

Sparkle

Here it is, Fourth of July weekend, and like most Americans, I plan to attend the obligatory display of fireworks with its noxious smoke, ear-splitting bangs, its flash and twinkle. I'll probably even enjoy it. I won't enjoy it as much as the other spectacle of sparkle I hope to indulge in if it gets warm enough. You know the one I mean, the one that turns nighttime meadows into enchanted realms for a few weeks each year—the festival of fireflies.

The fireflies do not flash to impress us, of course, but to impress each other; they flash to meet up with a mate. The males usually have the more complicated flash patterns. They fly about blinking as attractively as they can, while the females remain on the ground or perched on a branch observing and comparing. The bigger and brighter the male's flash, the more likely he is to contribute genes that will result in brighter flashing progeny. When a female spots such a showy male, she flashes back, alerting him to her presence. This female sexual selection has led to gaudiness in males throughout the Animal Kingdom.

On the other side of natural selection, however, are the predators, the bats and birds and bigger bugs are also more attracted to brighter males. The fireflies have their own defense, however. When under attack, they ooze bug blood that contains a toxic chemical. The flash can therefore serve as a warning to all that might consider a firefly meal.

Here the plot thickens. Between 20 and 30 different species of fireflies inhabit the Northeast, each with a distinctive flash pattern. These are divided, unequally, into three genera. Only two of these can produce the deterrent toxin. The third genus, *Photuris*, cannot. These fireflies are an inch long, about twice as big as those in the other two genera. They produce a bright, distinctly green flash. I will call them the Big Greenies. Most of our fireflies are in the genus *Photinus*. They produce the typical yellow-green flash. They will be called the

Little Yellows. The remaining genus, *Pyraclomena* are about the same size as the Little Yellows, but are much less common. The glow from their abdomens has an amber tint.

The Big Greenies cannot produce the toxin, but they can obtain it—by eating fireflies from the other groups. They can even pass the toxins along to their young, the larval glowworms. This dynamic changes the innocent activity of wooing suitors into one of treachery, deceit, and danger. It is the female Big Greenies that have become firefly femme fatales. They have evolved to imitate the flash patterns of Little Yellow females. When a male Yellow flies over, the female Greenie emits a coquettish flash, and down swoops the male to his doom. The Big Greenie males, often frustrated by the females' gustatory obsession, have been observed emitting the flash pattern of male Little Yellows. The female Greenies lick their lips, return the flash, and instead of finding themselves fed, find themselves fertilized.

Not all of the Big Greenie females give perfect imitations of the Little Yellow female flashes. Since Little Yellow males are female flash connoisseurs, they recognize these faulty flashes as warning beacons. Firefly researchers have observed that when Little Yellow males locate a female and begin to home in, some of them switch to a flash pattern that mimics the faulty Big Greenies', thereby scaring away rival males.

As the Little Yellows have become more savvy, some Big Greenies have become less reliant on finesse, luring a LY close, and then nabbing the lusty little firefly on the wing, a strategy known as "hawking."

Here in Vermont we are lucky to have great hayfields and meadows that reliably blink into life on warm nights throughout June and early July. In other places, firefly aficionados have seen populations blink out. For millennia, fireflies have co-evolved to succeed in the dog-eat-dog world of nature. Today new challenges arrive at rates that do not allow firefly evolution to keep pace. Insecticides used to control mosquitoes and the insects that feed on food crops and ornamental plants



are not species-specific. The grasslands and wetlands where fireflies proliferate have given way to pavement and lawns. Lawn mowing also kills fireflies. The biggest threat to fireflies may be light pollution. Fireflies like the dark, and are more active on moonless nights. Research indicates that fireflies become less active in the presence of artificial light.

There are a few things each of us can do to safeguard the primal display of the lightning bugs. The obvious and ecologically beneficial choices are to avoid using pesticides and to mow lawns less frequently, if at all. Turning off outside lights is another easy choice, and even shading the windows of your house on big firefly nights.

Another important thing you can do is to become a backyard firefly scientist. The Boston Museum of Science is spearheading a project called Firefly Watch that trains volunteers to survey lightning bugs. Over time the information gathered by these volunteers will help scientists monitor firefly populations. The Museum's website contains a wealth of firefly information, including a fun, interactive habitat page that simulates the flash colors and patterns of the different firefly species. Learn more at www.MOS.org.

