

Education by

EXAGGERATION

BY RICK WEISS

One professor's offbeat answer to entomological illiteracy

Hardly a month goes by, it seems, without word of another survey revealing new depths of scientific illiteracy among U.S. citizens. Clearly, the experts say, the nation needs a revitalized approach to science education.

May Berenbaum is doing her share. Realizing there's more than one way to educate the public about her particular specialty — entomology — the University of Illinois professor organizes an annual Insect Fear Film Festival in the otherwise peaceful college community of Urbana-Champaign.

Last week marked the sixth annual screening of Berenbaum's insect extravaganza. The program this year ranged from an animated short starring Jiminy Cricket to the feature-length 1957 thriller, "The Deadly Mantis," in which a giant praying mantis consumes much of the Eastern Seaboard and climbs the Washington Monument before getting stuck in the Lincoln Tunnel between New York and New Jersey.

Interspersing educational demonstrations with some of the best — and much of the worst — in insect-oriented cinematography, Berenbaum imparts her entomological erudition to overflow audiences.

"If we were to advertise that we were going to have a lecture on insect biology and show some nature films, nobody would show up," Berenbaum says. "But show movies about insects the size of mobile homes attacking major cities and you get a good crowd."

And crowds she gets; 400 to 500 viewers attend the festival each year. Some come to revel in Disney-dominated childhood memories, as epitomized by this year's showing of "Picnic at Bug Stump," an "incredibly adorable" animated short, Berenbaum says. Others, preferring the bizarre to the benign, show up for the festival's full-length features depicting giant insect mutants gone amok. Whatever their motivation, viewers invariably

leave the festival knowing a little more about real-life insect biology.

"Before each film we have introductory remarks about why what the audience is about to see could not possibly happen," says Berenbaum.

For example: Could giant ants really pick up school buses filled with screaming children? A quick lesson in ant anatomy and a bit of physics proves the answer is no.

Ants appear so strong in nature because of a muscle arrangement that is very efficient in a tiny body, with its high surface-to-volume ratio, Berenbaum explains. As size increases, that ratio decreases. "If they were as big as we are, they wouldn't have any more strength than we do," she calculates with assurance.

To illustrate such points, she brings to the theater a menagerie of living and preserved insect specimens. "We like to feature the ones that are in the films," she says. "Sort of a 'meet the stars' — so people can compare."

Take Jiminy Cricket — Walt Disney's memorable voice of conscience in "Pinocchio" and star of a series of educational shorts such as "I'm No Fool With Electricity," shown at this year's festival. Even the most cursory comparison to the real McCoy indicts the movies as hotbeds of insect misinformation. "He's the wrong color, the mouth is wrong, the eyes are wrong, he has the wrong number of legs," Berenbaum laments.

If nothing else, then, let's get the basics

straight: Insects — crickets included — have six legs; spiders, mites and ticks have eight. Compound eyes don't have pupils. And despite what you see in the movie "Charlotte's Web," spiders do *not* have antennae.

While Berenbaum's educational festival has in recent years earned her international attention, her rise to insect fame was hardly foreshadowed in childhood.

"I'm not one of those people who grew up with 4-H collections and butterfly nets and caterpillars in fruit jars," she says. "I grew up terrified of insects."

But a freshman college entomology course tapped hidden reserves of insect appreciation in the young student. Later, while going on to become an entomology professor herself, she remained troubled by the average person's misunderstanding about — and misdirected enmity toward — insects. So in 1982 she sought to bridge that gap by asking the University of Illinois' unit of cinema studies to help produce the first Insect Fear Film Festival.

The unit's director, she recalls, "wrote a very nice letter back saying, basically, 'The unit doesn't do kitsch.'" But the assistant director, Richard J. Leskosky, provided help nonetheless, initiating a working relationship that ultimately blossomed into marriage. Now the husband-wife team co-produces the annual



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Movies such as "Empire of the Ants," "The Savage Bees" and "The Giant Spider Invasion" play upon people's fear of — and ignorance about — insects and spiders. In the right hands, though, such films can serve as educational tools.

event.

This year's festival focused on orthopteroids — a taxonomic subgroup that includes crickets, grasshoppers, katydids and mantids, and one that provided Berenbaum a fine opportunity to prove her love of insects has its limits.

"People tend to look favorably upon crickets," in part because of their cheerful chirping, she says. "Actually they're garbage-eating cannibals, given the opportunity."

Moreover, that chirping, or stridulation — often amplified in movies to a blood-curdling roar just before a city-block-sized orthopteroid pounces on its prey — is in real life not a war cry but a love song. "There are lots of insects that stridulate," Berenbaum says. But in the honest-to-goodness, bug-eat-bug world — where the element of surprise can make all the difference between eating or starving — "it would be kind of maladaptive to stridulate before they pounce."

Berenbaum uses her collection of pinned specimens to note another common orthopteroid misconception. "Most female grasshoppers and crickets have these sword-like ovipositors," or egg-laying mechanisms, protruding from their abdomens, she notes. "The trouble is that uninformed people tend to extrapolate from human experience. They see this long object projecting from the abdomen and they assume those are the males. Kind of a sexist preconception."

Orthopteran sexual identity was of more than passing interest during the production of "Exorcist II: The Heretic" — a late-night feature at this year's festival. The film stars James Earl Jones as an African scientist who, in his efforts to combat locust plagues, appears in some scenes dressed as a locust. Jones' gender was never in question. But Warner Brothers imported 3,000 real African locusts for the film. And to minimize the risk of their landing with a load of locust eggs, U.S. government agencies insisted all 3,000 of the pests be males.

A painstaking survey of the imported population resulted in the discovery — and disposal — of six female stowaways, Berenbaum says.

From the entomological point of view, the most obvious examples of movie misinformation are those suggesting insects can be enormous. The super-big bug, commonly depicted as the victim of a radiation accident, is a physiological impossibility, Berenbaum asserts.

"Insects don't breathe like we do," she notes. "They breathe through tracheae — a system of tubes that deliver oxygen to each cell." The larger the body, the more complicated this oxygen delivery system gets. And in anything bigger than about

the size of a mouse, the volume of air could not move fast enough to supply sufficient oxygen to the insect. So even if an insect *could* grow to the size of a station wagon, Berenbaum promises, "it would be so sluggish and out of breath that it wouldn't be much of a threat to anybody."

In any case, she adds, an insect has no hope of ever growing so large. "Insects have this external skeleton that they are constrained to molt in order to grow. And when you shed your skin, the new skin takes a while to harden." That's fine, she says, as long as you're small and the effects of gravity are not too great. "But the larger your volume, the larger the effects of gravity and the greater the probability that your new skin will deform before it hardens."

Never mind what you saw in the science fiction thriller "Mothra," Berenbaum concludes. A freshly emerging moth the size of a B-52 would be flattened by gravity before it had a chance to unfold its freshly metamorphosed wings.

As for the many animated movies that oversimplify or otherwise misdepict insect anatomy, Berenbaum sympathizes with the filmmakers' plight. "You've got six or eight legs, a pair of antennae and two or four wings all moving in three directions. It's kind of time consuming from the point of view of an animator."

And in fairness to the many flicks that cast insects in a less-than-complimentary light, even Berenbaum concedes some bugs seem inherently unlovable. "Not too many people keep insect pets," she admits. "But I'd like to foster an appreciation of all the planning and architecture and amazing connections that go into an insect before you step on it."

Consider, for example, the tiny parasitic wasps known as "fairy flies." (A misleading nickname, Berenbaum wants you to know. Among other differences, wasps have four wings; flies have two.) Smaller than some one-celled protozoans, these tiniest of insects — which parasitize the eggs of water beetles — deserve our respect.

Forget spiders the size of Yankee Stadium, the entomologist implores. "Here you've got an incredibly complex system of muscles and nerves, tracheae and all kinds of organs all packed into a body that's smaller than one cell. I mean *that's* kind of staggering."

As for oversized spiders, this year, as every year, the film festival was to feature a live tarantula for those interested in handling the hairy but relatively harmless octopod. However, says festival co-producer Leskosky, the tarantula escaped two weeks before the festival and has yet to turn up.

"It managed to get out of its little container somehow," he says. "Let's just hope it doesn't go into those rooms with the radiation signs on the door, or who knows what'll happen." □