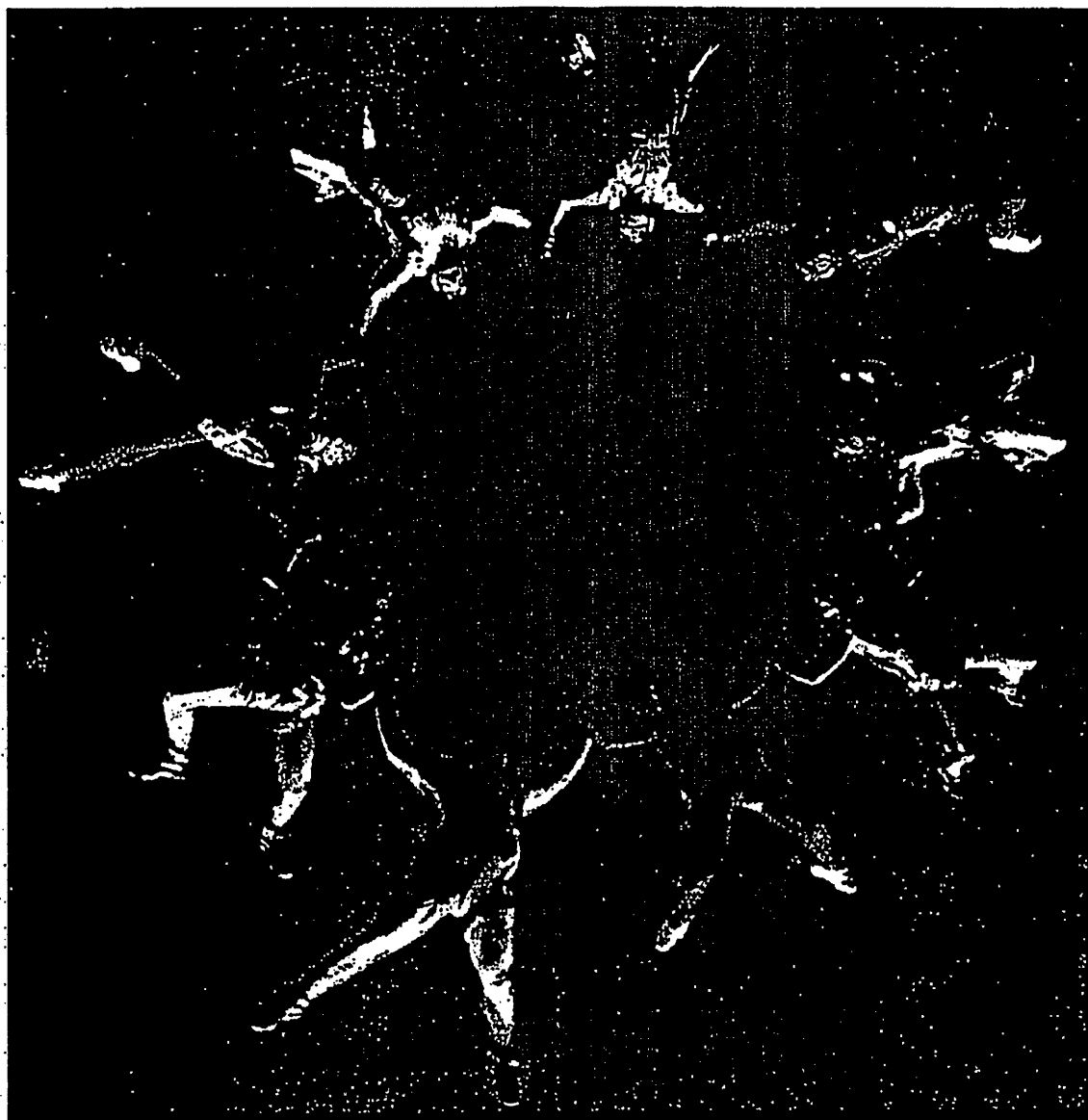


ALLEN & DUCH



**THINKING TOWARD SOLUTIONS:
Problem-Based Learning
Activities for General Biology**

Stage 1: The Gypsy Caterpillar Invasion

CAMPING WITH CATERPILLARS

Harold B. White

The faint patter of fecal pellets hitting the dry leaves sounded like a steady light rain despite the bright sunshine that filtered through what remained of the shredded oak leaves. There were gypsy moth caterpillars everywhere—thousands, even millions, of them. During the day they crowded into the dark corners and cracks of the cabin eaves and tree trunks. What a contrast to the lush greenery that had greeted Bob June a year ago when he had arrived for his first summer as a counselor at Camp Calosoma.

As he surveyed the scene, Bob noticed that the devastation had a fairly definite boundary and occupied a roughly circular area a few hundred yards across. Parts of Camp Calosoma still had dense shade. Interestingly, within the heavily infested area there were some plants such as tulip poplar and laurel, that seemed to flourish.

Mr. Kalnia, the camp director, met with the counselors that evening to answer questions and discuss plans for the summer. "No, we are not going to spray insecticides." "Yes, some campers might get a rash from handling the caterpillars." "No, they are not poisonous." "Yes, the infesta-

tion could very well become the theme of this year's nature program." He went on to philosophize about how things that seem to be disasters can be opportunities and that the "Invasion of the Gypsy Moths" was an enormous opportunity. "How we deal in life with situations such as this reflects our character. Whether it be gypsy moths, zebra mussels, dandelions, kudzu, the chestnut blight, English sparrows, killer bees, or smallpox, humans have intentionally or accidentally introduced exotic species into their environment and occasionally lived to regret it. There are important lessons to be learned. Please think about this and come up with ideas for a creative summer program."

Bob suppressed his first reaction to find another summer job and began brainstorming with the other counselors.

Questions to ponder:

- What do you know about the life cycle of moths and butterflies?
- How is it possible for one species to have a sudden population explosion?
- How can plants defend themselves against caterpillars?

Stage 2: *The Lights Go on for Bob*

CAMPING WITH CATERPILLARS

It was well after dark when the counselors' meeting ended. As Bob headed back to his bunk for the night, the insects around a light distracted him momentarily. In particular, he noticed several large iridescent green beetles commonly known as caterpillar hunters. It suddenly dawned on him, "These beetles must be feasting on gypsy moth caterpillars. And the cuckoos I heard this afternoon—they have an appetite for caterpillars as well. We humans must be oblivious to all sorts of things happening around here due to the gypsy moth infestation. Maybe exploring all the links between gypsy moths and other organisms could be the kind of opportunistic program theme for the campers that Mr. Kalmia would like." Bob's clock read 2 A.M. He couldn't get to sleep. His mind still was playing. "Though harmless to us,

how different the green beetles would look through caterpillar eyes. The campers could identify with that by imagining themselves encountering a tiger. Maybe a survival game, "Checks and Balances," involving various trees, birds, insects, and humans, could be created. What about having the campers see if the insects attracted to light were different in the infested and noninfested parts of the camp?" The possibilities seemed to multiply.

Questions to ponder:

- Imagine you are a gypsy moth caterpillar. What factors will affect your survival? Which of these are beyond your control? Which might you influence in your favor? Most of the 9- and 10-year-old

Stage 3: A Mystery Killer

CAMPING WITH CATERPILLARS

boys assigned to Bob's cabin got interested in the caterpillars as a part of the "Camping with Caterpillars" theme. His group had decided to see if starving caterpillars would eat sassafras, laurel, or tulip poplar leaves. Another group wanted to see how many caterpillars the caterpillar hunters could eat. Yet another group tried different ways to protect trees at the edge of the gypsy moth infestation. A few days into the second week of camp, after a few damp days, Joey, a camper who got up early for a walk every day, woke everybody shouting, "They're all dead! They're all dead!"

Sure enough, dead caterpillars by

- ### Questions to ponder:
- What might have caused the caterpillars to die? Are any possibilities ruled out by the information provided?
 - If you were Bob, how could you integrate this event into the summer program?

Basic Background Topics

the thousands hung limply on the trunks. Only a few survived. Interestingly, all of those kept in jars by the campers survived. Other insects in the area seemed unaffected

Topics Introduced by the Problem:

CAMPING WITH CATERPILLARS

- (Your textbook can be consulted for information on these.)
- Factors that influence population size
 - R- versus K-selection
 - Characteristics of a temperate deciduous biome
 - Trophic levels
 - General stages in insect life cycles
 - General aspects of insect classification

More Advanced Topics

- (You may want to consult additional resources for information on these.)
- Defenses of tree against insect predators
 - Allelochemicals
 - The oak-hardwood forest ecosystem
 - The life cycle and life history of the gypsy moth

Additional Resources for Researching Problem Content:

CAMPING WITH CATERPILLARS

Articles and books:

Elkinton, J. S., and A. M. Liebhold. 1990. "Population Dynamics of Gypsy Moth in North America." *Annual Review of Entomology* 35: 571-596.

Herrick, O. W., and D. A. Gansner. 1987. "Mortality Risks for Forest Trees Threatened with Gypsy Moth Infestation." *USDA Forest Service Research Note* NE-338.

Montgomery, M. E., and W. E. Wallner. 1988. "The Gypsy Moth: A Westward Migrant." In *Dynamics of Forest Insect Populations*, A.A. Berryman, ed. New York: Plenum.

Romoser, W. S., and J. G. Stoffolano Jr. 1998. *The Science of Entomology*. Boston: WCB/McGraw Hill.

Weseloh, R. M. 1985. Predation by *Calosoma sycophanta* (Coleoptera: Carabidae): Evidence for a Large Impact on Gypsy Moth, *Lymantria dispar* (Lepidoptera: Lymantriidae) Pupae." *Canadian Entomologist* 117:1117-1126.

Electronic resources:

National Park Service. Western Regional Server of National Integrated Pest Management (IPM) Network. "Gypsy Moth." *Integrated Pest Management Manual*. <<http://www.colostate.edu/Depts/IPM/natparks/gypsymth.html>>