

siliferous sedimentary rocks. Though he deals with a record that is notably incomplete and confused, he may depend on a few principles that seem to have held through the billion years that life has been on earth. The rock in which the fossil is enclosed may be held in general to represent its environment when living—a shale is the mud in which the trilobite grubbed for food, a sandstone may very probably record a local-

ity near which a river emptied into the sea. Fundamental structures of bodily form have been the same in each branch of living forms, and may be depended upon in reconstructing pictures of the past life of the earth. In short, paleoecology furnishes an impressive evidence of the continuity of the biological and geological conditions under which animals and plants have lived and died for many millions of years.

## Harmonize Your Testing with the Tenets of Your Teaching

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As a final examination in high school botany, an experiment termed an "activity test" has just been completed. The aim in doing this was an attempt to harmonize more closely our testing with the tenets of our teaching.

It seems advisable before going further to present briefly an outline of the type of course being taught. The semester's work is subdivided into four major parts.

### 1 Morphology: Time, three weeks

This seems a necessity for those few who intend to do advanced work in biology.

### 2 Plant Physiology: Time, three weeks

Such a unit allows the instructor to integrate the parts of a plant with the fundamentals of growth and function.

### 3 Conservation: Time, three weeks

### 4 Applied Botany

The remaining nine weeks are aimed at individual and community problems. These are selected by the students. The time on each problem varies from one period to two weeks. The following are but a few of the topics considered last semester:

- (a) caring for the lawn
- (b) starting a new lawn
- (c) controlling pests
- (d) potting house plants
- (e) transplanting
- (f) trimming trees
- (g) caring for berry beds
- (h) starting house plants from cuttings

These last nine weeks are intensely practical, self-motivating and interesting. They leave the instructor with the feeling of having performed a real service to the student and the community. But enough of the type of course. Its application presented another problem, which is our main interest. How should one test this different, if not unique, approach to botany? The answer was found in the "activity test."

Question number one was completed at home. The student was to construct a "seed flat," prepare the soil, seed it, give it proper care, label with the type of seed, date of seeding, and present for grading and inspection at a specific date. (The lapse of time from the assignment

to the inspection varied from five days to two weeks depending on the speed of germination of the particular seeds planted.)

In this task, attention to organization and detail were demonstrated by neatness, evenness of seeding, promptness, and timing of necessary tasks. Initiative played a part, for some presented flats that were painted while others had neat wooden partitions between the differently seeded areas. One lad built a sliding glass cover, the adjustment of which allowed him to leave the flat outside at a much lower temperature.

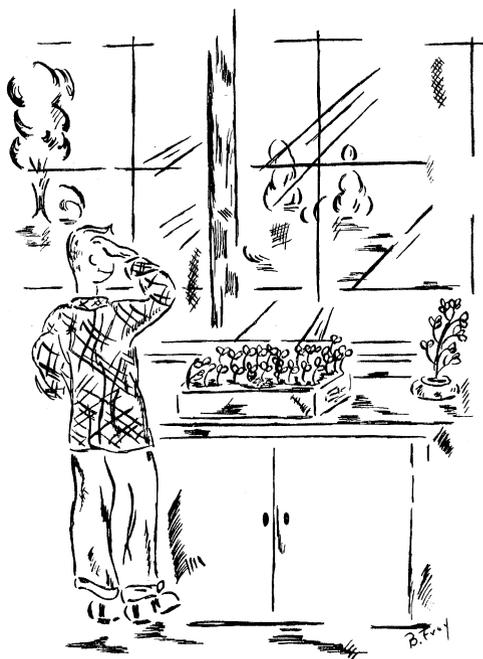
The students asked questions: "Why do my plants bend toward the window?"

"My tomatoes are up, but the first two leaves do not look like the second pair. Is something wrong?"

One period was set aside to discuss these questions. The answers became a part of the students' ever-growing store of knowledge. This more than ever convinced the instructor that here was a test which truly possessed a learning process.

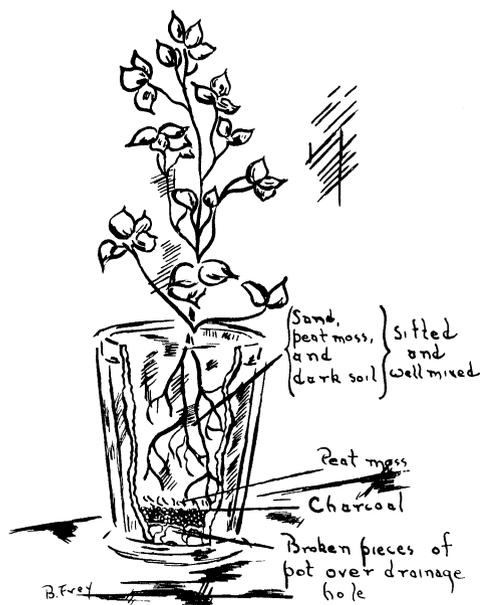
The second question required the students to pot a plant correctly. (A demonstration lecture had been given earlier in the course.) This task was undertaken on one of our lab days, which consisted of two forty-minute periods. Materials were in the green house, and, one at a time, students entered to pot a plant. A limit of two minutes per pupil allowed the testing of thirty students in the one double period.

Next the students were required to make alkaline and acid tests of soil samples. Three different soil testing methods had been discussed in class during the course of the semester. The tests selected were reliable, and the chemicals used were those which are usually obtainable in a home. One of the three sets of materials was placed at the work tables before each student. The test was



completed and a brief summary written while the individuals were under observation by the instructor. This test was accomplished in a forty-minute period.

For the fourth question the writer thought it wise to test the unit on morphology. There are six work tables in the biology room, and five envelopes were prepared for each table. In each envelope was one seed and one leaf. The envelopes were handed from one student to the other at each table. The student merely wrote down whether he thought the seed and the leaf were of the same phylum. After this, a seed from a grapefruit was given to each examinee. He was to describe in writing the characteristics of the leaf veinage, and to give a brief description of the flower telling the number of parts. (The student first ascertained whether the seed was monocot or dicot; then he described the flower and leaf of a plant he had never seen by applying his knowledge of morphology.)



### Potting of Plant

A sample "activity test" question, which, in the author's opinion most successfully measured scientific thinking was introduced by presenting each student with a quantity of soil approximat- ing one pound. Several divergent types of soil were used. His task was, in effect, a research experiment of a simple nature. He was to measure the percentages of hydrostatic, hydroscopic, and hydrosatur- ated water content in this soil sample. His procedure was usually to saturate

the soil, weigh it, air dry the soil, weigh it again, and finally weigh the soil after heating. This was started in a Friday period. After the first step the students flattened the soil for fast drying and placed it in a warm location until Mon- day, at which time the work was com- pleted.

The sixth and final part of this test came on the final examination day sched- uled for the biology classes. By special arrangement, a full half day was allotted for this purpose. It was easy then to arrange the students of the three classes in alphabetical order and to give each student a time to appear in class, from 8 to 12 at three-minute intervals. Sev- eral students waited in the classroom for their turns. Each was given a three- minute oral quiz in the green house. A student monitor called in the next partic- ipant and escorted the last one out of the classroom. The questions were conc- ise. About 40 had been prepared, but each student received only three. Ex- amples are: "When is the best time to plant grass seed, and why?" "How would one control dandelions on his lawn?" "With this paper and pencil, sketch the best method of trimming a hedge, and tell why it is best."

Below is a sample of the last three weeks' activities in a semester.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Question No. 1	Usual class procedure on these days .....			
.....	Question No. 2	Question No. 3	Question No. 4	Question No. 5
	Check results of No. 1 on these days .....			
Question No. 5	Discussion	Regular Finals on Wed. and Thurs. for all other classes. Oral quiz on Thurs. 8 to 12 for biology		

Discussion with the students as to fair grading standards resulted in a scale for each of the six questions. Each question counted one-sixth of the final, and the final counted as one-fourth of the semester grade.

A sample grading scale for the first question is given as a guide:

20%	promptness and dependability (work must be in on a specified day)
20%	workmanship on flat
20%	preparation of soil with peat moss and sand, and the achievement of good drainage
10%	ingenuity
30%	results
<hr/>	
100%	total

The students filled out cards with these percentages written out and tacked them to the flats. Completing the grade and recording it was an easy task.

Interest in these examinations was tremendous. They knew they were thinking, and they loved it! The results of their thinking could be measured and expressed by an activity, and they loved that too!

The advantages of the "activity test" are listed in brief conclusion.

1. A major abundance of interest and enthusiasm was noted. The good student realized value, while the poor student had the impression that he was "getting out" of a final.
2. Here was a test with a true learning process for the student.
3. The student was allowed full expression of ingenuity and was given credit for the same.
4. Simplicity and accuracy added to the pleasure of the instructor in grading. Grading was accomplished during school hours.

The only disadvantage to the test is that it consumes longer classroom time. In so far as class time should be utilized in the "learning process," this liability is immediately cancelled by asset number two.

Should any readers decide to plan such an "activity test," the author would appreciate an exchange of ideas since he is currently organizing a similar test for zoology.

Both illustrations are by BARBARA FREY, student at Crystal Lake High School

## The Integrated College Course in General Biology

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No elementary science course now taught in college is so lacking in standardization as *General Biology*. It has absolutely no standard pattern. Comparison of the varied textbooks at present available offers convincing evidence of this. Even greater differences between courses with this title are suggested by an analysis of the credits students transfer from one college to another.

An introductory course in college biology may meet two hours each week for one term and consist of formal lectures only. Or it may meet six to eight hours each week for a year, and include laboratory and field work, as well as formal lectures and informal discussion sessions. Obviously, the students introduced to biology in courses so diverse in length and method of instruction have, at the end, reached different levels of under-