

fluorescent substance by means of the main filter alone. When this was the case, the desired bands were added by the introduction of a supplementary light source and appropriate filters (Fig. 2₄).

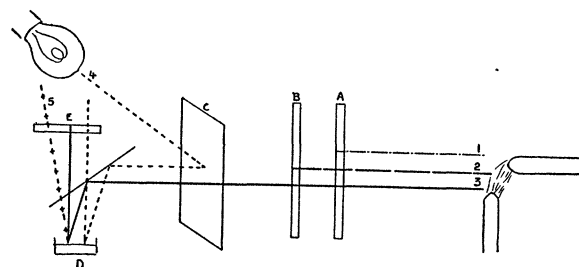


FIG. 2. The path of the rays. (1) Infra-red rays; (2) visible rays; (3) ultra-violet rays; (4) rays of the supplementary illumination; (5) fluorescent rays. (A) Heat-absorbing filter; (B) main absorbing filter; (C) reflector (Corex D Glass 2.10 mm thick); (D) tissue and fluorescence fluid; (E) complementary absorbing filter.

In order to make the outlines of the objects clearer, a complementary absorbing filter was inserted in the tube of the microscope between the eyepiece and the vertical illuminator. Different filters were required for different colored fluorescent light. With aesculine, which gives a blue light, a green filter (Nultra, Corning Glass Works) was used. Green required a yellow complementary filter, while violet fluorescence required none.

The important and difficult part of the technique deals with the light source and lens equipment. The procedure for making observations can be given briefly. Aesculine will be given as an example because it gives a brilliant fluorescence. The experimental animal (frogs, rats and mice have been used) was anesthetized and fixed to the adjustable operating board (Fig. 1E). After the desired tissue or organ was exposed, it was brought into focus with ordinary white light. A concentrated aqueous solution of the fluorescent substance was injected subcutaneously. The filters (Figs. 1A and B) were inserted and observation made through the microscope until fluorescence appeared.

This technique not only gives us a new application of a method (Thiel, '26, Ellinger and Hirt, '29)² for observing the interior of the living organism, a subject of interest in itself, but it has opened up a new experimental approach to other problems. It has given some unexpected information concerning the penetration of the layers of the skin by different

² Thiel, "Contribution to the Slit Lamp Microscopy of the Eye in Ultra-violet Light," *Ztschr. f. Augenheilk.*, Vol. 58, p. 56, 1926; Ellinger and Hirt, "Microscopical Observation on Living Organs," *Ztschr. f. Anat. u. Entw.*, Abt. i, 90: 791-802, 1929.

wave-lengths of light. The excretion of aesculine by the liver and kidney causes the bile capillaries and uriniferous tubules to become brilliantly illuminated, and this is being used as the basis for physiological studies of these organs.

EDWARD SINGER

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AN IMPROVED PROSPECTING PICK

GEOLOGISTS and fossil collectors have long felt the need of an accurately adjusted light prospecting pick, but heretofore only hand-made tools of this description have been obtainable.

After years of experience the American Museum of Natural History has developed what is considered a perfect tool of the kind, of drop-forged highest grade 85 carbon tool steel, with a perfect eye extended so as to secure the full purchase power of the

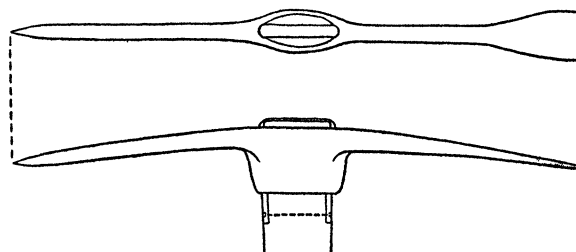


FIG. 1

handle. A metal bar inset over the head of the handle and riveted insures a perfect fit during the life of the tool regardless of shrinkage or number of times the pick is removed from the handle. Length of metal head fifteen inches, length of handle twenty-one and one half inches, total weight one pound and ten ounces.

These picks can be obtained from the Department of Vertebrate Paleontology, American Museum of Natural History, New York City.

BARNUM BROWN

JANUARY 26, 1932

A QUICK METHOD OF EMBEDDING SOFT MATERIAL IN CELLOIDIN

At the suggestion of Dr. A. F. Hemenway some experiments were made with celloidin dissolved in acetone for embedding green material that requires no softening. The blocks of material were prepared for cutting in three days by ordinary laboratory methods. Under reduced pressure leaf and soft stem material of *Hedera helix* and *Olea europea* were prepared in 50 minutes from the time the fresh material was gathered until the sections were mounted in balsam on the slides. There was little or no plasmolysis, no alteration of the natural color of the material, but it was necessary to bleach with 95 per cent. alcohol when staining was desired.

Schedule:

Cut material so that vascular tissue is not more than $\frac{1}{4}$ inch long.

Under reduced pressure, place in killing solution consisting of formalin, 6.5 cc; 50 per cent. alcohol, 100 cc; glacial acetic acid, 3 cc; glycerin, 5 cc.

Leave in killing solution five minutes.

Put through two changes of water, two minutes each.

Flood with acetone for five minutes, then for five minutes each in the following percentages of celloidin

and acetone: 3 per cent., 7 per cent., 10 per cent., and 14 per cent.

Place specimen on wood block with a thin covering of very thick celloidin. Let it become firm in air, then drop into chloroform until solid enough to cut.

Although infiltration was not complete, 12m sections without breaks were obtained, of a quality quite satisfactory for use in elementary classes.

UNIVERSITY OF ARIZONA

PALMER STOCKWELL

SPECIAL ARTICLES

TRICHROMATIC FUNCTIONS OF THE AVERAGE EYE¹

THE trichromatic color mixture curves have been studied on 68 subjects. Inasmuch as certain of the observations are quite inconsistent with classical color theory, it has been thought best to publish them in an abbreviated form in a periodical of general scientific circulation. The detailed report is in press elsewhere.

The apparatus is a modification of the Maxwell color-box, secured against stray light and equipped with variable slits in such a fashion that one can mix lights of any wave-length and a standard white in a semicircular field, and compare such mixtures with monochromes or mixtures in another juxtaposed similar field. The total field size was $1^{\circ} 40'$.

The source was two 500 watt tungsten lights operated at 2790° K diffused by three double ground sheets of optical glass (Eastman).

¹From the Department of Physiology and Pharmacology and the Department of Psychology, University of Louisville, Kentucky. This investigation was aided by

With standard white on one field and a mixture of the three primaries, 480, 517 and 670 m μ , on the other, each of the 68 subjects was asked to glance at the field (with centered pupil) and say how the appearance differed from a perfect match. In the light of his answer the color mixture was changed until the subject stated, after looking with each eye rested, that he could see no difference between the fields.

Dichromatic matches to monochromes were made in the same fashion.

The average amounts of the primaries required to match white are red 1.740 mm of slit-width; green 1.441 mm, and blue 1.249 mm after adjustments had been made for green excitation in 480 m μ . Instead of recalculating our data to conform to assumptions of equality of chromatic valence of the three primaries, any other match is presented and plotted directly as the slit-width of each primary required for a white or found.

(1) This investigation had for its first aim the de-a grant from the American Association for the Advancement of Science.

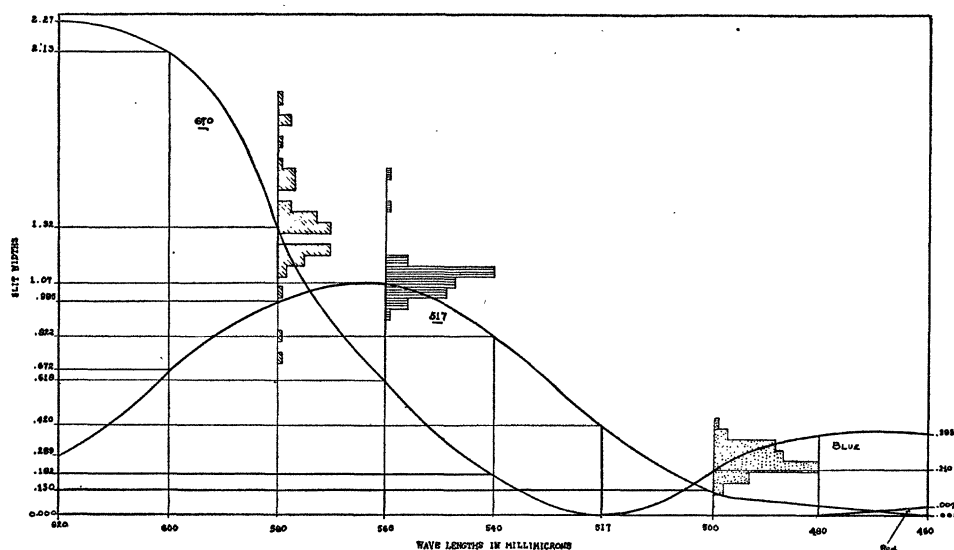


FIG. 1. Excitation Curves for Average Eye. (Showing also sample distribution of sensitivity in the population: diagonal is red; horizontal is green; stippled is blue.)