Susan Greenberg and Glen Miller organized the 2nd Annual K-12 Teacher Nanotechnology Conference at the University of New Hampshire, Durham, NH on April 5, 2006. The conference featured 8 nanotech presentations plus a keynote address given by George Kachen, Vice President of Business Development at Triton Systems, a nanotech company in Chelmsford, MA. The conference was attended by 70 New Hampshire teachers representing all grade levels, from elementary to high school.
On April 5, 2006, the University of New Hampshire hosted its 2nd Annual Nanotechnology Conference for New Hampshire based K-12 teachers. The event featured 8 workshops plus a keynote address given by George Kachen, Vice-President of Business Development at Triton Systems, a nanotechnology company located in Chelmsford, MA. The conference attracted over 70 teachers from all parts of New Hampshire, making this one of the largest nanotechnology conferences for K-12 teachers to be held anywhere in the Unites States. Each teacher attended two of eight possible workshops where topics ranged from the science behind nanotechnology to the history of nanotechnology to the societal impacts of nanotechnology. All of the teachers convened for the keynote address where Kachen described a variety of nanotech-based products that have already been commercialized. These include high strength, lightweight composites that are used in car parts, tennis rackets and golf clubs, as well as nanoparticles that are utilized in cosmetics, anti-stain and anti-wetting fabrics, and air purifiers. Kachen also described several up and coming nanotechnologies, including a cancer therapy and a computer memory chip, that are causing a great deal of excitement but have yet to be commercialized.

Glen Miller, Associate Director of the Center for High-rate Nanomanufacturing that hosted the conference notes that "Nanotechnologies will have a profound impact on our lives in the coming decades. The National Science Foundation predicts that new nanotechnologies will add two million jobs and one trillion dollars per year to the world’s economy by 2015. We are including K-12 teachers in our center’s efforts because they will be impacted as consumers and because their students represent the future nanotech workforce."
Susan Greenberg, K-12 Outreach Coordinator for the Center for High-rate Nanomanufacturing, organized the conference and notes that it represents one piece of a vibrant K-12 outreach program at UNH. “Scientists have been regularly visiting New Hampshire classrooms to discuss nanotechnology, contacting nearly 900 middle school and high school students this year alone.” Greenberg will follow the nanotechnology conference with a K-12 Teacher Institute to be held between July 24 and July 28 on the UNH campus. Interested teachers can contact Susan Greenberg at susan.greenberg@unh.edu or by visiting the Nano Group website at www.nano.unh.edu.

2nd Annual K-12 Nanotechnology Teacher Conference
April 5, 2006, Holloway Commons
Program Schedule:

8:30 am Check-in—table in hall outside Squamscott Room, 2nd floor—Sue Greenberg

9:00 am Continental Breakfast—Squamscott Room

9:15 am Welcome (Sue Greenberg & Glen Miller)

9:30-10:30 am First session workshops
Piscataqua room
Richard Johnson, Norman and Marie Waite Professor of Chemistry, University of New Hampshire
“Computer Molecular Modeling: A Window into the Nano and Molecular World.” An introduction to the field of molecular modeling will be presented. Current software permits the construction and visualization of sophisticated models for molecular structures and chemical reactions – from DNA to nanotubes. These molecular models are now widely applied in both research and teaching. Some classroom applications and examples of research at UNH will be described. (max. workshop audience attendance-25)

Cocheco room
Jim Harper, Professor of Physics, Director of the Materials Science Program, University of New Hampshire.
“Very Thin Films and Very Small Structures.” Many devices and surfaces that we use daily have thin film coatings that are used to improve their properties. Examples include optical coatings on lenses and window glass, wear-resistant decorative coatings on jewelry and tools, and electronic devices. This workshop will explore trends in thin film coatings as dimensions shrink into the nanoscale regime, creating opportunities for new devices and applications. (max. workshop audience attendance-25)

Lamprey room
Arthur Greenberg, Professor of Chemistry, University of New Hampshire
“Early (Pre-Nano) Nanochemistry.” Before the term nanotechnology was developed it was already know and in early application. Examples include Langmuir monolayers which precisely align hydrocarbon tails, and liquid crystals first discovered over a century ago. Nature “had this idea” even earlier and two natural nanomachines will be described: the enzyme complex ATPase and the structure and function of the flagellum. (max. workshop audience attendance-24)

Salmon Falls room
Howard Mayne, Professor of Physical Chemistry, University of New Hampshire
“Generating Patterns with Weak Forces.” Chemical bonds are strong, and give molecules their shape. Molecules interact with each other using much more subtle “bonds”. By recognizing how these forces work, we can build patterns of groups of molecules in two and three dimensions. The talk will illustrate briefly the operation of some of these forces in nature. We will then discuss possible ways that we can harness these forces to generate patterns in nanotechnology. (max. workshop audience attendance-24)

10:30-10:45am Break—Squamscott Room
10:45-11:45am  Second session workshops

Piscataqua room

Claire Duggan, Associate Director, Center for Enhancement of Science & Mathematics Education (CESAME), and Principal Investigator for RET (Research Experiences for Teachers), Northeastern University—group leader

Teachers include:  Gayle Roach, Knox Trail JHS, Spencer, MA;  Mark Casto, Amesbury High School, Amesbury, MA;  Jim Megyesy, Wilmington High School, Wilmington, MA;  Erica Wilson, Hyde Park High School, Boston;  Benadette Manning, TechBoston, Dorchester, MA

“Research Experience for Teachers (RET)—Integrating Research Skills Nanotechnology into the Classroom”  Would you like to know what all the “Nano” hype is about?  What does “Nano” really mean and what can it mean to your students?  Explore the “Nano” curriculum with us and have fun as well.  This presentation will take you from the research experiences of two teams of teachers to how you can begin to integrate nanotechnology into your STEM teaching.  Hear what three teachers at U. Mass. Lowell learned in their attempts to replicate nanoscale images and how two other teachers working at Northeastern University learned to make those images using electron beam lithography.  (max. workshop audience attendance-24)

Cocheco room

Karsten Pohl, Asst. Professor of Physics, and the Material Science Program, University of New Hampshire

“Small, Smaller, Nano – The Science of Atom Assembly.”  We will visit the wonderful world of atoms, meet them first one-by-one and then observe how they come together to form the Lego-blocks that will build the nanoworld.  This journey is made possible by an amazing microscope—built here at UNH—that lets us see and study atoms as they assemble themselves to form shiny gold surfaces or spongy membranes with pores 10,000 times smaller than a human hair.  (max. workshop audience attendance-25)

Lamprey room

Christina Talbot, Physical Science Teacher, Memorial High School, Manchester, NH & Harvard University RET

“Soft Lithography:  Practical Fabrication on the Micrometer and Nanometer Scales.”  Soft lithography is a method that uses transparent, polymer “stamps” with patterned relief on the surface to generate features as small as 30 nm.  The polymer stamps can be prepared by casting against masters created using conventional lithographic techniques.  Christina will bring research techniques that have been modified for the curriculum to the school lab setting.  This experiment promotes comprehension of soft lithography, nanotechnology, polymerization, polymers, redox equations, covalent bonding, solubility and chemical & physical properties, and fits into a variety of chemistry content areas.  (max. workshop audience attendance-24)

Salmon Falls room

Christopher J. Bosso, Associate Professor, Northeastern University

“Social Concerns and Regulatory Challenges facing Nanotechnology.”  Christopher J. Bosso is associate professor of Political Science at Northeastern University and an affiliate with the Nanotechnology and Society Research Group, the Center for High-Rate Nanomanufacturing, a NSF funded Nanoscale Science and Engineering Center.  He writes on environmental politics, science and technology policy, the tactics and strategies pursued by environmental organizations, and on public policymaking dynamics generally.  (max. workshop audience attendance-25)

12 noon  Lunch—Squamscott Room

1-2 pm  Keynote Speaker—Squamscott Room

George Kaachen, Vice President of Business Development, Triton Systems, Inc., Chelmsford, MA.

Commercialization of Nanotechnology:  How Nanotechnology Will Impact Our Lives.  George is the Chair of the Center for High-rate Nanomanufacturing Industrial Advisory Board.  His position at Triton Systems Inc. is as Vice President of Business Development where he oversees Triton’s fast growth
in the advanced materials sector. Triton Systems, Inc. is a leading materials product and process development company dedicated to creating innovative products in emerging materials markets including nano-scale engineering of materials properties, such as nanocomposites. Triton Systems Inc. focuses on space, automotive, food packaging, and chemical/biological sensing products, all of which can benefit from advances in nanotechnology. Companies like Triton Systems are already producing nanotech products that impact our lives. They are also the companies that will be hiring the nanotech workforce of the future, our students.

2 pm Future Opportunities at UNH and Concluding Comments (Glen Miller)

2:30 pm Conference concludes

For more information about nanotechnology outreach activities at UNH, contact Sue Greenberg at sjg3@cisunix.unh.edu.