

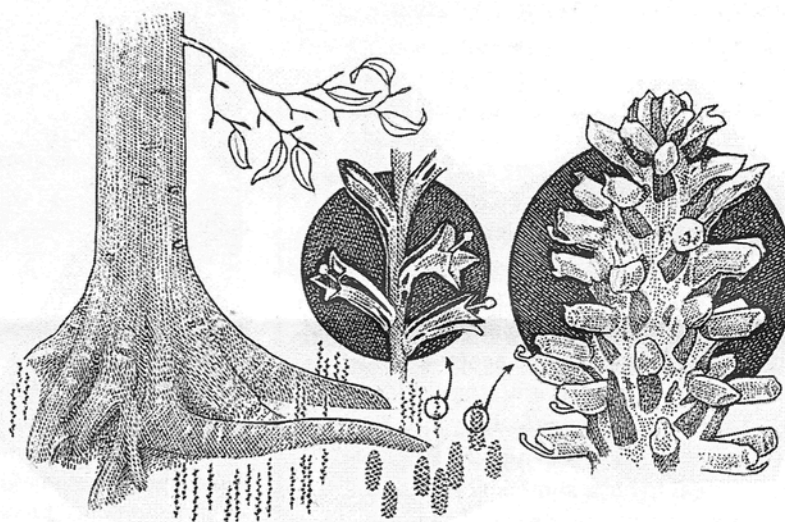
## Autumn Anomalies

Now is the time to take that long walk in the woods to witness Nature's fireworks—when the leaves “start to turn.” Our eyes are drawn to the crimson and scarlet: black gum and red maples, climbing Virginia creeper, and poison ivy. Equally stunning are the deep purple hues of the dogwoods and the maple-leaved viburnum. Along the forest edges, the orange mittens of sassafras mingle with the yellow pillowcases of pawpaw. Filling in the backdrop to this glowing landscape is the gold and bronze foliage of the American beech, perhaps the most common large tree in our forests. “When the leaves start to turn” is a lovely metaphor describing the shift in internal chemistry of broad-leaved deciduous trees and shrubs. Technically, it is the erosion of chlorophyll—the pigment that makes the leaves green in spring and summer and photosynthesis possible—that allows the blazing colors to step forward in the fall.

Under the beech trees is an anomaly in nature as well as a marvel of evolution—plants that have given up producing chlorophyll, not just seasonally like the parent beech, but forever. Clustered on the forest floor surrounding beeches of all sizes are foot-long, upright sticks holding dried flowers—or at least what resemble dried flowers. These are beechdrops, a parasitic plant whose Greek name says it all—*Epifagus*—meaning “growing on beech,” *Epi* meaning on, upon, or above, and *Fagus* being the Greek word for beech (and *Fagaceae* being the name of the beech, oak, and chestnut family). Beechdrops only grow on beech trees and are one of the most common parasitic plants found in North America. What is remarkable about beechdrops is that over the course of evolution they have lost all of their chlorophyll and thus the ability to engage in photosynthesis—that natural alchemy through which plants produce glucose and oxygen from

carbon dioxide and water, using only light as a source of energy. No need to make energetically expensive chlorophyll molecules itself anymore. The innocent looking beechdrop can send down a special root that taps into the mother beech and draws the nutrients it needs to grow, flower, and set seed.

In the plant world, parasitic species are an anomaly but fairly well represented among more



Beech tree roots with parasitic plants: left inset: Beechdrop; right inset: Squawroot.

than 4,000 species that are scattered among 19 distinct families (out of about 250,000 species of plants overall distributed among 415 recognized plant families). This suggests that the parasitic lifestyle has evolved independently among a number of unrelated plant groups. The family to which beechdrops belongs is called the broomrape family (*Orobanchaceae*), holding almost half of all parasitic plants.

Many plants in the broomrape family have given up the photosynthetic lifestyle. Some swing both ways—keeping their chlorophyll to photosynthesize when they need to but gaining nutritional or physical support from the host plant like other true parasites. The most familiar example, and a Christmas favorite, is Mistletoe (a common name for plants of the *Santalaceae* and *Loranthaceae* families), a green plant that

parasitizes the stems of a variety of tree species. Perhaps the tradition of kissing under the mistletoe would fade if more people knew the plant was a parasite. In any event, the nectar and fruits of mistletoe are more important ecologically—as food for sunbirds and other avian species—than the whole plant as a botanical inducement towards procreation in humans.

It is in early fall that beechdrops flower, and if you bend down to look at them, you'll see that the blossom is a two-lipped affair with bright purple lobes, perhaps more inviting of an embrace than mistletoe. Beechdrops produce pollen like other flowering plants and seeds, but they have no green leaves. The clumps of squawroot, also called American cancer root, are the grotesque cousins of the elegant beechdrops; squawroot looks more like a fungus than a plant and parasitizes beeches and oaks. There are also even broomrapes that parasitize fungi, such as the local wildflower known as Indian pipe. This ghostly looking plant rises up a few inches from the soil in late summer and sends out a single pale-white blossom. It is one of around 400 species of flowering plants that parasitize fungi. Look for both along the Cabin John Creek trail.

The word parasite has a negative connotation in our society and certainly a parasitic relationship is one to avoid. But parasitism in the natural world is common and can be a thing of beauty—witness the striking flowers of many species in the broomrape family, including the aforementioned Indian paintbrush, the state flower of Wyoming. The paintbrush genus, *Castilleja*, contains plants sporting bright red, yellow, or orange flowers and is largely pollinated by hummingbirds. These nectar feeders visit the mostly visually stunning plants of the forests and woodlands including mistletoe flowers and many other parasites, disproving the notion that parasites are ugly.

About ten years ago, the advent of molecular genetics threw plant taxonomy into a state of mild chaos and, in the re-sort, Indian paintbrush was chucked into the broomrape family. Ecologically this makes good sense because Indian paintbrush lives on the roots of grasses like little bluestem, its crimson blossoms enlivening the gray Wyoming prairies. These botanical exceptions, aside from being beautiful in their own right, illustrate how anomalies in nature add to diversity, a feature to be celebrated in its own right. —