



The Future is N.E.A.R.

Nanotechnology Education and Research
North Penn High School Engineering Academy

February 27, 2006

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Student Presentation

The Engineering Design and Development students within the Engineering Academy at North Penn High School will be offering an engaging and exciting presentation to the public about their nanotechnology research on Thursday, May 11, 2006 at North Penn High School in Lansdale PA.

If you are interested in attending the presentation or would like more information, please visit our website:

www.TheFutureIsNear.org/presentation

Students Visit Drexel University: Utilize Scanning Electron Microscope

The students participating in the Future Is N.E.A.R. (Nanotechnology Education And Research) program within the Engineering Academy at North Penn High School visited Drexel University on January 24th and 25th to utilize the scanning electron microscope.

The Engineering Design and Development students have been performing for-

mal research in the nanotechnology arena by researching, designing and performing their own custom-designed electrospinning experiments.

Electrospinning is a process of producing polymer fibers with a final diameter less than 300 nanometers.

(A human hair is roughly 80,000 to 100,000 nanometers in diameter)

Applications for these nanofibers range from use in advanced air and water filtration. See SEM page 2

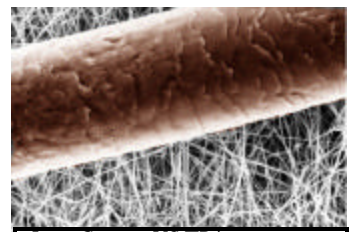


Image Courtesy: US EPA

The image above shows how small the nanofibers are in reference to a human hair.

Students to Give Final Presentation of Research

The Engineering Design and Development students within the Engineering Academy at North Penn High School will be offering an engaging and exciting presentation about their nanotechnology research on Thursday, May 11, 2006 at North Penn High School in Lansdale PA.

Their presentation, which will be designed, prepared and presented by the students, will outline research that they have performed in the nanotechnology field over the past several months.

The presentation will open with an introduction to nanotechnology, where it is currently utilized today and the impacts that this technology will have on future society. Examples and demonstrations will be given to

provide a more in-depth view of several different applications currently in use today and those that have promise for the future. A deeper look into nanotechnology will be given through the students' experiences with the experimental design and the electrospinning process; a method of producing polymer nanofibers from a polymer solution and a high voltage power source. Students will discuss how they took charge of their own learning and worked in design teams to research, design, prepare, analyze and assess their own experiments. Throughout the presentation, the students will also display their team websites, research papers, and an outline of all of the

work they have performed including images, video clips and other examples of their work.

An article released from the National Academies states, "If the United States is to maintain its economic leadership and sustain its share of high-technology jobs, it must prepare for future technological and societal changes ... Engineering programs and faculty should engage in efforts to increase public understanding of the field and to improve K-12 preparation of students in science, engineering, and mathematics education... This means we have to prepare engineers of tomorrow to acquire new knowledge quickly and apply it to emerging problems".

For more information about the presentation, please visit:
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Students Visit Drexel University: Utilize Scanning Electron Microscope...continued

tration devices to use as an anti-counterfeiting method in currency and sensitive personal identifications such as passports and licenses. These fibers could also be designed to be incorporated into smart clothing that can change their physical properties based on light, moisture or temperature or could be utilized as an identification to prevent illegal clothing manufacturers from copying name brand clothing. Research and development is also underway to create fibers with permanent antibacterial properties. Does this sound like science fiction? Many products with this technology are already available on the market today.

During the morning

hours of their trip to Drexel University, the students observed active research in avionics and autonomous robotics in the Drexel Autonomous Systems Laboratory, hydrogel research for spinal disc replacement in the Department of Chemical and Biological Engineering, as well as many other laboratories throughout the university that are performing cutting edge research.

In the afternoon, the students worked for more than five hours each day with Dee Breger, Director of Microscopy in the Drexel Nanotechnology Institute (DNI) of the Department of Materials Science and Engineering. The students utilized Drexel's scanning elec-

tron microscope (SEM) to acquire measurements and surface topography images of the nanofibers the students produced in class. Most of the teams' fibers measured less than 200 nanometers in diameter. Some were less than 50 nanometers!

The students are currently in the data acquisition and statistical analysis phase of their nanotechnology research endeavors. Primed with all of their statistical data, the students are now analyzing their collected data and drawing conclusions from their research to formulate identifiable trends from their experiments. Preliminary data shows some promising results.

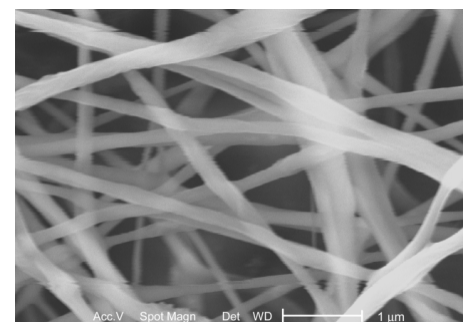
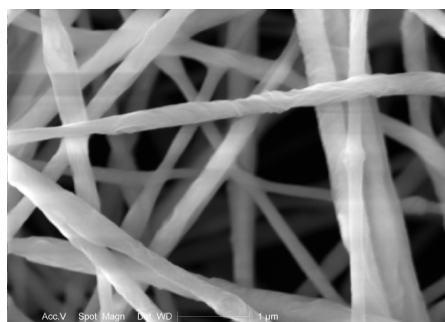
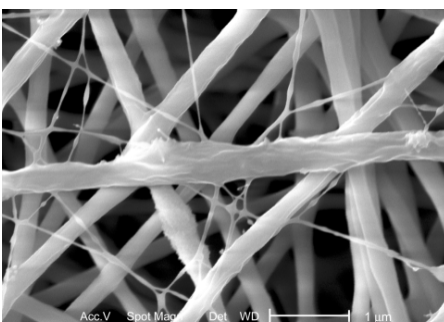
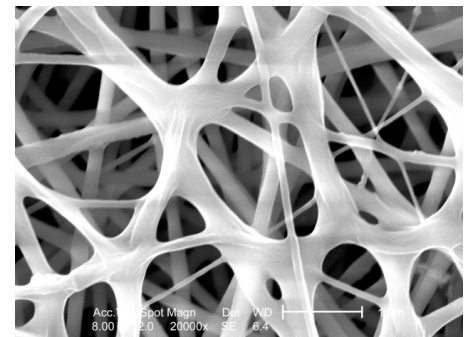
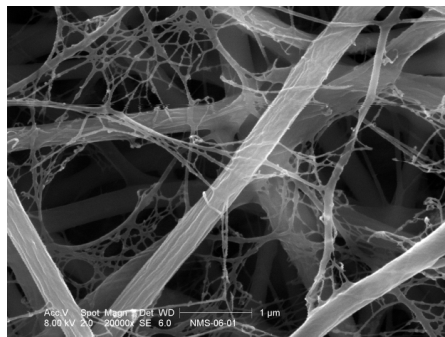
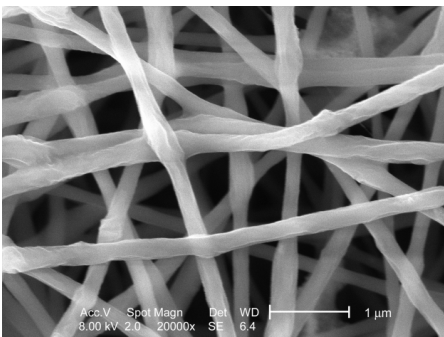
The next steps for the students are to prepare

their scientific papers and their final presentation. With the help of Drexel University, a plan is in the works to have the students' research reviewed and published in professional polymer scientific journals.

The final presentation has been set for Thursday, May 11, 2006 at 7pm at North Penn High School to be given to the organizations who donated funding: ING Financial, Dominion, Toshiba and the North Penn Foundation, local universities and businesses, parents, friends, students, members of the surrounding media and others who are interested in attending the presentation.

Please visit www.TheFutureIsNEAR.org

Scanning Electron Images: Student Research



Future Plans

What does the future have in store for the nanotechnology program? Please see below to see some of the exciting plans in store for the upcoming school years:

Course and Curriculum

1. Expand the curriculum to be a full year course.
2. Incorporate more physics, chemistry and mathematics (true convergence)
3. Apply for approval for the nanotechnology course to be a separate engineering academy elective starting during the 2007-2008 school year. The course would be open to the entire school population with the same academic requirements as the engineering academy.
4. Expand the research to include flow rate studies, vertical electrospinning, conductive, thermoactive and shape memory polymers.
5. Plan for application and integration into elementary and middle school education.

Equipment / Grants

1. Research and write grants for further research funding.
 - A. Vertical electrospinning stations
 - B. Conductive polymers
 - C. Metered pumps for polymer flow rate control
 - D. Lab equipment and furniture

Student Research Websites

<http://nanoresearch.thefutureisnear.org>

Interested in Attending the Final Presentation?

Are you interested in attending the Senior Engineering Academy Nanotechnology Presentation? You are welcome to join us on the evening of Thursday, May 11, 2006 at North Penn High School.

The students will be giving an exciting presentation about the past, present and future applications of nanotechnology and about the research they have been performing with the creation of polymer nanofibers.

Come see the Senior Engineering Academy Nanotechnology Presentation

WHEN: Thursday, May 11, 2006

WHERE: North Penn High School
1340 Valley Forge Road
Lansdale, PA 19446

TIME: 7:00 PM

www.TheFutureIsNear.org/presentation

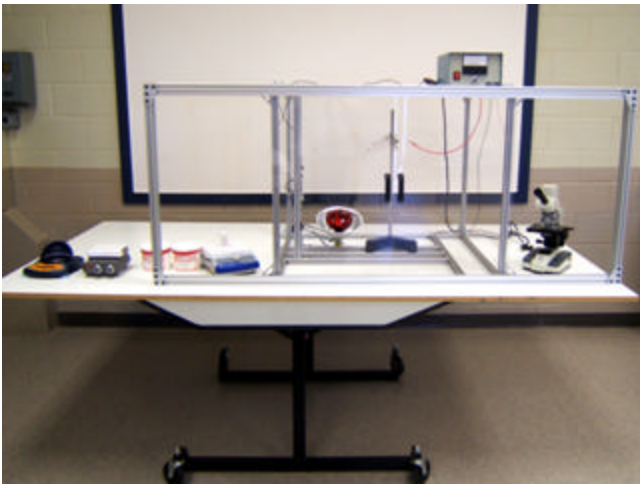
If you are interested or have any questions, please contact Mr. Michael Boyer at North Penn High School or visit the class website at:
www.TheFutureIsNear.org/presentation

Phone: 215.368.9800 x460 (voicemail x611)

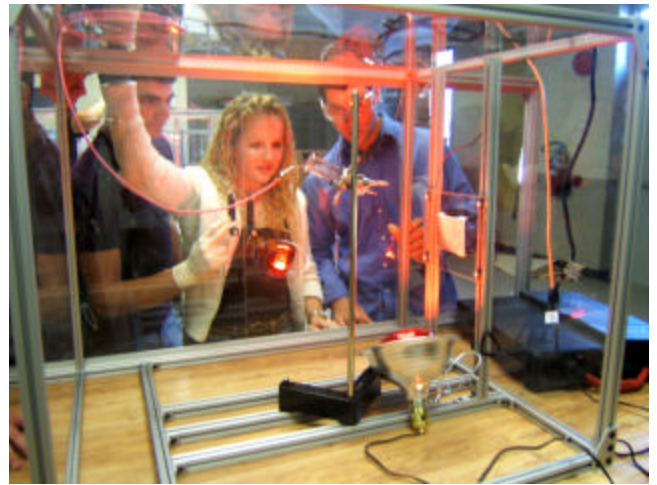
Fax: 215.855.0632 Email: boyerma@npenn.org

R. S. V. P. April 14, 2006

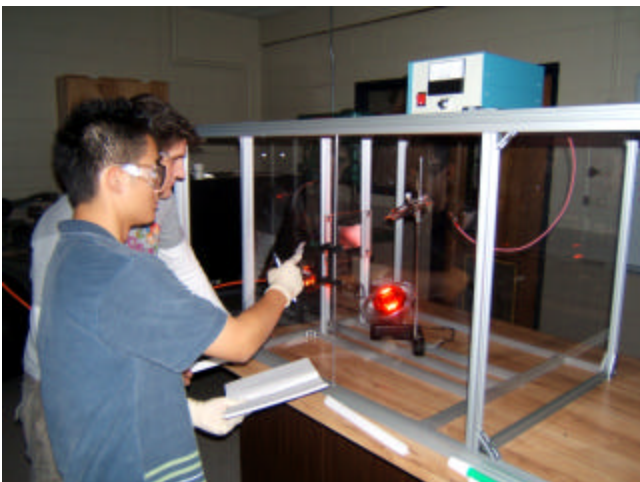
Student Images



Electrospinning station at North Penn High School



Students electrospinning in class



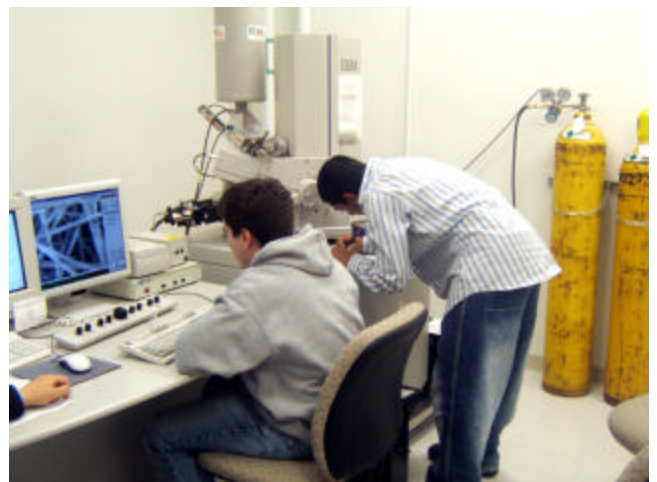
Students electrospinning in class



Student preparing a sample for the SEM



Scanning Electron Microscope at Drexel University



Students utilizing the SEM at Drexel University