three weeks to offset evaporation. The fish food was the fine size of Reliance Tropical Fish Food from the Reliance Products Company, Montclair, New Jersey. Stirring the water briefly with a finger caused about a third of the food to settle. If any of the food remained on the surface the following day, it was skimmed off, and the ration reduced.

Temperatures much above 70° F. proved harmful; 55° to 60° F. were very satisfactory. After the snails had occupied a jar about two weeks, long enough to have produced a slight accumulation of excreta, the Daphnia were introduced. The food-chain was then: fish-food—snails—bacteria, living on snail excreta—Daphnia.

The Daphnia environment was thus fairly natural and uniform, and almost self maintaining. Only small numbers of young were produced. For this reason, there was seldom any need of transferring to a new jar, certainly not more often than three times a year. Labor saving methods of maintaining other laboratory animals should be useful to instructors in zoology.

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An Easily Constructed Microprojector for Drawing Purposes

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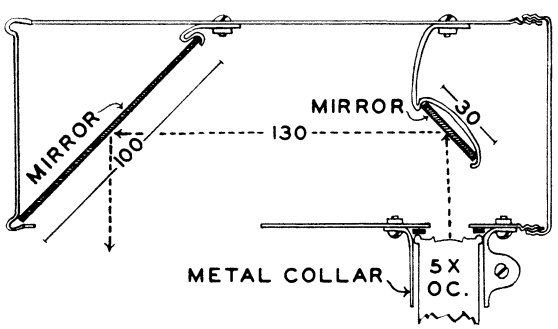
It is easier for the average person to make exact scale drawings by tracing a projected image than to use a camera lucida, an instrument particularly inconvenient for left-handed people. A 45° angle microprojection prism on a horizontal microscope will permit vertical projection onto drawing paper, but specimens temporarily mounted in fluids cannot be so projected.

The simple microprojector described here was designed for use on a vertical microscope. Direct planimeter measurements of small objects, such as nematode larvae, can be made without making dimension marks which have to be measured later. The device uses the periscopic principle to reflect the image horizontally and then downward onto the top of the table, by means of two war surplus front-silvered mirrors which cost less than $1.00. When using a 5× ocular, the microprojector will give magnifications of approximately 100×, 200×, and 430×, with 10×, 20×, and 44× objectives, respectively. Raising the draw tube or changing the projection distance will vary the image size. By rotating the draw tube, the instrument can be turned to permit drawings to be made by right- or left-handed persons. For small group demonstrations, the screw cap of the mailing tube mirror housing can be removed and the smaller mirror turned around to project the image horizontally onto a large ground glass or small motion picture screen. This makes a satisfactory substitute for a more expensive microprojection prism.



A simple microprojector made from two front-silvered mirrors and a metal mailing tube can be used for drawing or measuring at table level.

The diagram shows approximate dimensions in millimeters. When using the indicated mirror sizes and a 5× ocular, the entire visual field of the microscope will be projected. A 10× ocular can be used for greater magnification, but the outer portion of the field will be lost unless the larger mirror measures at least 80 ×140 mm. Bent strips of metal are used to support the mirrors at a 45° angle over two holes at the ends on the lower side of the horizontal tube. The reflecting surfaces of the mirrors face each other at a minimum distance of 130 mm. At this distance the image will not fall on the edge of the microscope stage. The larger mirror

width can be as short as 65 mm., as the width of the projected image on the 45° sloping surface is not as great as the vertical dimension.

A thin, metal collar is bolted or soldered at right angles to the horizontal mirror housing in order to clamp it around the ocular and draw tube of the microscope. A rubber ring placed above the ocular keeps it from being scratched. Lining the metal collar with felt or three layers of tape will protect the draw tube.

A concentrated light source, such as that produced by standard condenser type microscope lamps, will produce adequate illumination for 10× and 20× objectives. A carbon arc or other intense light source should be used for greater magnifications. The room must be darkened and shields are used to prevent light from reaching the drawing paper. Matte black paint or paper can be used inside the mirror housing to eliminate stray light reflections.

Knowledges of Botany Possessed by High School and College Students*

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This study was not undertaken originally for determining achievements of any group or groups of students in the field of botany. Rather, the conclusions herein were drawn from data obtained for a number of other studies.

During the last three years the author has engaged in a number of research projects involving the use of tests in the different areas of science. The tests have contained, of course, many questions other than those dealing with botany. The tests and the research projects in which they were used were these:

1. Over 4000 Regents Examinations in Biology of the University of the State of New York completed by high school students during 1949 and 1950. They were used in a major investigation concerning certain characteristics of the Regents Examinations.

2. Over 1000 Minnesota State Board Examinations in Biology for 1947 that were administered to students in five midwestern colleges and universities.

3. Over 180 comprehensive examinations in science taken by student teachers in six midwestern teachers' colleges and colleges of education, whose major field was science.

4. Over 80 comprehensive examinations in science and mathematics used by Western Michigan College of Education to award science and mathematics scholarships to superior students from high schools in the State of Michigan.

5. Over 100 classroom tests of subject-matter in biology given to students who were enrolled in the author's methods courses.

The questions found on these tests that dealt with botany were listed on a sheet of paper together with the passing percentages made by the students. Scores obtained on questions that dealt with the same topic were compared with one another, the types of errors made by the students were noted, and the types of questions that seemed to cause the greatest difficulty were listed. Also, whenever questions were found for which the passing percentage was the same for students in the upper and in the lower half of the score range, they were listed for further attention.

The data thus obtained were analyzed carefully. Two facts were noted immediately:

1. The *types* of errors found on the papers of college students and on the papers of the high-school students were much the same.

2. The major errors that appeared most frequently could be grouped under three major headings, (1) errors involving "psychological ownership," (2) those involving "absolutism and relativism" and (3) those involving "selectivity." Each of these categories of errors will be treated separately below:

I. Errors Involving Psychological Ownership. The term "psychological ownership" refers to the extent to which a student has an adequate perception of a topic of subject matter, the extent to which he can recognize the implications of that topic when they ap-

* A summary of a report entitled, "An Analysis of the Achievements in Botany of Students at the Secondary and College Levels," and presented to the Botany Section, 57th Annual Meeting of the Michigan Academy of Science, Arts and Letters, at Wayne University, Detroit, Michigan, April 14, 1953.