

**Materials Research Outreach Program Symposium  
February 5-6, 2013, Corwin Pavilion, University Center**

**UCSB Participants**

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**Professor Emeritus S. James Allen**  
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S. James Allen, received a Ph.D. degree in electrical engineering from M.I.T. in 1965. He was appointed Professor of Physics and Director of the Quantum Institute at UCSB in 1991, and recently served as Chair of Physics, 2000-05. In 2009 he became emeritus and was appointed Research Professor of Physics. Prior to that, he had been a member of technical staff at Bell Labs, where he was recognized as a “Distinguished Member of Technical Staff”, had availed himself of a Bell Labs supported leave at the Royal School of Mines, Imperial College London and later joined Bellcore as District Research Manager of Solid State Physics Research. He has also been an adjunct professor at Northeastern University and at Princeton University. Professional service has included election as

Member at Large of the Executive Committee of the Division of Condensed Matter Physics of the A.P.S. where he served on the Strategic Planning Committee and on the Nominating

Committee. He has also served on the Editorial Board of Physical Review. In 1995 he won a Humboldt Science Award, is a Fellow of the American Physical Society and a Fellow of the American Association for the Advancement of Science.

Jim has co-authored more than 200 publications on transport and terahertz excitations in semiconductor nano-structures, hot-electron dynamics, high temperature superconductivity, magnetism, superionic conductors, metal physics, clathrate inclusion compounds, protein dynamics and complex oxide heterostructures. He holds three patents. Current research focuses on terahertz dynamics in semiconductor quantum structures far from equilibrium, novel plasmonic terahertz detectors, spin wave logic devices, terahertz dynamics of bio-polymers in solution and 2D Mott systems in complex oxide heterostructures.

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**Professor Leon Balents**  
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Leon Balents is Professor of Physics in the Physics Department and a Permanent Member of the Kavli Institute for Theoretical Physics at the University of California, Santa Barbara. He is active in theoretical condensed matter physics, where his research interests include quantum magnetism, strongly correlated electrons, low-dimensional systems, and topological phenomena in solids. He received his Ph.D. in physics from Harvard University in 1994 and has been on the faculty at UCSB since 1999.

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Professor Bazan obtained his B.Sc. (Honors) from the University of Ottawa and his Ph.D. from the Massachusetts Institute of Technology under the advisement of Professor Richard R. Schrock. After working at the California Institute of Technology as a postdoctoral fellow with advisor Professor John E. Bercaw, he started his academic career at the University of Rochester in 1992. In 1998, Gui became a Professor of Chemistry at the University of California, Santa Barbara. A year later he joined the faculty of the Department of Materials (Engineering) and in June 2000, he became the Director of the Center for Polymers and Organic Solids.

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**Professor Matthew Begley**  
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Matthew R. Begley is Professor of Mechanical Engineering at the University of California, Santa Barbara, and Visiting Professor at the University of Virginia. He received his Ph.D. in Mechanical Engineering from UCSB in 1995, where he developed failure prediction codes for fibrous composites, with an emphasis on high temperature applications. From 1995-1997, Prof. Begley was a post-doctoral fellow at Harvard University. During this time, he worked on the thermomechanical performance of multilayered systems, with an emphasis on material behavior at small scales and the reliability of multifunctional coatings. Prof. Begley joined UCSB in 2010, following faculty positions at the University of Connecticut (1997-2001) and the University of Virginia (2001-2009). While at UVA, his research focus shifted to the intersection of mechanics and chemistry, notably the development of microfluidic point-of-care devices and the structure-property relations of nano-porous metals. Since joining UCSB, Prof. Begley has expanded his research program into bio-inspired composite materials, with an emphasis on high performance materials for energy-dispersive systems and multifunctional layered coatings.

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**Assistant Professor Ania Bleszynski-Jayich**

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Ania Bleszynski Jayich is in her third year as an assistant professor in physics at University of California Santa Barbara. Her research interests include nanoscale scanning probe microscopy of charge and spin, diamond optomechanics, and hybrid quantum systems for sensing and quantum information. She is developing a novel diamond-based scanning probe magnetometer that aims to achieve single spin sensitivity with nm scale spatial resolution, with an eye towards nanoscale magnetic resonance imaging of biological systems and novel materials for classical and quantum computing.

Ania received her PhD in physics from Harvard in 2006 and a B.S. in physics and mathematical and computational science from Stanford in 2000. Her

postdoc was split between Harvard and Yale. She currently holds the Bruker Endowed Chair for Science and Engineering at UCSB. She is also the recipient of the 2012 Presidential Early Career Award for Scientists and Engineers, as well as the Air Force Office of Scientific Research Young Investigator Award.

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**Professor John Bowers**  
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**Fred Kavli Chair in Nanotechnology**  
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John E. Bowers holds the Fred Kavli Chair in Nanotechnology and is the Director of the Institute for Energy Efficiency and a Professor in the Department of Electrical and Computer Engineering. Dr. Bowers received his M.S. and Ph.D. degrees from Stanford University and worked for AT&T Bell Laboratories and Honeywell before joining UC Santa Barbara.

Dr. Bowers is a member of the National Academy of Engineering, a fellow of the IEEE, OSA and the American Physical Society, and a recipient of the OSA Holonyak Prize, the IEEE LEOS William Streifer Award and the South Coast Business and Technology Entrepreneur of the Year Award. He and coworkers received the ACE Award for Most Promising Technology for the hybrid silicon laser in 2007. Professor Bowers' research interests are in silicon photonic integrated circuits for the next generation of coherent optical systems.

John Bowers is interested in energy efficiency and the development of novel low power optoelectronic devices for the next generation of optical networks. His research interests include silicon photonics and integrated circuits, fiber optic networks, thermoelectrics, high efficiency solar cells, and optical switching. Optical switches have the potential to reduce the energy required to switch data by factor of 10,000. Silicon photonics have the potential to reduce the energy require to transmit data on and off chips by a factor of ten or more. A recent collaboration with Intel led to the development of hybrid silicon lasers, which led to a prototype 50 Gbps high-speed optical data link, which is integrated onto silicon.

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Dr. Butler received her Ph.D. from the University of California, San Diego in 1982. She was a NIH Postdoctoral Fellow at UCLA and Caltech before joining the faculty in 1986. She has received an American Cancer Society Junior Faculty Research Award, and is a Fellow of the American Association for the Advancement of Science (AAAS). She has chaired three Gordon Research Conferences: Environmental BioInorganic Chemistry (2006), Metals in Biology (2004) and Marine Natural Products (2002).

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Michael Chabynec is an Associate Professor in the Materials Department. He received his B.S. in Chemistry from the University of Dayton in 1994 and his Ph.D. in Chemistry from Stanford University in 1999. He joined UCSB in 2008 after holding a postdoctoral position at Harvard University (1999-2001), and working as a staff researcher for the Palo Alto Research Center (PARC) from 2005-2009. Current interests include materials for flexible electronics and energy storage and conversion. Particular emphasis is on characterization of the electrical and morphological characteristics of organic semiconductors in thin film transistors and photovoltaics. Hybrid organic devices for energy storage are also of interest. The nature of organic interfaces in thin films is studied using a variety of techniques including x-ray scattering, scanning probe microscopies, and electrical transport measurements.



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Brad Chmelka is a Professor in the Department of Chemical Engineering. He obtained his Bachelors Degree in Chemical Engineering from Arizona State University in 1982, and afterwards worked as a retort startup engineer with Unocal's Parachute Creek Shale Oil Project in western Colorado. He received his Ph.D. in Chemical Engineering from the University of California, Berkeley in 1990. He joined the faculty at UCSB in 1992 after holding postdoctoral research appointments in Physical Chemistry at UC-Berkeley and at the Max-Planck-Institut für Polymerforschung in

Mainz, Germany. His research group focuses on the development of new heterogeneous materials and understanding the molecular origins of their macroscopic properties and functions, particularly using methods of nuclear magnetic resonance (NMR) spectroscopy. Areas of interest for his group are the synthesis and characterization of self-assembled inorganic-organic, porous, and nanoparticle materials for applications in catalysis, separations, electrochemical devices, and opto-electronics. Professor Chmelka is the recipient of a David and Lucile Packard Foundation Award (1993), a Camille and Henry Dreyfus Teacher-Scholar Award (1993), and an Alfred P. Sloan Foundation Research Award (1996). He has been awarded visiting professorships at Chalmers University in Sweden, the University of Rey Juan Carlos and University of Barcelona in Spain, the Weizmann Institute of Science in Israel, and the University of Paris, Jussieu. He currently serves on the Editorial Advisory Board of the journal *Chemistry of Materials*.

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**Professor Michael F. Doherty**  
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Professor Doherty taught at the Universities of Minnesota and Massachusetts (where he reached the rank of University Distinguished Professor) before joining the faculty at UCSB. He has held a visiting appointment at the University of Minnesota in the Spring Quarter of 1981 and was a visiting scholar at the University of California at Berkeley for the 1984 calendar year, and at the CNRS Laboratory in Condensed Matter and Nanosciences, Marseille, France in 2006-07. His research interests are broadly in the area of conceptual process design and include crystal engineering of organic materials, design and synthesis of nonideal separation systems, and separation with chemical reaction. He is the holder of four patents, has published over 150 technical papers and delivered 200 invited lectures; he was awarded best paper of the year in 1993 (jointly with M.F. Malone and Z.T. Fidkowski) and again in 2001 (jointly with M. F. Malone and S. B. Gadewar) by the editors of *Computers and Chemical Engineering*. He is co-author of the textbook, *Conceptual Design of Distillation Systems*, McGraw-Hill (2001), and editor of the distillation chapters in *Perry's Handbook*, and the *Kirk-Othmer Encyclopedia of Chemical Technology*. He has received numerous honors and awards for his teaching and research, including the Computing in Chemical Engineering Award of the CAST Division of the AIChE (awarded jointly with M. F. Malone in 1996), the Alpha Chi Sigma Award for Chemical Engineering Research of the AIChE (2004), the Clarence G. Gerhold Award of the Separations Division of the AIChE (2004) and the Excellence in Process Development Research Award of the Process Development Division of AIChE (awarded jointly with M. F. Malone in 2004). He has served as a consultant for many companies in the area of separations technology, and is a member of the Corporate Technical Advisory Boards for The Dow Chemical Company (2000-present) and Rhone-Poulenc (1997-1999). At the University of Massachusetts Dr. Doherty was Head of Department from 1988-1997, and served as Director of the Center for Process Design and Control (1997-2000). He has been a Trustee of the CACHE Corporation since 1987, and served as its president from 2000-2002. In 1993 he was Chair of the Computing and Systems Technology Division of the AIChE. He serves as a member of the Editorial Boards for *Computers and Chemical Engineering* (1997-present), *Process Systems Engineering Series*, Academic Press (1997- present), *Separation and Purification Methods* (1998-2002), *Industrial and Engineering Chemistry Research* (1995-1998), and *Transactions of the IChemE Part A: Chemical Engineering Research & Design* (2001- 2003).

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Glenn Fredrickson obtained his Ph.D. at Stanford University in 1984 and subsequently joined AT&T Bell Laboratories, where he was named Distinguished Member of the Technical Staff in 1989. In 1990 he moved to the University of California at Santa Barbara, joining the faculties of the Chemical Engineering and Materials Departments. He served as Chair of Chemical Engineering from 1998-2001 and is currently Director of UCSB's Mitsubishi Chemical Center for Advanced Materials (MC-CAM), Director of the Complex Fluids Design Consortium (CFDC), and Executive Director of the KAITEKI Institute in Tokyo, Japan. Professor Fredrickson has a long-standing interest in the statistical mechanics of complex fluids, including polymers, colloids, and glasses. His work is primarily theoretical and computational and

has been most recently focused on field-based computer simulation strategies for anticipating the bulk and interfacial self-assembly of multi-component polymers. Honors include a NSF-PYI Award, a Sloan Fellowship, the Dreyfus Teacher-Scholar Award, the Dillon Medal and Polymer Physics Prize of the American Physical Society, the Alpha Chi Sigma Award of the American Institute of Chemical Engineers, and election to the National Academy of Engineering.

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Deborah Kuchnir Fygenon received a B.Sc., degree (1989) in Physics from the Massachusetts Institute of Technology in 1989, and M.A. (1991) and Ph.D. (1995) degrees in Physics from Princeton University. She spent one year at Rockefeller University in the Center for Studies in Physics and Biology, and then two years at the University of Southern California in the Hedco Molecular Biology labs. She joined UCSB in 1998 as Assistant Professor of Physics. In the field of Materials, her research probes the physical interactions between biomolecular assemblies. She has studied non-equilibrium dynamics of protein aggregation and developed experimental techniques for measuring the interactions between cell-sized unilamellar vesicles and the purified protein

aggregates they contain, either free floating or embedded in the membrane. Her research in Physics focuses on understanding the nature of "conformational change" in a primitive protein (tubulin). This information is valuable for understanding and, eventually, engineering molecular machines.

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Mike Gordon joined UCSB as an Assistant Professor of Chemical Engineering in the fall of 2007. He received his BS/MS in Chemical Engineering from the Colorado School of Mines and was an Intel Fellow at the California Institute of Technology, where he received an MS in Applied Physics (1998) and PhD in Chemical Engineering (2003). Mike was also a Visiting Scientist at Caltech (2006) and spent two years as a post-doc in Grenoble, France at the Laboratoire des Technologies de la Microélectronique (LTM-CNRS). The goal of Mike's research at UCSB is to explore, understand, and exploit the unique physicochemical properties and dynamics of nanoscale systems found in different venues (material science, microelectronics, catalysis, and biology). His approach focuses on the development and application of

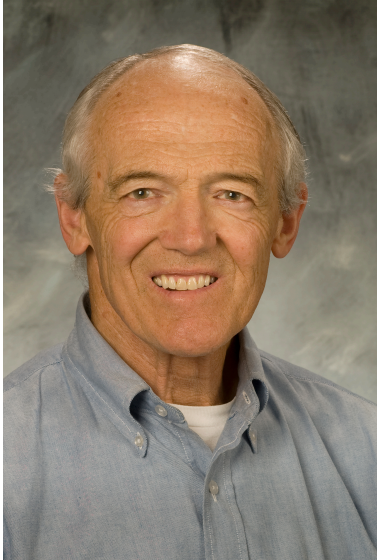
"hybrid" scanning probe microscopy techniques for chemical, optical, electrical, and mechanical interrogation of single nanostructures and surfaces to learn how size, confinement, organization, and surface chemistry affect behavior. The majority of his work is "hands-on" experimental science involving a combination of STM/AFM/SNOM, laser spectroscopy, and nanofabrication.

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Art Gossard received his Bachelor's Degree in Physics from Harvard University and his Ph.D. in Physics from University of California, Berkeley. He is professor of Materials and Electrical and Computer Engineering at University of California, Santa Barbara. His research involves the growth of artificially structured materials by molecular beam epitaxy. His special interests are molecular beam epitaxy, the growth of quantum wells and superlattices and their applications to high performance electrical and optical devices and the physics of low-dimensional structures. He is a fellow of the American Physical Society and the IEEE, a member of the National Academy of Engineering and the National Academy of Sciences, a recipient of the Oliver Buckley Condensed Matter Physics prize and James McGroddy New Materials prize of the American Physical Society, the John Bardeen award of the TMS and the AAAS Newcomb Cleveland prize.

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Dr. Han received her Doctoral Degree in Natural Sciences (Dr.rer.nat) from Aachen University of Technology (RWTH), Germany, in 2001. She pursued her postdoctoral studies at the Max-Planck Institute for Polymer Research, Mainz, Germany sponsored by the Max-Planck Fellowship and the University of California Berkeley sponsored by the Feodor Lynen Fellowship of the Alexander von Humboldt Foundation. Dr. Han joined the faculty at UCSB in 2004, received tenure in 2010 and was promoted to full professor in 2012. The key aspect of her research interest is the development of a technique called DNP-NMR, which will transform the most information-rich spectroscopic technique NMR into a fast spectroscopic method. The DNP principle uses highly populated unpaired electron spins, whose signal is effectively translated into NMR signal, so that the nucleus of choice in the molecule or material of interest is polarized to deliver several orders of magnitude sensitivity gain. This makes “real-time” monitoring of atomic details of biochemical processes such as protein folding, polymerization reactions and aggregation feasible.

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**Professor Craig J. Hawker**  
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Craig J. Hawker, FRS is the Alan and Ruth Heeger Chair of Interdisciplinary Studies. He received a B.Sc. degree and University Medal in Chemistry from the University of Queensland in 1984 and a Ph.D. in Bioorganic Chemistry from the University of Cambridge in 1988 under the supervision of Prof. Sir Alan Battersby. Jumping into the world of polymer chemistry, he undertook a post-doctoral fellowship with Prof. Jean Fréchet at Cornell University from 1988 to 1990 and then returned to the University of Queensland as a Queen Elizabeth II Fellow from 1991 to 1993. In 1993, he became a research staff member at IBM Almaden Research Center, where he remained until moving to the University of California, Santa Barbara in 2004. He is also a Chair Professor at King Fahd University of Petroleum and Minerals as well as an adjunct professor of chemistry at the University of Queensland. Professor

Hawker has authored or coauthored 50 patents and more than 350 research publications. He has received numerous awards including the Arthur C. Cope Scholar, Macro Group UK International Medal for Outstanding Achievement, DSM – International Performance Materials Award, and the ACS Award in Applied Polymer Science. He was recently elected as a Fellow of the Royal Society and is Editor of the Journal of Polymer Science, Part A: Polymer Chemistry.



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**UCSB Participants**

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**Professor Alan J. Heeger**  
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Widely known for his pioneering research in and the co-founding of the field of semiconducting and metallic polymers, Professor Heeger is also the recipient of numerous awards, including the Nobel Prize in Chemistry (2000), the Oliver E. Buckley Prize for Condensed Matter Physics, the Balzan Prize for the Science of New Materials, the President's Medal for Distinguished Achievement from the University of Pennsylvania, the Chancellor's Medal from the University of California, Santa Barbara, and honorary doctorates from universities in the United States, Europe and Asia. He is a member of the National Academy of Science (USA), the National Academy of Engineering (USA), the Korean Academy of Science and the Chinese Academy of Science.

Prof. Heeger has more than 800 publications in scientific journals and more than 50 patents. He founded UNIAX Corporation in 1990; UNIAX was acquired by DuPont in 2000. Prof. Heeger is a co-founder and serves on the Board of Directors of Konarka Technologies Inc. He is co-founder and Chairman of CBRITE Inc. in Santa Barbara. He is co-founder and Vice-Chairman of Cynvenio (micro fluidics for cell sorting, protein purification and diagnostics) and Cytomx Therapeutics (novel technology for targeted drug delivery).

He has long been interested in and a fan of theatre. He has participated in the production of three Broadway plays: "In the Heights" (2008 Best Musical and still running), "West Side Story" (revival currently running) and "Barefoot in the Park" (a revival in 2007 --- did not survive the critics!).

His research group at UC Santa Barbara continues to study aspects of the science and technology of semiconducting and metallic polymers with focus on the gate-induced insulator-to-metal transition in polymer Field Effect Transistors and low cost "plastic" solar cells. Current interests also include biosensors for the detection of specific targeted sequences on DNA, the detection of specific proteins and the detection of biologically relevant small molecules.

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Matt Helgeson joined the Department of Chemical Engineering in Spring of 2012 after working as a postdoctoral associate in the Novartis-MIT Center for Continuous Manufacturing and the Department of Chemical Engineering at MIT. He earned a B.S. with honors in Chemical Engineering from Carnegie Mellon University in 2004 and a Ph.D. in Chemical Engineering from the University of Delaware in 2009 under the supervision of Norm Wagner and Eric Kaler. Dr. Helgeson's research interests involve the microstructure, thermodynamics, and processing of complex fluids and soft matter for applications in advanced materials and biotechnology. His research has resulted in numerous publications and several U.S. and International Patents, and he has been the recipient of several professional

awards, including the Delaware Graduate Fellows Award, the Neutron Scattering Society of America Prize for Outstanding Student Research, and the Roy L. McCullough Scholars Award from the Delaware Center for Composite Materials.

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Jacob Israelachvili received his PhD in Experimental Physics from the University of Cambridge (UK) in 1972 and joined UCSB in 1986. He has developed experimental techniques for directly measuring the forces between surfaces in vapors and liquids, including static (equilibrium) and dynamic (non-equilibrium) interactions at the molecular level. His current research covers various solid-liquid interfacial phenomena, measuring the physical properties of very thin films, and understanding the rheology and tribology of surfaces. This information is valuable for controlling colloidal and biological systems, and various industrial engineering processes. Israelachvili is the author of the text-book "Intermolecular and Surface Forces", published by Elsevier Academic Press, a Fellow of the

Royal Society of London, a Foreign Associate of the National Academy of Engineering, and a member of the US and Australian National Academies of Science. He is the recipient of the 2004 MRS Medal.

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Ed Kramer received a B.Ch.E. Degree in Chemical Engineering from Cornell University in 1962 and a Ph.D. in Metallurgy and Materials Science from Carnegie Mellon University in 1966. He was a NATO Postdoctoral Fellow at Oxford before joining Cornell University in 1967 where he was appointed the Samuel B. Eckert Professor of Materials Science and Engineering in 1988. In 1997 he joined the UCSB faculty where he holds a joint appointment in Materials and Chemical Engineering. Professor Kramer's current research activities focus on polymer interfaces using a variety of depth profiling and microscopic imaging methods. His group is interested in the fracture of block copolymers and polymer

interfaces, from a micromechanical and molecular viewpoint, the kinetics of grafting reactions and instabilities at polymer melt interfaces and the ordering of block copolymer thin films as templated by interfacial interactions and external fields. His honors include membership in the National Academy of Engineering, fellowship in the American Academy of Arts and Science, the Polymer Physics Prize of the American Physical Society, and the Swinburne Award of the Institute of Materials (UK).

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Gary Leal received his Ph.D. degree in Chemical Engineering from Stanford University in 1969, and was a Professor of Chemical Engineering at Caltech from 1970-1989, including appointment as the Chevron Distinguished Professor in 1986. In 1989, he moved to UCSB, where he is the Warren and Katharine Schlinger Professor of Chemical Engineering, and also has joint appointments in Mechanical Engineering and in Materials. He is also currently the Editor of *Physics of Fluids*. He has had a long-standing interest in the behavior of complex fluids under flow, and, specifically the inter-relationship between flow, the microstructural state of the material, and its macroscopic properties. Current interests include the dynamics of entangled linear and branched polymeric liquids in strong flows; the flow behavior of liquid

crystalline polymers and nematic suspensions; the microscale dynamics of polymer blends, including reactive blending and the role of surface additives, and the formation and dynamics of lipid vesicles and vesicle suspensions. Honors include election to the National Academy of Engineering (1987), the Fluid Dynamics Prize of the APS (2002), the Bingham Medal of the Society of Rheology (2000), the Allan P. Colburn (1978) and William H. Walker (1993) Awards of the AIChE, Fellow of the APS (1984) and he was elected as a Fellow of the American Academy of Arts and Sciences (2011).

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Carlos G. Levi holds a Ph.D. in Metallurgical Engineering from the University of Illinois at Urbana-Champaign (1981). He joined the UCSB faculty in 1984 and is currently Professor of Materials and Mechanical Engineering. He is a participant in the NSF sponsored Materials Research Laboratory (IRG-3) as well as the International Center for Materials Research, the Pratt & Whitney Center of Excellence in Composites, the Center for Multifunctional Materials and Structures and the Institute for Energy Efficiency at UCSB. The overarching theme of his research is the fundamental understanding of microstructure evolution in inorganic materials, and the application of this understanding to the design and production of improved coatings, thin films, composites and monolithic systems for use in high temperature applications. Current areas of work include thermal and environmental barrier coatings for metallic and CMC components in advanced gas turbines, environmental protection of components for hypersonic vehicles and advanced nuclear energy

systems. His research is currently funded by NSF, ONR, AFOSR, DOE, Pratt & Whitney and Honeywell. He has published over 155 articles on his research, and has been recognized for specific contributions to the literature with the 1983 Howe Medal and the 1989 Grossmann Award, both from ASM International, and the 2004 DLR Wissenschaftspreis from the German Aerospace Agency. He has been honored for his career contributions to Materials Science with the 2002 Alexander von Humboldt Forschungspreis (Research Award for Senior U.S. Scientists from the AVH Foundation, Germany), the 2008 NIMS Award for Recent Breakthroughs in Materials Science for Energy and Environment (with A.G. Evans and D.R. Clarke), and most recently elected Fellow of the American Ceramic Society (2012).

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Professor Mishra, who received a Ph.D. from Cornell University in 1984, joined the College's ECE Department in 1990 from the Department of Electrical and Computer Engineering at North Carolina State University. A recognized leader in the area of high-speed field effect transistors, Dr. Mishra has made major contributions at every laboratory and academic institution for which he has worked, including: Hughes Research Laboratories in Malibu, California; the University of Michigan at Ann Arbor; and General Electric, Syracuse, New York. His current research areas attempt to develop an understanding of novel materials and extend them into applications. He is the Director of the AFOSR PRET Center for Non-Stoichiometric Semiconductors and of the ONR

MURI Center (IMPACT), which relates to the application of SiC and GaN based transistors for power amplification. In 1989 Dr. Mishra received the Presidential Young Investigator Award from the National Science Foundation. In 1992 he received the Young Scientist of the Year Award from the International Symposium on GaAs and Related Compounds. He was elected as a Fellow of IEEE in 1995.

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T.-Q. Nguyen obtained her Ph.D. in Physical Chemistry from UCLA in 2001. She received several awards including the Dissertation Award from the University of California for outstanding performance in research and the Outstanding Innovative Research Award from the Advanced Materials. She was a research associate in the Department of Chemistry and the Nanocenter at Columbia University working with Louis Brus and Colin Nuckolls. She also spent time at IBM Research Center at T. J. Watson (Yorktown Heights, NY) working with Richard Martel and Phaedon Avouris. She joined the faculty at UCSB in 2004. Her research focuses on understanding the charge transport and electronic properties of organic semiconducting materials for applications in transistors, photovoltaics, light-emitting diodes, and sensors. Particularly, she is interested in how chemical structures influence molecular packing, energy levels, photophysics, electronic properties, and charge transport in these materials both at the nanoscale and in the bulk using various scanning probe techniques and device configurations. Her group seeks to correlate the structure-function-property relationship and also work closely with synthetic chemistry and theory groups to design new materials. Recognition for her research includes the 2005 Office of Naval Research Young Investigator Award, the 2006 NSF CAREER Award, the 2007 Harold Plous Award, the 2008 Camille Dreyfus Teacher Scholar Award, the 2009 Alfred Sloan Research Award, and the 2010 NSF American Competitiveness and Innovation Fellows.

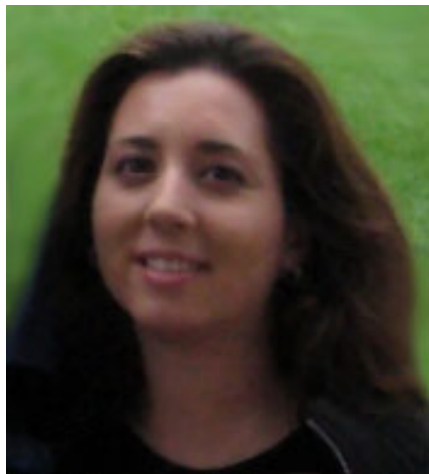


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Dr. Michelle A. O'Malley joined the UCSB Department of Chemical Engineering in Spring 2012. Prior to UCSB, Michelle was a postdoctoral associate in the MIT Department of Biology/Broad Institute of MIT and Harvard under the direction of Chris A. Kaiser. She earned her B.S. degrees in Chemical Engineering and Biomedical Engineering from Carnegie Mellon University in 2004 with university honors. She completed her Ph.D. in Chemical Engineering from the University of Delaware in 2009 under the supervision of Professor Anne Skaja Robinson. Her research focuses on the development of a tunable eukaryotic protein expression platform in *Saccharomyces cerevisiae*. Dr. O'Malley has received numerous awards including the NASA-Harriet G.

Jenkins Predoctoral Fellowship (2006-2009) and Marion and Jasper Whiting Foundation Fellowship (2011).

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Dorothy Pak received her Ph.D. in 1996 from Columbia University's Lamont-Doherty Earth Observatory. She came to UCSB as a postdoctoral scholar in the Marine Science Institute, where she has been a research scientist since 1997. Her scientific research focuses on marine proxy records of past climate change. She joined the MRL as Intern Coordinator in 1997 and became the Education Director in 2004. Her work at the MRL includes the design and implementation of science education outreach programs for K-12 students, teachers, undergraduates, and the public, with a particular focus on providing opportunities for diverse groups of participants.

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**UCSB Participants**

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**Professor Christopher Palmstrom**  
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Professor Chris Palmstrom, one of the world's leading researchers of electronic materials, joined the ECE faculty at UCSB in the Fall of '07. Born in Norway, Palmstrom received his Ph.D. in Electrical and Electronic Engineering from the University of Leeds (England) in 1979. After five years of research on semiconductor materials and contact technologies at Cornell, he joined Bellcore in 1985. There, he did groundbreaking research on semiconductor surfaces, semiconductor doping, polymer/polymer diffusion and the molecular beam epitaxial growth of metal/semiconductor heterostructures. In 1994, Dr. Palmstrom went to the University of Minnesota, where he soon became a leading researcher in several fields, including new spintronic materials that combine the

functions of electronic and magnetic manipulation and storage on information. Professor Palmstrom fits well into UCSB's research programs where he already has significant collaborations with Professors Gossard, Brown, Rodwell, Stemmer, and Van der Walle. With the addition of Palmstrom, UCSB can ensure the continued success of our strong activities related to molecular beam epitaxy development of new nanoscopically controlled materials for future electronic and optical devices and systems.

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Dr. Pennathur received her B.S. and M.S. in Aerospace and Aeronautical Engineering from M.I.T. (2000 and 2001 respectively), and Ph.D. in Mechanical Engineering from Stanford University (2006). Prior to joining UCSB in 2007, she performed postdoctoral studies at both Sandia National Laboratories and University of Twente.

Since arriving at UCSB, Pennathur has contributed significantly to the fields of nanofluidics and interfacial science. She has been able to push the envelope in both theoretical and experimental characterization of nanofluidic channels. Furthermore, she has discovered novel nanoscale concentration mechanisms which focus analytes of interest within nanofluidic channels and has demonstrated unique quantitative separations of various biomolecules. Finally, she has developed a novel fabrication process for on-chip detection of biomolecules, which has the potential to revolutionize bio-analytical devices, eliminating the need for laborious optical tagging of samples.

These major contributions have been disseminated in the form of over 60 archived journal publications, books or conference papers, 3 patent applications, and over 50 invited presentations. Notable awards include the DARPA young faculty award (2008), the UC Regents Junior Faculty Fellowship (2009), and the PECASE (presidential early career award in science and engineering) award (2010), and the Santa Barbara Chamber of Commerce Innovator of the Quarter Award (2012).

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Baron Peters received his Doctorate in Chemical Engineering (Ph.D.) from the University of California, Berkeley in 2004 under the instruction of Arup Chakraborty and Alexis T. Bell. He pursued postdoctoral studies under Bernhardt L. Trout at the Massachusetts Institute of Technology and also under Berend Smit in the CECAM at the Ecole Normale Supérieure in Lyon, France. Baron joined the faculty at UCSB in 2008. He earned an NSF Faculty Early Career Development award in 2009.

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**Professor Philip A. Pincus**  
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Fyl Pincus obtained his Ph.D. in Physics at UC Berkeley in 1961 and after an NSF post-doctoral fellowship at Saclay spent approximately 20 years in the Physics Department at UCLA. He then joined the Exxon Research and Engineering Laboratory in Annandale, NJ for 3 years before coming to UCSB in 1985 as Professor of Chemical Engineering. He now holds joint appointments in the Physics and Materials Departments and directs the Program on Biomolecular Science and Engineering. Professor Pincus is a condensed matter theorist who has worked in such diverse areas as magnetism, superconductivity, liquid crystals, and correlated electrons in organic conductors. His present activities are in theoretical soft condensed matter, mainly on biologically inspired problems relating to membrane-bound proteins, Coulomb effects in biomolecular assemblies, biopolymer brushes, protein adsorption, and hydrogen bond networks. Honors include Joliot Curie Professor (ESPCI, 1981), John Simon Guggenheim Fellow (Orsay, 1975), Raymond & Beverly Sackler Distinguished Lecturer in Physics (Tel Aviv, 1988), High Polymer Physics Prize of the APS (1992), Chaire- Paris Sciences (ESPCI, 1999). He is a Fellow of the American Physical Society and of the American Association for the Advancement of Science.

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Professor Pollock is a world-renowned expert in the science and technology of advanced structural alloys with applications in aerospace, energy and automotive industries. She holds degrees from Purdue University (B.Sc. 1984) and MIT (Ph.D. 1989). Her professional career started at GE Aircraft Engines, where she worked in the development of advanced superalloys for gas turbine engines. In 1991 she joined the MSE faculty at Carnegie Mellon University, where she was Alcoa Professor until 1999. In 2000 she moved to the University of Michigan, where she held the L.H. and F.E. Van Vlack Professorship of Materials Science and Engineering. In 2010, she joined the Materials Department at UCSB where she is now serving as Chair of the Department.

Professor Pollock is the recipient of numerous honors and awards, most notably her election to the National Academy of Engineering in 2005 and election as TMS Fellow in 2009 “for seminal contributions in the understanding of high temperature alloys, and for distinguished leadership in materials education and the materials profession”. She has been honored both for her contributions to the literature (2008 AIME Raymond Award, 2005 Magnesium Technology Award) as well as for excellence in teaching (1995 ASM Stoughton Award) and overall professional accomplishment (1999 ASM Silver Medal, 205 IMR Lee Hsun Award, 2007 ASM Jeffries Lecture). Professor Pollock was TMS President in 2005.

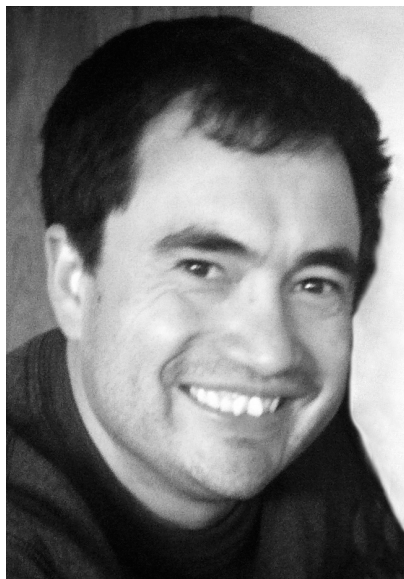
Professor Pollock’s current interests include the mechanical and environmental performance of materials in extreme environments, unique high temperature materials processing paths, ultrafast laser-material interactions, alloy design and 3-D materials characterization. Her recent research has focused on thermal barrier coatings systems and platinum group metal-containing bond coats, new intermetallic-containing cobalt-base materials, vapor phase processing of sheet materials for hypersonic flight systems, growth of nickel-base alloy single crystals with a new liquid tin-assisted Bridgman technique, development of new femtosecond laser-aided 3-D tomography techniques and development of models for Integrated Computational Materials Engineering efforts.

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Dr. Read de Alaniz received his B.S. degree from Fort Lewis College in 1999 and his Doctoral Degree from Colorado State University in 2006. His doctoral training under the direction of Professor Tomislav Rovis focused on asymmetric catalysis using N-heterocyclic carbenes. He pursued his postdoctoral studies at the University of California, Irvine where he worked in the area of total synthesis with Professor Larry E. Overman. During that time he was the recipient of the University of California President's Postdoctoral Fellowship. Dr. Read de Alaniz joined the faculty at UCSB in 2009.

Research in the Read de Alaniz group focuses on new reaction developments and their application to the synthesis of architecturally challenging and biologically important molecules. Our main focus is identifying efficient new methods for the efficient construction of carbon–nitrogen bonds.

Nitrogen-functionalized molecules are valuable pharmaceutical targets and fundamental building blocks in natural product synthesis.



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**UCSB Participants**

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Cyrus R. Safinya received a B.S. in Physics and Mathematics from Bates College in 1975. He received his Ph.D. degree in Physics in 1981 from the Massachusetts Institute of Technology for his work on "X-ray Scattering Study of the Critical Behavior of Binary Liquid Crystal Mixtures," under the supervision of Professor Robert J. Birgeneau. In 1981, he joined the Exxon Research and Engineering Company in New Jersey and conducted research on the structure of complex fluids and biological membranes. He joined the faculty of the University of California at Santa Barbara as a Professor of Materials and Physics in 1992. His group's research is focused on elucidating structures and interactions of supramolecular assemblies of biological molecules. This includes understanding structures of DNA condensed by oppositely charged lipids and multivalent counter-ions in vitro and the relationship with condensed DNA in vivo, and developing a fundamental understanding of interactions between cell cytoskeletal proteins and their associated molecules which leads to their distinct structures (related to their specific functions in cells) on the nanometer to the many micrometer scales. A major project in the group has a goal of developing lipid and polymer based non-viral vectors (carriers) of DNA, peptides, and proteins for gene and drug delivery applications. Structures are solved by combining reciprocal space and real space data resulting from x-ray diffraction and scattering, light-microscopy differential-interference-contrast and three-dimensional confocal imaging, and electron microscopy experiments.

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Omar Saleh received a B.S. in Physics from M.I.T. in 1997 and a Ph.D. in physics from Princeton University in 2003. His post-doctoral research in the field of single-molecule biophysics took place at the École Normale Supérieure in Paris, France. He arrived at UCSB in September 2005, where he is currently an associate professor in the Materials Department and Biomolecular Science and Engineering Program. He is generally interested in biomolecular and soft-matter physics, with special emphasis on the mechanics of such systems. His lab uses custom-developed single-molecule mechanical manipulation instruments to study the elastic response of polymers (with special emphasis on electrostatic effects), and to study the active mechanics of motor proteins. Saleh received an NSF CAREER award in 2008.

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**UCSB Participants**

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Ram Seshadri received his Ph.D. in 1995 from the Indian Institute of Science in Bangalore. After some years as a postdoctoral fellow with the CNRS in Caen, France, and in the University of Mainz, Germany, he joined the faculty of the Indian Institute of Science in 1999. He moved to the Materials Department, UCSB in 2002. In Fall 2007, he also joined the faculty of the Department of Chemistry and Biochemistry. The research currently being pursued in his group addresses magnetic phenomena in insulating oxides, thermoelectric and magnetic materials and composites, catalytic oxides, the structure and electronic structure of polar materials, luminescent materials for solid state lighting, and materials and architectures for energy storage.

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Joan Shea received a B.Sc. in Chemistry at McGill University and a Ph.D. in Physical Chemistry at the Massachusetts Institute of Technology. Following postdoctoral studies at the Scripps Research Institute, she joined the department of Chemistry and the James Franck Institute at the University of Chicago in 2000. Joan moved to her present position as an assistant professor of chemistry and biochemistry at UCSB in 2001. Her research interests are in the fields of theoretical and computational biophysics. She is the recipient of a Cottage Hospital Biomedical Award, an NSF Career Award, a David and Lucile Packard Fellowship and an A.P. Sloan Fellowship.

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Mark Sherwin received his Ph.D. in physics from University of California, Berkley in 1988. His research at UCSB is in experimental condensed matter physics. In particular, his research group is interested in how electrons move when they are confined to very tiny semiconductor structures driven by very high frequency electromagnetic radiation.

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Dr. Soh received his B.S. with a double major in Mechanical Engineering and Materials Science with Distinction from Cornell University, and Ph.D. in Electrical Engineering from Stanford University. Prior to joining UCSB in 2003, Dr. Soh served as the technical manager of MEMS Device Research Group at Bell Laboratories and MEMS R&D group at Agere Systems. His current research interests are in analytical biotechnology, especially in high throughput screening, directed evolution and integrated biosensors. He is Co-Director at the Center for Stem Cell Biology & Engineering and Associate Director of the California Nanosystems Institute (CNSI). He is the recipient of MIT Technology Review's "TR 100" Award (2002),

ONR Young Investigator Award (2004), Beckman Young Investigator Award (2005), ALA Innovator Award (2009), NIH Director's TR01 Award (2009), John Simon Guggenheim Fellowship (2010), NIH Edward Nagy Award (2011), Garland Endowed Chairship at UCSB (2011), and Humboldt Research Fellowship (2012).

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James S. Speck is a Professor in the Materials Department at the University of California Santa Barbara. He received his B.S.M.E. degree in metallurgical engineering from the University of Michigan in 1983 and his S.M. and Sc.D. in materials science from the Massachusetts Institute of Technology in 1985 and 1989, respectively. At UCSB, his early work focused on epitaxial oxide films on semiconductors, ferroelectric thin films, and strain relaxation in highly misfitting epitaxial systems. He has worked extensively on the materials science of GaN and related alloys. Major aspects of his work on nitrides include elucidating basic growth modes and defect generation, the development of MBE growth of GaN, and the development of nonpolar and

semipolar GaN. Speck received the Quantum Device Award from the International Symposium on Compound Semiconductors in 2007, he was named an inaugural MRS Fellow in 2008, and received the JJAP Best Paper Award in 2008. In 2009 he received became an APS Fellow. In 2010 he will receive the IEEE Photonics Society Aron Kressel Award for his work on nonpolar and semipolar GaN-based materials and devices. In 2007, Speck and his longtime collaborators founded Santa Barbara-based start-up companies Kaai and Soraa to commercialize their work on nonpolar and semipolar nitrides. Speck has over 550 publications in the referred archival literature.

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Todd M. Squires is Assistant Professor of Chemical Engineering at the University of California, Santa Barbara. He received his B.S. in Physics and B.A. in Russian Literature from UCLA in 1995, studied as a Winston Churchill Scholar at Cambridge University to earn a Certificate of Advanced Study (Part III of the Mathematics Tripos), and as an NDSEG Fellow to earn a Ph.D. in Physics from Harvard in 2002. He spent three years at Caltech as a Lee A. Dubridge Postdoctoral Fellow and NSF Mathematical Sciences Postdoctoral Fellow, and joined the faculty at UCSB in 2005. Combining theoretical and experimental research, he seeks to understand the physical phenomena that occur on the micron scale, and to then harness such understanding towards novel applications in microfluidic and microrheological systems. Specific areas of expertise include nonlinear electrokinetic flows, ion transport in porous electrodes, active and nonlinear microrheology, microrheology of surfactant-laden interfaces, and spatio-temporal control over chemical environments in microfluidic systems. He has received the NSF CAREER award, the Beckman Young Investigator Award, the Camille Dreyfus Teacher-Scholar Award, and the 2010 Allan Colburn and 2012 Dudley Saville Memorial Lectureships.



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Susanne Stemmer did her doctoral work at the Max-Planck-Institute for Metals Research in Stuttgart (Germany) and received her Ph.D. in 1995 from the University of Stuttgart. After working as a postdoctoral research associate at Case Western Reserve University and the Catholic University in Leuven (Belgium), she joined the Physics Department at the University of Illinois at Chicago as a Visiting Assistant Professor. In 1999, she joined the Department of Mechanical Engineering and Material Science at Rice University as Assistant Professor. She moved to UCSB in the summer of 2002. Her research focuses on structure-property relationships in functional oxide films, employing atomic resolution analytical and imaging techniques in transmission electron microscopy. Honors include an NSF Faculty Early Career Development award (2000).

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Dmitri Strukov received his M.S. in Applied Physics and Mathematics from the Moscow Institute of Physics and Technology in 1999 and a Ph.D. in Electrical Engineering from Stony Brook University in New York in 2006. In general, he is broadly interested in a physical implementation of computation, including device physics, circuit design, and high-level architecture, with emphasis on emerging device technologies. In particular, his main focus now is on various aspects of reconfigurable hybrid nanoelectronic systems, utilizing novel resistive switching ("memristive") device, for applications in digital memories, programmable logic, and neuromorphic networks. Prior to joining UCSB Dmitri Strukov worked as a postdoctoral associate at Hewlett Packard Laboratories from 2007-2009.

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Galen D. Stucky received his Ph.D. in 1962 from Iowa State University. After postdoctoral study at MIT, he held positions at the University of Illinois, Sandia National Laboratory and DuPont Central Research and Development Department before joining the UCSB faculty in 1985. His research focuses on molecular assembly of nanoscale to macroscale components of composite systems; the interface of inorganics with biomolecules and the cardiovascular system; the efficient utilization of energy resources, including natural gas conversion to fuels and petrochemicals, heterostructured thermoelectric systems and high energy density batteries; gradient materials and interfaces; and understanding Nature's routes to organic/inorganic bioassembly. Recent honors include a von Humboldt Senior US Scientist award (2000), the American

Chemical Society Award in the Chemistry of Materials (2002), an IBM Faculty Award (2003), the International Mesostructured Materials Association Award (2004), election to fellowship in the American Academy of Arts and Sciences (2005), the Advanced Technology Applications for Combat Casualty Care Award (2008), and the Nano Today Award (2011).

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Megan Valentine joined the UCSB faculty in 2008 as an Assistant Professor in Mechanical Engineering. She received her Ph.D. in Physics from Harvard University in 2003. Before coming to UCSB, she completed a Postdoctoral Fellowship in Biology at Stanford University under the sponsorship of the Damon Runyon Cancer Research Foundation and the Burroughs Wellcome Fund through a Career Award at the Scientific Interface. She is an expert in the development and use of novel techniques for the nanoscale characterization of biological materials. Her current research focuses on how molecular motors and cytoskeletal polymers generate force and sustain tension in cells.

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**Professor Chris G. Van de Walle**

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Before joining the UCSB Materials Department in 2004, Chris G. Van de Walle was a Principal Scientist in the Electronic Materials Laboratory at the Xerox Palo Alto Research Center (PARC). He received his Ph.D. in Electrical Engineering from Stanford University in 1986. He was a postdoctoral scientist at the IBM T. J. Watson Research Center in Yorktown Heights, New York (1986-1988), a Senior Member of Research Staff at Philips Laboratories in Briarcliff Manor, New York (1988-1991), and an Adjunct Professor of Materials Science at Columbia University (1991). Professor Van de Walle develops and employs first-principles computational techniques to model the structure and behavior of materials. He has performed extensive studies of semiconductor interfaces (including the development of a widely used model for band offsets) and of defects and impurities in semiconductors, with particular emphasis on doping problems. In recent years he has been focusing his attention on wide-band-gap semiconductors, nitrides, oxides, on the behavior of hydrogen in materials, and on spin centers for quantum computing. He co-leads IRG-2, “Correlated Electronics”, and his group is actively engaged in studies of efficiency limits in light emitters, novel channel materials for CMOS, transparent conducting oxides, and hydrogen storage materials. He has published over 250 research papers, holds 22 patents, and has given 130 invited and plenary talks at international conferences. Professor Van de Walle is a Fellow of the APS, AVS, AAAS, MRS, and IEEE, as well as the recipient of a Humboldt Award for Senior US Scientist and the David Adler Award from the APS. He has chaired three conferences, was Program Chair for the 27th International Conference on the Physics of Semiconductors in 2004, and co-organized the *International Symposium on Materials Issues in Hydrogen Production and Storage* at UCSB in 2006.

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**UCSB Participants**

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Herbert Waite is a professor in both the Departments of Chemistry and Biochemistry, and Molecular, Cell and Developmental Biology at UCSB. He was awarded an A.B. from Harvard and a Ph.D. in Biochemistry from Duke University before doing post-doctoral studies at the Universities of Copenhagen and Toronto. Waite held faculty appointments at the University of Connecticut Medical Center and the University of Delaware before moving to UCSB in 1999. He has pioneered the discovery of underwater adhesive chemistries in marine organisms. Primary present research focus is on structure-function relationships in load- and impact-bearing biomolecular materials. Waite was co-leader with Song-I Han in the last IRG-1 that focused on “Electrostatic and H-bonding Interactions in Soft Materials” and remains co-leader in the approved new IRG-1 on “Bio-inspired Wet Adhesion”.

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**UCSB Participants**

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Professor Wudl received a B.S. (1964) and a Ph.D. (1967) degree from UCLA where his dissertation work was done with Professor Donald J. Cram. After postdoctoral research with R.B. Woodward at Harvard, he joined the faculty of the State University of New York at Buffalo. In 1972 he moved to AT&T Bell Laboratories and ten years later he moved to UCSB, where he served as Professor of Chemistry and Materials and Associate Director of the Institute for Polymers and Organic Solids. In 1997 he moved to UCLA to occupy the Dean M. Willard Chair of Chemistry and Materials (formerly Courtaulds Professor of Chemistry) and become director of the Exotic Materials Institute.

He is a professor in the Department of Chemistry and Biochemistry as well as the Department of Materials Science and Engineering at UCSB since June 2006 and was the director of the Materials Creation Training Program at UCLA, an NSF sponsored training grant. He has co-authored over 400 scientific papers and holds 13 U.S. patents. In 2011 he became emeritus and was appointed Research Professor of Materials.

Professor Wudl has received numerous awards including Peter A. Leermakers Lecturer (twice, 1988, 1992), Fellow of the American Association for the Advancement of Science (1989), the William Rauscher Lecturer in Chemistry Award (Rensselaer Polytechnical Institute, 1992), ACS Arthur C. Cope Scholar Award (1993), Stouffer Award (USC, 1993), Arthur D. Little Award (1993), the Giulio Natta Medal of the Italian Chemical Society (1994), The Wheland Medal of University of Chicago (1994), ACS Award for Chemistry of Materials (1996), Alumnus of the Year Award from Los Angeles City College (1996), elected Member of the American Academy of Arts and Sciences (2001), Herbert Newby McCoy Award (UCLA, 2001) Honorary Doctors degree, Universidad Complutense, Madrid, Spain (2004), Professor C.N.R. Rao Lecture Award of CRSI, Honorary Fellow, Council of the Chemical Research Society of India (2005). MIT, Merck-Karl Pfister Visiting Professor in Organic Chemistry (2006), Tolman Medal, ACS Southern California Section (2006), Stephanie Kwolek Award from the Royal Society of Chemistry (2010).

**Materials Research Outreach Program Symposium  
February 5-6, 2013, Corwin Pavilion, University Center**

**UCSB Participants**

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Professor Zok obtained his Ph.D. from McMaster University in 1989 and joined the faculty of UCSB in 1990. His research interests concern the mechanical and thermal properties of fiber-reinforced metal and ceramic matrix composites and the development and validation of material models. He is currently Associate Editor for the Journal of the American Ceramic Society and Section Editor (Ceramics, Composites and intergrowths) for Current Opinion in Solid State and Materials Science.