the slow student to catch up on some concept that he has not been able to fully understand in class, or for the ambitious student to do supplementary work for extra credit. With the help of the media center staff, the teacher or student may set up carrels that are semipermanent. This gives the student an opportunity to work on his experiment anytime he has a free period; in other words, he is not restricted to the time he is assigned to the classroom or the science lab. A student on independent study can spend as many hours as he wishes on his project, with a variety of materials always at hand; he need not move from one part of the building to another in search of information.

And why not an autotutorial system, set up in the media center for the use of many students at their convenience? This would enable any student to make full use of the programmed carrels without perhaps disturbing a class or staying after school to finish his work.

The media center also offers the student the environment in which he can grow, limited only by the boundaries of his own imagination. It is here that he can more fully develop the self-direction he needs before venturing into college or technical school. The change from the traditional high school to the less structured halls of ivy is drastic for most students. They cannot be expected to spend 12 years under the aegis of the traditionally rigid school system and then function on their own, when they go on to higher education, without some adjustment—often quite traumatic. In surveys that we have sent to college students who were part of the Waterville High School Media Center program for four years, it comes through to us again and again how the opportunity to work by themselves and with other students helped them to make this transition with confidence. We say, give them tools to work with and then let them go. Let them become familiar with all the ways to use the equipment and materials that the modern media center affords. Let them develop the self-assurance that comes only when one learns by doing—not by reading out of a textbook.

When one considers the quality and quantity of printed and other materials available in the modern media center, together with the trend towards independent study, the idea of the media center as a mini-lab makes sense.

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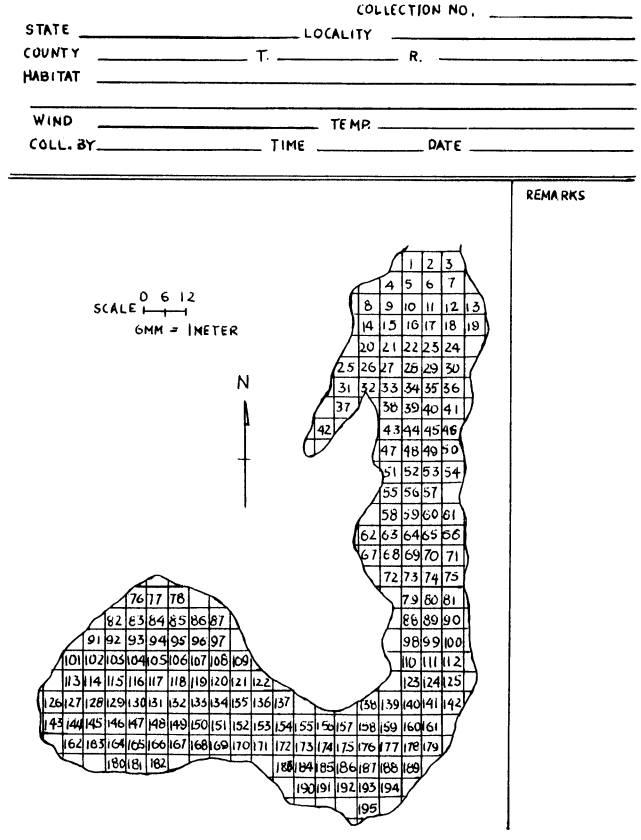
Grid Map as Part of A Field-Note System

"The strongest mind is weaker than the palest ink." Facts that are left to memory are usually questionable. The wildlife investigator should develop the habit of recording his field and laboratory data promptly in written or photographic form and filing



these records in such a manner that they may be readily consulted at any later date.

Nothing is as important and inexpensive in a field study as precise, coherent, descriptive, and easy-to-read field notes. During the past few years of research and supervision of class research problems, a method has been developed that helps the investigator distinguish between what is worth recording and what is not. Yet the system is flexible enough to allow the investigator to make the choice of relevance when in doubt.

The accompanying figure is a sample of a field-note sheet, which incorporates the written form and a grid map form. In this particular field note the sampling area is a temporary pool in the woods. The pool was mapped by the baseline method while the pool was dry; the border left by the water the year before was noted. (Larger sampling areas could be mapped by other ground survey methods or by aerial photography.) The map was then divided into numbered one-meter squares, so that each randomly selected sampling station could be marked for further reference. Incomplete marginal one-meter squares were not given numbers, because these areas were seldom covered with water; however, numbers could have been assigned to them, had this been necessary.

A map as part of the field-note system may seem impractical, but in actuality few sampling areas should present much of a problem. The advantages of having a scale map of the sampling area should be

obvious and will certainly become so after using it in the field-note system.

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The Slide-Rack Collector

The use of a slide rack to collect living organisms on glass slides is not only simple and inexpensive but also gives a tremendous amount of laboratory "mileage." Having experienced a fair amount of success in using this method to show students the diversity of life and its classification, I feel that more teachers should be made aware of it.

According to James M. Moulton, chairman of the biology department of Bowdoin College, the method was used at the marine laboratory at Woods Hole, Mass., during the 1940s by Mary D. Rogick in collecting young stages of bryozoa. My first experience with the slide-rack collector came in 1959, when I attended a National Science Foundation institute in marine biology at Bowdoin. I found the results fascinating then, and I still do.

A wooden slide rack was used at Bowdoin, but I find a hinged plastic rack more convenient. To make it, obtain a hinged plastic slide box (25-slide capacity) and cut out one window in the bottom and another in the cover. Leave enough of the plastic to prevent the slides from dropping out. Most of the plastic boxes have slots wide enough to accommodate two slides pressed together: organisms will then accumulate primarily on one side of a slide. Slots may be skipped between successive pairs of slides, to allow for freer circulation of water and thus prevent the accumulation of silt.

After filling the slide rack with the desired number of slides, lay a length of plastic clothes line against the inner surface of the hinges and then close the cover. The line is used to suspend the rack in the water. To prevent the lid from accidentally opening, secure it with an elastic band.

Slide-rack collectors can be used to obtain organisms from a wide variety of habitats: bogs, marshes, streams, lakes, rivers, and the ocean. Once I coated the slides with albumen fixative, hung the rack from a tree branch, and collected a number of pollen grains and molds and a variety of pollutant particles.

A lobsterman's float serves as an ideal spot for collecting marine organisms. The line is moored to the float so that the slide rack (or a series of racks, attached to the line at intervals) is suspended in the water. Within two or three weeks, usually, an exciting variety of creatures will have become attached to the slides. A plastic bucket of fresh seawater serves to convey the slide rack to the laboratory.

To examine a slide, place it in a petri dish containing salt water. The organisms can be observed under the dissecting microscope or under a low power (up to 100 ×) of the compound microscope. If observation at 430× or 440× is desired, the slide should be removed from the petri dish and a cover slip added. To view selected organisms under high power, remove them from the slide with a medicine dropper or a dissecting needle and make a wet mount. The slides can be used for several days if stored in a refrigerator between observations.

Students are amazed when they focus upon such things as a miniature bivalve extending its foot and pulling itself along the glass slide, a polychaete worm protruding its head and tentacles from its tube to sense its surroundings, the heart of a tunicate alternately beating in one direction and then in the other, and the symmetry and delicate beauty of diatoms.

The diversity of life found on the marine slides depends on such factors as the depth at which the slides are submerged, the period of submersion, and the season of the year. However, the following phyla are often represented: Protozoa, Chrysophyta, Cnidaria, Platyhelminthes, Nematoda, Annelida, Mollusca, Arthropoda, and Chordata. Students are more likely to be interested in a survey of the phyla when they observe living organisms that they themselves have collected from places that are familiar to them.

Comparisons can be made among slides that have been placed in different habitats or in the same habitat at different times of the year. Also, by removing slides from the rack one or two at a time over an extended period the phenomenon of succession can be observed. And records can be kept from year to year of the different genera or species collected: not only would this serve as a useful checklist, but in light of the rapid changes being brought about in the environment by pollution it might also develop into a worthwhile monitoring program. In this regard, the following quotation from *Biology and The Future of Man* (P. Handler, ed., 1970: Oxford University Press, New York; p. 499) seems particularly appropriate:

> Water pollution is now rightly considered one of our foremost problems. There is no more accurate or quicker way to determine the degree and the nature of pollution of a given body of water than to study the algae and other microscopic plankton organisms found in the water. Each species has its own requirements for oxygen, nitrogen, and other organic and inorganic additives to the water, and their study permits a rapid and inexpensive monitoring service.

I am convinced that the slide-rack collector provides an extremely worthwhile educational experience. If you have never used this technique, I strongly urge you to try it. Upon request I will suggest a source of ready-made collecting racks; please enclose a stamped, self-addressed envelope.

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