

NanoBusiness Talent

WINTER 2010

NEWSLETTER

ISSUE 1



*total applied
learning through
entrepreneurship*

Small science makes a big impact

“Synergistic developments in information technology, materials science, biotechnology, and nanotechnology will almost certainly transform human tools more dramatically and rapidly than at any time in human history.”

- Phase III Report of the U.S. Commission on National Security/21st Century

In this age of globalization and unprecedented technological and scientific advancement, it is important to make sure we educate and inspire the next generation of scientists and entrepreneurs. NanoBusiness Talent aims to give advanced students

at the high school level real experiences with nanotechnology that they wouldn't otherwise receive until late in college or graduate school. Students are placed in the entrepreneurial environment of the start-up company to gain first-hand experience of the trials and triumphs of transferring ideas from the bench to the marketplace.



In the two years since NanoBusiness Talent's inception, approximately 70% of participants have gone on to major in science and engineering at universities across the country; 75% expressed interest in pursuing academic research; 75% are interested in working for a start-up technology company; and 63% are interested in starting their own company.

Several changes will take place in 2010. Most notably, the program will expand from Illinois to Colorado and North Carolina. Kim and Griffith Kundahl of the Colorado Nanotechnology Alliance are spearheading the pilot program in Colorado. In order to foster a sense of community during the program, all students will spend the first four days of the program at a nanotechnology boot-camp at Argonne National Laboratory

in Argonne, IL where they can learn from preeminent scientists and interact with each other. As 2010 begins, NanoBusiness Talent looks forward to another exciting year for the program!

Lesley M. Hamming
Program Director

NanoBusiness Talent allowed me to deeply understand how pure nanoscience can become a product with human impact. There is nothing else like it.”

-Abigail Chao, 2009

2009 in review

Interviews for the finalists

Fourteen finalists were interviewed by representatives from Ohmx, Nanotope, NanoInk, Nanosphere, Questek and Advanced Diamond Technologies at the Illinois Science and Technology Park. The interviews ensured a good match of interests and needs between the students and the host companies.



Internships

Top students in Illinois were placed in summer internships at nanotechnology companies across Chicago. Kevin Chen (pictured at right) was placed at Ohmx Corporation. There, Kevin investigated the efficacy of using sP-selectin as a biomarker for patients at risk for cardiovascular afflictions such as atherosclerosis, arrhythmia, hypertension and coronary heart disease. Biosensor chips with gold nanoparticles are utilized at Ohmx for capture of the biomarkers for point-of-care diagnostics. The nanometer-size of the particles increases the surface area exposed to the sP-selectin to maximize the sensitivity of the chips.

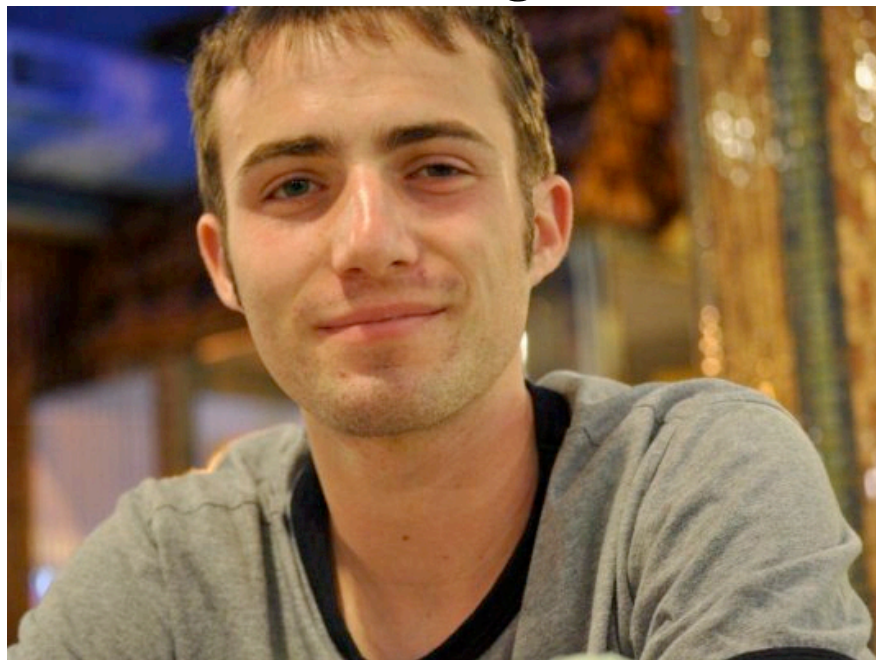


Social events



The Talent fellows also found time for socializing during the program despite their placement at different locations with several water balloon fights, dinners and a movie.

Bioactive, nanoporous putty to aid in bone regeneration



Paul Schied is building on his experience at Nanotope to begin research in bone regeneration under the guidance of Anna Laromaine at Harvard.

“The long-term goal is to produce a putty that will speed the healing of compound fracture in bones to prevent the need for amputation.”

Paul Schied, a 2009 Talent Fellow and current freshman at Harvard University, spent the summer at Nanotope, Inc. learning about cell culture and synthesizing bioactive peptides to aid in spinal cord regeneration. Nanotope was created by Professor Samuel Stupp of Northwestern University to commercialize his research in injectable nanometer-scale compounds that self-assemble in vivo into long fibers to aid in regenerative medicine.

Thanks to a collaboration between Harvard University, Northwestern University and the University of Texas Health Science Center at Houston with funding from DARPA, Paul was able to build upon the research he conducted at Nanotope when he started research in Professor Whitesides' group at Harvard.

The project is in its early stages but Paul says “the long-term goal is to produce a

putty that will speed the healing of compound fracture in bones to prevent the need for amputation.” The putty is pliable enough to be physically molded to the specific environment of each injury. It will also provide reinforcement for injured bone as a nano-porous scaffold. Similar to Paul's research at Nanotope, the putty will exhibit moieties to facilitate healing by attracting and stimulating the patient's own stem cells.

Since this is a new area of research, Paul will begin by developing a reliable in vitro model for bone cell growth. Once the design space has been narrowed, promising designs will be tested in animal models. Reflecting on his experiences, Paul says, “getting the opportunity to work on the cutting edge of exciting fields such as nanotechnology and regenerative medicine is something I greatly appreciate.”

Harvard University:

<http://gmwgroup.harvard.edu/>

Northwestern University:

www.northwestern.edu/newscenter/stories/2009/05/fractureputty.html

University of Texas Health Science

Center at Houston: www.uthouston.edu/media/newsreleases/nr2009/index.htm?id=1207469

Argonne National Laboratory

The 2009 Talent Fellows spent their first week gaining exposure to the instruments and leading-edge research in nanotechnology conducted at the Center for Nanoscale Materials (CNM) at Argonne National Laboratory. CNM has the right infrastructure, supportive culture and a diverse set of research endeavors to prepare the students for their internships with a broad overview of nanotechnology.

Student interaction with some of the premier scientists in the United States is one of the most beneficial aspects of the program. Scientists at CNM gave overviews of hot topics in nanotechnology such as nanotechnology in medicine, nanoelectronics, peptide synthesis and self-assembly and technology transfer.

Students observed demonstrations of two of the most important tools in nanotechnology: e-beam lithography and atomic force microscopy. Atomic force microscopy is essential for visualizing and manipulating nanomaterials and e-beam lithography is essential for bottom-up fabrication of nanomaterials. Tools for visualizing, manipulating and fabricating cover important tasks needed by nanotechnology researchers.

2010 Program Dates

EVENT	STATES	DATE
Deadline to submit application	CO, IL, NC	3/19/10
Finalists notified	CO, IL, NC	4/9/10
Interviews with finalists	CO, IL	4/15/10
Interviews with finalists	NC	4/20/10
Training at Argonne National Laboratory	CO, IL, NC	6/14 - 6/17
First day of internship	CO, IL, NC	6/21/10
Social Activity	CO, IL, NC	TBD
Research proposal due	CO, IL, NC	7/8/10
Dinner with fellows and mentors	CO, IL, NC	TBD
Practice presentations	CO, IL, NC	8/9/10
Final presentations	CO, IL, NC	8/11 or 8/12

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NanoInk, Inc.

NanoInk developed the Dip Pen Nanolithography® system that is capable of depositing nanoscale materials on many surfaces. Dip Pen Nanolithography® was a breakthrough in nanotechnology research because it offered straightforward and controllable deposition at the nanometer-scale in a manner analogous to a quill and ink. The "quill" is made from atomically sharp tips that are controlled by thermally activated cantilevers for precise movement.

NanoInk's technology is so sophisticated it can control deposition of up to 55,000 tips at once. With resolutions approaching 10 nm, this technique is a vital research tool for the nanotechnology community. NanoInk

has also adapted the system for protein deposition and detection, controlled production of stem cells, and NanoEncryption™ to apply nanoscale features to pills and capsules to prevent counterfeit and illegal diversion of the pills.

Four Talent fellows have been interns at NanoInk including James Yu ('09), Yifei Huang ('09), Andy Schneider ('08) and Ben Wilcox ('08). Two of the fellows, Ben and Yifei, worked on a new endeavor at NanoInk to create a suite of learning tools for high schools to teach concepts of nanotechnology right in their classrooms.

For more information, visit www.nanoink.net www.nanoguardian.net



The 2009 Fellows presented their summer research in August at the Illinois Science and Technology Park in Skokie, IL.

Interview with Alumnus: Andy Schneider

In 2008, Andy Schneider graduated from Evanston Township High School and was an intern at NanoInk as a Talent Fellow. Andy is now a sophomore at Williams College (Williamstown, MA).

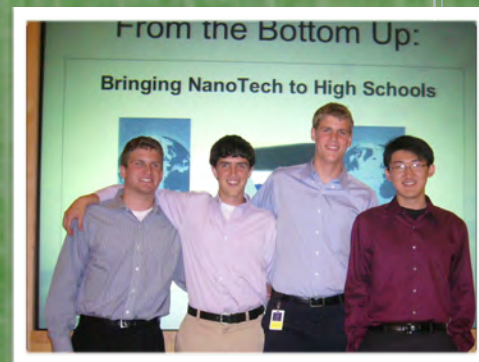
What have you liked most about college? Meeting all the amazing people has been the best part. Everyone is incredibly driven but still very down to earth, and that makes for the perfect academic atmosphere. There is a lot of pressure to expand horizons and take classes in a ton of different departments, and that emphasis on broad intellectual curiosity has been really good for me. Even though the campus can be a pretty high-stress place at times, everyone recognizes the importance of having fun.

What groups and activities are you involved in? I've done a lot of tutoring at the local elementary school, the high school, and for other students at Williams College. That helping out has been mostly with math, physics, and other sciences. I've also been involved with the physics department, and I was a teaching assistant for one of the intro-level courses this past semester. I also joined an American foreign policy discussion group, help out with the A Better Chance (ABC) program and play a few intramural sports. I also recently discovered squash, and now I play at least twice a week.

What is your major? I'm going to declare a physics major this upcoming spring. I have been really interested in physics for four years now, and I love the physics department at Williams. There are only about 12 to 15 physics majors a year, so each group is very close and has a lot of personal contact with the professors in the department. More so than anything else, I've realized that physics is the one subject to which I am constantly drawn. I can't imagine not taking at least one physics class in a semester.

What advice can you offer to incoming freshmen? I would urge incoming freshmen to really push themselves to take a wide variety of classes. It's easy to stick to what you know from high school, but it may not serve you best in the long run. Also, the quality of the professor is much more important in college than in high school – especially for smaller classes. Most colleges have some sort of professor-rating system, and I'd advise incoming freshmen to make good use of it.

Where do you see yourself in 5 years? I hope to be studying physics in graduate school. Between Williams and graduate school, however, I plan to take a gap year to do service work abroad and work on my Spanish.



2008 Talent Fellows (from left): Nick Wieczorek, Andy Schneider, Ben Wilcox, Jimmy Fang



Andy Schneider teaching math to a child in Peru.



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INFINITE CURIOSITY »

8045 Lamon Ave, Q3606
Skokie, IL 60077

t » 312 224 8319

f » 312 893 2176

www.nanobusinessstalent.org