DEPARTMENT OF METHODS, REVIEWS, ABSTRACTS, AND BRIEFER ARTICLES

MICROSCOPE ILLUMINATION WITH REFERENCE TO BROWNIAN MOVEMENT AND COMBINATION LIGHTING[1]

By

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Brownian Movement.—For the study of this phenomenon china clay was mixed with distilled water and passed through a double quantitative filter paper. The opalescent filtrate was run into the cavity of a hollow-ground slide, and this in turn placed over dull black paper on the stage of the microscope. A 4mm. apochromat objective surrounded by a ring-lamp[2] was lowered into the solution and the instrument focused.

Fig. 1

[1] Published by courtesy of the American Chemical Society. Read before the Division of Industrial and Engineering Chemistry at the Rochester, N. Y. meeting of the American Chemical Society, April 25–29, 1921.

[2] J. Ind. Eng. Chem., 9(1917), 971; 10(1918), 1013; 12(1920), 1200.—J. Soc. Chem. Ind., 38(1919), 126.—J. Royal Mic. Soc., No. 253 (1920), 98.

A 10x compensating ocular gave a magnification of 440 diameters. Not only was Brownian movement clearly evident, but the dot-like, rod and lenticular shapes of particles were shown with great definition in white against a black background.

Combination Lighting.—A comparative study was made of (1) the effect of transmitted light, (2) of direct super-stage illumination from a ring-lamp surrounding the objective, and (3) of combination lighting from above by the same lamp, a part of whose light passed through a glass slide and was reflected back by a sub-stage mirror placed parallel to the stage.

For this study a fossil insect in amber was employed. The length of the insect, 0.9 mm., will enable the reader to judge the magnification in the illustrations. A combination of 32 mm. objective and 10x ocular together with the length of bellows used in photographing gave a magnification of 60 diameters in the original photographic prints.

Figure 1 shows the effect of transmitted light from below, placing the mirror at an angle and using a 25 watt frosted spherical lamp. While sufficient contrast is obtained details are lacking because of the varying thickness of the insect.

Figure 2 shows the effect of direct light from the ring-lamp above the object with dull black paper placed under the slide. Some details are visible, but there is no contrast. Beautiful detail may be obtained by substituting white paper for black.

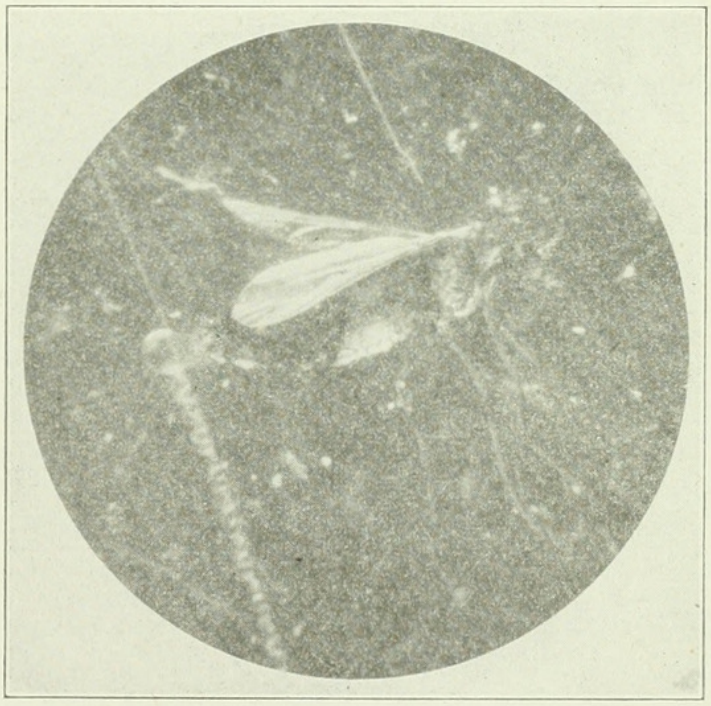

Fig. 2

Figure 3 is the result of a combination of light from the ring-lamp above, with its own light reflected upwards by the sub-stage mirror placed parallel to the microscope stage. A black paper was held over the sub-stage mirror after 15 seconds. This

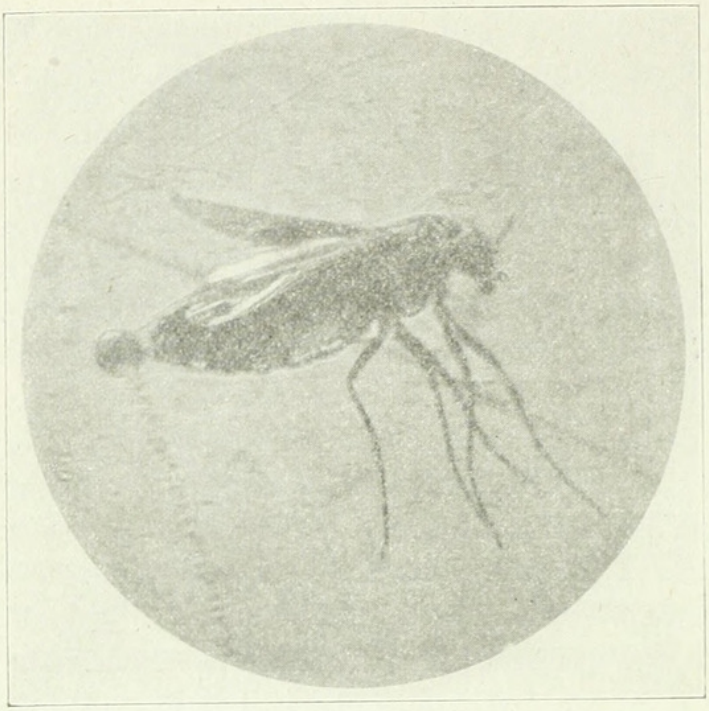

FIG. 3

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affords contrast and detail, and the method may prove desirable for photographing an object which has transparent, translucent and opaque parts.

Seeds Graflex plates, exposed 60 seconds, with a Davies shutter closed to the smallest stop, gave the results obtained in the insect photographs.

Conclusions.—This paper emphasizes the importance of a study of background colors and of combination lighting in microscopy and cites specific examples.