University Teaching." Evolution, genetics and the later history of bacteriology and protozoology are among the important subjects which unhappily failed to receive treatment. Consequently, the teacher is puzzled to know which book to use. He can not very well require students to purchase both. The omissions from the newer book are so serious that it seems to me they are not balanced by the gains. What we now need is a combination of the two books, with such condensation as may be necessary to keep the size down to reasonable limits. Certain modern researches should if possible be described, if only to show the fruition of earlier investigations. Aside from use as college texts, both books are well adapted for general reading, and should be in all public libraries. They can also be used to great advantage as reference books in high schools, on account of the many and excellent illustrations, which clarify the moderate technicalities of the text.

Personally, I do not like the method of splitting up the work of authors according to subjects, so that, for example, Leeuwenhoek is dealt with on pages 206 to 218, and again on pages 250 to 253. To overcome the confusion in historical perspective I have, in using the earlier book, prepared chronological tables by means of which the student may see what were the principal events in the whole field of biology at any particular time. Tables of this sort would form a useful appendix to the book. However, anything which may be said in criticism is of very small moment compared with the great services which Locy has rendered to the history of biology, and thereby to education.

T. D. A. COCKERELL

SCIENTIFIC APPARATUS AND LABORATORY METHODS

VACUUM TUBES FOR THE STORAGE AND SHIPMENT OF BACTERIA[1]

IN December, 1924, a progress report was made on "The Preservation of Bacteria in Vacuo."[2] The method described and still in use for the preservation of most of our stock cultures consists in drying the cultures on small bits of filter paper placed in small cotton stoppered tubes within pint milk bottles with specially ground covers. After establishing a fairly high vacuum the bottles are kept in the refrigerator. Under these conditions most bacteria remain alive for several years.

[1] From the Department of Pathology and Bacteriology of Johns Hopkins University, Baltimore, Maryland.

[2] Brown, J. Howard, "The Preservation of Bacteria in Vacuo." *Abstracts of Bacteriology*, Jan., 1925, ix, 8.

For certain purposes it has seemed desirable to preserve cultures in individual vacuum tubes rather than in pint bottles, especially for shipment by mail.

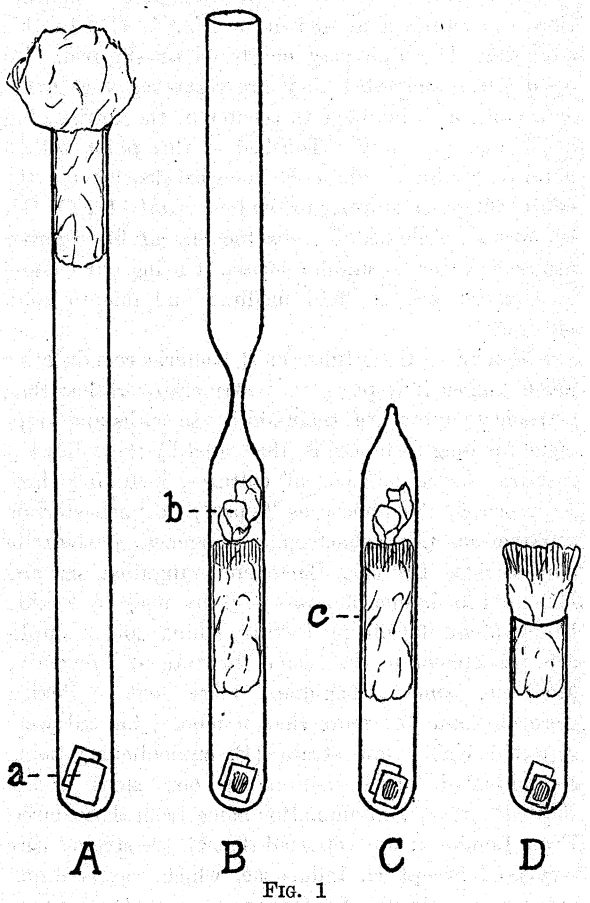

FIG. 1

For this purpose small test tubes (Fig. 1, A) about seven mm in diameter and nine cm long are employed. The tubes contain two small bits of filter paper (a), are plugged with cotton wool and sterilized by dry heat. Broth cultures are mixed with an equal volume of blood or serum. Agar slants should have two or three drops of blood or serum added to the condensation fluid. A loopful of the mixture is placed on each of the bits of filter paper within the tube. The cotton plug is then cut off with scissors just above the mouth of the tube; the plugged end of the tube thoroughly flamed and with a rod or pair of forceps the plug is pushed down into the lower half of the tube just above the filter papers. Two or three lumps of calcium chloride (previously sterilized by dry heat) are placed above the cotton plug, as shown at b in Fig. 1, B. In the small flame of a blast lamp or of a micro-burner a constriction is made at about the center of the tube, care being taken not to obliterate the lumen (Fig. 1, B). The tube is now to be connected

by means of pressure tubing to the vacuum pump,[3] which should have a manometer connected with it. When the air pressure has been reduced to 20 or 30 mm of mercury the tube is sealed off at the constriction and appears as shown in Fig. 1, C. In this condition the tubes may be stored or shipped. To open the sealed tubes they are scratched with a file at a point a little above the center of the cotton plug as at c in Fig. 1, C. Touched at this point with a hot wire or bit of glass the tube breaks, leaving the cotton plug as a stopper in the lower half (Fig. 1, D). By means of flamed forceps the bits of filter paper are transferred to suitable media, it being our custom to transfer one to fluid medium and one to solid medium.

Although in these tubes most bacteria remain alive much longer if kept in the refrigerator rather than at room temperature, their ability to withstand shipment for long distances is illustrated by the following results. An assortment of cultures, including three streptococci, Pneumococcus Type I, Corynebacterium diphtheriae, Corynebacterium pyogenes, Pasteurella cuniculicida, Proteus, Bacterium sanguinarium and Hemophilus influenzae, was sent by mail to Peking Union Medical College, Peking, China, and a duplicate assortment to the Lister Institute of Preventive Medicine, London, England. Those sent to Peking were en route for more than a month, but all were reported viable, one strain (P. cuniculicida) being contaminated. Examination of our stock strain showed that the contamination came from that source. From London it was reported that all the strains were recovered except H. influenzae, which was contaminated. A culture of Meningococcus later sent to London did not survive. We are indebted to Dr. Carl TenBroeck, of Peking Union Medical College, and to Drs. J. C. G. Ledingham and C. J. Martin, of the Lister Institute, for reporting on the viability of these cultures. Numerous cultures sent to various parts of the United States have been received in viable condition.

The method of putting up cultures in individual vacuum tubes for shipment has the following advantages: Saving in bulk and weight for mailing. Less danger of breakage or, if broken, less danger of contaminating the packing. A large number of vacuum tube specimens can be prepared from a single tube of growing culture. Cultures received in vacuum tubes need not be transplanted immediately, but may be stored for some time. A longer period of viability for most bacteria.

J. HOWARD BROWN

JOHNS HOPKINS UNIVERSITY

[3] A satisfactory pump for this purpose is the Hyvac Pump of the Central Scientific Company, of Chicago, Ill.

SPECIAL ARTICLES

UNDEFORMED PREHISTORIC SKULLS FROM THE SOUTHWEST[1]

INTRODUCTION

THE work of the archeologists in the American southwest is more and more becoming truly scientific and being conducted in a systematic manner, at least in a few districts. Hence we may look forward to satisfactory answers perhaps soon forthcoming in regard to culture characteristics, sequence, relations and origins.

But the task of the physical anthropologist is lagging far behind. The work has been sporadic, unsystematic and, as a result, we know little about the ethnic characters, relations and possible origins of the prehistoric populations of the southwest.

Archeology recognizes now two main cultures; the older is that of the so-called Basket Makers, the more recent belongs to the Pueblo Cliff Dwellers. The latter were brachycephalic people with heads artificially deformed posteriorly. The former had undeformed long skulls. But until now practically nothing has been published concerning them. In the past year I studied and measured all such crania as I could obtain. This is a very short résumé of my work in this line.

MATERIAL STUDIED

The following constitutes the basis of my study and conclusions:

(1) From Colorado: one female from Piedra (Archuleta Co.); one female skull from La Boca (La Plata Co); four female crania, more or less complete, and one fragment from La Plata Valley.

(2) From New Mexico: one female from near Rosa (Rio Arriba Co.) and fragments.

(3) From Arizona: three males and one female from Cañon del Muerto. Besides these, which I measured personally, I obtained, through the kindness of Dr. Hooton, of Harvard, pictures and measurements of four males and three females from the Marsh Pass district of Arizona. Also the principal measurements and indices of seventeen males and three females from Coahuila, Old Mexico; and finally 178 males and 137 females from Santa Barbara Islands, California, previously measured by Lucien Carr.

Dr. Hooton himself recognized the similarity existing between the Arizona skulls he studied and the Coahuila crania as well as the California skulls. I

[1] Address read before Section H—Anthropology—American Association for the Advancement of Science, Kansas City, December, 1925.