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Portable apparatus for photographing genitalic dissections

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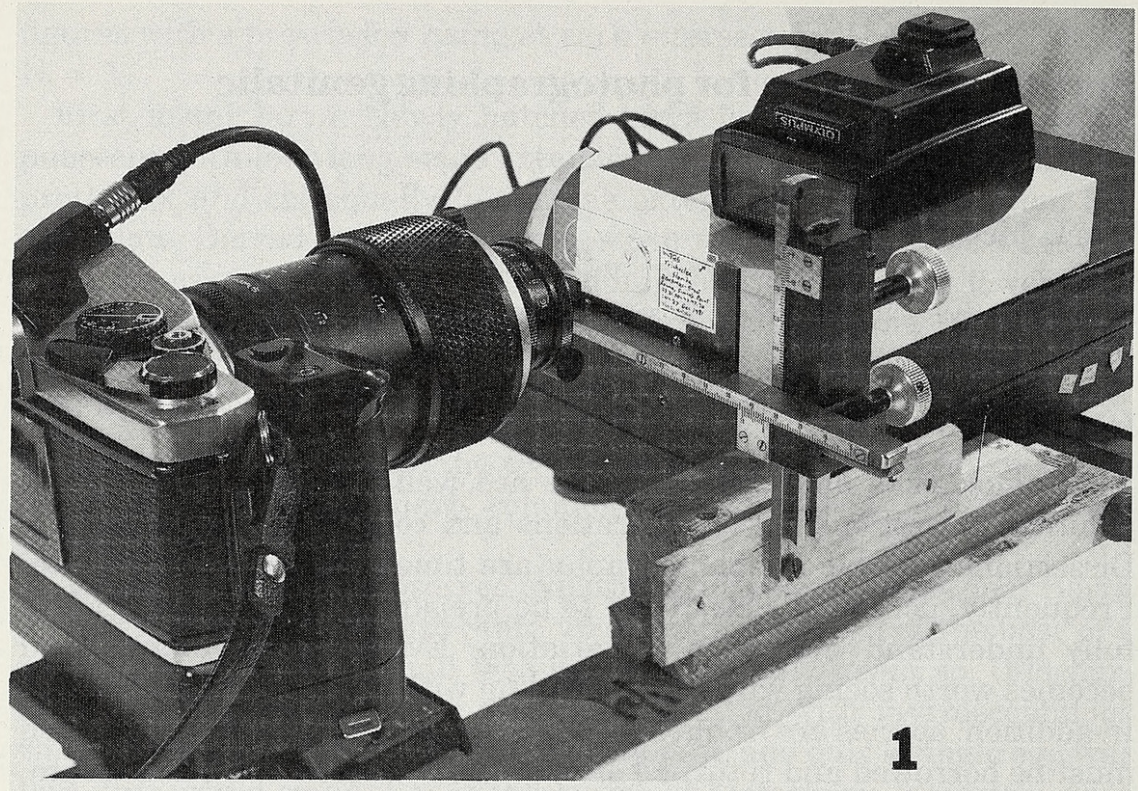
Introduction

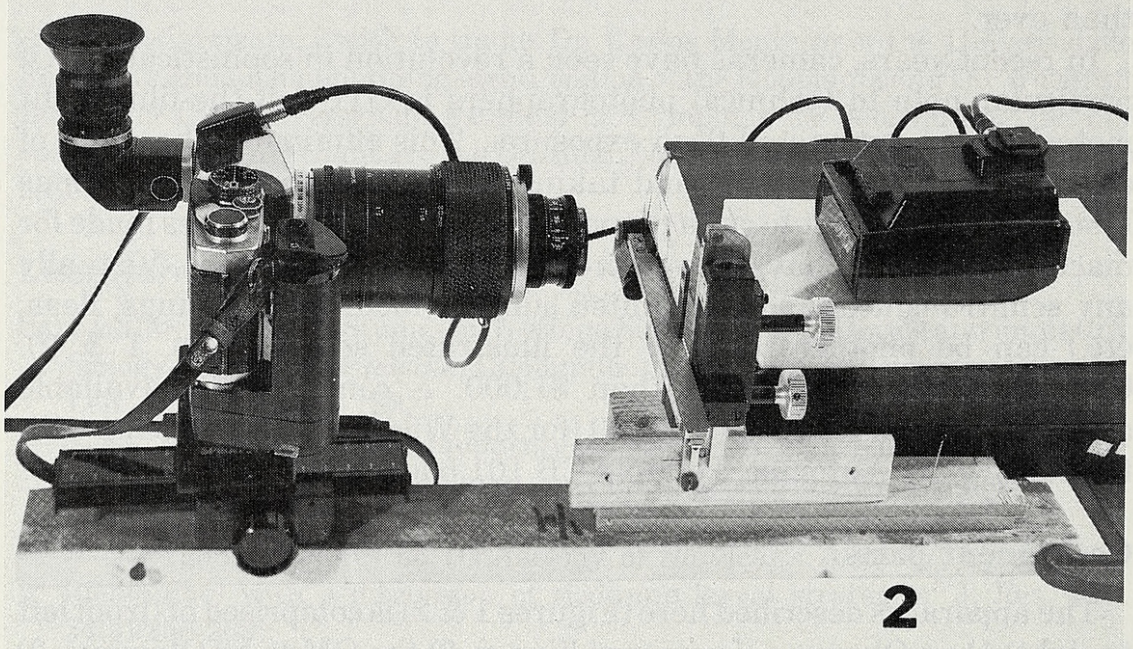
Entomologist's and Lepidopterist's are well aware of the value of genitalic dissections for identifications and comparative morphology. Dissections suitable for photography are time-consuming to produce. Frequently, dozens of slides have to be prepared of a single species to fully understand the range of variation. Every slide ever prepared becomes worth seeing when one is dealing with a problematical species. In addition, species are frequently known from a single specimen which must be borrowed and returned or examined while visiting a museum. Loan institutions are frequently equipped to provide photographs of needed dissections, but this can be a burden on already understaffed collections. The need for quality photographs of dissections is greater than ever.

In recent years, cameras have seen a revolution in sophistication. Of particular note to technical photographers is OTF (off-the-film) light metering and automated flash exposures. This eliminates the chore of calculating flash distances and taking multiple exposures at various F-stops in an attempt to get a properly exposed picture. Lenses made for macrophotography have also improved and dropped in price. Virtually any semitranslucent slide-mounted subject (mouthparts, wings, fleas, etc.) can be photographed by the illustrated set-up (Figs. 1 & 2). Component parts total less than $1,000. A commercially available apparatus would cost over $11,000 (for the Wild M420 Makroskop with the MPS 45/51 Automat, Polaroid CB 101 back and necessary lenses).

Component parts

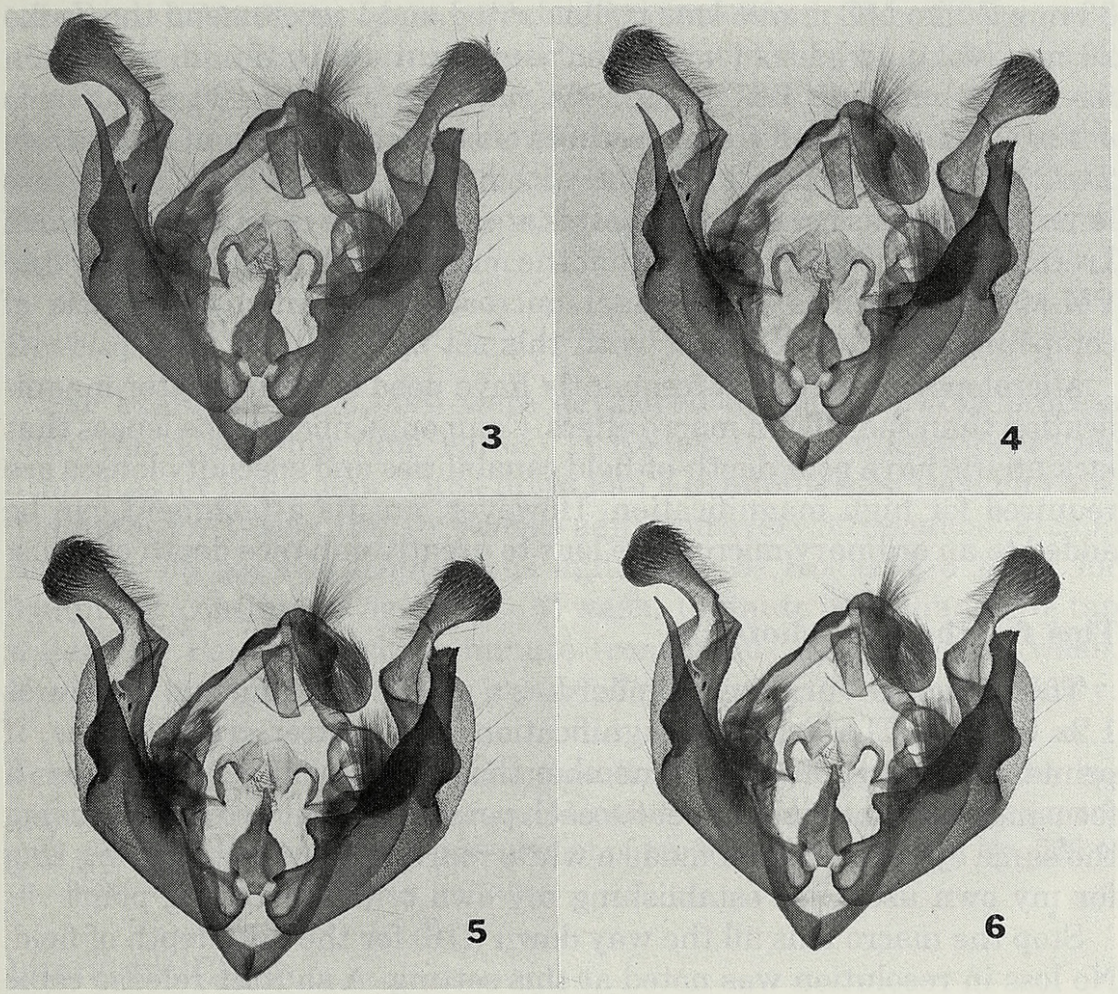
The apparatus described here (Figures 1 & 2) is comprised of (from left to right) 1) an Olympus Varimagni Finder; 2) the OM2n by Olympus; 3) flash-cable coupler with cable attached; 4) self winder; 5) bidirectional monorail from Spiratone; 6) Olympus Telescopic Auto Tube 65-116; 7) objective lens mount (PM-MTob); 8) Zuiko 38 mm Macro F 3.5; 9) salvaged microscope base; 10) opal glass; 11) Olympus T32 flash with blue filter (Electronic Flash Color Filter Set T32 — equivalent to Kodak Wratten 44). The rails are mounted on a board that can be clamped onto the edge of a table. A useful accessory not depicted is an AC adapter that





Figs. 1 & 2. Two views of the photomicrographic set-up.

plugs into the flash eliminating the need for AA batteries. Olympus has removable focusing screens, and a microscope focusing screen (clear field type 1-12) is necessary as the macro lenses require so much light as to make a diffuse focusing screen appear black. The Varimagni Finder can be independently adjusted to accomodate vision defects such as far



Figs. 3-6. Photographs of the same male genitalia slide of **Discestra farnhami** (Lepidoptera: Noctuidae): **3**) Tech Pan, shot at ASA 100; **4**) Panatomic X, shot at ASA 64; **5**) Ilford Pan F, shot at ASA 100; **6**) T-Max 100, shot at ASA 320.

or near-sightedness. The T32 flash is not mounted on the board, but merely supported on a box. The blue filter is placed over the flash to mask the amber color of the Canada balsam commonly used to make the specimen mount. Hardwick (1950; Preparation of slide mounts of lepidopterous genitalia. Can. Entomol. 82:231-235) describes a suitable Lepidoptera genitalia mounting technique. The blue filter makes only a minimal improvement in the resulting picture and the flash can be used without the color filter with only a slight loss in contrast. Of course, the camera can be used without the self-winder. The flash is rested 3-4 inches behind the frosted glass but can be moved closer if full magnification is used on a very thick slide mount. The subject should be at least a quarter inch in front of the opal glass to prevent features of the glass from appearing on the negative. From center to center, the monorail is mounted 7.5 inches from the slide stage to accomodate the entire spectrum for focusing with both the 20 and 38 mm macro lenses. A

38 mm Zuiko MC macro lens is illustrated and I recommend the Zuiko 20 mm MC macro lens for greater magnification. Optimum resolution for the 38 mm lens lies in the 2-6x range; that of the 20 mm lens is 4-12x. This allows full-frame pictures of subjects ranging in width from 2 to 20 mm (40 mm possible by use without extensions. The Zuiko macro lens illustrated is a manual lens. It is now available in automatic (which I recommend). Note, however, that the manual lens uses an adapter (the PM-MTob) which is a universal microscope mount allowing use of compound microscope lenses with this set-up.

Microlepidopterists will frequently have need of even greater magnification than the 20 mm macro offers. Compound microscope lenses that lack an iris have poor depth-of-field capabilities and specialty lenses are required for high magnification. However, an iris attachment can be added to an ordinary microscope lens to greatly enhance depth of focus.

Tips for the best shots

The Olympus Varimagni Finder has a switch allowing one to view at 1.2x or 2.5x. The greater magnification gives better critical focus. If prints appear out of focus, remember that the Varimagni Finder has a focusing ring that must be set for each person without eye-glasses using the same eye each time. I made a white mark to align the focusing ring for my own use after establishing my own critical focusing point.

Stop the macro lens all the way down (f16) for the best depth of field. No loss in resolution was noted at this setting. A shutter release cable (not illustrated) will help prevent vibration during exposure.

Each lens has its own peculiar effect on the camera's ability to autoexpose. I find the best negatives and prints are produced by adjusting the film speed (in the case of Panatomic X, Ilford Pan F, and Tech Pan) one F-stop faster (+1 on the Olympus ASA ring) with the Zuiko 38 mm macro (Figs. 3-5). T-Max 100 was pushed to ASA 320 to obtain the least contrasty print (Fig. 6). If prints appear grainy, it is undoubtedly because of the film. Clean dissections (dust-free surfaces, preparations with minimal debris in mounting medium) are a must, especially for the Lepidoptera genitalia illustrated.

Films

Kodak will soon be replacing its Panatomic X with T-Max 100 (a faster fine-grain film with better tonal range). T-Max 100 sensitivity to the blue filter is 1⅔ stops more sensitive than Pan X. This means the T-Max 100, which has an ASA of 100, will have to be pushed to ASA 320 to obtain the desired low-contrast negative.

Fine-grained films tested include Tech Pan, Ilford Pan F, T-Max 100, and Panatomic X. Tech Pan's ASA is variable according to development (Vetter, J. P. 1984. *In* Richard A. Morton, Ed., Photography for the Scientist, second edit, Academic Press, 393-456), but example given was

taken at ASA 50 to optimize low contrast. Ilford, like T-Max, was affected by the blue filter and will have to be pushed to produce a low contrast negative. Agfa Pan was not tested. Tech Pan had the finest grain (320 lines per mm versus 280 lines per mm in T-Max 100), the lowest contrast, and was the most versatile. The next grade of films, Plus X and others, was much too grainy to be used for this type of photomicrography

Development

The examples (Figs. 3-6) were developed by the following process (only the developing time varies) **1**) Kodak D-76 straight (68°F) for 5 minutes for Panatomic X and Ilford Pan F (8 minutes for Tech Pan and 9 minutes for T-Max 100) (5 seconds agitation every 30 seconds); **2**) Stop Bath for 30 seconds (continuous agitation); **3**) Kodak F-6 Fixer for 5 minutes (continuous agitation); **4**) wash, 1 minute (two changes of tap water); **5**) Perma Wash, 1 minute (continuous agitation); **6**) wash, 1 minute (two changes of tap water); **7**) Photo-flo, 30 seconds; **8**) dry.

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Literature Cited

HARDWICK, D. F., 1950. Preparation of slide mounts of lepidopterous genitalia. Can. Entomol. 82:231-235.

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