Assignment: Pollination—Part Two

In the last reading, you learned that most plants depend upon things in the environment, usually the wind and various kinds of animals, to pollinate their flowers. Plants have to do this successfully; otherwise, they will not be able to reproduce. But if plants all want to accomplish the same thing, why do their flowers look so different from each other? Why aren't they all designed the same way to do the same task?

It turns out that flowers vary so much in shape, size, and color because they are all trying to match different pollinators. A flower attractive to a bee, for example, will not necessarily appeal to a bat, butterfly, or bird, and will probably not be capable of being pollinated by the wind. The great diversity of flowers in nature, then, is largely due to the great diversity of pollinators the flowers are trying to match. With this in mind, you can often understand why flowers are designed as they are. Indeed, if you have a specific pollinator in mind, you can even predict what a flower designed to match it will look like!

Photo: Jessica Merz

Take flowers pollinated by hummingbirds, for example. Hummingbirds are incredible animals. The smallest birds in the world, they are no bigger than large moths and butterflies, and, like these insects, they like to feed on flower nectar. To reach the nectar, they often hover like miniature helicopters in front of blossoms and insert their long beaks and tongues deep inside them to reach their sweet, liquid food. The Eastern United States has one species, the ruby-throated hummingbird, but more than a dozen species live in the western United States. Central and South America have hundreds of different species.

If you were a flower and your goal in life was to be pollinated by a hummingbird, what would YOU look like? First, you would want to be noticed. It turns out that hummingbird vision is a lot like humans', so many hummingbird-pollinated flowers are red and orange, because these colors stand out against the green background of plants growing in forests and fields. How would you smell? Hummingbirds, like most birds, have no sense of smell, so flowers designed to match them typically have no scent, whatsoever! How would you be shaped? Take a look at the hummingbird photograph, and you can see that its bill is long and needle-like, like most hummingbirds. So, the typical flower pollinated by these birds is long and tubular, like a miniature trumpet. How would you arrange to cover the hummingbird with pollen, so it would do what you want

(unintentionally!) and carry it off to another blossom? You would have your anthers sticking out of the blossom, ready to brush pollen on the head or bill of the bird hovering in front of you. If you were designed like this, you would stand a good chance of being pollinated by a hummingbird. (Congratulations!)

Photo: David Wilbanks

But, would you also succeed in being pollinated by a bumblebee? Not as likely, for several reasons. First, bumblebees cannot see the color red very well, but they can perceive blue, violet, and even ultraviolet, which neither humans nor hummingbirds can see. Secondly, bumblebees, like most insects, have extraordinarily sensitive senses of smell. To attract them with pollen or nectar to eat, you would do well to have a sweet scent to advertise your wares. And, it wouldn't help to dangle your anthers out of the blossom, because the bumblebee will probably land on the flower and miss them entirely. So, bumblebee-pollinated flowers are often blue or violet. Some of them are also white or yellow with stripes that reflect ultraviolet light, which bees can see but humans can't. Bumblebee-pollinated flowers also have sweet scents to advertise their nectar and pollen, and they are usually sturdy to suit a relatively heavy insect.

Photo: Eric Milot

You can see, then, that flowers are not designed randomly, but rather to match specific pollinators. So, butterfly-pollinated blooms, such as milkweed, are often yellow, pink, or orange and flat across the top to provide a landing strip for the insects to stand on as they sip nectar (left photo). Flowers pollinated by night-flying moths typically bloom at night, are sweet-smelling, and are long and tubular in shape to fit the moths' long tongues. In the American southwest, such as Texas and Arizona, bats serve as pollinators. The flowers that attract them also bloom at night and are white (so they might be seen on moonlit evenings) and sweet-smelling, but they are also very big to hold large amounts of nectar and pollen needed to attract these relatively large pollinators. They also stand exposed at the ends of high branches where they can be noticed. The flowers of the spectacular saguaro cactus of Arizona and the agave plant of Texas are examples of bat-pollinated flowers.

Some flowers, however, offer no nectar or pollen or anything else to bribe pollinators to carry off pollen. Examples are flowers pollinated by wind. Obviously, they don't try to attract the attention of the wind, since wind can't see or smell; they simply wait for the wind to come along and pollinate them. Wind-pollinated flowers often escape our attention; they typically have tiny or even

non-existent petals, are green or brown, and have no scent. Their stamens and pistils often dangle exposed to the air, so that the slightest breezes will be able to pick up their pollen and deposit it on the desired flowers. Whether the pollen does this will depend entirely on chance, so wind-pollinated flowers produce massive amounts of pollen, because most of it will be wasted. Most of the trees and grasses in the United States are wind-pollinated. Though we often don't notice the flowers themselves, we do notice their effects: All this blowing pollen brings about the watery eyes and runny noses of hay fever.

Then, there are some flowers that attract pollinators through deception. Instead of offering food, they misrepresent themselves to trick pollinators into serving them without receiving anything in return.

Photo: hiromama

One example is the skunk cabbage (right photo), found commonly in swampy areas in the eastern United States. The skunk cabbage receives its name from the unpleasant odor its leaves give off when crushed. The flower, too, has a bad smell. Blooming in late winter, it is maroon in color and shaped like a monk's hood. What could find this strange flower attractive? It turns out that flies come to the flower readily, but not for nectar and pollen to eat. Instead, they are looking for dead animals and even animal excrement on which to lay their eggs, and they think that's what the skunk cabbage flowers are! The flies unintentionally carry pollen from flower to flower in their futile quest for a place to lay their eggs.

Photo: Gunnar Norman

And then there are a few flowers that live along the Mediterranean Sea in southern Europe. These actually look and even smell like female bees (left photo). Male bees visit the blossoms and attempt to mate with them, in the process picking up pollen that they carry from flower to flower in their quest for romantic fulfillment!

You can see that the world's incredible variety of flowers is specially designed to attract an equally amazing variety of pollinators. There is no "one size

fits all" flower that is pollinated by everything possible: birds, bats, wind, bees, etc. Likewise, no super pollinator exists that is capable of pollinating everything that blooms. This is very important to keep in mind when we think about how to protect biological diversity on our planet.

If we want to protect a flower, we have to protect its pollinators too. We have to be careful with our insecticides so we do not kill off the bees, moths, butterflies, and other insects that pollinate so many of our plants. We also have to protect the habitats of all of the birds, bats, and other animals that play vital pollination roles. Likewise, to protect animal diversity in our world, we have to protect the many plants that feed them nectar, pollen, and other foods. It is not sufficient to simply preserve only a few pollinators, because that will leave many flowers unpollinated and unable to reproduce. It is not enough to preserve only a few plant species, because many pollinators will be unable to find the food they need.

Plants and pollinators depend upon one another for their survival. We humans depend on them as well. Most of our food plants except for grains and cereals, for example, depend upon animals to pollinate them. Preserving both plant and pollinator diversity is not only vital for a healthy, beautiful, and fascinating planet, it is essential for our continued well-being.

Glossary

Deception: trickery

Habitat: a place where a plant or animal can get the food, water, shelter, and space it needs to live; there are many different habitats for various species

Insecticides: chemicals used to kill insects; they are used by farmers on crops as well as by homeowners in their homes and yards

Nectar: a sweet liquid secreted by the flowers of some plants and consumed by its pollinators

Pollen: the dust-like specks that hold male sperm cells found on the anthers of flowers; some plants produce pollen in large quantities, providing food for their pollinators that visit the flowers because of this food source

Ultraviolet light: electromagnetic (light) waves that are slightly shorter in wavelength than the visible colors that we see; they are invisible to us but can be detected by the eyes of some insects