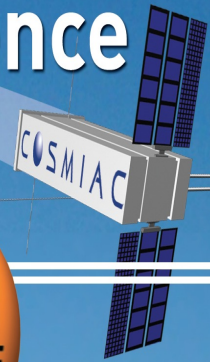


Micro-Nano Tech Conference 2014



Program Guide



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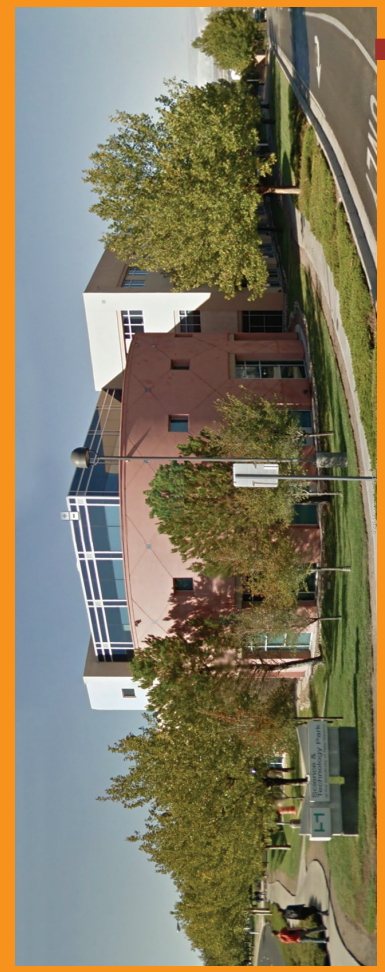
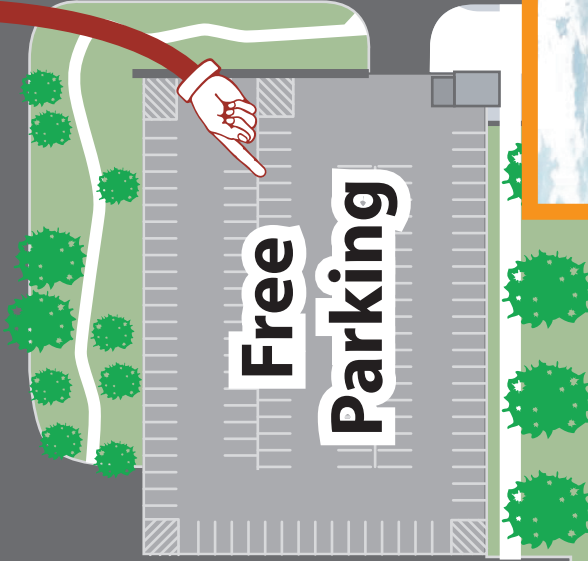
Meet Buses Here

800 Bradbury SE

AUDITORIUM

Bradbury Dr SE

Free Parking



Basehart SE

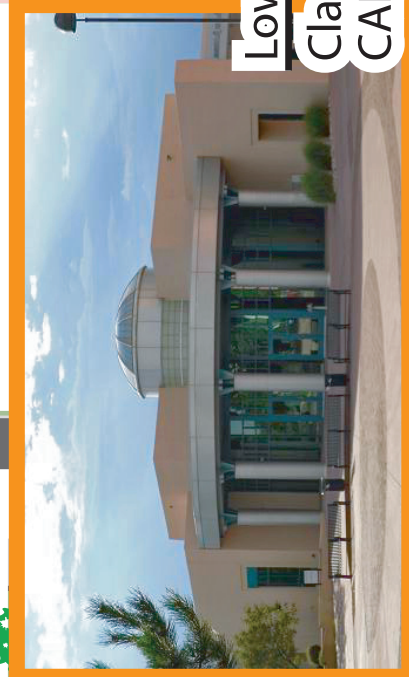
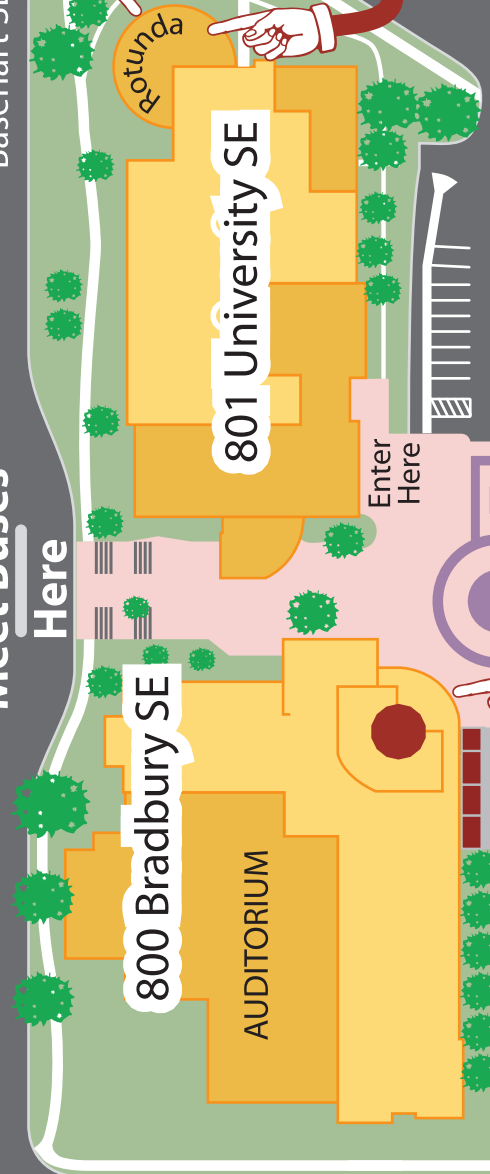
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Lower Level

Classrooms 158,160

CAD Lab

University Blvd

YOU ARE HERE

potunda

MNT 2014 Locations

Workshop and Presentations Schedule at a Glance

Day 1 - Wednesday

Time	Auditorium	Rotunda	Classroom 160	Classroom 158	CAD LAB RM 163
7:00		Participant Check In			
8:00		Welcome Remarks			
8:30-9:30		Center Introductions			
9:40-10:30	P1 - Amazing Materials - Chopra	P22 - Easy Photolithography - Clarkmoore	W9 - DNA Micro Array Willis/Lujan	W19 - Water Water Everywhere: Wonders of Fluid Flow - Newberry	
	P3 - Virtual Nanofab - Reeder	P23 - Packing Gold Atoms - Audi			
10:40-11:20	P2 - Nano Wire Sensors - Nam	P16 - Articulating & Teaching MNT Classes in HS Panel Discussion - Devery			
	P15 - Interactive Online Labs - Nam				
11:20-11:30	Assemble for Bus Pickup and transport to COSMIAC 2350 Alamo Ave. SE, Albuquerque, NM 87106				
11:45	Bus 1 Leaves				
11:55	Bus 2 Leaves				
12:00	Lunch				
1:30	Keynote - Craig Keif				
2:15	Keynote - Andy Kwas				
3:00	Invitation to COMS and MANCEF - Steven Walsh				
3:15	Networking, Showcases and Poster review - Make dinner plans with new connections!				
4:30-5:00	Busses return to hotel - FYI - the hotel is fairly close and one may choose to walk				

Dinner on your own

Day 2 - Thursday

Time	Auditorium	Rotunda	Classroom 160	Classroom 158	CAD LAB RM 163
8:30		Check-In			
9:00		Introductions/Announcements			
9:40-10:30	P4 – 21 st Century AZ Workforce – Tusi & Yamane	W1 - Emerging Tech & Water Treatment - Weeks	W17 – Remotely Accessible Instruments for Nano - Ehrmann		P20 – K-12 STEM and Nano LM Review - DeLuco
	W8 – Nanoscience Instruments Overview – Bhattachary				
10:40-11:20	P14 – SPC – Why you need it and how to use it – B. Lopez	W2 – Nano Experiences - Weeks		W8 - Nanoscience Instruments Open Lab Demo	W21 - Nanotechnology Course Overview - Munden
	P12 - Problem Solving - Willis				
11:30-12:30		Lunch			
12:30-1:30		Keynote – Eric McDonald			
1:40-2:00	P7 – What we didn't know about Nano - Hill	W7 – Jell-O Lab on a chip - Devery	W20 - MEMS Wheatstone Bridge PS – Zaman, B ell	W8 – Nanoscience Instruments Open Lab Demo	W3 – Enhancing your MNT courses – nano-Hub - Faitens
2:00-2:30	P8 - Challenges Facing Nano Ed Pgms - Lesiecki				
2:40-3:30	P9 - Nano: a Student Centered Approach - Zhou	W18 – Solar Cells with Shine - Devery			
	P11 - Nano and 21 st Cent. Skills: RET - Burch				
3:40-4:30	P5 – Early Career Research Exp. - Ashcroft				P13 - Take a Tour of SCME Ed. Materials – Pleil
	P21 - ELET 261 – Intro to Nano and Semi Eng for HS - Ashdown				
4:45	Assemble at Bus Pickup				
5:00	Busses leave for the Albuquerque International Balloon Museum – Keynote -9201 Balloon Museum Dr. NE, Albuquerque, NM 87113				
6:00	Serving dinner begins				
6:45	Recognitions				
~7:00	Keynote – Marc Madou				
~7:40	Docent Tours				
8:30	Assemble for bus return to hotel				

Day 3 - Friday

Time	Auditorium	Rotunda - Workshops	Classroom 160	Classroom 158	CAD LAB RM 163
7:45		Check-In			
8:00-8:20		Announcements			
8:30-9:20	P6 – Community Engagement with Mobile Activities - Vaughn	W5 - Intro to AFM - Michelen	W6 - Nanobiotechnology Ed: Workforce Trends, pedagogy and outreach success strategies! - Pattarkine	W4 – Micro to Nanomaterials - Grady	W14 – Science of Thin Films – Schum
	P19 – Flexible Model for ET PGM - Carlson				
10:30-11:20	P17 – All Models are Wrong - Newberry			W10 - micro-Pressure Sensor Process – Willis/Lujan	
	P18 – A Schrodinger what? - Newberry				
11:30-1:00		Complete Surveys and Lunch			
12:50	Adjourn and Assemble for Airport Bus Pickup				
1:00	Bus leaves for the Airport				

MNT 2014 Detailed Program Guide

How to use this guide

- Presentations and workshops are cross-listed with the Program at a glance using a cross reference number: P1, P2.... W1, W2.....
- Posters and Showcases are detailed at the end and will be available for viewing at COSMIAC, Wednesday afternoon.

Presentations

P1 - Amazing materials: Medical Nanomechanics and Nanobots – Day 1, 9:40am, Auditorium

Nanotechnology, the manipulation of matter at the atomic and molecular scale to create materials with remarkably varied and new properties, is a rapidly expanding area of research with huge potential in many sectors, ranging from healthcare to construction and electronics. In medicine, it promises to revolutionize drug delivery, gene therapy, diagnostics, and many areas of research, development and clinical application. Molecular manufacturing promises precise control of matter at the atomic and molecular level, allowing the construction of micron-scale machines comprised of nanometer-scale components. One highly sought goal in this field is the ability to tailor treatments according to the genetic make-up of individual patients. Therapies that involve the manipulation of individual genes, or the molecular pathways that influence their expression, are increasingly being investigated as an option for treating diseases. DNA-based nanobots are also being created to target cancer cells. Hence it will be possible to create a molecule-scale production line, where a molecule can be moved along till the right location is reached, and a nanobot does a bit chemistry on it. Protein-based drugs are very useful because they can be programmed to deliver specific signals to cells, and have the potential to be produced in situ. Nanofibers with diameters of less than 1,000 nm have the potential to be used for wound dressings and surgical textiles, materials used in implants, tissue engineering and artificial organ components. Nanofibers made of carbon also hold promise for medical imaging and precise scientific measurement tools. Medical nanomachines applications include the use of respirocytes, clottocytes, microbivores, Pharmacytes, Dentifrobots, Vasculoid, Chromalloytes, and programmable dermal displays. Nanotechnology is already moving from being used in passive structures to active structures, through more targeted drug therapies or “smart drugs” and is in early stage development as scaffolding in nerve regeneration research.

Vimlarani Chopra - Houston Community College - vimlachopra@gmail.com

P2 - An Affordable Demonstration Kit for Nanowire Sensors – Day, 10:40am, Auditorium

A high surface area to volume ratio is generally key to effective resistive sensor structures since it improves detection sensitivity and response time. Nanowires are very promising structure for sensing due to their inherently very large surface area to volume ratios. However, the fabrication approaches of these nanowire-based sensors are very complex and expensive. The demonstration kit developed by NACK network is simple and easy to implement to any levels of science labs. The kit also covers wide ranges of topics (e.g., surface energy, capillary force, electrochemical deposition, electrical conductivity).

Wook Jun Nam, Stephen J. Fonash - NACK Network, The Pennsylvania State University - wxn105@psu.edu

P3 - Virtual NanoFab: A Silicon Nanofabrication Trainer – Day 1, 10:10am, Auditorium

How can educators meet the challenge of introducing meaningful hands-on nanofabrication activities that do not require huge and continuing infrastructure investments? A demonstration will be given of educational software, being developed by the authors, that familiarizes students with the primary steps in a typical top-down device fabrication process. Students can use the software to sequence and visualize the results of deposition, patterning, and etch steps. Students control process parameters for each step, and the software provides a two-dimensional cross-section view of the structure that results from each step.

Nick Reeder - Sinclair Community College - nick.reeder@sinclair.edu

Andrew Sarangan, University of Dayton;

Jamshid Moradmand, Sinclair Community College

P4 - Survey on 21st Century Workforce Education Needs in Arizona – Day 2 9:40am, Auditorium

Nanotechnology has the potential to create many jobs in the future, even at the level of skilled technicians that have graduated from Associate's Degree/Certificate programs. The demand for such skilled technicians is anticipated to increase with increasing numbers of nanotechnology-related products and processes. The community colleges in Arizona have an excellent opportunity to address this need by launching programs in nanotechnology in collaboration with Arizona State University. This presentation describes an industry survey conducted to identify the current demand in Arizona for workers with an Associate's Degree/Certificate in nanotechnology, and to identify what skills are needed in their workplaces

Mangala Joshua - Mesa Community College - mangala.joshua@mesacc.edu

Raymond Tusi - Arizona State University

Xaxiri Yamane - Maricopa Advanced Technology Education Center

P5 - Early Career Research Experience at Pasadena City College – Day 2, 3:40pm, Auditorium

The Early Career Undergraduate Research Experience (eCURE) is a program at Pasadena City College (PCC) designed to give underrepresented students an undergraduate research experience in the natural or physical sciences. Through this program, we have developed collaborative and interdisciplinary research projects to provide underrepresented students with research experience at the onset of their scientific careers to better inform their decision to pursue a career in science. This unique experience inspires enthusiasm for scientific research by introducing students to cutting edge projects with a broader impact in terms of energy, the environment and emerging scientific technologies.

Jared Ashcroft - Pasadena City College - jmashcroft@pasadena.edu

P6 - Community Engagement with Mobile Activities to Promote Emerging Technology – Day 3, 8:30am, Auditorium

Rio Salado college is committed to bringing STEM, and in particular, Nanotechnology concepts, to the community. Recently, we participated in a local event, Geeks' Night Out, where we presented remote access to an SEM and Dye Sensitized Solar Cells to students and community members of all ages. Both of these hands on opportunities were designed to engage students in thinking about science at the nano scale. Participants were also encouraged to consider how nanotechnology impacts energy conservation and management. A Scale of The Universe applet was used to explore scale from subatomic scale to intergalactic. In this interactive session, we will share the activities, promotional materials, and planning processes used to host a successful community engagement event.

Rick Vaughn, Jeanne Ratliff & Bob Semmler - Rio Salado College - rick.vaughn@riosalado.edu

P7 - What we didn't know about Nanotechnology – Day 2, 1:40pm, Auditorium

This presentation will outline how the Electrical Engineering Technology department at Erie Community College entered the Nanotechnology field. It will describe how the idea of offering a Nanotechnology degree emerged. The bulk of the presentation will cover the obstacles that the department had to overcome to develop critical knowledge mass in this field. The department members had little expertise in the Nanotechnology field, but we located enough resources through the NACK website to get started, such as workshops/training for community colleges to offer courses/programs in Nanotechnology. The NACK network also directed us towards resources to help build a nanofabrication laboratory.

Rich Hill - Erie Community College - hill@ecc.edu

P8 - Challenges Facing Nanotechnology Education Programs – Day 2, 2:00pm, Auditorium

Join our moderator and panelists in this far-ranging discussion on the challenges surrounding today's nanotechnology programs. Questions such as: - Where do you find funding for equipment? - What are the messages you need to send to your students?

- How do you develop essential relationships with industry, demonstrating value and return on investment? Of course, these questions apply across the spectrum of technology programs. Our goal is that you will have the information necessary to either begin on the nanotechnology path or to accelerate your program along this exciting course.

Michael Lesiecki - Maricopa Community Colleges - mlesiecki@gmail.com

Sam Agdasi, Kevin Conley, Peter Kazarnoff, Qiaoying Zhou

P9 - Nanotechnology: a Student Centered Approach – Day 2, 2:40pm, Auditorium

The Northwest Vista College Nanotechnology Program focuses on providing immediate entry-level employment to students and/or preparing them as Research Assistants to Professors in pursuit of their higher educational goals. This is accomplished through an emphasis of immediate hands-on skills and through the visiting Professor lecture program.

Three students have been awarded by NanoJapan. One student was invited for internships at both Yale and MIT universities. One student was offered research position at Hokkaido University, Rice and UTSA. One student has been awarded by National Nanotechnology Infrastructure Network, hosted at UT-Austin. Finally, three students were nominated for the ATE PI Conference. The presentation will share ideas and learning experiences on how to create opportunities for students in the nanotechnology field.

Qiaoying Zhou - Northwest Vista College - qzhou2@alamo.edu

P11 - Nanotechnology and 21st century skills : RET Program Research Experience for Teachers Summer 2013 – Day 2, 3:05pm, Auditorium

Overview: High school students today have far more access to information and many more formats with which to interact. In this unit students will follow the research experience of an engineering student at Arizona State University through videos and interviews. Such a connection may well prove to students the necessity of learning and applying 21st Century skills while still in high school to prepare for higher education and the workplace. The purpose of this unit is to engage and empower students with the skills required to succeed in the 21st century workplace. These skills include but are not limited to critical thinking, problem solving, communication, collaboration, information/technology literacy, and personal skills.

Theresa Burch - Ironwood High School/Glendale Community College - tburch@pusd11.org

P12 - A Systematic Approach to Problem Solving as Applied to Microtechnology – Day 2, 11:00am, Auditorium

This short presentation is an overview of the problem solving learning module developed by the Southwest Center for Microsystems Education. This learning module is unique in that it applies a six step approach to problem solving to a realistic problem that could be found in a microtechnology fabrication facility. Tools such as Cause & Effect Diagrams and SPC charts are included. New problems can easily be developed by the instructor for additional practice in applying a systematic approach to solving realistic problems.

MJ Willis - Southwest Center for Microsystems Education (SCME) - mjwillis@comcast.net

P13 - Take a tour of SCME Educational Materials – Day 2, 3:40pm, CAD LAB RM 163

Participants will be presented with a wide range of Microsystems/STEM resources for the classroom including downloadable learning modules, hands-on kits, and YouTube lectures and animations. This is in the computer lab allowing participants to “drive” through the website and create an account to access educator materials.

Matthias Pleil - SCME - mpleil@unm.edu - www.scme-nm.org

P14 - SPC - Why you need it and how to use it – Day 2, 10:40am, Auditorium

This presentation is an overview to the SCME Learning Module - Statistical Process Control. We will answer the questions "What is Statistical Process Control (SPC)?" and "Why is it important to high tech manufacturing of micro and nano-systems?"

Barbara Lopez - SCME/University of New Mexico - botero@unm.edu

P15 - Interactive Online Labs for Hands-on Learning – Day 1, 11:00am, Auditorium

Hands-on learning is a very effective approach for students to engage into a concept with “a deeper understanding” than lecture only lessons. NACK network has developed interactive online labs covering the topics discussed in the six capstone courses (E SC 211 ~ E SC 216). These online labs employ an interactive format which consists of multiple video demonstrations of a unit process step instead of a single long video demonstration. The topics of the interactive online labs will be introduced and be discussed in the presentation.

Wook Jun Nam - The Pennsylvania State University - wxn105@psu.edu

P16 - Articulating and Teaching Micro Nano Classes in the High Schools – Day 1, 10:40am, Rotunda

The panel will discuss their experiences with creating micro and nano classes to be taught in high schools and the process of obtaining dual credit or articulation agreements with local two-year colleges.

Maureen Devery - Seattle's Hub for Industry-driven Nanotechnology Education - mdevery@northseattle.edu

Valerie Kovach - Atrisco Heritage High School – Albuquerque, NM

Stephen Schum – Manzano High School – Albuquerque, NM

Ray Nance – ASK Academy Charter School – Rio Rancho, NM

P17 - All Models Are Wrong – Day 3, 10:30am, Auditorium

For centuries, drawing and pictures have been used to describe, clarify or explain operating systems - whether biological or non-biological. More recently in expensive physical models have been used and also computer simulations. The benefits of drawings, models or simulations is fairly clear -- However, each of these contain both overt and covert assumptions. It is especially critical when considering the

processes and interactions at the nanoscale. This presentation will use examples of typical drawings, models and simulations to discuss the danger of ignoring the inherent assumptions and the importance of teaching students how to be aware of these assumptions.

Deb Newberry - Nano-Link - dmnewberry2001@yahoo.com

P18 – A Schrodinger What? – Day 3, 11:00am, Auditorium

Defining the depth of understanding that any course or program provides can be a significant challenge for educators, students and employers. Even with the guidance of Blooms taxonomy, depth of understanding can still be a confusing issue. This presentation will present results of correlation studies between traditional science concepts and the major concepts at the nanoscale as well as various approaches that have been used to help create educational content of the appropriate depth - that matches needs and requirements of employers.

Deb Newberry - Nano-Link - dmnewberry2001@yahoo.com

P19 - Flexible Model for Engineering Technology Programs – Day 3, 9:00am, Auditorium

CVTC has used its Nano Engineering Technology program as a model for other engineering degree programs which share some classes and resources resulting in more choices for students and more specialized grads for industry. Other colleges might use the model to support their own programs which could benefit from a "lean education" make-over.

Kurt Carlson - CVTC - kcarlson15@cvtc.edu

P20 - K-12 Level STEM & Nanotechnology Learning Modules Review – Day 2, 9:40, CAD Lab RM 163

NEATEC Learning Modules (NLM) for K-12 grade were developed by New York State teachers and curriculum developers to introduce students to STEM and nanotechnology concepts through hands on activities while fulfilling state education requirements. A material kit available through a lending library designed to lessen the cost burden on schools and teachers also accompanies NLMs. This presentation will give a brief overview of the modules' development, implementation and a statistical analysis of their first year of use.

Natasha DeLucco-Campione - NEATEC - n.deluccocampion@hvcc.edu

P21 - ELET 261:Introduction to Nanotechnology and Semiconductor Engineering for High Schools Day 2, 4:00pm, Auditorium

ELET 261 is a semester length long class designed to introduce community college students to the fields of nanotechnology and semiconductor engineering. Through work with local educators, NEATEC has adapted ELET 261 to be given as 15-week high school level course available for 2 college credits. This presentation will give a brief overview of the course including its development, implementation and a statistical analysis of its first two years of use.

Jonathan Ashdown - NEATEC - j.ashdown@hvcc.edu

Natasha DeLucco-Campione, NEATEC

Abraham Michelen, NEATEC

P22 – Easy Photolithography for Schools without dedicated equipment – Day 1, 9:40am, Rotunda

This workshop will show you how to add photolithography into your curriculum, even if you do not have dedicated equipment or the use of a clean room. A standard Cuisinart kitchen mixer, a compound microscope, and a projector are all that you need. I'll show you how to turn the Cuisinart into a spin coater, and the microscope and projector into a lithography mask and exposure tool. Photolithography is a valuable nanotechnology fabrication method, and now your students can do it in your classroom.

Ethan Clarkmoore - North Seattle College - mstry4u@yahoo.com

P23 - Packing Gold Atoms Into Nanoparticles: How many gold atoms can you pack in a gold nanoparticle?

This is part of a series of nano education lessons about nanoparticles, crystal structure, surface-to-volume ratios, nanoparticles shape, but more specifically gold nanoparticles (AuNPs). It takes the form of a multi-level math challenge for students with different math readiness and abilities. It also explores how we see Gold nanoparticles (AuNPs) both physically and theoretically. This exercise can branch out into the students exploring nanoscience literature to answer open ended questions more accurately.

Ahmad Audi - College of Lake County - aaudi@clcollinois.edu

Workshops

W1 - Emerging technology and Water Treatment – activities for the classroom from NanoLink – Day 2, 9:40am, Rotunda

Join us to experience new activities that focus on nanotechnology and its use in water treatment. Handouts provided!

Sandra Weeks - McREL International - sweeks@mcrel.org

W2 - NanoExperiences a program designed to help high-school students along to higher-education and onto a career path – Day 2, 10:40am, Rotunda

NanoEx is an out of school program preparing high school Career and Technical Education (CTE) students for postsecondary learning leading to participation in the STEM workforce! We focused on inspiring the next generation of nanotechnicians, but our session will focus on sharing the lessons we have learned from the development and scale-up of the program in ways that may apply to yours. Join us!

Sandra Weeks - McREL International - sweeks@mcrel.org

W3 - Enhancing your MNT courses with free resources and simulation tools from nanoHUB.org - Day 2, 1:40pm, CAD Lab RM 163

In this hands-on workshop, you will learn to use free nanoHUB simulations to enhance your existing MNT courses. nanoHUB.org is an NSF-sponsored project for education and research in nanoscience and nanotechnology that hosts a wide range of free online simulation tools and lectures on many topics such as crystal structures, thermal properties, semiconductors, MEMs, microfluidics, AFM, TEM, batteries, photovoltaics, modeling, computation and more! You will receive personal assistance in assembling an individualized set of nanoHUB resources for your own courses. You may use the computers provided, or bring your own web-enabled laptop computer with the latest version of Java installed.

Tanya Faltens - NCN/ Purdue University- tfaltens@purdue.edu

W4 - Micro to Nanomaterials – Day 3, 8:30am, Classroom 158

Three materials science modules have been selected to infuse with nano topics. The project aims to show the process used for the infusion and the framework developed for infusing nano into micro materials modules. Development and delivery of the modules will be demonstrated with some hands-on participation. The educational technology used for capture and demonstration of the process will be presented. Discussion for further development of micro to nano content in other areas of interest to the audience will follow.

Kim Grady - NanoLink - kimgrady@behaveheuristics.com

Deb Newberry, NanoLink

W5 - Introduction to the Atomic Force Microscope – Day 3, 8:30am, Rotunda

This workshop will introduce participants to the theory and usage of a portable AFM. Using the NaoAFM from Nanosurf the participants will learn how to load and measure small samples of materials ranging from silicon wafers to chemical and biological samples. Several college level, classroom ready modules will also be demonstrated.

Abraham Michelen - NEATEC - a.michelen@hvcc.edu

Ryan Munden NEATEC Curriculum Developer, Assistant Professor Electrical Engineering, Fairfield University

W6 - Nanobiotechnology Education: Workforce trends, pedagogy and outreach success strategies! Day 3, 8:30am, Classroom 163

With nanotechnology applications for life-sciences and consumer-based fields such as medicine, diagnostics, environment, cosmetology, bioenergy, packaging, pharmaceuticals, it is of utmost importance to create awareness amongst educators, career counselors and students. The two major hurdles are lack of awareness and misconceptions such as nanotechnology cannot be taught without million dollar machines! This workshop will share experiences and resources that have allowed several thousand students and several hundred teachers realize the fact that nanotechnology concepts can be taught with a shoestring budget. Resources such as hands-on activities and model-making activities will be shared. This workshop will include a brain-storming component to assess the educator's needs as well as provide a one-on-one opportunity for discussion.

Mrunalini Pattarkine - Harrisburg University of Science and Technology - lpattarkine@harrisburgu.edu

W7 - Jell-O Lab on a Chip – Day 2, 1:40pm, Rotunda

Soft lithography utilizes a polymer or other “soft” material to create a structure that can be used for a variety of applications such as analysis in medicine and biology. In this workshop, we will explore the process and principles of soft lithography using Jell-O and other inexpensive materials.

Maureen Devery - SHINE - mdevery@northseattle.edu

W8 - Hands-on in a Nanoscience Classroom – Presentation: Day 2, 10:00am, Auditorium “Open House” – see live demos of a several Nanoscience Instruments – SEM, AFM and TEM table top models. Day 2, 10:40am – All Day - Room 158

Does hands-on experience with nanotechnology tools impact learning? We think it does. We will give an overview of micro- and nanotechnology instruments that we provide. We will explain the capabilities of the instruments and how each bridges the gap between a textbook versus a real world application. After the 30 minute presentation, we will have hands-on demonstrations all day in a nearby classroom so attendees can visit at their convenience to see the features of the equipment up close.

Shreya Bhattacharyya-McCamy - Nanoscience Instruments - shreya@nanoscience.com

Jennifer Wall - Nanoscience Instruments - jwall@nanoscience.com

W9 - The DNA Microarray - Applications and Fabrication – Day 1, 9:40am, Classroom 160

The DNA microarray is an invaluable tool in the fields of genetics and biomedical diagnostics and analysis. This workshop presents applications of DNA Microarrays, how they work and how they are fabricated. Participants will engage in several activities that help them better understand the basic concepts of DNA microarrays including fabrication, hybridization and interpretation. The SCME's DNA Microarray Model Kit (formerly GeneChip Model Kit) will be used to support some of these activities.

*MJ Willis - Southwest Center for Microsystems Education (SCME) - mjwillis@comcast.net
April Lujan, SCME*

W10 - A Micro Pressure Sensor Process – Day 3, 10:30am, Classroom 158

The Manufacturing Technology Training Center (MTTC) at the University of New Mexico has developed a ten-step process for a working micro pressure sensor. SCME has developed a learning module and supporting kit that use MTTC processed micro pressure sensor chips to teach the individual process steps and allow students to "see" the result from each step of the process. This workshop will take you through this ten step process and the Micro Pressure Sensor Process Kit.

*MJ Willis - Southwest Center for Microsystems Education (SCME) - mjwillis@comcast.net
April Lujan, SCME*

W14 – The Science of Thin Films - hands-on in class kit. – Day 3, 8:30am, CAD Lab Rm 163

Learn how to implement this SCME kit into a high school STEM course.

This kit and supporting learning modules are a study of thin films used to fabricate MEMS or microelectromechanical devices. The learning modules discuss the various types of thin films and how these films are deposited, grown and etched. The kit allows one to further study the characteristics of thin films, specifically silicon dioxide.

*Stephen Schum - Manzano High School
Matthias Pleil – SCME – mpleil@unm.edu*

W17 - Using RAIN (Remotely Accessible Instruments for Nanotechnology) in your classroom, Day 2, 9:40am, Classroom 160

Would you like to bring meaningful hands-on nanotechnology experiments into your classroom, but are concerned about how to do this economically and effectively? Remotely Accessible Instruments for Nanotechnology (RAIN) allows students and educators to gain teacher-led and individual "hands-on" experience with high tech equipment that would otherwise be unavailable. This session includes hands-on practice experiments that can be used in your classrooms as well as participant remote interrogation of samples utilizing free remote access to NACK Network tools around the country. This workshop is offered by the NSF ATE sponsored National Nanotechnology Applications and Career Knowledge Network which is headquartered at Penn State.

Bob Ehrmann NACK Network - Penn State rke2@psu.edu

W18 - Solar Cells with SHINE – Day 2, 2:40pm, Rotunda

Solar cell efficiency is one of the biggest barriers to making this technology commercially viable. Learn how solar cells are made and how nanotechnology is playing a large part in the ability to make these materials more efficient. Assemble working solar cells using dye from raspberries. (Chlorophyll and certain types of other berries may be used).

Maureen Devery - Seattle's Hub for Industry-driven Nanotechnology Education - mdevery@northseattle.edu

W19 - Water, Water Everywhere: The Wonders of Fluid Flow – Day 1, 9:40am, Classroom 158

Fluid flow is one of the areas of science where life is clearly not the same at the macro, micro and nano scales. Participants in this workshop will get hands on experience of fluid flow at different size scales using two approaches. First participants will investigate laminar and turbulent flow using channels that have been created using puffy paint and PDMS (we cannot actually make the channels in the workshop - PDMS takes a day to set). Channels of different sizes and designs will be used to study laminar and turbulent flow. The second approach focuses more on the capillary action which results from the combination of cohesive, adhesive and gravitational forces. Capillary tubes of different diameters and different fluids will be used in this hands on experiment.

Deb Newberry - Nano-Link - dmnewberry2001@yahoo.com

W20 - MEMS Wheatstone Bridge Pressure Sensor Workshop – Day 2, 1:40pm, Classroom 160

Microelectromechanical systems (MEMS) are micro/nano/milli scale devices that integrate mechanical and electrical components to sense, think, act and communicate. MEMS pressure sensors are designed to measure absolute or differential pressures. To sense the changes in pressure, MEMS pressure sensors use a Wheatstone Bridge circuit that consists of four resistors in series-parallel combinations. The variable output voltage of the circuit represents the changes in pressure. This workshop focuses on providing the participants hands-on experience on the operation of the Wheatstone bridge pressure sensor. Participants will develop a MEMS pressure sensor using simple consumable products and simulate the characteristics of the sensor.

Tanima Zaman - Ivy Tech Community College - tzaman@ivytech.edu

Andrew Bell – Ivy Tech Community College – abell118@ivytech.edu

W21 - Nanotechnology Course Overview for the Novice Professor – Day 2, 10:40 CAD Lab Rm 163

This workshop will offer an overview of an Introduction to Nanoscience and Nanotechnology course, developed as part of a state-wide college-level minor-certificate program in Nanotechnology in Connecticut. This first course in Nano is now taught at Fairfield University as a core-science course, accessible to non-STEM majors and STEM majors alike, and can open the path to the minor for students who might not otherwise have approached the topic. There are elements which can build on the strengths and knowledge that each student brings to the class as topics span materials science, electron and atomic force microscopy, consumer products, nanobiology and medicine, as well as science fiction, and the societal and ethical implications of nanotechnology. The workshop will provide an overview of the course content, as well as the variety of pedagogical techniques used to engage students of all backgrounds in the topics of nanotechnology. We will also discuss strategies for adopting the course(s) into existing program curricula.

Ryan Munden - NEATEC/Fairfield University - r.munden@fairfield.edu

Posters and Showcases

These will be displayed at COSMIAC – Day 2, Afternoon

PS1 - Integration of Nanotechnology Courses in an Associate Degree in Electronics Technology

We propose to present an overview of the activities of our participation in NACK Network, including the offering of nanotechnology workshops, translation of instructional material to Spanish, establishment of a network for nanotechnology education in Puerto Rico, and integration of nanotechnology courses in our Associate Degree in Electronics Technology (Industrial Nanotechnology, theory and laboratory). Emphasis will be given in the curriculum of the two nanotechnology courses, which include the use of a teaching cleanroom based in the model of PENN State.

*Rogério Furlan - University of Puerto Rico at Humacao - rogerio.furlan@upr.edu
Luis G. Rosa and Josee Vedrine*

PS2 - Chaining Nanotechnology Courses

A sequence of four courses are being created to allow a more comprehensive education in Nanotechnology at Río Piedras Campus of University of Puerto Rico. The courses do not require pre-requisites. They are offered to Natural Sciences students in their third or fourth year. Two courses are part of General Studies College curricula to fulfill the requirement of General Science courses. The other two are electives offered by the Chemistry Department. The sequence also aims to reach a broader public as courses of continuing education.

*Estevao Rosim Fachini - University of Puerto Rico- erosim@gmail.com
Liz Díaz, Juan Carlos Delgado, Carlos Vicente, Alexei Savvinov*

PS3 - Enhancing your Courses with free Simulation Tools and Resources for MNT Education on nanoHUB.org

There are thousands of free educational resources available on nanoHUB.org, so where does one start? Come visit the nanoHUB table to explore the site one-on-one with NCN's Educational Content Creation Manager. You can discuss the particular needs of your course and learn how to start collecting material you can use in class. You'll learn how to find video lectures, popular educational simulation tools, and see how easy it is to create a group for your class and even publish your own work to share with the MNT community, and beyond. For more in- depth training, please attend the 90 minute, hands-on nanoHUB computer workshop.

Tanya Faltens - nanoHUB.org/ Purdue - tfaltens@purdue.edu

PS4 - Nano-Link: Center for Nanotechnology Education

One of the focus areas of Nano-Link is outreach to educators students and industry. As a result Nano-Link has created over 26 topic specific, activity based nanoscience and emerging technology educational modules. Although primarily focused on grades 10 through 14 these modules have been used in classes from kindergarted to graduate level. The modules are self contained and easy to use. Nano-Link provides educational workshops at your facility to help educators learn how to use and integrate the modularized content into traditional science classes, photonics, biotech and environmental courses. The modules are also crafted to teach all aspects of STEM and critical thinking. Visit us to see how you can use our educational content.

Deb Newberry & Curt Carlson - Nano-Link - dmnewberry2001@yahoo.com

PS5 - Noncontact Nanolithography using the Nanosurf Easyscan 2 AFM

A laboratory procedure was developed to demonstrate non-contact lithography using a NanoSurf EasyScan 2 Atomic Force Microscope equipped with a Sicon A cantilever tip. Mica discs were spin coated with polyisoprene using a clinical centrifuge resulting in a surface variation of +/- 10nm. Under default

conditions, line widths of approximately 1um were obtained. Tip speed and its effects on line depth and thickness were examined. This laboratory protocol can be an effective means to demonstrate spin-coating, nanolithography and metrology concepts in a teaching laboratory.

*Frank Fernandes - Northcentral Technical College - fernande@ntc.edu
Richard Wilkosz*

PS6 - Chained Courses in Nanotechnology

A coordinated sequence of four courses, but both independent from each other, is being created at UPRRP. This is a collaborative project between the General Studies and Natural Sciences Colleges. The population served is primarily undergraduate students in Natural Sciences. Two of the courses serve as the curricular requirements of interdisciplinary education in science, and the other two are optional courses in the area of concentration. In the future we hope to offer the sequence as continuing education courses. Students who complete 12 credits and make a practical final project will be issued a certificate of training in Nanotechnology.

*Estevao Rosim Fachini University of Puerto Rico erosim@gmail.com
Alexei Savvinov, Carlos Vicente, Juan Carlos Delgado, Liz Díaz*

PS7 - Seattle's Hub for Industry-driven Nanotechnology Education

The booth will include a poster and program materials describing Seattle's Hub for Industry-driven Nanotechnology Education (SHINE). SHINE, an NSF ATE Regional Center, is working to increase nanotechnology education in Washington, Idaho, and Oregon.

*Maureen Devery SHINE mdevery@northseattle.edu
Peter Kazarinoff, SHINE*

PS8 - Preparing the Nano Workforce: At Look at Educating Undergraduate Students in Nano-Safety

The Texas Regional Alliance to Foster Nanotechnology Environment, Health, and Safety Awareness (NanoTRA) is a project funded by the Nanotechnology Undergraduate Education Division of the National Science Foundation (NSF). This project is a collaboration with Texas State University and The University of Texas at Tyler to develop future leaders/managers in nanotechnology. The project consist of teaching undergraduate students the aspects of social, ethical, environmental, health, and safety issues of nanotechnology. The content was developed into introductory and advanced modules which can be integrated into industrial technology, engineering technology, and engineering courses.

Dominick E. Fazarro - University of Texas at Tyler - dfazarro@uttyler.edu

PS9 - The Nanotechnology Applications and Career Knowledge (NACK) National Network

The Nanotechnology Applications and Career Knowledge (NACK) Network partners with education institutions across the US to promote a model for broad nanotechnology education and workforce preparation. NACK offers a fully developed set of industry recognized, continuously evolving course work / skill sets for institutions across the country to utilize as a resource within their existing or developing programs. Curriculum (lectures and lab materials), professional development workshops, webinars, remote access to tools across the country can be accessed through the NACK website www.nano4me.org.

*Bob Ehrmann - NACK Network - Penn State - rke2@psu.edu
Wook Jun Nam, Osama Awadekarim, Samia Sulliman (NACK Network)*