

**Investigative Lab 3**

## Termite Tracking

### *Learning About Termite Behavior*

**Inquiry Challenge** How do termites navigate in their environment?

**Lab Overview** In this inquiry investigation you will discover how worker termites find their way in their environment and how they signal other worker termites to follow them.

**Background** Termites are insects that build large colonies either underground (subterranean termites) or inside wood (drywood termites). Most termites eat dead wood, although some species feed on living trees. Termites are able to digest certain plant fibers found in wood with the help of protists that live in the termites' digestive system. The protists produce a chemical that breaks down plant fibers into compounds the termites can absorb.

The termites you will observe in this investigation are worker termites, one of several types, or castes, of termites that make up a subterranean termite colony. Each caste carries out specific jobs in the colony.

**The Queen and King** The queen termite produces eggs. The queen has a large abdomen that is adapted for laying thousands of eggs every year or even thousands of eggs each day in some species. The king termite fertilizes the eggs. The queen and king cannot leave the nest's "royal chamber" because their bodies are too large to fit through the passageways. Termites that hatch from the fertilized eggs develop into one of three castes—soldiers, workers, or winged termites.

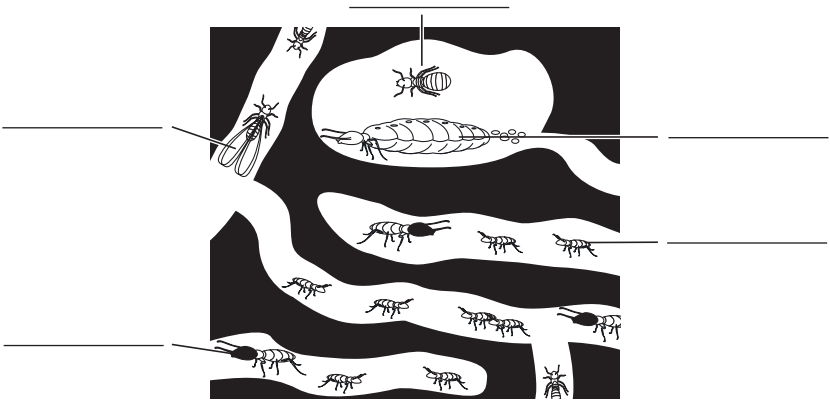
**Soldiers** The soldier termites defend the colony. If a soldier spots an invader, it signals other soldiers to fight. Some soldier termites also stay at the entrances to the "royal chamber" to protect the queen and king. Soldier termites have large pinching mouthparts that help them fight. These termites cannot reproduce.

**Workers** The worker termites build the tunnels and chambers in the nest, search for food, and feed the other termites. For example, workers must feed the soldier termites. Workers also bring food to the queen and king, and feed young termites. When foraging, workers often travel more than 70 meters from the nest. Worker termites have light-colored, relatively soft bodies and cannot reproduce. You will study worker termites in this investigation.

**Winged Termites** The winged termites fly away and start new colonies. These termites have hardened bodies and two pairs of wings of equal size. When winged termites find a new place to start a colony,

they find a mate, remove their wings, and mature into queens and kings. When a queen matures, she produces a chemical that prevents other nearby winged termites from developing into queens.

**Prelab Activity** Examine the termite nest shown below. Identify the queen, the king, soldier termites, worker termites, and winged termites. Then, answer the Prelab Questions.



**Prelab Questions**

1. What tasks do the worker termites perform in a termite colony?

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2. In a mature colony, which castes of termites can reproduce?

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3. Would you expect worker termites to have keen eyesight? Explain.

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4. How could you test the ability of a worker termite to see?

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5. How could you test whether a worker termite can smell?

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6. Why do you think you will use worker termites in this experiment?

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## Materials

- worker termite
- white paper
- assorted ballpoint pens
- small paintbrush
- stereomicroscope or hand lens (optional)
- plastic petri dish (optional)

## Procedure



### Part A: Observing Termite Behavior

1. Use a small paintbrush to gently transfer a termite to a piece of white paper. Practice moving the termite with the brush. How does the termite react to being touched?

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2. Develop a list of questions about how a termite finds food or locates other termites. Write your questions in the space provided.

### Questions:

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### Part B: Testing an Ink Trail

1. Using one of the ballpoint pens provided by your teacher, slowly draw a line in front of your termite. Change the direction of the line. Record your observations below.

### Observations:

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2. Which of the following hypotheses, if any, explains your observations? You may want to write your own hypothesis.
  - a. Termites deposit a chemical trail they follow by smell.
  - b. Termites deposit a chemical trail they follow by sight.
  - c. Wood produces a chemical smell that termites migrate toward. This ink contains the same chemical smell.
  - d. Other hypothesis:

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## Part C: Designing Your Own Ink Trail Experiments

1. Develop a hypothesis to answer the question, “How do termites navigate in their environment?” Then write a prediction in the form of an “If . . . then” statement, based on your hypothesis. Design an experiment using ink trails to test this hypothesis. Describe your experiment and results on a separate piece of paper. If you are unable to answer the question based on the results of your first experiment, revise your hypothesis and design a new experiment.

**Question:** How do termites navigate in their environment?

**Hypothesis:**

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**Prediction:**

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2. When you are finished with your experiments, return the termite to the original container as directed by your teacher.

## Analysis and Conclusions

1. What have you learned about how termites navigate in their environment?

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2. Explain how your observations support your conclusions about termite navigation behavior.

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3. What new questions do you have based on your observations? How might you test them?

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## Extension

Place two or three termites together in a petri dish and observe their interactions. Make a list of questions you have about how they interact with each other. Design a hypothetical experiment to answer one of the questions. (**NOTE:** *Do not carry out any investigations without permission from your teacher.*)