

This study was not government funded, it was not required as inservice growth credit, and it was not part of any college credit. It just seemed somewhat hypocritical of me to stress to my students the value of the scientific approach to problem solving and objectivity when I subjectively evaluated my own teaching. I hope that other teachers might attempt to evaluate their own classes and performance as I have tried to do. Only in this manner can we show the responsibility necessary for directing our own accountability.

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A TECHNIQUE TO INTRODUCE DICHOTOMOUS KEYS

I have found that working with and constructing dichotomous keys usually presents some difficulty for beginning biology students. Thus, I have adopted the following techniques to introduce the concepts involved. I construct a "key" to an assortment of keys. Door keys, house keys, and car keys are "keyed out" by the use of this scheme. Following is a copy of my introductory key. The structural characteristics utilized in this key are presented in fig. 1 and the individual keys in fig. 2.

Dichotomous Key to Keys

- 1a. Key head with curved edges (A and B) .. go to 2
- 1b. Key head with straight edges (C, D, E) . go to 3
- 2a. Key head circular shaped (see fig. 2A) Key A
- 2b. Key head oval shaped (see fig. 2B) Key B
- 3a. Key head triangular shaped (see fig. 2C) . Key C
- 3b. Key head with more than 3 sides go to 4
- 4a. Key head pentagon shaped (see fig. 2D) . Key D
- 4b. Key head triangular shaped (see fig. 2E) . Key E

Although this key is specific only for my particular key chain, it is very adaptable and does illustrate the important concepts involved in using and construct-

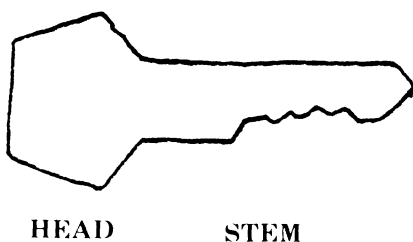


Fig. 1. Structural characteristics of keys.

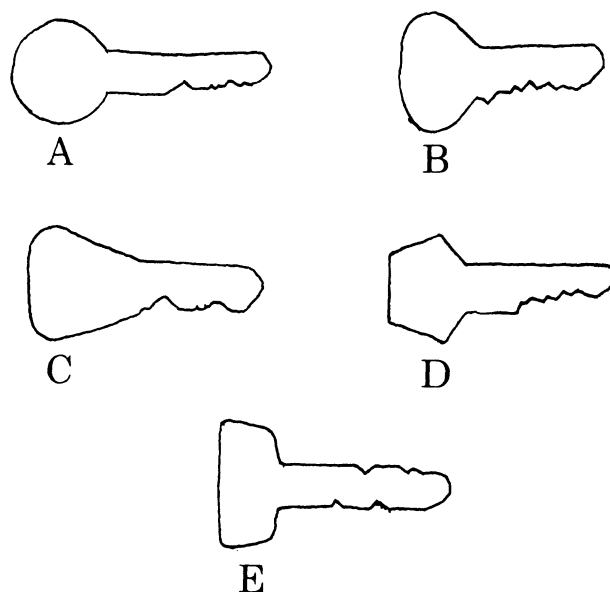


Fig. 2. Specific keys.

ing keys. First, it is based on structural characteristics as are most biological keys. Then, also, this key demonstrates the principle of elimination inherent in dichotomous keys.

After being exposed to this key, my students are asked to construct a key of their own for the purpose of keying out the contents of their purses (girls) or pockets (boys). Diagnostic characteristics to separate a comb from lipstick, or a coin from chewing gum, soon become apparent. The students test the effectiveness of their keys by trying them out on their classmates.

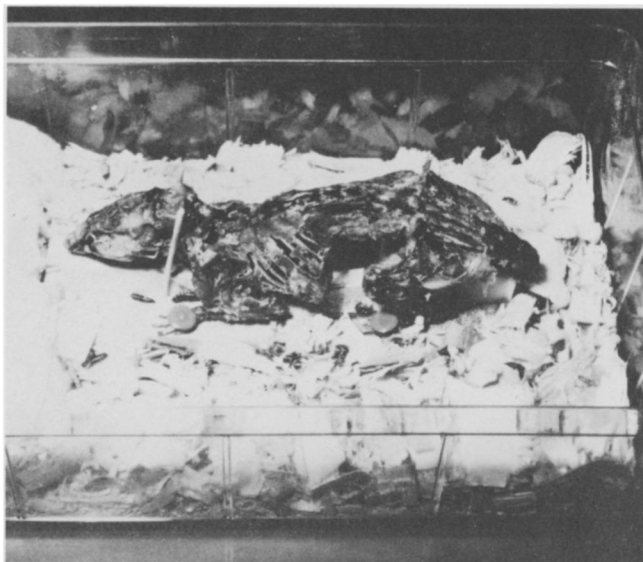
I teach from BSCS "Green Version" in my classes. This textbook presents keys in chapters 4 ("Animals") and 5 ("Plants"). Investigation 4.2, "Structural Characteristics in the Identification of Animals," presents keys to distinguish classes of various animal phyla. Investigation 5.1, "Diversity in Angiosperm Leaves," requires the writing of a key to distinguish a set (usually 10) of leaves. I have found that these investigations run more smoothly after the introduction described above.

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PREPARATION OF SMALL ANIMAL SKELETONS USING BEETLE CORROSION

As a biology instructor I have often wished for a convenient method of preparing skeletons of small mammals, rodents, reptiles, and amphibians in the classroom. The conventional boiling technique is difficult because of the destruction of bone, cartilage, and ligaments resulting in the disarticulation of the skeleton. Students become frustrated and lose interest in trying to glue the skeleton back together. I believe that a solution to this problem lies in the use of beetles to remove the flesh during skeletal preparation.

The leather beetle, *Dermestes vulpinus*, is a beetle



A mounted rat cadaver undergoing the process of beetle corrosion.

that eats dried flesh but does not feed on putrifying tissue, a characteristic that makes it a valuable scavenger in nature and readily adapts it to classroom use with a minimum of odor. This beetle is cosmopolitan in its distribution. It is a hardy insect that will prosper with minimum attention. Its three basic requirements are food, in the form of the cadaver, adequate moisture, and a temperature of 23-27 °C to stimulate maximum activity. Placing a colony under a lamp will provide proper temperature control. The insect seldom flies, although a colony should be kept in an escape proof container, preferable a clear plastic to allow observation of beetle activity.

Any animal to be used for skeletal preparation with beetle corrosion must be skinned, have its viscera removed, and be dried. It will be helpful later if the dried cadaver is mounted on a support to help position the finished skeleton in a standing position.

Elapsed time for the corrosion of a single cadaver is about six weeks. The only critical part of the corrosion process involves removal of the skeleton from the colony when the beetles have consumed all of the flesh but before they eat away the ligaments. Proper timing here will prevent disarticulation of the skeleton.

After the skeleton is removed from the colony it should be cleared by immersion in an undiluted solution of sodium hypochlorite (Hilex or Chlorox) for one and one-half minutes and then rinsed. The skeleton is then bleached in a 3% solution of hydrogen peroxide for 48 hours. This is followed by rinsing and then degreasing by immersion in a strong detergent solution for one hour. At this point the skeleton will be very limber and unable to stand without support. It should be propped into a normal standing position and allowed to dry from 48 to 72 hours. It may be necessary to glue loose bones or weakened joints at this point. Finally the skeleton should be sprayed with a clear acrylic plastic (Krylon No. 1301, for example).

Interest in this process was outstanding. Students became more enthralled with the progress of the beetles' consuming the dried flesh of the cadaver than

any other activity they were involved in during the year. Even nonscience students became avid observers as the word spread. It did not take long before the students discovered that the beetles were reproducing in the corrosion box. This opened the door for a fruitful investigation of the life cycle of the insect, the morphology of the various stages, and the process of metamorphosis. We also conducted open-ended experiments into the eating habits of the beetles, the effect of lowered temperatures on their activity, and a population density study using a pair of beetles as the parents of a new colony.

In my opinion, the main advantage of beetle corrosion is the ease of obtaining a completed skeleton without the tedious process of having to glue bones back together. However, the stimulation of interest on the part of the students, the excitement of working with a new laboratory animal, and the success as measured by student questions, discussion, and involvement were unexpected side benefits.

Instructors interested in this process but lacking the time or means to collect the necessary props can procure a complete skeletal preparation kit including dried cadaver and beetles from International Biologics Inc., 1991 Sharondale Ave., St. Paul, Minn. 55113.

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Just a Routine Test

At January's AAAS meeting in New York, Philip La Fleur, chief of the Analytical Chemistry Division of the National Bureau of Standards, reported that literally billions of chemical analyses are performed every year, but that many of the measurements probably are not accurate enough for the use intended. Chemical analyses in the nation's clinical laboratories are subject to the same kind of errors, and whether or not patients will be surgically treated or given chemotherapy is often based on these analyses.

Four billion clinical analyses will be performed in the U.S. in 1975, La Fleur said, at a cost to the patient of about \$2 an analyses, for a total cost of \$8 billion. Knowledgeable clinicians say it is necessary to repeat at least a tenth of all clinical analyses because of inaccurate results. If repeat analyses could be eliminated entirely, the savings would be nearly \$1 billion a year.

Four Precepts

Four precepts: to break off customs; to shake off spirits ill-disposed; to meditate on youth; and to do nothing against one's genius.

Nathaniel Hawthorne