These last chapters of the book are much more complete than this brief review indicates, for they represent, as I have said, that field of biochemistry to which Morrow devoted his life. The value of these chapters is greatly added to by the giving of methods which have not before appeared in print, methods developed not only by Morrow himself but by his colleagues.

Dr. Morrow's book on biochemical laboratory methods is one which should be in the hands of every teacher and student in biochemistry, biophysics and physiology.

WILLIAM SEIFRIZ

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A COMBINED FIXATIVE AND STAIN FOR DEMONSTRATING FLAGELLA AND CILIA IN TEMPORARY MOUNTS

BELOW is given a new fixative-stain combination, which has proved to be especially suitable for the rapid preparation of temporary mounts to show flagella and cilia. The reagent contains:

80 cc	saturated solution of phenol in water
20 cc	40 per cent. solution of formaldehyde in water
4 cc	glycerine
20 mgms	gentian violet

It is advisable, in order to facilitate the dissolving of the dye, to moisten it thoroughly with a cubic centimeter of water before adding the other ingredients.

Mix a drop of the reagent with a drop of the culture or infusion containing the organisms to be studied. The flagella and cilia stain clearly, while the cell body remains quite natural in shape and sufficiently transparent to observe the nucleus and the other cytoplasmic structures, such as granules, pharyngeal rods, chloroplasts, pyrenoids, paramylum bodies and the like. The background remains practically colorless, the dye concentrating itself in the organisms. The depth of the stain can be regulated by varying the proportions of reagent to infusion.

The reagent promises to be extremely useful in demonstrating flagella to elementary classes and in identifying the minute flagellates in protozoology courses. It has been used with surprising success on Oicomonas, Tetramitus, Menoidium, Peranema, Euglena, Astasia, Chilomonas, Polytoma, Naegleria and others. It will undoubtedly prove useful as a quick method for studying the flagellated stages of algae, fungi and myxomycetes.

The cilia, cirri, membranelles and undulating membranes of the ciliates are stained by it in approximately natural form, permitting an accurate determination of the number of the ciliary rows, and the arrangement and number of the cirri, membranelles and membranes. To any one who has tried to work out the exact arrangement of the locomotor organelles of a small hypotrich the advantage of such a reagent is obvious.

For staining internal protozoan parasites it is advisable to use more glycerine and dye (approximately 8 cc glycerine and 25 mgms gentian violet have given good results). The presence of mucus interferes with the staining process. It is consequently advisable to mix the material to be examined with three or four times its volume of normal salt solution before using the reagent. With these precautions the method has been used with success on Trichomonas, Chilomastix and Balantidium. With further work along this line it might be possible to develop a method that would materially facilitate the diagnosis of intestinal and other parastic protozoa.

Unfortunately the reagent does not work well with Paramecium, since the discharge of the trichocysts tends to tear away the cilia, but satisfactory preparations have in some cases been obtained in spite of this difficulty. With smaller ciliates, such as Cyclidium, Colpidium, Urotricha, Colpoda and Aspidisca, the method works beautifully; and in larger forms without a heavy trichocyst layer very satisfactory results have been obtained, for example with Stylonchia, Ophryoglena and Chilodon. The cilia stand out as clear blue, individual threads.

Bacteria stain clearly and stand out distinctly against the colorless background. It is possible in the filamentous types to observe the gelatinous sheath in which the rods are imbedded. However, the flagella of the motile forms, such as the larger spirilla and bacilli commonly found in laboratory infusions, do not take the stain.

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REPRODUCING ILLUSTRATIONS WITHOUT A CAMERA

EXACT copies of drawings or photographs are reproduced cheaply and effectively by the following method:

(1) Make the drawing transparent. Saturate the drawing with oil of cedar, oil of cloves or "Three-in-one" oil. Remove the excess of clearing-oil from the surface by blotting the print between sheets of any absorbent paper.

(2) Make a negative. Use an ordinary photographic printing-frame. Print through the transparent original onto glossy paper. The ink of the

original must bear against the emulsion of the paper. Expose approximately the same length of time as a normal negative. Develop and dry the paper.

(3) Make the negative transparent. Repeat processes outlined in (1).

(4) Make any number of the desired prints. Print the transparent negative as in (2). The prints are made on any desired surface of paper. Greatest definition is secured by the use of glossy paper. A good glossy print is as detailed as was the original.

(5) Recover the original drawing. Wash the original print or drawing in xylol, and dry. It returns to its original opaque condition and is none the worse for the processes through which it has passed.

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For many kinds of scientific work, the negative secured in (2) is more effective than is the positive secured in (4), due to the reversal of the colors.

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SPECIAL ARTICLES

THE PARATHYROID GLANDS AS INFLUENCED BY SELECTIVE SOLAR RADIATON

SINCE hyperplasia of the parathyroid glands occurs in animals kept upon a diet deficient in calcium, and since calcium metabolism is dependent upon vitamin D, present either in the diet or in the lesser wave-lengths of sunlight, an experiment was tried to determine the effect of selective solar radiation upon the parathyroid glands of chicks maintained upon diets in which the content of calcium was adequate.

Four convenient pens were constructed and screened upon their southern exposure by amber, blue, ordinary and vitaglass filters, transmitting variable portions of the sun's spectrum. Each of these four pens was divided by a median partition, so that four pairs of compartments, each pair illumined through a single filter, were thus arranged. The basic diet employed throughout the experiment was the Wisconsin ration, Bulletin 371, Agr. Exp. Station, Madison, Wis. This ration, without the cod-liver oil, was provided the chicks in one compartment of each filter; while the cod-liver oil was added to the diet in the other compartment of each filter. The chicks were placed in he filters on April 22, 1927, and the experiment was discontinued October 25, six months later. Certain chicks in each pen were killed after two, three, four, eight and twelve weeks of experimental observation. The thyroids and parathyroids were fixed in Bouin's fluid, sectioned and stained for histological study. Differential blood counts, serum calcium and phosphorus were determined at frequent intervals throughout the study.

The normal parathyroid tissue in the chick is massed into a pair of small glands which lie at the caudal angle of each thyroid lobe. Each gland is an epithelial structure, surrounded by a thin capsule which continues within the gland as the stroma. The cells comprising the gland are arranged into irregular groups or cords, sometimes alveolar or tubular in organization. The cells are usually large and contain elliptical nuclei with numerous nucleoli. Mitotic figures are frequently seen.

After three weeks of observation a differential growth in these glands under the various filters is manifest. Hyperplasia is more apparent in the glands of those chicks grown under the blue and amber filters on a diet devoid of cod-liver oil. In the chicks kept under these filters and fed the cod-liver oil the glands are smaller than those without the oil, but are larger than the parathyroids of chickens grown in the compartments having vitaglass or ordinary window-glass. Vitamin D, present in the cod-liver oil, appears to compensate partially for the absence of direct sunlight, at least in so far as the size of the parathyroids is concerned.

In the absence of the optimal wave-lengths of sunlight the chicks immediately evidence an increase in the number of parathyroid cells, apparently normal and of entirely functional significance. Chickens taken from compartments with blue or amber filters and maintained upon a diet without the cod-liver oil have parathyroids at the end of one month nine times the size of the gland in a chick grown under the vitaglass filter on the same diet.

Progressive changes within the hyperplastic glands become manifest about the end of the first month. Such regression is first manifest by an increase in the extent of the connective tissue stroma followed by a destruction of the normal cords and columns of cells. Hyperemia is also characteristic of such regression. Two distinct types of cystic degeneration occur within these hyperplastic glands. These cysts appear to be composed of extensive mucoid deposits walled off, in one case, by a high columnar epithelium and in the other case by a series of pavement cells concentrically arranged. The columnar cells of the first type appear to be formed by parathyroid cells of the normal columns, which break away to wall off the developing cyst from the adjacent parathyroid tissue. The origin of the concentric pavement cells is not clear, although those cells appear to arise in connec-