BOTANY FOR GARDENERS

After reading Brian Capon's *Botany for Gardeners*, 3rd ed. (268pp. Timber Press, 2010) you may never be able to think about plants in the same way again.

"With only roots, stems and leaves to work with, plants modify them in limitless ways, to survive in environments over which they have no control." Plants created the biosphere and continue to support all other life. They could live forever without animals; animals couldn't live at all without them.

Capon calls photosynthesis – plants' ability to use sunlight to create food out of water and carbon dioxide – "the single most important process on Earth." All attempts to duplicate it have failed.

The oldest plants are blue-green algae and bacteria, at a cool three billion years; vascular plants (able to circulate water and nutrients) showed up 300 million years ago as club mosses and horsetails; then came ferns and gymnosperms (cone producers, like pines) and finally, 150 million years ago, the flowering plants. A still living Bristlecone pine was 1,000 years old when Moses led the chosen people out of Egypt.

Plants range from the Sequoia at 340 feet and the Amazon's Victoria water lily with leaves 80" long, resting on water and able to support 165 pounds, to the Wolffia, which in full bloom would fit inside an "o" on this page.

Of the 400,000 different kinds of plants, a third don't have roots, stems or leaves, and 150,000 never produce flowers. Up to 98% of a living tree's cells are dead, including those that conduct water.

Pulling weeds, you've probably noticed that some plants have fibrous roots, others tap roots. But Capon points out that a single plant may grow either, depending on conditions of soil and moisture. One rye plant had fourteen million root segments, totaling 380 miles. Some desert shrubs' tap roots reach down 90 feet. The growing tip of a root, in 1/10th of an inch, contains the genetic potential to elongate stems, arrange leaves, provide for branches and flowers – all arranged to receive maximum sun.

Plants' survival strategies include storing food in tubers, bulbs, etc, and water in tissues (succulents), leaves that eat insects and small animals, the creation of insecticides and strong odors, hormones that effect birth control in insects, and the keeping and feeding of ants for defense. The roots of some bulb species pull themselves deeper into the soil for protection.

The tips of "twiners" – think honeysuckle, pole beans – cast wide circles until they find a support to coil on. Plants can tell time in 24 hour periods, measuring nights' lengths (hence short day, long day and day neutral varieties). They also know when to flower and produce seeds – annuals' only method of surviving harsh winters. "It seems like plants are not only measuring the passing hours, but also anticipating the future."

Defying gravity – remember the giant Sequoia – plants push water from below and pull it from above through transpiration, replacing an unbroken column of molecules through stems and leaves as they're lost to the atmosphere.

Flowers, so far from being innocent beauties, are instead clever lures, using bright pigments and exotic perfumes to help plants reproduce. Once seeds are formed, plants send

them abroad by wind, water, burrs, fruit, parachutes, wings, hooks, in animals' and birds' guts and in the mud on their coats, feathers and feet.

Capon more than fulfils his promise to take us deep inside the world of plants, even into the chloroplasts of their cells. And if he sometimes loses sight of the "for gardeners" in his title, I for one am quick to forgive him, so mind-altering is the picture he paints.