area relieves eye strain and provides a warm air space below the paper, thereby increasing the rate at which the spots will dry. A small pull-type drawer serves as a handy storage place for pipettes, etc. The level of the table on which the apparatus is placed is adjusted to bring the level of the pipette to shoulder-height when the operator is in a sitting position.

CLARK H. LIVINGSTON
MERLE G. PAYNE
JESS L. FULTS
ROGER M. BLOUCH
Departments of Chemistry and Botany and Plant Pathology
Colorado Agricultural Experiment Station
Fort Collins, Colorado

Manuscript received December 15, 1952.

Zoological Collecting Expeditions and the Salvage of Animal Bloods for Comparative Serology

ADEQUATE collections of individuals and species of animals are indispensable in the present-day approach to the problems of animal systematics. This requires that much collecting remains for the future and that even some of the territories previously surveyed may need to be revisited. We call to the attention of those planning and participating in zoological collecting expeditions the possibility and the desirability of saving the blood and obtaining the sera of representative animals in order that a thorough study of the amounts of serological and biochemical correspondence of their blood proteins may be made.

Useful samples of animal bloods and sera may be obtained even with the barest minimum of equipment and facilities. Such samples may serve in "first approximation" studies and may help to indicate where more careful testing is needed.

Let us be realistic and assume that most zoological collecting expeditions will be: (1) short-handed and incapable of devoting more than a minimum of time to extra duties, however desirable from other points of view; (2) unequipped for refined serological collecting; and (3) inexperienced in the standard procedures for collecting and handling animal bloods. And let us also be optimistic in assuming that some members of such expeditions would be willing to give limited help to us and save the bloods and sera of some of the animals obtained in normal routine collecting. What could such people do that would require the very minimum of time, experience, and equipment?

We will discuss the possibilities for collecting animal bloods on two levels, viz., (1) that where no facilities for collecting fluid blood are available and (2) that where fluid blood and sera may be collected but at the minimum level of equipment.

1. Collection of blood without facilities for handling volumes of fluid blood or sera: The simple procedure, for small birds or mammals, is to make use of filter paper or towelling paper to soak up the blood from wounds or the blood and sera from the animal's carcass as it is being skinned. Care should be taken to keep the paper free of fat. Such blood and sera squeezed from the carcasses may be supplemented by blood obtained directly upon cutting open the heart and major vessels. It would be desirable to obtain the equivalent of a 2-inch square of soaked filter paper from a single small bird or mammal, but often this is not possible. In such cases the procedure may be repeated for several individuals of the same species—all on one piece of filter paper if the identification is certain. For a very rare small specimen we will be glad to get anything at all. The fact is that sometimes it is possible to identify the species from a spot of blood no larger than a matchhead. For animals as large as a red fox or larger, it should be possible to obtain the equivalent of a square foot or more of soaked paper from one or more individuals.

The soaked paper should be hung up in the shade to dry at prevailing temperatures, carefully shielded from other papers and from visitations by insects. When thoroughly dry, complete the labelling by writing in pencil, directly on the paper, the scientific name of the specimen, date, locality, whether sample is pooled or single, and name of the collector. If the identification is uncertain and the skin or other parts of the specimen are being preserved for later identification, indicate the specimen number and institution. Wrap the filter paper in protective paper and keep dry until sent to the Serological Museum.

2. Blood collecting where containers for fluid blood, bottles for serum, and preservatives are available: Any clean jar or container may be used for collecting fluid blood from fresh wounds or cuts. Allow the blood to clot in as cool a place as possible (but whole blood should not be frozen). After it has clotted, loosen the blood from the sides of the container and allow it to stand for several hours at room temperatures or overnight at refrigerator temperatures. During this time the serum will usually express itself from the clot as the clot shrinks. Pour off the serum as clear as possible into a serum bottle and add the preservative. A standard preservative is 2% formalin prepared by adding 2 ml of commercial formalin (equivalent to about 40% formaldehyde) to about 98 ml of fresh water. Use one part of this standard 2% formalin to nine parts of serum. The final concentration of formalin in the serum is thus 0.2%, and this has served as a very good field preservative.

If no suitable bottles are available for the storage of the serum, it may be soaked up directly onto the filter paper, and dried as for whole blood.

It is our hope that some useful samples for serological study may be obtained in these ways and that bloods which would otherwise have been lost may thus be salvaged. It is our hope also that through the modest but considerate help of *many* individuals and expeditions it will not be necessary to organize special collecting expeditions to obtain the needed sera. We would appreciate very much therefore, being in-

formed in regard to collecting expeditions while in their planning stages, in time so that we may have the opportunity of explaining our simple needs to those who will be in a position to help. The Serological Museum acts as a kind of world center for the study of comparative serology and has been designated as a Subsection of the Section of Zoology of the International Union of Biological Sciences. It has also been approved as a reception agency for animal bloods and sera from all parts of the world by the U. S. Department of Agriculture, subject to their regulations in regard to the treatment of the bloods and sera so received. We offer services of several kinds to those interested in comparative serology, such as an identification service for blood dots representing the blood meals of insects or other arthropods feeding upon unknown hosts. We offer materials, facilities, and instruction to visiting scientists, and publish a semiannual bulletin, distributed free to those interested in this field of work. Help has already been given us by many cooperating institutions and other agencies and by collectors in many parts of the world. But the task of obtaining representative collections of the sera of animals of many groups is so vast that more help will be needed for a long time to come. The source of all contributions of animal sera will be acknowledged in the scientific reports which concern them.

Inquiries and all other correspondence may be addressed to:

ALAN BOYDEN

Serological Museum
Rutgers University
New Brunswick, New Jersey

Manuscript received April 3, 1953.

Wanted—Definitions

RECENTLY Bauer (SCIENCE **117,** 40 [1953]) made a plea for "Logic and Language in Medical Writing." The other day in quizzing my class the meaning of the word "spore" came up and since no one seemed to know its meaning I assigned them an exercise on the derivation and meaning of the word. I was rather disappointed with the results, but when I looked in the books (including two medical dictionaries) which were available to the students, the only one that I found to have a correct derivation and definition of the term was Webster's *Unabridged Dictionary.*

As samples of the definitions given I quote the following. "A cell in a resistant covering, capable of developing independently into a new individual. Gr. *spora* (sic), seed." This definition would not hold for bacterial spores, which are not reproductive, or for zygospores, which do not develop independently, or for spores which do not have a resistant covering. Another: "A cell which produces a new individual without fertilization." Parthenogenetic eggs do this. A third: "Gr. *spora* (sic). A special reproductive body of one of the lower organisms. It is protected by a resistant covering, and capable of developing independently into a new individual." Same objections as to first definition. A fourth zoology text did not define the word at all.

How can we expect our students to be accurate when their textbooks and even reference books are inaccurate and misleading?

P. H. YANCEY

Department of Biology, Spring Hill College
Mobile, Alabama

Manuscript received March 9, 1953.

Book Reviews

Advances in Cancer Research. Vol. I. Jesse P. Greenstein and Alexander Haddow, Eds. New York: Academic Press, 1953. 590 pp. Illus. $12.00.

This is a remarkably fine collection of reviews in ten lines of investigation on cancer. Every contribution displays thoroughness, sound knowledge, and evaluation of the topic, and a scholarly, scientific approach. This would be anticipated from the authors, each one of whom is an expert research worker in the specific field.

The orientation of the volume is along "fundamental" research. All but two of the reviews deal with some aspect of carcinogenesis. C. A. Coulson's presentation indicates that the high expectations of some years ago in the mathematical formulations that a high condensation of Π-electrons in the so-called K region of condensed polycyclic hydrocarbons is related to carcinogenic property have not been realized.

L. Dmochowski brings up to date the work on the milk agent in the origin of mammary tumors in mice. It is now clear that the milk agent is not essential for the genesis of some of the tumors, and that the milk agent is not essential for the continuous growth of the neoplasms. Rapid progress in the subject still awaits at least partial isolation of the agent and more rapid bioassay methods for its presence. R. J. C. Harris, in describing studies on the Rous virus, where rapid bioassay methods are available, shows how far we still would be from the heart of the problem even if such viruses were available in the pure state. The key problems are the functional organization of cells and the effect of viral invasion upon such function. As such, research on viruses in general, and on cells in general may in the long run contribute more to the understanding of the role of viruses in cancer than the direct study of the few examples of virus-induced neoplasia.

E. V. Cowdry reviews the studies of his group on the cytologic and biochemical events that occur when