

## Results

Figures 2 through 4 are images of the three samples annotated with the line width measurements. Table 1 lists the measurement results.

	Sample 1 Silicon, High Vacuum	Sample 2 Silicon, 30 Pa.	Sample 3 Sapphire, 30 Pa
Width 1 (nm)	52	59	66
Width 2 (nm)	52	57	52
Width 3 (nm)	62	57	57
Width 4 (nm)	55	73	57
Average Width	55	62	57

Table 1. Line width measurements of the three samples.

There was a maximum variation of only 7 nm between the three samples. Given the minimum line width of this system of 15 to 20 nm it can be seen that the variation within this experiment is less than the width of a single line.

## Conclusions

This work demonstrates that it is possible to write nano-scale patterns on insulators using a variable pressure electron microscope. The use of variable pressure allows writing on insulators without adding any conductive layers during the lithography process. While this work did not explore the ultimate resolution limits of this technique, it did demonstrate that lines of 60 nm are possible. Further, at the resolution of this experiment, there was no noticeable difference between patterns written in conventional high vacuum mode and those written in variable pressure mode. ■

## Reference

1. Ed., P. Rai-Choudhury, *Handbook of Microlithography, Micromachining, and Micro fabrication, Volume 1, Microlithography*, pg 2.7.1

## MICROSCOPY FOR CHILDREN

Caroline Schooley

New children's microscopy books were introduced at the Microscopy & Microanalysis meeting in Honolulu this last summer. They deserve your attention, particularly if you work in an SEM lab. These reviews are available at MSA's Project MICRO website, <http://microscopy.org/ProjectMICRO/>.

Levine, S. Johnstone, L., & Humphrey, E., 2005 **Extreme 3-D: Scary Bugs, Extreme 3-D: Weird Animals, Extreme 3-D: Your Body**

8.5 x 11", 48 pp, hardbound, \$ 14.95 each, ISBNs: 1-59223-365-1, 1-59223-364-3, 1-59223-366-x. Silver Dolphin Books, [www.silverdolphinbooks.com](http://www.silverdolphinbooks.com) Shar Levine and Leslie Johnstone have written some of the best children's "how-to" microscopy books. For this new series they are joined by electron microscopist Elaine Humphrey. The result is a series of far better quality than the various "ugly bug" picture books that were published in the '90s. "Scary Bugs" includes insects, spiders, and millipedes, "Weird Animals" are invertebrates, several phyla of vertebrates, and tarantulas, and "Your Body" has body parts plus parasites and bacteria. The micrographs are excellent, the red-green stereo is effective, and the text is well-written and informative. The books are well-made; the binding and 3-D glasses are more durable than most. All three use the same four page explanation of stereo vision and microscopy. Two pages are devoted to each topic; the high magnification images are supported by text and several low magnification views of the organism. Since the low power images aren't 3-D, even those with stereo vision problems will find the books interesting. *These three should be in every SEM lab that does tours for visiting classes.* Age 8 - adult

Sly, A. & Kunkel, D., 2005 **Mosquito Bite**  
9x 9", 32 pp, hardback \$ 15.95, ISBN 1-57091-591-1 Charlesbridge Publishing, [www.charlesbridge.com](http://www.charlesbridge.com), (800)225-3214

**Mosquito Bite** isn't "just another ugly bug book"; it presents the mosquito life cycle in the context of children's backyard play. Dennis Kunkel's electron micrographs are, as usual, excellent. The design of the book will appeal to its intended audience (ages 6-11), but some of the concepts and vocabulary need support from an informed teacher or parent. Current concern about West Nile virus should make it a useful teaching aid.

*This following book isn't new, but the very cheap paperback edition is; it's even cheaper on the internet. It's a perfect match with MICRO, and it should be in every classroom that uses MICRO's manual, "Microscopic Explorations".*

Kramer, S. & Kunkel, D. 2001 **Hidden Worlds: Looking Through a Scientist's Microscope**

11 x 8.5", 57 pp, paperback, \$5.95, ISBN 0-618-35405-0, Houghton Mifflin Co., [www.houghtonmifflinbooks.com](http://www.houghtonmifflinbooks.com)

**Hidden Worlds** is an award-winning (and low cost!) book about the excitement of observation and the beauty of the micro-world. The micrographs are excellent, and the types of light and electron microscopes used to produce them are described clearly, without technical jargon. Chapter titles include "Becoming a Scientist", "Working as a Scientist", "Seeing Hidden Worlds in Nature", and "How to Become a Scientist". Its dramatic presentation and readable text will capture the imagination of the children who read it. Grades 4-8. ■

PHONE/FAX  
(239)945-6763

### SCOPETRONIX

## Introducing the MaxView Plus Digital Camera Attachment System

The MaxView Plus kit includes adapters to fit microscopes & optical devices with any of the following attachments;  
C-Mount, C/S-Mount, T-Mount, 23mm Eyepiece Port, 30mm Eyepiece Port, and 1.25" Eyepiece Ports







The MaxView Plus can also be used as a high quality wide angle eyepiece with the included thread-on eyeguard. The MaxView Plus is "T" threaded on top so you will need the appropriate Attachment Kit to mate it to your particular digital camera. We carry dozens of attachment kits to fit most all popular digital cameras and we update them regularly so your MaxView Plus will not become obsolete when it is time to upgrade to a new camera. If using it with a 35mm SLR you will need the appropriate T-Ring for your brand of camera.



The heart of the MaxView system. A wide field 40mm focal length four element symmetrical (Plossl) lens assembly specially mounted in a carefully designed custom cell. The lens is mounted only 1mm from the top to maintain the close coupling required to reduce vignetting. The cell features a unique sliding collar assembly which serves several important functions, it allows quick and easy removal of the camera, it allows you to adjust eyeguard height for easy visual use, allows you to adjust magnification when used with a 35mm camera, **and allows you to adjust lens position to minimize vignetting with a digital camera.**



**MaxView Plus Kit  
only \$299.00**







ScopeTronix Astronomy Products • 1423 SE 10th Street Unit 1A • Cape Coral, Florida 33990  
Phone/Fax 24 HOUR ONLINE SHOPPING & SECURE ORDERING  
(239)945-6763 **WWW.SCOPETRONIX.COM**