

NanoBusiness Talent

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Talent Finalists in Colorado

Back row: Simon Lee, Brian Schopen, Andrew Wilt, Casey Anderson, Abigail Rice

Front row: Nick Broady, Han Tran, Garrett Chado, Sarah Khan, Bonnie Fan



Small science makes a big impact

Humans have been engineers for 2.5 million years since our ancestor, Homo habilis, sharpened a stone flake to help him cleave meat from an animal. The event ushered in a new phase of human evolution. Humans started looking towards inventions and innovation to overcome environmental challenges rather than waiting for natural selection to lead to biological adaptations. Our intelligence and accumulated knowledge over the last 2.5 million years is certainly impressive, but it pales in comparison to the 4 billion years Mother Nature has had to engineer elegant biological solutions for animals, plants and organisms.

Nature designs at the nanoscale; DNA is 2 nm wide. Scientists are now at the stage in which they have the tools, such as atomic force microscopes and tunneling electron microscopes, to visualize and manipulate matter at this size scale. Many leading scientists are working towards unlocking the secrets to these biological adaptations and applying them to current challenges in society.

At NanoBusiness Talent, we

believe big breakthroughs in science can come at these small, nanometer scales to create efficient solar cells to reign in our reliance on fossil fuels, create targeted drug delivery agents to reduce chemotherapy's side effects, and design materials that are lighter, stronger and stiffer than ever before. These advances can only come by inspiring our next generation of scientific leaders.

Eleven emerging technology companies in NC, IL and CO are leading this endeavor by mentoring Talent Fellows this summer: BD Technologies, Protochips, Appealing Products, Advanced Liquid Logic, Nanosphere, NanoIntegris, Nanophase, Ohmx, Questek, Zettacore and MemPro Ceramics. Each of these companies is breaking new ground in technology.

In its third year, NanoBusiness Talent experienced a surge in interest from high school students hoping to contribute to these emerging technology companies. In 2010, we received 290 applications compared to just 85 in 2009. The applications were narrowed down to an exceptional group of finalists that were interviewed by representatives from each

The level of student that was enrolled in the program was exceptional and very helpful. Both students at NanoInk caused their mentors to quickly revise their schedules. In our group, I would say we had to revise our estimated time by a factor of four at least.

-Mentor John Ireland, 2009

company. In April the companies selected the Talent Fellows with a diverse set of passions and experiences. The program kicks off with an introductory camp at the Center for Nanoscale Materials at Argonne National Laboratory in June. With such a remarkable group of students and mentors, it promises to be an exciting summer!

Lesley M. Hamming
Founder and Program Director



Partner Spotlight: Protochips

Protochips Speeds Research with Nanoscale Laboratories By Lauren Meade

During a gold rush, making shovels is a profitable business. Likewise, as nanotechnology research races forward, Protochips Inc. found a niche developing nanoscale tools designed to speed discoveries.

Protochips Inc. recently partnered with NanoBusiness Talent's North Carolina chapter. The company, which operates in Raleigh, N.C., will host one Talent Fellow this summer for eight weeks.

Protochips was founded in 2002 by three graduate students, John Damiano, PhD, Stephen E. Mick, PhD, and David P. Nackashi, PhD. The trio initially developed glass slides for holding and viewing specimens under electron microscopes.

They later unearthed another market need. One problem in nanotechnology research is the tools used to observe and those used to manipulate nanoscale materials typically are separate, independent tools. Protochips addressed this problem by creating nanoscale laboratories that allow researchers to

maneuver materials as small as one-billionth of a meter (one nanometer) and view the results in real-time. Nano materials that took months to study now can be examined in an afternoon.

One technology, called Aduro, helps scientists use electron microscopes to view live chemical reactions. Without the device, researchers can only see the reactions as still images because they must stop experiments before each observation.

With the Aduro platform, scientists can control and create chemical reactions, such as changing the gas, liquid or temperature inside the device. These chemical reactions can cause temperatures to rise to 1200° C (or 2192 °F). Aduro is equipped to handle extreme

temperatures, allowing scientists to view single atoms in conditions closer to real-world reactions than ever before.

With this bread box-sized device, Protochips aims to expedite breakthroughs in fuel, batteries and drug-delivery agents, leading to a gold mine of practical solutions for everyday problems.

To learn more, visit www.protochips.com.



2010 NanoBusiness Talent Fellows

Colorado

Sarah Khan - MemPro Ceramics Corporation (Rock Canyon High School)

Simon Lee - Zettacore (Boulder High School)

North Carolina

Katherine Hobbs - Advanced Liquid Logic (Raleigh Charter High School)

Christian Johnson - BD Technologies (North Carolina School of Science and Mathematics)

Jenifer Brown - Appealing Products (North Carolina School of Science and Mathematics)

Gregory Izatt - Protochips (Raleigh Charter High School)

Illinois

Claire Lee - Questek (William Fremd High School)

Krystle Leung - Nanophase (Naperville Central)

Akash Kumar - Ohmx (Cherry Creek/Illinois Math and Science Academy)

Yucheng Pan - Ohmx (Deerfield High School)

Will Edwards-Mizel - NanoIntegris (New Trier High School)

Amishi Bajaj - Nanosphere (Illinois Math and Science Academy)



Will Edwards-Mizel
Claire Lee
Amishi Bajaj

Interview with alumnus: Zach Epstein

As a Talent Fellow in 2009, Zach Epstein, 18, learned the real-world applications of nanotechnology during an internship with NanoIntegrus, a supplier of electronically pure metallic and semiconducting single-walled carbon nanotubes. Zach, who graduated from Adlai E. Stevenson High School in Lincolnshire, IL, currently is majoring in physics as a freshman at Duke University. During a recent interview, Zach discussed his internship experience and career goals.

Describe your experience as a talent fellow.

It was an awesome experience. We participated in an orientation during the first four days. Scientists gave us presentations about nanotechnology and showed us around Argonne Laboratory. After the orientation, I worked as an intern at NanoIntegrus. NanoIntegrus sorts single-walled carbon nanotubes, which are essentially atom-thin sheets of graphite rolled into tubes. The tubes have different properties depending on their diameters and the angle at which they're rolled. NanoIntegrus mainly provides solutions of high purity metallic or semiconducting nanotubes to companies that incorporate the nanotubes' unique properties into a variety of applications. As a talent fellow, I helped with basic lab procedures such as distilling solutions and operating a spectrophotometer. I also looked at different items the company considered buying and researched the pricing.

What are your career goals?

I'd like to go to grad school to obtain a PhD in physics and eventually work as a physics professor and researcher. My greatest goal is to make a contribution to the field that ultimately benefits humanity. At this point, I'm most interested in high energy physics and astrophysics. As I take more specialized classes, I expect to get a better sense of whether I'm better suited for theoretical or experimental physics.

“At NanoIntegrus, Dr. Nathan Yoder, the chief technology officer, was an awesome mentor.”

How did your experience as a talent fellow shape your career goals?

The internship got me really excited for a career in science. I was worried nanotechnology would be beyond me, but the orientation was a great introduction to the basic principles of nanotechnology. We also learned about the different procedures and techniques. At NanoIntegrus, Dr. Nathan Yoder, the chief technology officer, was an awesome mentor. He took the time to teach me about many aspects of NanoIntegrus' work, such as how to use optical absorbance graphs to determine various constants and quantitatively calculate the metallic or semiconducting purity of a carbon nanotube solution.

What advice do you have for this year's talent fellows?

The talent fellows should try to learn as much as they can during this unique opportunity to explore nanotechnology, a field with many current applications and extraordinary potential. The internship is also a very solid introduction to nanotechnology and a great way to evaluate career interests.

What activities and hobbies are you involved with in college?

I am involved with a Duke capella group. I also play guitar and write songs. Later this summer, I plan to emerge as a singer-songwriter by organizing a benefit concert to raise money for Alzheimer's disease research. My great-grandmother had Alzheimer's, so this cause is close to my heart. If I get 100 people to buy \$10 tickets for the concert, that's \$1,000 for Alzheimer's research.

What advice do you have for high school students applying to college?

The four years of college are the best years of your life. Find a place where you feel comfortable and are happy. Try to make the most of your time because you'll find that it gets more and more precious as time goes on. I love my education at Duke. My professors have been great, and I have found time to balance music, friends, the gym and studying.

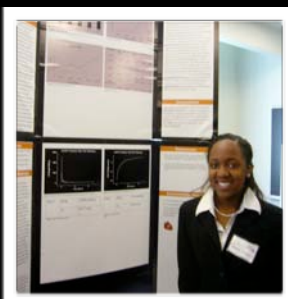
Interview by Lauren Meade





Krystle Leung, a 2010 NanoBusiness Talent Fellow, placed in the top 20 in the U.S. National Chemistry Olympiad in 2009.

Students Yash U. Mehta, Ivan A. Kuznetsov and Mark Greenfield (right) of William G. Enloe High School were awarded first prize for NanoBusiness Talent's outstanding nanotechnology project at the 2010 NC State Science Fair. The young scientists went on to a silver medal out of 465 projects from 71 countries at the International Sustainable, World Energy, Engineering & Environment Olympiad.



Abriana Johnson (above right) from East Chapel Hill High School was awarded second place for NanoBusiness Talent's outstanding nanotechnology project at the 2010 NC State Science Fair.

Get the Most Out of Your Internship

By Lauren Meade

Your first internship can be a nerve-wracking experience. Besides battling the morning commute and being the youngest person in the office, you have the added challenge of learning the ins and outs of a highly technical field.

Two scientists who hosted Talent Fellows last year offer tips for making a good impression. Sarah E. Kiehna, PhD, is Senior Peptide Chemist at Nanotope, Inc. Dimitria Georganopoulou, PhD, is Director of Research at Ohmx.

NANOBUSINESS TALENT: Which qualities have impressed you most about past NanoBusiness Talent Fellows?

DR. KIEHNA: I was very impressed with our last intern's excitement and enthusiasm for his research project. He did a lot of external reading about the research and asked many insightful questions.

DR. GEORGANOPOULOU: Ohmx is extremely fortunate to be involved with the NanoBusiness Alliance and Talent program. Last year we had Kevin Chen, a high school student from IMSA. I was very impressed with Kevin's maturity, level of interest and commitment. He also demonstrated attention to detail and a sense of ethics. He was assigned to research and present the various aspects of cardiovascular diseases, and he managed to tackle this problem as if he were a medical student. Often I would have to ask him to remind me how old he was. His professionalism made him an equal member of our team.

NANOBUSINESS TALENT: Do you have any advice for the incoming students to maximize their internship experience?

DR. KIEHNA: My biggest piece of advice is that there are no dumb questions. Sometimes an intern's questions reveal a different perspective and make me think about things I wouldn't have otherwise considered. If an intern isn't clear on an aspect of an experiment, I would much prefer him or her to ask me about it, rather than potentially waste time and resources if the experiment fails.

DR. GEORGANOPOULOU: I would strongly suggest students to be receptive of the guidance and advice given, not only by their managers, but also the rest of the team and their peers. Often I am faced with representatives of the new generation that have an attitude of entitlement or infinite knowledge. This can be very frustrating. The time to train and teach the students (which is hard work for everyone involved) is very limited before they can be productive for the company.

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Contact Lesley Hamming for information regarding NanoBusiness Talent in IL and NC (lesley@nanobusinesstalent.org)

Contact Kim Kundahl for information regarding NanoBusiness Talent in CO (kim@nanobusinesstalent.org)

Contact the Public Relations Manager, Lauren Meade, with any alumni updates or press inquiries (lauren@nanobusinesstalent.org).



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INFINITE CURIOSITY »»

8045 Lamon Ave, Q3606
Skokie, IL 60077

† » 312 224 8319

f » 312 893 2176

www.nanobusinesstalent.org