Seed pods are incredible little vessels tasked with protecting seeds as they mature, and assisting with their dispersal. *Dispersal* explores how species have evolved different forms to fulfill these common functions. Individually, each photograph is a fine art portrait of a unique botanic specimen; as a series, the collection becomes a visual and scientific inquiry into the diversity of botanic design. Each specimen profile includes text exploring the seed pod’s relationship to its parent plant and natural environment, and a bit about its ethnobotanical history. The project explores questions of structure and behavior: Why are the magnolia’s seeds red? Why do lotus seeds remain dormant for so long? Why do some trees hold onto their fruits until the seeds have dispersed, while others release the entire vessel?

The project began in Southern California, where I began collecting seed pods—dangling from tree canopies and lodged between sidewalk cracks—in my urban Hollywood neighborhood. I have since collected specimens in the rain forests of Hawaii, the deserts of northern Iraq, and ecologies throughout the United States, including the Arnold Arboretum.
Hawaiian wood rose (*Merremia tuberosa*)

*Collected: February 2012 in Hilo, Hawaii*

*Merremia tuberosa* is an exquisite specimen, this dowager of the woods: a morning glory in youth, a rose in death—its tubular, yellow blossoms are lovely, but hardly memorable. Then, in its senescence, the callow flowers are replaced by the vestments of old age—a dried calyx, a delicate globe that envelops its seeds. I was introduced to the species on a collecting trip in Hawaii last winter. Its native range is Central America, but *Merremia tuberosa* has traveled the high seas to appear in dried flower arrangements in India, the Cook Islands, and French Polynesia. On the leeward side of the island, they blossom liberally along roadsides. Each pod nurtures four black seeds, nested together like a tiny teacake. Ballooning high on a vine, the papery vessels are perfectly positioned to tumble towards new soil, catch a breeze, or drift along in the tide. Hawaii is a good climate for all these dispersal mechanisms, perhaps most of all by water. The seeds occasionally appear along beaches, and more often are carried locally via streams and storm runoff. Hawaiians have names for many of their plants, and the wood rose is no exception. They call it Pilikai, which means “close to the ocean.”
Oriental poppy (*Papaver orientale*)

*Collected: September 2010 in Portland, Oregon*

European plant collectors gathered seeds from mountains adjacent to the Euphrates River in the early eighteenth century, and the species has since dispersed in temperate regions throughout the world, including the Pacific Northwest and gardens in Portland, Oregon. With its tomato-red petals and eggplant-colored anthers, the *Papaver orientale* blossom has long been a darling of botanical illustrators. It is beautiful. The seed pod, however, better reveals the unusual morphology common to species in the Papaveraceae family: there is no style, instead a collection of sessile stigmas radiates atop the ovary, now swelling above a tangle of dehiscent anthers. When mature, seeds are released through small apertures that open below the stigmatic disc. The puckered pod shivers in the breeze, tossing small black bits like a pepper-pot.
Lotus seeds are botanically renowned for their patience—or, more accurately, “persistent seed dormancy.” When they tumble into the water from a bowed stem and ripened pod, *Nelumbo nucifera* seeds will not germinate right away—sometimes, not for many centuries. Instead, they collect together in what becomes an underwater seed bank. It’s a survival strategy, one with two-fold functionality in the genus *Nelumbo*. First, seed dormancy prevents new plants from competing with their parents. A single lotus plant can spread quickly, cultivating an entire fresh water pond in a couple years. Any young plant would have little chance of survival in such a densely populated environment. Instead, the seed remains safely buried underground. When catastrophe strikes, viable *Nelumbo* seeds will regenerate a stricken population (this natural-disaster-contingency is a common explanation for plants that exhibit seed dormancy). The second reason is more particular to the lotus. With their nutritious rhizomes, a pond of *Nelumbo* is a food bank for aquatic herbivores. A family of muskrats or beavers will establish residence and remain for several generations, leaving only when they’ve eaten the entire root system. If new seeds were to germinate, they’d be consumed as well. It’s a good idea, then, to wait until the hungry muskrats depart the pond in search of new tubers. Then, the seeds have a safe—and open—space to grow.
Fleshy-flowered Spindletree (*Euonymus carnosus*)

*Collected: October 2012 at the Arnold Arboretum in Boston, Massachusetts*

In the fall, the Arnold Arboretum’s grove of *Euonymus* trees is a pink haze of plump ornaments. Trees in the genus are characterized by their inconspicuous green or yellow flowers, while the fruits are brightly-colored capsules that split open to reveal seeds covered in an equally bright arillus. Like many other species in the genus, *Euonymus carnosus* appeals to its primary seed dispersal agent—birds—with small flashes of red fleshy skin, from which the black seeds seem to coalesce like droplets. Birds, attracted to red wavelengths, pluck the seeds and consume the wattle-like skin. The seeds are carried for the length of the courier's digestive tract, then dispersed. The specific epithet, *carnosus*, translates to “fleshy,” which refers to the thick flower petals and fruits. *Euonymus* means “aptly-named,” an etymology with origins in Greek mythology. The genus of fiery-leaved trees was believed to descend from Euonyme, the mother of the Furies, as the fruits of the tree are beautiful but can be poisonous. *Euonymus carnosus* is native to forests and woodlands in parts of China and Japan; multiple accessions of this species have grown well at the Arnold Arboretum.
Empress Tree (*Paulownia tomentosa*)

Collected: October 2012 at Lotusland Garden in Montecito, California

Like scales of a fish or feathers on a bird, *Paulownia tomentosa* seeds nest in tight formation—as many as 2,000 to a pod, packed in four interior compartments. Woody, beaked capsules hinge open from a high canopy (often 10 to 25 meters [33 to 82 feet] above ground), offering seeds a long trajectory to seek new ground. Autumn gusts conjure clouds of silvery wings that billow to earth by the millions. *P. tomentosa* flowers are no less marvelous: tubular purple blossoms believed to endow eternal youth in its native China, where it was first recorded in the third century BCE. Today, its prized wood is carved into bridal chests and coffins in Japan and elsewhere. The tree reached American shores in two ways: as an introduced ornamental tree, and, apparently, as a sort of stowaway. There are accounts of its entry as packing material for nineteenth-century Chinese porcelain exports. Traveling major cities by rail or ship, the crates left seeds in their wake—a legacy of empress trees.
It’s not always easy—or possible—to identify a seed pod collected in the wild. I found these in the Iraqi steppe near Jarmo, a neolithic farming site in Kurdistan’s foothills, one of the first settlements to cultivate grains. I was working on a documentary about the future of agriculture in the Fertile Crescent, and, as we were finishing an interview with an antiquities curator, I set down my camera to collect these capsules. They would prove difficult to identity. One can often refer to a flora (a manual listing all plants in a country), but Iraq lacks this document. Begun years ago, it was delayed due to wars and sanctions. Botanists from Iraq and the Royal Botanic Garden Edinburgh have recently resumed the project, but it will take a while. Having yet to collect this species in Iraq’s vast desert wilderness, none of the botanists were able to identify the pods. Meanwhile, I’ve tentatively named it an Astragalus and have sought confirmation from an Astragalus expert in neighboring Iran. When he replies to my query, I’ll have a line to contribute to Iraq’s flora.

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