"Nanovation: From Science to Startups"

October 27, 2012
Stanley Hall, UC Berkeley Campus

9:00 Registration, Networking, Light breakfast
9:30 Opening Remarks Dhaval Brahmbhatt. IEEE SFBA Nanotechnology Council
Session 1.
10:00 Keynote: *Collaborative Innovation* - Dr. Carol Mimura
10:35 *Reflections on Building a Science-Based Business* - Dr. Robert Walters
11:10 *Commercializing Layer by Layer Assembly: Pushing it Out of the Labs and into your World* - Dr. Ben Wang
11:45 Lunch
Session 2.
12:45 *Case Histories for the Introduction of New Technology Through Entrepreneurship* Dr. Eli Yablonovitch
1: 20 *Creating a Nanostructured Materials Business Through Collaboration, Consulting and Sponsored Research* - Dr. Robert Meagely
1: 45 *Carbon Nanofiber Nanoelectrode Arrays for Biosensing Applications* Dr. Jessica Koehne
2: 20 Break
Session 3.
2:40 *One Dimensional Semiconductor Heterostructures: Potential and Implications for Advanced Technologies* - Dr. Shadi Dayeh
3: 15 *Ecosystem for Biophotonics Innovation: Entrepreneurial Research and Training at UC Davis* - Dr. Zachary Smith
3:30 *The First Step to Take When You Consider Taking Your Scientific Breakthrough to Startup* - Zvi Or-Bach
4:05 Closing

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Title: Collaborative Innovation

Speaker: Dr. Carol Mimura, Assistant Vice Chancellor for Intellectual Property & Industry Research Alliances (IPIRA) at the University of California, Berkeley

Abstract: The road from discovery to commercialization is long and winding. It's full of potholes, switchbacks and dead ends. A tale of two startups offers some insights into successful navigation techniques on the road to commercial success. New modes of collaboration between universities and industry are constantly being invented and tested. Partnerships and innovation on innovation itself is making new sources of funding available to bridge translational research gaps both inside and outside of the university.

Biography: Carol Mimura is the Assistant Vice Chancellor for Intellectual Property & Industry Research Alliances (IPIRA) at the University of California, Berkeley. She is a member of the Forum on Drug Discovery, Development, and Translation of the Institute of Medicine of the National Academy of Sciences, has served on the board of directors of the Children's Hospital Research Institute in Oakland, CA and of BayBio, the regional voice of biotechnology in Northern California, was an Executive Director of U.C. Berkeley's Office of Technology Licensing, and is a Registered Technology Transfer Professional (RTTP), an international, professional accreditation.

Prior to her positions at U.C. Berkeley, Carol was an analyst at Technology Forecasters, a consultant to Cor Therapeutics and Genomyx, and wrote for the Genetic Engineering News. She holds a B.S. degree from Yale University in Molecular Biophysics & Biochemistry and Ph.D. in Biology (biochemistry & microbiology concentration) from Boston University. At Berkeley, she was an NIH-sponsored postdoctoral fellow and research scientist in Biochemistry and in Chemical Biodynamics.

Title: Reflections on building a science-based business

Speaker: Dr. Robert Walters, President and CEO Integrated Plasmonics Corporation

Abstract: I will describe some of my experiences in transitioning my research in nanophotonics to my start-up company, Integrated Plasmonics, over the last two years. Rather than focusing on technical details of our product or sharing our investor pitch, my intention is to relate some of the lessons I've learned personally in taking the company from an unpolished idea to a funded venture with 12 full time scientists.

Biography: Robb Walters is a scientist turned entrepreneur building a venture-backed company called Integrated Plasmonics with a team of cofounders and intrepid early employees. After completing his PhD in applied physics at Caltech and working as a postdoc at the FOM Institute for Atomic and Molecular Physics in Amsterdam, Robb decided in late 2010 to test the hypothesis that a startup company would be a better vehicle for creating real world impact through science than continued research in academia. Robb will share some of his experiences and lessons learned from his ongoing experiment.

Title: Commercializing Layer by Layer Assembly: Pushing it Out of the Labs and into your World

Speaker: Dr. Ben Wang, Founder and Vice President of Svaya Nanotechnologies

Svaya Nanotechnologies is revolutionizing surface engineering with an industrial scale molecular layer deposition (MLD) platform, based on Layer-by-Layer (LbL) self assembly, which has yielded performance advances in the fields of drug delivery, energy storage, extreme wettability and complex optics. Leveraging an efficient, self-limiting process which operates in an ambient environment (room temperature and pressure) using dilute, aqueous solutions, Svaya can rapidly deposit high uniformity films only achievable by vacuum processes today. Complex, multilayer thin films are assembled via electrostatic interactions over very large areas, at high throughput (15 linear meters/min), with precise control and uniformity.

We will provide a technical background to the technology and discuss how Svaya is using it to solve critical problems in the display, architectural and automotive industries today, with such multilayer optical films as durable, high transmission antireflection films and multilayer non EM-interfering infrared reflecting films. We will highlight the details and features of the technology and also touch on how these capabilities are extensible to new markets and applications. By building off of known work from the LbL world and porting this technology onto Svaya's MLD production platform, new opportunities will arise for functionalizing new surfaces to create performance textiles, improved energy generation systems and dynamic functional films.

Speaker: Dr. Ben Wang is Founder and Vice President of Svaya Nanotechnologies and has been working in micro/nanofabrication for 15 years. Prior to his efforts at Svaya, Ben held a variety of engineering roles at Caliper Life Sciences, commercializing microfluidic lab-on-a-chip applications for drug discovery and diagnostics, and at TRW's advanced semiconductor device group, building advanced RF devices using molecular beam epitaxy. Ben is a chemical engineer by training and received his PhD from MIT and his BS from Stanford University.

Title: Case Histories for the Introduction of New Technology Through Entrepreneurship

Speaker: Professor Eli Yablonovitch, Department of Electrical Engineering, UC Berkeley

Abstract:
I will review the case histories of the following four companies, of which I was a Co-Founder:
1. Ethertronics, Inc. San Diego, CA. Antennas for portable electronics
2. Luxtera, Inc. Carlsbad, CA. Nano-photonic integration in foundry Silicon
3. Luminescent, Inc. Palo Alto, CA. A photolithography software company
4. Alta Devices, Inc. Santa Clara, CA. Thin film GaAs solar cells

Professor Eli Yablonovitch is the Director of the NSF Center for Energy Efficient Electronics Science (E 3S), a multi-University Center based at Berkeley. He received his Ph.d. degree in Applied Physics from Harvard University in 1972. He worked for two years at Bell Telephone Laboratories, and then became a professor of Applied Physics at Harvard. In 1979 he joined Exxon to do research on photovoltaic solar energy. Then in 1984, he joined Bell Communications Research, where he was a Distinguished Member of Staff, and also Director of Solid-State Physics Research. In 1992 he joined the University of California, Los Angeles, where he was the Northrop-Grumman Chair Professor of Electrical Engineering. Then in 2007 he became Professor of Electrical Engineering and Computer Sciences at UC Berkeley, where he holds the James & Katherine Lau Chair in Engineering. Prof. Yablonovitch is a Fellow of the IEEE.

In his photovoltaic research, Yablonovitch introduced the 4n 2 light-trapping factor that is used commercially in almost all high performance solar cells. Yablonovitch introduced the idea that strained semiconductor lasers could have superior performance due to reduced valence band (hole) effective mass. Today, almost all semiconductor lasers use this concept, including telecommunications lasers, DVD players, and red laser pointers. Yablonovitch is regarded as one of the Fathers of the Photonic BandGap concept, and coined the term "Photonic Crystal".

Title: Creating a nanostructured materials business through collaboration, consulting and sponsored research

Speaker: Dr. Robert Meagley, Founder, ONE Nanotechnologies, LLC

Abstract: We will describe work ongoing at ONE Nanotechnologies to create and refine chemoselective surfaces and films for several sensor platforms. Organic materials and nanocomposites have been developed for gas and liquid phase detection of explosives and chemical agents. Highly structured surfaces with capability to recognize individual proteins from mixtures have also been developed for protein characterization.

Electrohydrodynamic spray (ES) deposition has proven to be a facile method to create nanostructured films from wide variety of materials types at my company. Client / supplier facilitation, and business development through collaboration, consulting and sponsored research will be discussed in the context of building a small business.

Biography: Rob Meagley is an inventor, and scientist living in Berkeley California. He founded ONE Nanotechnologies, LLC, in August of 2007 to develop and market proprietary biomolecule discovery and chemical detection technology, and also provides consulting services to the nano-, bio-, and MEMS industry. Rob earned a bachelors degree from the University of Maryland, College Park (‘89) and Ph.D. from the University of Delaware (’96) and was a post doctoral fellow at Cornell University (96) and the University of California, Berkeley (97). He joined Intel’s corporate materials organization in 1998, working in CMP materials, commodity chemicals and lithography materials groups, then was managing Lithography Materials Group in 2003. In August of 2004 he was named Intel's Researcher-in-Residence at Lawrence Berkeley National Laboratory and served there as Principle Investigator and Engineering Manager. The team, Molecules for Advanced Patterning (MAP), was focused on the discovery, development and commercialization of advanced lithography materials. Prior to Graduate school, Rob was a chemist at the Dupont Experimental Station working with early high Tc superconductive thin films, photopolymers, exotic fluorochemicals and telomers.

Title: Carbon nanofiber nanoelectrode arrays for biosensing applications

Speaker: Dr. Jessica Koehne, Nano-bio sensing systems Scientist at NASA Ames Research Center

Abstract: A sensor platform based on vertically aligned carbon nanofibers (CNFs) has been developed. Their inherent nanometer scale, high conductivity, wide potential window, good biocompatibility and well-defined surface chemistry make them ideal candidates as biosensor electrodes. Here, we report two studies using vertically aligned CNF nanoelectrodes for biomedical applications. CNF arrays are investigated as neural stimulation and neurotransmitter recording electrodes for application in deep brain stimulation (DBS). Polypyrrole coated CNF nanoelectrodes have shown great promise as stimulating electrodes due to their large surface area, low impedance, biocompatibility and capacity for highly localized stimulation. Our approach combines a multiplexed CNF electrode chip, developed at NASA Ames Research Center, with the Wireless Instantaneous Neurotransmitter Concentration Sensor (WINCS) system, developed at the Mayo Clinic. In the future, combining CNF based stimulating and recording electrodes with WINCS may lay the foundation for an implantable "smart" therapeutic system that utilizes neurochemical feedback control while likely resulting in increased DBS application in various neuropsychiatric disorders. In total, our goal is to take advantage of the nanostructure of CNF arrays for biosensing studies requiring ultrahigh sensitivity, high-degree of miniaturization, and selective biofunctionalization.

Biography: Dr. Jessica Koehne has worked for the NASA Ames Center for Nanotechnology since 2001. Her expertise is in the development of ultrasensitive nanomaterials based biosensors for health diagnostics. Dr. Koehne has published over 20 articles in peer-reviewed journals and given 16 presentations at scientific conferences including 7 invited talks. She has received 9 awards from NASA including the 2011 NASA Ames Honor Award in the category of scientist. In 2012, Dr. Koehne received a Presidential Early Career Award for Scientists and Engineers (PECASE). In addition to nanotechnology research, she is an advocate for student education in STEM fields, especially to underrepresented students, by serving on advisory boards of a NASA University Research Center (URC) and two NASA Science and Technology Institutes (NSTI). Over the past 4 years, she has mentored 23 students in nano-biosensor development and research. She received her BS in Chemistry from Santa Clara University and her PhD in Chemistry from the University of California Davis.

Title: One Dimensional Semiconductor Heterostructures: Potential and Implications for Advanced Technologies

Speaker: Dr. Shadi A. Dayeh, Department of Electrical and Computer Engineering, UC San Diego

Abstract: The boundary conditions for materials science and device physics in 1D semiconductors are dramatically different from their bulk counterparts. From a materials perspective, surface energetics dominate growth and structural integrity in 1D materials and help extend their coherency limits for heterostructuring compared to bulk. From a device perspective, compositional changes along their 1D axis provide new control over charge transport, and their cylindrical structure allows for better electronic and optoelectronic device architectures.

Here, we exploit interface engineering to provide new foundations for materials science in nanoscale 1D semiconductors, to perfect their crystal growth, and to devise energy band-edge engineered devices in the Ge/Si material system. Coherency limits and strain relaxation mechanisms for 1D heterostructures are unambiguously determined for the first time. We will then discuss a novel approach for addressing high density penetrating Nanowires for biosensors with emphasis on neural prosthetics.

Biography: Shadi Dayeh joined the ECE department at UC San Diego as an Assistant Professor in the Fall of 2012. After receiving his PhD in electrical and Computer Engineering/Electronic Materials and Devices at UCSD in 2008, he joined the Center for Integrated Nanotechnologies at Los Alamos National Laboratory. An experimentalist with rigorous training in the III-V and Ge/Si material systems, his graduate and postdoctoral work laid down the foundations for understanding the growth, structure, and transport properties of InAs and Ge/Si heterostructured nanowires. He has given over 20 technical presentations including as an IEEE EDS Ambassador Lecturer. He is a listed author on a large number of published technical papers, conference presentations, and poster papers.

He completed his M.S. in EE at SMU and a B.S. at Lebanese University Beirut.

Title: Ecosystem for Biophotonics Innovation: Entrepreneurial Research and Training at UC Davis

Speaker: Dr. Zach Smith, Project Scientist and Entrepreneurial Fellow at UC Davis, Center for Biophotonics Science and Technology, UC Davis Medical Center

Abstract: Typical graduate, and postgraduate training in academia is narrowly focused on scientific research, with little regard to the eventual fate of the research beyond the next paper or grant application. This talk will present a case study of my own experience as an Entrepreneurial Fellow in the Ecosystem for Biophotonics Innovation at UC Davis, a program funded by the National Science Foundation and matching funds from industry. The EBI program attempts to bridge the gap between academic research and commercialization, with academic research and publication duties balanced with training in networking, technology commercialization, starting up companies, obtaining venture capital, and protecting intellectual property developed during research. I will give an overview of the EBI program and its industry-funded projects, as well as present some specific lessons I've learned to apply in my own research.

Biograhphy: Dr. Zach Smith is a Project Scientist and Entrepreneurial Fellow at UC Davis. He is engaged in research into light-cell interactions, particularly involving elastic light scattering for particle sizing and inelastic light scattering for chemical analysis of biological samples. He has been involved in optics research for over 10 years and has worked in such fields as high-energy physics, UV lithography, and most prominently biomedical optics. B.S. & Ph.D., Optics, University of Rochester

Title: The first step to take when you consider taking your scientific breakthrough to startup

Speaker: Zvi Or-Bach is the founder of MonolithIC 3D™ Inc.

Abstract: That first step is to protect your "unfair advantage". As a young technologist entrepreneur, you might not have any of the elements that VCs are looking for: domain knowledge, exceptional management skills, marketing wizard,..., but if you hold the proprietary rights to a commercially viable technology, you have good chance to get support for your venture. This talk will review the types of such rights and how to secure them effectively, especially in the early phases of a new venture where the financial resources are extremely limited.

Biography: Zvi Or-Bach is the founder of MonolithIC 3D™ Inc., a Finalist of the “Best of Semicon West 2011” for its monolithic 3D-IC breakthrough. Or-Bach has a history of innovative development in fast-turn ASICs for over 20 years. His vision led to the invention of the first Structured ASIC architecture, the first single via programmable array, and the first laser-based system for one-day Gate Array customization. Prior to MonolithIC 3D, Or-Bach founded eASIC in 1999 and served as the company's CEO for six years. eASIC was funded by leading investors Vinod Khosla and KPCB in three successive rounds. Earlier, Or-Bach founded Chip Express in 1989 (recently acquired by Gigoptix) and served as the company's President and CEO for almost 10 years, bringing the company to $40M revenue.

Even before his entrepreneurial ventures in ASIC technology, Or-Bach held engineering management positions at Elbit Computers, Ltd., Israel (subsidiary of Elron) and Honeywell (Lexington, Massachusetts). Zvi Or-Bach received his B.Sc. degree (1975) cum laude in Electrical Engineering from the Technion - Israel Institute of Technology, and M.Sc. (1979) with distinction in Computer Science, from the Weizmann Institute, Israel. He holds over 100 issued or pending patents, primarily in the field of 3D integrated circuits and semi-custom chip architectures.

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