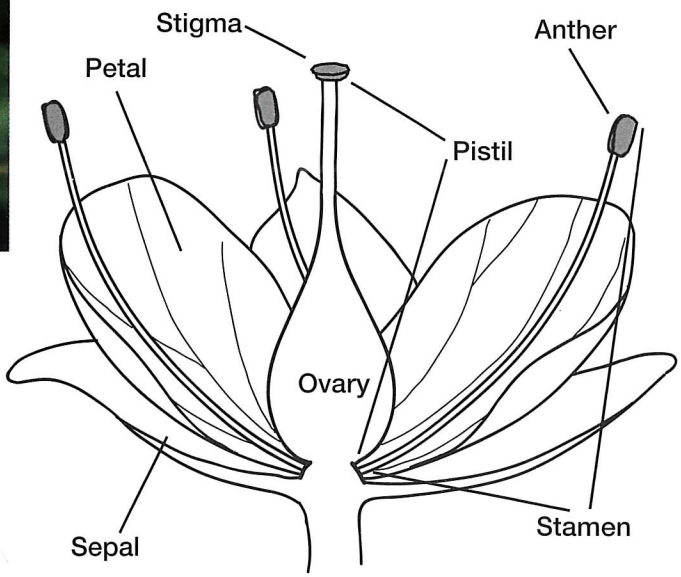
Flowers to Seeds

Why do plants produce flowers? Is it to provide people with something pretty to look at? Or maybe to supply food for bees? Not at all. Flower production serves the best interests of the plant. Flowers are serious business for plants and involve the survival of the species. Flowers are about **reproduction.**

Flowering plants engage in **sexual reproduction.** This means that a male cell and a female cell must unite to produce a new life—the next generation of that plant—a new baby plant. Although plants achieve this union in a great variety of ways, the story can be generalized.

First a brief tour of the parts of a flower. The most visible and showy parts of a flower are the **petals.** Around the base of the petals, where the flower attaches to the stem, are some green leaflike structures called **sepals.** When flowers are starting to develop, the sepals completely enclose the bud. Once the flower opens, the sepals help support the flower on the end of the stem.



The reproductive parts of the flower are in the middle. Reaching up from the center of the flower are several **stamens,** the male parts of the flower. Each stamen has two parts, the long, thin **filament** that is tipped with an **anther.** The anther is usually orange or yellow. Thousands of **pollen grains** form in the anthers. Inside each pollen grain is the specialized male sex cell, the **sperm.**

Right in the middle of the flower is the **pistil,** the female part of the flower. The flattened tip of the pistil is the **stigma,** and the base of the pistil deep inside the center of the flower is the **ovary.** Inside the ovary are the **ovules,** the "nests" in which the specialized female sex cells, the **eggs,** reside. That's a flower.

Pollination

In order to produce a new plant, a female sex cell (egg) and a male sex cell (sperm) must unite to form a single cell that has information from both of the parent cells. The combined cell is said to be **fertilized.** This single fertilized cell divides and grows, eventually developing into the living embryo of a new free-living plant.

So how do the two sex cells meet and unite? The answer is **pollination.**

Plants don't get around to meet each other. This is potentially a problem when it comes time to reproduce. If a female egg can be fertilized by the pollen on the anthers right there in the flower with her, it's easy to imagine what might happen—a little breeze or a bump might launch a pollen grain in the right direction for pollination to occur. But this doesn't happen in most plants. Eggs can't be pollinated by pollen from the same flower; the pollen must come from another flower on the plant or, in some cases, from a flower on another plant. How do they manage?

They have help. Plants rely on an agent of some kind to carry the pollen from where it is produced to a mature stigma. The two primary agents are wind and animals.

Some plants produce oodles of tiny pollen grains that are easily carried on the wind. That's their strategy for pollination—throw billions of grains into the wind and some are bound to strike pay dirt.

Plants that use wind for pollination tend to have tiny, plain flowers. Grasses are wind pollinators. Have you ever seen grass flowers? Take a look next time you are around a field or unmowed lawn. Grass plants just don't invest much energy in their flowers.

Most flowering plants need assistance from an animal to carry pollen from point *A* to point *B.* Insects do the largest share of the work. Most plants do not, however, wait passively for an insect to happen by. They actively advertise their presence and even bribe insects to transfer pollen. The advertisement is the bright colors, patterns, shapes, and fragrances, and the payoff to insects that respond to the advertisement is sweet nectar and nutritious pollen.

The Honey Bee

The most celebrated of the pollinators is the honey bee. Scientists have determined that bees can see in the ultraviolet range. Humans can't. Flowers that appear yellow or white to us may look blue or violet to bees. Often the ultraviolet color is in the center of the flower, so that the pistil and stamens are positioned right on the bull's-eye as the bee approaches.

The bee sips nectar or gathers pollen, both essential food sources for the bee colony. Because nectar is deep in the center of the flower, the bee has to scramble over and around the pollen-loaded anthers to get at it. In the process, she gets pollen stuck on her hairy thorax and abdomen.

When the bee flies off to her next stop, she usually looks for a flower of the same kind. When she lands there, once again she will scramble over the stamens and the pistil, leaving pollen grains on the stigma as she does. When pollen is deposited on the sticky stigma, pollination is complete. It's not only honey bees that do this. Many other kinds of bees, and other insects as well, visit flowers for nectar and pollen.

Flower Diversity

The diversity of flowers in the world is the result of the process of evolution. Each flower variation that showed up as a result of chance had to attract a pollinator or the plant that displayed the new flower would not reproduce, and therefore would disappear from the world. Thus each and every flower is adapted to attract one or more pollinators reliably.

Hummingbirds have virtually no sense of smell; they are attracted to brilliant colors. Butterflies often feed only on flowers that are of a similar color to their wings, which helps camouflage the insect. Moths are only active at night. They are attracted to large white flowers adapted to bloom after dark.

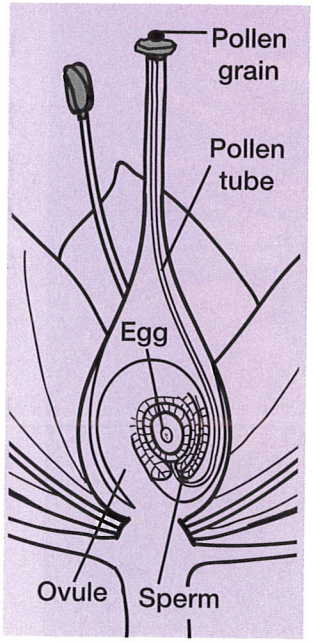
Scent is a powerful attractant. Moths can home in on a strong, sweet aroma to find night-blooming flowers. But not all pollinators are drawn to sweet smells. Flies are also important pollinators. Often the

odors that attract flies are a far cry from what we think is a floral scent. Some flowers smell like old rotting meat or dung. Such plants fool the flies into acting in their behalf as pollinators. But can you imagine...a bouquet for your sweetie of flowers that smell like...!

The shape and arrangement of petals on a flower add to its appeal to certain pollinators. Butterfly tongues are very long, giving them access to nectar in deep, narrow tube flowers that are not accessible to other insects. Flies have short blunt tongues and more often visit shallow flowers that have small amounts of nectar readily available.

After Pollination

After successful pollination some plants stop putting energy into producing pollen and nectar and maintaining petals. Energy is now directed to the development of seeds. A few flowers change color after pollination. The Texas bluebonnet has a small white spot to direct the bee to the pollen. After pollination the dot turns red, signaling potential pollinators not to come because there is no longer a supply of nectar and pollen.



After successful pollination, fertilization begins. The male sperm cell inside the pollen grain on top of the pistil must fuse (join) with the female egg cell deep inside the ovary at the base of the flower. Shortly after landing on the sticky stigma, the pollen grain performs an astonishing feat. It grows a long tube, like a root, down the length of the pistil and into the ovule. The sperm, which contains the male's genetic information, travels through the pollen tube into the ovule to fertilize the egg, which contains the female's genetic information.

The story continues. After successful fertilization, the single cell divides, and each of those cells divides, and on and on until the many cells develop into an embryo. Then development stops.

The parent plant supplies the resting embryo with a package of energy-rich food, the future cotyledon, and wraps the whole system in a weatherproof coat. The plant has produced a seed, the living package that will produce the next generation of the plant.

Some plants have flowers that produce a single seed, like a peach flower or a cherry blossom. In this case the ovary contains only one ovule. Other plants, like green beans or apple trees, have flowers with maybe five to fifteen ovules in the ovary, and others, like tomato and watermelon flowers, have hundreds of ovules in the ovary. Each ovule has the potential to produce a new plant if it is fertilized.

At the same time the fertilized ovule is developing into a seed, the ovary that

surrounds the seed is developing into a **fruit.** The fruit is any structure that grows around the seeds to ensure the survival and success of the next generation. Familiar examples of fruits include grapes, lemons, cantaloupes, and pears. Scientifically speaking, a number of objects that we often refer to as vegetables are in fact fruits, including tomatoes, squash, beans, cucumbers, olives, peanuts, and eggplants. The general rule is that, if it has seeds, it is a fruit.

Composite Flowers

Composite flowers, such as sunflowers, daisies, and dandelions, have wide, flat faces that are actually hundreds or even thousands of tiny **florets.** Each floret is a complete flower. Many types of insects can pollinate them, and as they move from floret to floret, they track pollen all over the place. An insect can crawl around for a long time, feasting and pollinating at the same time.

Each floret has an ovary with a single ovule, so each floret produces a single seed. The ripe sunflower seed head is a marvel of seed packing. And everyone is familiar with the puffy seed head of the dandelion with a tiny seed attached to each of the windblown parachutes. Next time you give one of those seed heads a puff and watch the delicate seeds fly off, take a look at the bare remains on the end of the stem. You will be able to see the texture on the vacant seed head that indicates where each of the little seeds developed.

Flowers are much more than pretty decorations on plants. Flowers are highly evolved structures designed for one purpose: reproduction. The more attractive it is to a potential pollinator, the more successful the plant will be in the continuing struggle to survive and reproduce.