THE BIRDS AND BEES

by Frederick B. Essig

photo by Frederick B. Essig

The reddish, tubular flowers of Hamelia patens *are adapted for pollination by hovering hummingbirds.*

When it comes to sexual reproduction in plants, it is quite often literally up to the birds and bees - along with butterflies, bats, flies, wasps and the occasional lemur! Eggs are housed in the female parts of flowers - the pistils - and sperm cells are brought to them by pollen grains. Like most earthly creatures, plants must somehow get egg and sperm together in order to create new individuals. The various ways that plants accomplish this is one incredible story.

In pines, oaks, grasses, sedges, cattails, birches, beeches, maples, elms, pecans, and many other plants, pollen is transported from one plant to another by the wind, an ancient method that gives many of us allergies. But the majority of flowering plants are adapted to entice, seduce, manipulate, or just plain hoodwink various kinds of animals into serving as their couriers. This is why flowers have such a variety of colors, fragrances, and shapes.

photo by Frederick B. Essig

The starflower, Stapelia, *a simple carrion flower, attracts flies with its foul odor and brownish color.*

Pollen is produced by the stamens of one flower, and must be deposited onto the stigma of another flower. Although humans can duplicate this process with a small brush, understanding how nature does "it" can make creating the next great hybrid that much easier.

For most kinds of flowers, pollination can take place only at certain times, but there is great variation in this. At one extreme, most epiphytic orchids are continuously receptive to pollination for 1-2 weeks. As long as the flowers look fresh, pollination can take place. At the other extreme, some flowers (like our native sundew, *Drosera capillaris*), are open for less than

photo by Frederick B. Essig

Butterflies have mouths like long needles or straws to suck up the sugary nectar.

2 hours in the late morning.

The period during which a flower can participate in the pollination process is called anthesis. Male anthesis is when the anthers split open and release their pollen; female anthesis is when the stigmas are spread open, fresh and glistening, and slightly sticky. Male and female anthesis always occur at the same time of day, but not necessarily in the same flower on the same day. The common amaryllis flower avoids self-pollination by releasing pollen one day, then having its stigmas receptive the next day. By insuring that breeding occurs only between flowers from different individuals, the offspring are genetically diverse and better able to adapt to future environmental challenges.

Brightly-colored flowers generally are active during the day, lack fragrance, and rely on animals with good color vision (birds, bees, butterflies) for pollination. White or drably-colored flowers are usually active at night, and rely on strong fragrances to attract nocturnal animals like moths and bats to do the deed.

Once the animals are drawn in, most need to be rewarded so they will want to visit another flower of the same type. Nectar, a liquid loaded with sugar, is the primary food for moths, butterflies, birds, some small mammals, and many kinds of bees. Many flowers produce nectar, including honeysuckle, jasmine, clematis, poinsettia, petunias, and most members of the sunflower family.

For animals that are primarily pollen-feeders, flowers must produce large quantities of pollen - enough to satisfy the visitors, while leaving a few grains stuck on the nose, back of the head, or some other inaccessible place. With luck, these will get knocked off when the animal visits the next flower.

The shape, size, and orientation of the flower also relate to how it is pollinated. Some flowers, such as jasmines, honeysuckles, lantana, pentas, and blue porterweed, have their petals joined into a narrow tube with a drop of nectar at the base. Only animals like butterflies, moths, and hummingbirds can reach the nectar with their narrow feeding tube or bills, and often the length of the tube in a particular flower matches the length of a particular animal's feeding apparatus. Such exclusive arrangements insure great loyalty on the part of the animals, and highly-efficient pollen transfer. Such species of flowers generally produce much smaller quantities of pollen than others.

A flower that hangs downward, particularly if it is red, is likely specialized for pollination by hummingbirds. They hover directly under the flower and direct their long bills upward into its narrow tube. The red color is invisible to bees and most other insects, so the nectar reserves are not drained by unintended visitors.

Bees do not see red, but yellow, blue, purple, and even ultraviolet are highly attractive to them. Most bees do better if they can land and crawl into a flower, so many bee-pollinated flowers stick out horizontally

photo by Frederick B. Essig

Amaryllis avoid self-pollination by shedding pollen one day (left) and activating their stigmas the next (right).

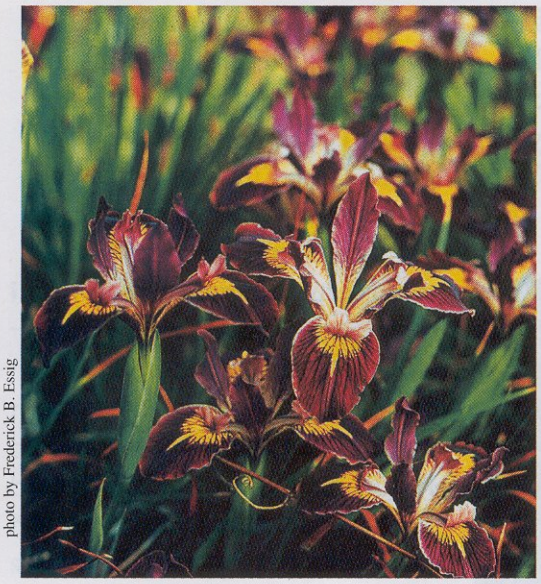

photo by Frederick B. Essig

Irises provide 3 landing platforms for bees.

from the stalk, and their lower petals are modified into elaborate "landing platforms." The most ornate part of most orchid flowers is the lower petal, which folds around the reproductive organs at its base and juts forward to form a broad, colorfully-marked runway for the appropriate species of bee. Members of the mint and snapdragon families also provide landing platforms for bees; irises provide 3 such runways.

Very large animals such as bats will only visit large flowers with lots of food in them. Bats generally fly at night, so flowers adapted to exploit their movements are large, white, fragrant, and open at night. In Florida, a number of species of night-blooming cacti are visited by flower-feeding bats, if any are around.

Ironically, other large flowers like magnolias are pollinated by tiny beetles and other fairly primitive insects. The beetles swarm over the stamens and stigmas, occasionally carrying a pollen grain to another flower. This primitive means of pollination was used by the very first flowers.

Some flowers, however, provide no reward to visitors. They rely on the fact that insects are fundamentally not very bright and can be tricked into thinking they're going to get a reward. This is particularly true for carrion flies who go into a frenzy when they detect the enticing fragrance of rotting flesh. The starflower (Stapelia), Dutchman's pipe (Aristolochia), and certain aroids like the grotesque *Amorphophallus paeonifolius*, emit a remarkable imitation of the smell of corpses, and are a deep, mottled brown color to match. The flies swarm and bumble around looking for food, until they give up in frustration. But as they fly off, they inevitably carry a few pollen grains stuck to their bodies. Some will be drawn to another false corpse and go through the whole process again.

photo by Frederick B. Essig

Which bee is actually pollinating these flowers?

Certain orchids disguise themselves as female bees and wasps and lure males in with the promise of sex. In their unsuccessful attempts to mate with the orchids, the male bees or wasps carry pollen to the next bogus female they encounter. Orchids have a unique strategy for achieving pollination. Each flower contains a million or more tiny embryonic seeds and a corresponding number of pollen grains. The pollen grains are all stuck together into one or 2 big lumps called pollinia; if one sticks to a visiting insect who carries it to another flower, all of the embryonic seeds will be fertilized at the same time.

Every unique kind of flower has a unique method of pollination. To make your dreams of the next great hybrid come true, just follow the birds and the bees and do what they do.

An Associate Professor of Biology at USF in Tampa, Frederick B. Essig wrote about tabebuias in the Feb/Mar 04 issue of ***Florida Gardening.***

Further Reading

Principles of Pollination Ecology
by Faegri and van der Pijl
Pergamon Press 1971

The Natural History of Pollination
by Proctor, Yeo, and Lack
Timber Press 1996