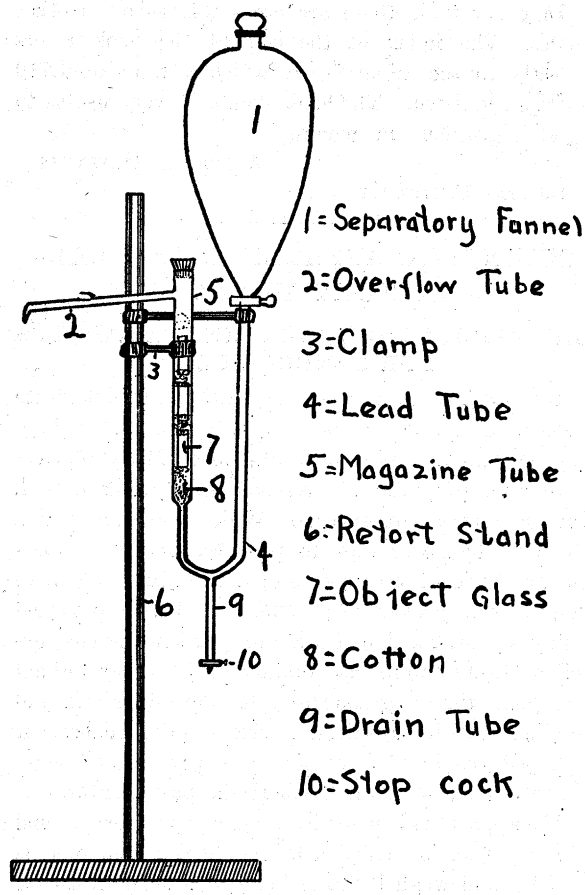

and filled with the appropriate fluid. A small piece of absorbent cotton was placed at the bottom of the magazine tube for the lower object-glass to rest on, and also to aid in gradual change in the strength of fluids. The object-glasses are made in the usual way, by selecting a piece of glass tubing a bit smaller in diameter than that of the magazine tube, and cutting into suitable lengths. The ends of the object-glasses were prepared in either of two ways. When the object-glasses were of small diameter, *i.e.*, to be used for very small objects, they were fitted with glass tube-stoppers which had a bit of bolting-cloth stretched across the inner open end. If the object-glasses were of larger diameter, *i.e.*, to be used for larger objects, the ends were heated and slightly flanged so that cheese-cloth, or cloth of suitable mesh, could be tied over the ends. Inside each object-glass a small bit of paper was placed with the record written in waterproof India ink.

The prepared object-glasses were then placed in the magazine tube, one on top of the other. With larger tissues the magazine tube was often filled with small cheesecloth bags, each bag containing the desired tissues and label. The stop-cock of the separatory funnel was then turned so that the fluid passed through the tissues, out the overflow tube and into a dish. The passage of fluid can be controlled so that any amount passes through—from a few cc per day to liters. The dilutions varied 10 per cent., from water to absolute alcohol, and the time of immersion in each dilution was the same. These two factors being constant, the dehydration rate was very gradual, with a minimum of shrinkage of the tissues.

The change of xylol for objects to be mounted in gums, dissolved in that medium or to be imbedded in paraffin, was made a gradual one by using similar methods. The strengths of xylol in absolute alcohol were 10, 25, 50, 75 and 100 per cent.

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IMMOBILIZATION OF PARAMECIUM

VARIOUS methods have been suggested from time to time for the immobilization of active ciliates for the purposes of study.

In some recent preliminary experiments on Paramecium with ultra-violet radiation it was observed that cultures of this infusorian, exposed in small embryological dishes filled to a depth of 0.5 cms, were in some cases immobilized to such an extent as to permit of detailed study of ciliary activity, vacuole contraction and formation and the general activities of the organism.

The apparatus employed was an ordinary quartz mercury vapor-lamp, DC voltage 90, current 3–4 amperes. The cultures were placed at a distance of 10 cms from the source of light and exposed for a period of eight minutes.

After one such exposure, the result seemed to offer possibilities for rapidly securing immobilization of Paramecium for class study, and so four other cultures were similarly treated with identical results. This simple procedure may prove a satisfactory means of immobilizing this much-used infusorian for class study.

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A BURETTE CLEANER

I HAVE used a burette cleaner for ten years, but have never seen the method explained in print. In school-work, where there are anywhere from one hundred to one thousand burettes in use during the year, often we find several which will not clean up with chromic acid. After trying chromic acid, which is oxidizing in nature, the burette will become clean very easily if the following method is used:

Wash once with a little 95 per cent. ethyl alcohol and drain. Add about 2 cc of ethyl alcohol 95 per cent., and stand upright under a hood. Now add about 5 cc of concentrated nitric acid, and place a large test-tube over the open end of the burette to prevent any liquid from spatting out. In a very few minutes the reaction begins and throws the contents repeatedly up the full length of the burette. After the reaction has gone to completion, the burette will be clean and the contents are easily washed out.

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SPECIAL ARTICLES

THE PHOTO-MECHANICAL CHANGES IN THE RETINA OF MAMMALS

AT various times attempts have been made to demonstrate the occurrence of pigment migration and positional changes of the visual cells in the retinae of mammals. Conflicting results have been obtained on certain forms, and in only one or two cases, notably that of the ape (Cercopithecus)[1] and that of the dog,[2] have measurable differences in pigment or cone position been observed after light and dark exposures.

The band of retinal pigment is very narrow in most mammals, and in all that I have studied the pigment needles are relatively pale, never having the almost black color observed in fishes and amphibians. In the ape mentioned above, Garten reported a pigment band two or three granules wide in the dark- and three or four granules wide in the light-adapted animal. This slight difference has been accepted by subsequent workers in this field as definitely proving the existence of pigment migration in at least this one member of the mammalian group. The suggestion made by Garten and reaffirmed by Arey[3] that the photomechanical changes occur so quickly in mammalian eyes as to fail to be "caught" by the fixative seems to be invalidated by the work of Detwiler[4] on nocturnal animals, for he was always careful to excise and fix the eyes of dark-adapted animals under faint red light and got negative results.

It has seemed to me that the slight differences found in the pigmentation of the retinae of oppositely-adapted mammals might well have existed before the experiments, and it occurred to me that it would be better to experiment on a single individual, first light-adapting one eye and removing it, then dark-adapting the other eye. Casting about for a form in which it would be easy to remove one eye without much shock or blood loss to the animal, the deer-mouse (Peromyscus maniculatus) was chosen. The eye in this form is very large and protrudes well from the surface of the skull.

My thanks are due to Dr. H. W. Feldman, of this laboratory, who supplied the animals used from his breeding stock and assisted in the operations.

Two animals were used. One was placed in darkness overnight to obtain a standard and for practice in a technical way.

The other, or experimental animal, was placed in diffuse daylight supplemented by the light from a 60-watt lamp and reflector, for five hours. Under ether, one eye was pulled out slightly in its orbit, the optic stalk was ligated with silk thread and the eye snipped off distal to the ligature. The blood loss was negligible, and the animal was allowed to recover in total darkness in which it was kept for twenty hours. At the end of that time the animal was again etherized and the second eye removed under faint red light.

The eyes from both animals were fixed in Perenyi's fluid, embedded in Parlodion and cut 7.5 μ. Sections from both eyes of the experimental animal were mounted on the same slide for convenience, but were not stained. The pigment bands in the two eyes were identical in all respects. They were five or six granules in width, quite uniform in all parts of the eyeball and showed no measurable differences attributable to migration. No attempt was made to measure cone positions, since cones, if present, are indistinguishable from rods in mouse retinae.[4]

I believe this method to be superior to that employing separate animals for the two exposures, and that skilled operators might apply it to other forms in the attempt to settle once and for all this long-standing question as to whether the retinal pigment migrates in mammals and "consequently" in man.

I should like to suggest a more or less philosophical reason why pigment migration should after all not be expected in mammals. If the photo-mechanical changes in the retina be considered from a comparative standpoint, their story is one of degeneration. In the fishes the phenomena are rapid and pronounced; in the amphibians they are less rapid and in general less marked, though still obviously of functional value; in the reptiles only long exposures have resulted in measurable differences in pigment and cone positions in light and darkness. In the mam-

[1] Garten, S., 1907, "*Graefe-Saemisch Handbuch der ges. Augenheilkunde*," Leipzig, Aufl. 2, Bd. 3, Kap. 12, Anhang; 130 pp., 5 Taf., 49 Textfig.

[2] Chiarini, P., 1906, *Arch. Ital. de Biol.*, Tom. 45, Fasc. 3, pp. 337–352, 8 fig.

[3] Arey, L. B., 1915, SCIENCE, n. s., Vol. 42, pp. 915–916.

[4] Detwiler, S. R., 1924, *J. Comp. Neur.*, Vol. 37.