

## Stinking beauty betrays dung beetles

Many blossoms offer sweet fragrances that attract pollinators, not to mention young lovers, but a purple flower in Borneo takes a different tack. It gives off an odor convincing enough to win the attention of dung beetles.

This plant provides a rare example of pollination machinery specialized for beetles that eat dung, says Shoko Sakai of Kyoto University in Japan. Other plants stink, but they usually attract flies or a mix of excrement lovers. The flower in Borneo, however, relies mostly on small *Onthophagus* beetles, she and Kyoto colleague Tamiji Inoue report in the January AMERICAN JOURNAL OF BOTANY.

The plant's name, *Orchidantha inouei*, honors the senior author, who died in a plane crash at the research site before publication. *Orchidantha* belongs to the same taxonomic order as ginger, bananas, and bird-of-paradise plants. The order includes plants that command the pollination services of birds, bats, tree shrews, and even lemurs.

*Orchidantha* flowers don't offer nectar but release their special fragrance from around 7:30 a.m. until midnight. To the human nose, the odor does not smell exactly like dung but "more simple," Sakai reports. It's not the strongest floral odor she's smelled, but she can catch whiffs of a blossom from about a meter away.

For more than 100 hours, the researchers watched or videotaped two *Orchidantha* patches. Flies and various other insects window-shopped, but only

dung beetles crawled behind a floral screen to the reproductive structures. Out of 30 visits from *Onthophagus*, proposed as the major pollinator, the beetles brushed the female stigma in 18 cases. In 16 of those 18 cases, beetles brushed the male anthers and emerged from the flowers sporting white pollen.

The world would be less pleasant without the clean-up efforts of the 30,000 species of dung beetles, says Bruce D. Gill, a dung beetle specialist for the Canadian Food Inspection Agency in Ottawa, Ontario. Ancient beetles even cleaned up after dinosaurs (SN: 9/21/96, p. 186).

Some dung beetles shape their dung finds into lumps the size of croquet balls, with diameters 2 to 3 times the insects' body length, which they take home for the family. "When you see these beetles rolling a ball of dung along the road, it's pretty spectacular," Gill says.

The *Onthophagus* beetles that visit the Borneo flower don't roll dung but tunnel under fresh piles. There, a male and female work together to stuff an underground chamber with dung from above. It makes great baby food when eggs hatch. Adults also feed on dung, especially the fluids. "It's sort of a yogurt for beetles," Gill says.

*Orchidantha* disrupts this quest for dung. "The poor beetles are working hard to clean up the mess left by mammals and these flowers are fooling them," Gill grumbles.

Telling deceit from a subtle trade can



Attracted by the flower's distinctive perfume, a dung beetle visits *Orchidantha inouei*.

be difficult, observes Gordon Frankie of the University of California, Berkeley. For example, some orchids look like female bees, and males trying to mate get covered with pollen. The male seems a clear loser, but evidence suggests that openings in his legs collect plant scrapings as raw material for manufacturing pheromones to attract a real mate. Frankie urges more research before concluding that the dung beetles gain no benefit from the flower.

"Nothing surprises me with pollinators," he says. New oddities surface, and familiar puzzles linger. Despite vital importance to humanity, he says, researchers are not even sure what animals pollinate the coffee plant. —S. Milius

## Infant temperament shows its flexibility

Developmental investigations suggest that some babies exhibit a genetically inspired shyness that leads to an inhibited personality style later in life, whereas other infants display signs of an inborn sociability that heralds an outgoing nature.

However, these early behavioral styles often undergo noticeable shifts by age 4 1/2, according to a new report. Most babies at both behavioral extremes fall in a social middle ground by the time they become preschoolers, displaying neither pronounced shyness nor exuberance, contend psychologist Jerome Kagan of Harvard University and his colleagues.

Numerous childhood experiences may modulate the social disposition that infants start out with, Kagan's group theorizes.

"Our findings suggest that genes constrain temperament, they don't determine it," Kagan says.

The researchers studied 193 white, middle-class children. At 4 months of age, 74 of them had kicked, squirmed, and cried vigorously when they heard a tape recording of a woman's voice and

received other types of simple stimulation. These youngsters were classed as high reactive, a response style linked in some studies to having a shy personality by adolescence.

The remaining 119 kids had remained largely calm and attentive during the same laboratory experiences. They were classed as low reactive, a designation for children deemed likely to become highly sociable and emotionally spontaneous with others.

The same children encountered further unfamiliar events in the laboratory at ages 14 and 21 months. The scientists also assessed each youngster at 4 1/2 years old during interactions with an unfamiliar female experimenter and in play sessions with two unfamiliar children of the same age and sex. Parents were present at all times.

Preschoolers continued to display their infant temperaments to only a modest degree, the investigators conclude in the December 1998 CHILD DEVELOPMENT. Only about one-quarter of high-reactive infants were emotionally subdued and shy at 4 1/2

years old. Similarly, only about one-fourth of low-reactive infants ended up interacting with others in a spontaneous, outgoing style.

Even so, only nine children exhibited a social approach at 4 1/2 years old that was completely at odds with their infant temperament: Three high-reactive kids became spontaneous and sociable, and six low reactives became withdrawn and shy.

Nearly 70 percent of the children were neither extremely inhibited nor uninhibited as preschoolers, signifying that they had undergone moderate temperamental changes, the scientists assert.

Experiences that pull high-reactive infants out of their social shell are of particular interest, Kagan says. One crucial factor may be the presence of parents who encourage these kids to cope with their fears, he suggests.

The new results agree with findings from a developmental study directed by psychologist H. Hill Goldsmith of the University of Wisconsin-Madison.

"We observe a similar low degree of consistency for inhibited and uninhibited types from 30 months to 7 years of age," Goldsmith says. —B. Bower