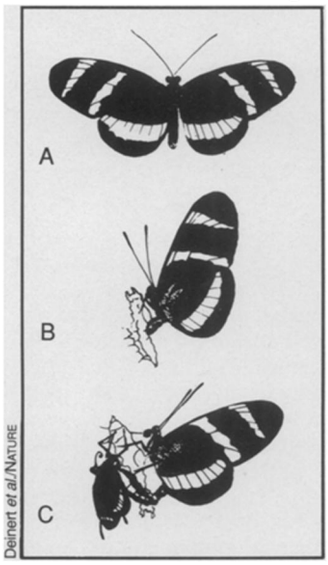
Best males have big wings, small bodies



Deinert *et al.*/NATURE

Male butterfly (a) digs into cocoon (b) to await and mate with an emerging female (c).

Impatient for procreation, some male *Heliconius* butterflies attempt to claim a mate before she has even emerged from her cocoon. The male settles on a female's cocoon, often jamming its rear end into the casing to stabilize its perch. Rivals will then circle the cocoon, sometimes landing as well. One male can displace another if the suitor tires and falls off before the female makes her appearance.

For 4 years, Erika I. Deinert and her colleagues at the University of Texas at Austin followed these courtship tactics in 235 marked male butterflies. Each courtship involved several males. In all, the researchers witnessed 27 mating events.

It turns out that older, more experienced males fared no better than younger ones. The larger males more often cornered a cocoon, but because of their more flexible abdomens, smaller males were more successful in holding on to their potential mates, Deinert, John T. Longino, and Lawrence E. Gilbert report in the July 7 NATURE.

Thus, natural selection favors neither large nor small males. Instead, it has led to a change in the relative size of wings and bodies, say the researchers. They reached this conclusion by comparing the wing and body lengths of three species of butterflies that engage in pupal courtship with four related species that do not. The two groups had similar wing and body lengths, but pupal-mating species had much longer wings relative to body size than did the other species, they note.

Gene controls cell shape, floral brilliance


Ken-ichi Noda *et al.*/NATURE

Snapdragon

Snapdragons come in many hues, providing colorful accents for summer gardens. It stands to reason that a pale pink variety simply fills its petals with less pigment than its darker counterparts and that certain genes guide the amount of pigment produced.

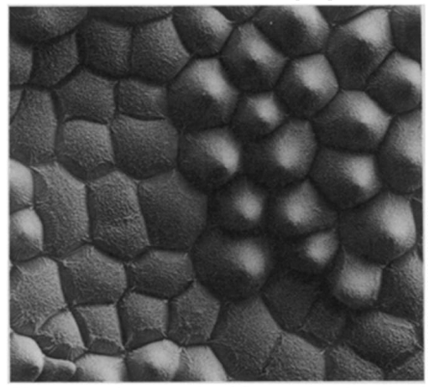
But that isn't the case in at least one snapdragon, says Cathie Martin, a botanist at the John Innes Institute in Norwich, England. She and her colleagues have discovered that a single gene can ruin a floral finish, but not in the way they had expected. When snapdragons inherit a gene called mixta, they look pale in comparison to those that don't have this gene.

The mixta gene looks like other genes in other plants that researchers have studied. Those genes regulate pigment production in corn, for example, by controlling the activity of genes that code for proteins involved in such production. But the researchers detected no difference in the amounts of pigment in snapdragons with and without mixta, they report in the June 23 NATURE.

Other scientists have demonstrated that the intensity of some floral hues can depend upon the shape of the cells containing the coloring pigment. Cone-shaped surface cells focus more light onto pigments, enhancing their vividness; flat cells lead to duller, paler flowers.

Instead of controlling genes involved in pigment production, mixta guides genes that help control the amount of cell wall produced along the outer edge of cells on the petal surface. The thicker, more corrugated this surface, the more intense the coloration.

Cells with mixta fail to develop these thick walls and pointed geometries. When the researchers remove cell walls, the color differences between mixta and nonmixta petals disappear, Martin says. Never before have scientists pinpointed a single gene that could shape cells like this, she adds.


Ken-ichi Noda *et al.*/NATURE

Electron micrograph of flat and pointed cells.

"[Mixta]'s acting very similarly, but it's doing very different things," says Martin. "Yet it's having a similar effect."

The researchers succeeded in tracking down the mixta gene because when they bred mixta snapdragons with wild snapdragons, they first obtained petals with both flat and pointed cells that corresponded to dull and bright coloration. This indicated that a piece of DNA was jumping in and out of the gene, causing cell-to-cell variation. By comparing DNA between bright and dull regions, they pinpointed this piece, called a transposable element, then used it to find the mixta gene itself.

Once geneticists understand better how conical cells develop, they may be able to use this gene or its relatives to enhance the colors of flowers that do not make pointed cells or to make plants more shade-tolerant by creating leaves with conical cells that gather light more efficiently, Martin suggests.

Perfect timing: Fungi use plant cues

Scientists have long wondered how a green, unblemished tomato can arrive at market a black, moldy mess. Now they know that the tomato surface may harbor invisible fungal spores that sense the production of a gas called ethylene as the fruit ripens. The ethylene causes the spores to germinate just as the fruit becomes most vulnerable, says Pappachan E. Kolattukudy, a biochemist at Ohio State University in Columbus. Certain plants—bananas, avocados, and tomatoes, for example—sharply increase their production of ethylene as they ripen.

Thus, for the fungus to use this cue "is a simple, logical, failsafe mechanism," Kolattukudy says.

He and visiting Israeli plant pathologist Moshe A. Flaishman observed that spores placed on a microscope slide reacted to ethylene but not to other, similar hydrocarbon gases such as methane. The spores also became active when placed on unripe fruit and exposed to ethylene or to a compound that produced this gas. However, they did not germinate when placed on a transgenic tomato incapable of making ethylene, the researchers report in the July 5 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

After exposure, the dormant spores send out thin tubes. A spoonlike plate forms at the end of each tube, attaches to the fruit surface, and penetrates the surface with a pointed peg. "The infection then takes off," Kolattukudy says.

The same chemicals that inhibit a plant's ability to react to ethylene also make the spores insensitive to this gas, an observation suggesting that the fungi may have co-opted the plant's ethylene receptor for their own use, he adds.