ROCK STARS OF THE ORCHID WORLD

CAROL SIEGEL

Orchid habitat showing plants with stiff, vertical leaves, lichen covered roots.

A FEW YEARS AGO, my husband and I hiked Yosemite with a group from the Smithsonian Institution. Our young guide had just hiked the iconic rock face of El Capitan, a sheer granite escarpment rising 3000 feet above the valley floor, 2.5 times as high as the Empire State Building. Since the ascent was a four- to six-day trek, she slept, hanging precariously from the sheer granite wall on a portaledge (a collapsible, lightweight cot she assembled while hanging against the rock face). At 28 pounds, it had straps and loops to hold all her climbing gear, food, and water. It was a grueling climb that demanded a very special, fit, and brave person. My first city-girl thought was, "Why?" Why spend time on a sheer rock high up in the baking sun? Why not sleep in a nice hotel with movies? What if she fell off? What if she ran out of water or food? What if she got very hot during the day or too cold at night? How was she able to survive on that challenging precipice?

My guide had, for some reason, chosen to cling for days to the side of that cliff, but hundreds of orchids have no choice but to cling for a lifetime to bare rocks and sheer cliff faces. We call them "lithophytes," plants that grow on rocks. About 5% of orchids make their living in this unique environment. That doesn't sound like many, but with more than 28,000 species, at least 1,400 species grow mainly on rocks. Many more orchids sometimes grow on rocks if conditions are just right, even though they usually live in the ground or on trees.

Orchids have evolved to live in harsh environments like rocks. A slippery surface? No problem. They have roots and stems that can scramble across rocks and grow into crevices to hold tight to slippery surfaces. Not much water? No problem. Orchids have roots covered in a super-absorptive tissue called velamen that quickly sucks up available water and nutrients. Many have pseudobulbs like canteens for water and sugar storage during dry times. The pseudobulbs are often round to maximize volume-to-evaporative surface area. Many use Crassulacean Acid Metabolism (CAM) for photosynthesis, which allows them to keep their stomatal openings closed during the day to reduce water loss. Their leaves often have thick, waxy cuticles to keep water loss to a minimum. Too much heat and sun on the rock? No problem. Evolution has favored stiff leaves that are vertically oriented instead of broad leaves that spread out horizontally to catch extra rays when light is low. Sometimes the orchids keep cool by

Various orchid species growing on a boulder in a cloud forest.

Epidendrum excisum

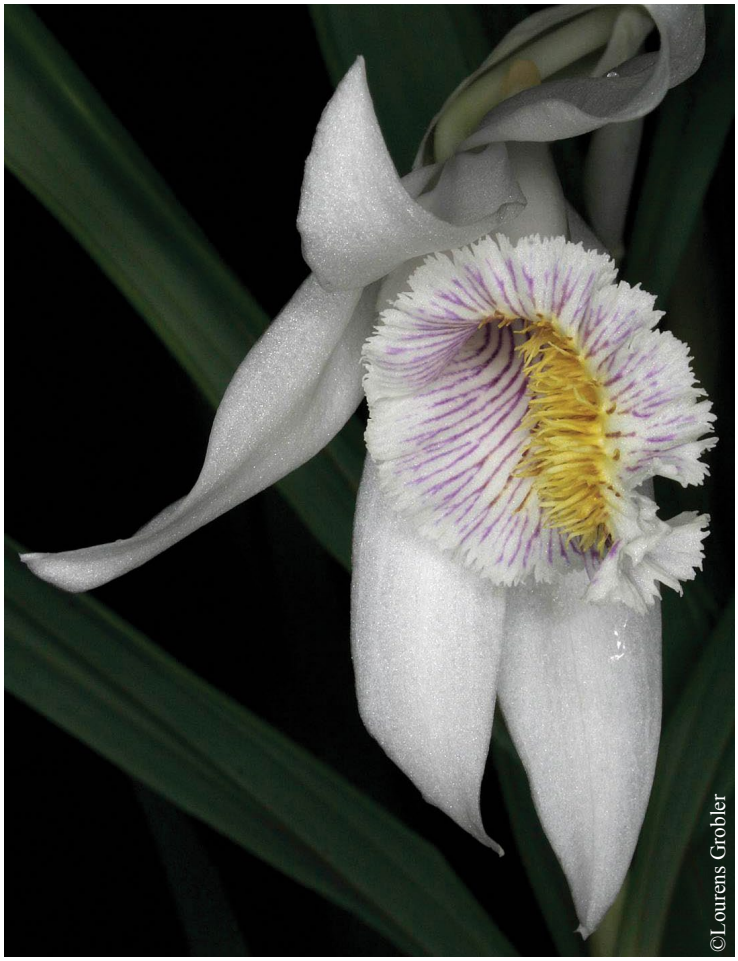
growing deep within rock crevices and crannies, barely peeking out above the rock surface.

These plants are as tough as my Yosemite guide and have had millions of years to figure out how to make a living in the toughest of environments.

Modifying The Rock

Orchids have a difficult time, as you can imagine, clinging to bare rock and prefer rocks that have been naturally modified in some way to make it easier to grow on. A crack, crevice, depression, or protrusion makes it easier to gain a foothold. Some rocky surfaces are covered with mats of lichen, cyanobacteria, or moss, creating a textured surface allowing seeds and later plants to cling. One of the most interesting examples of rock modification is found on the bare rock of the Concepcion volcano in Nicaragua. An active stratovolcano, erupting 24 times since 1883, produces blocky, jagged lava called "aa" (a Hawaiian word) with a rich silica content. High moisture and open areas have allowed lichen to flourish on the lava giving it a bark-like texture. Seventeen species of orchids, including *Epidendrum excisum, Epi. radicans, Epi. rigidum,* and *Bletia purpurea,* which usually grow on trees in cloud forests, use this lichen-covered chunky rocky surface as a substitute for tree bark. Orchids have difficulty growing on the smoother "pahoehoe" (another Hawaiian word) ropy lava of some other volcanoes.

Epidendrum radicans



Thunia alba

Strongyleria pannea (*Eria pannea*)

Lan Hin Taek in Phu Hin Rongkla Natural Park

One of the world's most spectacular places to see lithophytic orchids is the Lan Hin Taek (Broken Rock Field) in Phu Hin Rong Kla National Park in Thailand. The rocks are encrusted with orchids, including *Dendrobium amplum, Strongyleria pannea* (*Eria pannea*), *Phalaenopsis pulcherrima, Thunia alba, Liparis stenoglossa, and* numerous species of *Bulbophyllum, Coelogyne, Eria, Luisia,* and others. The rocky terrain covers an area of some ten acres and has many long fissures caused by the shifting of the earth's crust. Some fissures are small, but others are so huge you could hide a truck inside. The area's landscape comprises hundreds of round and smooth rocks with an average height of one foot, so the cracks provide an ideal place for orchids to grow. In addition, the broken rock area is covered with mosses, lichens, algae, and ferns, modifying the rock into a more suitable habitat for seeds and seedlings. Unfortunately, in the 1970s, it was the site of fierce warfare between Thai soldiers and communist guerrilla warriors, causing damage to the beautiful area, which is now protected as a national park.

Jack A. Fowlie's Trip to Collect Orchids in the Dry Barrancas of Ocana

The Orchid Digest published a fascinating article in January of 1970 which illustrates how orchids growing on rocks can survive with some rock modification and access to water and humidity. J. A. Fowlie hunted orchids among the rocks in Ocaña, a city that sits astride a ridge of the Eastern Cordillera of the Colombian Andes bordering Venezuela. The area is dry and rocky, hardly what you would expect as an ideal orchid habitat. Mr. Fowlie set out with a party on an adventure to find *Phragmipedium schlimii* and *Lycaste macrobulbon.*

Lycaste macrobulbon

The area was arid, with high peaks and ridges removing moisture from the air currents coming off the Caribbean. A dry, rocky barranca (a narrow, winding river gorge) with arid slopes sat atop a rushing river in its depths. Yet here he found his orchids. *Phragmipedium schlimii* grew in the rocky barranca in cracks and fissures in the granite with water seepage from a small spring 50 feet up, keeping them very wet. The streamlet, coursing over a little waterfall, broke into a hundred trickles over the face of a large boulder. Small trees had taken root on the wet rocks, gelatinous algae growing in loose mats on their roots. Clumps of leaf mold fixed to the mats of permanently wet algae provided a textured surface for the orchids to grow. Great old clumps of lady slippers grew attached at steep angles on the sides of rocky slopes with their roots attached to the net-like mats on the tree roots. Orchids also grew in rocky, wet crevasses where the roots had attached with such determination that they could not be removed intact. A strong odor of amines, a sewer-like smell, issued from the gelatinous algae associated with the roots that continuously fed the orchids. These lithophytic orchids flourished in this unlikely place, and all their needs were met.

It took another three days to find the *Lycaste macrobulbon*. The terrain was so hot and dry that it seemed, to Fowlie, to be impossible for the orchid to grow there. Scrambling up another 300 feet, he found a more substantial stream that had, through the centuries, made a notch in the vertical rock walls filled with cacti and succulents. An occasional *Encyclia* and *Laelia* (*Schomburgkia*) species were seen. Small trees grew near steep waterfalls on 30-foot cliffs along either side of the streamlet, their branches forming a shady canopy.

The *Lycaste macrobulbon* grew on the rocky granite point immediately above the creek, 30 feet above Fowlie's head. It received full sun in the morning and afternoon for short periods, with midday broken light.

Dendrobium striolatum

Dendrobium striolatum habitat

The trees above gave some shade. The plants had the humidity of the grotto that at night condensed into dew to maintain the roots and pseudobulbs in a healthy condition during the dry periods. Air movement was excellent, and the plants were healthy.

So here was a formula for surviving on a rock—a crack to provide a secure anchor, a living mat to provide a foothold and some water retention, a stream to provide water and humidity, and some trees to provide shade. An unlikely orchid heaven…

Dendrobium striolatum: Tasmania's Yellow Rock Orchid

Many orchids CAN grow on rocks, but some grow ONLY on rocks, and we call them "obligate lithophytes." *Dendrobium striolatum* (*Dockrilla striolata*) is the lone lithophyte in Tasmania. In Tasmania, the form was formerly known as ssp. *chrysanthum.* Called "*striolatum"* because of its striped flowers, it has a distinctive frilly-edged lip and a pure white labellum devoid of markings. This orchid is a very robust and resilient species; some colonies on Flinders Island are more than a century old. The thick white roots spread widely over the bare rock and snake into crevices, clinging tightly to rocks with no soil. Its terete leaves (shaped like a pencil) give it the name "the pencil orchid" and help the plant to survive dry conditions by limiting water loss. The wiry sections of rhizomes are just strong enough to sup-

port the short, smooth "pencils" away from the base of the plant. The Sutherland and Shire Orchid Society says that a specimen plant looks like a novelty wig of thick green hair that has been neatly combed downward. Occasionally, the wig will take on shades of purple when exposed to strong sunlight, a natural sunscreen to protect the plant. In favorable conditions, the orchids can grow into large, thick, compact clumps.

It seems resilient to human intrusion. Even with people biking, scrambling over rocks, and climbing, the species remains healthy and persistent, flowering year after year in places like the lookout on the Wineglass Bay Track on the Freycinet Peninsula. Resilient to natural disturbance, it is quite resistant to wildfires and prescribed burning. An intensive wildfire in February 1980 left slopes on the Freycinet Peninsula denuded for many years, exposing boulders supporting *Dendrobium striolatum*, but the species remained abundant.

In Australia, it is found in New South Wales and Victoria. It grows on rocky outcrops along sandstone cliffs facing protected areas on large boulders near creeks. In Tasmania, it grows only on granite-granodiorite and other types of igneous rock, such as dolerite. Where found, the species occurs on massive rock outcrops, taking advantage of imperfections and crevices in the rock surface. Some even grow on smaller granite boulders in open forests. Most Tasmanian colonies are found on east-facing sites directly exposed to moisture from sea breezes, although sometimes they are found farther inland. They can be found far from the coast in Australia, suggesting that ocean exposure itself is not a limiting factor.

Dendrobium speciosum: Australia's Rock Lily Orchid

Dendrobium speciosum can often be a monster of a lithophyte. Clumps can grow as big as a family car, the product of generations of seedlings. We have all seen pictures of this award-winning orchid at shows, in big tubs and wheelbarrows in unbelievably massive displays of intensely fragrant yellow or white flowers that

Dendrobium speciosum

take your breath away. Ninety-nine percent grow on rocks, rock faces, and cliffs, while one percent grow on trees. An extremely hardy orchid, it is very drought-resilient and tough, tolerating near frost to temperatures over 113°F (45°C) without severe damage. It grows under harsh, dry conditions over a vast section of Australia.

Typically *Dendrobium speciosum* is a lithophyte growing on sandstone in open sclerophyll forest (adapted to long periods of dryness), but it is not restricted to sandstone, and nearly any rock substrate will do if its needs are met. Its thick, leathery leaves prevent water loss in dry areas and adapt to low humidity. In dry, exposed locations like Mount White, a peak in South Australia, the v-shaped leaves are erect to minimize overheating and water loss, helping the plant collect organic litter and rain. Leaves may take on a purple hue if exposed to direct light. The leaves are larger and flatter in forested areas like the Wattagan Range. Plants are exposed to full sun on volcanic plugs, and only their leaves may be evident between rock crevices, with the pseudobulbs protected between layers of stones. Roots are always covered with a blanket of moist ferns and mosses, helping to keep them moist, and large pseudobulbs help store emergency water and sugar.

Want to know just how hardy this species is? They can survive the frequent Australian bushfires; most adult clumps can re-shoot after fire from dormant eyes located on older pseudobulbs protected in the middle of the plant. The fires of March 1983, widely regarded as the worst in recorded history, did not eliminate *Den. speciosum,* although it burnt some to the ground. A few months later, the plants were 12 inches (30 cm) high with three or four leaves, regenerating from dormant buds. Plants that had 30 canes before the fire now had 20 new ones. Within three years, the plants were starting to flower. This is undoubtedly one tough species!

Colonies within the coastal Bouddi National Park grow on sandstone cliffs overlooking the Pacific and tolerate the frequent salt spray. At the same time, the populations on limestone at Jenolan Caves, in the Central Tablelands region, frequently get blanketed by snow several times a winter with no ill effects.

Coming in six varieties, with nomenclature always an issue, its main drawback for growers is that it doesn't bloom every year, frustrating us by being a dud in two of three years. When it does bloom, however, boom years often produce blooms on every pseudobulb with many racemes, winning awards by the handfuls.

The Tiny Lithophyte: *Mexipedium xerophyticum*

At the other extreme in size, tiny-flowered but mighty, *Mexipedium xerophyticum* is also mighty expensive now. These are very rare plants in nature, with only seven plants (!) originally being found in just one location. Due to a fire not many years ago, there was a report that only one specimen was left in the wild. First described in 1990, this is a lithophytic, endemic, monotypic genus (only one species in the genus) from the state of Oaxaca, Mexico. Plants grow on vertical north-facing limestone walls with xerophytic vegetation (adapted to dry conditions) surrounded by rainforests and warm oak forests. *Mexipedium xerophyticum* is a warm-to-hot growing lithophyte found on eastern-facing slopes with a very wet summer season and a distinct dry season from winter into spring. The seasonally dry, relatively open scrub where it grows is dominated by cacti, century plants (*Agave)*, and the succulents, *Nolina* and *Yucca*.

The species epithet refers to its tolerance to arid conditions, with thick, drought-adapted leaves that help the plants to survive the prolonged winter dry period in this part of Mexico. The leaves are small, stiff, and may be semi-erect. Growth form is unusual in that it tends to spread by runners (stolons), helping it to cling to its rocky home. The conspicuous, erect rhizomes may be up to eight inches (20 cm) between growths, allowing the plant to scramble along the rock. It grows well on rocks or in the detritus in crevasses.

The plant is at risk of extinction because it is found in such small numbers in an area prone to fire. Thankfully, it has been propagated by interested nurseries, although we know of no plans to reintroduce it to the wild.

Mexipedium xerophyticum

Paphiopedilum vietnamense

Phragmipedium besseae

Paphiopedilum vietnamense: Going, Going Gone

While serving as president of the Greater Las Vegas Orchid Society, one of our speakers took me aside to present a gift of a then-very-illegal lithophytic *Paphiopedilum vietnamense*. Appalled that he thought it an appropriate gift for a "green" person, or for any person for that matter, I politely declined and never invited him back. Sadly, he was not the only one who thoughtlessly pushed this gorgeous orchid to the brink of extinction. With very large rose-pink or rose-purple flowers and lovely tessellated green leaves, it caused a sensation in 1997 when it was first discovered. This one was indeed a star in a genus of spectacular tropical Asiatic slipper orchids. A Vietnamese endemic closely related to *Paph. delenatii,* all specimens originated from a single source in eroded limestone areas of Vietnam. It grows lithophytically in crevices and holes in very steep, humid slopes under the shade of lush vegetation amid ferns and warmth-loving little trees. Large colonies were found when first discovered in the company of other warm-growing paphs like *Paph. concolor, Paph. hirsutissimum, Paph. tranlienianum,* as well as other orchids like *Cleisostoma rostratum, Coelogyne fimbriata, Dendrobium chrysanthum, Liparis mannii,* and *Vandopsis gigantea*, typical of limestone orchid flora at low elevations.

Rocky hillsides, limited in size, were quickly stripped of plants within days of discovery. The first plants were found among quantities of other wild-collected paphiopedilums by a Vietnamese-Japanese plant nursery in 1997. A month later, many more specimens were exported illegally to several countries. The region is easily accessible, and nurseries pay local villagers one to two dollars a kilogram to collect large quantities. By 1998, only a few plants were left, and it is likely *to* be extinct in the wild soon.

The USDA licensed the sale of nursery-raised stock from confiscated illegal plants. Primary hybrids first became available in 2001, registered as *Paph.* Ho Chi Minh and *Paph*. Wössnser's Vietnam Love. Plants and primary hybrids had already gotten awards from the German Orchid Society by 2004. Hopefully, the availability of seedlings will stem the search for wild plants.

The Wet Slippers On The Rocks: Phragmipediums

Some Old-World slipper orchids grow on rocks, especially limestone rocks; however, the majority of New World slipper orchids in the genus *Phragmipedium* are lithophytic, growing in a thin layer of soil over a rocky substrate. These are most often found beside streams. These are the wet ones. They frequently grow on wet rock faces with the roots attached directly to the rock. Several species, like *Phrag. caricinum* and *Phrag. pearcei* grow on rocks in fast-flowing Andean streams, a challenging environment periodically inundated by water during floods.

Phragmipedium longifolium

Phragmipedium pearcei has areas of up to two inches (five cm) between growths (stoloniferous rhizomes) that protect them in fast-moving currents. *Phragmipedium hirtzii*, found by prolific Ecuadorian collector Alex Hirtz in northwest Ecuador, was discovered perched on large boulders at the top of a cascade in a fast-flowing stream, constantly wetted by spray. The rhizomes were up to eight mm (one-third inch) in diameter with up to 5 inches (12 cm) between growths, rooting at the nodes. Scrambling along rocks in this manner, it could hold tight in rushing water. *Phragmipedium hirtzii* var. *anchicayense,* a newly-discovered variety from Colombia, grows only along the Anchicaya River and Calima River on the rocky sides and boulders within the main river channels. Their root systems are firmly attached to the sandstone and volcanic rock. Capable of surviving immersion during high currents, some grow below the flood line.

Phragmipedium lindenii, the only species without a slipper-shaped lip, grows quite often on old lava flows, forming extensive colonies, particularly around the foot of the Tungurahua volcano in Ecuador.

Phragmipedium besseae, discovered in 1979 by J. Halton and Libby Besse, grows on wet granite cliffs in semi-shade where other red-flowered plants like begonias and fuchsias are often found; hummingbirds pollinate it. It was discovered initially in Peru but is now found in Ecuador, where it has survived initial over-collection. Frequently lithophytic, it has scrambling growths and long rhizomes to, again, cling to rocks. Its brilliant red color makes it a desirable parent for numerous hybrids.

Phragmipedium schlimii, the orchid that Fowlie hunted, is found in Colombia on wet slopes, road cuts, and rocky crevasses of wet forests. With roots that reach deep between rocks, it isn't easy to dislodge.

Phragmipedium longifolium, the most widespread and variable species, is found in Costa Rica, Panama, Colombia, and Ecuador. Although sometimes terrestrial, it grows like a weed on and among rocks along rivers, spray basins of waterfalls, vertical wet escarpments, and volcanic ash cliffs by rivers.

The sensational and notorious *Phragmipedium kovachii* is found on the eastern flank of the Andes, where it grows on vertical banks and rocky cliffs in somewhat shaded and humid conditions.

So you can see that a scrambling growth habit, tenacious roots, and an ability to thrive in very wet conditions have made the genus *Phragmipedium*'s lithophytic lifestyle successful.

Habitat of Cattleya elongate.

Inselbergs: Rocky Island Refuges

Inselbergs worldwide provide unique habitats for rock-dwelling orchids, often in the middle of otherwise inhospitable places. The term was introduced by the German geologist Bornhardt (1900), denoting solitary, usually monolithic stone mountains or groups of mountains that rise abruptly from the surrounding plains. They represent terrestrial islands that differ from the surrounding natural ecosystem and are often quite different from one another. They are exposed to high solar radiation, high evaporation, a total or partial absence of soil, low water and nutrient availability, and constant wind.

In Brazil, inselbergs or "island mountains" are composed of granite or gneiss, small sugar loaf mountains that harbor a flora with high richness and endemism. These Precambrian rocks are considered ancient landscape elements, more than 50 million years old. They are the remnants of erosion processes forming isolated mountains from a few to several hundred meters in height. In the Tropics, they are often hot spots of plant and animal diversity, including orchids, succulents, carnivorous plants, and other xeric species. For example, the summit of the inselberg of Sierra da Piedade, Minas Gerais, Brazil, is virtually encrusted with lithophytic orchids. One is a large-sized bifoliate cattleya, *Cattleya elongata,* found on bare rock outcroppings.

Many orchids grow on the rocky inselbergs that conspicuously dot the landscape in the Atlantic Forest of southeastern Brazil. Rising high above the flat beaches in places like crowded Rio de Janeiro, inselbergs provide a unique refuge for orchids. It is no surprise that they harbor unique vegetation with particular adaptations. For example, on the dark-colored rock on inselbergs, temperatures routinely can reach 140^{O}F (60^{O}C), and species of *Cyrtopodium* can survive by having stilt-like roots that enable these hardy orchids to fix their pseudobulbs in an upright position avoiding the high temperatures near the rock. The genus *Cyrtopodium* has nearly fifty species, mainly lithophytic, with two-thirds occurring in Brazil. Interestingly, some *Cyrtopodium* species are stimulated to flower when their pseudobulbs are exposed to fires that burn off their dry bracts.

Bifrenaria harrisoniae grows on the rocky inselbergs in some organic material, often with shade from bromeliads and ferns. Its leaves are straight up and quite leathery,

Maxillaria notylioglossa and *Maxillaria rigida* scramble over the rocks to hold on. They live in such harsh conditions on inselbergs that only their front bulbs look alive; the older part of the plant looks dead.

Maxillaria rigida habitat

In southeast Brazil, many granitic inselbergs are also home to numerous unique rupicolous orchids, small colorful cattleyas that thrive in that environment. You also find the beautiful *Epidendrum cinnabarinum* and *Epi. secundum*. Rupicolous vegetation elsewhere in Brazil grows on a range of underlying substrates, including quartzite, sandstone, ironstone, carbonate, or karstic outcrops.

Southeast Brazil is one of three important regions of plant diversity in inselberg ecosystems, along with Madagascar and Australia. Inselbergs in Madagascar are home to numerous orchids, many in the subtribe

Maxillaria notylioglossa

Epidendrum cinnabarinum

Cattleya angereri

Cattletya caulescens

Angraecinae, including *Angraecum rutenbergianum, Angcm. sororium, Angcm. magdalenae, Jumellea ibityana*, and *Jum. rigida.* Australian inselbergs are home to many different orchid species, including *Dendrobium, Bulbophyllum,* and *Sarcochilus* species. Many *Polystachya* species are found on inselbergs in Gabon, Equatorial Guinea, and Cameroon.

Angraecum rutenbergianum

The orchids in this rocky environment can grow on the rock or in crevasses that hold more moisture. Sometimes the orchids grow amongst the roots and stems of associated vegetation on the rocks. Some orchids grow on the woody stems and roots of plants in the family *Velloziaceae*, which colonize rock outcrops in Brazil.

Fires, quarrying, plant collectors, and rock climbers threaten plants on the inselbergs. In places like Espirito Santo, Brazil, orchids on the inselberg are threatened by the ornamental rock mining industry, one of the state's most important economic activities, and grasses introduced for cattle grazing.

Rupicolous Cattleyas (Formerly Laelias): Colorful, Dwarf Orchids

Everyone loves the colorful, dwarf, rock-dwelling orchids in Brazil known as "rupicolous laelias," now classified as cattleyas. They have a reputation for being difficult to grow, but they are delightful orchids. Depending on who is counting, there are approximately 65 species of rupicolous cattleyas and many natural hybrids. These orchids are tough, with thread-like filiform roots that tightly grasp rock crevices. The pseudobulbs vary from one cm in *Cattleya liliputana* to more than 20 inches (50 cm) in *Cattleya angereri.* Although the pseudobulbs are often cylindrical, round pseudobulbs can be found on plants growing in extreme sunlight. More than half of these rupicolous orchids have round pseudobulbs, usually on very small plants.

Round pseudobulbs have the most volume to surface area to minimize water loss, a valuable adaptation for a rock-dwelling plant. There is usually one fleshy leaf on each pseudobulb. Many leaves are boat-shaped (lanceolate), but when exposed to extreme sunlight, the leaves become fleshier and almost round. The flowers are almost always star-shaped, with sepals and petals very similar, and the colors can be white, yellow, orange, red, pink, or lavender. The ones that grow on rocky ledges are often associated with *Vellozia* shrubs and bromeliads. However, *Cattleya caulescens* grows

right on the rocks without sun protection, while *C. crispata, C. cinnabarina*, and *C. angereri* grow protected by shrubs.

Some of the rupicolous cattleyas have a distinct rock preference. In Minas Gerais, two regions of concentration occur, the first around Belo Horizonte, the capital city of the state. The other is around Diamantina, around 300 km (186 miles) northeast of the capital. In Belo Horizonte, orchids like *Cattleya crispata* seem to thrive only on iron ore rocks. Other rupicolous cattleyas are less fussy and, although growing by the million on iron ore, can also be found on granite crystalline rock. The species that grow around Belo Horizonte differ from those that grow around Diamantina and have a robust local distribution. Sometimes you find one species on one mountain and not on another a few kilometers away.

The rupicolous cattleyas grow on inselbergs in full sun. They range in size from compact to miniatures. The state of Minas Gerais, famous for mining, is the center of distribution with the highest species concentration. Other species are native to Espirito Santo, Bahia, and Rio de Janeiro states. They typically grow at 400 to1,700 meters (1,300 to 5,600 feet). First discovered in the 19th century, more are being discovered all the time. The rupicolous cattleyas lend brilliant colors, compact growth, a lovely shape, and a good flower count to hybrids. For example, *Cattleya cinnabarina* is the granddaddy of brilliant orchids like *Laeliocattleya* Chit Chat (*Gur. aurantiaca* × *C.* Coronet (1902), *Lc.* Red Gold (*Gur. aurantiaca* × *C.* Charlesworthii (1900)), and *Sophrolaeliocattleya* Hazel

Cattleya cinnabarina

Boyd (*C.* California Apricot × *Ctt.* Jewel Box). Since being described in 1838, it has sired over 15,620 progeny.

Cattleya fournieri is an example of a rupicolous orchid that grows on inselbergs right in rock cracks that retain moisture making it more hospitable. The rocks are covered in lichens which also hold moisture. The

Cattleya fournieri

Cattleya rupestris

pseudobulbs of this species are round to minimize evaporations, and its erect, v-shaped leaves minimize overexposure to sunlight and capture moisture and rain.

Among the most striking, *Cattleya crispata* has a bright chrome-yellow flower with an airplane shape because the petals are longer than the sepals. Fairly common on the iron ore mountains around Belo Horizonte, its leaves and pseudobulbs are often stained with iron oxide, as is the surrounding vegetation, providing perfect camouflage when the orchids are not in flower. In spring, all the flowers open simultaneously at the end of a 10 to18 inch (25 to 46 cm) inflorescence. It is in the background of nearly 5,703 hybrids to date, including *Lc*. Trick or Treat (C. Icarus × *Ctt*. Chit Chat), *Laeliocattleya* Magic Bell (C. loddigesii × Ctt. Trick or Treat), *Lc*. Waianae Flame (*C*. Icarus × *C*. Alma (1913)), and *Potinara* Burana Beauty (*Rth*. Netrasiri Starbright × *C*. Netrasiri Beauty).

The most widespread species, *Cattleya rupestris*, has glaucous (silvery) leaves as an adaptation to the extremely hot and dry environment in the north where they grow. The leaf-covering looks like a grayish powder, especially on new leaves to protect the plant. The flowers barely peak above the leaves. Some habitats are xerophytic, and these orchids grow with cacti and *Vellozia*, protecting the orchid from direct sunlight. *Cattleya rupestris* grows with the rhizomes and bases of the pseudobulbs hiding inside crevices.

Cattleya bradei

Cattleya milleri caused a stir when it was found in a shipment of *C. crispata* sent to a California orchid nursery. It is a rugged plant that grows in full sun and among debris on the crags of the iron-ore mountains of the Serra da Moeda. Under extreme pressure from iron ore mining, it is nearly extinct in its natural habitat. It has been used extensively for breeding with 1,474 progeny to date, including *Laeliocattleya* Rojo (*Gur. aurantiaca* × *C. milleri*), *Brassolaelia* Richard Mueller (*B. nodosa* × *C. milleri*), and *Cattleya* Zip (*C. tenebrosa* × *C. milleri*).

Cattleya caulescens is common and so plentiful around Belo Horizonte that they are difficult not to step on in some spots. The species are common on iron ore as well as on granite mountains. These orchids get constant wind and dew every morning.

Cattleya liliputana, one of the smallest rupicolous cattleya, grows in cracks for protection and can barely be seen above the cracks

Cattleya bradei, one of the smallest yellow-flowered rupicolous cattleyas, grows around Diamantina on crevices or directly over rocky ledges where water can accumulate during summer. The rhizomes are capable of staying underwater for a few months. The plants are extremely sturdy and grow with no protection from sunlight in areas that are always very windy.

Big Lithophytic Cattleyas

Not all the cattleyas that grow on rocks are small and delicate. Big, gorgeous *Cattleya lobata* is famous for its large, colorful flowers; it grows on the vertical granite walls of inselbergs restricted to peri-urban areas of Rio de Janeiro and Niterói, Brazil. Historical records describe the coffee and orange growers' rapid occupation of forested areas. This local environmental devastation resulted in *Cattleya lobata* being limited to inselberg cliffs. Thankfully, it was beyond the reach of predation by European orchid hunters. The orchid is the symbol of the most globally famous mountain peak of Rio, Pao de Acucar (Sugarloaf)

Cattleya lobata was one of the first five orchids protected under CITES and has been considered endangered since 1992. Despite being included in CITES Appendix 1, it is still illegally collected. It is, therefore, at significant risk of extinction with small numbers in the population, made worse by the tremendous impact of tourism and recurring fires during the dry season. In Tijuca National Park, the walls that shelter *C. lobata* are visited by large numbers of rock climbers causing physical damage to the plants and removal of entire clumps. It is imperative to preserve the few (less than 30) individuals in Pao de Acucar and Alto Mourao populations, now just relict samples of the species.

Cattleya gaskelliana, another large, magnificent orchid is native to Venezuela, grows as both a lithophyte and an epiphyte. It occurs in various environments, from tropical, humid cloud forests to somewhat drier areas where it grows on rocks in nearly full sun. It has been collected to near extinction in some areas and is

Cattleya lobata

no longer plentiful. *Cattleya gaskelliana* has several wonderful qualities: easy to grow, fragrant, and free-flowering with large seven-inch (18 cm) flowers. Most are light lavender with a slightly darker lip that often has a saddle-shaped purple blotch or splash in the center. It blooms right after *C. mossiae* that flowers in May and before *C. warscewiczii* in mid-June. Frederick Sander, the famous nurseryman, remarked with glee, "We now have Cattleya flowers all year round!"

Rock Stars of The Orchid World

Rupicolous orchids, growing in some of the most inhospitable places in the world, surely dazzle us with their beauty and ability to survive and flourish. They are undoubtedly rock stars in every sense of the word.

Cattleya gaskelliana

Some Orchids That Grow on Rocks

These are just a few of them. Some are strictly found as lithophytes (obligate lithophytes), but sometimes some live as epiphytes or terrestrial plants (facultative lithophytes).

Obligate lithophytes	**Faculative lithophytes**	
Angraecum magdalenae	*Acianthera teres*	*Maxillaria notylioglossa*
Angraecum sororium	*Angraecum calceolus*	*Maxillaria picta*
Cattleya gloedeniana	*Angraecum rutenbergianum*	*Maxillaria rigida*
Cattleya alvaroana	*Bifrenaria atropurpurea*	*Paphiopedilum concolor*
Cattleya angereri	*Bifrenaria harrisoniae*	*Paphiopedilum hirsutissimum*
Cattleya blumenscheinii	*Bifrenaria tyrianthina*	*Paphiopedilum niveum*
Cattleya bradei	*Bletia purpurea*	*Paphiopedilum stonei*
Cattleya briegeri	*Brassavola nodosa*	*Paphiopedilum vietnamense*
Cattleya caulescens	*Cattleya elongata*	*Phalaenopsis maculata*
Cattleya cinnabarina	*Cattleya fournieri*	*Phalaenopsis pulcherrima*
Cattleya crispata	*Cattleya gaskelliana*	*Phragmipedium besseae*
Cattleya endsfeldzii	*Cattleya lobata*	*Phragmipedium caricinum*
Cattleya esalqueana	*Cattleya mixta*	*Phragmipedium fischeri*
Cattleya flava	*Cattleya rupestris*	*Phragmipedium hirtzii*
Cattleya ghillanyi	*Cattleya sanguiloba*	*Phragmipedium kovachii*
Cattleya hispidula	*Cattleya sincorana*	*Phragmipedium kovachii*
Cattleya itambana	*Cleisostoma rostratum*	*Phragmipedium lindenii*
Cattleya kettieana	*Coelogyne corymbosa*	*Phragmipedium longifolium*
Cattleya liliputana	*Coelogyne fimbriata*	*Phragmipedium pearcei*
Cattleya lobata	*Coelogyne phuhinrongklaensis*	*Phragmipedium schlimii*
Cattleya longipes	*Corybas geminigibbus*	*Scaphyglottis graminifolia*
Cattleya luetzelburgii	*Cyrtopodium flavum*	*Stelis segoviensis*
Cattleya milleri	*Cyrtopodium glutiniferum*	*Strongyleria pannea*
Cattleya munchowiana	*Dendrobium amplum*	*Thunia alba*
Cattleya neocardimii	*Dendrobium bigibbum*	*Vandopsis gigantea*
Cattleya neokautskyi	*Dendrobium chrysanthum*	
Cattleya nevesii	*Dendrobium kingianum*	
Cattleya pfisteri	*Dendrobium rigidum*	
Cattleya reginae	*Dendrobium speciosum*	
Cattleya rupestris	*Dendrobium teretifolium*	
Cattleya tereticaulis	*Encyclia altissima*	
Cattleya vandenbergii	*Epidendrum radicans*	
Dendrobium chrysanthum	*Epidendrum rigidium*	
Dendrobium striolatum	*Eulophia maculata*	
Jumellea ibityana	*Jumellea rigida*	
Mexipedium xerophyticum	*Lepanthes rupestris*	
Paphiopedilum charlesworthii	*Liparis manii*	
Paphiopedilum tranlienianum	*Liparis stenoglossa*	
Phragmipedium hirtzii var *anchicayense*	*Lycaste macrobulbon*	
Rimacola elliptica		

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