All the electrical connections are placed on the inside of the back (*C*). The only critical area is the placement of the flashlight socket so that the tip of the flashlight bulb will extend above the top of the maze. The battery holder and stove bolts are placed on the end of the box (fig. 1).

The three wires from the end points are secured under the bolts. A piece of wire 25 cm long is secured to one terminal of the light socket, and an alligator clamp is attached to the other end. Thus the alligator clamp can be moved to any one of the three end points (stove bolts). The student cannot see the end point or the maze pattern when he is using it, due to the low height of the maze box.

From one end of the battery holder connect a short wire to the free terminal of the light socket. Cut a piece of wire 1 m long and connect it to the other end of the battery holder. In the top (*A*) drill a hole just large enough to allow the passage of the wire from the battery holder.

Place the top over the box. Locate the area where the bulb from the light holder will be and drill a hole just large enough for the bulb to pass through. After attaching the top to the box, thread the 1 m of wire from the battery through the hole previously drilled for it.

The probe used to trace the maze pattern is made from a bolt and two nuts, with the end of the bolt rounded so it will follow the maze smoothly. Screw one nut on the stove bolt up to the head end. Strip and wrap the end of the wire from the battery holder around the bolt; screw the second nut up and secure the wire between the two nuts. Wrap the nuts holding the wire with plastic tape.

Insert a battery and a light bulb. Attach the alligator clamp to each one of the bolts and place the probe in the corresponding end point of the maze to check for proper functioning.

There are many ways in which this maze can be utilized in biology. In my sophomore biology classes the maze is used in connection with the teaching of a unit on behavior and learning. The following is one procedure that has been enthusiastically received by the students.

Two students are chosen or volunteer to try the maze at the start of the class period each day for five days. The two subjects are usually a boy and a girl for added competition and interest. The time it takes them to complete the maze is recorded by using a stop watch. Each subject is rewarded with a piece of candy after completing the maze. The data are taken down by all students and used later in the construction of a graph. The two subjects do not use or look at the maze at any time except when they are doing it before the class. The students not running the maze are free to look over and try the maze on their own. On the sixth day the end point is changed without the two students knowing it. A student who has never tried the maze is picked to run it and his time is noted. Then each of the two students who have learned the maze with a different end point is given a chance. Their efforts usually demonstrate frustration and bring forth many comments and discussions by the class.

Purposes of the human maze are as follows:

1. It allows the student to see and experience the learning process on a very elementary level, including trial and error, frustration, and satisfaction of accomplishment.

2. It gives students first-hand experience in dealing with why it is best to learn something right the first effort so that time is not wasted unlearning the wrong method.

3. Very general comparisons between human and animal behavior can be made, with evidence that reward and punishment work in both groups.

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A SILKWORM ENCOUNTER

Providing science teachers with the opportunity to write laboratory investigations is an excellent technique, which enables them to gain greater insight into the various components of a good inquiry-oriented activity. Teachers involved in writing such investigations also demonstrate proficiency in writing and stating clear, concise rationales, goals, objectives, and procedures.

Fig. 1. Silkworm larvae, 5 weeks old.

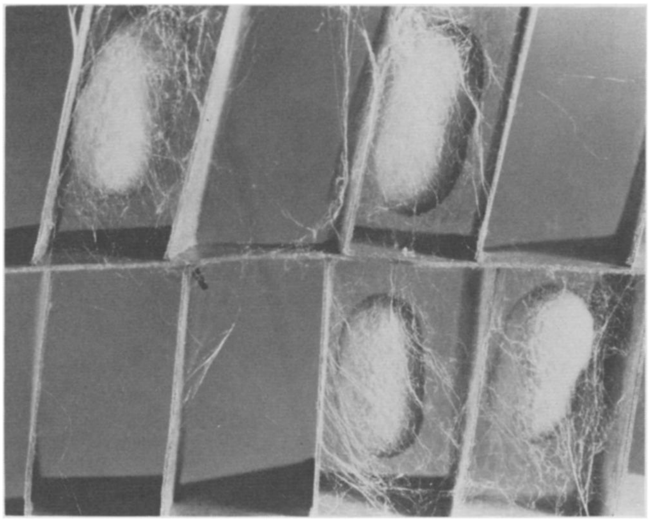

Fig. 2. Silkworm cocoons within cardboard compartments.

Writing investigations demands familiarity with the particular content area. The content should also lend itself to this type of format. A biology teacher from Japan, Toyonobu Ikeda, who recently visited the University of Texas at Austin, provided faculty members and National Science Foundation Academic Year Institute participants an opportunity to become familiar with the life cycle of the silkworm moth, *Bombyx mori*. This life cycle appears to be an excellent vehicle to provide biology teachers with this experience.

An egg that is 1 mm long, a larva that increases in body weight 10,000 times, a cocoon with a single filament of more than 1,000 m, and the dramatic emergence of a moth are a few of the fascinating accounts apparent in the life cycle of the silkworm (fig. 1, 2, and 3).

It was, at one time, practical for teachers to rear silkworms only during the spring months, when mulberry leaves were obtained. However, artificial food is now available, and the rearing of silkworms on this medium provides teachers with an activity independent of the seasons.

Students, participants in the Academic Year Institute, enrolled in a biology course at the Science Education Center were presented with the following task:

> Given a petri dish containing silkworm eggs, larvae, and artificial food, observe the life cycle of the silkworm moth. List observations in your notebook.

In fulfilling the above task, students demonstrated a proficiency with the process skills of observing and measuring. Students identified and named various stages in the life cycle and also described each stage.

Once the students became familiar with this particular animal, they were then instructed to complete the second task:

> Using the information gathered from observing the life cycle of the silkworm moth, write one laboratory investigation which may be implemented in a secondary school life science or biology class.

Suggested components for the laboratory investigation were the title of the investigation, rationale, goals, performance objectives, statement of problem including the dependent and independent variables, materials, procedure, treatment of data, and request for hypotheses. Inquiry-oriented questions were also suggested for possible insertion at appropriate places within the format. A reference section and suggestions for teachers completed each investigation.

"A Comparison of the Length (cm.) of the Silkworm Larvae to the Length (cm.) of its Cocoon,"

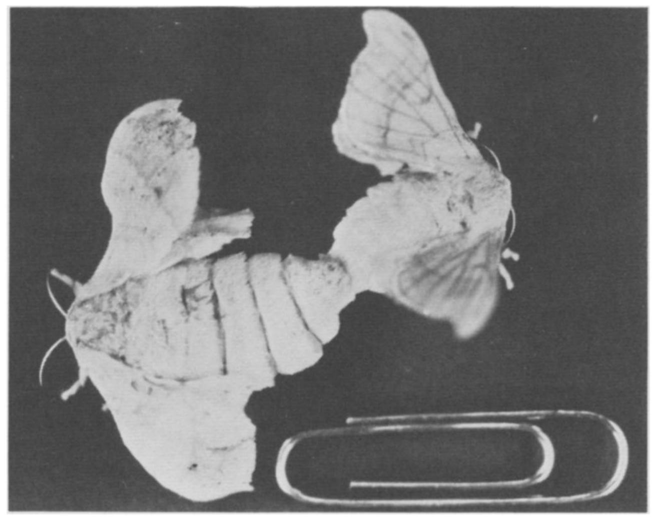

Fig. 3. Mating of male and female silkworm moths.

"The Effects of the Amount of Light on the Eating Behavior of Silkworm Larvae," and "The Effects of Temperature on the Duration of the Silkworm's Life Cycle" are examples of titles of some investigations submitted.

Teachers have many creative and thought-provoking ideas for possible laboratory activities but never have time or the opportunity to develop them. One student stated that "This was the most worthwhile thing I have done all year." This student had the opportunity to write an investigation about a content area with which she had first-hand experience. This investigation can now serve as a model for others she may propose and write in the future.

Note.—Silkworm eggs may be purchased from the Turtox Co., 8200 S. Hoyne Ave., Chicago, Ill. 60620. Artificial food may be purchased from the Nippon Formula Feed Manufacturing Co., Ltd., 640 Higashiterao, Tsurumi-ku, Yokohama, Japan.

Acknowledgment.—The photos are by Charles Geffen.

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