The nanoAdvisor
Educational News & Events in Nanotechnology

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This newsletter is published by Nanoscience Instruments, Inc. to support the nanoscience education community. Comments and suggestions are welcome. Requests for your education program to be reviewed, guest editorials, or other comments can be made to edu@nanoscience.com.

An electronic version of this newsletter is available at nanoscience.com/education.
Materials Science Goes Nano at Eau Claire

The University of Wisconsin - Eau Claire is a liberal education university with a strong focus on undergraduate research and other “immersion experiences”. Recently, the university has developed a unique major in materials science, with an option to carry out an emphasis in nanoscience. The major has a strong foundation in math and the sciences coupled with a liberal education approach, but without the traditional engineering emphasis. The major in materials science grew in part out of the formation of the UW-EC Materials Science Center (MSC). Dr. Doug Dunham is the director of the Center, and Dr. Marc McEllistrem is director of the academic program. NanoAdvisor spoke with them about their vision for Materials Science at UW-EC.

The MRC currently has eight Nanosurf® easyScan 2 atomic force microscopes which are used in courses and for student research. One of the considerations while designing the lab was to keep the student-instrument ratio low. Furthermore, the instruments needed a modest learning curve for operating, easy & fast setup, and a robust design. Typically, two students use one AFM in order to get a thorough and in-depth experience. Dr. Dunham teaches the upper level materials course for majors. His students already have a basic understanding of material science and they are very motivated and focused. They make their own samples and then characterize them with the AFM and other techniques. Samples include polystyrene beads dispersed on a substrate of their choice, metal foils, nanowires and PMMA mixtures. The idea behind the course is to use various characterization techniques to develop a comprehensive understanding of novel materials.

Dr. McEllistrem teaches the introductory materials course and some of his students are not science majors. He enjoys this impressionable crowd as they all start out with little or no science background. The challenge to Dr. McEllistrem is getting them excited about nanotechnology. He uses a variety of samples from the Nanosurf Extended AFM sample kit, which allows the students to quickly get started. Once the students master imaging with the AFM, they are allowed to image their own samples like nanowires and polystyrene beads. He has also acquired a desktop SEM and found that it complements the AFMs well.

When looking to outfit their laboratory with AFMs for the first time, Drs. Dunham and McEllistrem chose the easyScan products primarily due to their ease-of-use, portability and affordability. Dr. Dunham likes the fact that the AFMs can be stored away easily in their carrying cases. This frees up valuable lab space for other instruments when the AFMs are not in use. The assembly and disassembly is extremely simple as well. “Students bring out the AFMs when they need them for experiments and put them away after they are done. It is as simple as that.” says Dr. Dunham. Dr. McEllistrem thinks the easyScan is extremely well-designed and is pleased about how robust it is. He likes the fact that it can withstand rough handling the freshmen inevitably put it though. “We are not afraid to let the students use it” he says. “In fact, we encourage even high school students use our AFMs.” He also likes the intuitive software. His freshman students do not have any problems learning the intricacies of the instrument.

After completing the four-year program at Eau Claire, students either seek employment in the industrial sector or stay in academia to pursue higher education. Drs. Dunham and McEllistrem want their students to be ahead of the curve, whatever their career choice. They interface with local industries and give them access to their equipment, hoping to ultimately create a job market for their students. They also encourage other educators to give them feedback about their “unconventional” program at a liberal arts college.

To find out more, or to provide feedback, please contact Dr. Doug Dunham at dunhamdj@uwec.edu and Dr. Marc McEllistrem at mcelliml@uwec.edu.
**Phenom Desktop SEM Opens Up Endless Possibilities**

Scanning Electron Microscopy has proved to be extremely valuable in visualizing nanoscale science. However, full-sized SEMs are bulky, expensive and require too much upkeep for an undergraduate teaching environment. Nanoscience Instruments now provides a desktop SEM which is easy to use and virtually maintenance-free. It is a great way to explore the sub-micron world with students and make the learning process fun and exciting. We asked educators around the country how they use their Phenoms.

**Occidental College uses the Phenom SEM for undergraduate research and teaching**

Dr. Gary Martin, Professor of Biology at Occidental College, told the Nanoadvisor how he incorporates the Phenom into his undergraduate courses as well as research projects. The department had enough potential users to request an SEM almost two years ago. The Phenom proved to be the perfect choice because of its quick learning curve, superior image quality and hassle-free operability. “We love the Phenom” states Dr. Martin enthusiastically.

He has used the SEM in demonstrations for undergraduate classes. The response was so overwhelmingly positive he incorporated it into his upper division courses in Invertebrate Biology and Histology. The students prepare their own samples of flagellates, diatoms, cells and tissues. “The Phenom was the most fun instrument the students have used” he told us. “They were both excited and fascinated to see features they had never seen before with an optical microscope.”

Dr. Martin’s research projects with the Phenom involve studying the functional morphology of marine crustaceans and molluscs. Contact Dr. Martin at gmartin@oxy.edu with questions. Dr. Goffredi, a colleague at Occidental College, has studied the structural properties of bacteria found on the appendages of the Yeti crab with the Phenom SEM. Her research was included in a peer-reviewed publication.

**Clarkson University uses the Phenom SEM for research**

Dr. Igor Sokolov, director of Nanoengineering and Biotechnology Laboratories at Clarkson University uses the Phenom mostly for research and sometimes for open house demonstrations. His students study the morphology of particles synthesized in the lab. The SEM is also used for imaging the cross-sections of biological cells. Students in his lab also combine the AFM and SEM for certain experiments. This amalgamation of two imaging techniques holds tremendous potential, according to Dr. Sokolov.

Another use of the Phenom in the NABLAB is for open house demonstrations for prospective graduate students. Dr Sokolov likes to show-case this particular tool as it is “fun” and “easy to use” and so far, it has never failed to impress potential candidates. Contact Dr. Sokolov at isokolov@clarkson.edu.

**Oregon Museum of Science and Industry uses the Phenom SEM for “Science Pubs”**

The Phenom was a part of the Nanotechnology exhibit at OMSI in 2010. The display, which consisted of microscopes of different resolution powers, started with a magnifying glass and culminated with the SEM. Museum visitors were allowed to play with SEM images and discover features they had never seen before. “It was a truly amazing experience for our visitors” said Dr. Marilyn Johnson, Director of R&D at the OMSI. The nanoAdvisor also asked Dr. Johnson about Science Pubs, which are informal, interactive discussions about cutting edge science and technology. The audience varies from those completely unfamiliar with science to self-professed “geeks”. The Science Pub involving live demonstrations with the Phenom SEM attracted over 150 people and managed to captivate the entire audience. Visit their website at http://www.omsi.edu to find out more.
Optical Microscopy and AFM
View from the microworld to the nanoworld

The Nanosurf LensAFM combined with an optical microscope allows your students to bridge the microworld to the nanoworld. Conveniently explore a sample with a familiar optical microscope. Continually zoom in until you reach the limits of the optics, and then switch to AFM.

By simply turning the turret, you can start imaging with the AFM and peer into the nanorealm.

The LensAFM can be used with most standard optical microscopes. We also provide a high end solution by combining the AFM with the Zeta-20. The unique Zeta-20 system gives you three dimensional, true color, optical images. By viewing and comparing the 3D optical data with the 3D atomic force data, you have a true metrology solution good for teaching, research and industrial quality control.

Contact us at info@nanoscience.com or 1.888.777.5573.

One Package: Four Techniques
Atomic Force, Scanning Tunneling, Scanning Electron and Optical Microscopy

Nanoscience Instruments now provides a complete range of microscopy techniques to give your students a true understanding and appreciation of the nanoworld. The Zeta-20 3D optical microscope bridges the macro with the micro - in true color and 3D. The scanning electron microscope takes the optical images to a new level - down to 25 nm resolution. The AFM and STM complete the transition to single nm and even atomic resolution. A package with all four microscopes starts at $140k.

Contact us for configurations and detailed pricing information at info@nanoscience.com or 1.888.777.5573.

New Desktop SEM
For education and research

The Phenom is a compact and easy to use desktop Scanning Electron Microscope. Its touchscreen interface, rotary knob for focus & zoom, and intuitive controls makes it the most user friendly SEM available. The Phenom’s superb image quality makes the instrument ideal for both research and teaching. It rivals SEMs that are much more expensive and harder to operate.

An amazing feature of the Phenom is the speed at which it acquires stunning images. After loading your sample, you can immediately take video images. In just 30 seconds you’ll be acquiring an SEM image. It is the fastest SEM on the market.

The Phenom’s user-friendly design translates into minimal time spent on student training. The unique touchscreen interface makes this SEM easy to use and fun to operate. An integrated video camera provides continuous location feedback so you always know where you are on your sample.

The electron source lasts >1,500 hours, which is 20 times longer than a tungsten filament. No user maintenance is required for this SEM. This means that you don’t need a specialist on hand for source changes, cleaning, or other routine maintenance.

Sample preparation is so easy with the Phenom SEM that it can be used by students in all phases of education.

Two Phenom SEMs are currently offered, the Pure (17,000X) and the Pro (45,000X).

Contact us at info@nanoscience.com or 1.888.777.5573.

CONFERENCES

2yC3: Two-year College Chemistry Consortium
Sept. 16-17, 2011 Brevard Community College, FL
Nov. 11-12, 2011 Montgomery College, MD
Website: http://www.2yc3.org

Southeastern ACS Local Meeting
Oct. 26-29, 2011 Richmond, VA
Nanotechnology Education in the Chemical Laboratory
Website: http://sermacs2011.org
Contact Dr. Kurt Winkelmann at kwinkel@fit.edu
Deadline for abstract submission: Sept. 20, 2011