President’s Message
A Good Year to See Plants from the Underground
by Richard Spjut

This winter has been exceptional in precipitation, making it a good year to see plants we rarely see in Kern County such as snow plant (*Sarcodes sanguinea*, Fig. 1), desert sand plant (*Pholisma arenarium*), broom rapes (*Orobanche spp.*), coral root (*Corallorhiza maculata*), and others, all belonging to diverse families: Ericaceae, Ehrretiaceae, Orobancheceae, and Orchidaceae, respectively. I refer to them as plants from the underground because that is where they live perennially, only surfacing annually to show off their flowers in order to reproduce. Underground, they steal nutrients from fungi or plants, either by their root or underground stem (rhizome) connecting with a specific fungal host that in turn forms symbiotic associations (mycorrhizal) with roots of other plants, usually shrubs or trees, or by direct penetration into roots of host plants. In feeding underground, they have done away with photosynthesis, thus, no green leaves.

Probably most familiar is the snow plant, *Sarcodes sanguinea* in the subfamily, Monotropoideae of the heath family (Ericaceae); the epithet refers to the bright red color of the flowers. In Kern County its floral shoots often emerge from the ground during May to July (CCH³). *Sarcodes* roots specialize in connecting to fungal thread-like cells (mycelium) of a truffle-like fungus, “...a handful of soil can contain more than 5000 species”

Fig. 1. Snow plant (*Sarcodes sanguinea*)

Fig. 2. Sugar sticks (*Allotropa virgata*) Humboldt Bay National Wildlife Refuge Complex

The California Native Plant Society is a non-profit organization dedicated to the conservation of California native plants and their natural habitats, and to increasing the understanding, appreciation, and horticultural use of native plants.
Rhizopogon ellenae, which in turn connects with roots of white fir, red fir, or species of pine, all nestled together at the root base of snow plant into a bulbous mass network of mycelia and roots. The mycorrhizal (fungal tree root) association allows the tree to take up water and minerals in exchange for giving carbohydrates to the fungus. From the fungal perspective, it connects with two species of seed plants, one that photosynthesizes — to make food via chlorophyll converting sunlight into chemical energy — to fuel the reaction between carbon dioxide and water, and the other — the snow plant — providing nothing beneficial in return. Thus, it seems that the snow plant uses the fungal hyphae as feeding tubes to siphon off some of the nutrients being taken in by the fungus from the tree.

Other leafless monotropoids in Kern County are sugar sticks (Allotropa virgata, Fig. 2), found in the Greenhorn Mts., gnome plant (Hemitomes confestum), a rarely-seen species with coral-like flowers, known in Kern County from a single collection by James Shevock (Sep 1982) near the summit of Sunday Peak, pine drops (Pterospora) that occurs in the Greenhorn Mts., on Breckenridge Mt., and on Mt. Pinos in the Iris meadow (CCH). They associate with other fungi, for example, sugar sticks associates with mushroom Tricholoma magnivelare (Fig. 3). The monotropoids are not saprophytes — species that live off decaying organic matter — as often indicated in the literature; rather, they are parasites because they take nutrients from living fungal mycelia without giving anything in return.

The coral root (Corallorhiza maculata, Fig. 4), a species of the orchid family, is widely distributed in the western U.S., mostly in the montane coniferous forest but also along coastal regions of California as far south as Monterey County. Its name reflects its coral-like underground stems and spots on its flowers. In the Sierra Nevada it occurs in Sequoia groves where sugar sticks may also be present. For Kern County, CCH has only one record, “Greenhorn Peak,” probably Greenhorn Pass, collected by Gerald Griffith, July 6, 1937 (RSA-POM); however, Twisselmann reported it occasional in montane pine and red fir forests of the northern Greenhorn Range. Its favorite hosts are mushroom genera of Russulaceae.

Two CCH specimens reported as rare plants from Piute Mt. (Fig. 5), may be a new subspecies. L. R. Heckard (1962, 1969, in annotations) noted that the flowers are atypical in their narrower corolla lobes and in their ovary of four placentae instead of two. One was collected by Charlotte N. Smith, 28 Aug 1943, on a westerly slope near the summit of Piute Peak along the road from Bodfish to French Meadows at 8000 ft, where she reported seeing only one plant growing in open among trees (fir, pine) with sage and Ribes. A later collection by Twisselmann — he identified as O. grayana var. feudigei (now O. californica ssp. feudigei) — was found on the southeast flank of Bald Peak where reportedly rare in openings in dense brush along a ridgetop on gravelly soil, 6300 ft (June 22, 1962). L. R. Heckard identified Smith’s specimen in 1962 as O. corymbosa, and in 1969 as O. californica ssp. feudigei. These specimens were again annotated in 2015 by L. T. Collins, A. E. L. Colwell and G. Yatskievych without further change. The subspecies is
The most common *Orobanche* in Kern County is clustered broomrape, *O. fastigiata* (Fig. 6), represented by 21 of the 50 specimens in CCH for the county. The species is widely distributed in North America as also naked broomrape (*Artemisia O. uniflora*) represented by 7 CCH specimens. Both are also known as cancer root. The Montana Indian used the “parasite [O. fasciculata] on sweet sage [Artemisia frigida] roots...for cancer”, while other native Americans used *O. fasciculata* for treating wounds, sores and hemorrhoids. A sample of *O. cooperi* I collected in Baja California Sur in 1981 showed antitumor activity in the NCI astrocytoma assay. The broomrape chemically recognizes the *Artemisia* root by signaling strigolactones, plant hormones that have potential for treating cancer. Broomrapes have also been considered invasive to agricultural crops, especially in Europe and Asia; yet, species native to the California deserts may be in decline.

*Pholisma arenarium* (Fig. 7), commonly known as Christmas tree, scaly-stemmed sand plant, and purple sand food, which usually emerges in sandy places during May to June, was indicated by Twisselmann to be rare in Kern County; however, M. Hall and H.P. Chandler reported long ago (June 8, 1906, CCH) that it was “common from Haiwee Meadows to Red Rock Canyon.” This sand plant parasitizes roots of cheese bush (*Hymenoclea*) and rabbitbrush. A related species, which grows on the Algodones Dunes near Yuma AZ, *P. sonorae* (Fig. 8), looks more like a mushroom. It was a favorite food of the Papagos (Tohono O’odham), but only seasonally since the plants emerge from the sand for short time, April to May, depending also on a good winter rain.

Thus, if you are looking at what appears to be a mushroom growing out of the sand, it could be an inflorescence connected underground to mycelia of a mushroom or to the roots of other plants in a world where “a handful of soil can contain more than 5000 species.”

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