

Patrick Elvander Taxonomy Trail



The Patrick Elvander Taxonomy Trail at the Arboretum at UC Santa Cruz

A guide for botany students,
botanists, and other plant lovers



How to use this trail guide:

This guide is meant to be used as an aid to those studying plant families in a taxonomy or systematics course, but can be used by anyone who wants a 1 and 1/2 mile walk through some of the major gardens at the Arboretum.

The official start to the trail is by the parking lot closest to High St, but you may start anywhere on the trail. Follow the World Tour Signs. *(Some people will start at the top of the stairs between the Horticulture Building. Follow the World Tour Signs.)

Individual plants are marked with an Elvander Trail logo. The signs list on the first line the common names in regular letters and indigenous names in italics. The second line has the scientific name in italics and the third has the plant family common name and in parentheses the scientific name of the family.

For Gardening information: Read the signs along the 1.5 mile long trail with horticultural information about attractive species from the Californian, South African, New Zealand, Australian, Succulent, and Aroma gardens.

For Taxonomic information: Taxonomy is partly the study of the naming and classification of plants. For this more technical information about plant families, key characters, and relationships use this brochure that we stock near the two major welcome signs at the entrance parking lot and at the Horticulture Buildings We understand there have been recent changes in family delimitations. Please see the Angiosperm Phylogeny Project on the web for current information. We almost always follow their lead. Recent changes in family classification are often noted after the family. This is followed by the genus and species in italics. After this are sometimes directions to help you follow the trail. The plants that are mentioned in this trail guide can have their flowers opened up and examined and a few parts removed. Other plants along the trail may be the only specimen of that species in North America, so there is no collecting of any plant or animal material dead or alive from the Arboretum.

More information on plant families and other topics is available in the Arboretum's Jean and Bill Lane Horticultural Library.

Please send comments and suggestions to:
arboretum@ucsc.edu

Patrick Elvander, our engaging and marvelous instructor of botany, died unexpectedly in 1998. He was only 48 and had so much more to give. He was an extraordinarily articulate lecturer and superb educator. When he taught plant systematics (a subject beset with technical tongue-twisting terminology), he not only delivered the information with surgical precision, but he choreographed, conducted, and performed his material as one born to the stage. His students came away from his classes challenged, inspired, and with great respect for botany and for Patrick. Patrick cared about teaching.

He was highly organized and extremely efficient. For example, he was among the first of the 150 or so authors who co-operated on the Jepson Manual of Higher Plants to complete his section. His treatment on the Saxifragaceae was used to produce a preview edition of the Manual in 1989.

By establishing this Taxonomy trail as a memorial, we hope that Patrick and his marvelous botanical instruction will live on in the hearts and minds of his students, friends, and newcomers alike.

— by Brett Hall, Director of Horticulture and Living Collections, Arboretum at University of California Santa Cruz, 1998.

Major funding for this trail has been provided by the Stanley Smith Horticultural Trust and by friends, family, the Arboretum, and members of Patrick Elvander's undergraduate class, Class of '72, at Pomona College. This printing funded by the Elvenia J. Slosson Fund. Funding for upkeep of the trail is needed. Contributions can be sent to Arboretum, 1156 High Street, Santa Cruz CA 95064

Horticultural and/or conservation information about particular species may be read on signs in the gardens. More technical information about plant families, key characters, and relationships are found in this brochure. You may start at either end of the trail or simply go to the numbered sites of families you would like to see in the garden.

1.Ericaceae Usually woody shrubs. Flowers 4 to 5 merous, often pendant with petals fused into an urn-shaped bell (or Rhododendron like flowers). Stamens have anthers with poricidal dehiscence. (cf Epacridaceae) *Arctostaphylos edmundsii* and *Arctostaphylos bakeri* ssp. *bakeri*.

2.Papaveraceae Leaves generally toothed or lobed, though these are entire. Sepals fall off early, flowers may have 4-6 petals. Fruit a capsule. Often with brightly colored or milky sap. This one w/clear sap. *Dendromecon harfordii*.

3.Saxifragaceae 5 petals, 10 stamens, & 2 pistils. Usu herbaceous. *Heuchera*.

4.Solanaceae Flowers have 5 fused petals which may be plicate. Stamens are epipetalous (filaments are fused to the petals). Leaves are generally alternate. Note *Brugmansia* with 15-25cm long, trumpet shaped flowers by lower restroom. Potato, tomato, tobacco in the family. *Solanum*.

5.Rhamnaceae Usually trees, shrubs or woody vines. Stipules are present. 4-5 petals are concave and curve around the stamens which are opposite and fused to the petals. *Rhamnus californica* Next two are under the *Rhamnus*.

6.Liliaceae Parts in 3's. Plants often bulbous and with contractile roots. Stigma undivided. Seeds often stacked. Incl. *Tulipa*, *Calochortus*, *Fritillaria*. *Lilium*.

7.Orchidaceae 20,000 species, incl. *Vanilla*. Gynoecium and anthers are fused to form the orchid column. Often with swollen pseudobulbs at the base of the stem. Middle petal a lip (labellum) "often with fleshy bumps or ridges and of an unusual shape or color pattern." *Epipactis gigantea*

8.Sarraceniaceae Native w/pitcher-shaped carnivorous lvs. *Darlingtonia californica*.

9.Rosaceae Usu. numerous stamens, w/ hypanthium and nectary disk. Stipules common. Fls 5 merous. Lvs usu alternate, often w/ glandular tipped teeth. Other Rosaceae incl the strawberries near # 13. *Spiraea*.

10.Rhamnaceae Stipules help in keying spp. Incl *Phyllica* in S. African garden. *Ceanothus maritimus* and *C. hearstiorum*.

11.Iridaceae Lvs 2-ranked and equitant. Tepals "modified" as in *Iris* or not as in *Sisyrinchium*. Both sides of path. *Iris*.

12.Garryaceae Dioecious shrubs and small trees with simple, opposite leaves. Flowers in catkins. *Garrya elliptica*.

13.Fabaceae Flowers usually have 5 partially fused petals and sepals, fruit is a legume. Banner, wings and keel. *Lupinus*.

14.Lamiaceae Aromatic foliage, square stems and opposite leaves. Flowers bilaterally symmetrical. Fruit: 4 nutlets. Elsewhere in California, compare with Boraginaceae, which has radially symmetrical flowers and Scrophulariaceae with no "nutlets" *Salvia spathacea*.

15.Plantaginaceae (Scrophulariaceae) Flowers have fused, 5-lobed, 2-lipped corolla that is bilaterally symmetrical. Fruit a capsule, **not** with 4 nutlets. *Mimulus longiflorus*.

16.Poaceae The grass family has hollow stems. The floret is composed of the lemma, palea, stamens and pistil. Fruit is a specialized achene. *Festuca californica*.

17.Juncaceae Leaves are usually round with brush-like bracts & fls. on the sides. *Juncus*.

18.Onagraceae 4 sepals and 4 clawed petals. Single stigma may be 4-parted or capitate. Ovary is inferior. These *Epilobium* were in *Zauschneria*.

19.Malvaceae Was in Sterculiaceae which only had 5 stamens. 5 valvate sepals. 5 petals and 5-numerous stamens fused into a tube around the gynoecium. *Fremontodendron*.

20.Hydrangeaceae Was in Philadelphaceae, but now a subfamily of this one. Lvs usu opposite, simple or lobed. Carpels often ribbed. *Hydrangea* w/ showy sterile fls. *Philadelphus lewisii*.

21.Berberidaceae Plants are herbs or shrubs with alternate leaves and no stipules. Flowers are radial, bisexual and 3 merous. *Mahonia pinnata* ssp. *insularis*.

22.Polygonaceae Sheathing paper-like stipules surrounding the stem. Perianth parts often in 3's, odd for a "dicot." Fruit is a winged achene. *Eriogonum*.

23.Cupressaceae Large trees or shrubs with generally scale-like leaves that completely cover the young stems. *Cupressus guadalupensis*. New world *Cupressus* have recently been put in *Callitropsis*, then into *Hesperocyparis*.

24.Papaveraceae These from the part of the family with bilaterally symmetrical flowers that used to be the Fumitoriaceae. *Dicentra formosa*.

25.Grossulariaceae Palmately lobed and veined leaves, hypanthium present, fruit a berry. Close to Saxifragaceae. *Ribes*.

26.Violaceae Usually herbaceous, but see *Hymenanthera* in the Australian garden. 5 petals,asymmetrical, note nectar guides.

27.Ruscaceae Was in **Liliaceae**. Rhizomatous herbs to trees. Lvs spiral w/parallel venations. May end up in *Maianthemum*. For now in *Smilacina*.

28.Proteaceae Four perianth parts with stamens adnate to tips. Often w/ large inflorescences (esp. in Africa) subtended by showy bracts. *Protea*.

29.Iridaceae Leaves 2-ranked and equitant. 6 perianth parts, 3 stamens. *Watsonia sp.*

30.Aquifoliaceae Lvs opposite. Teeth w/ single vein and opaque, deciduous apex. *Ilex paraguariensis*.

31.Proteaceae See #28. This one bisexual and without large bracts. *Leucospermum cordifolium*

32.Zamiaceae Cones. Large, tough, pinnately compound lvs. *Encephalartos*

33.Restionaceae Rush-like plants especially from Australia, NZ, SE Asia, and South Africa. Lvs. much reduced. Fls in inflorescence or solitary. *Chondropetalum mucronatum*.

34.Cupressaceae See #23 and look for Callitris between # 62 and #63 *Tetraclinis articulatus*.

Go through the gate to New Zealand garden.

35.Laxmanniaceae Inflorescence in cymose clusters. Vessels in lvs. Tepals persisitent in fruit. Was in Dracaenaceae, Agavaceae, and Liliaceae. “just looking for a home” *Cordyline*.

36.Hemerocallidaceae Lvs 2-ranked, folded and keeled. Pedicel usu articulated. Was in Phormiaceae, Agavaceae, and Liliaceae. *Phormium*.

37.Plantaginaceae These unusual in having only 2 stamens. Many different species in the New Zealand garden. They all have opposite leaves with perpendicular orientation. (decussate leaf arrangement a.k.a. 4-ranked leaves) Was in Veronicaceae and Scrophulariaceae. See # 12. *Hebe*.

38.Podocarpaceae Gymnosperm, often only 1 seed per cone, subtended by a +-or- fleshy aril. Male cones catkin like. *Phyllocladus glaucus*.

39.Xeronemataceae Lvs 2-ranked, equitant. Inflorescence superficially reminiscent of *Callistemon*. Was in Liliaceae. *Xeronema callistemon*.

40.Poaceae See # 16. *Chionachloa flavescens*.

41.Araliaceae Shrub or woody vine with simple or compound alternate leaves. Stipules generally fused to the sheathing petiole. Rarely flowers, these New Zealand ones change from juvenile to adult foliage as they get above the height of the now extinct Moas (flightless birds). *Aralia*.

42.Piperaceae Tiny fls densely covering thick spikes. *Piper nigrum*

43.Onagraceae Inferior ovary, parts in 4’s. *Fuchsia*.

44.Asteraceae Composite flowers made up of disk and/or ray flowers. Inferior ovary. Was in *Senecio*, now in *Brachyglottis*.

Go through the gate.

45.Euphorbiaceae With white milky sap that is often caustic, poisonous, and/or allergy inducing. Monoecious or dioecious. Fruit often a 3 lobed schizpcarp. *Colliguaja odorifera*.

46.Winteraceae Carpels “not quite fused.” with suture line. “Primitive” wood. *Drimys*.

47.Quillajaceae See # 11. *Quillaja saponaria* At bench, turn right off main trail and follow dirt path until the dirt road to see *Cupressus* and *Prostanthera*.)

48.Ericaceae Lvs narrow, curled under. Petals usually fused into a tube or bell shape, but also note *Rhododendron*. *Erica*.

49.Polygalaceae Not with banner, wings and keel, though it looks like it. *Polygala*

50.Sapindaceae Petals... with +- basal appendages on adaxial surface... nectar disk present, usu extrastaminal”

51.Asteraceae Composite flowers with ray and disk fls with an involucre of bracts, inferior ovaries.

52.Fabaceae Yes, with banner wings and keel. Compare with #49.

Cross the dirt road

53.Proteaceae See #31. *Grevillea* ‘Australflora Fanfare’

54.Haemodoraceae Monocot with leaves that are two ranked and equitant. Perianth is usually hairy and has the stamens fused to it.

55.Malvaceae See #18. *Alyogyne heugelli* “Purple Hibiscus” white fl. version here. Palmately lobed and veined lvs, star shaped hairs.Stamens fused around gynoecium.

56.Myrtaceae Leaves are aromatic and have glandular punctate dots (pellucid dots) on the underside. Fruit are generally fleshy berries or woody capsules. *Darwinia citriodora*.

57.Ericaceae Styphelioideae group of the Erica family, often with parellel veination in lvs (phyllode-like) in *Epacris*.

58.Iridaceae See #11 &25. *Diplarrena moreoa*

59.Hemerocallidaceae *Dianella* was in Liliaceae, now with Day lilies and cabbage trees.

60.Myrtaceae Pellucid dots.aka gland dotted. *Callistemon*

61.Araucariaceae Branches whorled. Seeds 1 to a scale. Pines have 2 per scale. *Araucaria*.

62.Rutaceae Leaves are alternate and simple or pinnately compound. Some strongly aromatic. Generally 5-merous, solitary, bracted flowers.

63.Fabaceae subf. Mimosoideae. Showy stamens, petals not.Compound lvs or not compound phyllodes. *Acacia*.

64. Apiaceae Umbel family. 5 small sepals. carpels usu 2(-5). fruit usu w/ 2 dry segments.

65. Stylidiaceae Note trigger pollination mechanism.

66. Scrophulariaceae Was in Myoporaceae. Fls more like *Verbascum* than *Mimulus*. *Myoporum*.

67.Fabaceae subf. **Faboideae** *Chorizema X*.

68. Eleocarpaceae Was Tremandraceae. Plants are small shrubs generally with solitary inflorescences. Flowers have 3-5 free sepals and petals with twice as many stamens as petals. *Tetratheca ericifolia*.

Turn right on concrete path.

69. Cunoniaceae “may be recognised by their opposite, usually odd-pinnately compound leaves with serrate leaflets and well-developed often intrapetiolar stipules.” *Bauera*.

70. Lamiaceae See #13. Usu aromatic. 4 nutlets.*Prostanthera*.

71. Dilleniaceae Most have alternate leaves with prominent veins. Flowers have 5 persistent sepals and 5 easily deciduous yellow (or orange) petals. Once thought to be a family with many retained (primitive) characters.

72. Proteaceae Tremendous variation in lvs within the genus. *Grevillea montis-cole*.

73. Thymelaeaceae lvs spiral (alternate) or decussate in these. “Wood often flouresces”. *Pimelea ferruginea*.

Cross gravel road and head down service road.

74. Goodeniaceae Plants are usually herbaceous with alternate leaves, stipules are absent. Fan-shaped flowers. *Scaevola*.

75. Asteraceae *Brachyscome*.

76. Amaranthaceae Was in Chenopodiaceae. No petals, 0-5 sepals. Scurfy leaves, halophytic. *Atriplex*.

77. Magnoliaceae note flattened stamens and stamen scars on old receptacles. *Magnolia*.

78. Magnoliaceae Deciduous woody trees or shrubs. Large flowers have perianth parts that spiral around the stem. *Michelia figo*.

79. Brassicaceae Four sepals, four clawed petals, six stamens – 4 long, 2 short. Note fruit. *Arabis hoffmannii*.

80. Myrtaceae Fleshy fruited part of the family. *Ugni molinae*.

81. Bromeliaceae Monocot. Umbrella-like trichomes absorb water in some species. Look at the hairs on underside of leaf with a hand lens. Leaves are usually in a basal rosette. Flowers are in a terminal inflorescence *Puya bertoniana*. Sharp prickles on leaf margins. *Puya sp. Tillandsia usnioides* “Spanish moss”

82. Verbanaceae Was in Lamiaceae briefly. Now some of Verbenaceae taken out and put in Lamiaceae, but this remains here.

83. Ranunculaceae Indeterminate number of parts in some. Anemone.

84. Fabaceae subf. “Caesalpinioideae” 5 imbricate petals, not banner, wings and keel. *Cassia*.

85. Apocynaceae. These used to be in the Asclepidaceae, but the entire family is now here. Simple, opposite leaves with milky sap. Sepals and petals are reflexed and stamens are fused into a filament column. Intricate pollination mechanisms and pollinia, some are fly-pollinated. e.g. *Stapelia*

86.Foquieriaceae Deciduous leaf blades and branches. the mid-vein of the leaf often remaining as a spine. Tubular flowers. *Idria columnaris*.

87.Agavaceae Succulent with fibrous leaves in a basal rosette. Flowers generally have 6 perianth parts that are partially fused. *Agave*, *Chlorogalum!*, *Manfreda*.

88.Ruscaceae Formerly Agavaceae, Nolinaceae, etc. *Nolina*

89. Sapindaceae Maples are in the portion of the family that used to be the Acearaceae with Leaves are opposite and palmately lobed. Stipules are absent. Flowers are fairly inconspicuous and green with a small nectary disk at the base. Single or paired wingd fruits are common. (Tree above garden and hut.) *Acer macrophyllum*.

90.Aizoaceae Succulent herbs with narrow petals. 5 perianth parts and numerous showy, sterile stamens that resemble thin petals. *Pleiospilos* sp. and other stone plants.

91.Asphodelaceae Succulent leaves have a clear mucilaginous center and are arranged a basal rosette or opposite and distichous. Flowers have 6 partially fused perianth parts. *Aloe*

92.Cactaceae Many genera with typical fleshy stems and spines with glochids at the base. Multiple tepals, showy flowers. fruit often sunken into the end of a stem (in Opuntia).

93.Euphorbiaceae Some can be cactus-like and have spines, thorns, or prickles. Leaves can be easily deciduous. Flowers have two petal-like bracts around a cyathium. Dicot with parts, especially fruits in 3’s. Petals usually not showy, but bracts can be.

94.Geraniaceae Palmate leaves. 5 sepals and 5 petals which may have nectar guides for pollinators. Fruit is a schizocarp or capsule. *Pelargonium crithmifolia*

95.Portulacaceae Leaves are simple, entire, and semi-succulent. Radially symetrical flowers with 2 sepals and 5 or more petals. *Anacampteros* here, also *Lewisia cotyledon* in the family.

96.Crassulaceae Most are succulent herbs, usually leaf succulents, many with waxy leaves. Leaves alternate in a rosette or opposite. Fruit a follicle. Petals and sepals usually in 4’s, 5’s or multiples. Leaves mostly succulent opposite or alternate (in rosettes). Fl parts in 4’s or 5’s. *Dudleya*, *Echeveria*, *Pachyphytum* and *Graptopetalum*.

97.Geraniaceae cf. #94.

98.Apocynaceae In the dogbane part of the family. Many are poisonous. 5 connate petals in a pin-wheel formation (twisted in the bud). Milky Sap. White milky sap. Fl parts fused into a tube with petal lobes often at 90° to tube.

99.Gesneriaceae Petals 5, stamens 4, +- didynamous (2 short, two long)

100.Caryophyllaceae Swollen nodes, opposite leaves, petals often clawed and fringed.

101.Lamiaceae Opposite lvs, square stems, aromatic folliage. *Salvia greggii*.

102.Melianthaceae Serrate lvs, large, toothed stipules. *Melianthus*

103.Melianthaceae Used to be Greyiaceae with leaf sheaths fused to the stems. *Greyia*.

104.Strelitziaceae Tree-like or with rhizomes. 2-ranked leaves with long, sheathing petioles. *Strelitzia*.

105. Fagaceae Monoecious, female flowers are catkins located in the leaf axils. Fruit often an acorn. Leaves are simple, alternate, and petioled with small stipules.Oaks. *Quercus*.

106. Malvaceae Stamens fused into a column *Malacothamnus*

These next ones aren’t part of the trail, but you might be able to find them:

Myricaceae *Myrica californica* Drive or walk up Empire Grade from the Arboretum. Halfway between Arboretum and West Entrance to campus. Hard to find! **Hippocastanaceae** *Aesculus californica* Up Moore Creek outside of Arboretum fences, above “Frog Heaven” artificial frog ponds. Hard to find! Summer deciduous trees with large, dark brown fruits,beyond end of the trail. Or see ones below the UCSC Parking office area, above Coolidge Drive and the parking kiosk. Also in the lower stretch of Bonny Doon Road.**Taxodiaceae** Now in Cupressaceae. The Redwood Family, if considered separately from the cypress family, has 10 genera and 14-17 species. All 10 genera are in the Arboretum, many in the Redwood Family area, which is an area that is closed part of the time now, except for tours. Used for timber, habitats, and ornamental trees. **Salicaceae** Willows. Deciduous trees and shrubs. Leaves are simple, alternate, and usually serrated. Female flowers are catkins usually subtended by a hairy bract. Seeds have a basal tuft of hair. *Salix* Go outside the back gate and to the left or just go across the parking lot from the start of the Elvander Trail. **Amborellaceae** Most primitive angiosperm. First branch off of cladogram of angiosperms. *Amborella trichopoda* (Temporarily off display, except occasionally on tours.) Revised March 29, 2010.