

Nanotechnology 2011 Conference and Workshops

**NANOMATERIALS AND NANOCHEMISTRY, NANO-ENABLED ENERGY SYSTEMS,
NANOMEDICINE AND NANO-BIO CONVERGENCE- Emphasizing Emerging Science and
Technologies, Applications, Commercialization and Business Opportunities**

Javits Convention Center, New York, NY

November 1-3, 2011

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University of Maryland – Department of Chemical & Biomolecular Engineering

Nanotechnology is already transforming our lives with new technologies and products. As nanotechnology tools and devices are developed, nanoparticles and nano-engineered materials and systems will play increasingly important roles in a number of industrial sectors such as: energy, biotechnology, electronics and information technology, healthcare and medicine, and industrial products.

The conference will focus on the synthesis, processing and application of nanoengineered materials with an emphasis on energy generation and storage, biological applications including pharmaceuticals, nanomedicine and nano-enabled devices. Cutting edge research from some of the world's leading nano scientists, technologists and business leaders will be presented in six conference sessions. The program will provide attendees an unmatched look at the state-of-the-art in these emerging technologies and their path to the market place.

This unique meeting will bridge the gap between science, technology and commercialization and attract an international group of participants that represent the research, business, and investment communities.

PROGRAM

Tuesday, November 1, 2011

8:30 a.m. to 12.00 p.m. -Workshop I - NANO 101 – BASIC CHEMISTRY OF GREEN/BIO – NANO CONVERGENCE

Instructors: **Prof. George John**, *Associate Professor, Organic Materials, Bio-Nanotechnology, Green Chemistry, City college of New York, City University, New York, NY;*

Prof. Tewodros (Teddy) Asefa, *Associate Professor, Inorganic and Materials Chemistry, Rutgers University, NJ*

The workshop will start with an overview of green nanotechnology with emphasis on bio-based nanomaterials. The workshop will then cover nanostructured materials with selected applications: (i) Nanomedicine, and (ii) Nanoparticle Films and Applications in Catalysis and Energy Technology. Finally, the workshop will cover the status-quo of nanomaterials and nanotechnology with select examples.

1.30 p.m. to 5 p.m. – Workshop II - NANO 102 –NANOPARTICLE SYNTHESIS AND PROCESSING ISSUES

Instructors: **Prof. P. Somasundaran**, *LaVon Duddleson Krumb Professor of Mineral Engineering and Director, NSF Center for Particulate and Surfactant Systems, Columbia University, New York City, NY;*
Prof. Stephen O'Brien, *Associate Professor of Chemistry, City College of New York, City University, New York, New York, NY*

The workshop will start with an overview of nanoparticles and their synthesis, characterization, processing and environmental impacts. The workshop will then cover nanostructured materials with selected applications: (i) In-vivo Imaging and Cancer Therapy, and (ii) Nanoparticle Films and Applications in Energy Technology. Safe handling and utilization of nanostructured materials will also be reviewed with emphasis on nanotoxicity and mitigation of toxicity. An attempt will be made to present selected case studies to illustrate the applications and health & safety related issues of engineered nanoparticulate materials.

Wednesday, November 2, 2011

8:30 a.m. Conference Commences

Inaugural Conference Session

Introduction – “Faces and Places”

Dr. Thomas Abraham, Program Chairman and President, *iRAP*, Inc. (Stamford, CT, USA)

Welcome

Janet Joseph, *Vice President for Technology and Strategic Planning, NYSERDA, Albany, NY*

8:50 a.m. – 10.20 p.m.

Session I – Nanomaterials – Emerging Applications, Market Trends and Economic Impact

Session Chair and Moderator – Vincent Caprio, *Vice President and Events Director, NanoBusiness Alliance, Shelton, CT*

Dr. Mostafa Analouri, Head of Healthcare and Life Sciences, Livingston Securities LLC, New York, NY, **Nanotechnology – Global Developments and Investment Landscape**

- Current State of Public and Private Nano-investment
- Recent Key developments in Nanobio: Therapeutics, Diagnostics, Medical Devices
- Emerging Products and Business Opportunities

Alton Parrish, *Senior Market Analyst, Innovative Research and Products, Durham, NC*, **“Emerging Markets for Nanotechnology and Hard Nanomaterials”**

- Nanotechnology Market Segments
- Energy-related – Battery and Fuel Cells, Solar
- Electronics, Photonics and Magnetics
- Nano-enabled Aviation Components
- Nano Rare Earth Materials

Prof. S.V. Babu, *Director, Distinguished Professor and Director, Center for Advanced Materials processing, Clarkson University, Potsdam, NY*, **“Nanomaterials for Chemical Mechanical Planarization (CMP) , Processing Requirements, Emerging Technologies and the Economic Impact”**

- CMP as a Key Enabling Technology for Fabricating ULSI Devices – New Challenges
- Nanoparticles and Additives in CMP Slurries for Dielectric and Metal Planarization
- Applications of Various Nanoabrasives in CMP for Other Emerging Technologies

- Economic Impact of the Nano-enabled Semiconductor Industry

10:20 – 10:40 a.m. Networking Break

10:40 a.m. – 12.10 p.m.

Session II – Nano-enabled Energy Systems

Session Chair and Moderator – Dr. Pradeep Haldar, *Vice President, Clean Energy Programs, Director, E2TAC - Energy and Environmental Technology Applications Center, Professor, College of Nanoscale Science & Engineering, Head, NanoEngineering Constellation*

Dr. Philip H. Lippel, Consultant, Nanoscience and Emerging Technologies, Chevy Chase, MD,
“Nanomaterials and Nanoscale Devices in Advanced Energy Technologies”

The role of advanced nanomaterials and nanoscale devices for:

- developing renewable energy sources and integrating them with the grid
- improving the efficiency, security, and reliability of current electrical infrastructure while reducing the environmental footprint of fossil fuel burning plants
- solid state lighting
- improving the efficiency of commercial building systems and industrial machinery

Jamison McLaughlin, Business Development Lead, Advanced Photovoltaics, Albany, NY,
"Nanotechnology Enabled Innovations in Solar Technology"

- Overview of current solar PV market
- Current PV technologies and their limitations
- Nanotechnology enabled innovations in solar
- Future outlook of solar PV market

Fernando Gómez-Baquero, Business Development Director, BESS Technologies, Albany, NY,
"Silicon-based Nanoengineered Materials for High Capacity Anodes"

- Overview of Li-ion batteries in energy storage applications
- Challenges and requirements of the Li-ion battery market
- Si-based nano-engineered materials for improved anodes
- Future outlook of nano-engineered materials in Li-ion batteries and in other energy storage technologies

1.45 p.m. Lunch Break

1.45 p.m. – 3.15 p.m.

Session III – Nanomedicine - Emerging Technologies and Applications

Session Chair and Moderator – Dr. Dana Durham, *Associate, Nanobiz, LLC., Pittstown, NJ*

Dr. Anil Diwan, *President and Chairman, NanoViricides, Inc., West haven, CT*,
"Nanoviricides - Novel Antiviral Agents Against HIV, Influenza, and Many Other Diseases – Current Developments"

- What is a nanoviricide : "Find-Encapsulate-Destroy" antiviral strategy

- FluCide(tm) - Pan-Influenza nanoviricide against pandemic, epidemic influenzas, bird flu, high path viruses
- HerpeCide(tm) - Anti-HSV-1 (oral herpes) and HSV-2 (genital herpes) skin cream.
- Anti-Dengue nanoviricide drug is in preclinical development.
- HivCide(tm) - Anti-HIV nanoviricide was superior to oral HAART cocktail therapy in animal models
- Broad-spectrum nanoviricides - A low cost approach against Neglected Tropical Diseases

Dr. Lawrence Tamarkin, Co-Founder, President and CEO, CytImmune Sciences, Inc., Rockville, MD, “Changing the Way We Treat Cancer with CYT-6091 (Aurimmune®): A Model Cancer Nanomedicine”

- By design, ideal cancer nanomedicines avoid immediate uptake by the immune system.
- By design, ideal cancer nanomedicines target tumors passively and actively.
- By design, solid tumor interstitial fluid pressure broken down to enhance delivery of active anti-cancer agents.
- By design, ideal cancer nanomedicines manufactured by a robust, reproducible, cost-effective process.
- Cancer patients treated with nanomedicines prior to surgery to exploit leaky tumor neovasculature for nanomedicine tumor targeting.

Prof. P. Somasundaran, LaVon Duddleson Krumb Professor of Mineral Engineering and Director, NSF Center for Particulate and Surfactant Systems, Columbia University, New York City, NY; I.

Chernyshova and S. Ponnuram, Columbia University, New York City, NY;

“Physicochemical characterization of nanobiointerfaces for some emerging applications: Problems of nanotoxicity and mitigation strategies”

- Unique physicochemical attributes of nanoparticles and ranking based on them
- Some of the important evolving applications of nanoparticles
- Controlled release and tissue engineering
- Nanotoxicity and Mitigation strategies

3.15p.m. – 3.30 p.m. Networking Break

3.30 p.m. – 5.00 p.m.

Session IV –Nano-bio Convergence

Session Chair and Moderator – Dr. Charles Brumlik, JD, Principal, Nanobiz, LLC., Branchburg, NJ

Dr. Samuel Brauer, Principal, NanoTech Plus, LLC, Stamford, CT, “The Parlous State of Cancer Diagnostics: An Opportunity for Nanotechnology?”

- Cancer and diagnostics today
- Cancer roadmaps and other advances
- The lack of a business model for diagnostics
- The need for better diagnostics- and opportunity for nanotechnology?

Dr. George John, *Associate Professor of Chemistry, The City College of the City University of New York (CUNY), New York, NY*, **“Biorefinery: A Design Tool for NanoMaterials”**

- Biorefinery-a new concept in materials design
- Low molecular weight building blocks into nanoscale assemblies
- Soft materials from agri-sources - simple organic transformations and by enzyme catalysis
- Molecular gels as delivery vehicles.
- Oil thickening agents and oil spill recovery materials

Dr. Srinivasa R. Raghavan, *Patrick & Marguerite Sung Chair & Associate Professor*, and **Matthew B. Dowling**, *Department of Chemical & Biomolecular Engineering, University of Maryland, College Park, MD*, **“Nano-Velcro: A Self-Assembly Approach to Hemostatic Control”**

- Hemostasis - Stopping of bleeding from wounds, critical to the survival of soldiers and victims of accident
- Hemostatic bandages currently used
- New self-assembling biopolymer - An effective, yet low-cost alternative for hemostasis

5.00 p.m. – 5.05 p.m.

Concluding Remarks and Announcements

5.30 p.m. to 8 p.m. Networking Reception and Dinner hosted by



Venue: Thai Select, 472 Ninth Ave. (between 36th and 37th St.), New York, only 3 blocks from Javits Convention Center.

Thursday, November 3, 2011

8.30 a.m. Conference Commences

8.30 – 10.30 a.m.

Session V – Emerging Laboratory Technologies Related to Nanoparticles and Nano-Engineered Materials in Nano-enabled Energy Generation and Storage

Dr. Charles Brumlik, JD, A. Choudhury, A.A. Lakhani, P. Kuyate, P.P. Pathak, M. Vaidya, *Nanobiz, LLC., Branchburg, NJ*; **Dr. K.W. Lem**, *Dept. of Physics, MTSE Program, New Jersey Institute of Technology, NJ*; **Dr. Zafar Iqbal**, *Dept. of Chemistry and Environmental Science, New Jersey Institute of Technology, Newark, NJ* and **Jean-Michel Careil**, *Intellixir, Manosque, France*, **Overview of 2010-2011 Technology Trends in Nano-engineered Energy Generation and Storage for Large Commercial Markets**

Abstract: Discussion of changing energy opportunities. Review of the underlying top 2010-2011 patent and research trends. Near term commercialization strategies based on leveraging improved nanostructured materials for energy generation and storage. Practical commercialization topics will include solar (e.g., active layers, cost reduction, protective layers, efficiency), storage (e.g., battery electrodes, supercapacitors, flywheel), wind (e.g., composites, storage, heat transfer), fuels (e.g., shale gas, biofuels), and applications (e.g., vehicles, portable devices, grid).

Tina Šetinc, S. Kunej, M. Spreitzer and D. Suvorov, J. Stefan Institute, Ljubljana, Slovenia, Influence of Process Parameters on the Morphology and Properties of CSD-derived SrTiO₃ Thin Films for Microwave ICs

High-permittivity perovskite thin films gained an increasing interest recently, due to their potential application as ceramic capacitors for miniaturized microwave integrated circuits (MMICs).^{1,2} Among perovskite materials, incipient ferroelectric strontium titanate SrTiO₃ attracted considerable attention for tunable microwave applications owing to its high dielectric constant, large dielectric tunability, and low microwave losses.^{3,4} With respect to dielectric properties of SrTiO₃ thin films their strong dependence of the film thickness, epitaxy and microstructure was observed.⁵ Thus, the ability to tailor the microstructure is crucial for deposition of high-performance thin films.

SrTiO₃ thin films were deposited by chemical solution deposition method (CSD) with the use of Sr-carboxylate and Ti-alkoxide precursors. By controlling the deposition conditions that primarily affect the nucleation and the film formation process, the morphology of CSD-derived SrTiO₃ thin films was tailored in order to achieve columnar grain structures. The decomposition behavior of the precursors, phase formation and the film morphology were investigated by means of X-ray powder diffraction (XRD), DTA/TG analyzer coupled with online evolved gas analysis (EGA), field-emission scanning electron microscopy (FEG-SEM), and atomic force microscopy (AFM). Crystallization behavior, densification process and the influence of the thin film microstructure on the dielectric properties will be discussed.

Ganesh Skandan, Nader M. Hagh, Farid Badway and Mumu Moorthi, NEI Corporation, Somerset, NJ, Recent Advances in the Development of Energy Storage Systems

Abstract: The growing demand for energy storage systems with high volumetric and gravimetric energy densities has highlighted secondary lithium ion batteries as a viable candidate for numerous applications in consumer electronics, biomedical, telecommunication, military, automotive industry, and even grid applications. This large demand has directed research toward energy storage systems with high efficiency in Li intercalation/de-intercalation, improved cycling stability at elevated temperature, higher safety and lower cost. This presentation will review recent work in developing advanced nanoscale electrode materials for Li-ion rechargeable energy storage systems. In particular, recent work on high capacity and high voltage cathode materials will be presented.

Ines Bračko, Manca Logar, Boštjan Jančar and Danilo Suvorov, Advanced Materials Department, Jozef Stefan Institute, Jamova Ljubljana, Slovenia, Cu decorated Titanate Nanobelts composite Thin Films for Photo-catalytic Applications

In the field of photocatalysis several approaches have been successfully introduced to enhance the photosensitivity of titanate-based 1D nanostructures in the UV and visible regime.^{1,2} Recently, the increased photoactivity in the visible range was observed with the metallic nanoparticles/titanate nanocomposites.³⁻⁵ With these materials, enhanced photoactivity is assigned to the metallic nanoparticles which act as electron traps and thus suppress the electron recombination rate in the semiconductor. Additionally, visible response of such nanocomposite is obtained by the near electromagnetic field induced by the surface plasmon resonance of metallic nanoparticles.

Cu decorated titanate nanobelts (Cu⁰/Ti-NBs) were formed by the in-situ precipitation of Cu within weak-polyelectrolyte multilayer (PEM) film assembled on the surface of the Ti-NBs. After annealing and subsequent reduction process composite Cu⁰/Ti-NBs were obtained. Thin films were fabricated via layer-by-layer deposition of oppositively charged polyelectrolytes and Cu decorated Ti-NBs, where the amount and density of Cu⁰/Ti-NBs in the films was controlled by varying the number of Cu⁰/Ti-NBs layers. The transmission electron microscopy (TEM), field emission scanning microscopy (FE-SEM) and X-ray powder diffraction (XRD) were employed to evaluate the morphological and structural characteristics of the Cu⁰/Ti-NBs composite thin films. In this contribution, the influence of processing parameters on the photocatalytic activity of the as formed Cu⁰/Ti-NBs composite thin films will be discussed.

Dr. Eli S. Leland, *City University of New York (CUNY) Energy Institute, New York, NY,*
Metacapacitors: Printed, Low-cost Capacitors for Electric Power Conversion

Abstract: Newer and better capacitors will be required to allow switched capacitor DC-DC converters to transition to higher-power applications including drivers for LED lighting and voltage conversion for photovoltaic panels. These improved capacitors must combine high frequency performance with low leakage, low loss, and low cost. We have developed a method for fabricating capacitors using printed nanoparticle dielectrics that offers the requisite performance for these power conversion applications. Whereas standard ceramic capacitor manufacture requires a high-temperature firing step, our printed capacitors are fabricated using only low-temperature processing, and thus enable flexible, configurable high-throughput deposition onto a polymer substrate at low cost.

10.30 –11.00 a.m. Networking Break

11.00 a.m.–12.30 p.m.

Session VI – Emerging Laboratory Technologies Related to Nanoparticles and Nano-Engineered Materials in Nanomedicine and Nano-bio Convergence

Dr. David H. Gracias, *Department of Chemical and Biomolecular Engineering, Johns Hopkins University, Baltimore, MD,* “Self-Folding Materials and Devices for Biomedical applications”

Abstract: The human body is a 3D structure and elaborately patterned from the nano to the macroscale. Hence, there is a need to extend planar micro and nanopatterning techniques into the third dimension to enable precisely structured diagnostic and therapeutic devices. Self-folding refers to self-assembly processes wherein planar structures fold up spontaneously, typically when released from a substrate or exposed to specific stimuli. The processes are versatile and can be used across length scales and with diverse materials. I will describe the use of self-folding methods to fabricate precisely patterned hollow polyhedral containers, physical and chemical scaffolds and bio-chemically actuated wireless surgical tools

for less-invasive surgical diagnostics. These examples highlight the use of self-folding to achieve unprecedented precision and machine-based autonomous functionality on a hierarchy of length scales for micro and nanostructured biomedical implants and devices.

Dr. Jason H. Hafner [1,2], *Associate Professor*, **Lindsey J. E. Anderson** [1], **Courtney M. Payne** [2], **Yu-Rong Zhen** [1], **Peter Nordlander** [1], *Department of Physics and Astronomy [1], Department of Chemistry [2], Rice University, Houston, TX, “A Tunable Plasmon Resonance in Gold Nanobelts”*

Abstract: Plasmon resonant nanoparticles have found wide applications in science and technology due to their strong, tunable optical absorption, scattering, and near field enhancement. We have recently synthesized gold nanobelts that are only 10's of nanometers in height and width, yet 10's of microns in length. Through optical microscopic imaging, these single crystal gold nanostructures were found to exhibit a strong transverse plasmon resonance at visible wavelengths. By correlating atomic force microscopy measurements of individual nanobelts with their scattering spectra, it was seen that the plasmon resonance tunes with cross-sectional aspect ratio. Simulations revealed that the scattering plasmonic modes are transverse antisymmetric excitations across the nanobelt width. Despite being essentially macroscopic in one dimension, these nanobelts exhibit sharp, tunable plasmon resonances similar to those of nanoparticles. Their tunability, large optical cross section, and unique extended plasmonic structure may make gold nanobelts idea for applications in nanomedicine and nanophotonics. The nanobelt properties and other variations on this structure will be discussed.

Dr. Laura Faulconer, *Center of Innovation for Nanobiotechnology (COIN), Durham, NC,*
“Accelerating Commercialization of Technologies at the Convergence of Advanced Materials and Life Sciences”

At the intersection of advanced materials and life sciences, there is significant nanobiotech innovation occurring that generates substantial commercial opportunities through the evolution of novel products. Many corporations in industries ranging from pharma and medtech to cosmetics and agricultural biotechnology have a direct interest in nano-enabled platform technologies to augment their product portfolios and pipelines. Although many of these companies are expert in their respective life sciences foci, they often do not have significant in-house expertise in advanced materials or the networks in place to effectively source these types of technologies. In a rapidly evolving space, like nanobiotechnology, novel commercialization vehicles are needed. This presentation will provide an overview of nano-enabled biomedical products that are on- or near-market, insights into areas of opportunity for cross-fertilization of innovation, and information on opportunities to connect industry needs with emerging tech solutions.

12.30 –12.35 p.m.

Concluding Remarks

1.00 p.m. to 2.00 p.m. - Informal Lunch hosted by *iRAP*



ZENDO Sushi & Asian Cuisine, 480 Ninth Ave., (between 36th and 37th St.), New York, only 3 blocks from Javits Convention Center.

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<http://northeastregional.aiche.org/content/registration>. One could register separately for the workshops or the conference or both.

PROFILES OF SPEAKERS AND SESSION CHAIRS



Dr. Thomas Abraham, Conference Chairman

Dr. Abraham is president and founder of Innovative Research and Products, Inc. (www.innoresearch.net), an industry and market analysis company based in Stamford, CT. Dr. Abraham has been conducting market research in advanced materials for 25 years. Starting as Director of the Advanced Materials Group at Business Communications Co. (BCC) of Norwalk, CT, Dr. Abraham became its Vice President of Research. Dr. Abraham is experienced both as a materials scientist and technical economic analyst in the field of advanced and nano materials. Dr. Abraham has completed over 50 multi-client market research studies in advanced materials and systems, nanomaterials and nanotechnology. Dr. Abraham has been a frequent invited speaker on the state of the nano and advanced material industries at various international meetings. Dr. Abraham has also conducted technology transfer and commercialization studies for several companies and major laboratories. Dr. Abraham has organized ten international conferences in Fine and Nano Powders, Nanoparticles, Nanotechnology and Nanomaterials. A graduate of Columbia University (MS and PhD.), Dr. Abraham had worked earlier for Brookhaven National Laboratory and the University of Denver.



Dr. Mostafa Analouri

Mostafa Analoui, Ph.D., is Head of Healthcare and Life Sciences at The Livingston Group (New York, NY). Previously he was the Senior Director at Pfizer Global Research and Development. Dr. Analoui is actively involved in investment, management and scientific/business development of nanotechnology, drug discovery/development, diagnostic imaging, and global strategies. While at Pfizer, he was the Site Head for Global Clinical Technology in Groton and New London, a division focusing on emerging technologies for development and validation of biomarkers and diagnostics for drug development. Prior to joining Pfizer, Dr. Analoui was the Director of Oral and Maxillofacial Imaging Research, Associate Professor of Radiology at Indiana University, and Associate Professor of Biomedical Engineering and Electrical & Comp Engineering at Purdue University. He was also President and CEO of Therametric Technology Inc. He has received his Ph.D. from Purdue University, followed by Post-Doctoral Fellowship at IBM TJ Watson Research Center in NY.

In addition to industry leadership in biomedical and technology fields, he consults and lectures in US, Europe and Asia. He has also served on various scientific, regulatory, and business advisory committees and boards, including NIH, NSF, PhRMA, NASA, and OECD. Dr. Analoui has authored over 130 publications, including journal articles, book chapters and technical reports. He is senior member of IEEE, SPIE, and RSNA. He currently serves as board member of VirtualScopics (Nasdaq: VSCP), Calando Pharmaceutical (Nasdaq: ARWR), BEACON (Biomedical Engineering Alliance and Consortium) and NanoBusiness Commercialization Association.



Prof. Teddy (Tewodros) Asefa

Dr. Asefa is an Associate Professor of Chemistry and Chemical Biology and an Associate Professor of Chemical and Biochemical Engineering at Rutgers University at New Brunswick. He is also a member of the Rutgers Institute for Materials, Devices and Nanotechnology (IAMDN) and The Rutgers Energy Institute (REI). He currently serves as an Interim Director of

The Rutgers Catalysis Research Center (RCRC). Teddy's research interests at Rutgers focus on the design, synthesis, self-assembly and engineering of novel inorganic nanoporous and nanostructured materials and nanobiomaterials having unique catalytic, biocatalytic, nanomedical, and photoelectronic properties. His research group's effort aims to address several important challenging problems that the US and the world currently face, including (1) development of novel catalysts for efficient and 'green' production of fine chemicals and synthetic materials, and for environmental remediation and (3) developing nanomedicine for the treatment of various diseases effectively, including cancer. In June 2010, he was named by NSF as one of the ten NSF American Competitiveness and Innovation (ACI) Fellows.



Prof. S.V. Babu

Prof. Babu is a Distinguished University Professor and the Director of NY State supported Center for Advanced Materials Processing (CAMP) at Clarkson University, where he has been on the faculty since 1981. He was a member of the Chemical engineering faculty at IIT, Kanpur during 1972-80. He is internationally recognized for his research in Chemical Mechanical Planarization (CMP) of metal and dielectric films, having delivered keynote speeches at several international conferences. He has published extensively in this area and also coauthored many patents some of which have been licensed and commercialized. His research has been supported by several semiconductor manufacturing and supplier companies in the US, Japan, and Korea over the years.



Fernando Gómez-Baquero

Fernando Gómez-Baquero is Director of Business Development at B.E.S.S.-Technologies. Gómez-Baquero holds a B.S. in Industrial Engineering, a Specialist Degree in Economics, and an M.S. in Nanoscale Science & Engineering with a Nanoeconomics concentration. He is an innovation economist, nanomaterials engineer, and entrepreneur that performs economic analysis of nanotechnologies, develops science and innovation metrics, studies regional economic

development through innovation in nanotechnologies, and promotes improved science and technology policy for emerging technologies. B.E.S.S.-Technologies product is a novel silicon-based anode for lithium-ion battery systems.



Dr. Samuel Brauer

Samuel Brauer, Ph.D. is the founder of Nanotech Plus, LLC an alliance of consultants focused on the business of nanotechnology offering analysis and operational assistance in this burgeoning field to major corporations, small materials companies, venture and angel investors, and other financial institutions. Established in 2004, the firm's projects have ranged from evaluating patent portfolios to estimating markets for novel therapeutics.

Prior to Nanotech Plus, he was with the Business Communications Company for 7 years, leading market research on a broad range of advanced materials topics including polymer nanocomposites, carbon nanotubes, advanced polymer composites, DNA micro arrays and *in vitro* toxicology. He received his doctorate in bioinorganic chemistry involving chromium carcinogenesis from Dartmouth in 1990 and did a postdoctoral stint on protein structure at UC Davis.



Dr. Charles Brumlik, Session Chair and Speaker

Dr. Brumlik is president and co-founder of Nanobiz, LLC. (<http://www.nanobizllc.com>), a firm assisting in assessing and commercializing cross-disciplinary advanced materials and industrial processes. Charles Brumlik is also a business and patent attorney who advises Fortune 500 companies, angels, venture capital groups, and startup technology companies around the world. Dr. Brumlik specializes in commercialization, due diligence, and technology sourcing in alternate energy, materials, cleantech and nanotechnology. Representative areas include membranes, separations, chemical functionalization, ultrafine particles, high surface area materials, cermets, displays, solid state lighting, sensors, and electronics. Commencing with his Ph.D. dissertation

entitled “Nanochemistry and Nanomaterials” at Texas A&M, Dr. Brumlik has 20 years of experience working with nanotechnology. He has over 20 nanotechnology publications and patents in nanotechnology including nanoparticle hydrogen storage, electrochemical energy storage, and related processes.



Vincent Caprio, Session Chair

Mr. Caprio (www.vincentcaprio.org) is the Executive Director of the NanoBusiness Commercialization Association (www.nanobca.org). Mr. Caprio is one of the foremost advocates for government funding of emerging technologies at both the State and Federal levels. Mr. Caprio has testified before the state legislatures of New York and Connecticut, and has participated in NanoBusiness’ Washington, DC Roundtable for the past nine years. Mr. Caprio is the founder and event director of the 10th Annual NanoBusiness Conference which will be held in Boston, MA on September 25-27, 2011. During the past five years (2006-2011), Mr. Caprio was an invited speaker and guest lecturer on Nanotechnology at over 50 conferences. In addition, Mr. Caprio has appeared on numerous Connecticut TV and radio stations, including WICC 600AM <http://www.annkarrick.com/ThisWeek>, discussing the impact of Water and Nanotechnology.

Mr. Caprio graduated from Villanova University in 1979 with a B.S in Accounting and completed a MBA from Northeastern in 1987. Mr. Caprio is a member of Villanova University’s Financial Club and serves as an active member of Villanova’s President Club. Mr. Caprio serves on the Board of Trustees for the Easton Community Center and the Easton Learning Foundation in Easton, CT. In the summer of 2008, Mr. Caprio was appointed to the Board of Directors for the Fabricators & Manufacturers Association Communications, Inc. based in Rockford, IL.



Dr. Anil Diwan

Dr. Diwan invented novel polymeric micelle-based nanomedicine technologies as early as 1991. Dr. Diwan is a prolific inventor and a serial entrepreneur. Prior to co-founding NanoViricides, Inc., (a

public company, NNVC), he has founded TheraCour Pharma, Inc., a privately held company focused in nanomedicines and cell-targeted drug delivery, and AllExcel, Inc., a company with diverse portfolios including nanomedicines, small chemicals, device technologies, as well as informatics. He has won several NIH SBIR (small business innovation research) grant awards. Anil holds a Ph.D. from Rice University, TX, a B.Tech. from Indian Institute of Technology, Mumbai (IIT-B), India, and has consistently held high scholastic ranks and honors. Dr. Diwan has over 25 years of Bio-Pharmaceutical R&D experience with over 20 years as an entrepreneur. He has one issued patent, three filed international patent applications (resulting in several national level patents), and several anticipated patent applications in various stages.



Dr. Dana Durham, Session Chair

Dr. Durham is an associate with Nanobiz, LLC (www.nanobizllc.com), a firm assisting in commercializing cross-disciplinary advanced materials and industrial processes. Dana has expertise in Product Lifecycle Management, strategy development and technology assessment. Prior to joining Nanobiz, Dana served as R&D director for several Fortune 500 companies providing materials to the semiconductor and flat panel display industries. He holds 38 US patents.



Dr. Laura Faulconer

Laura Faulconer has been with Center of Innovation for Nanobiotechnology (COIN) since its fledgling days, launching many programs that accelerate commercialization of nanobiotechnology. She is currently focused on launching the Industry Outreach Program, a single-point of entry to the nanobio tech ecosystem providing access to innovators, critical business intelligence, and open innovation opportunities. Laura has over five years experience in

research ranging from bench science to clinical. Laura completed her Ph.D. in Biomedical Engineering from the University of North Carolina at Chapel Hill in 2009 and a BS in Forensic Science from Virginia Commonwealth University in 2004.



Dr. David Gracias

David Gracias is an Associate Professor in the Department of Chemical and Biomolecular Engineering at The Johns Hopkins University. He did his Ph.D. at UC Berkeley and was a post-doctoral fellow at Harvard prior to starting at Johns Hopkins in 2003. He is an author on 115 publications including 74 journal articles and 20 issued patents. His research has been published or highlighted in prestigious journals such as Science, Nature Nanotechnology, Nature Photonics, Nature Physics, Nature Chemistry, PNAS and press portals such as the Wall Street Journal, the New York Times, Forbes and Discover Magazine.



Dr. Jason H. Hafner

Jason H. Hafner earned his Ph.D. from Rice University in 1998 under Richard Smalley for work on carbon nanotubes, and then pursued postdoctoral studies at Harvard with Charles Lieber. Hafner returned to Rice in 2001 to join the faculty where his lab studies plasmonics, interfacial chemistry, and biophysics at the nanometer scale. Hafner has served as an Associate Editor of ACS Nano since 2010 and won the 2011 Hackerman Award in Chemical research from the Welch foundation.



Dr. Pradeep Haldar

Pradeep Haldar serves as Vice President of Clean Energy Programs at the College of Nanoscale Science & Engineering (CNSE) and as Chief Operating and Technical Officer of the \$300M, newly established U.S. Photovoltaic Manufacturing Consortium (USPVMC) in partnership with SEMATECH. He is Professor of NanoEconomics and NanoEngineering and Head of the NanoEconomics Constellation. He is also Director of the Energy and Environmental Technology Applications Center at CNSE.

Dr. Haldar's activities are centered around world-class technology development, R&D, entrepreneurship and commercialization of nanotech and clean energy ecosystems. He has over 25 years of industrial and academic experience in these areas with considerable expertise in building open innovation capabilities, strategic alliances, business and technology strategy, technology portfolio management, and incubation. He manages iCLEAN, the Clean Energy Incubator at CNSE; the NSF Partnerships for Innovation initiative; serves as Board Member and Executive Director of New Energy New York Consortium; and is Past Chair, DOE NREL's Clean Energy Alliance. Prior to joining CNSE, Dr. Haldar founded and served as General Manager and Director of Technology, of rapidly growing SuperPower, a start-up and new spin-out subsidiary of Intermagnetics (sold to Philips for \$1.3B). He is a senior member of IEEE and an author or co-author of over 250 reviewed technical papers, conference proceedings with several patents issued and pending. He is a Fellow of the Institute of Physics and recipient of the President's Excellence in Research award. He has his Ph.D. from Northeastern University and an MBA from Rensselaer Polytechnic Institute.



Dr. George John

George John, Ph.D., is Associate Professor of Chemistry, the City College of the City University of New York (CUNY). His research interests are in the broad area of organic and macromolecular

materials chemistry; specifically includes biobased organic synthesis, self-assembled soft materials for functional applications, templated synthesis of nanoparticles, green chemistry, understanding growth mechanisms of nanostructures and designing new structures and multifunctional nanocomposites. He is in the editorial team of two international journals, *Journal of Biobased Materials and Bioenergy* and *Green Nanotechnology*. Prof. John's research on biobased materials has been widely acclaimed in many journals and publications including *Nature*, *Newsweek*, *New Scientist* and in the *New York Times*.



Janet Joseph

Janet Joseph is the Vice President for Technology and Strategic Planning at the New York State Energy Research and Development Authority (NYSERDA). Janet oversees a multifaceted energy research program focused on developing and accelerating the market introduction of emerging energy efficient and clean energy technologies in New York. Janet also oversees NYSEDA's energy analysis and planning functions. Janet has held a variety of technical and policy positions at NYSEDA over the past 20 years including R&D Director, Environmental Research Program Manager, Buildings Research Program Manager, and Research Scientist and Manager of Planning. Prior to joining NYSEDA, Janet was a research scientist at Battelle Pacific Northwest Laboratories. Janet has also worked as an environmental consultant for Booz-Allen and Hamilton in Washington, D.C. Janet has a Master's degree in Environmental Chemistry from the University of Maryland.



Dr. Eli Leland

Eli Leland is a postdoctoral researcher at the CUNY Energy Institute. His research focuses on printed electronics for high-efficiency power conversion. In 2010 Eli was a Mirzayan Fellow in energy policy at the National Academies in Washington, D.C. Eli has MS and PhD degrees in mechanical engineering from the University of California, Berkeley, and an undergraduate degree from Princeton University, and is a member of Sigma Xi.



Dr. Philip Lippel

Philip Lippel is an expert consultant on nanoscience and emerging technologies. He has worked on a variety of technical, policy, and science communication issues at the national and international level in fields including nanotechnology, science education and workforce, informatics, telecommunications, and commercialization of emerging technologies. Dr. Lippel has provided top level scientific support to the leadership of the U.S. National Nanotechnology Initiative; helped to keep Congress, the public, and other interested parties up to date on federally funded nanotechnology research and development; and liaised with companies, NGOs, and state agencies interested in nanotechnology commercialization. He served government as a senior policy analyst at the National Nanotechnology Coordination Office and as an AAAS Science and Technology Policy Fellow at the National Science Foundation; industry as a Member of Technical Staff at Agilent Technologies and as founder of L Cubed Consulting; and academia as a faculty member in the Physics Department of the University of Texas at Arlington.

He received an A.B. in Physics and in Theatre from Williams College, and the M.S. and Ph.D. degrees in Physics from Brandeis University.



Jamison McLaughlin is a co-founder of Advanced Photovoltaics, a solar technology startup spun out of the College of Nanoscale Science and Engineering (CNSE) at the University at Albany. Prior to attending CNSE, Jamison served as VP of Operations in China for an international capital equipment manufacturer as well as previously working in project engineering and operations roles. His research is focused on the economics of innovation and analyzing emerging technologies and the constraints to their commercialization. Jamison's technological interests span a wide range, from clean energy technologies to nanomedicine and biotechnology.



Prof. Stephen O'Brien

Dr. Stephen O'Brien is Associate Professor of Chemistry at City College and a member of the CUNY Energy Institute. He also has appointments on the Doctoral Faculty of the CUNY Graduate Center and Grove School of Engineering Department of Chemical Engineering. Steve is an established academic researcher in nanotechnology, with expertise in inorganic materials chemistry and materials science and engineering, applied physics. His disciplinary areas: Nanomaterials synthesis, properties and structural characterization: Nanoparticle synthesis and self-assembly into superlattices. Transition metal oxide nanomaterials, high k dielectrics/memory materials: perovskites and garnets at the nanoscale, ferroics. As a Principal Investigator, he is leader and advisor of research projects to a team of PhD and post-doctoral research scientists. He is published in over 75 articles as lead author or co-author in peer reviewed American and international research journals, including Nature, Science.



Alton Parrish

Market Analyst Alton Parrish has a Bachelor of Fine Arts degree from the University of North Carolina. He has over 25 years of experience as a journalist and market research analyst. He served as a reporter, news director and managing editor for Houston News Service and Metro News Service in Houston, TX before entering the field of market research. Recent work includes *"Nanofabrication Equipment for IT and Electronics"* and *"Fuel Cells, Hydrogen Energy And Related Nanotechnology,"* published by Innovative Research and Products, Inc. He has also published a number of studies for Business Communications Company among them are: *"Carbon Capture and Storage Technology," "Holography for Industrial Applications," "Market Potential For Metal-Air Fuel Cells"* and *"Portable Power Devices: Industry Review and Market Projections."*



Dr. Srimi Raghavan

Dr. Raghavan is an Associate Professor in the Department of Chemical & Biomolecular Engineering at the University of Maryland, College Park (UMCP) where he holds the Patrick & Marguerite Sung Chair. He received his B.Tech. and Ph.D. in Chemical Engineering from the Indian Institute of Technology, Madras, and North Carolina State University, respectively. Srimi's research on soft materials has resulted in more than 80 publications and six patent applications. He has received several awards for his research, including the CAREER award in 2004 from the National Science Foundation (NSF) and "Invention of the Year" at UMCP in 2009. A class of biomaterials developed in his lab are being commercialized by *Remedium Technologies*, a company he co-founded.



Tina Šetinc

Tina Šetinc attended the University of Ljubljana and received a Bachelor's degree in Chemical Engineering in 2008. Continued her graduate studies at the "Jožef Stefan International Postgraduate School" and started working at Department for Advanced Materials, at the "Jožef Stefan" Institute, and became involved in research related to Nanotechnology with the emphasis on hydrothermal synthesis and sol-gel chemistry of perovskite-type materials.



Dr. Ganesh Skandan

Ganesh Skandan earned his Ph.D in Materials Science and Engineering from Rutgers University, where he co-developed and patented processes for producing nanoscale particles. Shortly after his graduate work, Dr. Skandan co-founded NEI Corporation. As Vice President R&D for six years at NEI, he led the development of an array of Nanomaterials technologies that today constitutes the technology platform that NEI is built on. As CEO of for the past eight years, he has transitioned materials technologies into commercial products that have enabled NEI to grow into a diversified Advanced Materials company. Dr. Skandan also led the formation of an international joint venture, United Nanotech Products Limited (UNTPL), based in Kolkata, India. UNTPL manufactures Li-ion battery electrode materials.

Dr. Skandan was recognized as outstanding alumnus of the Graduate School at Rutgers University at its 50th anniversary. In 2011, Rutgers University recognized Dr. Skandan's accomplishments with a Distinguished Alumni award for Distinction in the Physical Sciences. Dr. Skandan has co-authored encyclopedia articles and technical papers, and has been awarded nine US patents. He is associated with the National Academy of Engineering through the Frontiers of Engineering Series Symposia.



Dr. P. Somasundaran

Professor Somasundaran is the La von Duddleson Krumb Professor at Columbia University School of Engineering and Applied Science, the Director of the Langmuir Center for Colloids & Interfaces and the founding director of the National Science Foundation Industry/University Cooperative Research Center for Particulate and Surfactant Systems.

He is a member of the U.S. National Academy of Engineering, the highest professional distinction conferred upon an engineer, and the equivalent national academies in China, India,

Russia and the Balkans and winner of many awards including Richards Award, Ellis Island Medal of Honor, Gaudin Award, Taggart Award and the AIME Education Award etc.

His research interests are surface and colloid chemistry, polymer, surfactant and protein adsorption, flocculation/dispersion and biosurface phenomena, molecular interactions at surfaces using advanced spectroscopy, environmental engineering (waste treatment).



Dr. Lawrence Tamarkin

Lawrence Tamarkin is CEO and Founder, CytImmune. Dr. Tamarkin is the co-inventor of the colloidal gold-based, tumor-targeted nanomedicine platform technology, which is covered in 36 allowed and 46 pending patents both domestically and internationally. The Company's first cancer nanomedicine, Aurimune®, has been successfully tested in a Phase I advanced-stage cancer patient study, and Phase II testing in combination with approved chemotherapies is planned. Recognizing that cancer isn't a single disease, under Dr. Tamarkin's leadership a pipeline of nanotherapeutics is being developed, with each product being designed to attack tumors by different mechanisms; the second-in-a-family of cancer nanomedicines, AuriToI™, is expected to enter clinical testing in 2013, with a third nanomedicine advancing through pre-clinical development. Dr. Tamarkin was graduated from SUNY at Stony Brook receiving a B.S. degree and received his Ph.D. degree from the University of Connecticut.