

Scientific Documentation Through Photomacrography

By: Lauren Held

Scientific photomacrography can be an extremely useful tool for accurate documentation of all types of specimens. When executed properly, one can take photographs that are consistent in lighting and sample treatment to show changes in a single subject over time or the differences between multiple subjects.

The most important aspect of consistent photomacrography is creating a reproducible lighting set up. To do this, one must first use light sources that will be available again and again. Natural light, while beautiful, will never be consistent or reproducible.

The sun will always be changing position and the cloud cover will never be the same. Available room light is also likely to change. Unless working in a completely controlled lab environment, the photographer doesn't have control over which bulbs are used in room lights, when they are changed, and how frequently they are replaced.

The best option will be to create a set-up using small light sources in easily reproducible positions in relation to the specimen. Probably the most common macro lighting set-up is that which consists of the use of a copy stand and two lights on ei-

ther side of the specimen set at 45 degree angles. The fact that this set-up is so widely used is to its advantage. Most labs which use photomacrography as a tool for documentation and analysis will already own a copy stand with posable lights. This means that this set-up can easily be reproduced.

This common lighting set-up will create flat, even lighting.

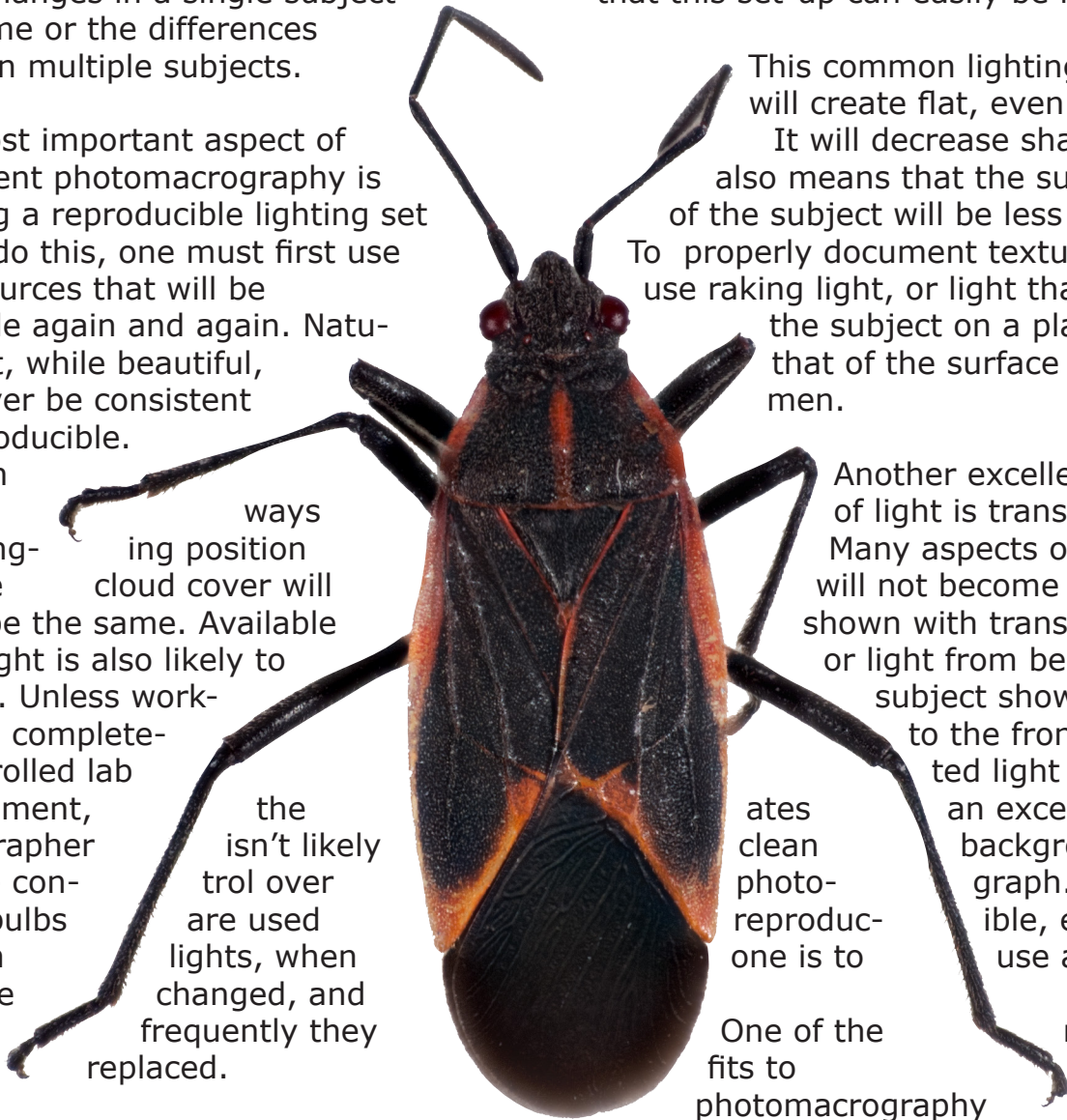
It will decrease shadows, which also means that the surface texture of the subject will be less noticeable.

To properly document texture, one must use raking light, or light that comes at the subject on a plane similar to that of the surface of the specimen.

Another excellent source of light is transmitted light. Many aspects of a subject will not become visible unless shown with transmitted light, or light from behind the subject showing through to the front. Transmitted light also creates an excellent, even, background for the graph. It is easily reproducible, especially if one is to use a light table.

One of the many benefits to photomacrography as a tool for scientific documentation and analysis

is that it is non-destructive—that is, it will not harm the specimen. Of course, some older, more fragile pieces of art may be adversely affected by exposure to light, thus affected by the lighting used in photomac-



rography. However, this is not the main focus of this exercise. One should be expected to know the limitations of the specimen they are documenting and whether or not the techniques used will harm the object.



About the Sample

Classification

Kingdom: Animalia (Animals)
Phylum: Arthropoda (Arthropods)
Class: Insecta (Insects)
Order: Hemiptera (True Bugs, Cicadas, Hoppers, Aphids and Allies)
Suborder: Heteroptera (True Bugs)
Superfamily: Coreoidea
Family: Rhopalidae (Scentless Plant Bugs)
Subfamily: Serinethinae
Genus: Boisea
Species: trivittata (Eastern Boxelder Bug)

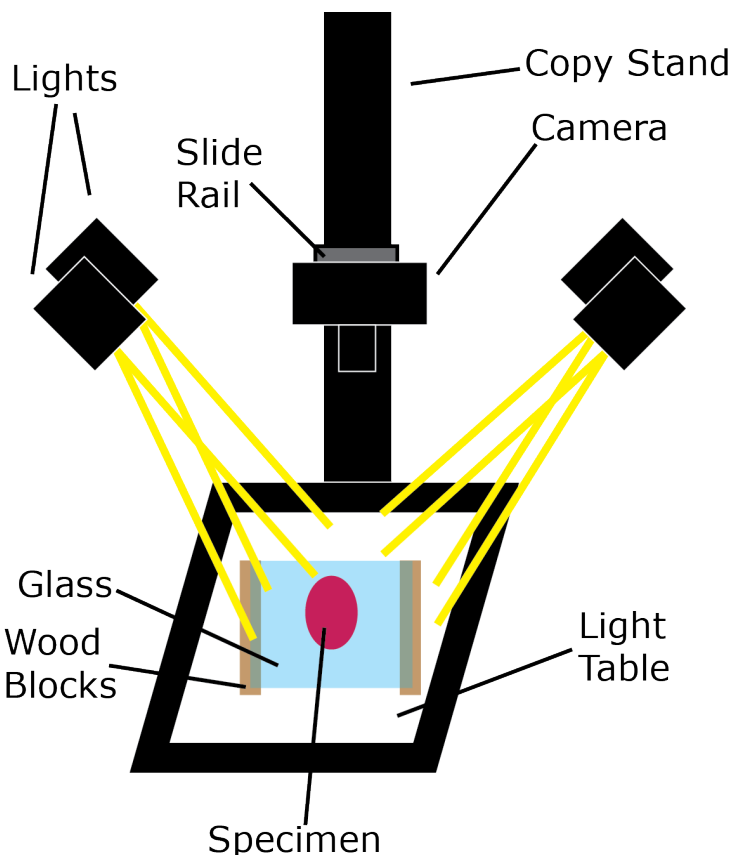
For this example, the *Boisea trivittata*, or Eastern Boxelder Bug, was the specimen chosen. The average Boxelder Bug is about ½ inch in length. They have three red stripes across their pronotum, which is where their Latin name, *trivittatus* or “three-striped,” derives from. They feed on the sap of trees such as *Acer grandidentatum* (Bigtooth Maple), *A. negundo* (Boxelder), *A. saccharinum* (Silver Maple), *A. buergerianum* (Trident Maple), and *Sapindus saponaria* (Soapberry). They use their sharp, straw-like mouthpieces to suck the sap out of the leaves, flowers, and seeds of these trees.

Eastern Boxelder Bugs are commonly found in Southern Canada and most of the United States east of the Rocky Mountains. Another species, the Western Boxelder Bug, exists west of the mountains. These bugs need warmth to survive and thus are often found wintering in buildings. This is how these particular specimens were captured alive.

Once captured, the bugs were stored for several days in a plastic bag, before being moved individually to a glass jar to be exterminated. The jar contained a layer of crumpled paper towel at the bottom to absorb the ethyl acetate, which was used as a killing agent. The bug was then placed into the jar, and the lid screwed shut. Ethyl acetate allows for the posing of the bug after it has died, before rigor mortis sets in. Once each bug had been assumed dead, it was placed on a piece of foam and posed using entomology pins. The pins held the bug in the proper position until it had dried. This is a fairly common practice for novices interested in bug collection.

Photographing the Subject

After the bugs had dried, they were placed on a piece of glass, supported by blocks of wood, above a light table on a large copy stand. This was to aid in the focusing of the subject, as the copy stand was not originally intended to focus on such small objects. The glass also lifted the subject off of the light table, ensuring that any marks or scratches on the surface of the table would not be in focus with the subject.



The camera was attached to a fine focusing rail, which was then attached to the copy stand. The focus rail allows for finer adjustments to be made in the position of the camera relative to the specimen. This is a very useful tool for focus stacking and is highly recommended.

As previously stated, the lights were placed at a 45 degree angle to the subject to create flat, even lighting. Diffusion materials were not used in the photographing of these bugs in order to accurately show their reflective and shiny qualities.

The camera was tethered to a computer for remote shutter release. This is also highly recommended as it cuts down on camera vibration caused by the use of the on-camera shutter release button. It is also useful for fast downloads for editing and organization. This method allows the photographer to instantly see the photograph on a large screen once the data has transferred to the computer. It also allows for more accurate focusing with the live view feature.

The captured images were then quickly batch edited for any exposure or white balance issues in Lightroom 4. They were then exported as .jpg files with their edits. These smaller files are better for stacking. Their size allows for faster processing speed within the stacking software. Realistically, since the images will be stacked, larger files such as .tifs are not necessary to produce quality final image. One could certainly go much more in-depth as to the process by which one stacks; however that is not the focus of this article.

After the images were stacked, a small amount of sharpening was applied in Photoshop CS6 and the group of final images was checked for consistent white balance and exposure.

Consistency

In the end the scientific photographic process boils down to repeatability. This setup is believed to be simple and repeatable. However, it will not always be the best lighting to show various aspects of the specimen in question. The photographer must always use his or her best judgment when approaching each subject. Careful notes should always be taken; photographing one's set-up is always advised. If a photographer, whether the original producer of the body of work or another individual, is able to mimic the lighting and achieve similar results, then the set-up was successful.



About the Author

Lauren Held is a fourth-year Biomedical Photographic Communications major at the Rochester Institute of Technology in Rochester, NY. She will be graduating in late February of 2013 with her degree, a minor in Spanish Language, and concentrations in High Magnification Photography and Photographic Conservation. She hopes to pursue a career in medical photography, photomicrography, or photographic conservation. When not busy photographing in the lab, Lauren enjoys biking, singing, acting, cooking, and playing ultimate frisbee. More of her work can be viewed at www.LaurenHeldPhotography.com. Any questions, comments, or inquiries about the use of these photograph should be directed to LHeldPhoto@gmail.com.

Equipment Used

Nikon D700
Nikon 60mm macro lens
Nikon Bellows
Thimble Lens
Velbon tripod slider mount
Copy Stand with Tungsten Posable Lights and Lightbox
Sheet Glass
Wood Blocks
Mac Computer
Tethering Cord

Sources

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- Hadley, Debbie. "Box Elder Bugs, Boisea Trivittatus." Insects. About.com, n.d. Web. 5 Nov. 2012. <<http://insects.about.com/od/truebugs/p/box-elder-bugs.htm>>.

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