

# BUGS IN THE CLASSROOM

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## ***CHEMICAL COMMUNICATION IN TERMITES***

### BACKGROUND:

Most termites found in the Southeast are referred to as subterranean termites, meaning that the major portion of the colony is located underground, which provides them the moisture that they require. In order to maintain the social structure of these colonies, these termites use a sophisticated chemical (pheromone) communication system. Although termites utilize a wide range of pheromones categorized as trail, alarm, aggregation, recruitment, mating, and others, this exercise only examines trail pheromones. This type of pheromone is produced by termites when they are trying to get other members of the colony to follow them to a particular area, perhaps a new food source for the colony. Trail pheromones, like most other types, are typically short-lived so that when the food source is no longer available, the trail rapidly dissipates. This keeps workers from going to the location after the food source is no longer present.

The drying agent in the ink in Papermate<sup>®</sup> and Scripto<sup>®</sup> pens acts similar to the trail pheromone of the eastern subterranean termite, *Reticulitermes flavipes* (Kollar).

### SUPPLIES:

You will need to have a supply of pens that include a variety of colors and manufacturers (NOTE only Papermate<sup>®</sup> and Scripto<sup>®</sup> pens contain the solvents that are attractive to termites). Paper, including blank newsprint and cash register tape. Termites, which can be easily located in rotten logs or piles of bark or sawdust. Workers are totally white and about 1/4 inch in length, soldiers have white bodies and large, brown heads, while reproductive forms have large dark bodies with wings as adults and are white with wing pads in the immature stage. Workers are best for this study, but you also may want to have the students examine differences between workers and soldiers.

### SUGGESTED EXPERIMENTS:

1) Determining what type of pens (inks) contain termite attracting compounds.

To conduct this study, students should be divided into groups with each group receiving a selection containing a variety of pens (must include at least one of either Scripto<sup>®</sup> or Papermate<sup>®</sup> product), some blank newsprint, and a container of termites. Students should place a few termites on the paper and observe and record their activity, asking questions such as, "Do the termites exhibit any pattern to their movements?" or "Do they go in any particular direction?"

After recording the termites' activity, they should then begin to draw straight lines with the pens; one at a time, in the area where the termites are located on the paper. As termites contact the lines, the students should record any reaction that the termites exhibit as they move over the ink lines. They should record which color ink and type of pen (manufacturer) caused the greatest reaction and what type of reaction they observed. After all groups have gathered their data, they should get together and summarize their results. This will show patterns that individual groups will not have seen. For example, if one group had five different colored pens of five manufacturers,

and they had a red Scripto® or Papermate® pen, they would most likely conclude that termites were following a red line. However, by pooling the data from all groups, the pattern of termites following lines drawn by Scripto® or Papermate® pens, no matter the color, will emerge.

## 2) Determining the shape lines that termites can best follow.

Termites are better at following relatively straight or gently curved lines rather than those containing sharp angles. After completing the above study and determining that Scripto® or Papermate® pens contain a chemical that mimics the termite trail pheromone, the students can also examine what geometric shapes termites can follow.

Place lines on a clean piece of newsprint so that there is a straight line followed by a sequence of angled lines in 15° increments to an angle of 135° or greater. They should then place termites individually on the end of the line with the most shallow angle and record their activity as they move along the line. This works well if the students initially draw the pattern using pencil and then trace it with the pen immediately before releasing the termites.

Students should record the activity of the termites as they attempt to follow the line. Suggested questions may include, "What do they do when they reach the end of the line?" or "What do they do if they miss a turn in the line?" Students may also want to put a termite on both ends of a line and observe what they do when they meet?

## 3) How long will an ink trail last?

For older students, it is interesting for them to determine how long an ink trail will remain attractive to the termites. To do this they should draw a circle around the outer edge of a single piece of paper, or create a "track" around a large table top using pieces of cash register paper tape. One student should then draw the trail while another marks the time that the trail was drawn on the paper at several points along the trail. This will allow students to determine how long the trail has existed and also how long it remains attractive to the termites. About five termites should be released at the starting point and the time that each stays on the trail recorded. We have noted that soldier termites will often follow a trail longer than workers, so the caste of the termites should be recorded.

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