From the Director:

Welcome to the NCN News, which high-lights newsworthy events and accomplishments of the Network for Computational Nanotechnology. As we wrap up the NCN’s first five years, we have much to be proud of. September 2002 doesn’t seem so long ago, but since that time, the NCN has achieved wide recognition for creating a special resource for the nanotechnology community and as an early example of successful cyberinfrastructure. I’m sure that the next five years will be just as challenging and even more successful than our first five. I want to use this opportunity to thank the NCN students, staff, and faculty for the hard work and dedication that has put the NCN and our nanoHUB science gateway on such a strong trajectory. Please enjoy the NCN News, and pass along your comments and suggestions for future issues.

Mark Lundstrom
NCN Director
http://www.nanohub.org/contributors/2862/

‘Nanocantilevers' yield surprises critical for designing new detectors

Today’s pathological tests are relatively inefficient and require millions of copies of virus/bacteria present in a milli-liter of blood for diagnosis of a disease. In contrast, the emerging electronic nanobio sensors promise that one day, in not so distant future, one would be able to detect single virus, bacteria, or pathogen in simple, inexpensive, and ubiquitous tests — allowing earlier detection and more effective prevention. This could forever change environmental-health monitoring in hospitals and homeland security and could pave the way for “lab-on-a-chip” technologies.

This rendition depicts an array of tiny, diving-boardlike devices called nanocantilevers. The devices are coated with antibodies to capture viruses, which are represented as red spheres. New findings about the behavior of the cantilevers could be crucial in designing a new class of ultra-small sensors for detecting viruses, bacteria and other pathogens. (Image generated by Seyet, LLC).

One such sensor -- the nanocantilever -- detects biomolecules by monitoring the reduction of frequency of vibration after the molecule is attached. The smaller the cantilever, the more sensitive is the detection -- or so says the classical theory -- and hence the worldwide effort to reduce the dimensions of the cantilever to nanometer range. Now a member of the NCN Nanobio group -- M. A. Alam -- in collaboration with Prof. Bashir of ECE/BME have shown that the physics of sensors nanoscale is more complex/counterintuitive than previously believed. Indeed, as the molecules attach to sensors, its frequency may either increase (!) or decrease depending on sensor dimensions. This is because at nanoscale the larger cantilevers catch more antibody than smaller ones. And since the protein thickness is
comparable to thickness of the cantilever, these biomolecules not only increase the mass (expected) but also changes the spring constant (surprise) of the cantilever. In short, when sensor size becomes comparable to the molecules being sensed, classical intuitions are no longer effective guides and design of sensors require dramatically new approach.

These results were recently published in *Proceedings of National Academy of Sciences*. The research was supported by NCN and NIH. A. Gupta from Prof. Bashir’s group did the key experiments and P. Nair from Prof. Alam’s lab developed the mathematical models. See more on Alam at [http://www.nanohub.org/contributors/2624/](http://www.nanohub.org/contributors/2624/) and Bashir at [http://www.nanohub.org/contributors/4202/](http://www.nanohub.org/contributors/4202/).

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Meet Mr. Matthew Potrawski who officially joined us on November 1, 2006 as NCN’s new Managing Director. He had been serving as a consultant for us since March 2006 when he was initiated into our program by working with all of us on the Annual Report and Site Visit. Matthew received his BS in Computer Science from Ball State University in 1988, his CSP (Certified Systems Professional) from ICCP, and his PMP (Certified Project Management Professional) from Project Management Institute. Matthew lives in the area with his wife, Renee, and two children, Nicole and Derek. Welcome Matthew!

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Dr. Peter M. Osterberg – University of Portland
*See the rest of his comments at [http://www.nanohub.org/quotes/osterberg](http://www.nanohub.org/quotes/osterberg)*

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**What’s New on nanoHUB**

- **A Vision for the Digital Data Universe** (in Online Presentation, January 18, 2007)  
  [http://www.nanohub.org/resources/2291/](http://www.nanohub.org/resources/2291/)

- **Thin Film Nanotubes** (in Simulator, January 17, 2007)  
  [http://www.nanohub.org/simulation_tools/nanonet_tool_information](http://www.nanohub.org/simulation_tools/nanonet_tool_information)

- **Team-based learning in a nanotechnology course: Enhancing critical thinking through course structure** (in Online Presentation, January 16, 2007)  
  [http://www.nanohub.org/resources/2159/](http://www.nanohub.org/resources/2159/)

- **SPMW Mechanisms of atomic friction studied by friction force microscopy** (in Online Presentation, January 13, 2007)  
  [http://www.nanohub.org/resources/2102/](http://www.nanohub.org/resources/2102/)

- **Nanobiotechnology and Biosensors** (in Online Presentation, January 11, 2007)  
  [http://www.nanohub.org/resources/2260/](http://www.nanohub.org/resources/2260/)

*See more at [http://www.nanohub.org/whatsnew/](http://www.nanohub.org/whatsnew/)*

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**Quotable Quotes**

“I am VERY ENTHUSIASTIC about nanohub.org. I find it extremely useful, rich, intuitive and enjoyable. I found it during my sabbatical last year at Stanford where I was taking one of their nanotech courses. One of the professors told me about nanohub.org and suggested I check it out. Well, I was VERY impressed when I looked at it. I have been using it almost daily since then.”

Dr. Peter M. Osterberg – University of Portland
*See the rest of his comments at [http://www.nanohub.org/quotes/osterberg](http://www.nanohub.org/quotes/osterberg)*

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**NCN 2007 Calendar of Events**

- April 4 – All Hands Meeting
- April 5 – External Advisory Board Meeting
- May 11 – Fifth Annual Report due
- June 18-20 – Annual Site Visit

*See also [http://www.ncn.purdue.edu/activities/](http://www.ncn.purdue.edu/activities/)*

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**Coming Soon: New and Improved nanoHUB**

We value your comments and suggestions, and we're constantly folding your input into our web site, to make it better. Soon we will launch a newly redesigned nanoHUB, which works just like the nanoHUB that you know and love, but is more streamlined to improve navigation.

[http://www.nanohub.org/support/suggestions/](http://www.nanohub.org/support/suggestions/)

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