

## CAN DEW HELP US TO IMAGE INSULATING MATERIAL?

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In high resolution imaging of biologic structure, atomic force microscopy (AFM) has been prevailing over scanning tunneling microscopy (STM). This is primarily because biologic materials do not conduct electricity, and STM requires that electrons flow to or from the surface of the specimen, whereas electron flow is not required for AFM. Microscopists intent on using STM have compensated by coating specimens with a thin coat of metal. However, the presence of metal atoms on the surface degrades the resolution. A new development may make STM more useful to biologists than ever before.

Reinhard Guckenberger, Manfred Heim, Gregor Cevc, Helmut Knapp, Winfried Wiegräbe, and Anton Hillebrand of the Max-Planck-Institute for Biochemistry and the Technical University of Munich have discovered how to manipulate an insulating specimen so that it can be examined at high resolution with the STM. The key is dew! Actually, what they did was adjust the humidity within the specimen chamber so that a very thin film of about a monolayer of water molecules covered the specimen. Using very low currents (in some experiments, even below 0.1 picoamp, corresponding to about only 1,000 electron per pixel) they were able to image a coating of water over DNA molecules and other non-conducting materials. In a non-imaging mode without scanning and with the STM tip touching the surface, they measured the dependence of surface current on humidity even down to currents as low as 2 femptoamps!

An additional interesting aspect of this discovery of high electrical conductivity of very thin water films is the physics of this conductivity. Guckenberger *et al.* theorized that proton conductivity is involved, with protons hopping along structured water at the surface. A definitive answer to this question requires additional investigation.

Whereas the resolution gained in these initial experiments is quite

impressive, Guckenberger *et al.* are confident that the ultimate limit of resolution with their technique will be even better. Imaging the dew on an important molecule has never been as interesting, or as rewarding! ■

<sup>1</sup> The author gratefully acknowledges Reinhard Guckenberger, Max-Planck-Institut für Biochemie, Abteilung Molekulare Strukturbiologie, D-82152 Martinsried, Germany, for reviewing this article.

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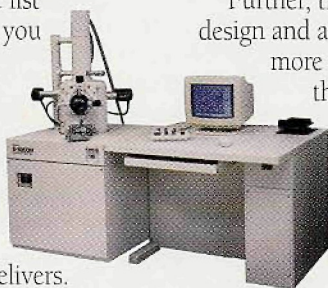
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## Videotapes For Children

Caroline Schooley

Did you give your child a microscope for Christmas? Has it become a favorite thing? If not, maybe some suggestions about exciting subjects to look at are in order. The readers of *Microscopy Today* are professional microscopists, but we're specialists whose work is usually far removed from the "simpler" wonders of the microworld. There are some recent videotapes which will provide children, parents, and teachers with a lot of helpful advice and information.

John Acorn is a freelance science writer who lives in Edmonton, Canada. He's built a substantial reputation north of the border for his work in film, television, and children's books. He has just completed a 13-part series of half-hour programs titled *Acorn, the Nature Nut* for Canadian educational television which presents the natural world as an adventure in personal discovery. Episode #6 is "Under the Microscope". In it, Acorn shows how to choose an inexpensive compound microscope, collect pondwater, and look at the microlife in a drop. He calls his approach lighthearted - others might say cornball - but it's effective, accurate, and entertaining. Be prepared for role playing (van Leeuwenhoek and a 1950s style science nerd) and a humorous ballad about pond life.

The series can be rented in some Canadian video stores, and it has been purchased by several U.S. PBS stations for showing this year. The tape can be purchased from Filmwest Associates for U.S. \$69.25; call (702)883-8090 or in Canada, (604)769-3399.

While Acorn's tape opens the door to the microworld, there's another wonderful series of tapes that presents a sampling of the it's wonders. Warren Hatch is a Los Angeles elementary school substitute teacher who has produced a remarkable archive (almost 18 hours of tape!) of microscopy for children. He has 2-hour tapes that have a mix of insects, pondwater, foods, sand, crystals, seeds, and household items, plus shorter tapes that focus on one category. They're all time-listed for easy reference. His personal story is worth reading:

*"I was raised by two extraordinary parents, both of whom cared dearly about nature. As a child growing up in Portland, Oregon, I was incessantly curious about everything, and there were many butterflies, ants, and bees to observe in our "forested" neighborhood. I did have a chemistry set when I was about 10, and enjoyed it, and I did have some kind of kid's microscope, but I don't think that I got it working very well.*

*I majored in Elementary Education in college. As a full time substitute teacher for 11 years, I first got excited about magnification in teaching when I used a 30X battery-powered magnifier about 8 years ago. Wow! That's great for examining fabric, paints, skin, etc. I bought 30 and used them with about 1000 children, who were very energized by 30X explorations. Two years later I found a better illuminated magnifier and bought 24; I used them with another 1000 children over 5 years. At first, I bought seeds but after one lesson a girl said 'Mr. Hatch, next time bring bugs!! I said that I didn't really like bugs (cockroaches were a big problem in my previous apartment), but her comment caused me to catch a fly at school and look at it. Fascinating. So since then most of my interest has been in insects and spiders and most of my teaching has been with live arthropods.*

*I bought my first compound microscope 5 years ago, for \$450. I wanted to share it with my students but travel meant that the only way to do so was by videotape. I'd seen a videomicroscope setup at a science teacher's conference, and finally decided to spend \$1,100 on an excellent camera and microscope adaptor. So for the last 4 years I've videotaped everything that I was interested in, onto more than 200 carefully cataloged tapes.*

*Using primitive equipment at first, I edited a microscope video and kept working at it. I finally made one decent enough to offer in Instructor magazine's "Teacher's Sharing" section in 1992. I sent 200+ copies of that video to teachers all over the U.S. My equipment is better now, and I've continued to produce tapes. My goal has always been to open the eyes of elementary (and older) students to the whole other world only visible through a microscope"*

Hatch's dedication is truly extraordinary. He sells his tapes for the unbelievably low price of \$20 each, and they're available on loan (\$10 fee) from the Microscopy Society of America. Contact Warren for a detailed tape list and ordering information at 123 S. Figueroa St., Apt. 944, Los Angeles, CA 90012-5455.

There are other microscopy videotapes available, plus a variety of children's books on the subject. Please refer to the first issue of the *Journal of Microscopy Society of America* for a detailed bibliography. ■

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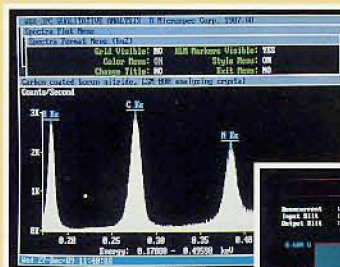
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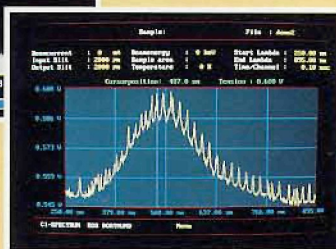
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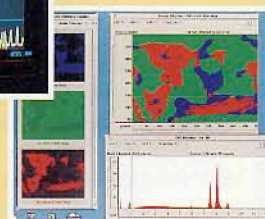
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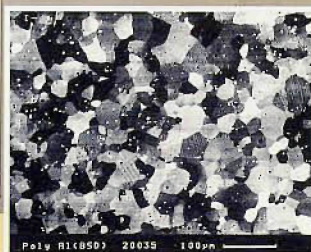
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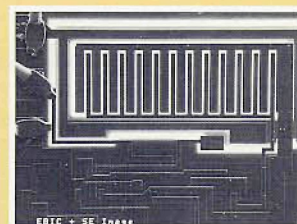
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