the authors; Comstock & Huntington (1962, *infra*) restricted it to the former); *ibid.* 1901, *op. cit.* (suppl.), p. 718; Draudt 1920, *in* Seitz, Gross-schmett. Erde 5: 780, pl. 155 g; Hoffmann 1941, An. Inst. Biol. (Mexico) 11: 712; Comstock & Huntington 1962, J. New York Ent. Soc. 70: 115.
Allosmaitia pion: Clench 1964, J. Res. Lepid. (1963) 2: 255.

One ♀, worn, Santa Ana Nat. Wildlife Refuge, nr. Alamo, Hidalgo Co., Texas, 11–xi–1968 (*leg.* R.O.K.).

This is an uncommon species in Mexico, occurring chiefly in scrub and low forest, particularly in montane areas. Hoffmann (*l.c.*) records it from no farther north than Tabasco and southern Veracruz. There are specimens in Carnegie Museum, however, from as far north as Sinaloa (19 mi E Concordia) and Hidalgo (7 mi N Zimapan, 1830 m).

ACKNOWLEDGMENT

To Harry K. Clench, Carnegie Museum, Pittsburgh, Penn., I wish to express my sincere appreciation for determining these specimens, reviewing this paper, providing the references cited, and furnishing additional distribution data for each species.

INEXPENSIVE PHOTOMICROGRAPHY

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INTRODUCTION

In essence, photomicrography usually consists of positioning a film several inches from the ocular lens of a compound microscope to receive the magnified image of the subject. A special camera, without lens, generally is used for this purpose; detailed descriptions are given in texts such as those by Allen (1941) and Shillaber (1944). An inexpensive camera may be used *without* removing the lens (Loveland, 1943), but this method has serious disadvantages, e.g. tendency of a "flare spot" (bright area in the center of the field) to appear in the picture.

Following is a brief description of construction and operation of homemade equipment of the camera-without-lens style using both negative-positive (conventional) and Polaroid processes.

CONVENTIONAL FILM

Apparatus.—The apparatus (Figure 1) consisted of two parts: (1) a wooden base, with generous working area, on which two rigid uprights

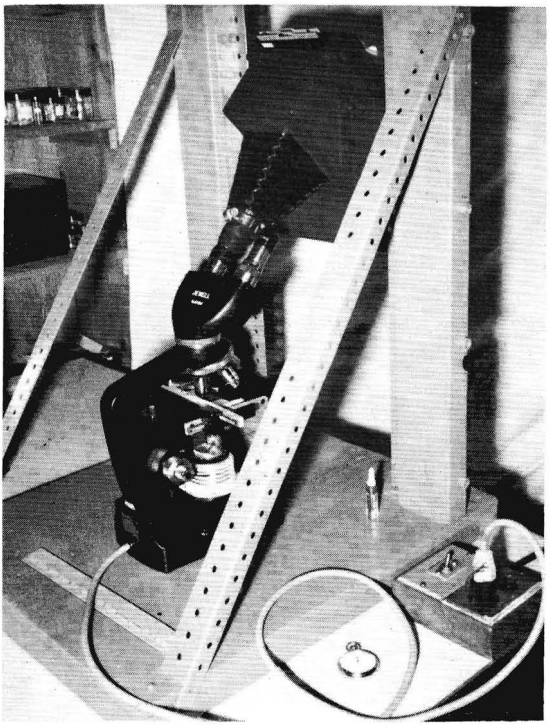

Fig. 1. Conventional-film camera, with 4 × 5 in. cut film holder in place, attached to 40–1000× binocular microscope (Jewell Optical Co.).

were mounted, and (2) a camera body, constructed of plywood, with an attached bellows (an inexpensive item purchased from Edmund Scientific Co., Barrington, New Jersey). The bellows allowed variation in magnification by changing the lens to film distance, which fortunately can be varied widely (actual focussing is done with the microscope adjustments). The camera body was mounted in a rectangle of ½ in. plywood with slots permitting attachment to the angle irons of the uprights using bolts and wingnuts (see Figure 2). The camera was painted flat black to minimize internal reflection and was designed with a hinged back (see rear view, Figure 2) to accommodate a 4 × 5 in. cut film holder as previously found suited for close-up (low magnification) photography of mounted Lepidoptera (Kolyer, 1965). Because the microscopes at hand all had eyepiece housings inclined at 45°, the camera was mounted at this angle.

To link the bellows to the microscope, a sleeve of black felt attached to the bellows was slipped over the eyepiece housing and held in place by wrapping with a piece of heavy copper wire. This method was found

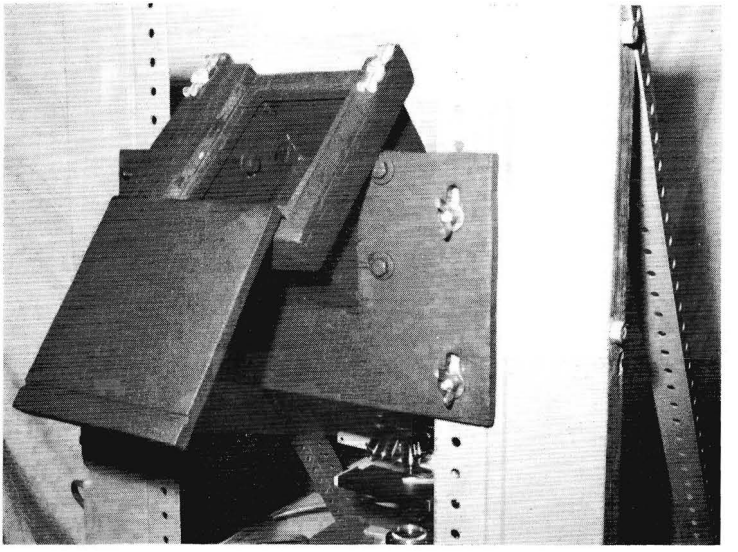

Fig. 2. Rear view of apparatus of Figure 1, showing hinged back open (film holder removed).

advantageous because the microscope was touched only by the felt, preventing marring of the instrument, and the connection was flexible so that microscopes with a movable tube (as opposed to the movable stage on some models) could be focussed while viewing the image on the ground glass.

A less-sturdy but satisfactory apparatus, so light in weight that it may be fixed to the microscope without additional support, can be constructed from cardboard (Anonymous, circa 1958). In fact, any design or materials are suitable provided that the film is held in the focal plane.

Procedure (*black & white*).—A rectangle of frosted glass was mounted on a 5 mm thick composition board frame so that, when inserted in place of the film holder, the frosted surface was at exactly the same distance from the eyepiece as the film. This was used to focus the image and then was replaced by a cut film holder. A film was exposed, and the illuminator was turned on for the desired exposure time (using the switch at lower right of Figure 1).

Excellent results were obtained with Kodak Plus-X Pan professional Film, Estar thick base, 4 × 5 in., developed according to the manufacturer's instructions. Using a Tasco 16× stereo microscope (shown, with a different camera, in Figure 3), with the Bausch & Lomb illuminator shown in Figure 3 set at highest intensity and positioned with the illuminator lens 4 in. from the specimen, optimum exposure time was 20 sec. The dis-

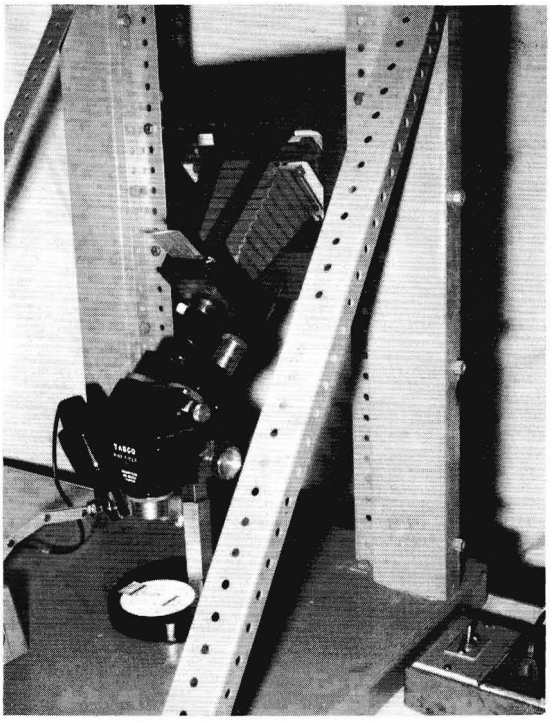

Fig. 3. Polaroid Model 220 camera, adapted for photomicrography, attached to a 16× stereo microscope (Tasco). Also shown is the Bausch and Lomb micro lamp (Nicholas illuminator) used in the examples in the text.

tance from microscope eyepiece lens to film surface was about 7.8 in. With the Jewell binocular microscope (Figure 1) at 1000× (10× wide-field eyepiece, 100× objective (N.A. 1.25) immersed in oil), longer exposures, e.g. 2 min., were required.

Prints (4 × 5 in.) were prepared with Kodak Azo F-3 paper by the contact method, using a relatively long distance (16 in.) between negative and light bulb (250 watts) to secure even light intensity over the whole print.

Procedure (color).—Kodak Ektachrome Color Reversal Film (for artificial light), Type B, 4 × 5 in., was used to make transparencies. Development was done at home with a Kodak Ektachrome film processing kit, E-3, one-gallon size. Because this film was more light-sensitive than the Plus-X Pan, exposure times were shorter, e.g. 1 sec. with the Tasco 16× microscope and illuminator positioned as above. With a 100× microscope, using a 10× objective (0.25 N.A.), more light was required.

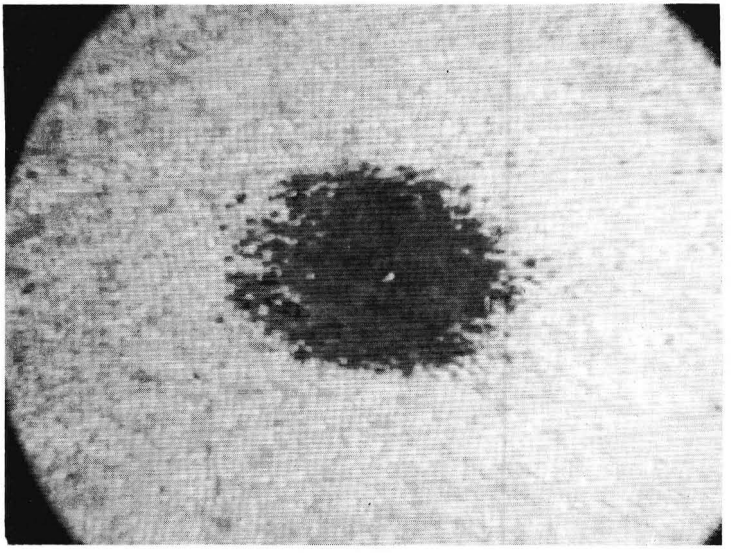

Fig. 4. Black spot on the forewing of *Pieris rapae* (L.) (♀), photographed with the apparatus shown in Figure 3.

A typical exposure time was 1 sec. with the B & L illuminator tilted 15° down from the horizontal and the lens of the illuminator only 1.3 in. from the subject.

POLAROID FILM

Apparatus.—A holder for 4 × 5 in. Polaroid film sheets is available which is dimensionally the same as a standard 4 × 5 in. cut film holder and will fit the apparatus described above, but this lists for about twice as much as the less-expensive Polaroid cameras. Also, the 4 × 5 in. Polaroid film is about twice as costly per photograph as the popular 3¼ × 4¼ in. black & white Polaroid film sold in packs of 8 (Type 107, ASA 3000). Therefore, a Polaroid Model 220 camera, intended to use both black & white and color film, was adapted by removing the lens and replacing with a wooden block with sliding aluminum insert which closed the opening between exposures and was drawn up to open the light path when photographs were being taken (as shown in Figure 3). The distance from eyepiece to film was about 8 in. Again, a frosted glass was used for focussing.

Procedure (black & white).—After focussing the image, the frosted glass was removed and replaced by a film pack (Type 107, ASA 3000). Successive photographs were made to optimize exposure time by trial

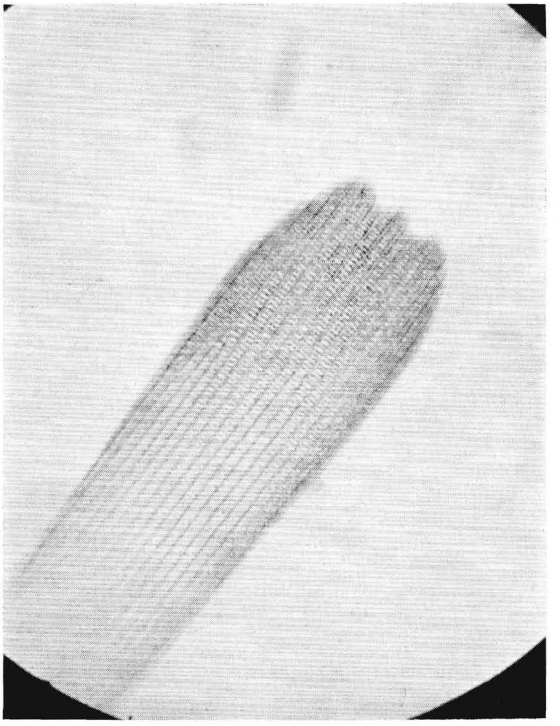

Fig. 5. A black scale from the spot shown in Figure 4, mounted in Permount (Fisher Scientific Co.) and photographed with the camera shown in Figure 3 attached to the microscope (at 1000×) shown in Figure 1. Localization of the pigment is suggested.

and error. Examples of satisfactory pictures are shown in Figures 4 and 5. In comparison to the above-described conventional film, the Polaroid Type 107 film is very fast (light-sensitive) so that less light is needed. In the case of Figure 4, illumination was provided by a Tensor lamp (G. E. 93 bulb, at high intensity) set at 45° and 7 in. from the subject; the Tasco microscope was used, as shown in Figure 3. Using a stopwatch, optimum exposure time was about 1.5 sec. (1 sec. was too short and 3 sec. too long for best intensity in the photograph). For Figure 5, the Jewell binocular microscope was used at 1000X as in a preceding example. An exposure time of 2–3 sec. was suitable.

Procedure (*color*).—The preceding procedures were repeated using a Polariod color film pack (ASA 75), 3¼ × 4¼ in. prints (8) as with the black & white. Since this is a slower film than the black & white 3000 speed, longer exposure times were necessary. With the 16× stereo microscope (B & L illuminator at 45° with illuminator lens 4.5 in. from subject), an exposure

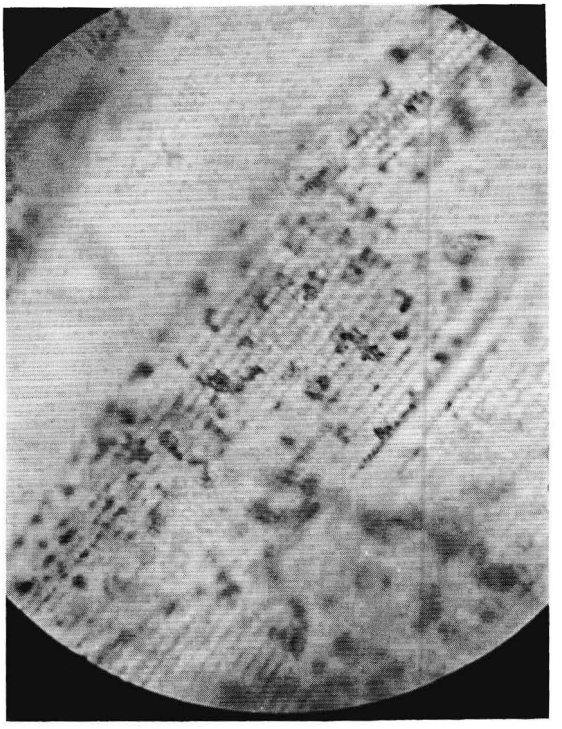

Fig. 6. A white scale from a wing of *P. rapae* which had been exposed to chlorine gas to stain the pterin pigment particles by murexide formation. This is a black & white reproduction of a Polaroid color picture taken with the apparatus used for Figure 5.

time of 10 sec. was suitable. With the 1000× microscope, 1 min. was too short (very dark print), 7.5 min. gave a somewhat dark print, and 11 min. (used for Figure 6) was satisfactory. The colors deviated considerably from reality but may serve to distinguish features stained differentially. In Figure 6, here reproduced in black and white, the irregularly-shaped particles on the scale were red-violet to the eye and appear dark violet (against a pale blue-green background) in the photograph.

CONCLUSION

A photomicrographic camera using conventional films may be home-made and give excellent results, but the inexpensive Polaroid cameras now available (color models for under $30) are readily adapted for photomicrography and offer the advantage of "instant" pictures using the popular, relatively low-cost film packs. Polaroid color photographs, useful

at least in cases of differential staining, are easily taken once exposure time has been optimized. Film cost is a little over 50¢ per color picture.

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NOTES ON THE GENUS *CEPHISE* EVANS, WITH A NEW RECORD FOR MEXICO (HESPERIIDAE)

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When W. H. Evans (1952, p. 153) described the genus *Cephise*, he made the statement that the actual systematic position of the genus was doubtful. "The elongated wings and the conspicuous tornal lobe H indicate affinity with *Chrysoplectrum* in the *Urbanus* group, while the broad costa points to *Achalarus*. But the genitalia are not of the Urbanus type: the very broad-ended uncus with a snow-white dorsal tuft is peculiar. The proximity of veins 7 and 8 F rather than veins 6 and 7 point to the *Celaenorrhinus* group near *Nascus* and there is a similar sexual difference, F spots yellow in male, white in female, though not differing in size or disposition. The position in repose is unknown. ♂ upf with an unusually long costal fold, reaching to beyond the discal spots. Clasp with a slender style."

Evans also stated that there was but a single species, *cephise* (Herrich-Schaeffer) 1869, represented by two subspecies. In the nominate subspecies the cuiller of clasp is long, narrow and straight. The spot in space lb in both sexes is against the outer edge of the spot in space 2. The subspecies is recorded from Honduras, Panama, Fr. Guiana, Surinam, Upper Amazons (St. Paulo d'Olivenca), Para, Ecuador and Peru. The other subspecies is *hydarnes* (Mabille) 1876, which has the cuiller of clasp broad and irregular. The females have the spot in space lb on the upper surface of the primaries with the upper edge exactly against the lower edge of the