43. T F If a bat comes into the room, it is a sign of death.
44. T F Bats like to become entangled in human hair.
45. T F A nutshell hung around the neck will prevent disease.

The instructions were to mark a statement believed true or false by encircling accordingly either the letter T or F and to leave unmarked the statements about which the student had no opinion. Scoring was done in terms of correct responses. The test was constructed by the five instructors in charge of the course. Its reliability obtained by the use of a Kuder-Richardson formula was .78.

In Table I is presented the comparative performances of students having had high school biology and those having had no high school biology. Test results with the *ACE Psychological Examination* indicate that in both years the groups compare closely in intelligence. In 1940, the mean score of the biology group was 108.02; that of the non-biology group, 108.23. The variability of the two groups was also similar, a standard deviation of 26.07 being found for the biology group and a standard deviation of 26.26 for the non-biology group. In 1941, also, the groups were not significantly different in performance on the ACE Test.

The results in both years show a difference in favor of the students who have had a course in biology in high school. Only in the instance of the 1941 results, however, is the difference large enough to be said to be statistically significant.

TABLE I

	Students having a course in biology in high school	Students not having a course in biology in high school	Ratio of difference to probable error of difference
Students entering the university in 1940			
Number of students	54	46	
Mean score	51.79	48.18	2.6
Standard deviation	9.99	10.69	
Students entering the university in 1941			
Number of students	41	37	
Mean score	54.88	48.82	4.4
Standard deviation	13.02	18.07	

Your Classroom Can Be A Museum

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A biology classroom should never lack objective materials because a school cannot afford expensive biological supplies. Better "brands" of biology are often taught with student-made equipment. In this case the teacher and the students share alike in the joy of their accomplishments. An "empty" classroom probably indicates that the course is founded upon passive textbook humdrum, that the teacher lacks energy and initiative, and that the students lack the real interest which results in active participation. A classroom reflects the kind of teaching that goes on within it.

Since the study of biology is the study of life it is of necessity intimately associated with phenomena such as chemistry, physics, electricity, and light. Students have specific interests in these subjects, which require only the proper biological "hookup" to stimulate active interest in biology. Probably no other course in our secondary schools is so rich in opportunities for active participation by both teachers and students as biology. Herein lies the opportunity of the gifted teacher to plan the greatest good for the greatest number, founded upon associated and interrelated materials, and suited to individual needs and interests. To work effectively it must be a plan in which the most gifted and the least gifted may contribute according to ability; it must provide unlimited suggestion for a large variety of activities, and above all the final results must be objective.

A Natural Science Museum in the biology classroom can be the ultimate objective of such a plan. Many types of interests may be utilized in building a museum, in fact the variety may become so great that almost everyone of an entire class may contribute something to the cooperative plan as a whole.

How To Start A Museum

Every class in biology has within itself the potential possibility to start and develop a small Museum of Natural History. This potential museum may take the form of latent energy among the students ready to be released through proper stimuli under the direction of the teacher to make collections, to mount and to classify.

It is quite possible that large numbers of students have scattered among their homes enough interesting specimens to start the nucleus for a worth while museum in the classroom. Since the glamor of interesting specimens in the home usually wears off as they become old and dusty, many parents are glad to part with their treasures when they know they are to serve a useful purpose.

To accomplish his purpose a teacher must first "sell" the idea of a museum to his students with a vivid word picture of what he intends to accomplish through the co-operation of all his students. Since a student may not know what his parents have stored in the attic or cellar it is usually good strategy to begin to search the grounds most familiar to him, *i.e.,* his home. In this project he will probably obtain the co-operation of his parents who may help to carry the hunt to a successful conclusion.

When a classroom museum is started from "scratch" the following list will prove helpful to supply the initial material for a quick start, namely:

1. Old shadow boxes, or good mounting boxes of any kind.
2. Picture frames with a wooden finish.
3. Window glass, 8×10 inches or larger.
4. Stuffed birds or animals.
5. Potted plants of any kind.
6. Water plants for aquaria.
7. Cocoons or insects in good condition.
8. Wild fish such as sunfish, minnows, bullheads or carp.
10. Straight-sided pickle jars or mayonnaise jars, quart or pint sizes.
11. Fish bowls, large jars or aquariums.
12. Industrial exhibits of a biological nature.
13. National Geographics on plants or animals.
14. Books of any kind related to biology, such as tree or flower guides; books on botany, zoology, health, etc.
15. Cigar boxes, for mounting insects and storing materials.

Constant suggestion is the secret for success in student collecting. Like adults, high school students forget, and must be constantly reminded.

If the teacher has "sold" the museum idea, and if he is lucky with the above list he may find that what started out to be a class project may have developed into a community project. Among the parents there are often nature enthusiasts who welcome the opportunity to contribute. The materials that may be collected in the above manner may surpass a teacher's wildest imagination.

How To Develop The Museum

Co-operation should be constantly emphasized as a means of accomplishing results that could not be acquired by any one individual such as for example:

1. Co-operative planning.
2. Co-operative collecting of working materials.
3. Co-operative working of special interests such as art and woodwork to produce a finished product.

Repetition should be used to offer additional suggestions for activities that may strike all types of individuals. All projects should be carried through to their logical conclusions, once they have been started. A student should not be allowed to give up once he has selected and started a given piece of work. In this connection it is often wise to put a good student and a poor student on more difficult projects. Since the poorer student will shine in some of the reflected glory of his partner he will learn a great deal of application which could not be otherwise self-imposed.

Every effort should be made to use all types of abilities. Those interested in art should be encouraged to use their talents in painting still life, constructing dioramas, modeling and labeling materials. The shop boy who probably is not artistic may share in the glory of a finished product by making a wooden case for a diorama. Many students with an artistic tendency are especially gifted in manipulation and arrangement of materials. Such students can mount materials successfully, and make good dissections under the direction of the teacher. Finally, those who are not gifted in any other way are often good collectors. These people play their part by keeping up the supply of live material in the laboratory. Of course, collecting should not be done merely for the sake of collecting. Everything should eventually be classified and mounted when possible so that it may be used in classroom work. Nothing should be wasted.

Thus, the laborer, the mechanic, the architect and the artist may combine in school as in real life to turn out a worth while product.

Organization

Organization is the secret of successful teaching in our modern schools with their mass education methods. It is especially true in laboratory courses such as biology where materials must be used each day with a minimum of loss and breakage. Such materials should be classified, grouped and filed so that they may be found in a definite place on a moment's notice, and with a minimum of uncertainty and confusion. Definiteness and system are reflected in neatness and order in the classroom because many students will take pride in doing their share of the work. Pride in the classroom itself will lead to greater enthusiasm about the subject matter with a desire to do additional work beyond the original assignments. When a student can point to a piece of work and say, "I did that, that is mine!" he immediately becomes an integral part of the classroom setup.

Summary

1. It is not enough merely to suggest that students start a museum in the laboratory or classroom. The idea must be popularized and "sold" to them by the teacher.

2. Constant repetition of the museum idea with unlimited suggestions for projects will finally bring about activity.

3. The teacher must organize all types of abilities so that everyone may contribute something to the general plan as a whole.

4. As soon as the museum becomes fairly well established classroom organization in the handling of materials becomes a prime factor for efficient teaching.

Biological Briefs

TEALE, EDWIN WAY. *Children of the Sun.* Nature Magazine 35: 427–429; 444. October, 1942.

The activities of insects are in many ways correlated with temperature. Ants run much more quickly as the temperature rises, and decrease their rate of progress immediately when passing through a shady spot. Their speed, as well as the rapidity of the song of the snowy tree cricket, may serve as an accurate substitute for a thermometer. Certain butterflies and grasshoppers fly only when a certain temperature level has been reached, and bees are immobilized below 45° F. Although it is phototropism which attracts moths and other night-fliers to lights, this activity is greatly increased between 80° and 90°. The speed of cockroach growth is markedly influenced by temperature, and adults seek out homes where the range is between 70° and 80°. During the warm summer months, aphids reproduce asexually and only females exist; with the drop in temperature as fall approaches, males appear and the time between generations increases. The eggs of short-horned grasshoppers require winter cold to break their dormancy, and fail to develop normally if kept warm throughout the winter.

STANFORD, E. E. *Plants in a World at War.* Nature Magazine 35: 456–462; 498; 500. November, 1942.

Rubber is not the only plant product whose source of supply has been closed to us. The barks of many native trees are now being tested to replace a variety of imports from which leather-tanning extracts are obtained. The few California cork oaks have been stripped and more trees are being planted, while the potentialities of the barks of several firs for granulated cork are being investigated. Fibers from redwood bark may be adapted for insulation and for admixture with textile fibers. Of all textile and cordage materials, we are self-sufficient in cotton and rayon alone. A limited amount of fiber flax is produced in Oregon. The available supply of Manila hemp is carefully husbanded, and wherever possible sisal and cotton are substituted. Domestic hemp production is being emphasized. Milkweed floss may serve as a partial substitute for kapok. We need larger plantings of bush flax for linseed oil to substitute for tung, while Brazilian palm-oils and gums from pines may also help our drying-oil problem. We may manage to raise castor beans to replace imports for medicine, paints, leather finishing, and calico printing. Cottonseed, soybeans, and peanuts are our most important source of food-oils, and the first two of these, together with South American palm oils, must serve to replace coconut oil for soap and glycerine.

RUTH S. STEIN

Books

REESE, ALBERT M. *Outlines of Economic Zoology.* 4th edition. The Blakiston Company, Philadelphia. xii + 359 pp. illus. 1942. $3.25.

Opening with a discussion of the intestinal amebas of man, and closing with comments of the uses of whale ribs and porpoise leather, *Outlines of Economic Zoology* is a text-book for a general survey course in its field or a supplementary source for the traditional courses in biology and zoology.

For each phylum there is a brief review of classification. Appropriately the author devotes relatively more space to forms for which there is less literature ordinarily available. For example, the discussion on alligators takes seven pages, while all of the insects take only 25. A bibliography of 348 references is arranged by groups.

While there are occasional quotations from more technical reports, the vocabulary is no more difficult than that of the average elementary text in biology. A number of our students using the book for special report topics, have shown reasonable mastery of the ideas. Comparing it with his own biology text one high school sophomore said, "It has more in it that you want to know."

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