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Arizona's 2nd Annual

Nanotechnology Symposium

March 23rd 2007

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ARIZONA NANOTECHNOLOGY CLUSTER

Welcome to the 2nd Annual Arizona Nanotechnology Symposium.

On behalf of the Organizing Committee, I want to express our appreciation for your participation in this event. Outstanding speakers, chairpersons, presenters, and panelists have stepped forward to share their insights and experiences with us today. As a result, the agenda includes an excellent balance of technical and business topics. Some of the areas that will be overviewed include:

- Progress in many technologies and products
- Examples of progress in Canada and France
- Real world issues facing nanotechnology, nanotechnology businesses, and financing nanotechnology.

This range of topics will help remind us of the breadth of progress and products that leverage nanotechnology. Also, the balance of the presentations and discussion throughout the day will underscore the broad range of interdependences among the technical and business aspects of nanotechnology.

Net proceeds will go to:

- Furthering public awareness of nanotechnology in the state of Arizona
- Supporting the K-20 outreach efforts of the Arizona Nanotechnology Cluster
- Joint collaborative events with other technology related nonprofit organizations

A core value of our mission is to encourage study in science, technology, engineering, and math at all levels of education.

Thanks again for your attendance and participation.

Glen Vaughn
Organizing Committee Chairman
Arizona Nanotechnology Cluster

WELCOME

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ARIZONA NANOTECHNOLOGY CLUSTER

The Chairman's Welcome

Matt Kim, PhD
Chairman Arizona
AZ Nanotechnology Cluster

Michael Berman
Co-Chairman
AZ Nanotechnology Cluster

Dou Goodman
Chairman Emeritus
AZ Nanotechnology Cluster

On behalf of the Members and Board of the Arizona Nanotechnology Cluster, we would like to welcome all of you to The 2nd Annual Arizona Nanotechnology Symposium. The symposium culminates significant planning and organization efforts of our Organizing Committee led by Glen Vaughn, and the gracious support of our Sponsors. The idea that Nanotechnology is no longer the technology of the future, but that it is real today, is the significance of the symposium theme "**Real Progress, Real Products".**

The Arizona Nanotechnology Cluster, is an Arizona not-for-profit organization, and was formed in January 2003 to share technological advances, and to promote business development in the fast-growing field of nanotechnology. Membership is free, as are our monthly seminars in Tucson and Phoenix, which are open to the public. Arizona is a wonderful state for Technology Development and we are thankful to have the amount of support for our Cluster. We have world class Universities in Arizona, which provide significant engagement and involvement in the cluster.

There are many groups to whom we would like to extend special thanks. First are our sponsors, next is our good friends and international associates. We also have many students of Science, Technology Engineering and Mathematics here today, who represent the future of Nanotechonlogy in Arizona, and we hope that the Keynote talks and the Sessions will reaffirm to the students that they are in the right fields at the right time. Nanotechnology forms a large branch of knowledge that finds its place at the very top of many new as well as existing fields.
It is a great pleasure of having this opportunity to meet you personally, we are sure that this will be a outstanding opportunity for us to learn from each other. We encourage you to meet our Members and Special Guests who are listed in the Program.

Once again we want to welcome everybody and hope that you will find the keynotes and the sessions both interesting and inspiring.

On behalf of the Arizona Nanotechnology Cluster, we thank you for your interest in moving Arizona forward in this exciting field. Cordially, Matt, Michael, Doug

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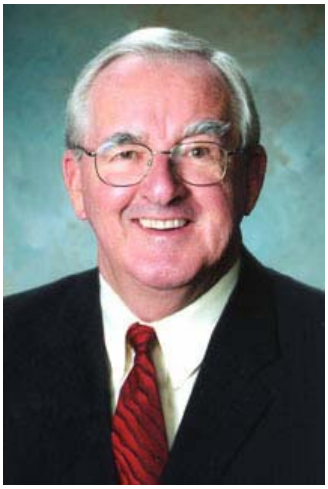

Dr. Arthur W. DeCabooter

President Scottsdale Community College
Maricopa Community Colleges

Scottsdale Community College (SCC) is located on the eastern boundary of the city of Scottsdale, Arizona on 160 acres of leased land belonging to the Salt River Pima-Maricopa Indian Community. SCC opened its doors in 1970 and today is serves nearly 12,000 students.

The mission of Scottsdale Community College is to create accessible, effective, and affordable environments for teaching and learning for the people of our communities in order that they may grow personally and become productive citizens in a changing and multicultural world.

SCC, which is lead by Dr. Art DeCabooter, is one of the ten colleges that comprise Maricopa County Community College District.

Mary Manross

Mayor of Scottsdale, Arizona

Mayor Mary Manross has been Mayor of Scottsdale since June 2000. She was reelected and began her second term as Mayor in June 2004. Previously, she served two terms as a City Councilwoman from 1992 to 2000.

Mayor Manross has held leadership positions in city government and community, educational and church organizations since she came to Scottsdale in 1972. Among her primary areas of interest have been neighborhood and redevelopment issues and preservation of the McDowell Mountains and Sonoran Desert.

She chaired the Scottsdale Parks and Recreation Commission, served on the Planning Commission and served as vice chair of the Scottsdale Bond Committee in the early 1980s.

She was director of the Marriage Preparation Seminars at the Franciscan Renewal Center for 22 years, in which more than 15,000 adults have participated. She also served as vice president of the Casa de Paz Y Bien Foundation and as a member of the leadership team for the Valley Interfaith Project.

She served on the Governor's Task Force on Urban Planning, the Arizona Town Hall and as a League of Women Voters board member. She also participated as chairwoman of the Maricopa Association of Governments Youth Policy Advisory Committee and as a board member of Arizona Women in Municipal Government. She was a member of the National League of Cities (NLC) Energy, Environment and National Resources Policy Committee.

Mayor Manross continues to represent her community at the regional, state and national levels. She is a member of the Executive Committee of the Arizona League of Cities and Towns and a board member of the Arizona Municipal Water Users Association. She serves on the Regional Public Transportation Authority, where she previously served as chair. She is vice chair of the Maricopa Association of Governments Executive Committee, chair of the MAG Regional Domestic Violence Council and serves on the MAG Transportation Policy Committee.

Currently, she is a member of the NLC Transportation, Infrastructure and Services Steering Committee, the primary group responsible for the NLC's national policy on transportation.

Mayor Manross has a bachelor's degree in political science and a teaching credential. She attended both the University of California at Los Angeles and Minot State University.

She and her husband Larry have four children and two grandchildren.

SPEAKERS

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ARIZONA NANOTECHNOLOGY CLUSTER

ORGANIZERS

Chair: Glen Vaughn

Michael Berman
Herb Finkelstein
Doug Goodman
Matt Kim
Sandra Helsel
Tom McGlew
Dawn Nagle
Cindi Pillote
Gerald Thurman

Michael J. Berman

Laboratory Manager
Micro/Nano Fabrication Center (MFC)
University of Arizona

Co-Chairman Arizona Nanotechnology Cluster

During more than 25 years in the semiconductor industry, Michael has published 12 papers, been issued over 40 patents with 20 patents pending.

Before coming to the UA, Michael was a both a manager and staff engineer for LSI Logic. At LSI, Michael was "Inventor of the Year" for 2002 and "Outstanding Patent Liaison of the Year" for 2003.

mberman@ece.arizona.edu

Herb Finkelstein

Research Liaison Officer
Ira A. Fulton School of Engineering
Arizona State University

Herb Finkelstein joined ASU in 1997 as a research liaison officer. His responsibilities include working with industrial sponsors and partnerships to support the Fulton School's research mission. He helps promote and facilitate faculty/industry research partnerships and works to create a resource network in the university, community and the international arena to identify and cultivate industrial partners.

Mr. Finkelstein's professional experiences include a position with the U.S. Army's Night Vision Lab as a contracting officer and technical representative. His research experience here involved working in the R&D sector on Army specific technologies, such as image intensifiers, night vision goggles and solid state transformers, as well as initiating the Night Vision's hybrid microelectronics lab. He was the acquisition manager for Naval Air System Command (NAVAIR) for the radar warning receiver, the ALR/67 and the ALR/45. From 1982 to 1997, Mr. Finkelstein worked with FAI/Nanotechnologies, a logistics consulting company, where he won a large contract with the Naval Supply System Command for a new program called the Rapid Acquisition of Manufacturing Parts (RAMP). He was named CEO of a small manufacturing firm in Rockville Maryland, fabricating High Voltage Focused Ion Beams for research facilities

Since joining ASU, Mr. Finkelstein has contributed to a broad range of efforts to promote Fulton research endeavors, including bringing in well over $2 million in research grant opportunities to the engineering school. He has coordinated the development of resource materials to market the school's research capabilities, worked to identify, facilitate and communicate the contributions of the Fulton School to economic development agencies, and collaborated with university administration to ensure smooth operations of faculty and industry research interactions. Initiated marketing program which introduced the school's research program to the community; these programs include working with the City of Tempe on the networking event named Techie Tuesday, Research Breakfast Forum, and the Discovery Series.

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Douglas L. Goodman

President and CEO of Ridgetop Group, Inc
Chairman Emeritus, Arizona Nanotechnology Cluster

Doug Goodman is the President and CEO of Ridgetop Group, Inc, a well-established electronic prognostics and fault-tolerant semiconductor design firm in Tucson, and has an extensive background in Electronic Design, Metrology, and Test. He is a co-founder and Chairman Emeritus of the Arizona Nanotechnology Cluster.

Doug has helped start several companies over the years serving the Semiconductor Industry, including Opmaxx (now part of Credence Systems), Environmental Metrology Corporation and Ridgetop in Tucson. He has also served as VP of Engineering at Analogy, Inc, (now part of Synopsys) and held various managerial and engineering roles at Tektronix and Honeywell.

Doug holds a BSEE from California Polytechnic State University (Cal Poly) and an MBA from the University of Portland. He has served as an Adjunct Faculty member at the University of Arizona and was named an Entrepreneurial Fellow by the University of Arizona, Eller College of Business in 2002. He is a member of the University of Arizona's Electrical and Computer Engineering Affiliates Board. In 2006 he received the Chairman's Award at the Governor's Celebration of Innovation in Phoenix for his contributions to Arizona's High Tech Industry.

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Dr. Matt Kim

CEO, QuantTera
Chairman, Arizona Nanotechnology Cluster

Dr. Matt Kim holds a Ph.D. in Physics from the University of Illinois in Urbana-Champaign and B.S. in Engineering Physics from Cornell University.

Dr. Kim is the Founder and President of QuantTera. QuantTera specializes in developing quantum based devices for photonic applications. Our focus is to develop manufacturable lasers, detectors, driver amplifiers and opto-electronic integrated circuits.

Dr. Kim is chairman of the board of the Arizona Nanotechnology Cluster a non-profit organization for advancing nanotechnology issues in the Phoenix area. In 2006 he received the Chairman's Award at the Governor's Celebration of Innovation in Phoenix for his contributions to Arizona's High Tech Industry.

In 2000 Dr. Kim co-founded MicroLink Devices, Inc., a leading manufacturer of transistors for cellular communications in Niles, IL. At MicroLink he was Vice President of Operations and supervised the transistor manufacturing program which ultimately resulted in vendor qualification at major telecommunication companies.

From 1994 to 2000, Dr. Kim served as Principal staff scientist at Motorola's corporate research laboratory. He demonstrated transistors with very high gain, which were used in Motorola cell phone technology. From 1989 to 1994, Dr. Kim was a senior scientist at Bandgap Technology Corporation where he was in charge of the characterization of transistors and lasers for telecommunication applications.

Thomas McGlew

Instructional Program Development Specialist
Maricopa Advanced Technology Education Center (MATEC)
Academic Affairs Division
Maricopa Community Colleges

Thomas McGlew has more than thirty years of experience in the fields of semiconductor manufacturing and employee development. Tom has served as one of the founding Committee Members of the Northwest Semiconductor Workforce Development Consortium, as a Steering Member for the Arizona SEMI Committee, and as a Member of the American Society for Training and Development (ASTD).

He is the Instructional Program Development Specialist at MATEC, with Project Lead responsibilities for the Work-Ready Electronics Program.

Thomas is a certified instructor for numerous Management and Leadership Development Workshops and has spoken at two ASTD Technical Education Conferences on Mentoring in the Workplace.

DAWN NAGLE

Trade Commissioner
Canadian Consulate, Phoenix

Dawn Nagle is a Trade Commissioner with the Canadian Consulate in Phoenix, Arizona. Her priority sectors include Information and Communications Technologies, Biotechnology, and Nano-Technology. She focuses on promoting closer trade, commerce, investment and S&T partnerships between Canadian governments, institutions, agencies and private sector firms, and their counterparts in Arizona and New Mexico.

She received her Bachelor of Science Degree from Chicago State University in Chicago, Illinois.

She has an extensive background in the software and the IT sector previously working for such companies as Compuware and TRW Global Systems Integration.

Ms. Nagle is a longstanding member Phoenix Sister Cites Commission, a member of the Nano Giga Challenges Symposium Organizing Committee, and a member of the Arizona Nanotechnology Cluster's Symposium Committee.

She can be reached at dawn.nagle@international.gc.ca

Cynthia L. Pillote, Esq.

Attorney
Snell & Wilmer, L.L.P.

Cindy is an attorney with the law firm of Snell & Wilmer. Her legal practice includes intellectual property counseling; patent, trademark, and copyright prosecution; related technology transfer; and licensing. Technical experience in, among other areas, nanotechnology, medical devices and products, life sciences, nutraceuticals, cosmeticeuticals, semiconductors and semiconductor manufacturing, electronic commerce, mechanical devices, chemical processes and compounds, mining technology, and electronic communication.

In addition to the various Bar Associations, Cindy also is a member of the American Intellectual Property Law Association, Arizona Nanotechnology Cluster, Integrated Trademark Association, and the Licensing Executive Society. She is also a board member of the Center for Applied Nanoiononics at ASU and Community Health Charities.

Prior to earning her law degree from Arizona State University in 1997, she had a professional career in engineering at Motorola and Digital Equipment Corporation and earned a B.S. in Chemical Engineering (1987) and an M.S. in Materials Science Engineering (1991) also from ASU.

Gerald Thurman

CS Instructor
Scottsdale Community College

Gerald Thurman has been a computer and math instructor at Scottsdale Community College since the fall of 1997. Thurman received a B.S. in mathematics from the University of Wisconsin at Whitewater in 1979 and a M.S. in Computer Science from Purdue University in 1980. He spent six years as a Member of Technical Staff at AT&T Bell Labs.

After moving to Arizona in 1985, Thurman worked three years as a computer programmer for three different start-up software companies. Prior to joining SCC, Thurman spent eight years as a chief programmer and system administrator at Scottsdale-based Discount Tire Company.

Glen Vaughn

Over 28 years experience with Medtronic, Inc. including 24 years in several director roles within the Medtronic Microelectronics Center. These included technology and product development, manufacturing, wafer fabrication, test engineering and operations, product engineering, IT, HR, training, security, and finance.

Twelve years with Motorola, Inc. in a variety of engineering and software roles.

Also, in recent years, had the privilege of serving on three boards: the Board of Directors of the Arizona Nanotechnology Cluster, the Board of Directors of the Arizona Bio-Industry Association, and the Dean's Advisory Board of the Ira A. Fulton School of Engineering.

Education includes Bachelor's and Master's degrees in Electrical Engineering from Arizona State University, along with a Doctorate in Economics.

PROGRAM

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ARIZONA NANOTECHNOLOGY CLUSTER

MORNING SCHEDULE

A. REGISTRATION AND CONTINENTIAL BREAKFAST — **7:30 – 8:00**

B. INTRODUCTION — **8:00 – 8:10**
Dr. Matt Kim – *CEO, QuantTera*

C. WELCOME — **8:10 – 8:15**
Dr. Arthur W. DeCabooter – *President of Scottsdale Community College*

D. WELCOME — **8:15 – 8:20**
Mary Manross – *Mayor of Scottsdale, Arizona*

E. KEYNOTE PRESENTATION — **8:20 – 9:05**

Introduction — Michael Berman – *Laboratory Manager of the Micro/Nano Fabrication Center, University of Arizona* — **8:20 – 8:25**

Keynote: **Nanotechnology and Energy**

Presenter: Dr. Wade Adams – *Director of the Richard E. Smalley Institute for Nanoscale Science and Technology at Rice University; Chairman of the Board of the Texas Nanotechnology Initiative (TNI)* — **8:25 – 9:05**

F. SESSION I – Nanotech in Arizona — **9:05 – 10:10**

Chairperson: Jon McGarity – *President & CEO of the Arizona BioIndustry Association; President & CEO of INSYS Therapeutics, Inc.; President & CEO, EthiX Associates; Senior Managing Director, Biopharmaceutical Industry at Alare Capital Partners, LLC; CEO of GenBioPro, Inc.* — **9:05 – 9:10**

Topic 1: Nanotechnology: from Fundamental Science to Medicine?

Presenter: Dr. Stuart Lindsay – *Center for Single Molecule Biophysics, Biodesign Institute, Arizona State University* — **9:10 – 9:30**

Topic 2: C-Mats – Non-Woven Double-Walled Nanotubes – and their Applications

Presenter: Dr. Raouf O. Loutfy – *President, Materials and Electrochemical Research Corporation* — **9:30 – 9:50**

Topic 3: High Throughput Mass Spectrometric Immunoassays in Human Plasma Profiling and Targeted Protein Analysis

Presenter: Dr. Randall W. Nelson – *Director of the Molecular Biosignatures Analysis Unit, Biodesign Institute, Arizona State University; Research Professor and Adjunct Professorship in the Departments of Chemistry and Biochemistry, ASU; President and CEO of Intrinsic Bioprobes, Inc.* — **9:50 – 10:10**

REFRESHMENT BREAK and VENDOR DISPLAYS — **10:10 – 10:30**

A. SESSION II – International Nanotech **10:30 – 11:35**

Chairperson: Donna Kent – *President, Arizona Technology Council; Founder and President, ThunderBay Consulting* **10:30 – 10:35**

Topic 4: The Path to Manufacturing Nano-Photonics Components

Presenter: Dr. Sylvain Charbonneau – *Director, Applications Technologies; Institute for Microstructural Sciences; National Research Council, Canada* **10:35 – 10:55**

Topic 5: Navigating United States Export Controls on Nanotechnology

Presenter: Matthew A. Goldstein, Esq. – *Snell & Wilmer L.L.P.* **10:55 – 11:15**

Topic 6: High Efficiency Solar Cells for Concentrated Photovoltaic (CPV) using Semiconductor Nanostructures

Presenter: Dr. Simon Fafard – *President and CTO, Cyrium Technologies Incorporated* **11:15 – 11:35**

LUNCH and VENDOR DISPLAYS **11:35 – 12:45**

AFTERNOON SCHEDULE

B. KEYNOTE PRESENTATION **12:45 – 1:30**

Introduction Dr. Sandra Helsel – *SK Helsel & Associates* **12:45 – 12:50**

Keynote: **Impact of Nanotechnology**

Presenter: Patti Glaza – *Vice President PennWell Corporation, Group Publisher of Small Times* **12:50 – 1:30**

C. SESSION III – Technology of Nano **1:30 – 2:35**

Chairperson: Dr. Sayfe Kiaei – *Director, Connection One Center & WINTech Programs; Professor; IEEE Fellow, Arizona State University, Ira A. Fulton School of Engineering* **1:30 – 1:35**

Topic 7: A NanoCeramic Vector for Cancer Therapy and Molecular Imaging

Presenter: Dr. Sandwip Dey – *Professor, School of Materials, Center for Interventional Biomaterials, and Department of Electrical Engineering, Ira A. Fulton School of Engineering, Arizona State University* **1:35 – 1:55**

Topic 8: Virtual Processing of Nanostructured Materials

Presenter: Dr. Timothy S. Cale – *Faculty Member, Department of Chemical Engineering, Rensselaer Polytechnic Institute, Directs the Focus-Center, New York, RPI; President, Process Evolution, Ltd.* **1:55 – 2:15**

Topic 9: The Semiconductor Production Nanotechnology Dimension

Presenter: Morry Marshall – *VP Strategic Technologies, Semico Research Corp.* **2:15 – 2:35**

REFRESHMENT BREAK and VENDOR DISPLAYS **2:35 – 2:55**

J. SESSION IV – Nanotech and Finance **2:55 – 4:00**

Chairperson: Dr. Papu Maniar – *Leads the Physical Technologies Laboratory within Motorola's Embedded Systems research organization within Motorola's Corporate Technology Organization* **2:55 – 3:00**

Topic 10: Nanotechnology Investment Climate

Presenter: Dr. Alexei Andreev **–** *Executive Vice President / Managing Director, Harris & Harris Group* **3:00 – 3:20**

Topic 11: Nano Measurements, AFM, and Why Agilent is in Phoenix

Presenter: Jeff Jones **–** *AFM Operations Manager, Agilent AFM Business Operations, Agilent Technologies, Inc.* **3:20 – 3:40**

Topic 12: Public/Private Funding of Nanotechnology in Grenoble, France

Presenter: Sharon Rehbinder **–** *Director for North America, AEPI, the Grenoble-Isere, France, Economic Development Agency* **3:40 – 4:00**

K. PANEL DISCUSSION – Business Challenges of Nanotech **4:00 – 5:30**

Moderator: Jim Jindrick – *Mentor-in-Residence and Entrepreneurial Fellow in the Eller College of Management at the University of Arizona*

Panelist: Dr. Alexei Andreev **–** *Executive Vice President / Managing Director, Harris & Harris Group*

Panelist: Gary Emmett **–** *Sr. Associate at Stantec Consulting Inc. managing Stantec's Arizona mechanical and electrical engineering group; Advisory board member of the Canada Arizona Business Council; Board member and northern Arizona coordinator for the Arizona Optics Industry Association(AOIA)*

Panelist: Dr. Stephen Goodnick **–** *Associate Vice President for Research at Arizona State University; Fellow of the Institute of Electrical and Electronics Engineers (IEEE); an Alexander von Humboldt Research Fellow*

Panelist: Dr. Papu Maniar – *Leads the Physical Technologies Laboratory within Motorola's Embedded Systems research organization within Motorola's Corporate Technology Organization*

Panelist: Amy Corinne Smith **–** *Senior Vice President, Global Technology Group, Lehman Brothers*

Panelist: Sandra Watson **–** *Senior Director of Workforce and Business Development, Arizona Department of Commerce; Executive Director, Governor's Council on Innovation and Technology*

ADJOURN **5:30**

SPEAKERS

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MORNING KEYNOTE: Nanotechnology and Energy

Dr. Wade Adams

Director of the Richard E. Smalley Institute for Nanoscale Science and Technology at Rice University
Chairman of the Board of the Texas Nanotechnology Initiative (TNI)

Dr. Wade Adams is the Director of the Richard E. Smalley Institute for Nanoscale Science and Technology at Rice University. The Smalley Institute is devoted to the development of new innovations on the nanometer scale by coordinating and supporting nanoscience and nanoengineering research of over 120 faculty members. Some current thrusts include research in carbon nanotubes, nanoporous membranes, molecular electronics and computing, and diagnostic and therapeutic medical applications of buckyballs and nanoshells. The Smalley Institute is part of a major initiative at Rice to expand activities in nano, bio, info and enviro science and engineering, and to expand interactions with the Texas Medical Center through the Alliance for NanoHealth.

Dr. Adams retired from the US Air Force senior executive ranks in January 2002, as the Chief Scientist of the Materials and Manufacturing Directorate, Air Force Research Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Dr. Adams was educated at the U.S. Air Force Academy, Vanderbilt University, and the University of Massachusetts.

For the past 33 years he has conducted research in polymer physics, concentrating on structure-property relations in high-performance organic materials. He is internationally known for his research in high-performance rigid-rod polymer fibers, X-ray scattering studies of fibers and liquid crystalline films, polymer dispersed liquid crystals, and theoretical studies of ultimate polymer properties. He has written more than 200 publications on these topics, including several review articles and two edited books, has four patents (one licensed), and has given over 600 technical presentations. He is a Fellow of the American Physical Society and the Air Force Research Laboratory. Dr. Adams retired from the Air Force Reserve in the rank of Colonel in 1998.

Abstract: Energy is both the single most important problem facing humanity today and a magnificent scientific and technical opportunity. We will need a minimum of ten terawatts (the equivalent of 150 million

barrels of oil per day) from a new, clean energy source by 2050. Solving this problem will demand revolutionary breakthroughs in the physical sciences and engineering, and particularly in nanotechnology. This talk will discuss the magnitude of the problem, some enabling nanotechnology revolutions that will be needed to address the problem, the people/workforce issues that impinge on the problem, and some thoughts on how to organize to solve the problem.

Be a Scientist – Save the World!

Nanotechnology and Energy

Wade Adams, Amy Jaffe, and Richard E. Smalley*

Richard E. Smalley Institute for Nanoscale Science & Technology, MS-100
James A. Baker III Institute for Public Policy
*In memoriam, Carbon Nanotechnology Laboratory, MS-100
Rice University, 6100 Main St., Houston, Texas 77005

SPEAKERS

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SESSION I – Nanotech in Arizona

Chair: Jon McGarity

Speakers:
Dr. Stuart Lindsay
Dr. Raouf O. Loutfy
Dr. Randall W. Nelson

SPEAKERS

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SESSION I Chair - Nanotech in Arizona: Jon McGarity

President & CEO, Arizona BioIndustry Association
President & CEO, INSYS Therapeutics, Inc.
President & CEO, EthiX Associates
Sr Managing Director, Biopharmaceutical Industry,Alare Capital Partners, LLC
CEO, GenBioPro, Inc.

Jon W. McGarity has over three decades of experience in the pharmaceutical and biotechnology industries. He is currently the President & CEO of INSYS Therapeutics, Inc., a privately held specialty pharmaceutical company with a focus on pain management and CNS disorders. During the past twelve years, he has been the President & CEO of EthiX Associates, his own consultancy business serving the pharmaceutical and biotechnology industries. He is also the Senior Managing Director, Biopharmaceutical Industry at Alare Capital Partners, LLC. In addition he is the CEO of GenBioPro, Inc., a virtual company engaged in the regulatory approval and commercialization of biopharmaceutical products.

He serves as the President & CEO of the Arizona BioIndustry Association and sits on the Boards of the Arizona BioIndustry Association, Arizona Technology Council, Global Advisory Council at Thunderbird School of Global Management, Northern Arizona Technology and Business Incubator, Leadership Council for Arizona Biomedical Research, Arizona State University Technopolis and Entrepreneur Mentoring Programs and the Masters Level Computational Biosciences Degree Program at Arizona State University. Currently he is a Board Director at Cypress Biosciences Inc. (CYPB), a public biotech company based in San Diego as well as GenBioPro, Inc., INSYS Therapeutics, Inc., Restorative Biosciences, Inc. (formerly Cynexus Corporation) and Apthera, Inc. (formerly Advanced Peptide Therapeutics, Inc.), private biotechnology companies based in Phoenix. He is also a Board Director for Clinical Information Network, Inc. which is focused on video promotion to improve pharmaceutical sales force productivity.

Mr. McGarity co-founded and was Vice Chairman, President & COO of Pharmaceutical Marketing Services, Inc., a publicly traded technology, data services and consulting business to the international pharmaceutical industry. He has functioned in his consulting business as the acting CEO of three biotechnology start ups as well as President & COO of a preclinical drug development business. His pharmaceutical experience includes senior management positions with GlaxoSmithKline, Bristol Myers Squibb and Novartis (Sandoz Pharmaceuticals). Mr. McGarity has launched over 40 products as well as completing numerous business development deals involving product acquisitions, licensing, co-marketing and promotional arrangements.

Mr. McGarity earned a BS (Premed) at the State University of New York in Albany, and has accomplished numerous executive courses at Harvard, Duke, Stanford, Wharton, Columbia, UCLA, and the University of Michigan.

SPEAKERS

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SESSION I – TOPIC 1

Nanotechnology: from fundamental Science to medicine?

Stuart Lindsay

Center for Single Molecule Biophysics
Biodesign Institute
Arizona State University

Stuart Lindsay, PhD, specializes in biophysics at the molecular level and scanning probe microscopy. Much of his work is aimed at speedier diagnosis as well as to medical breakthroughs to understand and cure many diseases. He holds 27 patents and is a technology advisor for the Atomic Force Microscope Division of Agilent Technologies. Agilent has acquired Molecular Imaging Corporation, which he co-founded in 1993.

Dr. Lindsay's lab conducts innovative research in biological physics, molecular electronics, solar energy and condensed matter physics. The Lindsay Lab researchers are interested in how genes work, and study the way in which proteins change DNA structure to switch genes on and off. They are also interested in the chemistry and physics of the liquid-solid interface, and are trying to understand electrochemical and charge transfer processes at the single-molecule level. One project that Dr. Lindsay is pursuing is a new method of DNA sequencing to allow much faster and cheaper sequencing of individual human genomes. His radical approach involves using Atomic Force Microscopy (AFM), which is customarily used to analyze the surface structure of materials at molecular resolution with the ultra-small tip of a sensitive probe, in combination with naturally occurring ring-shaped sugar molecules called cyclodextrins. Lindsay believes that the ring molecules, when paired with the AFM probe tip, can effectively be used as sensors to "read" the sequence of nucleic acid code (DNA "bases") in the human genome that comprises many millions of bases.

Dr. Lindsay also constructs specialized scanning probe microscopes in collaboration with Molecular Imaging Corporation. His 27 patents include one in 2004 for "Devices based on molecular electronics".

After receiving his PhD in Physics from the University of Manchester, Dr. Lindsay spent two years as a consultant at Philips Industries in London before joining the faculty at ASU. He has been at ASU for 25 years. His body of published work comprises over 138 articles in peer-reviewed journals and many book chapters and refereed conference papers.

Dr. Lindsay sits on the editorial boards of Biophysical Journal and AIP Press International Series in Basic and Applied Biological Physics. He also holds the position of Associate Editor for Probe Microscopy at Ultramicroscopy, and Associate Editor for the Americas at Nanobiology. He is a fellow of the American Association for the Advancement of Science and the American Physical Society.

Abstract: The Scanning Tunneling Microscope (STM) was invented 26 years ago. Its more versatile cousin, the atomic force microscope (AFM) was invented 20 years ago. These microscopes allow imaging, measurement and manipulation on the nanometer scale even for samples in physiological fluids: they have the potential to revolutionize biology and medicine by allowing researchers to look directly at living processes on the molecular scale. Prompted by this potential, my lab at ASU built a microscope for imaging molecules in water over 20 years ago. That program led, amongst other things, to the forming of a microscope company, Molecular Imaging. Molecular Imaging is now Agilent AFMs based in Tempe, Arizona.

Some of the dreams of 20 years ago are now being realized, and I will describe briefly programs aimed at nano-scale diagnostics and DNA sequencing. Technology of this sort will be required for the next phase of medicine – that is medicine that is tailored to the unique molecular profile of each patient.

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SESSION I TOPIC 2

C-Mats - Non-Woven Double-Walled Nanotubes - and their Applications

Dr. Raouf O. Loutfy

President, MER Corporation
COO, FIC Corporation

Dr. Loutfy earned his BS (1964) in applied chemical technology, MS (1966) degree in Solid State Sciences from the American University in Cairo, a Ph.D. (1971) in Electrometallurgy from University of Western Ontario, and Diploma in Business administration (1976) from McGill University.

He was a group leader in the electrochemical technology group at Noranda Research Center (1972-1976) and at Argonne National Laboratory (1977-1981). Dr. Loutfy joined Atlantic Richfield (ARCO) in late 1981 where he became Research Advisor (one of 11 in the entire company), and led the development and commercialization of advanced materials. A plant to produce specialty chemicals based on this effort was built and operated in 1985. This plant is still in operation today. Dr. Loutfy started MER Corporation in 1986 and at the same time, entered into a joint venture with an international company to develop and commercialize advanced materials including aluminum nitride substrates for the electronic industry. This venture was sold to the partner in 1988 and MER continued to develop advanced material technologies.

Dr. Loutfy has been leading MER's effort on the production and application development of fullerenes and nanotubes for the last 10 years, and as results in 1999, MER entered into a joint venture with Mitsubishi Corporation and Research Corporation Technology (RCT) forming Fullerene International Corporation (FIC) for the commercialization of Fullerenes. As a result of the overwhelming interest and the near term application potential of fullerenes and nanotubes, the President of Mitsubishi Corporation announced the creation of a $100 million fund to commercialize fullerene-based nanotechnology. This fund will be managed by the joint venture of which Dr. Loutfy is a board member

Dr. Loutfy co-authored a book on fullerenes, contributed a chapter to the encyclopedia of technology on fullerene hydride, contributed 12 chapters to the Proceedings of International Fullerenes Workshop 2001 Tokyo, Kluwer Academic Publishers, and published over 100-reviewed article. He has been quoted in New

York Times (April 19, 2000 issue), NASA Tech Brief June 2000, Fortune Magazine (June 2001 issue), RedHerring July 18 2001, Smalltimes Nov 8 2001, Chemical week Dec 12 2001, and Smalltimes July 2002 for his vision for scale up and applications development of fullerenes and nanotubes. Dr. Loutfy has been invited speaker promoting nanocarbon Technology in ASM Material Solution 2001, Nanotechplanet Boston November 2001, Nagano ISNC November 2001, IBF Nanotechnology Investing Forum -- Palm Springs February 2002, Kyoto Industry Meets on Nano-Technology March 2002, Nanotechplanet, San Jose May 2002, and Nanotechplanet Asia, Singapore June 2002

Dr. Loutfy has received six R&D 100 Awards; in addition, he has won the prestigious National Tibbetts award in 1998 and 2001 for outstanding contribution to the commercialization of technologies from the SBIR programs.

Abstract: The discovery of carbon nanotubes has opened up many new areas of research and development. The challenge so far has been to apply the unique properties of these novel materials to a real world application. In particular, applications have been slowed by the lack of an economical method to produce large-area dispersible of carbon nanotubes with good uniformity. MER/TMC's *C*-Mats are a revolutionary way to harness the properties of carbon nanotubes without the necessity to separate or align them. Our proprietary manufacturing technique produces the *C*-Mat directly from the reactor. The *C*-Mat is ready for use as a component in a number of exciting applications, including:

- **Filtration media** such as bio-filters for use in liquids and gases for applications ranging from drug manufacturing to water purification to gas separation.
- **Composite materials** showing increased mechanical strength, electrical conductivity and other physical properties
- **Electron-emitting cathodes** for back-lighting and other display applications. Also as high current point sources.
- **Transparent, conductive flexible films** as a replacement for Indium Tin Oxide, ITO (which cracks and degrades)

The advantage of using our C-mat for these applications will be addressed.

SESSION I TOPIC 3

High Throughput Mass Spectrometric Immunoassays in Human Plasma Profiling and Targeted Protein Analysis

Randall W. Nelson, Ph.D.

Director of the Molecular Biosignatures Analysis Unit, Biodesign Institute, Arizona State University
Research Professor and Adjunct Professorship in the Departments of Chemistry and Biochemistry, Arizona State University
President and CEO, Intrinsic Bioprobes, Inc

The focus of Dr. Nelson's career has been primarily on the development of mass spectrometric technologies and methods for the characterization of biomolecules residing in various biological milieu. In 1986 he received his BS in Chemistry from Eastern Oregon State College (LaGrande, OR), and in 1990 received his Ph.D. in Chemistry from Arizona State University (Tempe, AZ), where, under the mentorship of Prof. Peter Williams, his thesis topic was the development of laser desorption/ionization approaches from frozen aqueous media for the mass spectrometry of DNA. From 1990 – to – 1993, Dr. Nelson occupied the roles of Senior Research Scientist and Product Manager at Vestec Corp. (Houston, TX, subsequently bought by Applied Biosystems, Inc.), where he oversaw the development of the world's first commercial line of MALDI-TOF mass spectrometers. From 1994 – to – 1997, he returned to the Dept. of Chemistry & Biochemistry at ASU as an Academic Professional/Visiting Assistant Prof. During this time, he developed a number of proprietary methods and devices for the detailed analysis of proteins from biological fluids. These technologies include mass spectrometric immunoassay (MSIA), bioreactive mass spectrometer targets (BRP) and surface plasmon resonance mass spectrometry (SPR-MS). From 1997 – 2006, Dr. Nelson undertook the roles of President and CEO of Intrinsic Bioprobes, Inc (Tempe, AZ), which he co-founded to commercialize these technologies. Currently, Dr. Nelson is Director of the Molecular Biosignatures Analysis Unit within The Biodesign Institute at Arizona State University, where he also holds the position of Research Professor and Adjunct Professorship in the Dept. of Chemistry & Biochemistry. One of the objectives of the MBAU/BDI is to apply the novel proteomics and mass spectrometric technologies and methodologies to the study and understanding of diseases the human populations. Dr. Nelson has published ~ 100 peer-reviewed manuscripts regarding biological mass spectrometry and proteomics, and is inventor or co-inventor on 22 issued and ~ 25 pending patents covering mass spectrometric technologies and methods.

Abstract: Critical to using MALDI-TOFMS based platforms for disease diagnostics is the need to transcend from the general profiling of proteins to the specific targeting of panels of proteins. The value of such targeted approaches lies

in the ability to generate data on only the specific molecular determinants relevant to the disease. Thus, it is important to reduce significant findings from any clinical (proteomics) study to its essential components, try to understand the physiological relevance of such findings, design targeted multiplexed assays and analyze thousands of real-world samples – i.e., to meet some fundamental criteria for a diagnostics platform. Over the past decade we have devoted much effort to meeting these objectives, in the form of Mass Spectrometric Immunoassay (MSIA).Data from studies will be given to illustrate the high throughput application of MSIA in targeted plasma proteome analysis. In one example, MSIA was used to characterize a panel of 25 proteins from the (blood) plasma of 96 healthy individuals. In each instance, the targeted-protein was characterized for each individual as wild-type or non-wild-type, and if non-wild-type, the identity of the variant was determined. From these collective data, the frequency of occurrence of each variant was established for the 96-individual cohort, as well as semi-quantitative data regarding relative abundance of the variants. In all ~ 2,500 targeted analyses were performed, which resulted in the observance of > 75 protein variants within the 96-individual cohorts (as opposed to the observation of 25 wild-type proteins). Based on these initial findings, proteins in disease-state samples were screened using identical MSIA protocols to evaluate potential structural changes related to the disease(s). Findings will be presented from targeted MSIA analysis of cardiovascular disease and cancer samples, and how these findings are used to develop second and third generation multiplexed MSIA assays for use in disease detection.

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SESSION II – International Nanotech

Chair: Donna Kent

Speakers:
Dr. Sylvain Charbonneau
Matthew A. Goldstein, Esq.
Dr. Simon Fafard

SPEAKERS

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SESSION II – Chair: International Nanotech
Donna Kent

President, Arizona Technology Council; Founder
President, ThunderBay Consulting

Donna resides in Scottsdale, Arizona, with her husband Tom and their two children Victoria, age 14, and Jack, age 9. They moved to Arizona 9 years ago with Xerox Corporation. Donna and Tom grew up in Long Island, NY. Donna attended Long Island University at the CW Post Campus. She spent one year abroad in Florence, Italy with Syracuse University studying the arts and international economics. Donna graduated Magna cum Laude with a dual degree in English and English Education.

Donna Kent enjoys over 25 years of outstanding business performance holding positions such as: COO, VP/GM and Division President. As a senior manager with Xerox Corporation, she is Malcolm Baldridge trained, certified and awarded. Over her vast career with Xerox she earned 9 significant promotions and held responsibility for their largest field operation of over 2000 employees and a P&L responsibility of 350 million. In this role she managed the direct business, channel, and the outsourcing division.

As a company vanguard, she developed, tested and measured forward field strategies for national and global adoption. Her business acumen includes strong financial knowledge and the operational understanding of running a complex organization. She led the evolution of various company transitions. She has experience with developing innovations, and applying such into a profitable and integrated business model.

Having accountability for many strategic and global clients, she appreciates the art and discipline of sales and marketing. Strategically Donna has had first hand experience in CRM and the new Customer Experience genre. As a Director within Corporate Marketing, she has a keen focus and well-educated passion for the customer, and the processes needed to deliver Customer Delight. As an executive of many integrated business, Donna has the knowledge needed to balance complex business challenges with the financial needs of the organization and the achievement of overall goals and strategies.

With her broad based business acumen, she was recruited as COO for a fast growing company out of Kirkland WA. In this role she directed manufacturing operations and managed all customer-facing operations.
Within the manufacturing arena she revamped financial methodologies and streamlined the operation to optimize profitability. In the customer facing area, she had responsibility for designing and managing the after sale organizations to ensure post sale revenue growth and customer compliance. As an executive of the company, she instituted a new financial model that is the platform for their growth to 100 million and the next round of investment.

Having co-founded Thunder Bay Paper Corporation 16 years ago with her husband; she decided to test her entrepreneurial spirit and became President and founder of her own business: ThunderBay Consulting. Donna supports clients who want to create new business strategies and alliances, who require "Go to Market" expertise, process and operational improvement, and sales assessment and training. In doing so, she forged strong alliances within the Document Management industry, became a VAR for several national learning organizations and is a facilitator for international sales training.

Donna Kent is a certified educator for the State of Arizona; a trained facilitator, Baldridge awarded, and is certified to conduct Business and Financial Acumen Training.

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SESSION II Topic 4
The Path to Manufacturing Nano-Photonics Components

Sylvain Charbonneau

Director, Applications Technologies
Institute for Microstructural Sciences
National Research Council Canada

Sylvain Charbonneau received the Ph.D. degree in semiconductor physics from Simon Fraser University, British Columbia, Canada in 1988. In l988 he joined the Institute for Microstructural Sciences of the National Research Council of Canada. For a period of 10 years, he became involved in a number of research activities within the institute and led such programs as wavelength routing and switching and more exploratory research efforts like the nano-photonics program. He has published over 180 papers and has sixteen patents granted or pending in the field of optoelectronics.

From 1998 to January 2000, Dr. Charbonneau took on the responsibility of Director of Components Technologies for the Institute for Microstructural Sciences. His responsibilities included components related research and development programs for the Institute as well as the initial development phase of the newly funded Canadian Photonic Fabrication Center (CPFC). In 2000, Dr. Charbonneau founded an optoelectronic components company and served as Chief Technology Officer. In 2002, he returned to the Institute for Microstructural Sciences as the lead Director responsible for the management and operation of the CPFC. He is an Adjunct Professor at four Canadian universities and sits on six national and international Boards of photonics related organizations.

Abstract: The Canadian Photonics Fabrication Centre (CPFC) is an industrial grade, pure-play foundry offering a comprehensive suite of services in both III-V semiconductor (GaAs and InP) and silicon-based materials for organizations in Canada and around the world interested in developing leading-edge photonic devices down to the nanometer scale. CPFC has been designed, equipped and staffed to facilitate innovation in all areas of photonics applications, including telecommunications, health, energy, the environment, defense and security. Its mission is to facilitate the commercialization of photonic devices by de-risking technology and investment by providing a world-class, industrial grade facility that bridges the gap from innovation to product. CPFC services include design & modeling, epitaxy, fabrication, and test & characterization. Services range in complexity from feasibility studies to single-step foundry deliverables to complete custom solutions.

One of the technical offerings of the CPFC is in the delivery of fine pitch gratings which are required for a variety of devices such as optical filters, semiconductor lasers and sensors for bio-medical applications. Various lithographic techniques are commercially available for fabricating gratings, with the choice depending on the type of grating required, cost and volume of manufacture. It is possible to use state of the art high-resolution projection steppers, common to silicon device manufacturing, for half pitch gratings down to 65 nm, but for much smaller volume manufacturing of photonic devices these tools have a prohibitive cost of ownership. Thus, remaining techniques for sub 120 nm half pitch gratings are holography, electron beam lithography, and nano-imprint lithography. Nano-Imprint lithography, the most recent addition to the suite of lithographic techniques, is an effective technique to duplicate nanoscale patterns for several kinds of industrial applications. In this presentation we compare, characterize, and discuss the practical application of these three methods, which are all accessible through the CPFC fabricating nano-photonic components and devices.

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SESSION II – TOPIC 5
Navigating United States Export Controls on Nanotechnology

Matthew A. Goldstein, Esq.

Snell & Wilmer L.L.P.

Matthew Goldstein is an attorney in the Tucson, Arizona, office of Snell & Wilmer L.L.P. where he is a member of the firm's Export Controls and Economic Sanctions Industry Group. His practice is concentrated in the areas of commercial litigation and export controls compliance for military, commercial, and dual use items and technologies.

Matthew's recent presentations and publications include coverage on such topics as export controls and economic sanctions; government restrictions on international travel with laptop computers; how export controls affect the practice of law; reducing company exposure to terrorism related claims; and consideration of export controls and foreign transactions and practices regulations in merger, acquisition, and divestiture activities.

Matthew has represented electronics manufacturers in the export of defense articles and wireless telemetry products to Australia, Canada, England, and the Middle East. He has also provided consultation to manufacturers in the analysis of commodity jurisdiction and commodity classification requests to the Department of State Directorate of Defense Trade Controls and Department of Commerce Bureau of Industry and Security.

Matthew is admitted to practice in the Supreme Court of Arizona, United States District Court for the District of Arizona, United States Court of Appeals for the Ninth Circuit, and the United States Court of International Trade.

His academic background includes a Juris Doctor degree from Arizona State University College of Law and a Master of Arts degree from the Nelson Rockefeller College of Public Affairs and Policy at the State University of New York, Albany.

Abstract: Nanotechnology research projects often rely on U.S. Department of Defense funding through such agencies as the Defense Advanced Projects Research Administration or the Defense Threat Reduction Agency. Such projects, and the very nature of certain nanotechnology applications that can serve both commercial and military purposes, implicate the potential for government imposed restrictions on transfers of information. This presentation will discuss the present-day applicability of U.S. export control regulations to nanotechnology as well as emerging industry and government perspectives on developing controls applicable to the transfer of products and technology derived from nanotechnology research.

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SESSION II TOPIC 6

High Efficiency Solar Cells for Concentrated Photovoltaic (CPV) using Semiconductor Nanostructures

Dr. Simon Fafard

President and CTO, Cyrium Technologies Incorporated

Dr. Simon Fafard has over 15 years of Optoelectronics experience covering the complete product development cycle: from innovative R&D, material research and engineering, new product design and prototyping.

A pioneer in the field of quantum dots and their applications, he is currently the President & CTO of Cyrium Technologies, a VC-backed startup in Ottawa commercializing high efficiency III-V solar cells using semiconductor nanostructures.

Abstract: The presentation will review the approach of using semiconductor nanostructures to optimize the efficiency of III-V semiconductor solar cells used for Concentrated Photovoltaic (CPV) power generation to obtain clean renewable electricity. The optical properties of semiconductor quantum dots are tailored using otherwise standard MOCVD growth processes to increase the infra-red absorption and therefore improve the device performance for such applications where the conversion efficiency can translate directly into a lower cost ($/Watt).

AFTERNOON SESSION

KEYNOTE

Patti Glaza

SPEAKERS

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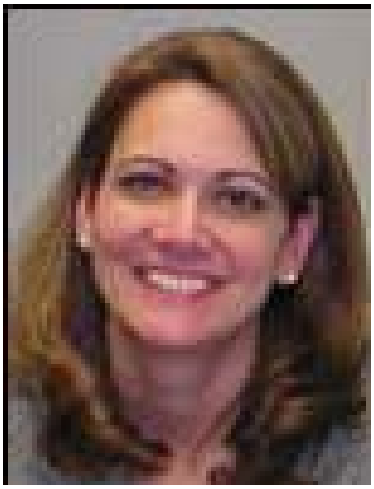

AFTERNOON KEYNOTE: IMPACT of NANOTECHNOLOGY

Patti Glaza

Group Publisher of Small Times
Vice President PennWell Corporation

Small Times is an international business publication group covering the fast-emerging nanotechnology, MEMS, and microsystems markets. Founded in 2001, it is the leading source of news and analysis for micro and nanotechnologies, detailing technological advances, commercial applications, and investment trends to help business and technology leaders and top researchers stay informed and make critical decisions for their organizations. Small Times is published by PennWell Corporation, a diversified global media and information company based in Tulsa, Oklahoma, and with offices worldwide. Ms. Glaza leads the Small Times' publishing group, focusing on strategy, marketing, and business development. Prior to the acquisition by PennWell in late 2004, Ms. Glaza served as the company's CEO. Before coming to Small Times Media, Ms. Glaza was Director of Business Development, Marketing and Client Services at HealthMedia, a fast-growing technology and health management start-up company. Prior to HealthMedia, Ms. Glaza worked at Avalon Investments, a venture capital company focused on technology company financing. Ms. Glaza started her career as a consulting professional and manager in the logistics, business services and retail industry groups for Andersen Consulting (now Accenture). Ms. Glaza is a graduate of Michigan State University from the James Madison and Honor's Colleges with a Bachelor's Degree in International Relations and Economics. She earned a Masters in Business Administration from the University of Michigan, Ann Arbor.

Abstract: In a world full of macro challenges like sustainable energy, clean water, affordable healthcare, it is the nanoworld that we are turning to for solutions. While revolutionary changes are still on the horizon, we must look at the evolutionary development of these emerging technologies to understand the progress we have made and the amazing potential still to be realized.

The commercial impact of nanotechnology in consumer and industrial applications is growing rapidly. It is difficult to walk into a store or mall and NOT find a product that has a nano connection. However there are real threats that must be addressed. The public markets have yet to value nanotechnology. Standards are still in their infancy. And while the human and environmental benefits of nanotechnologies far exceed the risks, the public relations battle is starting to put both nanotechnology commercial activity and research funding in jeopardy.

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SESSION III – Technology of Nano

Chair: Dr. Sayfe Kiaei

Speakers:
Dr. Sandwip Dey
Dr. Timothy S. Cale
Morry Marshall

SPEAKERS

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SESSION III – Chair: Technology of Nano

Dr. Sayfe Kiaei

Director, Connection One Center & WINTech Programs
Professor
IEEE Fellow
Arizona State University
Ira A. Fulton School of Engineering

Dr. Kiaei has been with ASU since January 2001. He is currently a Professor and the Director of the Connection One Center (NSF I/UCRC Center) and WINTech Programs in the Ira A. Fulton School of Engineering.

From 1993 to 2001, he was a Senior Member of Technical Staff with the Wireless Technology Center and Broadband Operations at Motorola where he was responsible for the development of Wireless Transceiver IC's, and Digital Subscriber Lines (DSL) transceivers.

Before joining Motorola, Dr. Kiaei was an Associate Professor at Oregon State University from 1987-1993 where he taught courses and performed research in digital communications, VLSI system design, advanced CMOS IC design, and wireless systems. Dr. Kiaei assisted in the establishment of the Industry-University Center for the Design of Analog/Digital ICs (CDADIC) and served as a Co-Director of CDADIC for 10 years.

He has published over 50 journal and conference papers and holds several patents and his research interests are in wireless transceiver design, RF and Mixed-Signal IC's in CMOS and SiGe. His research projects are funded by a large number of industrial sponsors including Motorola Inc., Intel, the National Science Foundation, Texas Instruments and SRC. He has published more than 75 journal and conference papers and holds several patents. Dr. Kiaei is an IEEE Fellow and a member of IEEE Circuits and Systems Society, IEEE Solid State Circuits Society, and IEEE Communication Society. Dr. Kiaei has been organizer, on the technical program committee and/or chair of many conferences, including: RFIC, MTT, ISCAS, and other international conferences.

Ph.D.: Washington State University, 1987

SESSION III TOPIC 7

A NanoCeramic Vector for Cancer Therapy and Molecular Imaging

Dr. Sandwip K. Dey

Professor, School of Materials,
Center for Interventional Biomaterials and Department of Electrical Engineering
Ira A. Fulton School of Engineering
Arizona State University

Sandwip K. Dey received his Ph.D. in 1984 from New York State College of Ceramics at Alfred University, in Alfred, NY. After completing a post-doctoral fellowship at the University of Illinois, Urbana-Champaign, he joined the Arizona State University faculty in 1987. Currently, he is a tenured Professor in the School of Materials, and affiliated with Electrical Engineering and Center for Interventional Biomaterials. He has focused his efforts on the processing science of nanoparticles, and epitaxial and polycrystalline films of metals and ceramics by chemical precipitation, sol-gel, MOCVD, and ALCVD for advanced electronics and medicine.

Sandwip K. Dey has received the President's Award from California Institute of Technology and the Ranier Zuleeg award from the ISIF Organization. He has over 100 peer-reviewed publications, 200 presentations, two book chapters, one US patent, and two patent disclosures. He was the Editor of Electroceramics in the *Encyclopedia of Advanced Materials and Technology* (Elsevier, 2001), and Technical Program Chair and Editor of Proceedings of the 8th, 17th and 18th *International Symposium on Integrated Ferroelectrics* (Gordon and Breach Publishers, 1996; Taylor and Francis, 2005, and 2006).

Abstract: Drug delivery platforms based on nano-sized geometries (aka nanovectors) hold high potential to improve the safety and efficacy of bioactive and biochemical (or pharmaceutical/therapeutic) agents. To support and protect these bio-molecular agents from rapid degradation, polymeric formulations utilizing nanoparticles, micro/nanospheres, nanocapsules, nanosuspensions, micelles, liposomes, and dendrimers have been the focus of intense research. Additionally, imaging agents and affinity ligands have been incorporated or conjugated to such nanovectors for targeting and detecting specific physiological targets (e.g., vasculature, cancer cells). The benefits offered by these polymeric platforms include reduced drug toxicity and side effects, lower dosage and enhanced drug potency, as well as an increase in number of drugs that can be utilized as therapeutic agents.

Non-metallic, inorganic ceramics, offering a wide variety of desirable properties, are also an attractive class of biomaterial due to inherent biocompatibility and stability in physiological environments. Layered double hydroxide nanoparticles (LDHN) have been extensively studied since the mid-19th century for a variety of applications including antacids, catalysts, anion exchangers, and adsorbents. However, only since 2001, LDHN have been evaluated as a potential vector for drug and non-viral gene delivery. The positively charged cationic sub-layers are counterbalanced by negatively charged anions. These internal anions, which are ionically-bonded, have been readily exchanged (or bio-hybridized) with a variety of negatively charged bio-molecular agents including carboxylic acids, amino acids, nucleoside phosphates, proteins, DNA, ATP, vitamins, and cancer drugs. Moreover, the bio-hybridized (Mg^{2+}, Al^{3+}) LDHN platform has been evaluated *in vitro* as a passive vector for drugs and non-viral gene delivery, but developments are at their stage of infancy today.

The focus of this presentation is to (1) specify the documented attributes of LDHN as a ceramic nanovector for passive targeting, (2) identify the issues in and potential attributes of LDHN for active targeting, (3) judiciously select physiologically relevant and safe LDHN compositions, and demonstrate their synthesis, (4) demonstrate surface activation of LDHN; a critical first step towards surface functionalization for eventual active targeting, and (5) describe the amenability of the structure to build in molecular imageability. Finally, a few strategies to build in multimodalities with respect to therapy and imaging will be outlined and these ideas reinforced with preliminary experimental results.

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SESSION III TOPIC 8

Virtual Processing of Nanostructured Materials

Timothy S. Cale

Faculty Member, Department of Chemical Engineering
Rensselaer Polytechnic Institute
Directs the Focus-Center, New York, RPI
President, Process Evolution, Ltd.

Dr. Timothy S. Cale received his B.S.Ch.E degree from Arizona State University, Tempe, AZ, in 1976, and his Ph.D. in Chemical Engineering from the University of Houston in 1980. He was a professor in the Department of Chemical, Bio and Materials Engineering at Arizona State University (ASU) from 1981 to 1998.

He has been actively involved in microelectronics related research since 1989, and has about 250 publications in the area. He served as Director of the Center for Solid State Sciences at ASU from 1993 to 1995. From 1990 through 1997, he consulted regularly in the Advanced Technology Center at Motorola, Inc., where he also spent a sabbatical year and a year as an assignee from ASU. During that timeframe, he developed EVOLVE, a software package that simulates processes used to fabricate ICs. His research focused on experimental and modeling aspects of deposition, etch and think film flow processes. Dr. Cale moved to Rensselaer Polytechnic Institute in 1998, where he is a faculty member in the Department of Chemical Engineering. He also Directs the Focus-Center, New York, RPI, which is the RPI part of the MARCO/DARPA supported Interconnect Focus Center. His current research interests are property and performance predictions using multi-scale modeling and simulation, particularly relating to three-dimensional wafer scale integration.

Dr. Cale is also President of Process Evolution, Ltd., a software and consulting company that focuses on helping companies understand unit operations and process integration issues. He is a member of MRS, ECS, AVS, AIChE and IEEE, and participates in organizing conferences for these organizations and several specialty conferences; e.g., the Advanced Metallization Conference. He is an Associate Editor for IEEE Transactions on Semiconductor Manufacturing.

Abstract: Virtual fabrication, that is process modeling and simulation, has long been used to help develop and refine processes to make reliable products. Over the years, more and more physics have been added to the models, making them more predictive and useful in studies of product manufacturability and reliability. We discuss aspects of the virtual fabrication of nanostructures in integrated circuits, with an emphasis on introducing ‘grain-focused’ modeling and simulation. For some systems, grain-focused models can provide information that traditional continuum and atomistic models cannot.

SESSION III TOPIC 9

The Semiconductor Production Nanotechnology Dimension

Morry Marshall

VP Strategic Technologies
Semico Research Corp.

Morry Marshall is responsible for introducing and developing Semico market research for emerging strategic semiconductor technologies. Morry brings more than thirty years of semiconductor industry and market research experience to this task, including progressive experience in sales, sales management and marketing management positions. During that time, he was involved with semiconductor industry breakthrough products such as semiconductor memory for the first personal computers and LED displays for the first handheld electronic calculators.

After graduating from the United States Military Academy, West Point, NY in 1961, Morry served as an Armored Cavalry platoon leader. When a line-of-duty medical retirement ended his military career, he transitioned into the electronics industry.

Abstract: The semiconductor industry has kept pace with Moore's law for several decades by continuing improvements to lithography technology; but, beyond the 32 nanometer technology node, further refinements may not be technically or economically feasible. A point will be reached where features sizes will be measured by the thickness of only a few atoms. Something new will be needed. The nanotechnology community may have answers to this problem, but it needs to understand the volume requirements of the semiconductor industry. In addition, a communications bridge needs to be established between nanotechnology research and semiconductor production equipment and manufacturing engineering. This presentation will provide information about the semiconductor industry to facilitate building that bridge.

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SESSION IV – Nanotech and Finance

Chair: Dr. Papu Maniar

Speakers:
Dr. Alexei Andreev
Jeff Jones
Sharon Rehbinder

SPEAKERS

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SESSION IV – Chair: Nanotech and Finance

Dr. Papu Maniar

Leads the Physical Technologies Laboratory within Motorola's Embedded Systems research organization within Motorola's Corporate Technology Organization

Papu leads the Physical Technologies Laboratory, within Motorola's Embedded Systems research organization, which is focused on investigating micro- and nano- scale materials, processes, and characterization technologies.

He more than 25 issued patents and at least 25 publications.

Papu has a Ph.D. in Geology from the University of Pittsburgh and was a Postdoctoral Fellow at Princeton University in Experimental Thermodynamics.

Papu Maniar can be contacted by email at Papu.Maniar@motorola.com

SESSION IV TOPIC 10

Nanotechnology Investment Climate

Alexei A. Andreev, Ph.D.

Executive Vice President / Managing Director
Harris & Harris Group since 2005

Prior to joining Harris & Harris Group, Mr. Andreev was an Associate with Draper Fisher Jurvetson (DFJ), a venture capital firm, where he was exclusively focused on nanotechnology and material science investment opportunities. While at DFJ, he played an integral role in sourcing and funding EoPlex, Intematix, Solicore and D-Wave Systems, for which companies he served as an active Board Director or Observer.

Previously, he worked for TLcom Capital Partners, a London-based venture capital fund backed by Morgan Stanley. Prior to that, he was employed by Renaissance Capital Group/Sputnik Funds, a venture capital fund in Moscow, Russia.

Before he started his business career, he was a researcher at the Centre of Nanotechnology, ISAN (RAS), in Troitsk, Russia, where he was focused on optical and electrical properties of Quantum Dot heterostructures

He was graduated from the Department of Theoretical Physics of Moscow Steel & Alloys Institute with a Ph.D. degree, where he was a recipient of the Scholarship for Outstanding Young Scientists of Russian Academia of Sciences, the Scholarship from the International Center of Fundamental Physics and Soros Scientific Foundation. He also was graduated from Moscow Steel & Alloys Institute with a B.S. with honors in Engineering/Material Sciences and from Stanford Graduate School of Business with an M.B.A.

He is a co-founder and Director of the American Business Association of Russian Expatriates (AmBar).

SPEAKERS

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SESSION IV TOPIC 11

Nano Measurements, AFM, and Why Agilent is in Phoenix

Jeff Jones

AFM Operations Manager
Agilent AFM Business Operations
Agilent Technologies, Inc.

Jeff Jones has over 20 years experience in sales, marketing, and R&D management positions. He is currently responsible for Molecular Imaging's integration into Agilent and leading the sales and marketing for this new line of high performance AFMs. Previously he was marketing manager for Agilent's Operation Support System (OSS) Business unit, worked in R&D and marketing for Agilent's Optical Networking Division, and marketing manager for the Telecom Systems Division in Edinburgh Scotland.

Jones has a BSEE from Lafayette College and an MBA from George Washington University.

Abstract: This presentation will review why Agilent, the measurement company that was spun out of Hewlett-Packard in 2000, chose to pursue a business in Nanotechnology. This will be followed by a review of why Agilent choose Molecular Imaging, a leading manufacturer of atomic force microscopes (AFM), as its initial step into the Nanotech market. The presentation will close with some thoughts on why Agilent chose to keep the business in the greater Phoenix area.

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SESSION IV TOPIC 12 Public/Private Funding of Nanotechnology in Grenoble, France

Sharon Rehbinder

Director for North America, AEPI, the Grenoble-Isere, France, Economic Development Agency

Sharon Rehbinder joined AEPI, the Grenoble-Isere, France, Economic Development Agency, as its Director for North America in 2001. In this capacity, and based in Los Angeles, she is responsible for providing, to US and Canadian companies, complimentary services and information relating to developing business and establishing a presence in the Grenoble area, silicon valley of France. Grenoble is among Europe's top three centers for micro- and nanotechnologies. Sharon also works closely with, for example, Minatec/CEA (LETI lab for electronics, IT and nanobio, LITEN for new energies and nanomaterials, etc.) and other public and private partners in search of partnerships, collaborations and contacts.

She has spoken about nanotechnology in France at various conferences over the past several years.

Prior to AEPI, Sharon served as Director of Communications for the Invest in France Agency (IFA), North America, where she started in 1996 as an investment advisor. Sharon reported from Los Angeles to the agency's headquarters in New York City and to the main office in Paris, France. Before this position, Sharon spent a total of 8 1/2 years at the Consulate General of France in Los Angeles; first as Assistant to the Press Attaché, then as Assistant to the Deputy Consul General.

She is a graduate, cum laude, of California State University, Northridge. Her B.A. degree in French Language and Culture included a year at L'Institut d'Etudes Francais pour Etudiants Etrangers, in Aix-en-Provence.

Abstract: A look at nanotech funding in France, with a detailed examination of the "Competitive Cluster" model via the Minalogic cluster in Grenoble. In late 2004, the French government began the process of identifying clusters and earmarked a total of €1.5 billion in funding for 2006 to 2008, including €300 million in social security and tax exemptions. A combination of industry, research community and education institutions located within a well-defined geographical area, clusters include partners that are all involved in partnerships that create synergies around innovative projects, and together they must reach a critical mass/ threshold for international visibility. Minalogic, a micro-nanotechnologies and embedded software consortium currently comprised of 79 companies, is a stellar example of an international-level competitive cluster. Among the members are 48 companies, including 33 SMEs (70%), 10 research centers and universities, and other local partners. The goal of the Minalogic cluster is to encourage innovation, speed up commercialization and move the competition battle from the field of production costs, to that of innovation speed, and enriched product feature sets & services.

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PANEL DISCUSSION – Business Challenges of Nanotech

Moderator: Jim Jindrick

Panelists:
Dr. Alexei Andreev
Gary Emmett
Dr. Stephen Goodnick
Dr. Papu Maniar
Amy Corinne Smith
Sandra Watson

PANEL DISCUSSION – MODERATOR: BUSINESS CHALLENGES of NANOTECH

Jim Jindrick

Mentor-in-Residence and Entrepreneurial Fellow
Eller College of Management
University of Arizona

Jim Jindrick has 30+ years high-tech management experience encompassing strategic planning, business development, product research and engineering, international marketing, and manufacturing operations. He was responsible for the development of over 30 products and business ventures, and received seven U.S. utility patents. Jim is currently a Mentor-in-Residence and Entrepreneurial Fellow in the Eller College of Management at the University of Arizona. He has also served as a MOOT CORP Fellow at the University of Texas and as an Entrepreneur-in-Residence at the University of Oregon. He received his engineering and business education at the University of Wisconsin.

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PANELIST: Alexei A. Andreev, Ph.D.

Executive Vice President / Managing Director
Harris & Harris Group since 2005

Prior to joining Harris & Harris Group, Mr. Andreev was an Associate with Draper Fisher Jurvetson (DFJ), a venture capital firm, where he was exclusively focused on nanotechnology and material science investment opportunities. While at DFJ, he played an integral role in sourcing and funding EoPlex, Intematix, Solicore and D-Wave Systems, for which companies he served as an active Board Director or Observer.

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PANELIST: Gary Emmett

Sr. Associate at Stantec Consulting Inc.
Advisory board member of the Canada Arizona Business Council
Board member and northern Arizona coordinator for the Arizona Optics Industry Association (AOIA)

Mr. Gary L. Emmett is a Sr. Associate at Stantec Consulting Inc. and manages Stantec's Arizona mechanical and electrical engineering group. Gary is an advisory board member of the Canada Arizona Business Council and a board member and northern Arizona coordinator for the Arizona Optics Industry Association.

His 30 plus years of design and construction project management experience includes semiconductor, national science laboratory, copper refining, municipal water and wastewater, petrochemical, power utilities and federal market segments.

Mr. Emmett is Registered Professional Electrical Engineer in Arizona and New Mexico. He is a Centennial Distinguished Alum, New Mexico State University, in recognition of contributions to the Integrated Circuit Manufacturing Industry. Gary is a member of IEEE and ISA and served on the IEEE Industry Applications Society – 1999 Annual Meeting Committee. He is also active in the Alliance for Construction Excellence – a non-profit organization at Arizona State University established to advance, connect and enrich the construction industry.

Gary's current projects include a sustainable business-class hotel, high performance data center and concentrating solar power plant.

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PANELIST: Dr. Stephen Goodnick

Associate Vice President for Research at Arizona State University
Fellow of the Institute of Electrical and Electronics Engineers (IEEE)
Alexander von Humboldt Research Fellow

Steve Goodnick is associate vice president for research at Arizona State University. As one of ASU's most successful researchers over the past decade, Goodnick's research specializations lie in solid-state device physics, semi-conductor transport, quantum and nanostructure devices and device technology, and high frequency devices.

Goodnick previously served as the interim deputy dean for the Ira A. Fulton School of Engineering at ASU, and earlier as chair of the Fulton School's Department of Electrical Engineering, one of ASU's most active and successful units, and served as President of the Electrical and Computer Engineering Department Heads Association from 2003-2004.

He received his B.S. in engineering science from Trinity University in 1977, and his M.S. and Ph.D. degrees in electrical engineering from Colorado State University in 1979 and 1983, respectively. Germany, Japan and Italy are among the countries he has served as a visiting scientist.

Goodnick is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) and an Alexander von Humboldt Research Fellow. Other honors and awards he has received include the IEEE Phoenix Section Society Award for Outstanding Service (2002), the Colorado State University College of Engineering Achievement in Academia Award (1998), and the College of Engineering Research Award (Oregon State University, 1996). He is a member of IEEE, the American Physical Society, American Association for the Advancement of Science, and the American Society of Engineering Education.

His publication record includes more than 165 refereed journal articles, books and book chapters related to transport in semiconductor devices and microstructures.

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PANELIST: Dr. Papu Maniar

Leads the Physical Technologies Laboratory within Motorola's Embedded Systems research organization within Motorola's Corporate Technology Organization

Papu leads the Physical Technologies Laboratory, within Motorola's Embedded Systems research organization, which is focused on investigating micro- and nano- scale materials, processes, and characterization technologies.

He more than 25 issued patents and at least 25 publications.

Papu has a Ph.D. in Geology from the University of Pittsburgh and was a Postdoctoral Fellow at Princeton University in Experimental Thermodynamics.

Papu Maniar can be contacted by email at Papu.Maniar@motorola.com

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PANELIST: Amy Corinne Smith

Senior Vice President
Global Technology Group
Lehman Brothers

Amy Corinne Smith is a Senior Vice President in the Global Technology Investment Banking Group based in Menlo Park, CA. Ms. Smith joined the Firm in its London office in October 1997 to help establish Lehman Brothers' European Leveraged Finance Group.

Ms. Smith heads the Firm's solar energy investment banking activity and also advises certain public and private semiconductor and nanotechnology companies. Ms. Smith maintains relationships with numerous leading solar companies including BP Solar, Canadian Solar, Energy Conversion Devices, E-ton, MEMC Electronic Materials, Motech, Renewable Energy Corporation, SunPower, Suntech and others.

Ms. Smith's semiconductor relationships include Cypress Semiconductor, Fairchild Semiconductor, Freescale, International Rectifier, Intersil, LSI Logic, ON Semiconductor, QUALCOMM, Techwell and others.

Over the years, Ms. Smith has participated as a keynote speaker / panelist in several leading nanotechnology conferences including the NASA Ames Research Nanotechnology Conference, as well as numerous roundtable discussions with government authorities and agencies.

Prior to joining Lehman Brothers, Ms. Smith worked at Bank of America in its Media/Telecommunications and Entertainment Corporate Lending Division.

Ms. Smith graduated Phi Beta Kappa from UC Santa Barbara in 1995.

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PANELIST: Sandra Watson

Senior Director of Workforce and Business Development;
Arizona Department of Commerce
Executive Director, Governor's Council on Innovation and Technology

Sandra Watson works to ensure the needs of Arizona's emerging technology and life sciences industries are being met in Arizona. Her office at the Arizona Department of Commerce is dedicated to providing assistance and resources to accelerate the growth of innovation, technology and entrepreneurship throughout the state.

Sandra has enjoyed incredible success at the Arizona Department of Commerce. She has served as Innovation and Technology Development Director, as well as the Business Development Director. Sandra endeavors to lead efforts that support innovation and technology development throughout the state. Previously she led marketing and site location efforts required to diversify and expand Arizona's employment base.

Under Sandra's leadership, the Business Development Team assisted approximately 230 companies relocating or expanding in Arizona, thus creating over 50,000 jobs in the state from the period of July 1998 – April 2002.

Sandra has an Honors Bachelor of Commerce Degree and has completed the Global Leadership Certificate Program at Thunderbird International Graduate School. Sandra has been designated an Economic Development Finance Professional by the National Development Council.

Sandra is a member of several economic development organizations including: Ex – Officio Board Member for the Arizona Technology Council, Southern Arizona Tech Council, Center for Innovation, and the High Tech Advisory Board for Southern Arizona.

Sandra is married and has three children.

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In 2004 the Government of Canada opened seven new Consulates in the United States including one in Arizona. With offices in both Phoenix and Tucson, there are four Canadian trade commissioners promoting closer trade, commerce, investment and S&T partnerships between Canadian governments, institutions, agencies and private sector firms, and their counterparts in Arizona. Reporting to the Canadian Embassy in Washington, the Consulate represents Canada and the Canadian business community throughout Arizona and New Mexico. Advocacy is also an important part of the job where we discuss the Canadian position on a wide variety of bilateral topics of interest.

To assist you with your questions about Canada, please contact us at
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Snell & Wilmer has grown to become one of the largest full-service law firms in the western United States, with more than 400 attorneys in six offices located throughout the region including, Denver, Colorado; Las Vegas, Nevada; Orange County, California; Phoenix and Tucson, Arizona and Salt Lake City, Utah. Since being established in 1938, the firm's diverse client base of Fortune 500 companies, small businesses, emerging organizations, individuals and entrepreneurs has grown to more than 10,000 businesses and individuals. Over the years, Snell & Wilmer has earned a reputation for providing clients what they value--exceptional legal skills, quick response and practical solutions with the highest level of professional integrity.

Snell & Wilmer's team of over 30 experienced intellectual property attorneys represents clients in the nanotechnology, biotechnology, biomedical, chemical, semiconductors, electronics, computer hardware and software, data processing, image processing, computer vision, metallurgy, fiber optics, organic and inorganic chemistry, space and aviation related technology, telephony, mechanical and electrical engineering, pharmacology and biology, and other technologies. Our proven track-record of working with companies ranging from emerging businesses to Fortune 500 companies in the development of effective and aggressive strategies for protecting intellectual property rights provides our clients with a distinct advantage. Our objective is to understand the goals of our clients, and develop a strategy to help achieve them in an efficient, cost-effective manner. Ultimately, we work to build a structure designed to bring value that can be leveraged for the good of the business, and uncompromisingly protect the structure.

As a large, full-service law firm, Snell & Wilmer provides the competitive advantage of having the ability to call upon the diverse experience of our more than 400 attorneys, which allows us to address the particular and evolving legal issues of any specific engagement. The firm can easily assemble a team of attorneys and support staff for large-scale projects or emergency situations. Following is a list of our main areas of practice. While extensive, is not exhaustive. The legal environment is constantly evolving and, in response to the needs of current and potential clients, Snell & Wilmer frequently expands its areas of practice.

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Copper Sponsor: Intel's Transistor Technology Breakthrough Represents Biggest Change to Computer Chips In 40 Years

Intel Producing First Processor Prototypes With New, Tiny 45 Nanometer Transistors, Accelerating Era of Multi-Core Computing

In one of the biggest advancements in fundamental transistor design, Intel Corporation revealed in January 2007 that it is using two dramatically new materials to build the insulating walls and switching gates of its 45 nanometer (nm) transistors. Hundreds of millions of these microscopic transistors – or switches – will be inside the next generation Intel® Core™ 2 Duo, Intel Core 2 Quad and Xeon® families of multi-core processors. The company also said it has five early-version products up and running -- the first of fifteen 45nm processor products planned from Intel. The company remains on track for 45nm production in the second half of this year at Fab 32, currently under construction in Chandler, Arizona.

The transistor feat allows the company to continue delivering record-breaking PC, laptop and server processor speeds, while reducing the amount of electrical leakage from transistors that can hamper chip and PC design, size, power consumption, noise and costs. It also ensures Moore's Law, a high-tech industry axiom that transistor counts double about every two years, thrives well into the next decade.

Intel® engineer holding 300 mm wafer with 45 nm shuttle test chips

Intel's Transistors Get a "High-k and Metal Gate" Make-Over

Intel is the first to implement an innovative combination of new materials that drastically reduces transistor leakage and increases performance in its 45nm process technology. The company will use a new material with a property called high-k, for the transistor gate dielectric, and a new combination of metal materials for the transistor gate electrode.

"The implementation of high-k and metal materials marks the biggest change in transistor technology since the introduction of polysilicon gate MOS transistors in the late 1960s," said Intel Co-Founder Gordon Moore.

Transistors are tiny switches that process the ones and zeroes of the digital world. The gate turns the transistor on and off and the gate dielectric is an insulator underneath it that separates it from the channel where current flows. The combination of the metal gates and the high-k gate dielectric leads to transistors with very low current leakage and record high performance.

"As more and more transistors are packed onto a single piece of silicon, the industry continues to research current leakage reduction solutions," said Mark Bohr, Intel senior fellow. "Meanwhile our engineers and designers have achieved a remarkable accomplishment that ensures the leadership of Intel products and innovation. Our implementation of novel high-k and metal gate transistors for our 45nm process technology will help Intel deliver even faster, more energy efficient multi-core products that build upon our successful Intel Core 2 and Xeon family of processors, and extend Moore's Law well into the next decade."

For comparison, approximately 400 of Intel's 45nm transistors could fit on the surface of a single human red blood cell. Just a decade ago, the state-of-the-art process technology was 250nm, meaning transistor dimensions were approximately 5.5 times the size and 30 times the area of the technology announced by Intel.

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Grant Thornton has worked with numerous Phoenix technology-related companies. Here is what one of them has to say about Grant Thornton's Technology Industry Practice Group:

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Chuck Vermillion, CEO
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