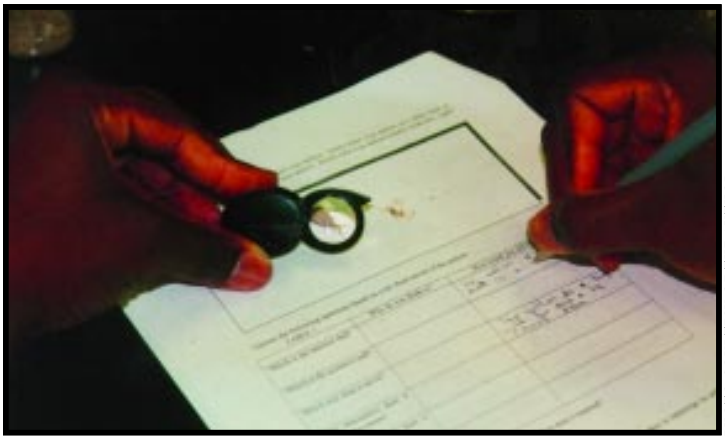
Activities with Antlions

Students learn concepts of insect behavior by observing doodlebugs

MANY STUDENTS VIEW SCIENCE AS A body of knowledge—something that can be taken off a shelf. Some of them see it as an activity that only elderly men wearing thick glasses and lab coats can perform. Once students become aware that science is something that most of us "do" daily, they are more apt to want to do science themselves. To encourage students, I developed a laboratory experiment that introduces them to scientific inquiry, starting with a question about the environment and leading through an investigation—all without using intimidating terminology.



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FINDING THE ANTLION

In this activity, students discover antlions. Some of us know antlions by their common name "doodlebugs," the curious little creatures that dig pitfalls in sandy areas and flick sand when disturbed. Antlions belong to the insect order Neuroptera—"nerve wings" or "net wings"—that includes lacewings, mantispids, snake flies, and dobsonflies. They are the predacious larvae of an adult form resembling a damselfly. The family name Myrmeleontidae has the Greek roots "myrmex" (ant) and "leo" (lion), from which we get the English name "antlion." Antlions exhibit complete metamorphosis, even though the larvae are much better known than the nocturnal adult. Many larvae dig conical pits to trap small insects. They wait hidden at the base of the funnel and use their immense jaws to grab any insects that fall into their pit. If an insect tries to escape, the antlion flicks sand to the edge of its pit, causing a landslide that hastens the fall of its prey (Swanson 1999).

Antlions are distributed throughout the United States, particularly in the southwestern states. They are typically found in sandy soil sheltered from rain, often next to buildings and under eaves. On our campus, I found a few dozen under the overhangs in front of our school, and several hundred were found beneath the trailer classrooms behind our main building.

I have not found antlions to be commercially available, so they have to be collected in the field. It is advisable to collect antlions the day preceding the lab to ensure that they build their concave traps in their containers. To collect specimens for the activity, I use a plastic spoon to scoop the entire trap, antlion and all, into a container and then add extra soil from the site to fill the container to a depth of 3 to 5 centimeters. I place one antlion in each container, which can be a small beaker, plastic cup, or whatever is on hand. For observational purposes, it is best to use 100-milliliter beakers or clear plastic cups. Teachers may want to reserve some extra cups with formed funnels for observation, as some students may accidentally disrupt their pit before they even notice its existence. Often, when their pits are disturbed, antlions immediately begin rebuilding, and students can observe the interesting sand-flicking behavior. Although antlions have large poisonous jaws for capturing prey,

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FIGURE 1.

In this activity, you will use science to explore a sample of dirt. Materials for each pair of students: magnifying glass, sand, dirt, four cells of an egg carton, water, cup, ruler, and plastic spoon.

Procedure for part I.

1. You have been given a container with dirt in it. Without disturbing the container or its contents, make as many observations as possible about the dirt inside the container.

2. You may have noticed an inverted funnel in the sand. What do you think may have caused it? Why do you think this? How could you know for sure? What additional questions would you like to ask?

3. Make a sketch of what kind of creature in the sand may have made this funnel and what it looks like based on the information you have thus far. Make sure you include any special adaptations the creature might have for sensing and capturing prey, making its trap, or living underground. Label the body parts in your sketch, and tell their function.

4. Carefully sift through the sand until you find an antlion and gently place it on a white sheet of paper. Use a magnifying glass to look at your antlion and sketch what your antlion actually looks like. Label any parts that you think you can identify.

Answer the following questions based on your observations of the antlion:

	Why do you think so?	How could you tell for sure?
Which is the anterior end?		
Which is the posterior end?		
Which way does it move?		
What structure(s) does it use for movement?		
How (with what) does it catch its prey?		
How (with what) does it construct its funnel?		

5. Gently hold the antlion by its abdomen. How does it respond? Why do you think it responds that way?

6. Put your antlion back in the cup with the dirt. Time how long it takes to submerge itself in the dirt. Do you think an antlion would prefer a wet environment or a dry one? Why do you think so? How could you know for sure?

Procedure for part II.

1. Obtain a section of egg carton from the teacher. Fill both compartments with soil, making sure the soil is level with, but not covering, the ledge between the two compartments.

2. Wet one compartment thoroughly with water.

3. Place your antlion on the ledge between the two compartments, making sure it is facing neither compartment.

4. Observe the type of soil in which your antlion buries itself and record this in a table.

5. Repeat steps 3 and 4 four times and determine which type of soil your antlion prefers.

6. Obtain another section of egg carton from your teacher. Fill one compartment with sandy soil and the other with loamy soil. Make sure the soil is level with, but not covering, the ledge between the two compartments.

7. Place your antlion on the ledge between the two compartments, making sure it is facing neither compartment.

8. Observe the type of soil in which your antlion buries itself and record this in table form.

9. Repeat steps 7 and 8 four times and determine which type of soil your antlion prefers.

10. Now that you have investigated some of the soil preferences of antlions, where do you think you might find them on campus? Why do you think so?

11. What are some other antlion preferences that you might be able to investigate?

they pose no threat to humans and are easily and safely handled by students.

EXPERIMENTING WITH ANTLIONS

Teachers should make a variety of tools available to students for their initial observations. Small paintbrushes can be used for moving soil and transferring antlions to white paper for better observation. Sometimes antlions "play possum" when touched or disturbed outside their funnels, and students may think that they are dead, especially when they lie on their backs. Gently blowing on them usually encourages them to right themselves and move around. We have also noticed an interesting phenomenon. In a test to determine which type of soil antlions prefer, antlions are first seen going to wet soil and then turning around and burying themselves in dry soil; when doing this test, students need to record the type of soil in which the antlion eventually buries itself, not which soil it chooses first. I do this lab in two 50-minute periods—part one is performed on the first day and part two on the second (Figure 1).

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Antlions are most active during the late spring and summer months; however, I have also found them to be active on my Georgia campus throughout the fall and into winter. With my general-level students I use this investigation in the fall as an introduction to the scientific method. This lab was designed to use minimal vocabulary and is intended to harness students' natural curiosity and to get them to perform innate science skills. In post-lab discussions, teachers can assign terms to the various parts of the lab, so students can see that they hypothesized, proposed experiments, and drew conclusions naturally. Teachers might want to have a dictionary on hand to help define terms like subterraneous, anterior, and posterior.

I vary this antlion activity for my advanced students. They perform this investigation in the late spring after researching antlion classification, habitat, life cycle, behavior, and so forth. Students gather enough information about antlions to perform an experiment with them. After researching preferred habitats, I send students to search for and collect antlions on campus—always providing assistance for those who absolutely cannot find any. Then for two days, students explore authentic questions about antlion food, color and light preference, pit construction, distance between pits, and the distance antlions are able to flick sand. Other investigations include antlions' temperature preference, predation behavior in response to motion, recognition of prey and non-prey items, preference for live or dead prey, response to prey outside of the pit, and positioning of pits in varying population densities.

Students were given three days to research, devise, and execute their experiment, and then they wrote an article on their findings for peer review. Reports mirrored scientific journal reports and included the following:

- Title—describe the study done. (A title is usually long in scientific articles.)
- Author(s)—list primary author first, and include contributors.
- Abstract—summarize the study and place the summary at the beginning of the paper. This is most easily written after the paper has been written.
- Introduction—provide background information on organism(s), scientific classification of organism(s), identify problem, state hypothesis, present your if . . . then . . . statement.
- Methods and materials—list protocol in enough detail that it can be replicated and describe equipment (diagrams and flow charts might be appropriate). State dependent and independent variables, and include your control.
- Results—present results in a format from which the reader can interpret and draw conclusions (graphs, charts, quantitative data, and so forth). This is not a discussion of implications.
- Discussion—state whether experiment supported the hypothesis. Discuss researcher's interpretation of results, and propose further areas of study.
- Bibliography—list resources
- Acknowledgments—optional

Once we have studied our antlions, we return them unharmed to their place of capture. Sometimes antlions can spend years in their larval forms, so I have not tried to keep them through pupation. I use antlions to acquaint students with investigative science, and they have a roaring good time. ✧

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REFERENCE

Swanson, M. 1999. *The Antlion Pit: A Doodlebug Anthology*. Online *www.enteract.com/~mswanson/antlionpit/*.