native to Cochin-China and Hainan; has stems up to 10 feet long, with many flowers on a panicle, each up to 3 inches long, the panicle up to 3 feet long; dorsal petals and sepals scarlet; lip yellow striped with red; blooms from April to September.

R. imschootiana

native to Assam, Burma, and Indo-China; flowers about 2½ inches across on stems to 2 feet long; dorsal sepals and petals yellow spotted with scarlet, lateral sepals scarlet; lip scarlet with a yellow crest; blooms in May and June. Plants grow well near the roof.

Rhynchostylis (Saccolabium)

The epiphytic *Rhynchostylis* genus of orchids is grown by about the same method as is *Aerides*. It is often sold as *Saccolabium*.

R. retusa (*Saccolabium* *blumei*)

native to India, Burma, Indo-China, Malaya, and the Philippines; flowers ¾ inch across in many-flowered, pendulous racemes to 18 inches long; white spotted with red; lip red purple; blooms from June to September.

The plants have leafy stems. The flowers are in dense racemes, the dorsal sepal and petals similar, the lateral sepals broader, the lip entire and spurred.

Rodriguezia (Burlingtonia)

The epiphytic *Rodriguezia* species may be treated like many species of *Cattleya*. The plants do well in shallow pots filled with tough peat fiber so that drainage is good. During the growing season the temperature should be around 65° to 75°. The plants may be rested at 50°, with little water given. Syringing during

R. secunda

native to Panama, Trinidad, and northern South America; pale rose to red flowers in many-flowered racemes up to 15 inches long; blooms from February to October.

R. venusta (*Burlingtonia* *fragrans*)

native to Brazil; white, fragrant flowers about 1½ inches in diameter, borne on pendulous racemes; last two to three weeks; blooms from January to May.

the growing season is recommended. The plants should be shaded from the direct sun.

The plants have one or two leaves and flowers in racemes, with petals and dorsal sepals similar, the lateral sepals united and concave, the lip slightly two-lipped and with a short spur.

Schomburgkia

The epiphytic *Schomburgkia* species require about the same conditions as *Cattleya*, with liberal watering and more sun, especially in winter, to induce flowering. The temperature should be between 60° and 65° in winter or up to 70° by day.

The plants are large and the flowers

rather inconspicuous, borne on stems several feet long. The petals are smaller than the sepals and wavy, the lip three-lobed and united with the base of the column. Three specimens—*S. crispa*, *S. tibicinis* (*tibicina*), and *S. undulata*—are described in some detail in the following three paragraphs.

S. crispa

native to British Guiana; many flowers to 2 to 3 inches across at the apex of 3-foot stems; sepals and petals with wavy margins; brownish yellow; lip whitish tinged rose and with five keels; blooms in winter.

S. tibicinis
(*tibicina*)

native to Central America; flowers to 3½ inches across, with 10 to 15 flowers on stems to 10 feet high; red lilac, brown, or burnt orange, the lip white, veined in darker color and with yellow center and lilac tip; blooms from February to August. Reported to be the best species of the genus.

S. undulata

native to Trinidad, Venezuela, and Colombia; flowers 1½ to 2 inches across, with many loosely arranged near apex of 3-foot stems; sepals and petals very wavy; purplish brown; lip with lateral lobes pale rose and purple midlobe; blooms mostly in spring.

Sobralia

This is a genus of strong terrestrial orchids with slender, reedlike stems and showy flowers, which do not last long. The plants are grown in a cool greenhouse. The compost may be the same as for *Coelogyne*. The roots should never be permitted to become dry, but the

plant requires little water during the rest period.

The flowers are solitary or are in terminal racemes, the sepals and petals are spreading, the lip is overlapping around the column, forming a tube with expanding limb.

S. leucoxantha

native to Costa Rica; solitary flowers 4 to 5 inches across on stems to 3 feet high; white; blooms in summer.

S. macrantha

native to Mexico and Costa Rica; stems are 6 to 8 feet long; solitary flowers to 6 inches across may appear in succession, and last about three days; sepals and petals rose violet, lip violet, throat yellow; blooms from May to November. Reported to be the finest species of the genus, and worth growing as a foliage plant.

S. xantholeuca

native to Guatemala; flowers 4 to 6 inches across on stems to 6 feet high; creamy yellow; blooms in summer.

Sophonitis

This is a group of small epiphytic orchids from Brazil grown mostly in shallow pans under the roof. The plants are grown in fern fiber in a cool temperature not less than 50° in winter. They

need semishade—not less than 50 per cent light. Keep the plants moist, but water less when plants are resting. The blooming period of the showy flowers is in winter.

S. cernua

native to Brazil; flowers 1 to 2 inches across and one to three to a stem; cinnabar red; blooms in winter.

S. grandiflora
(*coccinea*)

native to Brazil; flowers about 3 inches across and one to two to a stem; scarlet; blooms over a long season but mostly in winter.

Stanhopea

This epiphytic genus is appreciated in collections, but the individual flowers decline too soon to be of commercial importance. A fragrance of vanilla is present in some species. *Stanhopea insignis* was the original species introduced, but at least half a dozen kinds are available for collections. Some fanciers consider *S. tigrina* the best of the genus. *S. oculata* and *S. wardi* are among other beautiful species.

The plants are grown in crates or baskets suspended from the roof or crossbars, so that the flower stems can push downward through the potting ma-

terial—equal parts of chopped sphagnum and fern fiber. They need plenty of shade and liberal watering during the growing season. A rest after blooming is normal. Some *Stanhopeas* flower twice a year, and flowers may appear early in California.

The plants have one large, leathery leaf and two to 10 large fragrant flowers borne on scapes, the sepals and petals reflexed, the lip saccate at the base, with two lateral horns in center, the front lobe keeled. *Stanhopea ringspot* is a virus disease that has been reported in California.



Species of *Stanhopea* have the peculiar habit of flowering through the sides or bottom of the container.

- S. eburnea* native to Guiana; flowers about 4 to 5 inches across and one to two to a stem; ivory white; blooms in summer.
- S. insignis* native to Brazil and Peru; flowers about 4 to 5 inches across and one to four to a stem; dull yellow; blooms in summer.
- S. oculata* native from Mexico to Honduras; four to eight flowers on stem to 14 inches long; light yellow with numerous red-purple spots resembling eyes; blooms mostly in summer.
- S. tigrina* native to Mexico, Guatemala, Colombia, and Venezuela; flowers to 7 inches across and two to four on a raceme; yellow spotted with violet, the lip tipped with white; blooms from May to July.

Trichopilia

The epiphytic *Trichopilia* genus is worthy of consideration because the flowers last well on the plant or when cut. The plants should be grown in a temperate house near the window. They may be grown in peat, with good drain-

age. The surface is well elevated above the rim of the pot.

The plants have one leaf and flowers on nodding scapes, the petals and sepals similar, the lip entire, overlapping around the column.

- T. crispa* native to Central America; similar to *T. marginata* but with more robust panicles; usually two-flowered; sepals and petals red, often with a yellow-white border; lip purple crimson in the throat; petals not twisted; blooms from April to June.
- T. marginata*
(*coccinea*) native to Costa Rica and Panama; flowers 4 to 5 inches across; sepals and petals pale brown or reddish margined with green or white; lip whitish outside and crimson inside; petals somewhat twisted.



Trichopilia fragrans bears almond-scented flowers that bloom from summer to winter. Individual blooms are short-lived.

T. tortilis

native to Central America; inflorescence, one- to two-flowered, with peculiar corkscrew-like sepals and petals; purplish brown or dull rose edged with greenish yellow; lip white; blooms from February to June and again from September to December.

Vanda

The epiphytic *Vanda* group wants little shade, with none from November to February. The winter temperature should be 70° to 75° during the day and 60° to 65° at night. The summer temperature may be ten degrees higher, with good ventilation. *V. amesiana*, *V. coerulea*, and *V. kimbaliiana* tolerate a cooler temperature than many other species. There should be plenty of moisture at all seasons, and a damp atmosphere should

be maintained in summer. Chopped sphagnum about the roots, with a little charcoal added, has been recommended.

The stems are leafy, and the flowers are in axillary racemes, the sepals and petals similar and spreading, the lip three-lobed, spurred or saclike, united with foot of column. The vandas bloom two or three times a year, and include some of the most beautiful orchids that are grown.

V. amesiana

native to Burma and Indo-China; dwarf, free-flowering species with flowers to 1½ inches across, 15 to 20 on an erect scape to 20 inches; white with rose lip edged with white; blooms from December to April.

V. coerulea
(*caerulea*)

native to the Himalayas and Burma; flowers 4 to 5 inches across in dense racemes with three to 11 flowers; usually light blue but color varies from pale to dark blue; blooms from July to January, but mostly in summer. *Vanda* ringspot is a virus disease that has been found on some plants of this species.

V. kimbaliiana

native to Burma and China; flowers to 2 inches across with four to 12 or more on nodding scapes; white and wavy, with dark-rose lip with yellow side lobes spotted red; blooms from August to November.

V. sanderiana

native to the Philippines; flowers to 5 inches across and seven to 15 to a raceme; yellow and rose; lateral sepals larger, greenish or brownish yellow with purple-red veining; blooms in summer.

V. suavis

native to Java; flowers to 2 inches across; free flowering with eight to 10 flowers on short racemes; sepals white, petals spotted with purple at base; blooms from February to July. Large aerial roots like to run under other foliage in the greenhouse.

V. teres

native to the Himalayas and Burma; climbing in habit; flowers to 4 inches across in three- to five-flowered racemes to 1 foot long; sepals nearly white, petals violet with rose lip, yellow at base, spotted with red; blooms from May to August. Flowers last from four to five weeks, but plants are rather shy bloomers. Needs plenty of water and air, and should be cut back each year.

V. tricolor

native to Java; flowers 2 to 3 inches across and five to nine in a raceme; whitish yellow but there are several color forms; very fragrant and fleshy; blooms from February to July.

Zygopetalum

This is an epiphytic genus of orchids that is of fairly easy culture when given intermediate heat and compost similar to that required by *Phaius* (*Phajus*). The plants may be grown on a raft or in a basket.

The plants have two or more leaves and rather large flowers, solitary or in three to 10 flowers on racemes, the sepals and petals similar, the lip three-lobed with a broad, spreading midlobe or entire.

Z. gairrianum

native to Ecuador; handsome, large, solitary flowers; violet tipped with black purple above; the lip purplish rose with 15 to 17 radiating keels; blooms in summer.

Z. mackayi

native to Brazil; flowers to 3 inches across; sepals and petals yellowish green spotted with brown purple; blooms from November to June, and flowers last a long time.

Z. maxillare

native to Brazil; handsome flowers to 1½ inches across in six to eight flowers, drooping racemes, with as many as 70 flowers on the plant at a time; sepals and petals barred with brown; lip violet blue with paler margins and purplish crest; free flowering, and blooms at different times in the year.

Some hints to the orchid breeder on lines of crossing

Both interspecific hybrids (between species within a genus) and intergeneric hybrids (between species of different genera) are widely grown. Some interspecific hybrids have already been listed under the appropriate genus. New forms of orchids have been obtained by crossing species in different genera, and the possibilities along this line are almost unlimited. *Sanders' Complete List of Orchid Hybrids* names most of the hybrids and gives their parentage. The

American Orchid Society has helped distribute this reference in America. Unfortunately, it is now out of print. Reference copies may be found in some public libraries.

Among some of the generic parents may be listed *Brassavola*, *Cattleya*, *Epidendrum*, *Laelia*, *Lycaste*, *Miltonia*, *Odontoglossum*, *Oncidium*, *Phaius* (*Phajus*), *Phalaenopsis*, *Schomburgkia*, *Sophronitis*, *Vanda*, and *Zygopetalum*. The results of such crosses now bear

standardized names recognized by organized orchid fanciers. Thus Brassolaeliocattleya results from crossing *Brassavola* with *Cattleya* and with *Laelia*. Laeliocattleya results from crossing *Laelia* with *Cattleya*.

Persons who intend to cross different genera might well review the literature to see what crosses have been made and which seem to produce the most popular hybrids. Within each particular type of hybrid there may be numerous varieties. The parentage of any particular variety can be determined readily by consulting the Sanders' reference, which also tells who made the cross and in what year. The orchid breeder should save a great deal of time and accomplish more by carefully studying crosses that have already been made and by planning future crosses. The breeder will probably undertake some special line of crossing, and he should be familiar with crosses reported, as well as with the recognized names of the crosses. A few illustrations may be of interest.

Brassavola digbyana, with its fine, fragrant, greenish-white flowers up to 5 inches across, was used to give the fringed lip to its offspring in the crosses shown below.

Cattleya labiata was crossed with *C. warscewiczii* to produce Cattleya Amabilis. In turn, *C. Amabilis* was crossed with *C. mossiae* to give Caracas and with

C. trianae to give Trimabilis. *C. bowringiana* crossed with *C. trianae* has given Barbara. *C. dowiana* has been an important parent in many crosses, using either species or varieties as the other parent. *C. Hardyana* resulted from crossing *C. dowiana* and *C. warscewiczii*, and in turn has been crossed with many varieties to produce popular new varieties.

Cymbidiums have been very popular in California, and some of the varieties have already been listed. Butterfly is the result of a cross between *Cymbidium insigne* and *Lowio-Grandiflorum*. Hugh Evans is a cross between Curlew and Lowianum. Crosses of similar nature will continue, and orchid fanciers interested in breeding will find the parentage given in supplementary literature issued from time to time.

The *Cypripedium* group of orchids, known to some botanists as *Paphiopedilum*, has been used in crossing to produce popular hybrids, such as Cardinal Mercier, which has been used as a parent in many of the best later types such as Cardinal. *C. Morganiae* is a cross between *C. stonei* (*Paphiopedilum stonei*) and *C. superbiens* (*P. superbiens*), and is considered to be one of the best of this hardy group of terrestrial orchids.

Laelia purpurata was used in the crosses shown below.

Odontoglossum invites hybridization with a near relative, *Cochlioda noezli-*

-
- B. digbyana × Cattleya Hardyana = Brassocattleya Heatonensis
 - × Cattleya dowiana = Brassocattleya Mrs. J. Leeman
 - × Cattleya mendeli = Brassocattleya Digbyano-Mendeli
 - × Cattleya mossiae = Brassocattleya Digbyano-Mossiae
 - × Laelia cinnabarina = Brassolaelia Mrs. M. Gratrix
 - × Laelia purpurata = Brassolaelia Digbyano-Purpurata

- L. purpurata × Cattleya labiata = Laeliocattleya Bella
- × Cattleya mossiae = Laeliocattleya Canhamiana
- × Cattleya warscewiczii = Laeliocattleya Callistoglossa
- × Cattleya dowiana = Laeliocattleya Dominiana
- × Cattleya leopoldi = Laeliocattleya Elegans

ana. The latter was crossed with *O. crispum* to produce Odontioda Bradshawiae; with *O. ardentissimum* to produce Odontioda Cooksoniae; and with *O. pescatorei* to produce Odontioda Vuylstekeae. *O. crispum* has been crossed with *Miltonia warscewiczii* to produce Odontonia Laireseae. *Cochlioda noezliana* was crossed with *Oncidium incurvum* to produce Oncidioda Charlesworthi.

A cross between *Miltonia vexillaria* and *M. roezli* was made by Bleu in 1889, and this cross is now known as *M. Bleuana*. Bleuana has been used further in crossing to provide many other varieties.

These few illustrations will show how the orchid breeder may use the reference on hybrid orchids to determine parentage and perhaps make it easier to select promising parents for further crossing. *Cattleya* and *Laelia* species have been crossed to produce Laeliocattleya. In turn, the offspring have been crossed

with *Brassavola* to produce Brassolaeliocattleya Mackayi. Breeders in the future may want to know that *Brassavola digbyana* was crossed with Laeliocattleya Elegans back in 1903 by Chamberlain at Hughbury, Moor Green, Birmingham, England, to produce this hybrid.

It is difficult to predict the nature of the offspring, for seedlings may be different and are occasionally better than either parent. Sometimes they closely resemble one parent, as Laeliocattleya Callistoglossa and Lc. Canhamiana, which closely resemble their *Laelia purpurata* parent, while Laeliocattleya Dominiana resembles the *Cattleya dowiana* parent.

Schomburgkia tibicinis has been crossed with *Laelia tenebrosa* to produce Schombolaelia Tibirosa, and with *Cattleya mossiae* to produce Schombocattleya Spiralis. Fanciers may greatly increase such hybrids if they so desire.

REFERENCES

BOYLE, LOUIS MORRIS

1947. My observations on growing cymbidium orchids out of doors. 47 p. Published by the author, Ojai, California.

BRISCOE, T. W.

1946. Orchids for amateurs. 3d ed. W. H. and L. Collingridge, Ltd., London. (Unpaged.)

FAIRBURN, D. C.

1944. "Gravel" culture for orchids. Missouri Botanical Garden Bul. 32:133-51, October.

HARRISON, C. ALWYN, and T. W. SANDERS

1925. Orchids for amateurs. 140 p. Lockwood Press, London.

HOGG, R. B.

1947. Orchids for everybody; a complete handbook on all phases of orchidology. 204 p. J. Bisset, Sydney, N.S.W.

LOCAN, HARRY B., and LLOYD C. COSPER

1949. Orchids are easy to grow. 312 p. Ziff-Davis Publishing Co., Chicago, Ill.

LUMSDEN, DAVID

1947. Culture of orchids. U. S. Dept. Agr. Leaflet 206:1-8. Wash., D.C.

SANDERS, T. W.

1927. Sanders' orchid guide. 452 p. Sanders, St. Albans, England.

1946. Sanders' complete list of orchid hybrids. 307 p. Sanders, St. Albans, England.

1951. Sanders' popular orchid growing. 75 p. Waterlow and Sons, London.

WATKINS, JOHN VERTREES

1942. Orchids in Florida. Florida Agr. Ext. Bul. 116:1-47

1948. ABC of orchid growing. 134 p. Ziff-Davis Publishing Co., Chicago, Ill.

WHITE, E. A.

1942. American orchid culture. 276 p. (3d ed. rev. and enl.) A. T. De La Mare Co., New York.

Table 1. Orchid Flowers Month by Month*

JANUARY	MAY
<i>Cattleya percivaliana</i> (I)	<i>Aerides crassifolium</i> (W)
<i>Coelogyne cristata</i> (C)	<i>Calanthe veratrifolia</i> (C)
<i>Dendrobium phalaenopsis</i> (W)	<i>Cattleya intermedia</i> (I)
<i>Laelia superbiens</i> (I)	<i>Cymbidium lowianum</i> (C)
<i>Lycaste skinneri</i> (I)	<i>Cypripedium concolor</i> (W)
<i>Oncidium cavendishianum</i> (C)	<i>Laelia purpurata</i> (I)
<i>Phaius grandifolius</i> (I)	<i>Maxillaria sanderiana</i> (I)
<i>Phalaenopsis schilleriana</i> (W)	
FEBRUARY	JUNE
<i>Cattleya percivaliana</i> (I)	<i>Aerides lawrenciae</i> (W)
<i>Dendrobium bigibbum</i> (W)	<i>Brassavola digbyana</i> (I)
<i>Dendrobium brymerianum</i> (W)	<i>Cattleya warscewiczii</i> (I)
<i>Dendrobium superbum</i> (W)	<i>Cypripedium lawrenceanum</i> (W)
<i>Dendrobium wardianum</i> (W)	<i>Dendrobium infundibulum</i> (C)
<i>Odontoglossum crispum</i> (C)	<i>Laelia purpurata</i> (I)
<i>Odontoglossum rossi</i> (C)	<i>Masdevallia veitchiana</i> (C)
<i>Oncidium sphacelatum</i> (I)	<i>Miltonia vexillaria</i> (C)
<i>Schomburgkia</i> (I)	
MARCH	JULY
<i>Cattleya lawrenceana</i> (I)	<i>Aerides odoratum</i> (W)
<i>Cattleya skinneri</i> (I)	<i>Cattleya dowiana</i> (I)
<i>Cymbidium insigne</i> (C)	<i>Cattleya gaskelliana</i> (I)
<i>Cypripedium callosum</i> (W)	<i>Coelogyne corrugata</i> (I)
<i>Dendrobium bensoniae</i> (W)	<i>Cypripedium lawrenceanum</i> (W)
<i>Dendrobium nobile</i> (W)	<i>Epidendrum nemorale</i> (C)
<i>Lycaste cruenta</i> (C)	<i>Odontoglossum harryanum</i> (C)
<i>Odontoglossum pescatorei</i> (C)	<i>Stanhopea tigrina</i> (I)
APRIL	AUGUST
<i>Cattleya mossiae</i> (I)	<i>Catasetum macracarpum</i> (W)
<i>Coelogyne massangeana</i> (C)	<i>Cattleya lueddemanniana</i> (I)
<i>Coelogyne mooreana</i> (C)	<i>Cypripedium godefroyae</i> (W)
<i>Cypripedium bellatulum</i> (W)	<i>Oncidium flexuosum</i> (C)
<i>Dendrobium dearei</i> (I)	<i>Sobralia leucoxantha</i> (C)
<i>Laelia grandis</i> (C)	<i>Vanda coerulea</i> (W)
<i>Laelia majalis</i> (C)	
<i>Odontoglossum cirrhosum</i> (C)	
<i>Schomburgkia tibicinis</i> (W)	

*Orchid fanciers often want flowers each month of the year rather than most of the blooms at one time. It is possible to predict within certain limits what kinds of orchids will bloom in a certain month. Many species and varieties bloom over a period of months and may occasionally bloom out of season. With the hope of aiding beginners this table is given, but it may need to be changed somewhat for special conditions that affect the time of flowering. (C = cool or not under 50°F; I = intermediate or not under 55°F; W = warm or not under 65°F.)

SEPTEMBER

Catasetum maculatum (W)
Cattleya bowringiana (I)
Cypripedium charlesworthi (W)
Dendrobium deari (I)
Epidendrum skinneri (I)
Odontoglossum citrosmum (C)
Oncidium crispum (C)

OCTOBER

Cattleya bowringiana (I)
Cattleya guttata (I)
Cypripedium insigne (C)
Odontoglossum grande (C)
Oncidium ornithorhynchum (I)
Phalaenopsis amabilis (W)
Vanda sanderiana (W)

NOVEMBER

Angraecum eburneum (W)
Anota densiflora (W)
Calanthe vestita (C)
Cypripedium villosum (C)
Dendrobium chrysotoxum (I)
Laelia autumnalis (C)
Phalaenopsis stuartiana (W)

DECEMBER

Angraecum sesquipedale (W)
Cattleya trianae (W)
Laelia anceps (C)
Lycaste skinneri (I)
Phalaenopsis aphrodite (W)
Zygopetalum mackayi (C)

Table 2. Some Orchids with Flowers of Large Diameter

Species	Diameter, in inches	Number of flowers to cluster	Predominating color
<i>Angraecum sesquipedale</i>	6	2-5	ivory white
<i>Brassocattlaelia hybrid</i>	5-8	1-3	variable
<i>Brassia brachiata</i>	6	6-10	light green
<i>Cattleya dowiana</i>	6-8	2-6	nankeen yellow
<i>Cattleya labiata</i>	6-8	2-7	bright rose
<i>Cattleya loddigesi</i>	6	2-7	lilac rose
<i>Cattleya lueddemanniana</i>	7	2-7	flesh color
<i>Cattleya mendeli</i>	6-8	2-3	rose white
<i>Cattleya mossiae</i>	5-8	3-5	light rose
<i>Cattleya percivaliana</i>	5-7	3-5	deep rose
<i>Cattleya schroederiana</i>	6-7	2-3	light rose
<i>Cattleya warneri</i>	6-8	2-7	deep rose
<i>Cypripedium villosum</i>	5-6	1	greenish
<i>Laelia grandiflora</i>	6	1-2	rose
<i>Laelia purpurata</i>	6-9	3-9	rose white
<i>Laelia tenebrosa</i>	6-9	2-5	reddish brown
<i>Maxillaria sanderiana</i>	6	1	white
<i>Odontoglossum grande</i>	5-7	4-7	yellow
<i>Stanhopea tigrina</i>	5-7	2-4	red and yellow

Table 3. Some Orchids with White Prevailing*

Aerides falcatum	Laelia albida
Aerides fieldingi	Laelia crispa
Aerides odoratum	Laelia rubescens
Angraecum articulatum	Lycaste candida
Angraecum citratum	Maxillaria grandiflora
Brassavola glauca	Maxillaria venusta
Brassavola nodossa	Miltonia phalaenopsis
Calanthe veratrifolia	Odontoglossum cirrhosum
Coelogyne barbata	Odontoglossum citrosimum
Coelogyne corrugata	Odontoglossum crispum
Coelogyne cristata	Odontoglossum pescatorei (nobile)
Coelogyne mooreana	Odontoglossum pulchellum
Cymbidium erythrostylum	Peristeria elata
Cypripedium niveum	Phalaenopsis amabilis
Dendrobium bensoniae	Phalaenopsis aphrodite
Dendrobium dearei	Phalaenopsis stuartiana
Dendrobium formosum	Pleione maculata
Dendrobium infundibulum	Sobralia leucoxantha
Dendrobium nobile	Vanda suavis
Dendrobium sanderae	

* See white hybrids in lists from nurseries. See also varieties listed under *Cattleya* (such as *Barbara Billingsley*, *Barbara Dane*, *Bow Bells*, *St. Petersburg*, and *White Empress*) and under *Cymbidium* (such as *Balkis*, *Miranda*, and *Swallow*).

Table 4. Some Orchids with Yellow Prevailing

Species	Diameter, in inches	Species	Diameter, in inches
<i>Cattleya citrina</i> (tulip orchid)	3	<i>Odontoglossum halli</i>	3-5
<i>Cirrhopetalum</i>	¼-6	<i>Odontoglossum schlieperianum</i>	4-5
<i>Cyrtopodium andersoni</i>	1½	<i>Oncidium altissimum</i>	1½
<i>Dendrobium brymerianum</i>	2-3	<i>Oncidium bicallosum</i>	1½
<i>Dendrobium chrysotoxum</i>	2	<i>Oncidium cavendishianum</i>	1-2
<i>Dendrobium densiflorum</i>	2	<i>Oncidium lanceanum</i>	2
<i>Dendrobium heterocarpum</i> (aureum)	2-3	<i>Oncidium sphacelatum</i>	1
<i>Epidendrum brassavolae</i>	4	<i>Oncidium splendidum</i>	3
<i>Epidendrum stamfordianum</i>	1½	<i>Oncidium tigrinum</i>	3
<i>Epidendrum wallisi</i>	1½	<i>Oncidium varicosum</i>	3
<i>Laelia flava</i>	2-3	<i>Oncidium wentworthianum</i>	1
<i>Odontoglossum grande</i>	5-7	<i>Schomburgkia crispa</i>	2½

Table 5. Some Orchids with Red to Reddish Brown Prevailing

Species	Predominating color
<i>Bulbophyllum careyanum</i>	reddish brown
<i>Cochlioda</i> hybrids	red to rose
<i>Epidendrum radicans</i>	orange scarlet
<i>Epidendrum vitellinum</i>	cinnabar red
<i>Laelia cinnabarina</i>	cinnabar red
<i>Laelia harpophylla</i>	orange red
<i>Laelia monophylla</i>	orange scarlet
<i>Laelia tenebrosa</i>	reddish brown
<i>Masdevallia veitchiana</i>	bright vermilion
<i>Maxillaria tenuifolia</i>	dark red
<i>Miltonia candida</i>	chestnut brown
<i>Odontoglossum harrayanum</i>	chestnut brown
<i>Odontoglossum luteopurpureum</i>	chestnut brown
<i>Oncidioda</i> hybrids	reddish
<i>Oncidium longipes</i>	red brown
<i>Oncidium papilio</i>	reddish crimson
<i>Renanthera coccinea</i>	blood red
<i>Renanthera imschootiana</i>	vermillion
<i>Schomburgkia tibicinis</i>	reddish brown
<i>Sophronitis cernua</i>	cinnabar red
<i>Sophronitis grandiflora</i>	scarlet
<i>Stanhopea tigrina</i>	red and yellow

Table 6. Some Orchids with Many Flowers to a Cluster or Stem

Species	Number to cluster or spray	Diameter, in inches	Predominating color
<i>Bletilla hyacinthina</i>	6-12	1	light purple
<i>Cattleya bowringiana</i>	5-20	2-3	rose purple
<i>Cochloda</i> hybrids.....	10-15	1	red to rose
<i>Coelogyne pandurata</i>	5-15	4	green
<i>Cymbidium lowianum</i>	15-36	4-5	yellowish green
<i>Cymbidium tracyanum</i>	5-15	4-5	yellowish brown
<i>Dendrobium brymerianum</i>	7-15	2-3	golden yellow
<i>Dendrobium formosum</i>	7-15	3-4	white
<i>Dendrobium nobile</i>	4-18	2-3	white
<i>Epidendrum brassavolae</i>	10-20	4	yellow
<i>Epidendrum skinneri</i>	15-30	1½	rose
<i>Laelia flava</i>	8-10	5-10	canary yellow
<i>Lycaste tricolor</i>	10-30	1½	whitish rose
<i>Odontioda</i> hybrids.....	5-20	1-3	variable
<i>Odontoglossum pescatorei (nobile)</i>	over 20	2-3	white
<i>Odontonia</i> hybrids.....	5-15	3-4	whitish
<i>Phaius grandifolius</i>	10-20	3-4	yellow brown
<i>Phalaenopsis schilleriana</i>	over 20	3-4	light rose
<i>Vanda coerulea</i>	7-15	3-4	light blue, variable
<i>Vanda sanderiana</i>	7-15	5	yellow and rose

Table 7. Some Good Hybrid Orchids***Laeliocattleya Hybrids**

Bella (L. purpurata × C. labiata)	Lustre (Callistoglossa × C. lueddemanniana) (very good dark orchid)
Callistoglossa (L. purpurata × C. warszewiczii) (rosy, middle lip dark purple)	Marie Dobrott (Callistoglossa × Lustre)
Canhamiana (L. purpurata × C. mossiae), especially Alba (light rose and purple lip, throat orange)	Mme. Brasseur Hye (Lc. Aphrodite × C. Metior)
Dominiana (L. purpurata × C. dowiana)	Princess Margaret (Profusion × Clotho) (dark orchid)
Elegans (L. purpurata × C. leopoldi) (rose; a natural hybrid)	Queen Mary, Westonbirt's Variety (Lustre × Peetersi)
George Baldwin (Princess Margaret × Enid)	S. J. Bracey (Mrs. Medo × Thebes)
	White Queen (Britannia × C. mossiae) (white)

Brassocattleya Hybrids

Digbyano-Mendeli (B. digbyana × C. mendeli)	Heatonensis (B. digbyana × C. hardyana)
Digbyano-Mossiae (B. digbyana × C. mossiae)	Mrs. J. Leemann (B. digbyana × C. dowiana)
Digbyano-Trianae (B. digbyana × C. trianae)	Rosalind (B. digbyana × C. mossiae × Enid)

Brassolaeliocattleya Hybrids

Montecito (an Armacost and Royston variety)	The Baroness (chartreuse to yellow)
---	-------------------------------------

Brassolaelia Hybrids with Odd Colors

Digbyano-Purpurata (B. digbyana × L. purpurata)	Mrs. M. Gratrix (B. digbyana × L. cinabarina)
---	---

* See catalog listings for full color descriptions.

Table 8. Some Orchids Commonly Grown in Osmunda Fern Fiber (Epiphytic orchids)

Aerides	Maxillaria
Angraecum	Miltonia
Brassocattleya, etc.	Oncidium (in part)
Cattleya	Phalaenopsis
Coelogyne	Schomburgkia
Cynoches	Sophronitis
Dendrobium	Stanhopea
Epidendrum (in part)	Vanda
Laelia	

**Table 9. Some Orchids Grown in Leafmold and Gravel Mixtures
(mostly terrestrial but some epiphytic)**

Bletilla (Bletia)	Lycaste
Calanthe	Odontoglossum (epiphytic)
Cymbidium	Phaius (Phajus) (in part; mostly terrestrial)
Cypripedium (in part)	Pleione
as insigne	Sobralia
parishi	Zygopetalum (epiphytic)
spicerianum	
villosum	

**Table 10. Some Cool-House Orchids for Beginners
(50°F minimum)**

Species	Size of flowers, in inches	Predominating color
Calanthe vestita	3	creamy white
Coelogyne cristata	3-4	white
Coelogyne mooreana	3-4	white
Cymbidium	mostly 2-4	various
Cypripedium insigne	4-5	greenish white
Cypripedium spicerianum	3	white
Cypripedium villosum	5-6	greenish
Dendrobium infundibulum	4	white
Epidendrum cochleatum	2-3	yellowish green
Epidendrum obrienianum	1	red and yellow
Epidendrum vitellinum	1½	cinnabar red
Laelia anceps	3-4	deep rose
Laelia autumnalis	4	deep purple
Lycaste aromatica	1	golden yellow
Lycaste skinneri	4-6	whitish rose
Odontoglossum bictoniense	1½	yellowish green
Odontoglossum citrosium	2-3	white
Odontoglossum grande	5-7	yellow
Oncidium cavendishianum	1-2	yellow
Oncidium crispum	1-2	greenish brown
Oncidium leuchochilum	2	yellowish green
Oncidium tigrinum	3	yellow
Sophronitis grandiflora	3	scarlet
Zygopetalum mackayi	3	green and blue

**Table 11. Some Intermediate House Orchids for Beginners
(55° F minimum)**

Species	Size of flowers, in inches	Predominating color
<i>Cattleya amethystoglossa</i>	4	rose purple
<i>Cattleya bicolor</i>	4	bronze green
<i>Cattleya bowringiana</i>	2-3	rose purple
<i>Cattleya dowiana</i>	6-8	nankeen yellow
<i>Cattleya gaskelliana</i>	5	rose purple
<i>Cattleya labiata</i>	6-8	bright rose
<i>Cattleya loddigesi</i>	6	lilac rose
<i>Cattleya mendeli</i>	6-8	rose white
<i>Cattleya mossiae</i>	5-8	light rose
<i>Cattleya percivaliana</i>	5-7	deep rose
<i>Cattleya schroederiana</i>	6-7	light rose
<i>Cattleya skinneri</i>	2-3	rose purple
<i>Cattleya trianae</i>	6-7	light rose
<i>Cattleya warneri</i>	6-8	deep rose
<i>Dendrobium chrysotoxum</i>	2	golden yellow
<i>Dendrobium moschatum</i>	3-4	yellowish rose
<i>Dendrobium nobile</i>	2-3	white
<i>Laelia purpurata</i>	6-9	rose white
<i>Laelia tenebrosa</i>	6-9	reddish brown
<i>Oncidium altissimum</i>	1½	yellow
<i>Oncidium sphacelatum</i>	1	yellow
<i>Phaius (Phajus) grandifolius</i>	3-4	yellow brown
<i>Phaius (Phajus) wallichii</i>	3-4	white and buff
<i>Schomburgkia tibicinis</i>	2-3	reddish brown

**Table 12. Some Warm-House Orchids for the Beginner
(65°F minimum)**

Species	Size of flowers, in inches	Predominating color
Aerides crassifolium	1½	rose purple
Aerides odoratum	1	white
Cypripedium bellatulum	3	creamy white
Cypripedium concolor	3-4	light yellow
Cypripedium lawrenceanum	4-5	whitish green
Cypripedium niveum	3-4	satiny white
Dendrobium dearei	2½	white
Dendrobium phalaenopsis	3	deep rose
Oncidium luridum	1-2	yellowish green
Oncidium papilio	3-4	reddish crimson
Phalaenopsis amabilis	5	white
Phalaenopsis aphrodite	4	white
Phalaenopsis schilleriana	3-4	light rose
Phalaenopsis stuartiana	1½-3	white
Vanda coerulea	3-4	light blue, variable
Vanda sanderiana	5	yellow and rose
Vanda suavis	2-3	white
Vanda tricolor	2-3	whitish yellow