test, place about 5 cc of the water in a test tube and add 5 drops of the 0.04 per cent. indicator solution. Now, pour the water back and forth from one test tube to another for a minute or two, so that the water may come to complete equilibrium with the carbonic acid of the air, and then compare with proper standards. If the water is of good quality and the air is of average outdoor purity, the water should assume a pH of 5.6 to 5.8. If the pH is higher than this, it is a good indication that either the water or laboratory air contains appreciable amounts of ammonia. On continuing to pour back and forth for some time there may be a gradual rise in the pH, due to slow but gradual absorption of ammonia. The water comes to equilibrium with the carbonic acid of the air very much more rapidly than with the ammonia, so that, usually, the factor of ammonia in the air may be ignored. It may, however, be desirable to repeat the test at an open window or door or even entirely outdoors. At times even outdoor air contains sufficient ammonia to appreciably affect the test. The test is so extremely sensitive that it is easily possible to detect the difference in the ammonia content of air before and after a rain or snow.

The test may also be made in the complete absence of carbonic acid and ammonia by bubbling a current of air, purified so as to be free of these gases, through the test solution. The pH of good water under these conditions should approach near 7. For most purposes, however, it suffices to make the test after allowing the water to come to complete equilibrium with the air and recognizing that under these conditions pure distilled water has a pH of 5.6 to 5.8.

It is important to emphasize that pure water has practically no buffer capacity and that minute amounts of impurities may be sufficient to markedly alter the pH of it. In making conductivity tests of water, the same principles should be followed as in pH tests, namely, the water should either be in complete equilibrium with the air, or else carbonic acid and ammonia should be completely removed and excluded during the tests, and the results interpreted accordingly.

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A METHOD OF COPYING KYMOGRAPHIC RECORDS

THE physiologist or pharmacologist who during the course of a year accumulates a hundred yards or so of kymographic records must often wish, especially when he starts to write a paper, that he had in some way secured copies of those parts which are particularly convincing and illustrative, and had filed these under appropriate headings.

It is not always convenient to cut up the original records, and usually it will be found best to file in one place all the tracings made during several hours of experiment on one animal. Yet during that time several different phenomena may have been observed, several different experiments may have been tried, and several drugs may have been administered.

Many years ago it occurred to me that the cheapest method of obtaining a copy would be to make a print on fast bromide paper, using the smoked tracings as a negative. The method is so simple that it does not seem likely that I could have been the first to think of it, but I can not remember ever having heard of any one who used it. If the kymograph paper is well and evenly smoked and not handled overly much by greasy fingers the copy may be more clearcut and better suited for publication than is the original.

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APPARATUS FOR OBSERVATION OF A SMALL OBJECT WHILE FLOODED WITH VARIOUS SOLUTIONS

IN attempts to study the effects of various solutions upon individual nematode ova and coccidia, need has been felt for an apparatus which would allow continuous observation of an individual object before, during and after it was subjected to the action of chemical solutions. Following is a description of such an observation cell which has proved to be very satisfactory for this purpose:

Two small trough-like depressions, (A, A'), about 0.4 mm deep are ground into the surface of an ordinary microscope slide. This is quickly done by holding the surface of the slide against the edge of a small carborundum wheel. Next, a glass tube of approximately 5 mm in diameter is heated and a portion drawn to a diameter of about 0.5 mm, while at the same time the portion of the tube at the constriction is bent to form a right angle. The smaller portion of the tube (B) serves as the inlet to the observation

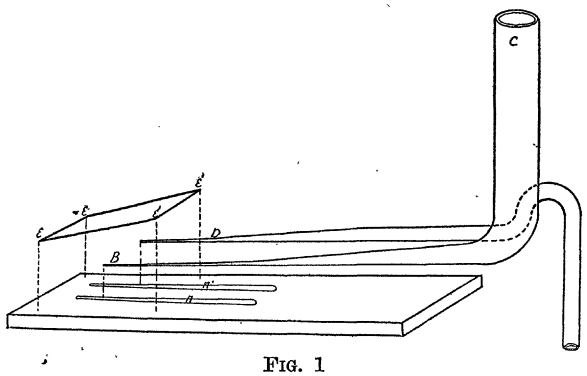

FIG. 1

cell, while the larger portion of the tube (C) becomes the reservoir for the fluid to be introduced into the cell. The smaller portion of the tube is placed in the trough in the slide with the reservoir in a vertical position, and sealed in place by means of De Khotinsky cement or sealing wax. For an outlet to the observation cell, a small glass tube (D) is drawn to approximately 0.5 mm and the opposite end bent to form an inverted U. This tube is placed in the other trough and similarly fastened in place, while the inverted U at the end prevents the liquid from running back along the tube. A cover glass (E, E′) is sealed over the ends of the troughs in such a way as to enclose the ends of both tubes. The side of the cover glass (E′) over the inlet and outlet tubes will be held a small distance above the surface, which will result in a small slant in the cover glass, giving a varying depth to the observation cell.

The material to be studied is introduced into the reservoir, where it drains into the observation cell. With the outlet closed by the finger, air pressure is exerted against the contents of the reservoir (C) with the result that the cover glass is slightly sprung, and the solid objects are forced between the cover glass and the slide where they become trapped with the release of the pressure and the return of the cover glass. Because of the varying depth of the cell it is now possible to select an individual object so located as to be firmly held by the cover glass, but not crushed or distorted. By adding any liquid to the reservoir, a constant bath of the desired liquid can be maintained around the object, while the object remains in focus in a photomicrographic camera or under a microscope. No difficulty has been encountered in maintaining coccidia in focus under either a No. 6 Leitz dry or a 1-7 oil immersion objective.

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A SIMPLE DEVICE FOR HOLDING ULTRAFILTRATION MEMBRANES

THE use of filtration through collodion membranes as a means of purifying biological products and determining the size of colloidal particles is becoming more wide-spread. Many apparatuses have been described to hold the membranes but their construction requires special glass blowing or machine work. The device described here can be prepared in any laboratory.

The filter membrane is held between two glass funnels and is protected from their ground edges by a rubber washer above, and a rubber band stretched over a metal washer below the membrane (Figure 1).

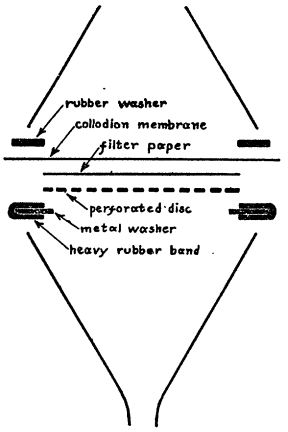

FIG. 1

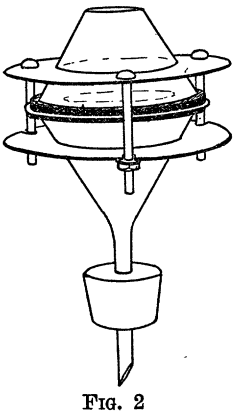

FIG. 2

The metal washer supports a perforated disc upon which is placed ordinary filter paper of the same diameter. When assembled, the top of the rubber band and of the filter paper are in the same plane, to prevent distortion of the membrane under pressure. The filter paper between the collodion membrane and perforated disc serves to increase the effective filtration area.

The funnels are clamped together by two rings of metal or Bakelite as shown in Figure 2. If the filter is to be autoclaved metal rings are advisable. In using metal rings, holes are drilled around their inner edges and a narrow strip of rubber woven through the holes and around the inner edge of the ring, forming a cushion between the funnels and rings.

When autoclaving, the membrane is replaced by filter paper and the apparatus is clamped loosely. After sterilization, the filter paper is replaced by the collodion membrane.

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The oxygen carriers of the blood in their relation to sex and season: OSCAR RIDDLE. For only two or three species of animals has it been definitely known that hemoglobin and red cells exist in different quantity in the blood of the two sexes, and seasonal changes in these values are very little known. Data of Riddle and Braucher make it clear that in two additional species—ring dove and pigeon—this sex difference is present, that here also these oxygen carriers exist in larger amount in male blood, and that hemoglobin and red-cell values markedly change with season. Riddle, Christman and Benedict have measured the basal metabolism of these