



UNIVERSITY of WASHINGTON

# MATERIALS SCIENCE & ENGINEERING



## TRAILBLAZERS

Many notable figures in materials industry and education hold degrees from the Department of Materials Science & Engineering. Here are just a few outstanding examples of alumni achievement.

### Stephen T. Ching (BS Ceramic Engr 1972)

Stephen Ching is president and VP of Engineering at Isolink Inc. and co-founded the company in 1987. Isolink is the leading supplier of optoelectronic radiation-tolerant components worldwide, providing products and services to military, aerospace, hybrid, industrial, medical and telecommunications markets. The company pioneered the miniaturization of some of the most advanced optoelectronic components. Before founding Isolink, Mr. Ching worked for Fairchild Semiconductors Linear Integrated Circuits and Hewlett Packard Optoelectronics Division.

### Tom H. Delimitros (BS Ceramic Engr 1963, MS Ceramic Engr 1966)

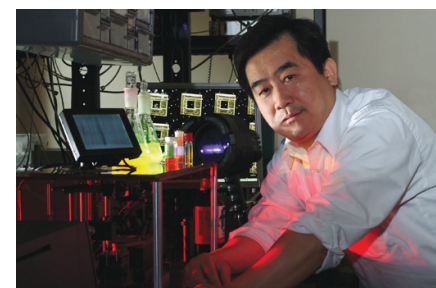
2001 MSE DISTINGUISHED SERVICE AWARD; 1993 COLLEGE OF ENGINEERING AWARD FOR DISTINGUISHED SERVICE

Tom Delimitros was a founding general partner of three Advanced Material Technologies Venture Funds from 1989 to 2011. Currently, he pursues his interest in venture funding through Delventec Investments, his personal investment vehicle, and serves on the boards of Photodigm, Inc. and TRS Group Inc., among others. Mr. Delimitros was recently re-appointed board member of the University of Washington Foundation Board, representing the College of Engineering through 2015. He currently serves as chairman of the MSE External Advisory Board. Previously, he helped lead the MSE Initiative, raising \$2.5 million to build Mueller Hall and equip the new labs, and established the Tom H. Delimitros Fellowship for MSE.

### Bonnie J. Dunbar (BS Ceramic Engr 1971, MS Ceramic Engr 1975)

UW ENGINEERING ALUMNI ACHIEVEMENT AWARD; 1999 MSE DISTINGUISHED SERVICE AWARD; 2004 UW ALUMNA SUMMA LAUDE DIGNATA; 2012 COLLEGE OF ENGINEERING DIAMOND AWARD FOR DISTINGUISHED SERVICE

A veteran of five space missions as a NASA Mission Specialist Astronaut, Bonnie Dunbar flew aboard the Space Shuttles Atlantis, Challenger, Columbia and Endeavor. Previously she served as a NASA mission controller, and held research and engineering positions at Boeing, Harwell Laboratories in the UK and Rockwell International. After retiring from NASA in 2005, Dr. Dunbar served as president and CEO of the Museum of Flight (MOF) in Seattle until 2010. Currently, she is director of Higher Education and STEM at The Boeing Company. She is a member of the National Academy of Engineering, a Fellow of several technical societies, and has received numerous awards and honors.



*"Materials science and engineering is an interdisciplinary field all about crossing boundaries. We explore the scientific fundamentals of materials, their design and their processing for real world applications. We apply the basic principles of chemistry and physics to understand the structure and properties of materials and we design processes to manipulate materials to meet the needs of modern technology."*

- Alex K-Y Jen, Boeing/Johnson Chair and Professor, Materials Science & Engineering

### Randy Kurosky (BS Ceramic Engr 1988)

2014 COLLEGE OF ENGINEERING DIAMOND AWARD FOR ENTREPRENEURIAL EXCELLENCE

As the co-inventor of two ceramic oxide powder processes and engineer of over 3,000 different metallic oxide compositions, Randy Kurosky is responsible for turning Seattle Specialty Ceramics, a technology transfer startup, into Praxair Specialty Ceramics. Today, Praxair is one of the premier international companies in the field of electronic grade specialty ceramics. He has overseen the growth of Praxair Specialty Ceramics, including several \$1M line expansions and the commercialization of additional R&D products. As an undergraduate, Randy co-invented a patented process, Combustion Spray Pyrolysis (CSP) that earned him a record six publication co-authorships. His technical engineering skill combined with his entrepreneurial instincts has advanced materials science engineering applications. His innovations on the synthesis of solid oxide fuel cell materials have become the industry standard.

### Mohan S. Misra (BS Metallurgical Engr 1970)

2013 MSE DISTINGUISHED SERVICE AWARD

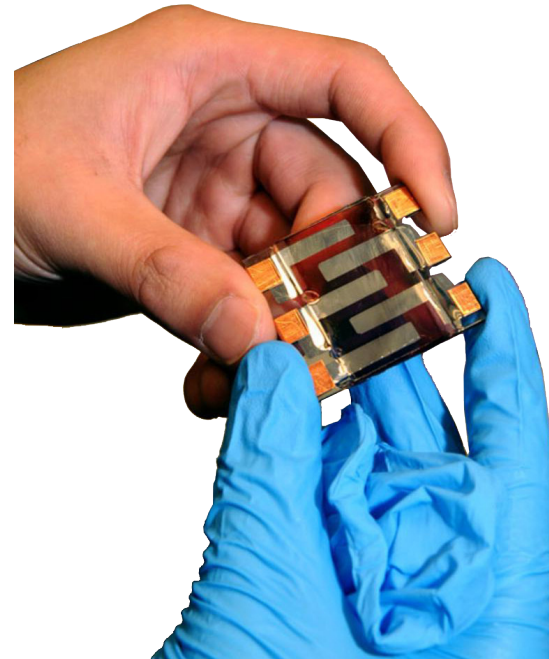
Mohan Misra founded ITN Energy Systems, Inc. in 1995. ITN Energy Systems was created for the research, development and commercialization of emerging technologies in the fields of energy, environment and space. Previously he led Materials Research & Technology at Martin Marietta Aerospace where developed and implemented several key technologies for aerospace applications including thin-film photovoltaics, smart materials and structures, advanced composites, lightweight structures and solar arrays. He has over 10 patents, 40 technology idea disclosures and over 100 technical publications. He is a member of the MSE External Advisory Board and serves on the Board of Trustees for the Colorado School of Mines.

### Larry A. Watters (BS Metallurgical Engr 1972)

2010 MSE DISTINGUISHED SERVICE AWARD

A founding member of Taggart Global LLC, Larry Watters has served as managing director for the company since 1993. From its roots as a small start-up company, Taggart has grown into a business with over \$400 million in operating revenue, providing solutions for clients in the coal production, power generation, steel making, and material handling sectors. With over 35 years in the coal preparation industry, Mr. Watters is a current member and previous chair of the Society for Mining, Metallurgy and Exploration - American Institute of Mining, Metallurgical and Petroleum Engineers (SME-AIME), as well as a board member of the International Coal Preparation Congress and the Coal Preparation Society of America.

The world is experiencing a materials revolution. Advances in materials have preceded almost every technological leap since the beginning of civilization and engineered materials are crucial to the continued vitality of countless industries. The University of Washington's Materials Science & Engineering Department is at the heart of this revolution preparing our students and conducting research to meet the needs of modern technology.



## MSE EDUCATION

Preparing students for successful careers is our highest priority. Our graduates find employment in aerospace, automotive, biomedical, chemical, construction, electronics, energy and numerous other fields.

## DEGREE PROGRAMS

**Bachelor of Science (BS)** - prepares students for graduate work or careers in industry, government, or academia.

**Master of Science (MS)** - applied master's program is a non-thesis degree program that prepares students for advanced careers in industry, government, and academia.

**Doctor of Philosophy (PhD)** - trains engineers for leadership roles in academia, industry and research institutions.

## STUDENT DEMOGRAPHICS

Undergraduate enrollment: 143 | Bachelor's degrees awarded 2014: 57  
Graduate enrollment: 100 | Master's degrees awarded 2014: 20  
Doctoral degrees awarded 2014: 8

DIVERSITY OF DEGREE RECIPIENTS	BS	MS/PhD
Women	23%	29%
Underrepresented Minorities*	8%	4%
International Students	20%	41%

\*African American, Hispanic American, Native American and Hawaiian/Pacific Islander

## UNDERGRADUATE LEARNING

### Program Features

We offer an ABET-accredited Bachelor of Science (BS) program. The department graduates the highest number of undergraduate students per faculty member among peer departments nationwide.

Unique aspects of our program include:

- Active student professional organizations
- Diverse student body
- Small class size
- Hands-on, team-based learning
- Undergraduate research projects
- A combined BS/MS program for well-qualified undergraduate students

### Excellence

Our undergraduate students win a variety of awards and scholarships, including several NSF undergraduate research fellowships, UWEB scholarships, UW Mary Gates Scholars, Husky Promise scholarships, SAMPE scholarships, a NASA Space Grant, a National Defense Medal and regular first-place finishes in national bridge- and wing-building and ceramic mug drop competitions.



## GRADUATE LEARNING

We offer an outstanding Master of Science (MS) and Doctor of Philosophy (PhD) Program. Our students perform cutting-edge interdisciplinary research on biomaterials for tissue engineering, ceramics and polymers for energy applications, composites and metals for aerospace, genetically engineered molecules, and semiconductors for electronics. Additional program features include:

- Educational and research training involving synthesis, processing, characterization and fabrication of all classes of materials using state-of-the-art research equipment and facilities
- Doctoral dissertation research opportunities for leading-edge, interdisciplinary work
- Research and teaching assistantships, stipends and fellowships for our doctoral program
- Faculty collaboration for a final project or internship for our master's program

### Excellence

Materials Science & Engineering doctoral students receive many fellowships from the department, College of Engineering and the Graduate School including AME, ARCS, Bank of America, Delimitros, Ford, Intel, Nanotechnology, NASA Space Grant, NSF, Schwager, and Stoebe and Wagstaff.

## RESEARCH AND INNOVATION

Our students and faculty conduct research in a variety of areas. Many of the research topics are interdisciplinary and involve participation from other engineering, basic science and medical disciplines.

### Photonics, Optoelectronics, Biosensing and Nanoscience

**Alex Jen** employs molecular, polymeric and bio-macromolecular self-assemblies to create ordered arrangements of organic and hybrid functional materials for photonics, optoelectronics, nanomedicine and nanotechnology.

### Active Nanoscale Material Systems

**Bruce Hinds** focuses on reinventing engineering membranes to become active nanoscale devices. These are based on biomimetic nanopores with active gatekeepers and nano-electrode architectures. Application areas include energy storage, environment, biochemical conversions/separations, and medical devices.

### Advanced Materials for Energy Storage and Conversion

**Jihui Yang** uses various experimental and theoretical techniques to design, synthesize, test, and understand advanced thermoelectric materials and Li-ion battery materials for energy conversion and storage.

### Advanced Structural Materials

**Dwayne Arola** focuses on the structure-property relationships of natural and engineered materials, with emphasis on fatigue, fracture behavior and the mechanisms of degradation posed by aging, environment and synergistic processes.

### Biomaterials: Nanoparticles and Tissue Engineering

**Miqin Zhang** combines the study of biomaterials and materials science to explore the interactions between materials and biological systems and develop materials and devices for biological and medical applications.

### Computational Materials

**Lucien Brush** focuses on mathematical modeling of material behavior in processes that involve phase transitions, interfacial phenomena and thin film hydrodynamics.

### Magnetism, Nanosciences and Bioengineering

**Kannan Krishnan** works at the intersection of magnetism, materials and medicine focusing on diagnostics, imaging and therapy, with appropriate translational research and commercialization activities. He also emphasizes nanoscale magnetic/transport phenomena and advanced characterization methods to develop new materials and devices for information and energy technologies.

## Centers for Excellence

The department is either lead partner or a core member in the following interdisciplinary centers:

- Institute for Advanced Materials and Technology (iAMT)
- Genetically Engineered Materials Science and Engineering Center (GEMSEC)
- Micron Laboratory for Combinatorial Materials Exploration
- Materials and Devices for Information Technology Research (MDITR) Science and Technology Center
- UW Center for Nanotechnology
- Microscale Life Sciences Center

### Materials in Extreme Environments

**Fumio Ohuchi** explores next generation materials for energy, information, and transportation technologies that can withstand extreme environments. Current projects explore the chemical and physical effects of materials in space.

### Molecular Biomimetics and Genetically Engineered Materials

**Mehmet Sarikaya** leads an interdisciplinary team of researchers to combine nature's proven molecular tools with nanoengineered materials in an emerging research methodology called molecular biomimetics.

### Molecular Self-Assembly

**Christine Luscombe** focuses on expanding current molecular self-assembly processes to develop functional molecules with novel electronic and photonic properties, ranging from well-defined macromolecules to polymers.

### Nanodevice Fabrication

**Marco Rolandi** focuses on transport phenomena at the nanoscale, improving processes to precisely control the position, size and shape of nanomaterials in order to reliably fabricate novel materials for nanoscale phenomena.

### Nanomaterials for energy related applications

**Guozhong Cao** examines the chemical processing of nanostructured materials for energy related applications including solar cells, batteries and supercapacitors as well as actuators and sensors.

### Nanoscale Optoelectronic Materials

**Peter Pauzauskie** explores basic materials science and engineering research to design, synthesize, and characterize nanoscale optoelectronic materials with unique compositions and morphologies.

### Nanoscale Optoelectronics

**Xiaodong Xu** aims to understand the optical, electronic and quantum properties of novel solid state nanostructures through nanoscale device design, optical spectroscopy, electrical transport, and scanning photocurrent measurements.

## FACULTY

### Composition

- 14 core faculty members
- 4 research faculty members
- 9 adjunct faculty members
- 11 affiliate faculty members
- 31 postdoctoral researchers

### Achievements

In recent years, our faculty members earned the following honors:

- 2014 Fellow of ASME
- 2014 TMS Distinguished Scientist/Engineer Award
- 2014 Thomson Reuters Top 1% Highly Cited Researchers in Materials Science
- 2014 American Physical Society Young Scientist Prize in Physics of Semiconductors
- 2014 Research Corporation for Science Advancement Foundation Cottrell Scholar Award

