

# DOCENT TRAINING: REGIONAL PARKS BOTANIC GARDEN

## 1. HOW PLANTS ARE NAMED

Glenn Keator

We all know that common names are unreliable; they are imprecise because the same plant may be named differently according to locale or have more than one common name in a given region. And common names change with the language spoken. The same name may be applied to two or more different plants. Finally, common names may mislead by implying relationships between unrelated plants; for example, many so-called lilies are not even members of the lily family Liliaceae. Pond lilies belong to the genus *Nuphar* in a dicot family called Nymphaeaceae, calla lily is really *Zantedeschia aethiopica* in the arum family Araceae, and the toad lily from mountainous California is *Montia chamissoi* in the portulaca family Portulacaceae!

So how do we go about using scientific nomenclature? For one thing we don't use English words. Latin is the standard in which scientific names are given for two reasons: (1) Latin has been the scholarly language for many years (although this is now changing), and (2) Latin is not a living language, so it doesn't favor one spoken language over another. Still, we're at a greater advantage with Latin than are speakers of Japanese or Chinese, since English contains many technical words from and cognates with Latin. Greek or words of other derivations may be used, but they're expressed in a Latinized form.

The categories we're most concerned with begin with family and end with species, and their varieties and/or subspecies. Family is a fairly natural assemblage of plants with common characteristics, but family size varies from a single species (which is called "monotypic"; for example, *Ginkgo biloba* is the sole member of the family Ginkgoaceae) to 20,000 or more species in the orchid family Orchidaceae and the daisy family Asteraceae. Note that all family names end in -aceae, so that it's easy to recognize a family name. There used to be eight exceptions to this rule; newer usage has eliminated those exceptional names so that they are now consistent with other family names. These eight are:

- Palmae (palm family) is now Arecaceae
- Gramineae (grass family) is now Poaceae
- Cruciferae (mustard family) is now Brassicaceae
- Compositae (daisy family) is now Asteraceae ■
- Umbelliferae (parsley family) is now Apiaceae
- Labiatae (mint family) is now Lamiaceae ■
- Guttiferae (a tropical family) is now Clusiaceae ■
- Leguminosae (pea family) is now Fabaceae.

People often ask why we can't simply add -aceae to the old name as, for example, Palmaceae. The reason is that all family names are based on a "type" genus name in the family. There is no genus *Palmus* or *Gramineus*. Thus, *Poa* (blue grass) is the type genus for the grass family Poaceae; *Brassica* (mustard) is the type genus for the mustard family Brassicaceae; and *Apium* (celery) is the type genus for the parsley family Apiaceae.

Another source of confusion about scientific names is just the perversity of human reason. Some botanists are lumpers, others spitters. You can be sure that humans often disagree on what belongs to a family, or whether a

family should be subdivided into two or more smaller families. The larger the family, the more likely it is to have subfamilies and tribes (such as the grasses, daisies, and heathers). Some feel that tribes or subfamilies are worthy

of separate family status. A case in point is the Fabaceae (pea family), which the splitters have made into three families:

- Mimosaceae. Flowers tiny, regular, densely clustered, without showy petals; stamens long and brightly colored. Examples: acacias, mesquite (*Prosopis*), mimosas, fairy duster (*Calliandra*).
- Caesalpinaceae. Flowers larger and showy, irregular but not pea like, petals obvious, stamens not particularly showy. Examples: cassias, redbud (*Cercis*), desert senna (*Senna armata*), palo verde (*Cercidium floridum*)
- Fabaceae. Flowers showy, highly irregular and pea like, with an upper petal called the banner, two side petals called wings, and two fused or partly fused lower petals containing the stamens and pistil called the keel. This is the group we're most familiar with in California's flora.

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Another classic example of splitting or lumping concerns the lilies and their relatives. Since this great assemblage includes several evolutionary lines, the splitters want to make each line a separate family. The lumpers, however, see the similarities between all the lines since they probably had a common ancestor, and so make one giant family the Liliaceae. Some of the families, the splitters have created include:

- Amaryllidaceae. Flowers borne in umbels rather than panicles or racemes. Includes many ornamentals, such as Amaryllis, Bloomeria (golden stars), Narcissus, the alliums (onions and relatives), and brodiaeas (a group of native wildflowers).
- Agavaceae. Mostly large, subwoody to woody trunked plants with large, succulent leaves shot through with strong, tough fibers, and large inflorescences of tubular to bell-shaped flowers. These are typical of our southwestern and Mexican deserts and include the yuccas, agaves, *Beschorneria*, *Nolina*, and several others.

Another source for confusion at the family level is when certain genera don't really fit the usual characters for the family; for example, *Actaea arguta* (baneberry) has fleshy berries, while other members of the buttercup family Ranunculaceae have follicles or achenes. Another example is *Circaea alpina* (enchanter's nightshade) which has two petals and a single-seeded fruit, while other members of the evening primrose family Onagraceae have four petals and capsules or berries with many seeds. When genera such as these are contemplated by the splitters, they often are placed in their own separate families.

## GENERA

A genus is a smaller unit of classification under family. Most genera correspond to roughly what we might call groups of plants, such as oaks (genus *Quercus*), pines (genus *Pinus*), or roses (genus *Rosa*). As such they seem natural units easily understood, although their size may vary from single species (monotypic) to over 1,000 species (e.g., *Senecio* and *Euphorbia*). As with families, opinions may diverge on what constitutes a given genus, and the larger genera are particularly apt to be split up. Note that genus names always start with a capital letter and are underlined (italicized). Good examples of large genera now split include *Brodiaea* (now separated into *Brodiaea*, *Triteleia*, and *Dichelostemma*) and *Berberis* (often split into *Berberis* for those with spines and simple leaves versus *Mahonia* for those lacking spines but with compound leaves). Many other dichotomies occur; sometimes the differences being emphasized by horticulturists, as with *Mimulus* (monkeyflower) for the nonwoody species and *Diplacus* (bush monkeyflower) for the shrubby species. One criterion which is frequently used for separating genera is the ability for different species to hybridize; seldom do members of one genus hybridize with those of a different genus. If that criterion were used, however, mahonias and berberises would be one genus, and so would mimuluses and diplacuses. The one place where the criterion of hybridization doesn't work very well is in the orchid family, where diverse genera have often been crossed in creating showy cultivars. The reason for this is simple: in nature, orchids are pollinated by

specific pollinators to the extent that they never exchange pollen with other species or genera; therefore, orchids have not evolved sterility barriers against gene exchange.

Sometimes learning more about the species within two genera will do just the opposite: unite two different genera into one. A classic example is the genus *Clarkia*, where formerly there was *Godetia* for the cup-shaped flowered species and *Clarkia* for those with fan-like petals. Since there are intermediate species, where no clear line can be drawn, all species are now considered part of a single genus *Clarkia*. The reason the name *clarkia* is used is that is the older name. The same principle is involved with *Rhododendron* versus *Azalea*; species with intermediate stamen number have meant the two groups are united into the single genus *Rhododendron*; again, *rhododendron* is the older name.

Just as genera (plural of genus) denote groups of plants, so species denote specific kinds of plants within genera. Species was once considered the smallest unit of classification; before evolution, botanists believed that species were uniform and unchanging; obviously, they didn't take a good look at what goes on in nature. Nonetheless, species are often the smallest unit in a given group. The kinds of pines or oaks would be good examples of species. Thus, *Pinus contorta* is beach pine, *Pinus lambertiana* sugar pine, *Pinus ponderosa* ponderosa pine, and *Pinus attenuata* knobcone pine. Species names always start with a small letter and, like genus names, are underlined or italicized. When giving genus and species, the genus name always comes first. Think of the genus name as the last name, followed by species name, the first name. Together these two names give us the binomial or scientific name for any given plant.

Unfortunately, species is the most elusive category to pin down; great controversy rages over how species are defined, and what one specialist in a given group does may differ radically from what a specialist in a different group does. Try as we can, there is no one satisfactory definition for species, which remains consistent for all groups. The criterion used by some is that different species do not interbreed or hybridize; with plants, however, there are as many exceptions as groups which "follow the rule." Another criterion is that there are certain traits which are always indicators of one species, and these traits are consistently different in other species. Again, there are many exceptions. One of the most difficult problems in applying the idea of not exchanging genes between species is that gene exchange may be limited to the first generation of offspring, but these offspring may be sterile; or that two species may exchange genes in a garden but would never do so in nature because they're separated geographically. Hopefully, this gives some sense of the difficulties involved. You'll find that species names are also often changed for several reasons:

- An older valid name has been discovered.
- Two species have been lumped together.
- A species has been split into two or more species.
- A species has been transferred to a different genus. If that genus happens to already have a species by the same name, the one with the older name (name used first) is retained, and the one with the newer name has to be renamed.

Finally, we come to the most perplexing categories of all: subunits of species. Since we now know that many species are highly variable, we need ways to designate those variations. This is particularly important for cultivated flowers and fruits where minor variations are often singled out because of their desirability. For native plants, the two smaller categories within species are subspecies and varieties. Unfortunately, some botanists use these categories interchangeably, while others use them in different fashion. We won't delve further into this.

For garden plants, the smaller units are often known as varieties, clones, and cultivars. Unfortunately even less precision is used for these names, with the result that there is great confusion. Varietal names given within single quotes, such as 'Wada's Dream' or 'California Glory' are true cultivar names (cultivar standing for cultivated variety).

Note that many cultivar names are often in English, and they use words beginning with capital letters. Note also that cultivar names are not italicized or underlined. Unfortunately, there is some confusion over just what a cultivated variety is. Some use cultivar to mean a plant with very specific and special characteristics, such as a plants with a single genetic makeup or genotype. Such cultivars are often selected for superior flower color, fragrance, extended blooming time, resistance to disease, cold hardiness, etc. When such

a cultivar is propagated by vegetative means--cuttings, grafting, meristem cloning, or divisions--it maintains those specific traits. Cultivars are often, however, propagated by seed, resulting in unpredictable results for the offspring.

A better way of naming cultivars might be the term "clone, " meaning that all individuals have genetically identical traits, as mentioned above for material propagated vegetatively.

Now for a few rules about botanical nomenclature. Whenever a new name is proposed--say for a newly discovered species--certain rules must be followed in order to assure its correct naming.

1. A pressed specimen of the plant upon which the name is based must be deposited in an herbarium and designated as the "type. " If the type should be lost for some reason, there is a complex set of rules for designating another type specimen.
2. The new species must be described in Latin.
3. The new description must be published in a circulated journal available to scientists.
4. The species name given cannot be the same name used by someone else within the same genus.
5. The genus name must not be used for some other totally unrelated group. (This last problem used to crop up in the days when publications weren't widely circulated or communications were slow).
6. A name validly published and described cannot be rejected on the basis of it being inappropriate. Many inappropriate names already exist, and most of us wish they'd go away, but unfortunately we're stuck with them.

Some examples:

- *Simmondsia chinensis* for jojoba or goatnut. This plant is native to the southwestern U.S. and not China.
- *Rubus parviflorus* for thimbleberry. The name "parviflorus" means little flower, but this species has the largest flowers of all in its group.
- *Mimulus moschatus* for musk monkeyflower. The musk is in allusion to the smell of the leaves, but this plant never smells musky.
- *Prunus emarginata* for bitter cherry. "Emarginate" means with a notch at the tip of the leaf, but this species seldom has this feature.

Just because a new species or genus has been named by someone, this doesn't automatically mean that everyone accepts the new name. Acceptance comes only after widespread usage of that name. Thus, there is no valid reason that you have to say *Sequoiadendron giganteum* for the giant sequoia of the Sierra; the old name *Sequoia gigantea* is still used by some botanists, who have not accepted the idea that this tree belongs in a separate genus from the coast

redwood. An even more vivid example is moving the *zauschnerias* (hummingbird fuchsias) into the genus *Epilobium* (fireweed, willow-herb). Few of us agree that the genus name *Znsuchneria* should be dropped, and so we continue to say that name regardless of what some expert has published!