Color code tells bumblebees where to buzz

Some flowers spurt pollen only when bees shake them just right. Some display color changes that welcome insects to the freshest blooms. A flashy North American wildflower depends on the rare combination of these specialized pollination tricks, report Brendon M.H. Larson and Spencer C.H. Barrett of the University of Toronto.

In the April AMERICAN JOURNAL OF BOTANY, they analyze the wiles of the Virginia meadow beauty, *Rhexia virginica.* For an East Coast flower, it "looks too gaudy, too tropical," Barrett says. Pink petals contrast with big yellow anthers, the organs that hold pollen.

Insects can grope around all they want, but the anthers release pollen only when buzzed. Bees must shiver their wing muscles, turning into live tuning forks. Vibrating anthers then shoot out streams of pollen grains. Bumblebees, but not honeybees, shake pollen from the meadow beauty, report Larson and Barrett.

Only a few buzz-pollinated species change color with age. However, on the second day a meadow beauty blooms, its anthers fade to pink. At this point, "reproductively, they're kind of eunuchs," Barrett notes. Both male and female gametes have lost most of their viability.

However, these otherwise useless blooms bulk up the display, Barrett points out. He and Larson found that big clumps of flowers, even if some are has-beens, attract more bees than skimpy displays. Once bees arrive, they use the color cue to focus on first-day flowers.

The meadow beauty's strategy avoids penalties of a plant's overselling itself. The danger of flashing a lot of flowers, Barrett says, is that pollinators just crawl from one to another, wasting the plant's pollen on its own blooms. The color change allows an alluring display but minimizes the number of blooms any insect visits. There's lots of dazzle, he says, "but the plant isn't paying the cost."

This observation fits with non-buzz flowers that shift color with age, notes Martha R. Weiss of Georgetown University in Washington, D.C. In the systems she studied, display-mass matters and pollinators avoid spent blooms (SN: 4/11/98, p. 233). She also tallied at least 214 genera that include color-shifting flowers.

About 8 percent of the world's flowers rely on buzz pollination, says Stephen Buchmann of the Department of Agriculture's Carl Hayden Bee Research Center in Tucson. Many of these grow in the tropics, but temperate-climate tomatoes, potatoes, blueberries, and cranberries need a good buzz, too.

In tests on a nightshade flower, buzzing threw out pollen with about 30 times the acceleration due to Earth's gravity, Buchmann reports. He notes that test pilots pass out at around 8 g.

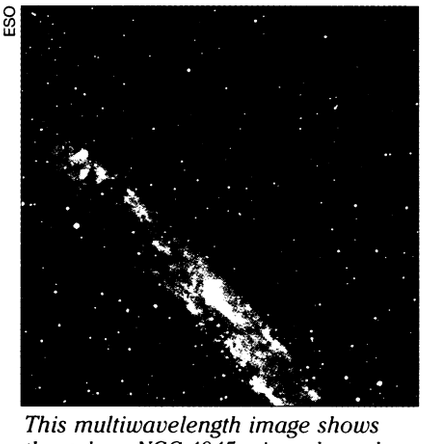
Buchmann is puzzled by the honeybee's failure as a buzz pollinator. It's not that honeybees are too small. Bees half the size of a honeybee's head can successfully buzz flowers, he reports. Honeybees certainly buzz in other circumstances. Yet in blooms that need buzzes, honeybees "do crazy things like stick their tongues into the [anther] pores," he says. "It's very weird." —*S. Milius*

Large-format camera snaps first color view

By adding a large-format camera to a large telescope, astronomers have increased their ability to rapidly scan large patches of sky. Last week, the European Southern Observatory (ESO) released an arresting image of the spiral galaxy NGC 4945, which is similar in shape to the Milky Way and resides about 13 million light-years from Earth.

Astronomers installed the camera, known as the Wide-Field Imager, last December on a 2.2-meter telescope at the ESO's La Silla Observatory in La Serena, Chile. The camera consists of a mosaic of eight solid-state light detectors containing 67 million electronic sensors. Only a handful of other telescopes have cameras with so large a light-collecting area, and the La Silla telescope is the largest of those that will observe the sky full-time. As mounted, the camera has a field of view that would easily contain the full moon. Objects detected can then be viewed in greater detail with even larger, high-resolution telescopes. —*R. Cowen*

ESO



This multiwavelength image shows the galaxy NGC 4945, viewed nearly edge-on. Most of the pointlike sources outside the main body are stars in the Milky Way, but a few are globular clusters, huge groupings of stars, within NGC 4945. Red light is shown as true color, blue as green, and ultraviolet as blue.

Marijuana mimic reveals brain role

Many psychoactive drugs mimic compounds in the brain. For example, tetrahydrocannabinol (THC), the primary active ingredient in marijuana, binds to the same receptors in the brain as a natural lipid molecule called anandamide.

Daniele Piomelli of the University of California, Irvine and his colleagues have now uncovered one of anandamide's normal roles. When released by nerve cells, it inhibits other nerve cells that trigger physical actions. It does this by blocking the action of the brain chemical called dopamine. Anandamide thus joins ranks with dopamine as a neurotransmitter, a chemical that carries signals between nerve cells.

"These findings promise to propel anandamide from candidate status to bona fide neurotransmitter and may also open the door to novel treatments for diseases that involve dysfunction of dopamine signaling," says David W. Self of the Yale University School of Medicine. Self's commentary appears with the report from Piomelli's group in the April NATURE NEUROSCIENCE.

The researchers studied anandamide in the striatum, a brain region where excessive dopamine activity may contribute to Tourette's syndrome, autism, and obsessive-compulsive disorders. The striatum is densely seeded with both dopamine and anandamide receptors, notes Piomelli.

To examine whether the striatum normally uses anandamide, the team artificially stimulated neural activity in that region in live mice. This triggered anandamide's release by nerve cells.

To test the interplay of neurotransmitters, the scientists injected other mice with dopaminelike drugs. One such drug prompted an anandamide flood.

"When we first saw that spectacular increase in anandamide levels, we didn't believe it," says Piomelli.

Normally, dopaminelike drugs added to the striatum make the animals hyperactive: They sniff, rear, and move about excessively. When the investigators gave the animals a dopaminelike drug plus one that blocks anandamide's effect on nerve cells, the mice became even more hyperactive. Piomelli concludes that anandamide normally regulates the activity of dopamine in the striatum. It's a dopamine "brake," agrees Self.

The brain quickly inactivates anandamide, notes Piomelli. Drugs that block this process would allow anandamide to linger, he says, and might help treat dopamine-related diseases. There is already some evidence that boosting anandamidelike activity by administering THC alleviates symptoms of Tourette's syndrome, says Piomelli. —*J. Travis*