

## Why the spider did not eat the fly

In the dog-eat-dog world of the wild, a disguise can mean the difference between freedom or being some other creature's luncheon special. Some prey animals, for example, copy the coloration and patterning of animals, plants or rocks that many predators find extremely unappetizing or even toxic.

Now, in the April 17 *SCIENCE*, two research groups independently describe a newly observed type of insect mimicry in which certain species of fruit flies imitate the behavior of one of their predators, the jumping spider, in order to avoid being eaten by it. "This is the first example of a prey animal actually mimicking its own predator," says ecologist Bernard D. Roitberg at Simon Fraser University in Burnaby, British Columbia.

What puts a fly in the ointment in the spider's meal plans are stripes on the fruit fly wings that resemble the markings on the legs of jumping spiders, as well as false eyespots on the fly's abdomen. Equally important is that the fruit flies, when disturbed, hold their wings out from their body and wave them up and down, a movement that looks like the aggressive leg-waving behavior of jumping spiders when they fight for turf with other spiders. The flies also do a side-to-side dance that resembles the "high-idle" gait of aggressive jumping spiders. With all this, a fruit fly is often able to deceive a jumping spider into thinking it has wandered into the territory of a worthy adversary.

While the similarity between jumping spider behavior and fruit fly wing patterns and movement had been noted previously, the *SCIENCE* papers are the first demonstrations that this actually protects fruit flies from jumping spiders.

In their study, Roitberg and student Monica H. Mather observed the behavior of hungry zebra spiders (*Salticus scenicus*, a type of jumping spider) allowed to approach snowberry flies (*Rhagoletis zephyria*, a type of fruit fly) held under a clear dome. They found that the zebra spiders fled from posturing snowberry flies at the same rate they fled from other jumping spiders and that zebra spiders pounced on house flies (which have neither wing stripes nor spider-like movements) much more often than they attacked snowberry flies.

The researchers also showed that even without stripes, posturing appears to offer some protection. They obliterated the snowberry stripes by coloring the wings with a black felt-tipped marker and discovered that the percentage of spiders that fled from these flies fell somewhere between the fraction that fled from normal snowberry flies and the percentage that fled from house flies.

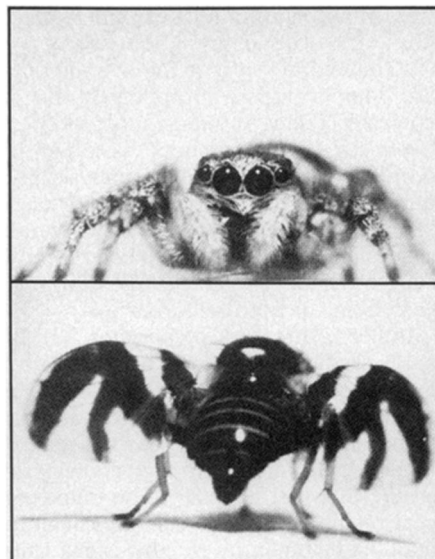
Ecologist Erick Greene at Princeton (N.J.) University's Department of Biology

and his colleagues obtained similar results but took a slightly different tack. They worked with the *Zonosemata vittigera* fruit fly and 11 jumping spider species. Greene's group recorded the behavior of the spiders when they were put in the same enclosure with one of the following: a normal *Zonosemata*, a normal house fly, a house fly onto which *Zonosemata* wings had been transplanted, a *Zonosemata* with house fly wings (which are about the same size and shape of *Zonosemata*'s) or a *Zonosemata* with wings from another *Zonosemata*. (Wings were attached with Elmer's White Glue. According to Greene the transplanted flies flew and behaved normally).

The first and last of these groups survived with flying colors; when they waved their wings, spiders stopped stalking and began to wave their legs at the flies. Most of these flies were then able to back away, zigzagging and wing-waving, and fly off. The other groups of flies did not fare as well. All but one of the house flies with *Zonosemata* wings (which the house flies held at an angle that obscured the stripes) were killed or at least attacked.

Greene's group also exposed *Zonosemata* flies to other predators, including assassin bugs, whiptail lizards and other kinds of spiders. Not one of the predators was fooled. "Most forms of mimicry confer protection against a lot of potential predators," says Greene. The fruit fly behavior "is a bizarre and quirky example of very specific mimicry that works against one class of predators and apparently no others."

The discovery of this kind of deception, he adds, raises a lot of questions about



Roitberg/SCIENCE

From the viewpoint of a zebra spider (above), the striped wings of a snowberry fly (below) look alarmingly like those of a fellow spider and not like part of a juicy meal.

how the mimicry evolved. "Until now, it's been thought that the wing markings and wing-waving behavior were only involved in courtship displays," he says. Perhaps the patterns and behaviors came to be favored in courtship because the flies possessing them were perceived by mates as having the best chances of survival. Alternatively, perhaps the flies that did not display these kinds of markings or courtship behaviors were eaten by spiders.

Greene and Roitberg suspect that jumping spider mimicry may be widespread among fruit flies. As Greene's group notes, "A cursory glance at a museum drawer of flies reveals many with leg-like wing patterns." — S. Weisburd

## Another up/down side of trimming the fat

Like a pendulum, the theories about whether lowering blood cholesterol leads to reduction of heart disease continue to swing both ways. Continuing this controversy are two recently reported statistical analyses — one finding that cholesterol levels are significantly related to mortality, the other concluding that dietary cholesterol reduction extends life for as little as three days.

Using statistics from the Framingham (Mass.) Heart Study, which has followed the medical fate of more than 5,000 subjects since 1948, researchers at the National Heart, Lung, and Blood Institute (NHLBI) compared blood cholesterol levels, overall mortality rates and incidence of death caused by cardiovascular disease and cancer in 1,959 men and 2,415 women. Subjects were free of heart disease and cancer when the Framingham study began. The NHLBI study evaluated data spanning 30 years, using cholesterol

values first measured from 1951 to 1955, and then every two years thereafter.

In the April 24 *JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION*, Keaven M. Anderson, William P. Castelli and Daniel Levy conclude that, for subjects under 50 years of age, cholesterol levels are directly related to overall mortality, as well as to deaths due to cardiovascular disease. They found that among people in this age group, overall death rates increase by 5 percent and cardiovascular death by 9 percent for each 10 milligrams per deciliter (mg/dl) increase in cholesterol levels above the 180 mg/dl they used as a normal baseline level for cholesterol.

Over 50 years of age, however, it is a different story, say the authors. They found no association between cholesterol levels and overall mortality rates in this age group. As for cardiovascular disease death, the group found that there