

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.

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FEATURE ARTICLE

Forsyth's Nanotech Program Gaining Momentum

North Carolina is one of the major Nanotech centers in the U.S. Dr. Kevin Conley at Forsyth Technical Community College in Winston-Salem, North Carolina provides training in the Nanotechnology skill set to serve both students and employers in the region. The college's two-year Associates Degree Program in Nanotechnology is the only one of its kind in the Southeastern U.S. and has been positively received by both students and employers.

The Nanotechnology degree program at Forsyth Tech is built on the "six pillars of Nanotechnology": Physics, Chemistry, Biology, Engineering, Economics, and Ethics. As Dr. Conley explains, "the legacy of Nanotechnology will be multidisciplinary. In our program, we use the tools of physics and the materials of chemistry to study biological systems. All the while we must keep product development, intellectual property, and regulatory issues in mind."

When looking to outfit an Atomic Force Microscope laboratory for the first time, Dr. Conley chose Nanosurf products primarily due to the step-by-step upgrading ability, and the significantly lower cost of the product line. Forsyth Tech's Nanotechnology program started in 2006 with a basic package including three STMs and a single AFM. In 2008 they acquired two Nanosurf® easyScan 2 FlexAFMs for use in the biological AFM course. Dr. Conley was also sold on the portability. "The easyScan 2 literally comes in a suitcase. This portability makes it easy to take an AFM with me wherever I go to put on a demonstration for my program," he explains. For educators working with limited funding, he suggests the purchase of a basic system, followed by accessories as more funding is secured and more specific needs come into focus. The Nanotechnology Program at Forsyth Tech has received funding from the Wachovia Foundation and the North Carolina BioNetwork.

The primary target of Dr. Conley's program is to help his graduates find employment. Typically his students find employment in the Nanomaterials and Nanomedicine sectors. The most important thing, according to Dr. Conley, is to understand the demands of the local economy by engaging directly with the employers. These values continue to be the focal point around which

Dr. Kevin J. Conley with students



Dr. Conley

Student Imaging with Nanosurf Microscope in AFM Lab



the courses in his Nanotech program are developed. It has also helped his students get internships – which very often turn into full-time employment opportunities. The average age of students in Dr. Conley's program is thirty-two. They want to get right into a new and exciting field, find hands-on training, and move into an industry.

Dr. Conley feels that community colleges will be in front of the curve when it comes to generating a work force in Nanotechnology. He explains that "graduates from my program can do everything a PhD does. My two-year graduates can take data, maintain equipment, and manage sample preparation. Meanwhile, the PhDs can focus on writing grants, developing their business model, directing the work of their employees, and making critical decisions."

In the future, Dr. Conley plans to expand into the field of Nanomedicine and has submitted grants with the hope of securing funds. Forsyth Tech's Center for Emerging Technologies in the Piedmont Triad Research Park is scheduled to open in 2014, and will include a new 35,000 square-foot facility for the Nanotechnology program. This new space will promote collaboration with industry and provide spaces for visiting start-up companies.

To contact Dr. Conley or to find out more about the Nanotechnology Program at Forsyth Tech, please email him at

kconley@forsythtech.edu



Six Pillars of Nanotechnology

Learning With Nanotechnology Through Visualization

Mohawk Valley Community College and SUNY Institute of Technology

A collaborative effort to develop instructional materials for nanotechnology between Mohawk Valley Community College (MVCC) and SUNY Institute of Technology (SUNYIT) has helped integrate the Atomic Force Microscope (AFM) into mainstream electrical engineering and other programs at both colleges.

Professor Robert Decker at MVCC and Dr. Sala Qazi at SUNYIT spoke to the Nanoadvisor about their endeavors. Two years ago they received a grant from the National Science Foundation called Transforming Undergraduate Education in Science, Technology, Engineering and Mathematics (TUES, formerly known as CCLI) and have developed instructional materials which are used by students in the laboratory. Prof. Decker has a Nanosurf® easyScan 2 AFM which they use on both campuses because of its easy portability. They have organized workshops on “Visualization of Nanoscale Components Using Low Cost AFMs” with the easyScan AFM as well as other microscopes. Students, faculty and industry employees interested in learning the application of nanoscale visualization using AFMs attended these workshops.

MVCC and SUNYIT have integrated visualization using AFM into their course offerings. Perhaps more importantly, this project has also strengthened the collaborative relationship between the MVCC and SUNYIT engineering technology programs. At SUNYIT students can combine their nanotechnology courses with courses such as Physics, Chemistry and Biology to get an interdisciplinary survey minor in Nanotechnology. Dr. Qazi says “Nanotechnology is a skill. It is an enabling technology and if students have this extra skill it will only help them to get better jobs.”

Prof. Decker and Dr. Qazi are also very active when it comes



▲ Prof. Decker (left) and Dr. Qazi (right) with participant (center) at workshop demonstrating use of Atomic Force Microscope.

◀ Workshop: Visualization of Nanoscale Components Using Low Cost AFMs

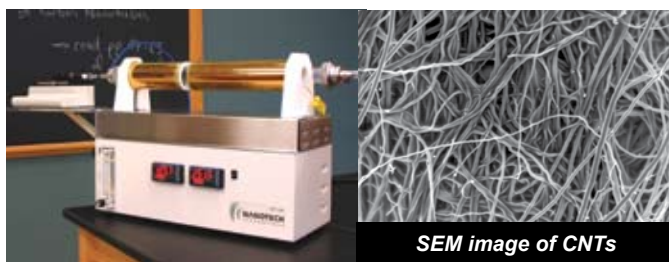


to nanotechnology outreach. They have performed demonstrations for middle school students and given talks to high school students to increase nanotechnology awareness.

They feel that students cannot really fathom or appreciate how small “nano” is unless they see a visual demonstration. The nanoAdvisor also spoke to their evaluator, Dr. Eugenio Basualdo, who is an associate professor from SUNY Oswego. He was clearly impressed with the interest and excitement nanotechnology generated amongst students and teachers alike at these workshops. He emphasized the need for technology awareness at the secondary level in order to continue education in the STEM (Science, Technology, Engineering and Mathematics) fields. “It can be applied to so many things; from criminal justice to biology to engineering” says Dr. Basualdo. “The Future of nanotechnology is wide open”.

When asked for tips for other educators who are looking to build a successful nanotechnology program, their unanimous vote went to sharing resources. Their synergistic approach helped to create a pool of knowledge, increased accessibility to instruments and opened up endless possibilities for them. Such partnerships are springing up all over the nation but they would like to see more. They also encourage educators to apply for funding at the federal and state level and attend nanotechnology workshops. ■

EDUCATIONAL PRODUCTS



SEM image of CNTs

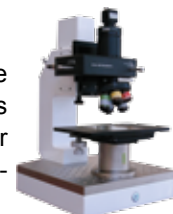
Grow Your Own Carbon Nanotubes!

Nanotech Innovations' new carbon nanotube synthesizer is a unique device that allows you to easily fabricate your own carbon nanotubes. The easy to use and inexpensive device is perfectly suited for an instructional lab where nanomaterial development is of interest.

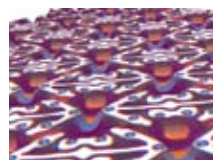
The benchtop system is easy to install in your lab. There is no required catalyst pre-deposition, and its single-step process eliminates the complexity and time typical in CNT fabrication. The result is a high quality multiwalled nanotube with less than 4% impurity. More info at nanoscience.com/products/CNT

Easy-to-use 3D Microscope For Education & Research

The Zeta-20 is an affordable and easy to use 3D optical microscope & profiler. It provides the ability to observe 3D images in true color and capture metrology data from the sub-micron to the millimeter-range.



Simple design and intuitive software allows images to be recorded in less than a minute. Surface roughness, profiling, step/feature height and depth, dimensions, slope angle and other parameters are provided instantly.



DLP Module from TV

3D optical microscopy can be used for the inspection of various materials. Many novel materials, such as those used in photovoltaics, LED substrates, MEMS, and biochips are easy to image with the Zeta-20 noncontact profiler. These same materials can be difficult or impossible to characterize with other systems.

The Zeta-20's affordability and low cost of ownership, combined with the robustness and ease of use, make it an ideal addition to your nanoscience curriculum. See more at nanoscience.com/products/Zeta20

FUNDING OPPURTUNITIES



NSF Funding

Transforming Undergraduate Education in Science, Technology, Engineering and Mathematics (TUES):

Formerly known as the Course, Curriculum

and Laboratory Improvement (CCLI) grants it is aimed at improving undergraduate STEM education. Proposals are due on May 26, 2011. The anticipated funding amount is \$35,800,000 through this solicitation and will be divided amongst 94-108 awards.

To find out more visit nanoscience.com/TUES

Advanced Technological Education (ATE):

This program focuses on 2-year colleges and promotes improvement of education in the science and engineering technicians at the undergraduate and secondary school levels. Preliminary Proposals (optional but recommended by the NSF) are due on April 22, 2011. Total funding amount for Fiscal year 2011 is anticipated to be \$64,000,000 and will be shared amongst 75 to 90 awardees.

For more information about this program visit nanoscience.com/ATE

Nanosurf[®] easyScan 2 AFMs Add Fluid & Biological Capabilities



The easyScan AFMs & STMs are robust, easy to use and portable. With thousands sold world-wide, they are the most popular AFMs for education. The latest addition to the easyScan family is the FlexAFM. With fluid capabilities, the FlexAFM

expands easy to use AFM to the realm of life science and biology. The Flex scanner uses a flexure-based technology that offers ultraflat, linear, and fast scanning capabilities in liquids and air.

The scanner also provides excellent resolution and other advanced capabilities such as inverted microscope integration, electrochemistry, and thermal analysis options. More info at nanoscience.com/flex



DNA Image with Flex AFM