Northeastern University
College of Engineering

ME 13 | 14 Scholarship Report

Global Experiential Research University

Founded in 1898, Northeastern is a global, experiential, research university offering undergraduate and graduate programs leading to degrees through the doctorate in nine colleges and schools, and select advanced degrees at graduate campuses in Charlotte, North Carolina, and Seattle,Washington.

Northeastern University
College of Engineering

» WELCOME to the Northeastern University Department of Mechanical and Industrial Engineering «

Dear Friends,

This annual scholarship report reflects the exceptional academic and professional accomplishments of the mechanical and industrial engineering faculty and their students for the 2013-2014 year. With $59 million in annual research expenditures and 134 tenure and tenure track faculty members the college is expanding in both size and research abilities. As one of the five departments in the college, the mechanical and industrial engineering department is home to 44 of these faculty members; 4 new faculty members will add to the 44 strong in Fall 2014. We look forward to a new Interdisciplinary Science and Engineering Complex building in 2016, adding a 220,000 square foot space which will provide state-of-the art labs.

As of 2013 I became the chair of this research active Department of Mechanical and Industrial Engineering. The department is home to two national academy members- Professor Nadine Aubry of the National Academy of Engineering; and Professor Vinod Sahney of the National Academy of Engineering, and the National Academy of Sciences' Institute of Medicine. Further, the department is home to three federally-funded research centers – one focused on nanomanufacturing and two focused on healthcare systems engineering.

Our scholars strive to use today's discovery and research to make tomorrow happen. You can see some highlights of our engineering faculty members at northeastern.edu/tomorrow. We hope you enjoy this book, and look forward to sharing future accomplishments in our annual scholarship reports.

Sincerely,

Hanchen Huang
Professor and Department Chair,
Mechanical and Industrial Engineering
h.huang@neu.edu

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See our faculty members through their scholarship focus, recent awards and publications.

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Explore the work of our recent doctoral students.

Key Contacts

Department Chair
Hanchen Huang, h.huang@neu.edu

Associate Department Chair and Program Director of Mechanical Engineering
Andrew Gouldstone, a.gouldstone@neu.edu

Associate Department Chair and Program Director of Industrial Engineering
Emanuel Melachrinoudis, emelas@coe.neu.edu

Director of Graduate Studies and Research
Nader Jalili, N.Jalili@neu.edu

Co-op Coordinator
Lorraine Mountain, l.mountain@neu.edu

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QUICK FACTS

COLLEGE QUICK FACTS

134
Faculty Members

Top 50 US Engineering School

Degree Programs

Undergraduate	Graduate
Chemical Engineering	Bioengineering
Chemical Engineering and Physics	Biotechnology
Civil Engineering	Chemical Engineering
Computer Engineering	Civil Engineering
Computer Engineering and Physics	Computer Engineering
Electrical Engineering	Computer Systems Engineering
Electrical and Computer Engineering	Electrical and Computer Engineering
Electrical Engineering and Physics	Electrical Engineering
Industrial Engineering	Energy Systems
Mechanical Engineering	Engineering Management
Mechanical Engineering and Physics	Gordon Engineering Leadership
	Industrial Engineering
	Information Systems
	Interdisciplinary Engineering
	Mechanical Engineering
	Operations Research
	Sustainable Building Systems
	Telecommunication System Management

Federally Funded Multi-Institutional Research Centers

ALERT	Awareness and Localization of Explosives-Related Threats; a Department of Homeland Security Center of Excellence
GORDON-CenSSIS	Bernard M. Gordon Center for Subsurface Sensing and Imaging Systems; a National Science Foundation Engineering Research Center
CHN	Center for High-rate Nanomanufacturing; a National Science Foundation Nanoscale Science and Engineering Center
CURENT	Center for Ultra-wide-area Resilient Electric Energy Transmission Networks; a National Science Foundation Engineering Research Center, jointly supported by NSF and the Department of Energy and led by the University of Tennessee
CHOT	Center for Health Organization Transformation; a National Science Foundation Industry-University Collaborative Research Center led by Texas A & M
HSyE	CMS Innovation Center for Healthcare Systems Engineering; a Department of Health and Human Services Regional Systems Engineering Extension Center
PROTECT	Puerto Rico Testsite for Exploring Contamination Threats; a National Institute of Environmental Health Sciences Superfund Research Program (SRP) Center
VOTERS	Versatile Onboard Traffic Embedded Roaming Sensors; funded by National Institute of Standards and Technology (NIST) Technology Innovation Program project

MECHANICAL AND INDUSTRIAL ENGINEERING
Faculty by Scholarship Focus

Biomechanics

Gouldstone, Andrew
Mavroidis, Dinos
Muftu, Sinan
Nayeb-Hashemi, Hamid
Ruberti, Jeffrey
Shefelbine, Sandra
Vaziri, Ashkan
Wan, Kai-Tak

Energy

Busnaina, Ahmed
Cipolla, John
Huang, Hanchen
Jung, Yung Joon
Kowalski, Greg
Levendis, Yiannis
Liu, Yongmin
Livermore, Carol
Metghalchi, Hameed
Narusawa, Uichiro
Sheikhi, Reza
Taslim, Mohammad
Whalen, Richard

Healthcare Systems

Benneyan, James
Griffin, Jackie
Kamarthi, Sagar
Lin, Yingzi
Sahney, Vinod
Turkcan, Ayten

Industrial Engineering/ Operations Research

Benneyan, James
Cullinane, Thomas
Fard, Nasser
Griffin, Jackie
Gupta, Surendra
Kamarthi, Sagar
Lin, Yingzi
Melachrinoudis, Emanuel
Sahney, Vinod
Turkcan, Ayten

Materials Science & Engineering

Ando, Teiichi
Busnaina, Ahmed
Erb, Randall
Gouldstone, Andrew
Huang, Hanchen
Isaacs, Jacqueline
Jung, Yung Joon
Lee, HeaYeon
Liu, Yongmin
Minus, Marilyn
Shefelbine, Sandra
Upmanyu, Moneesh
Vaziri, Ashkan

Mechanics

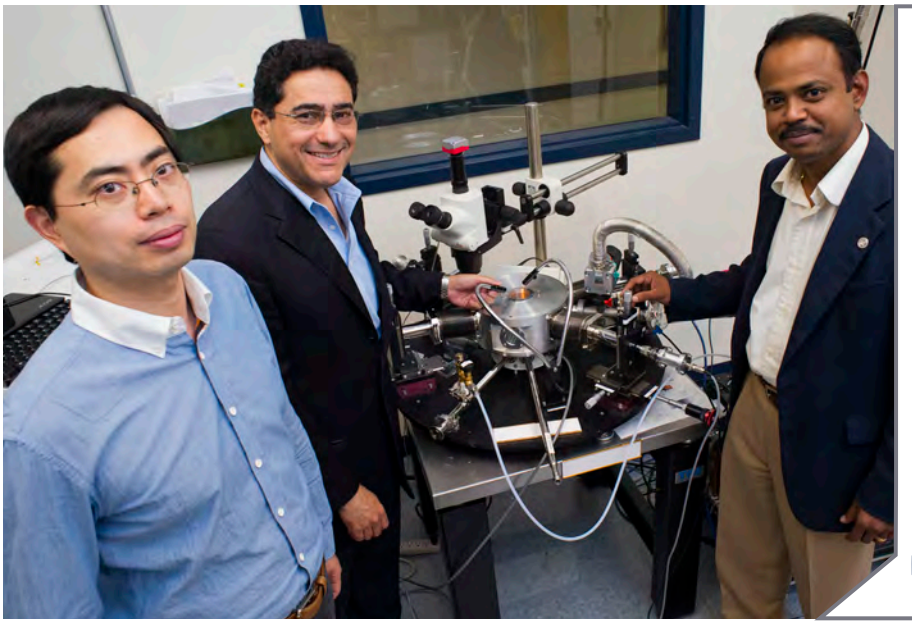
Adams, George
Chakravathy, Srinath
Gouldstone, Andrew
Hidrovo, Carlos
Jalili, Nader
Livermore, Carol
Martinez-Lorenzo, Jose
Mavroidis, Dinos
Muftu, Sinan
Nayeb-Hashemi, Hamid
Shefelbine, Sandra
Sipahi, Rifat
Vaziri, Ashkan
Wan, Kai-Tak
Zeid, Ibrahim

Mechatronics

Jalili, Nader
Lin, Yingzi
Mavroidis, Dinos
Sipahi, Rifat

Nanomanufacturing

Busnaina, Ahmed
Erb, Randall
Isaacs, Jacqueline
Jalili, Nader
Jung, Yung Joon
Liu, Yongmin
Livermore, Carol
Minus, Marilyn
Upmanyu, Moneesh



Ahmed Busnaina (center) is Director of the Center for High-rate Nanomanufacturing, a National Science Foundation Nanoscale Science and Engineering Center.

Northeastern University
Center for High-rate Nanomanufacturing

A Small-Scale Solution With a Large-Scale Impact

Microchips are pervasive in today's high-tech society, playing integral roles in the inner workings of your cell phone to your Keurig coffee machine.

A processing technology called CMOS, or complementary metal–oxide–semiconductor, made microchips economically feasible in the 1980s, said Sivasubramanian Somu, a research scientist in Northeastern's Center for High-rate Nanomanufacturing.

A critical element in any microchip is something called an inverter — an electronic component that spits out zeros when you give it ones, and vice versa. "A transistor [the basic element in an inverter] is a simple, extremely fast switch," Somu explained. "You can turn it on and off by electric signals."
In the early days of computer technology, mechanical switches were used for computational operations. "You cannot achieve fast computations using mechanical switches," Somu said. So CMOS, which used electric signals to turn the switches on and off, represented a significant advance in the field.

But despite its relative economy, a CMOS fabrication plant still costs about $50 billion, according to Somu. "We needed an alternative, cost-effective solution that still can compete with CMOS at the foundry level," he said.

CHN's proprietary "directed-assembly" approach is that alternative solution. Instead of requiring several fabrication steps of adding and removing material, as in the case of CMOS, directed assembly is an additive-only process that can be done at room temperature and pressure. A fabrication facility based on this technology, Somu said, could be built for as little as $25 million.

This cost savings would make nanotechnology accessible to millions of new innovators and entrepreneurs, unleashing a wave of creativity the same way the PC did for computing, said Ahmed Busnaina, the William Lincoln Smith Professor and Director of the NSF Center for High-rate Nanomanufacturing.

But creating a nanosized inverter is easier said than done, added Jun Huang, a postdoctoral research scientist in the center. Researchers have using materials like graphene and carbon nanotubes for creating inverters, but none of these has worked well on its own. Creating a nanosized inverter made up of different nanomaterials with excellent properties, Huang said, can result in excellent complimentary transistors. Using the directed-assembly process, the team created an effective complimentary inverter using Molybdenum disulfide and carbon nanotubes. "At the nanolevel," said Huang, "molybdenum disulfide occurs in thin, nanometer-thick sheets." At this scale, he noted, the material begins to demonstrate transistor characteristics critical to the construction of a good inverter. The success represents a step toward CHN's ultimate goal of enabling small– and medium-sized businesses to develop new, microchip-based technologies. The results of their research were reported in a recent article in the journal Nanotechnology.

See Busnaina profile, page 12

James Benneyan is the Director of the CMS Healthcare Systems Engineering Center, funded by the Center for Medicare and Medicaid Innovation. He is also co-Director of the Center for Health Organization Transformation (CHOT), a National Science Foundation industry-university cooperative research center (I/UCRC).

Proven Systems Engineering Methods Can Cure Complex Healthcare Challenges

Professor James Benneyan remarked he sometimes feels like the Maytag repairman, standing by with tools that can help fix healthcare's problems. The differences between Benneyan and "Ol' Lonely" are that the machine he's working on is actually broken and while he's actively helping numerous organizations, he wishes the phone would ring more.

As founding director of Northeastern's Healthcare Systems Engineering Institute, Benneyan is a nationally recognized expert in solving complex healthcare challenges using systems engineering methods.

Benneyan addressed a room full of senior healthcare improvement leaders at a recent Northeastern workshop, illustrating how his three centers have used these tools and approaches to address high-leverage problems also facing Boston healthcare organizations. This approach scaled nationally, he estimated, might cut the annual nearly $3 trillion healthcare budget by one-third.

"While roughly 70 percent of healthcare problems can be fixed with simple front-line improvement approaches," said Benneyan, "maybe another 20 percent need something a bit more. But the upper tail problems are fundamentally complex and in other industries would be solved with more advanced systems engineering methods."

Benneyan has shown this same potential in individual health systems and now has funding from the Centers for Medicare and Medicaid to scale it across an entire healthcare community, here in Boston.

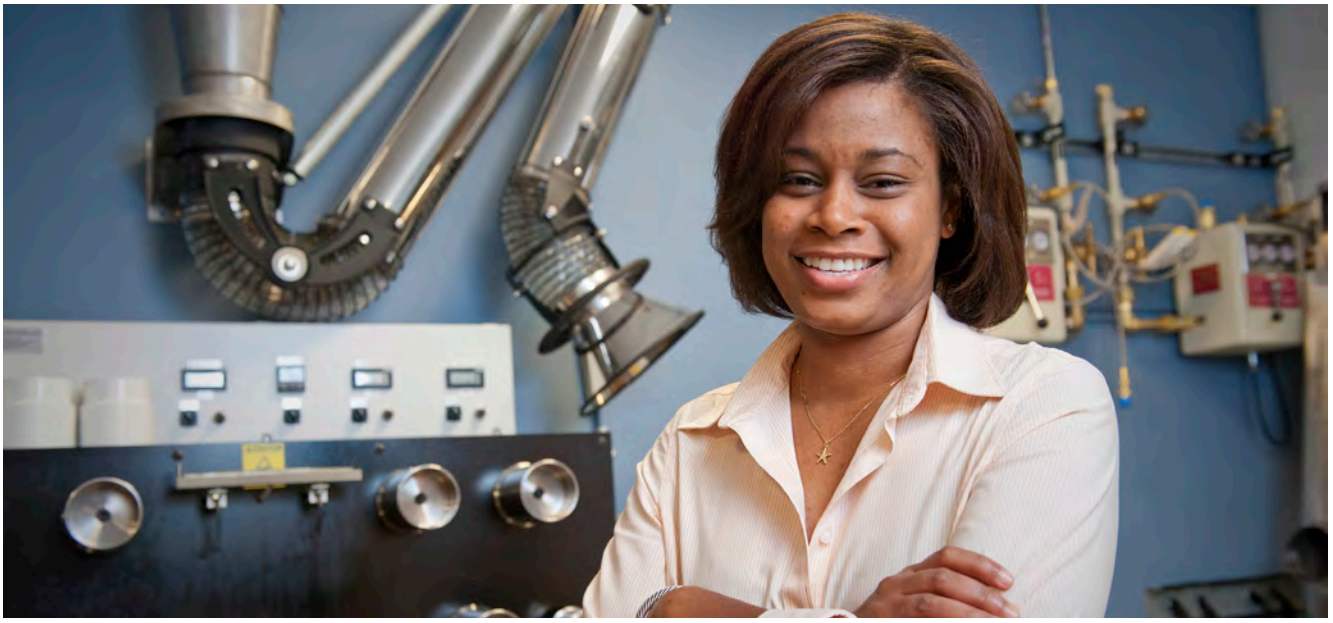
Simple improvement methods include things like reorganizing storage clinical closets so the most oft-used items are readily available. However, more advanced techniques usually are required to solve macro-level problems, such as identifying the best locations for new clinics, more efficient ambulance routing patterns, or optimized treatment schedules. For these sorts of challenges, Benneyan said, engineers turn to mathematical and computational modeling.

Benneyan gave an overview of the most common systems engineering models and several healthcare examples of each in order to stimulate group brainstorming of potential applications across Boston.

"Models are artificial representations of the real world, but useful for rapidly helping design better processes and systems," he explained. For example, his team can create simulation models that mimic such things as patient flow throughout a hospital, and then test hundreds of potential improvement ideas in order to identify the best changes to put into actual practice.

The workshop was the second in an ongoing series to introduce Boston healthcare professionals to the types of problems systems engineering can solve and the methods for doing so. After Benneyan's lecture, he led a group brainstorming discussion session to identify similar problems they could work on locally.

See faculty page 10



From Stronger Kevlar to Better Biology

Place two large, sturdy logs in a streambed, and they will help guide the water in a particular direction. But imagine if the water started mimicking the rigidity of the logs in addition to flowing along them. That's essentially what happens in a directed assembly method developed by Marilyn Minus, an assistant professor in Northeastern's Department of Mechanical and Industrial Engineering.

Instead of logs, Minus uses tiny carbon nanotubes and her "water" can be just about any kind of polymer solution. So far, she's used the approach to develop a polymer composite material that is stronger than Kevlar yet much less expensive and lighter weight. In that case, the polymer not only follows the direction of the nanotube logs but also mimics their uniquely strong properties.

With funding from a new CAREER award from the National Science Foundation, Minus is now expanding this work to incorporate more polymer classes: flame retardant materials and biological molecules.

"With the flame retardants, we want the high-temperature polymer and nanotube to interact, not necessarily act like the nanotubes," Minus said. Essentially, she wants the two materials to "communicate" by passing heat between one another, thereby increasing the temperature threshold of the flame retardants and allowing them to last even longer. "The nanomaterial can grab that heat and conduct it away, and it basically saves that polymer from burning up too quickly," she explained. "The polymer we're using can already withstand quite high temperatures; we're just pushing it even further."

In the case of collagen—the first biological molecule to which Minus has applied her method—Minus hopes the approach will allow the nanotubes to lend their rigidity to the system. Inside the body, collagen molecules organize themselves into a complex matrix that supports the structure of every one of our cells. But outside the body, researchers have had major challenges trying to reliably recreate this matrix.

If scientists could make collagen work outside the body the same way it does inside, it could provide an invaluable platform for testing drugs, understanding how tissues work, and even shedding light on the origins of a variety of diseases, Minus said.

Based on her prior research, she has found that the key to success in taking this approach is matching the size and geometry of the carbon nanoparticles she uses with that of the polymer in question. For instance, collagen molecules are about 300 nanometers long and 1.5 nanometers in diameter, so she'll want to find a nanotube that roughly meets those dimensions. She'll also want to use nanotubes for this application rather than the other carbon forms she has at her disposal: graphene, graphite, fullerenes, or even small nanocarbon particles—each of which offers a unique structure.

"We're trying to change the entropy of the system in order to get the polymers to organize themselves around the nanomaterials," Minus said. "Then you should be able to get this effect."

See faculty page 45

GEORGE ADAMS

COE Distinguished Professor, Mechanical and Industrial Engineering; affiliated faculty: Civil and Environmental Engineering, Electrical and Computer Engineering, PhD, University of California, 1975.
Joined Northeastern in 1979 | 617.373.3826 | g.adams@neu.edu | coe.neu.edu/~adams_g

Scholarship Focus

- Contact mechanics including adhesion, friction, and plasticity
- Modeling and analysis of microelectromechanical systems (MEMS)
- Modeling and analysis in nanomechanics

Honors and Awards

- Fellow, American Society of Mechanical Engineers
- Fellow, Society of Tribologists and Lubrication Engineers
- Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Books and book chapters

G.G. Adams

Contacts Considering Adhesion, In Encyclopedia of Tribology, Q. Jane Wang and Yip-Wah Chung (editors), Springer Reference, 2013, 571-579

G.G. Adams

Contacts Involving Wave Propagation, Encyclopedia of Tribology, Springer Reference, 2013, 579-583

G.G. Adams

The DMT Theory of Adhesion, Encyclopedia of Tribology, Springer Reference, 2013, 3560-3565

Papers in refereed journals

H. Pan, Y.-C. Wu, G.G. Adam s, G.P. Miller, N.E. McGruer

Interfacial Shear Stress Between Single-Walled Carbon Nanotubes and Gold Surfaces With and Without an Alkanethiol Monolayer, Journal of Colloid and Interface Science, 407, 2013, 133-139

J.R. Parent, G.G. Adams

A Model of a Trapped Particle Under a Plate Adhering to a Rigid Surface, Journal of Applied Mechanics, 80, 2013, 051011

Y.-C. Wu, N.E. McGruer, G.G. Adams

Adhesive Slip Process Between a Carbon Nanotube and a Substrate, Journal of Physics D: Applied Physics, 46, 2013, 175305

R.P. Hennessy, A. Basu, G.G. Adams, N.E. McGruer

Hot-Switched Lifetime and Damage Characteristics of MEMS Switch Contacts, Journal of Micromechanics and Microengineering, 23, 2013

Research Projects

Metal Contacts for High Power RF MEMS Switches

Co-Principal Investigator, Subcontract from Defense Advanced Research Projects Agency

Dissertations Supervised

Ryan Patrick Hennessy

Exploration of Hot Switching Damage and Damage Mechanisms in MEMS Switch Contacts (see p 67)

Yu-Chiao Wu

Nanomechanics Modeling of Carbon Nanotubes Interacting with Surfaces in Various Configurations (see p 70)

TEIICHI ANDO

Professor, Mechanical and Industrial Engineering
PhD, Colorado School of Mines, 1982. Joined Northeastern in 1996
617.373.3811 | tando@coe.neu.edu | coe.neu.edu/Research/AMPL

Scholarship Focus

- Rapid solidification processing
- Droplet-based materials processing
- Powder metallurgy
- Material processing by severe plastic deformation
- Processing-structure-property relationships in materials

Honors and Awards

- Fellow, American Society of Materials International
- Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Papers in refereed journals

D. Erdeniz, T. Ando

Fabrication of Micro/Nano Structured Aluminum-Nickel Energetic Composites by Ultrasonic Powder Consolidation, International Journal of Materials Research, vol. 104, issue 4, 2013, p 387-391

Z. Gu, Q. Cui, J. Chen, J. Buckley, T. Ando, D. Erdeniz, P. Wong, A. Hadjiafxenti, P. Epaminonda, I.E. Gunduz, C. Rebholz, C.C. Doumanidis

Fabrication, Characterization and Applications of Novel Nanoheater Structures, Surface Coatings and Technology, vol. 215, 2013, p 493-502

Research Projects

Collaborative Research: Microscale Joining Using Nanoheaters

Principal Investigator, National Science Foundation

A Fundamental Investigation of the Mechanisms of Ultrasonic Powder Consolidation and its to Hard-Facing of Forging Dies

Principal Investigator, Hitachi Metals, Ltd

Metallographic Characterization of Cold Sprayed Materials

Principal Investigator, Fukuda Metal Foil

Fundamentals of Bonding in Kinetic Consolidation Processes

Co-Principal Investigator, National Science Foundation

Theoretical and Experimental Investigation of in Cold Spray

Co-Principal Investigator, Plasma Giken

NADINE AUBRY

University Distinguished Professor and Dean of the College of Engineering, Mechanical and Industrial Engineering
PhD, Cornell University, 1987. Joined Northeastern in 2012
617.373.2153 | n.aubry@neu.edu

Scholarship Focus

- Chaotic mixing
- Electrohydrodynamics
- Fluid dynamics
- Microfluidics
- Particle manipulation
- Self-assembly

Honors and Awards

- Member, National Academy of Engineering
- Fellow, American Association for the Advancement of Science
- Fellow, American Institute of Aeronautics and Astronautics
- Fellow, American Physical Society
- Fellow, American Society of Mechanical Engineers
- National Science Foundation Presidential Young Investigator Award
- Ralph R. Teetor Educational Award, Society of Automotive Engineers (SAE)
- Former Chair, National Academies' U.S. National Committee for Theoretical and Applied Mechanics (USNC/TAM)
- Chair, American Physical Society Division of Fluid Dynamics

Selected Recent Publications

Papers in refereed journals

R. Chabreyrie, C. Chandre, N. Aubry

Complete Chaotic Mixing in an Electro-Osmotic Channel by Destabilization of Key Periodic Orbits, Physics of Fluids 23, 072002, 2011

M. Janjua, S. Nudurupati, P. Singh, N. Aubry

Electric Field Induced Self-Assembly of Micro- and Nanoparticles of Various Shapes at Two-Fluid Interfaces, Electrophoresis 32, 518-526, 2011

JAMES BENNEYAN

Director, Healthcare Systems Engineering Institute, College of Engineering and Health Sciences
Professor, Mechanical and Industrial Engineering, PhD, University of Massachusetts, Amherst, 1997
Joined Northeastern in 1997 | 617.373.2975 | jbenneyan@coe.neu.edu | www.hsye.org

Scholarship Focus

- Healthcare systems engineering
- Patient safety, flow, and medical decision making
- Quality and reliability engineering
- Probabilistic design
- Simulation and mathematical statistics

Honors and Awards

- Senior Fellow, Institute for Healthcare Improvement
- Fellow, Society for Health Systems
- Lifetime Fellow, Healthcare Information and Management Systems Society
- Fellow, Institute of Industrial Engineers

Selected Recent Publications

Papers in refereed journals

A.I Topcu, J.C. Benneyan, T.P. Cullinane
A Simulation-Optimization Approach for Reconfigurable Inventory Space Planning in Remanufacturing Facilities, International Journal of Business Performance and Supply Chain Modelling, 5 (1), 2013, 86-114

C.S. Aksezer, J.C. Benneyan
Multiresponse Optimization of Powder Metals Via Probabilistic Loss Functions, European Journal of Industrial Engineering, 7 (3), 2013, 295-311

J.C. Benneyan
Systems Engineering Approaches for Improving Reusable Medical Equipment Reprocessing Processes, International Journal of Innovation and Technology Management, 10, 2013

H. Musdal, B. Shiner, T.-C. Chen, M.E. Ceyhan, B.V. Watts, J. Benneyan
In-Person and Video-Based Post-Traumatic Stress Disorder Treatment for Veterans: A Location–Allocation Model, Military Medicine, 179 (2), 2014, 150-156

J.S. Peck, S.A. Gaehde, D.J. Nightingale, D.Y. Gelman, D.S. Huckins, M.F. Lemons, E.W. Dickson, J.C. Benneyan
Generalizability of a Simple Approach for Predicting Hospital Admission From an Emergency Department, Academic Emergency Medicine, 20 (11), 2013, 1156-1163

B.V. Watts, B. Shiner, M.E. Ceyhan, H. Musdal, S. Sinangil, J.C. Benneyan
Health Systems Engineering as an Improvement Strategy: A Case Example Using Location-Allocation Modeling, Journal of Healthcare Quality, 35 (3), 2013, 35-40

B. Chen, T. Matis, J.C. Benneyan
Computing Exact Bundle Compliance Control Charts via Probability Generating Functions, Healthcare Management Science, online, 2014

B.V. Watts, B. Shiner, J.A. Cully, S.C. Gilman, J.C. Benneyan, W. Eisenhauer

Health Systems Engineering Fellowship Curriculum and Program Development, American Journal of Medical Quality, 29 (4), 2014

Research Projects

Scalable Healthcare Systems Engineering Regional Extension, a CMS Healthcare Systems Engineering Center

Center Director and Principal Investigator, Centers for Medicare and Medicaid Services

Center for Healthcare Organizational Transformation (CHOT)-I/UCRC

Co-Director and Site Principal Investigator, National Science Foundation

Drug Safety Risk-Benefit Models

Principal Investigator, National Science Foundation

New England Healthcare Engineering Partnership (VERC)

Principal Investigator, U.S. Veterans Administration

Reducing Preventable Hospital Readmissions

Principal Investigator, Purdue University

Dissertations Supervised

Hande Musdal

Systems Engineering Models for Signature Injuries of Modern Military Conflicts (see p 67)

AHMED BUSNAINA

William Lincoln Smith Professor, Mechanical and Industrial Engineering; affiliated faculty, Bioengineering, Electrical and Computer Engineering, PhD, Oklahoma State University, 1983. Joined Northeastern in 2000
617.373.2992 | busnaina@coe.neu.edu | www.cmc.neu.edu | neu.edu/chn

Scholarship Focus

- Development of processes and tools for fast massive directed assembly of nanoscale elements
- High-rate printing 2D and 3D nanoscale structures
- Nano-scale particle transport, deposition, adhesion and removal, contamination-free manufacturing in semiconductor processes
- Nano-scale technologies, physical modeling of semiconductor processes
- Computational fluid dynamics, turbulence modeling, transport phenomena

Honors and Awards

- Fellow, American Society of Mechanical Engineers
- Fellow, the Adhesion Society
- Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Papers in refereed journals

C. Yilmaz, A.E Cetin, G. Goutzamanidis, J. Huang, S. Somu, H. Altug, D. Wei, A. Busnaina
Three-Dimensional Crystalline and Homogeneous Metallic Nanostructures Using Directed Assembly of Nanoparticles, ACS Nano, 2014, 8 (5):4547-4558

J.K. Lee, S.H. Cho, J.H. Lee, H.Y. Ryu, J. Park, S. Lim, B. Oh, C.W. Lee, W. Huang, A. Busnaina, H.Y. Lee
Wafer-Scale Nanowell Array Patterning Based Electrochemical Impedimetric Immunosensor, Journal of Biotechnology, vol. 168, issue 4, December 2013, p 584-588

H.Y. Jung, Y.L. Kim, S. Park, A. Datar, H.-J. Lee, J. Huang, S. Somu, A. Busnaina, Y.J. Jung, Y.-K. Kwon
A High-Performance H2s Detection by Redox Reactions in Semiconducting Carbon Nanotube-Based Devices, Analyst, 138, December 2013, issue 23, p 7206-7211

T.-H. Kim, C. Yilmaz, S. Somu, A. Busnaina
3-D Perpendicular Assembly of SWNTs for CMOS Interconnects, Electronic Materials Letters, November 2013, vol 9, issue 6, p 763-766

J.C. Benneyan, C. Bond
Systems Engineering Approaches for Improving Reusable Medical Equipment Reprocessing Processes, International Journal of Innovation and Technology Management, 10 (3), 2013

J. Lee, J.K. Lee, B.H. Park, A. Busnaina, H.Y. Lee
Acceleration of Poly(L-Lactide) Degradation by TiO2 Nanoparticles in Sunlight, Journal of Nanoscience and Nanotechnology, vol. 13, 10, Oct 2013, p 6983-6987

A. Busnaina, J.Mead, J. Isaacs, S. Somu
Nanomanufacturing and Sustainability: Opportunities and Challenges, Journal of Nanoparticle Research, vol. 15, September 2013, p 1984-1988

T.H. Kim, H. Cho, A. Busnaina, J.-G. Park, D. Kim
Shockwave-Induced Deformation of Organic Particles During Laser Shockwave Cleaning, Journal of Applied Physics, vol.114 ,issue 6, Aug 2013, p 063104

J. Seo, H.l Cho, J.-K. Lee, J. Lee, A. Busnaina, H.Y. Lee
Double Oxide Deposition and Etching Nanolithography for Wafer-Scale Nanopatterning with High-Aspect-Ratio Using Photolithography, Applied Physics Letters, 103, issue 3, July 2013, p 033105

J. Huang, S. Somu, A. Busnaina
Spin Coating Fabrication of Thin Film Transistors Using Enriched Semiconducting SWNT Solution, Electronic Materials Letters, July 2013, vol 9, issue 4, p 505-507

G. Li, C. Yilmaz, X. An, S. Somu, S. Kar, Y.J. Jung, A. Busnaina, K.-T. Wan
Adhesion of Graphene Sheet on Nano-Patterned Substrates with Nano-Pillar Array, Journal of Applied Physics, vol. 113, issue 24, June 2013, p 244-303

J. Shen, M. Wei, A. Busnaina, C. Barry, J. Mead
Directed Assembly of Conducting Polymers on Sub-Micron Templates by Electrical Fields, Journal of Materials Science and Engineering: B, vol. 178, issue 3, 20 February 2013, p 190-201

J. Lee, Jo.-K. Lee, A. Busnaina, B.H. Park, H.Y. Lee
Phospholipase-Catalyzed Hydrolysis in an Artificial Cell Membrane in the Presence of Melittin, Journal of Nanoscience and Nanotechnology, vol. 13, issue 1, Jan 2013, p 144-148

Research Projects

NSF Nanoscale Science and Engineering Center for High-Rate Nanomanufacturing
Principal Investigator and Director, National Science Foundation

Dissertations Supervised

Hanchul Cho
Development of High-Rate Nano-Scale Offset Printing Technology for Electric and Bio (see p 63)

Cihan Yilmaz
Precise Directed Assembly of Nanoparticles for Electronic, Optical and Biomedical Applications (see p 71)

SRINATH CHAKRAVARTHY

Assistant Professor, Mechanical and Industrial Engineering
PhD, University of Connecticut, 2007. Joined Northeastern in 2011
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Scholarship Focus

- Multi-scale (spatio temporal)/meso-scale numerical methods
- Development of predictive material models of micro/nanostructural features of engineering alloys
- Fracture and fatigue in metal alloys

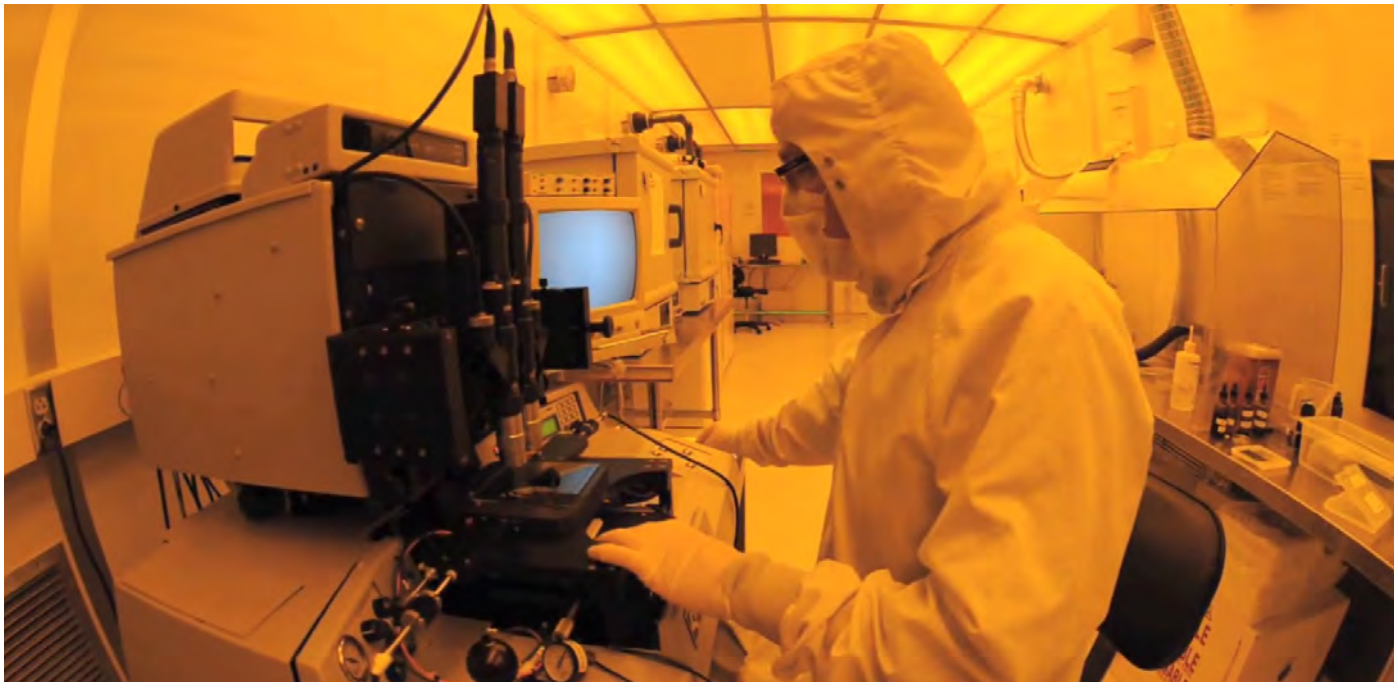
Selected Recent Publications

Papers in refereed journals

B.A. Szajewski, S. Chakravarthy, W.A. Curtin
Operation of a 3D Frank–Read Source in a Stress Gradient and Implications for Size-Dependent Plasticity, Acta Materialia, 2013, 1469–1477

S. Olarnithinun, S. Chakravarthy W.A. Curtin
Discrete Dislocation Modeling of Fracture in Plastically Anisotropic Metals, Journal of the Mechanics and Physics of Solids, 61 (6), 2013, 1391-1406

S. Chakravarthy, W.A. Curtin
Stress Gradient Plasticity: Concepts and Applications, Proceedia IUTAM, 10, 2014, 453-461



JOHN W. CIPOLLA

Donald W. Smith Professor, COE Distinguished Professor, Mechanical and Industrial Engineering
PhD, Brown University, 1970. Joined Northeastern in 1971
617.373.3805 | j.cipolla@neu.edu

Scholarship Focus

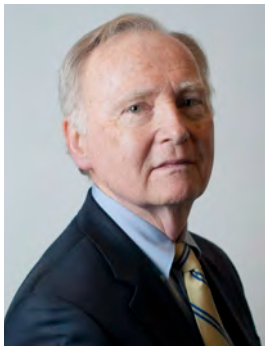
- Mathematical methods and modeling
- Thermodynamics
- Fluid dynamics
- Kinetic theory of gases
- Thermophoresis of aerosols

Honors and Awards

- Fellow, American Society of Mechanical Engineers
- Edwin F. Church Medal, American Society of Mechanical Engineers

THOMAS CULLINANE

Program Director, Engineering Management; Professor, Mechanical and Industrial Engineering; affiliated faculty, Business Administration. PhD,Virginia Polytechnic Institute and State University, 1972
Joined Northeastern in 1981 | 617.373.4851 | t.cullinane@neu.edu



Scholarship Focus

Analysis and design of efficient facilities focusing on inventory space control, materials handling and staffing levels.

Honors and Awards

Fellow, Institute of Industrial Engineers

Selected Recent Publications

Papers in refereed journals

A. Topcu, J. Benneyan, T. Cullinane

A Simulation Optimization Approach for Reconfigurable Inventory Space Planning in Remanufacturing Facilities, International Journal of Business Performance and Supply Chain Modeling, Volume 5, 2013

Research Projects

A Computer Game to Teach Sustainability in Business and Engineering

Co-Principal Investigator, Northeastern University

Engineering Management is the art and science of planning, organizing, allocating, directing and controlling the activities and resources applicable to individuals and organizations engaged in the management of engineering activities and technology development, including: project management, economic evaluation of systems, technology transfer, management of research programs, development, design, evaluation, production, and allied activities.

CHARLES DIMARZIO

Associate Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering, Mechanical and Industrial Engineering, PhD, Northeastern University, 1996. Joined Northeastern in 1987
617.373.2034 | dimarzio@ece.neu.edu | ece.neu.edu/faculty/dimarzio

Scholarship Focus

- Coherent optical detection
- Imaging in turbid media
- Multi-modal microscopy
- Medical imaging with light and sound

Selected Recent Publications

Papers in refereed journals

Z.R. Hoffman, C.A. DiMarzio
Structured Illumination Microscopy Using Random Intensity Incoherent Reflectance, Journal of Biomedical Optics, 2013

Z. Lai, J. Kerimo, Y. Mega, C.A. DiMarzio
Stepwise Multi-Photon Activation Fluorescence Reveals a New Method of Melanin Detection, Journal of Biomedical Optics, 2013

J.L. Hollmann, R. Horstmeyer, C. Yang, C.A. DiMarzio
Analysis and Modeling of an Ultrasound-Modulated Guide Star to Increase the Depth of Focusing in a Turbid Medium, Journal of Biomedical Optics, 18 (2):025004–025004, 2013

Z. Lai, J. Kerimo, Y. Mega, C.A DiMarzio
Stepwise Multiphoton Activation Fluorescence Reveals a New Method of Melanin Detection, Journal of Biomedical Optics,18 (6), 061225–061225, 2013

J.L. Hollmann, R. Horstmeyer, C. Yang, C.A DiMarzio
Diffusion Model for Ultrasound-Modulated Light, Journal of Biomedical Optics, 19 (3):035005–035005, 2014

RANDALL ERB

Assistant Professor, Mechanical and Industrial Engineering
PhD, Duke University, 2009. Joined Northeastern in 2013
617.373.4649 | erb@coe.neu.edu | coe.neu.edu/~erb/DAPS

Scholarship Focus

- Structure/property relationships in composites and ceramics
- Magnetic manipulation
- Colloidal physics

Selected Recent Publications

Books and chapter books

A.R. Studart, R. Libanori, R.M. Erb
Functional Gradients in Biological Composites, Bio and Bioinspired Nanomaterials, edited by D. Ruiz-Molina, et. al. Wiley-VCH, 2013

A.R. Studart, R. Libanori, R.M. Erb
Replicating Biological Design Principles in Synthetic Composites, Materials Design Inspired by Nature, ch. 15, 2013

Papers in refereed journals

R. Libanori, F. B. Reusch, R.M. Erb, A. R. Studart
Ultrahigh Magnetically Responsive Microplatelets with Tunable Fluorescence, Langmuir, 2013

R. Libanori, R.M. Erb, A.R. Studart
Mechanics of Platelet-Reinforced Composites Assembled Using Mechanical and Magnetic Stimuli, ACS Applied Materials & Interfaces, 2013, 5 (21),10794-10805

R.M. Erb, J. Sander, R. Grisch, A.R. Studart
Self-Shaping Composites With Programmable Bioinspired Microstructures, Nature Communications, 2013, 4, 1712

R. Libanori, R.M. Erb, A. Reiser, H. Le Ferrand, M. Süess, R. Spolenak, A.R. Studart
Stretchable Heterogeneous Composites with Extreme Mechanical Gradients, Nature Communications, 2013

R.M. Erb, J. Segmehl, M. Schaffner, A.R. Studart
Temporal Response of Magnetically-Labeled Platelets Under Dynamic Magnetic Fields, Soft Matter, 2013

A.R. Studart, R.M. Erb
Bioinspired Materials That Self-Shape Through Programmed Microstructures, Soft Matter, 10 (9), 2014

NASSER FARD

Associate Professor, Mechanical and Industrial Engineering
PhD, University of Arizona, 1982. Joined Northeastern in 1987
617.373.4113 | n.fard@neu.edu

Scholarship Focus

- Systems reliability
- Accelerated life testing in reliability prediction
- Big data- data driven decision making in spatiotemporal streaming environment
- Life data (survival data) analysis
- Robust design of experiments

Honors and Awards

- Outstanding Presentation Award from the Reliability and Maintainability Symposium
- Associate Editor, IEEE Transactions on Reliability
- Associate Editor, International Journal of Reliability, Quality and Safety Engineering
- Certified Quality Engineer by American Society for Quality

Selected Recent Publications

Papers in refereed journals

A. Motaeia, T. A. Niaki, N. Fard

Bayes Interval Estimation on the Parameters of the Weibull Distribution for Complete and Censored Tests, International Journal of Engineering, Transactions C: Aspects, vol. 26, no. 9, p 985-996, 2013

A. Mendes, N. Fard

Reliability Modeling for Appliances Using the Proportional Hazard Model, Institute of Electrical and Electronics Engineers Journal, 978 (1), 4673-4711, 2013

A. Mendes, N. Fard

Binary Logistic Regression and PHM Analysis for Reliability Data, International Journal of Reliability, Quality and Safety Engineering, 2014

A. Mendes, N. Fard

Accelerated Failure Time Models Comparison to the Proportional Hazard Model for Time-Dependent Covariates with Recurrent Events, International Journal of Reliability, Quality and Safety Engineering, vol. 21, no. 2, 2014

Dissertations Supervised

Alexandre Mendes

Proportional Hazard Model Applications in Reliability (see p 66)

ANDREW GOULDSTONE

Associate Professor, Associate Department Chair and Program Director of Mechanical Engineering; affiliated faculty, Bioengineering, Chemical Engineering, PhD, Massachusetts Institute of Technology, 2001
Joined Northeastern in 2008 | 617.373.3699 | a.gouldstone@neu.edu | coe.neu.edu/~agouldstone

Scholarship Focus

- Contact mechanics
- Materials science and engineering
- Thick films and coatings

Honors and Awards

- College of Engineering Faculty Fellow
- National Science Foundation CAREER Award

Selected Recent Publications

Papers in refereed journals

C.T. Nguyen, H.M. Gonnermann, Y. Chen, A. Gouldstone
Film Drainage and the Lifetime of Bubbles, Geochemistry Geophysics Geosystems, vol. 14 issue: 9 p 3616-3631, September 2013

T. Hu, S. Zhalehpour, A. Gouldstone, S. Muftu, T. Ando
A Method for the Estimation of the Interface Temperature in Ultrasonic Joining, Metallurgical and Materials Transactions A, vol. 45, issue 5, p 2545-2552, May 2014

Research Projects

IDR/Collaborative Research: Activities in Thermal Spray Processing and Volcanology
Principal Investigator, National Science Foundation

Garde: An Interdisciplinary Approach to Accommodate Fine Motor Control Disorders
Co-Principal Investigator, National Science Foundation

Fundamentals of Bonding in Kinetic Consolidation Processes
Co-Principal Investigator, National Science Foundation

Dissertations Supervised

Parnian Boloori Zadeh
The Evaluation of Pulmonary Surfactant Mechanics Under Different Inhaled Environments via Surface Tension Studies and Light Scattering (see p 62)

JACKIE GRIFFIN

Assistant Professor, Mechanical and Industrial Engineering
PhD, Georgia Institute of Technology, 2012. Joined Northeastern in 2012
617.373.7635 | ja.griffin@neu.edu | coe.neu.edu/~jgriffin

Scholarship Focus

- Dynamic resource allocation models
- Real-time hospital bed management algorithms
- Patient flow simulation and optimization
- Disaster preparedness and evacuation planning

Selected Recent Publications

Books and book chapters

J.A. Griffin, P. Keskinocak, J. Swann

Allocating Scarce Health Care Resources in Developing Countries: A Case for Malaria Prevention, in Handbook of Health Care Operations Management, ed. by Brian Denton, Springer Science + Business, New York, 2013, p 311-329

Papers in refereed journals

J.A. Griffin, P. Keskinocak, C. Stokes, N. O'Hara, A. Vats

Development of Patient-Bed Assignment Algorithms to Support Bed Management Processes for Improvements in the Rate of Overflow Assignments and Average Request to Assign Metrics, Critical Care Medicine 40 (12):1-328, 2012

J.A. Griffin, S. Xia, S. Peng, P. Keskinocak

Improving Patient Flow in an Obstetric Unit, Health Care Management Science 15: 1-14, 2012

SURENDRA M. GUPTA

Professor, Mechanical and Industrial Engineering
PhD, Purdue University, 1977. Joined Northeastern in 1978
617.373.4846 | s.gupta@neu.edu | coe.neu.edu/~smgupta

Scholarship Focus

- Green manufacturing
- Green supply chains
- Disassembly modeling
- Remanufacturing
- Reverse logistics
- Managing end of life products
- Environmentally conscious manufacturing
- Manufacturing sustainability
- Reverse and closed-loop supply chains
- Just-in-time (JIT) manufacturing and materials management
- Operations Research: stochastic and simulation modeling

Honors and Awards

Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Books and book chapters

S.M. Gupta
Reverse Supply Chains: Issues and Analysis, CRC Press, Boca Raton, Florida, 2013

O. Ondemir, S.M. Gupta
Quality Assurance in Remanufacturing with Sensor Embedded Products, in Quality Management in Reverse Logistics, Springer-Verlag, London, p 95-112, ch. 6, 2013

M.A. Ilgin, S.M. Gupta
Reverse Logistics, in Reverse Supply Chains: Issues and Analysis, CRC Press, p 1-60, ch. 1, 2013

S.M. McGovern, S. M. Gupta
New-Product Design Metrics for Efficient Reverse Supply Chains, in Reverse Supply Chains: Issues and Analysis, CRC Press, p 83-95, ch. 3, 2013

K. Nakashima, S.M. Gupta
Modeling Supplier Selection in Reverse Supply Chains, in Reverse Supply Chains: Issues and Analysis, CRC Press, p 113-124, ch. 5, 2013

O. Ondemir, S.M. Gupta
Advanced Remanufacturing-to-Order and Disassembly-to-Order System Under Demand/Decision Uncertainty, in Reverse Supply Chains: Issues and Analysis, CRC Press, p 203-228, ch. 8, 2013

C.B. Kalayci, S.M. Gupta

River Formation Dynamics Approach for Sequence-Dependent Disassembly Line Balancing Problem, in Reverse Supply Chains: Issues and Analysis, CRC Press, p 289-311, ch. 12, 2013

C.B. Kalayci, S.M. Gupta

Balancing a Sequence-Dependent Disassembly Line Using Simulated Annealing Algorithm, in Applications of Management Science, vol. 16, Edited by Kenneth D. Lawrence and Gary Kleinman, Emerald Group Publishing Limited, p 81-103, ch. 5, 2013

Papers in refereed journals

C.B. Kalayci, S.M. Gupta

Ant Colony Optimization for Sequence Dependent Disassembly Line Balancing Problem, Journal of Manufacturing Technology Management (JMTM), vol. 24, no. 3, 413-427, 2013

C.B. Kalayci, S.M. Gupta

Artificial Bee Colony Algorithm for Solving Sequence-Dependent Disassembly Line Balancing Problem, Expert Systems with Applications, vol. 40, no. 18, 7231-7241, 2013

C.B. Kalayci, S.M. Gupta

A Particle Swarm Optimization Algorithm with Neighborhood-Based Mutation for Sequence-Dependent Disassembly Line Balancing Problem, International Journal of Advanced Manufacturing Technology, vol. 69, no. 1-4, 197-209, 2013

CARLOS HIDROVO

Assistant Professor, Mechanical and Industrial Engineering
PhD, Massachusetts Institute of Technology, 2001. Joined Northeastern in 2014
617.373.7520 | hidrovo@neu.edu | coe.neu.edu/research/hidrovo

Scholarship Focus

- Multiscale and multiphase flow and transport phenomena
- Surface tension interactions in micro/nanoengineered structures
- Electrokinetic ion transport in porous media
- Development of novel imaging and diagnostic tools
- Applications in energy storage, portable biochemical diagnostics, thermal management, and water treatment systems

Honors and Awards

- National Science Foundation CAREER Award
- Defense Advanced Research Projects Agency Young Faculty Award
- American Society of Mechanical Engineers Robert T. Knapp Award

Selected Recent Publications

Papers in refereed journals

O.N. Demirer, R.M. Naylor, C.A. Rios Perez, E. Wilkes, C. Hidrovo
Energetic Performance Optimization of a Capacitive Deionization System Operating with Transient Cycles and Brackish Water, Desalination, vol. 314, p 130-138, 2013

O.N. Demirer, C.H. Hidrovo
Laser Induced Fluorescence Visualization of Ion Transport in a Pseudo-Porous Capacitive Deionization Microstructure, Microfluidics and Nanofluidics, vol. 16, no. 1-2, p 109-122, July 2013

A. Chhabra, R. Kanapuram, T.J. Kim, J. Geng, A. Da Silva, C. Bielawski, C.H. Hidrovo
Humidity Effects on the Wetting Characteristics of Poly (N-isopropylacrylamide) During a Lower Critical Solution Transition, Langmuir, vol. 29, no. 25, p 8116-8124, 2013

C.A. Rios Perez, O.N. Demirer, R.L. Clifton, R.M. Naylor, C.H. Hidrovo
Macro Analysis of the Electro-Adsorption Process in Low Concentration NaCl Solutions for Water Desalination Applications, Journal of The Electrochemical Society, vol. 160, no. 3, p E13-E21, 2013

R. Hale, R. Bonnecaze, C.H. Hidrovo
Optimization of Capillary Flow Through Square Micropillar Arrays, International Journal of Multiphase Flow, vol. 58, p 39-51, January 2014

R.S. Hale, R. Ranjan, C.H. Hidrovo
Capillary Flow through Rectangular Micropillar Arrays, International Journal of Heat and Mass Transfer, vol. 75, p 710-717, 2014

Research Projects

CAREER: Inertial Two-Phase Gas-Liquid Droplet Microflows
Principal Investigator, National Science Foundation

Advanced Thermo-Adsorptive Battery Climate Control System
Co-Principal Investigator, Advanced Research Projects Agency

Capillary and Boiling Limits of Micropillared Thermal Wicks
Principal Investigator, National Science Foundation

HANCHEN HUANG

Professor and Department Chair, Mechanical and Industrial Engineering
PhD, University of California at Los Angeles, 1995. Joined Northeastern in 2013
617.373.5558 | h.huang@neu.edu | ilab.coe.neu.edu

Scholarship Focus

- Fabrication of nanorods, involving physical vapor deposition experiments, atomistic simulations, and theoretical formulations
- Mechanics and radiation damage of nanostructured materials using atomistic simulations
- Solar and nuclear energy technologies

Honors and Awards

- Fellow, American Society of Mechanical Engineers
- Member, Connecticut Academy of Sciences and Engineering
- Senior Member, Chinese Mechanical Engineering Society
- Royal Society of London KTP Visiting Professor in Hong Kong

Selected Recent Publications

Papers in refereed journals

S. P. Stagon, H. Huang
Airtight Metallic Sealing at Room Temperature Under Small Mechanical Pressure, Nature Scientific Reports 3, 3066, 2013

X. B. Niu, S.P. Stagon, H. Huang, J.K. Baldwin, A. Misra
Smallest Metallic Nanorods Using Physical Vapor Deposition, Physical Review Letters 110, 136102, 2013

Q. Peng, W. Ji, H. Huang, S. De
Axial Ratio Dependence of the Stability of Self-Interstitials in HCP Structures, Journal of Nuclear Materials 437, 293-296, 2013

S. P. Stagon, H. Huang
Synthesis and Applications of Small Metallic Nanorods from Solution and Physical Vapor Deposition, Nanotechnology Reviews 2, 259-267, 2013

L.G. Zhou, H. Huang
Response Embedded Atom Method of Interatomic Potentials, Physical Review B 87, 45431, 2013

B. Narayanan, I.E. Reimanis, H. Huang, C.V. Ciobanu
Radiation Effects and Tolerance Mechanism in b-Eucryptite, Journal of Applied Physics 113, 33504, 2013

L. G. Zhou, H. Huang
Controversy Over Elastic Constants Based on Interatomic Potentials, Journal of Engineering Materials and Technology – ASME Transaction 135, 11010, 2013

Y. F. Zhang, L. G. Zhou, H. Huang
Size Dependence of Twin Formation Energy of Metallic Nanowires, International Journal of Smart and Nano Materials 4, 112-118, 2013

HANCHEN HUANG continued

Research Projects

Characteristic Length Scales of Growing Nanorods

Principal Investigator, Department of Energy Office of Basic Energy Science Core Program

Characteristic Length Scales of Growing Nanorods

Principal Investigator, Defense Threat Reduction Agency

Collaborative Research: Atomistic Mechanisms of Stabilizing Oxide Nanoparticles in Oxide-dispersion Strengthened Structural Materials

Principal Investigator, National Science Foundation

A New Characteristic Length Scale on Surfaces

Principal Investigator, National Science Foundation

From Nanofabrication to Commercial Production of Solar Cells

Principal Investigator, National Science Foundation

Collaborative Nuclear Fellowship Program Applied Research in Radiation Damage and Mitigation

Principal Investigator, Nuclear Regulatory Commission

JACQUELINE ISAACS

Professor, Mechanical and Industrial Engineering
PhD, Massachusetts Institute of Technology, 1991. Joined Northeastern in 1995
617.373.3989 | j.isaacs@neu.edu | coe.neu.edu/~jaisaacs

Scholarship Focus

- Economic-environmental assessment of alternative manufacturing and nanomanufacturing routes towards sustainable design and manufacture
- Societal implications of nanomanufacturing, with interdisciplinary collaborations in political science, philosophy, industrial hygiene and industrial engineering
- Development and assessment of educational games for engineering students

Honors and Awards

- National Science Foundation CAREER Award
- ELATE Fellow

Selected Recent Publications

Papers in refereed journals

S.-F. Hsieh, D. Bello, D.F. Schmidt, A.K. Pal, A. Stella, J.A. Isaacs, E.J. Rogers
Mapping the Biological Oxidative Damage of Engineered Nanomaterials, SMALL, Special Issue: Nanotoxicology, 9 (9-10): 1853–1865, May 27, 2013

A.A. Busnaina, J. Mead, J. Isaacs, S. Somu
Nanomanufacturing and Sustainability: Opportunities and Challenges, Journal of Nanoparticle Research, 2013

L.J. Dahlben, M.J. Eckelman, A. Hakimian, S. Somu, J.A. Isaacs
Environmental Life Cycle Assessment of a Carbon Nanotube-Enabled Semiconductor Device, Environmental Science and Technology, 2013, 47, p 8471–8478

Research Projects

Ethics Education in Life Cycle Design, Engineering, and Management
Co-Principal Investigator, National Science Foundation

Research Collaborative Networks: Sustainable Energy Systems
Co-Principal Investigator, National Science Foundation

Designing and Integrating LCA Methods for Nanomanufacturing Scale-up
Principal Investigator, National Science Foundation

Shortfall! – A Computer Game to Teach Sustainability in Engineering & Business
Principal Investigator, Northeastern University

The Center for High-rate Nanomanufacturing. Research Thrust on Responsible Nanomanufacturing
Associate Director and Investigator, National Science Foundation

ADVANCE: Institutional Transformation Award
Co-Principal Investigator, National Science Foundation

NADER JALILI

Professor and Director of Graduate Studies and Research, Mechanical and Industrial Engineering; affiliated faculty, Bioengineering, PhD, University of Connecticut, 1998. Joined Northeastern in 2009
617.373.3629 | n.jalili@neu.edu | coe.neu.edu/Research/psl

Scholarship Focus

- Piezoelectric-based actuators and sensors
- Dynamic modeling and vibration control of distributed-parameters systems
- Dynamics and control of MEMS and NEMS sensors and actuators
- Control and manipulation at the nanoscale

Honors and Awards

- Fellow, American Society of Mechanical Engineers
- National Science Foundation CAREER Award
- College of Engineering Martin Essigman Outstanding Teaching Award

Selected Recent Publications

Books and book chapters

N. Jalili
Nanomechanical Cantilever-based Manipulation for Sensing and Imaging, NanoRobotics: Current Approaches and Techniques, Springer, ch. 2, New York, NY, 2013

N. Jalili
Dynamic Systems, Controls and Measurements, Fundamentals of Engineering (FE) Exams, ch. 15, NCEES® Publishing, 2013-2014

Papers in refereed journals

S. Faegh, N. Jalili, S. Sridhar
Ultra Sensitive Piezoelectric-Based Microcantilever Biosensor: Theory and Experiment, Published Online, IEEE/American Society of Mechanical Engineers Transactions on Mechatronics, p 1-5

S. Faegh, N. Jalili, O. Yavuzcetin, D. Nagesha, R. Kumar, S. Sridhar
A Cost-Effective Self-sensing Biosensor for Detection of Biological Species at Ultra-Low Concentrations, Journal of Applied Physics, 113, 224905:1-8, 2013

S. Faegh, S. Sridhar, N. Jalili
A Self-Sensing Piezoelectric MicroCantilever Biosensor for Detection of Ultra-Small Adsorbed Masses: Theory and Experiment, Sensors, 13, 6089-6108, 2013

S. Eslami, N. Jalili
A Comprehensive Modeling and Vibration Analysis of AFM Microcantilevers Subjected to Nonlinear tip- Sample Interaction Forces, by Sohrab Eslami and Nader Jalili, Ultramicroscopy, p 94-95, 2013

S. Faegh, N. Jalili
Comprehensive Distributed-parameters Modeling and Experimental Validation of Microcantilever-based Biosensor with Application to Ultra-Small Biological Species Detection, Journal of Micromechanics and Microengineering 23, 025007, 2013

S. Eslami, N. Jalili

Model Development and Boundary Interaction Force Control of a Piezoresistive-Based Microcantilever, Robotica, FirstView Articles, p 1-19, June, 2014

Research Projects

High Temperature and High Acceleration End-Effector Pads for Semiconductor Applications – Phase II: Carbon Nanotube (CNT)-based Surface Treatment for Improved Adhesion and Friction Properties

Principal Investigator, Brooks Automation Inc.

High Temperature and High Acceleration End-Effector Pads for Semiconductor Applications – Phase I

Principal Investigator, Brooks Automation Inc.

Design and Development of Nanoscale Package-Embedded Vibration Sensing and Active Isolation – Phases I-V

Principal Investigator, Raytheon

A New Hands-on Mechatronics Course in Emerging Fields

Co-Principal Investigator, Mathworks

Dissertations Supervised

Samira Faegh

A Novel Self-Sensing Piezoelectric Microcantilever-Based Sensor for Detection of Ultra Small Masses and Biological Species (see p 64)

YUNG JOON JUNG

Associate Professor, Mechanical and Industrial Engineering
PhD, Rensselaer Polytechnic Institute, 2003. Joined Northeastern in 2005
617.373.4843 | jungy@coe.neu.edu | coe.neu.edu/research/onsi

Scholarship Focus

- Synthesis of low dimensional nanomaterials and engineering their molecular structures
- Assembly, transfer and integration of nanomaterials and nanostructured architectures and study properties and underlying fundamental science
- Nanoelectronics, flexible devices, chemical sensors and energy application

Selected Recent Publications

Papers in refereed journals

H. Jung, H. Chun, S. Park, S. Kang, C. W. Ahn, Y. Kwon, M. Upmanyu, P. M. Ajayan, Y.J. Jung
Liquid Metal Nanodroplet Dynamics Inside Nanocontainers, Scientific Reports, 3, 2588, 2013

X. An, F. Liu, Y.J. Jung, S. Kar
Tunable Graphene–Silicon Heterojunctions for Ultrasensitive Photodetection, Nano Letters, 13, 909, 2013

G. Li, C. Yilmaz, X. An, S. Somu, S. Kar, Y.J. Jung, A. Busnaina, K. Wan
Adhesion of Graphene Sheet on Nano-Patterned Substrates with Nano-Pillar Array, Journal of Appl. Phys., 113, 244303, 2013

M. Hahm, J. Lee, A.H.C. Hart, S.M. Song, J. Nam, H.J. Jung, D.P. Hashim, B. Li, T.N. Narayanan, C. Park, Y. Zhao, R. Vajtai, Y.A. Kim, T. Hayashi, B. Ku, M. Endo, E. Barrera, Y.J. Jung, E. L. Thomas, P.M. Ajayan
Carbon Nanotube Core Graphitic Shell Hybrid Fiber, ACS Nano, 7, 10971, 2013

H. Jung, Y. Kim, S. Park, A. Datar, H. Lee, Jun Huang, S. Somu, A. Busnaina, Y.J. Jung, Y. Kwon
A High-Performance H2S Detection by Redox Reaction in Semiconducting Carbon Nanotube-Based Devices, Analyst, 138, 7206, 2013

Y. Kim, H. Jung, S. Park, B. Li, F. Liu, J. Hao, Y. Kwon, Y.J. Jung, S. Kar
Voltage-Switchable Photocurrents in Single-Wall Carbon Nanotube – Silicon Junctions for Analogue and Digital Optoelectronics, Nature Photonics, 8, 239, 2014

Research Projects

Highly Organized Two and Three Dimensional Singlewalled Carbon Nanotubes- Polymer Hybrid Structures for Diverse Flexible Devices and Systems

Principal Investigator, National Science Foundation

Ultra-High Performance Carbon Nanotube “Parallel Nanotube Architectures” (PNAs) for on-Chip Gigascale Local and Global Interconnects

Principal Investigator, National Science Foundation

Controlled Synthesis of Silicon Carbide Nanowires for the Highly Effective Thermal Dissipation in Chemical Materials

Principal Investigator, Korean Ministry of Knowledge and Economy-Materials

Nanoporous Pt Film on Silicon Wafer and Engineering Their Nanopore Structure, Korea Institute of Science & Tech.

Principal Investigator, Korean Ministry of Knowledge and Economy-Materials

The Center for High-Rate Nanomanufacturing

Co-Principal Investigator, National Science Foundation

Flexible Electrodes and Catalyst Support Using Nanocarbon

Principal Investigator, Korea Institute of Science and Technology

High Performance Photoswitches Using Carbon Nanotube-Si Heterojunctions for Optoelectronic Logic Devices

Co-Principal Investigator, National Science Foundation

Dissertations Supervised

Bo Li

Highly Organized Single-Walled Carbon Nanotube-Polymer Hybrid Architectures (see p 66)

SAGAR KAMARTHI

Associate Professor, Mechanical and Industrial Engineering
PhD, Pennsylvania State University, 1994. Joined Northeastern in 1995
617.373.3070 | sagar@coe.neu.edu | coe.neu.edu/~sagar

Scholarship Focus

- Industrial engineering
- Advanced manufacturing
- Personalized disease management
- Sensor based diagnostics and prognostics

Selected Recent Publications

Papers in refereed journals

G.M. Uddin, K.S. Ziemer, B. Sun, I. Zeid, S. Kamarthi
Monte Carlo Study of the High Temperature Hydrogen Cleaning Process of 6H-Silicon Carbide for Subsequent Growth of Nano Scale Metal Oxide Films, International Journal of Nanomanufacturing, vol. 9, no. 5/6, p 407-430, 2013

H. Abuhimd, A. Zeid, Y.-J. Jung, G.M. Uddin, S. Kamarthi
Chemical Vapor Deposition Grown Vertically Aligned Single Walled Carbon Nanotubes Length Assurance, International Journal of Advanced Manufacturing Technology, Special Issue on Advances in Nano-manufacturing, vol. 64, p 545-553, 2013

S. Radhakrishnan, Y. Lin, I. Zeid, S. Kamarthi
Finger-Based Multi-Touch Interface for Performing 3D CAD Operations, International Journal of Human-Computer Studies, vol. 71, p 261-275, 2013

I. Zeid, J. Chin, C. Duggan, S. Kamarthi
Engineering Based Learning: a Paradigm shift for High School STEM Teaching, International Journal of Engineering Education, vol. 30, no. 4, p 1-12, 2014

Research Projects

Smart Manufacturing Performance Assurance (Mpass) Through Equipment Monitoring
Principal Investigator, National Institute of Standards and Technology

TRANSFORMing Liberal Arts Careers to Meet Demand for Advanced Manufacturing Workforce
Co-Principal Investigator, National Science Foundation

Research Frontiers in Health Care Mass Customization for Personalized Diagnostics, Care and Cure
Principal Investigator, Northeastern University

GREGORY KOWALSKI

Energy Systems Program Director, Associate Professor, Mechanical and Industrial Engineering
PhD, University of Wisconsin, 1978. Joined Northeastern in 1978
617.373.2971 | gkowal@coe.neu.edu

Scholarship Focus

- Energy related and calorimeter studies related to pharmaceutical developments
- Simulation of thermal effects on laser beam propagation through heated materials
- Simulating microscale heat transfer phenomena and its effects on laser beam propagation
- Simulation of laser welding processes

Honors and Awards

Fellow, American Society of Mechanical Engineers

Research Projects

Chip-Scale Nano-Calorimeter

Principal Investigator, Draper Lab Inc.

The Master of Science degree program in energy systems (MSES) integrates the technology side of energy systems development with the financial planning needed to effectively implement them. The goal of the MSES is to create a high-level signature, interdisciplinary graduate program for the engineer or technical business major who is pursuing an industrial or public-planning-based career.

YIANNIS LEVENDIS

COE Distinguished Professor, Mechanical and Industrial Engineering
PhD, California Institute of Technology, 1988. Joined Northeastern in 1988
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Scholarship Focus

- Gasification and combustion of solid fuels (coal, biomass and waste-tire-derived and waste plastics derived fuels)
- Generation and containment of combustion-generated pollution
- Synthesis and characterization of combustion-generated materials
- Fire suppression – fire extinction
- Engine design and operation

Honors and Awards

- Fellow, American Society of Mechanical Engineers
- Fellow, Society of Automotive Engineers
- Søren Buus Outstanding Research Award, College of Engineering
- George Westinghouse Gold Medal, American Society of Mechanical Engineers

Selected Recent Publications

Books and book chapters

T. Zannis, R.G. Papagiannakis, Y.A. Levendis
Diesel Engines, Contributed chapter in the book Oxygen-Enhanced Combustion, second edition, Charles E. Baukal, Editor, CRC Press, Taylor and Francis Group, Chapter 30, p 681-710, 2013

T. Zannis, E.I.A. Yfantis, D.T. Hountalas, R.G. Papagiannakis, Y.A. Levendis
Critical Review of the Effects of Diesel Fuel Composition and Properties on Engine Performance and Pollutant Emissions, Contributed chapter in the book Diesel Fuels: Characteristics, Performances and Environmental Impacts, Nova Publishers, ch. 1, 2013

Papers in refereed journals

Y.A. Levendis
Alternative Porous Media and Designs for Automotive Oil Filters, SAE International Journal of Fuels and Lubricants, 2013

T. Maffei, R. Khatami, S. Pierucci, T. Faravelli, E. Ranzi, Y.A. Levendis
Experimental and Modeling Study of Single Coal Particle Combustion in O_2/N_2 and Oxygen fuel (O_2/CO_2) Atmospheres, Combustion and Flame, 2013

R. Soheilian, A. Davies, S.T. Anaraki, C. Zhuo, Y.A. Levendis
Pyrolytic Gasification of Post-Consumer Polyolefins to Allow for 'Clean' Premixed Combustion, Energy and Fuels, 2013

F. Kazanc, Y.A. Levendis, T. Maffei
Chemical Composition of Submicron Particulate Matter Emitted from Combustion of Coals of Various Ranks in O_2/N_2 and O_2/CO_2 Environments, Energy and Fuels, 2013

J. Riaza, L. Alvarez, M.V. Gil, R. Khatami, Y.A. Levendis, J.J. Pis, C. Pevida, F. Rubiera
Ignition Behavior of Coal and Biomass Blends Under Oxy-Firing Conditions with Steam Additions, Greenhouse Gases: Energy and Technology, 2013

A. Davies, R. Soheilian, C. Zhuo, Y.A. Levendis
Pyrolytic Conversion of Biomass Residues to Gaseous Fuels for Electricity Generation, Journal of Energy Resources Technology, Transactions of American Society of Mechanical Engineers, 2013

Research Projects

Temperature Measurements and Submicron Ash Formation in Oxy-Combustion of Coal
Principal Investigator, National Science Foundation

NU STEP-UP: Science, Technology, Engineering
Co-Principal Investigator, National Science Foundation

Dissertations Supervised

Feyza Kazanc
Gaseous and Particulate Emissions from Pulverized Coal and Biomass Combustion Under Different O_2/N_2 and O_2/CO_2 Environments (see p 65)

Reza Khatami
Ignition and Combustion of Pulverized Coal and Biomass Under Different Oxy-Fuel O2/N2 and O2/CO2 Environments (see p 65)

YINGZI LIN

Associate Professor, Mechanical and Industrial Engineering; affiliated faculty, Bioengineering
PhD, University of Saskatchewan, 2004. Joined Northeastern in 2005
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Scholarship Focus

- Human-machine interactions, interface design and user experiences, system integration and evaluation
- Smart systems and non intrusive sensors, human friendly mechatronics, human state detection and information fusion
- Human factors in transportation and healthcare

Honors and Awards

National Science Foundation CAREER Award

Selected Recent Publications

Papers in refereed journals

S. Radhakrishnan, Y. Lin, A. Zeid, S. Kamarthi

Design, Evaluation and Implementation of Gesture Based Functions for CAD Modeling System Using the Multi Touch Interface, International Journal of Human-Computer Studies, 71, p 261-275, 2013

C.J. Liu, Y. Lin, H. Teng, Z.D. Wang, W.J. Zhang

An Experimental Study on Three General Interface Layout Designs for Chemical Process Plants, Journal of Human Factors and Ergonomics in Manufacturing & Service Industries, 2013

Research Projects

Integrated Individualized Modeling Towards Cognitive Control of Human-Machine Systems

Principal Investigator, National Science Foundation

CAREER: Bridging Cognitive Science and Sensor Technology: Non-Intrusive and Multi-Modality Sensing in Human Machine Interactions

Principal Investigator, National Science Foundation

YONGMIN LIU

Assistant Professor, Mechanical and Industrial Engineering; jointly appointed, Electrical and Computer Engineering, PhD, University of California, Berkeley, 2009. Joined Northeastern in 2012
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Scholarship Focus

- Nano optics
- Nano plasmonics
- Transformation optics/acoustics
- Nano structured materials and devices
- Nano optomechanics
- Energy harvesting technology

Selected Recent Publications

Papers in refereed journals

C.L. Zhao, Y. M. Liu, Y. H. Zhao, N. Fang, T. J. Huang
A Reconfigurable Plasmofluidic Lens, Nature Communications, 2013

Y.M. Liu, X. Zhang
Metasurfaces for Manipulating Surface Plasmons, Applied Physics Letters, 2013

H. Cang, Y. M. Liu, Y. Wang, X. Yin, X. Zhang
Giant Suppression of Photo-Bleaching for Single Molecule Detection via the Purcell Effect, Nano Letters, 2013

Research Projects

Plasmonic Metamaterials: A Sustainable, Bottom-up Approach
Co-Principal Investigator, Northeastern University

Graphene Photonics for Terahertz Radiation
Principal Investigator, Northeastern University

CAROL LIVERMORE

Associate Professor, Mechanical and Industrial Engineering; affiliated faculty: Bioengineering, Electrical and Computer Engineering, PhD, Harvard University, 1998. Joined Northeastern in 2011
617.373.4922 | livermore@neu.edu | northeastern.edu/mnl

Scholarship Focus

- MEMS-enabled systems for assistive technologies, energy harvesting, and microscale vacuum systems
- Tissue engineering via MEMS-enabled cell assembly and origami folding
- Carbon nanotube-based energy storage

Honors and Awards

National Science Foundation CAREER Award

Selected Recent Publications

Papers in refereed journals

F.A. Hill, T. Havel, A. John Hart, C. Livermore

Enhancing the Tensile Properties of Continuous Millimeter-Scale Carbon Nanotube Fibers by Densification, ACS Appl. Mater. Interfaces 5, 7198–7207, 2013

G. Agarwal, A. Servi, C. Livermore

Size-Selective, Biocompatible, Manufacturable Platform for Structuring Deformable Microsystems, Lab on a Chip, online, 2014

Research Projects

Compact Mechanical and Ion Pumping to Achieve High Vacuum

Principal Investigator, Defense Advanced Research Projects Agency

High-Resolution Tactile Displays for the Visually Impaired

Principal Investigator, Bocelli Foundation

EFRI-ODISSEI: Origami and Assembly Techniques for Human-Tissue-Engineering (OATH)

Principal Investigator, National Science Foundation

JOSE MARTINEZ LORENZO

Assistant Professor, Mechanical and Industrial Engineering; jointly appointed, Electrical and Computer Engineering, PhD, University of Vigo, 2005. Joined Northeastern in 2013
617.373.6835 | j.martinez-lorenzo@neu.edu | coe.neu.edu/~jmartinez

Scholarship Focus

- Compressive sensing and modeling using mechanical and electromagnetic waves
- Computational methods for differential and integral equations
- Physics-based signal processing, imaging and optimization
- Explosives detection: portal-based, standoff-based, and underground-based
- Multimodal breast cancer detection: x-ray and thermoacoustic-tomography
- Non-Destructive Testing (NDT) using mechanical and electromagnetic waves
- Micro-sized microwave atmospheric sounding satellites

Selected Recent Publications

Papers in refereed journals

B. Gonzalez-Valdes, J.A. Martinez-Lorenzo, C. Rappaport, A.G. Pino
A New Physical Optics Based Approach to Sub-Reflector Shaping for Reflector Antenna Distortion Compensation, IEEE Transactions on Antennas and Propagation, vol. 61, no. 1, p 467-472, Jan. 2013

B. Gonzalez-Valdes, Y. Alvarez, J.A. Martinez-Lorenzo, F. Las-Heras, C. Rappaport
On the use of Improved Imaging Techniques for the Development of a Multistatic Three-Dimensional Millimeter-Wave Portal Based Imaging for Personnel Screenings, Progress in Electromagnetics Research, PIER, vol. 138, p 83-98, 2013

Y. Alvarez, B. Gonzalez-Valdes, J.A. Martinez-Lorenzo, F. Las-Heras, C. Rappaport
An Improved SAR Based Technique for Accurate Profile Reconstruction, IEEE Transactions on Antennas and Propagation, vol. 61, no. 3, p 1490-1495, March 2013

J.A. Martínez Lorenzo, Y. Rodríguez-Vaqueiro, C. Rappaport, O. Rubinos Lopez, A. Garcia Pino
A Compressed Sensing Approach for Detection of Explosive Threats at Standoff Distances, Using a Passive Array of Scatterers, Homeland Security Affairs, Supplement 6, Article 1, p 1-6 , April, 2013

B. Gonzalez-Valdes, Y. Alvarez, J.A. Martinez-Lorenzo, F. Las-Heras, C. Rappaport
SAR Processing for Profile Reconstruction and Characterization of Dielectric Objects on the Human Body Surface, Progress in Electromagnetics Research, PIER, vol. 138, p 269-282, 2013

Y. Álvarez, J. Laviada, L. Tirado, C. García, J.A. Martínez-Lorenzo, F. Las- Heras, C. Rappaport
Inverse Fast Multipole Method for Monostatic Imaging Applications, Geoscience and Remote Sensing Letters, vol. 10, no. 5, p 1239-1243, Sept. 2013

B. Gonzalez-Valdes, J.A. Martinez-Lorenzo, C. Rappaport
A New Fast Algorithm for Radar-Based Shape Reconstruction of Smoothly Varying Objects, IEEE Antennas and Wireless Propagation Letters, vol. 12, no., p 484-487, 2013

JOSE MARTINEZ LORENZO continued

Y. Álvarez, Y. Rodriguez-Vaqueiro, B. Gonzalez-Valdes, J.A. Martínez-Lorenzo, F. Las-Heras, C. Rappaport
Phase Error Compensation in Imaging Systems Using Compressed Sensing Techniques, IEEE Antennas and Wireless Propagation Letters, vol. 12, no. 12, Dec. 2013, p 1574 - 1577

Research Projects

Small Business ERC Collaborative Opportunity: Advanced Deep View Signal and Image Processing Algorithms with Hardware Acceleration
Principal Investigator, National Science Foundation

Millimeter-Wave Standoff Detection of Concealed Explosives
Investigator, Department of Homeland Security (part of ALERT center of excellence)

Advanced Algorithm Development for Multiband GPR Radar Detection of Buried Mines
Co-Principal Investigator, US Army Night Vision and Electronic Sensors Directorate

Walking Robot Based Ground Penetrating Radar Sensor for Mine and IED Detection
Co-Principal Investigator, National Science Foundation

Advanced Mechanical-Electromagnetic Applications for next Generation Environmental Monitoring
Principal Investigator, National Oceanic and Atmospheric Administration

Microwave Nearfield Radar Imaging (NRI) Using Digital Breast Tomosynthesis (DBT) for Non-Invasive Breast Cancer Detection
Principal Investigator, National Science Foundation

Processing of Physiologic Optical Images and Signals for Development of an Intra-Operative Burn Surgery Diagnostic Device
Principal Investigator, Spectral MD

Multi-Modality Electromagnetic Detection and Localization of Implanted Explosives Using Ultra low Field MRI and Nuclear Quadrupole Resonance
Co-Principal Investigator, Defense Advanced Research Projects Agency (DARPA)

CONSTANTINOS MAVROIDIS

COE Distinguished Professor, Mechanical and Industrial Engineering; affiliated faculty, Bioengineering
PhD, Massachusetts Institute of Technology, 1996. Joined Northeastern in 2004
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Scholarship Focus

- Biomedical Mechatronics
- Medical Devices
- Rehibilitation Robotics
- Advanced Actuators

Honors and Awards

- Fellow, American Society of Mechanical Engineers
- Fellow, National Academy of Inventors
- National Science Foundation CAREER Award
- Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Books and book chapters

C. Mavroidis, A. Ferreira
Nanorobotics: Past, Present, and Future, Nanorobotics, Current Approaches and Techniques, Springer New York Heidelberg Dordrecht London, 2013

E. Brassitos, C. Mavroidis
Kinematics Analysis and Design Considerations of the Gear Bearing Drive, Advances in Mechanisms, Robotics and Design Education and Research Mechanisms and Machine Science, vol. 14, 2013, p 159-175

G. Sharma, Atul Dubey, C. Mavroidis
Protein-Based Nanoscale Actuation, Nanorobotics, 2013, p 425-455

M. Pietrusinski, I. Cajigas, P. Bonato, C. Mavroidis
Healthy Subject Testing with the Robotic Gait Rehabilitation (RGR) Trainer, Romansy 19 – Robot Design, Dynamics and Control CISM International Centre for Mechanical Sciences, 2013, p 341-348

Papers in refereed journals

J.E. Deutsch, M.J. Myslinski, M. Kafri, R. Ranky, M. Sivak, C. Mavroidis, J. Lewis
Feasibility of Virtual Reality Augmented Cycling for Health Promotion of People Post Stroke, Journal of Neurologic Physical Therapy, vol. 37, issue 3, p 118-124, Sept. 2013

Research Projects

Customizable Sensors for Humans Using an Integrated Polymer: C-SHIP
Principal Investigator, National Science Foundation

Prototype Funds to 3-SPARK LLC
Co-Principal Investigator, Northeastern University

Commercialization of Lower Body Robotic Exoskeletons for Gait Retraining
Principal Investigator, National Science Foundation

Compact Drive System for Planetary Rovers and Space Manipulators
Principal Investigator, National Aeronautics and Space Administration

CPS: Breakthrough: A Cyber-Physical Framework for MRI Guided Magnetic Nano-Particles
Principal Investigator, National Science Foundation

The Gear Bearing Drive: A Novel Compact Actuator for Robotic Joints
Principal Investigator, National Science Foundation

Robotic Leg Advancement Device
Principal Investigator, National Science Foundation

NICOL MCGRUER

Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering, Mechanical and Industrial Engineering, PhD, Michigan State University, 1983. Joined Northeastern in 1987
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Scholarship Focus

- MEMS
- NEMS
- Micro-fabrication
- Micro-systems
- Organic semiconductor devices

Honors and Awards

Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Papers in refereed journals

H. Pan, Y.-C. Wu, G.G. Adams, G.P. Miller, N. McGruer
Interfacial Shear Stress Between Single-Walled Carbon Nanotubes and Gold Surfaces With and Without an Alkanethiol Monolayer, Journal of Colloid and Interface Science, vol. 407, p 133-139

C. Pramanik, Y. Li, A. Singh, W. Lin, J.Hodgson, J. Briggs, S. Ellis, P. Müller, N. McGruer, G. Miller
Water Soluble Pentacene, J. Mater. Chem. C, 2013, 1, 2193-2201

Y.-C. Wu, N. McGruer, G.G. Adams
Adhesive Slip Process Between a Carbon Nanotube and a Substrate, Journal of Physics D: Applied Physics, vol. 46, 2013, 175305

R.P. Hennessy, A. Basu, G.G. Adams, N. McGruer
Hot-Switched Lifetime and Damage Characteristics of MEMS Switch Contacts, Journal of Micromechanics and Microengineering, vol. 23, 2013

Papers in refereed conferences

A. Basu, R. Hennessy, G. Adams, N. McGruer
Reliability in Hot Switched Ruthenium on Ruthenium MEMS Contacts, Proceedings of the 59th Holm Conference on Electrical Contacts (HOLM),2013, 22-25 Sept. 2013, Pages 1-8

A. Basu, R. Hennessy, G. Adams, N. McGruer
Leading and Trailing Edge Hot Switching Damage in a Metal Contact RF MEMS Switch, Proceedings of Transducers & Eurosensors XXVII: The 17th International Conference on Solid-State Sensors, Actuators and Micro-systems (Transducers & Eurosensors XXVII), p 16-20, 2013

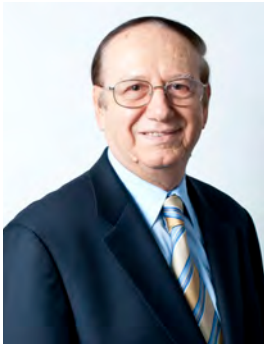
Research Projects

NSEC: The Center for High-Rate Nanomanufacturing (CHN)
Investigator, National Science Foundation

Center for RF MEMS Reliability and Design Fundamentals
Principal Investigator, Defense Advanced Research Projects Agency

EMANUEL MELACHRINOUDIS

Associate Professor, Associate Department Chair and Program Director of Industrial Engineering
PhD, University of Massachusetts, Amherst, 1980. Joined Northeastern in 1979
617.373.4850 | emelas@coe.neu.edu | coe.neu.edu/~emelas



Scholarship Focus

- Deterministic operations research and multi-criteria optimization
- Facility location
- Supply chain, transportation and logistics
- Wireless sensor network lifetime maximization with sink mobility
- Network design for maximum survivability

Selected Recent Publications

Papers in refereed journals

R. Heydari, E. Melachrinoudis

Location of an Obnoxious Facility with Elliptic Maximin and Network Minisum Objectives, European Journal of Operational Research, 223, p 452-460, 2012

M. Mekuria, P. Furth, E. Melachrinoudis

Optimization of Spacing of Transit Stops on a Realistic Street Network, Transportation Research Record, 4, p 29-37, 2012

N. Zaarour, E. Melachrinoudis, M. Solomon, H. Min

The Optimal Determination of the Collection Period for Returned Products in the Sustainable Supply Chain, International Journal of Logistics Research and Applications, 17, p 35-45, 2014

HAMEED METGHALCHI

Professor, Mechanical and Industrial Engineering
ScD, Massachusetts Institute of Technology, 1980. Joined Northeastern in 1979
617.373.2973 | metghalchi@coe.neu.edu | coe.neu.edu/Research/metghalchi

Scholarship Focus

- Fundamentals of combustion such as Burning speed and onset of auto-ignition measurement and flame stability analysis
- Development of chemistry reduction such as Rate-controlled Constrained-Equilibrium method
- Non-equilibrium thermodynamics

Honors and Awards

- American Society of Mechanical Engineers James H. Potter Gold Medal
- American Society of Mechanical Engineers Edward Obert Award
- American Society of Mechanical Engineers Dedicated Service Award
- Editor in Chief, American Society of Mechanical Engineers Journal of Energy Resources Technology
- Fellow, American Society of Mechanical Engineers

Selected Recent Publications

Papers in refereed journals

O. Askari, M. Metghalchi, A. Moghaddas, S.K. Hannani, R. Ebrahimi
Fundamental Study of Spray and Partially Premixed Combustion Characteristics of Methane/Air Mixture, American Society of Mechanical Engineers Journal of Energy Resources Technology, June 2013, 135 (2)

M. Janbozorgi, M.R. Sheikhi, H. Metghalchi
Principle of Detailed Balance and the Second Law of Thermodynamics in Chemical Kinetics, American Society of Mechanical Engineers, Journal of Energy Resources Technology, 135, 2013

A. Moghaddas, C. Bennett, E. Rokni, H. Metghalchi
Laminar Burning Speeds and Flame Structures of Mixtures of Difluoromethane (HFC-32) and 1,1-Difluoroethane (HCF-152a) with Air at Elevated Temperatures and Pressures, HVAC&R Research, 20, 2014, 42-50

O. Askari, H. Metghalchi, S.K. Hannani, H. Hemmati, R. Ebrahimi
Lean Partially Premixed Combustion Investigation of Methane Direct-Injection under Different Characteristic Parameters, ASME Journal of Energy Resources Technology, 2014, 136 (2)

G. Nicolas, M. Janbozorgi, H. Metghalchi
Constrained-Equilibrium Modeling of Methane Oxidation in Air, ASME Journal of Energy Resources Technology, 2014, 136 (3)

Research Projects

LSAMP Educational Research Project: Retention of URM Engineering Students through Practice-Oriented Experiential Education
Principal Investigator, National Science Foundation

Investing in Tomorrow's Engineering Leaders
Co-Principal Investigator, National Science Foundation

Combustion Research
Principal Investigator, Novatio Engineering

MARILYN MINUS

Assistant Professor, Mechanical and Industrial Engineering
PhD, Georgia Institute of Technology, 2008. Joined Northeastern in 2010
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Scholarship Focus

- Process-Structure-Properties relationships in polymer-based nano-composites fibers
- Polymer/nano-carbon interfacial interactions and interphase formations
- Lightweight composite materials
- Carbon-carbon composites

Honors and Awards

National Science Foundation CAREER Award

Selected Recent Publications

Papers in refereed journals

J. Meng, Y. Zhang, K. Song, M.L. Minus
Forming Crystalline Polymer-Nano Interphase Structures for High-Modulus and High-Tensile/Strength Composite Fibers, Macromolecular Materials and Engineering, vol. 299, Feb. 2014, p 144-153

K. Song, Y. Zhang, J. Meng, E.C. Green, N. Tajaddod, H. Li, M.L. Minus
Structural Polymer-Based Carbon Nanotube Composite Fibers: Understanding the Processing-Structure-Performance Relationship, Materials, vol. 6, 2013, p 2543-2577

Y. Zhang, K. Song, J. Meng, M.L. Minus
Tailoring Polyacrylonitrile Interfacial Morphological Structure by Crystallization in the Presence of Single-Wall Carbon Nanotubes, ACS Applied Materials & Interfaces, vol. 13, 2013 p 807-814

Research Projects

Evolution of Interphase-Polyacrylonitrile (i-PAN) Structure during Carbon Fiber Processing
Principal Investigator, Defense Advanced Research Projects Agency

Studying the Dependency of Interfacial Formation with Carbon Nanotube Length for Stress Transfer in Polymer Composite Fibers
Principal Investigator, Air Force Office of Scientific Research

CAREER: Understanding Directionally Templated Interphase Processing-Structure Development and Relationships in Polymer Nano-Composite Materials
Principal Investigator, National Science Foundation

SİNAN MÜFTÜ

Professor, Mechanical and Industrial Engineering; affiliated faculty, Bioengineering, Civil and Environmental Engineering, PhD, University of Rochester, 1994. Joined Northeastern in 2000
617.373.4743 | s.muftu@neu.edu | coe.neu.edu/~smuftu

Scholarship Focus

- Mechanics and tribology of axially moving, thin materials and flexible webs
- Numerical simulation of tissue healing and bone remodeling
- High velocity impact of micron scale particles

Honors and Awards

- Fellow, American Society of Mechanical Engineers
- Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Papers in refereed journals

J. Aguirrebeitia, S. Müftü, M. Abasolo, J. Vallejo
Experimental Study of the Removal Force in Conical Implant-Abutment Interfaces, Journal of Prosthetic Dentistry, 111 (4), 2013

H.Y. Chou, S. Müftü
On Peri-Implant Bone Healing Due to Immediate Loading in Dental Implant Treatments, Journal of Biomechanics, 46 (5), 2013, 871-878

J. Shi, S. Müftü, A.Z. Gu, K.T. Wan
Adhesion of a Cylindrical Shell in the Presence of DLVO Surface Potential, Journal of Applied Mechanics, 80, 2013

Research Projects

A Novel Biomechanical Model of Bacterial Adhesion and Aggregation
Co-Principal Investigator, National Science Foundation

Collaborative Research: Mechano-Lipidomics and Mechano-Cytosis of Drug Delivery Liposomes
Co-Principal Investigator, National Science Foundation

Theoretical and Experimental Investigation of Bonding in Cold Spray
Principal Investigator, Plasma Giken Kogyo Co

Tape Path Mechanics
Principal Investigator, International Storage Industry Consortium

Fundamentals of Bonding and Kinetic Consolidation Processes
Co-Principal Investigator, National Science Foundation

Dissertations Supervised

Qian Sheng
Tribological and Mechanical Characterization of Thin Polymer Films (see p 69)

Baran Yildirim
Mechanistic Modeling of High Velocity Micro-Particle Impacts: Application to Material Deposition by Cold Spray Process (see p 70)

SHASHI MURTHY

Associate Professor, Chemical Engineering; affiliated faculty; Bioengineering, Mechanical and Industrial Engineering, PhD, Massachusetts Institute of Technology, 2003. Joined Northeastern in 2005
617.373.4017 | smurthy@coe.neu.edu | microfluidicslab.org

Scholarship Focus

- Biomaterials
- Microfluidics

Honors and Awards

- College of Engineering Faculty Fellow
- National Science Foundation CAREER Award
- Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Books and book chapters

B. Zhu, B.D. Plouffe, S.K. Murthy
Functionalized Microfluidic Devices for Separation of Cell Phenotypes, in Microfluidic Cell Culture Systems, Boston, 2013, p 325-340

Papers in refereed journals

B. Zhang, C. Peticone, S.K. Murthy, M. Radisic
A Standalone Perfusion Platform for Drug Testing and Target Validation in Micro-Vessel Networks, Biomicrofluidics, vol. 7, 2013, p 044125

N. Pestana, L. Mortensen, J. Runnels, D.A.L. Vickers, S.K. Murthy, C.P. Lin, M. Niedre
An Improved Prototype Diffuse Fluorescence Flow Cytometer for High Sensitivity Detection of Rare Circulating Cells in Vivo, Journal of Biomedical Optics vol. 18, 2013, p 077002

D.A.L. Vickers, E.J. Chory, M.C. Harless, S.K. Murthy
P38 Signaling and Receptor Recycling Events in a Microfluidic Endothelial Cell Adhesion Assay, PLoS One, vol. 8, 2013, p 65828

N. Pestana, D. Walsh, A. Hatch, P. Hahn, G.J. Jaffe, S.K. Murthy, N. Niedre
A Dedicated Low-Cost Fluorescence Microfluidic Device Reader for Point-of-Care Ocular Diagnostics, Journal of Medical Devices, vol. 7, 2013, p 024501

B. Zhu, J. Smith, M.L. Yarmush, Y. Nahmias, B.J. Kirby, S.K. Murthy
Microfluidic Enrichment of Mouse Epidermal Stem Cells and Validation of Stem Cell Proliferation in Vitro, Tissue Engineering Part C – Methods, vol. 19, 2013, p 765-773

B. Zhu, S.K. Murthy
Stem Cell Separation Technologies, Current Opinion in Chemical Engineering, vol. 2, 2013, p 3-7

V. Tandon, B. Zhang, M. Radisic, S.K. Murthy
Generation of Tissue Constructs for Cardiovascular Regenerative Medicine: From Cell Procurement to Scaffold Design, Biotechnology Advances, vol. 31, 2013, p 722-735

Research Projects

Microfluidic Cell Separation for Tissue Engineering and Regenerative Medicine
Principal Investigator, National Institutes of Health

CAREER: Understanding the Role of Cell Surface Markers in Microfluidic Cell Separation- An Integrated Research and Education Program
Principal Investigator, National Science Foundation

Computational Fluid Dynamics Analysis of a Blood Analysis System
Principal Investigator, Constitution Medical Inc.

HAMID NAYEB-HASHEMI

Professor, Mechanical and Industrial Engineering; affiliated faculty, Bioengineering
PhD, Massachusetts Institute of Technology, 1982. Joined Northeastern in 1982
617.373.5515 | hamid@coe.neu.edu | coe.neu.edu/~hamid

Scholarship Focus

Biomechanics, mechanics

Honors and Awards

Fellow, American Society of Mechanical Engineers

Selected Recent Publications

Papers in refereed journals

J. A. Renick, A. Nazarian, V. Entezarim J. Kimbaris, A. Tseng, A. Masoud, H. Nayeb-Hashemi, A. Vaziri, B. Snyder

Finite Element Analysis and Computed Tomography Based Structural Rigidity Analysis of Rat Tibia with Simulated Lytic Defects, J. of Biomechanics, 2013

A. Marzban, H. Nayeb-Hashemi, A. Vaziri

Numerical Simulation of Load-Induced Bone Structural Remodeling Using Stress-Limit Criterion, Computer Methods in Biomechanics and Biomedical Engineering, 2013

P. Bloori-Zadeh, S. C. Corbett, H. Nayeb-Hashemi

Effects of Fluid Flow Shear Rate and Surface Roughness on the Calcification of Polymeric Heart Valve Leaflet, Material Science and Engineering C 33, 2013, p 2770-2775

P. Bloori-Zadeh, S. C. Corbett, H. Nayeb-Hashemi

In-Vitro Calcification Study of Polyurethane Heart Valves, Material Science and Engineering C 35, 2013

Research Projects

Knee Injury Prevention and Osteoarthritis Risk in Obesity

Co-Principal Investigator, National Priorities Research Program

Novel Multi Functional Composite Sandwich Panel

Principal Investigator, National Priorities Research Program

High-Performance Biodegradable Composites from Qatari Date Palm Waste

Principal Investigator, National Priorities Research Program

JEFFREY RUBERTI

Professor, Bioengineering; affiliated faculty: Mechanical and Industrial Engineering, Chemical Engineering
PhD, Tulane University, 1998. Joined Northeastern in 2004
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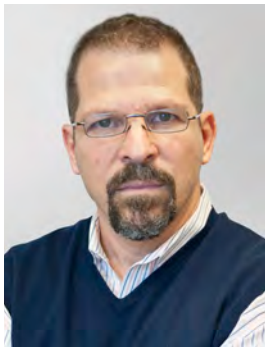
Scholarship Focus



- Tissue engineering of load-bearing matrix (Bone, Cornea)
- Bioreactor Design
- Multi-scale Mechanobiochemistry, Statistical Mechanics, Energetics
- Microscopy, High-resolution Imaging

Honors and Awards

Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Papers in refereed journals

D. Karamichos, C.B. Rich, R. Zareian, A.E.K. Hutcheon, J.W. Ruberti, V. Trinkaus-Randall, J.D. Zieske
TGF-B3 Stimulates Stromal Matrix Assembly by Human Corneal Keratocyte-Like Cells, Invest Ophthalmol Vis. Sci., Oct. 9, 2013

H.K. Kao, Q. Li, B. Flynn, X. Qiao, J.W. Ruberti, G.F. Murphy, L. Guo
Collagen Synthesis Modulated In Wounds Treated by Pulsed Radiofrequency Energy, Plast. Reconstr. Surg. April, 131, 2013

J.A. Paten, G. Tilburey, E. Molloy, R. Zareian, C. Trainor, J.W. Ruberti
Utility of an Optically-Based Micromechanical System for Printing and Testing Collagen Fibers, Biomaterials, April, 34, 2013

B.P. Flynn, G. Tilburey, J.W. Ruberti
Single Fibril Force/Enzyme Degradation Assay Reveals Highly-Sensitive Mechanochemical Switch in Native Collagen, Biomech. Model Mechanobiol., p 291-300, 2013

Research Projects

Mechanobiology of Matrix Production by Corneal Fibroblasts
Principal Investigator, National Institutes of Health

Lipid Activated Nuclear Receptors in Age-Related Macular Degeneration
Co-Investigator, National Institutes of Health

Biomimetic Bone: from Nano to Micro
Principal Investigator, National Science Foundation

Impact of Lipids on Intestinal Mucus Transport and Structural Properties
Co-Investigator, National Institutes of Health

Dissertations Supervised

Ramin Zareian
The Effect of Mechanics on Migration, Morphology and Matrix Production by Primary Human Corneal Fibroblasts: Long-Term Dynamic Observation (see p 71)

VINOD SAHNEY

University Distinguished Professor, Mechanical and Industrial Engineering
PhD, University of Wisconsin, Madison, 1970. Joined Northeastern in 2011
617.373.3831 | v.sahney@neu.edu

Scholarship Focus

- Health care initiatives
- Industrial engineering
- Operations research

Honors and Awards

- Member, Institute of Medicine, National Academy of Science
- Member, National Academy of Engineering
- Fellow, Health Care Information and Management Systems Society
- Fellow, Institute of Industrial Engineers
- Gilbreth Award for Lifetime Contribution to Industrial Engineering; Institute for Industrial and Systems Engineering

SANDRA SHEFELBINE

Associate Professor, Mechanical and Industrial Engineering; affiliated faculty, Bioengineering
PhD, Stanford University, 2002. Joined Northeastern in 2013
617.373.3199 | s.shefelbine@neu.edu | shefelbine.org

Scholarship Focus

- Multi-scale bone biomechanics – how the structure and composition of bone influences its mechanical properties
- Mechano-adaptation of bone and joint – how tissue responds to mechanical signals

Selected Recent Publications

Papers in refereed journals

N. Rodriguez-Florez, M. L. Oyen, S.J. Shefelbine
Age Related Changes in Mouse Bone Permeability, Journal of Biomechanics, vol. 47, issue 5 , p 1110-1116

A. Carriero, M. Doube, M. Vogt, B. Busse, J. Zustin, A. Levchuk, P. Schneider, R. Müller, S.J. Shefelbine
Altered Lacunar and Vascular Porosity in Osteogenesis Imperfecta Mouse Bone as Revealed by Synchrotron Tomography Contributes to Bone Fragility, Bone, 61:116-24, 2013

W. Macdonald, S.J. Shefelbine
Characterising Neovascularisation in Fracture Healing with Laser Doppler and Micro-CT Scanning, Medical and Biological Engineering and Computing, 2013, 51 (10):1157-65, 2013

M. Vanleene, S. J. Shefelbine
Therapeutic Impact of Low Amplitude High Frequency Whole Body Vibrations on the Osteogenesis Imperfecta Mouse Bone, Bone, 53 (2):507-14, 2013

B. Poulet, T.A.T. Westerhof, R. Hamilton, S.J. Shefelbine, A.A. Pitsillides
Spontaneous Osteoarthritis In STR/ORT Mice is Unlikely Due to Greater Vulnerability to Mechanical Trauma, Osteoarthritis Cartilage, 21 (5): 756-63, 2013

N. Rodriguez, M. L. Oyen, S. J. Shefelbine
Insight into Differences in Nanoindentation Properties of Bone, Journal of the Mechanical Behavior of Biomedical Materials, 2013, 18, 90-99

REZA SHEIKHI

Assistant Professor, Mechanical and Industrial Engineering
PhD, University of Pittsburgh, 2005. Joined Northeastern in 2009
617.373.3427 | sheikhi@neu.edu | coe.neu.edu/~rsheikhi

Scholarship Focus

- Turbulence
- Combustion and propulsion
- Computational fluid dynamics and high performance computing

Selected Recent Publications

Papers in refereed journals

M. Janbozorgi, M.R.H. Sheikhi, H. Metghalchi
Principle of Detailed Balance and the Second Law of Thermodynamics in Chemical Kinetics, ASME Journal of Energy Resources Technology, 135 (4), 041901 1-4, 2013

M. Safari, M.R.H. Sheikhi
Large Eddy Simulation for Prediction of Entropy Generation in a Nonpremixed Turbulent Jet Flame, ASME Journal of Energy Resources Technology, 136 (2), 022002 1-6, 2014

Research Projects

Experimental and Computational Investigations of the Ignition and Combustion of GTL and Jet Fuel Blends
Principal Investigator, Qatar National Foundation

Large-Scale Simulation of Turbulent Flames with Detailed Chemistry
Principal Investigator, American Chemical Society

Investigation of Coal-Biomass Catalytic Gasification Using Experiments, Reaction Kinetics and Computational Fluid Dynamics
Principal Investigator, Department of Energy

RIFAT SIPAHI

Associate Professor, Mechanical and Industrial Engineering; affiliated faculty, Bioengineering
PhD, University of Connecticut, 2005. Joined Northeastern in 2006
617.373.6011 | rifat@coe.neu.edu | coe.neu.edu/~rifat

Scholarship Focus

- Stability, stabilization, and control design for systems with multiple delays
- Systems-level approach to man-machine systems, security, and biomedical applications

Honors and Awards

- College of Engineering Faculty Fellow
- Defense Advanced Research Projects Agency Young Faculty Award
- Fellow, American Society of Mechanical Engineers

Selected Recent Publications

Books and book chapters

T. Vyhlidal, J.-F. Lafay, R. Sipahi (Eds.)
Delay Systems from Theory to Numerics in Applications, in Advances in Dynamics and Delays, Springer-Verlag, October 2013

Papers in refereed journals

W. Qiao, R. Sipahi
A Linear Time-Invariant Consensus Dynamics with Homogeneous Delays: Analytical Study and Synthesis of Right-Most Eigenvalues, SIAM Journal on Control and Optimization, vol. 51, p 3971-3992, 2013

R. Sipahi, I.I. Delice
On Some Features of Core Hypersurfaces Related to Stability Switching of LTI Systems with Multiple Time Delays, IMA Mathematical Control and Information, available online, 2013

P.M. Nia, R. Sipahi
Controller Design for Delay-Independent Stability of Linear Time-Invariant Vibration Systems with Multiple Delays, Journal of Sound and Vibration, vol. 332, p 3589-3604, 2013

Research Projects

Interplay Between Network Topology and Stability of Control Systems with Delays
Principal Investigator, National Science Foundation

EAGER: Mechatronics Based Braille Writing Device for the Blind
Principal Investigator, National Science Foundation

A New Hands-on Mechatronics Course in Emerging Engineering Fields
Principal Investigator, Math Works

Model-Free Algorithms to Assist and Control Human-Task Missions against Dynamic Environments
Principal Investigator, Defense Advanced Research Projects Agency

GARDE: An Interdisciplinary Approach to Accommodate Fine Motor Control Disorders
Principal Investigator, National Science Foundation

Building Handheld Devices to Accommodate Essential Tremor
Principal Investigator, Center for Integration of Medicine and Innovative Technology

Dissertations Supervised

Wei Qiao
Interplay Between Stability, Delays, and Graphs of a Class of Multi-Agent LTI System with Applications
(see p 68)

MOHAMMAD TASLIM

Professor, Mechanical and Industrial Engineering
PhD, University of Arizona, 1981. Joined Northeastern in 1982
617.373.5514 | m.taslim@neu.edu | coe.neu.edu/~taslim

Scholarship Focus

- Energy
- Gas turbine cooling technology
- Droplet characterization
- Renewable energy
- Fuel cell modeling

Honors and Awards

Fellow, American Society of Mechanical Engineers

Selected Recent Publications

Papers in refereed journals

K. Elebiary, M.E. Taslim

Experimental/Numerical Cross-Over Jet Impingement in an Airfoil Leading-Edge Cooling Channel, J. Turbomachinery , vol. 135, no. 1, p 011037-1-12, 2013

M.E. Taslim, M.K.H. Fong

Experimental and Numerical Cross-Over Jet Impingement in a Rib-Roughened Airfoil Trailing-Edge Cooling Channel, J. Turbomachinery, vol. 135, no. 5, p 051014-1-10, 2013

M.E. Taslim, X. Huang

Experimental/Numerical Investigation on the Effects of Trailing-Edge Cooling Hole Blockage on Heat Transfer in a Trailing-Edge Cooling Channel, J. Gas Turbine Power, vol. 136, no. 5, p 082603-1-15, 2014

AYTEN TURKCAN

Assistant Professor, Mechanical and Industrial Engineering
PhD, Bilkent University, 2003. Joined Northeastern in 2010
617.373.2032 | a.turkcan@neu.edu | coe.neu.edu/~aturkcan

Scholarship Focus

- Healthcare system engineering: Appointment scheduling, chemotherapy planning and scheduling, planning of mental health services, nurse staffing
- Production and transportation systems: Predictive/reactive scheduling, train scheduling, flexible manufacturing systems,
- Methodology: Discrete optimization, multi-criteria optimization, network optimization, simulation, constraint programming

Selected Recent Publications

Books and book chapters

A. Turkcan, L. Nuti, P.-C. DeLaurentis, Z. Tian, J. Daggy, L. Zhang, M. Lawley, L. Sands
No-Show Modeling for Adult Ambulatory Clinics, in B. Denton (ed.) Healthcare Operations Management: A Handbook of Methods and Applications, Springer, 2013

Papers in refereed journals

A. Turkcan, A. Zeng, M.A. Lawley
Chemotherapy Operations Planning and Scheduling, IIE Transactions on Healthcare Systems Engineering, 2 (1), p 31-49, 2012

Research Projects

Improving Health Care Systems for Access to Care by Under Served Patients
Co-Principal Investigator, Patient-Centered Outcomes Research Institute

Simulation-Based Planning Model for Mental Health Care Services
Co-Principal Investigator, Department of Veterans Affairs

MONEESH UPMANYU

Associate Professor, Mechanical and Industrial Engineering
PhD, University of Michigan, 2001. Joined Northeastern in 2009
617.373.3186 | mupmanyu@neu.edu

Scholarship Focus

- Materials science and engineering
- Computational materials science
- Kinetic phenomena in materials
- Engineering physics
- Crystalline defects and microstructures
- Interfacial phenomena
- Structure, morphology and properties of nanoscale materials
- Filamentous materials and their assemblies

Selected Recent Publications

Papers in refereed journals

H. Wang, L. A. Zepeda-Ruiz, G. H. Gilmer, M. Upmanyu
Atomistics of Vapor-Liquid-Solid Nanowire Growth, Nature Communications, 4, 1956, 2013

Z. Ma, D. McDowell, E. Panaitescu, A.V. Davidov, M. Upmanyu, L. Menon
Vapor-Liquid-Solid Growth of Serrated GaN Nanowires: Shape Selection Driven by Kinetic Frustration, Journal of Materials Chemistry C, 1, p 7294-7302, 2013

H.Y. Jung, H. Chun, S. Park, S.-H. Kang ,C.W. Ahn, Y.-K. Kwon, M. Upmanyu, P.M. Ajayan, Y.J. Jung
Liquid Metal Nanodroplet Dynamics Inside Nanocontainers, Nature Scientific Reports, 3, 2013

C. Wang, M. Upmanyu
Shear Accommodation in Dirty Grain Boundaries, Europhysics Letters, 106 (2), 26001, 2014

Research Projects

Computational Studies of Nanocrystal Growth
Principal Investigator, National Science Foundation

Nanomaterials for Force Protection and Increased Performance of Soldiers and Vehicles
Co-Principal Investigator, Armament Research

Particle Strengthened Interfaces
Principal Investigator, Office of Naval Research

Enhanced Stability and Mechanics of Ultra-Fine Grained Metals via Engineered Solute Segregation
Principal Investigator, US Army Research Office

Carbon Nanotube Reinforced Metal Composites
Principal Investigator, Schlumberger Foundation, Schlumberger

ASHKAN VAZIRI

Associate Professor, Mechanical and Industrial Engineering; affiliated faculty, Bioengineering
PhD, Northeastern University, 2004. Joined Northeastern in 2008
617.373.3474 | vaziri@coe.neu.edu | www.hpmsl.neu.edu

Scholarship Focus

- Solid Mechanics, materials
- Computational Methods
- Biomechanics
- Nanotechnology

Honors and Awards

- Air Force Office of Scientific Research Young Investigator Award
- National Science Foundation CAREER Award
- Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Books and book chapters

A. Vaziri, R. Ghosh
Numerical Analysis of the Response of Biomimetic Cellular Materials Under Static and Dynamic Loadings, Blast Mitigation. Springer, Edited by A. Shukla, Y. D. Rajapakse, M. E. Hynes, 2013

M.W. Moon, C. Kim, A. Vaziri
Ion Beam-Induced Self-Assembled Wrinkles, Mechanical Self-Assembly: Science and Application, Springer, Edited by X. Chen, 2013

Papers in refereed journals

J.A. Rennick, A. Nazarian, V. Entezari, J. Kimbaris, A. Tseng, A. Masoudi, H. Nayeb-Hashemi, A. Vaziri, B. Snyder
Finite Element Analysis and Computed Tomography Based Structural Rigidity Analysis of Rat Tibia with Simulated Lytic Defects, Journal of Biomechanics, 2013

B. Haghpanah, R. Oftadeh, J. Papadopoulos, A. Vaziri
Self-Similar Hierarchical Honeycombs, Proceedings of the Royal Society A, 2013, p 5322-5334

Y.T. Kim, B. Haghpanah, R. Ghosh, H. Ali, A. Hamouda, A. Vaziri
Instability of a Cracked Cylindrical Shell Reinforced by an Elastic Liner, Thin-Walled Structures, 2013 p 39-48

A. Nasto, A. Ajdari, A. Lazarus, A. Vaziri, P.M. Reis
Localization of Deformation in Thin Shells Under Indentation, Soft Matter, 2013.9, p 6796-6803

H. Ebrahimi, A. Vaziri
Metallic Sandwich Panels Subjected to Multiple Intense Shocks, Int. J. Solids and Structures, 2013, Int. J. Solids and Structures, 2013, 50, p 1164–1176

R. Oftadeh, B. Haghpanah, J. Papadopoulos, A.M. S. Hamouda, H. Nayeb-Hashemi, A. Vaziri
Mechanics of Anisotropic Hierarchical Honeycombs, Int. J. Mechanical Sciences, 81, p 126-136, 2014

H. Ebrahimi, A. Ajdari, D. Vella, A. Boudaoud, A. Vaziri
Directional Delamination of Highly Ellipsoidal Shells, Physical Review Letters, 2014, 112, 094302

J. Xiong, R. Ghosh, L. Ma, A. Vaziri, Y. Wang, L. Wu
Sandwich-Walled Cylindrical Shells with Lightweight Metallic Lattice Truss Cores and Carbon Fiber-Reinforced Composite Face Sheets, Composites Part A., 2014, 56: p.226-238

ASHKAN VAZIRI continued

B. Haghpanah, Sh. Chiu, A. Vaziri
Adhesively Bonded Lap Joints with Extreme Interface Geometry, International Journal of Adhesion and Adhesives, 2014, 48: p 130-138

B. Haghpanah, J. Papadopolous, A. Vaziri
Plastic Collapse of Lattice Structures Under a General Stress State, Mechanics of Materials, 2014, 68: p 267-274

J. Xiong, B. Wang, L. Ma, J. Papadopoulos, A. Vaziri, L. Wu
Three-Dimensional Composite Lattice Structures Fabricated by Electrical Discharge Machining, Experimental Mechanics, 2014, 54, p 405-412

Research Projects

CAREER: Functional Biomimetic Materials with Extreme Topology
Principal Investigator, National Science Foundation

Bioinspired Surfaces and Interfaces for Hybrid Multifunctional Structures
Principal Investigator, Air Force Office of Scientific Research

ALERT F4 Initiative
Principal Investigator, Department of Homeland Security

Mechanics of Carbon Nanotube Surface Decontamination
Principal Investigator, FM Global

Development of Novel High Friction, low Adhesion Materials
Co-Principal Investigator, Brooks Automation

New Approaches for Structural Protection in Oil and Gas Industry
Principal Investigator, National Priorities Research Program

Dissertations Supervised

Babak Haghpanah Jahromi
Mechanics of Regular, Chiral and Hierarchical Honeycombs (see p 64)

KAI-TAK WAN

Associate Professor, Mechanical and Industrial Engineering; affiliated faculty, Bioengineering
PhD, University of Maryland, 1993. Joined Northeastern in 2007
617.373.2248 | k.wan@neu.edu | coe.neu.edu/~ktwan

Scholarship Focus

- Cellular biomechanics
- Water filtration
- Thin film adhesion and characterization
- Subsurface mechano-sensing
- Shell adhesion
- Fundamental inter-surface forces

Honors and Awards

- College of Engineering Faculty Fellow
- National Science Foundation CAREER Award

Selected Recent Publications

Papers in refereed journals

Y. Li, X. Wang, A. Onnis-Hayden, K.-T. Wan, A. Z. Gu
Universal Quantifier Derived from AFM Analysis Links Cellular Mechanic Properties and Cell Surface Integration Forces with Microbial Deposition and Transport Behavior, Environmental Science & Technology, 2013

L. Sallaway, S. Magee, J. Shi, F. Quivira, K. Tgavalekos, D. Brooks, S. Muftu, W. Meleis, R. Moore, D. Kopans, K.-T. Wan
Detecting Solid Masses in Phantom Breast Using Mechanical Indentation, Experimental Mechanics, 2013

G. Li, K.-T. Wan
Adhesion Map for Thin Membranes, Journal of Applied Mechanics, 2013

J. Shi, S. Müftü, A. Gu, K.-T. Wan
Adhesion of a Cylindrical Shell in the Presence of DLVO Surface Potential, Journal of Applied Mechanics

X. Wang, Y. Li, A. Gu, K.-T. Wan
Predicting Macroscopic Colloidal Deposition and Transportation Based on Dimensionless Tabor's Parameter, Nano LIFE, 2013

G. Li, C.Yilmaz, X. An, S. Somu, Swastik Kar, Y. J. Jung, A. Busnaina, K.-T. Wan
Adhesion of Graphene Sheet on Nano-Patterned Substrates with Nano-Pillar Array, Journal of Applied Physics, 2013

M. Robitaille, J. Shi, S. McBride, K.-T. Wan
Mechanical Performance of Hydrogel Contact Lenses with a Range of Power Under Parallel Plate Compression and Central Load, Journal of the Mechanical Behavior of Biomedical Materials, 2013

KAI-TAK WAN continued

S. R. Shin, S.M. Jung, M. Zalabany, K. Kim, P. Zorlutuna, S.B. Kim, M. Nikkhah, M. Khabiry, M. Azize, J. Kong, K.-T. Wan, T. Palacios, M. R. Dokmeci, H. Bae, X. S. Tang, A. Khademhosseini

Carbon-Nanotube-Embedded Hydrogel Sheets for Engineering Cardiac Constructs and Bioactuators, ACS Nano, 2013

Research Projects

A Novel Biomechanical Model of Bacterial Adhesion and Aggregation

Principal Investigator, National Science Foundation

Mechano-Lipidomics and Mechano-Cytosis of Drug Delivery Liposomes

Principal Investigator, National Science Foundation

Development of Long-Term Adhesion Test for Photovoltaic Module Components

Principal Investigator, National Institute of Standards and Technology

Mechanical Characterization and Adhesion Measurement of Hydrogel Contact Lenses

Principal Investigator, Johnson & Johnson

Dissertations Supervised

Michael Conrad Robitaille

Multi-Scaled Adhesion Mechanics of Hydrogel Contact Lenses (see p 68)

Xin Wang

Integrated Surface and Mechanical Characterization of Freestanding Bological and Other Nano-Structures Using Atomic Force Microscopy (see p 69)

IBRAHIM ZEID

Professor, Mechanical and Industrial Engineering
PhD, University of Akron, 1981. Joined Northeastern in 1980
617.373.3817 | zeid@coe.neu.edu

Scholarship Focus

- Mechanics
- Personalized medicine
- Simulation techniques and complex networks analysis

Honors and Awards

Fellow, American Society of Mechanical Engineers

Selected Recent Publications

Papers in refereed journals

J.S. Chin, I. Zeid, S. Kamarthi
Using 3D Modeling and Neural Networks to Predict Time-To-Heal for Chronic, Nonhealing Wounds, Journal of Medical Devices, vol. 7, 2013

G.M. Uddin, K.S. Ziemer, B. Sun, I. Zeid, S. Kamarthi
Monte Carlo Study of the High Temperature Hydrogen Cleaning Process of 6H-Silicon Carbide for Subsequent Growth of Nano Scale Metal Oxide Films, International Journal of Nanomanufacturing, vol. 9, no. 5/6, 407-430, 2013

H. Abuhimd, A. Zeid, Y.-J. Jung, G.M. Uddin, S. Kamarthi
Chemical Vapor Deposition Grown Vertically Aligned Single Walled Carbon Nanotubes Length Assurance, International Journal of Advanced Manufacturing Technology, vol. 64, 545-553, 2013

S. Radhakrishnan, Y. Lin, I. Zeid, S. Kamarthi
Finger-Based Multi-Touch Interface for Performing 3D CAD Operations, International Journal of Human-Computer Studies, vol. 71, 261-275, 2013

A. Zeid, J. Chin, S. Kamarthi
New Approach to Effective Teaching of Stem Courses in High Schools, International Journal of Engineering Education, vol. 29, no. 1, 1-16, 2013

Research Projects

CAPSULE: CAP Stone Unique Learning Experience Replace
Principal Investigator, National Science Foundation

Research Frontiers in Health Care Mass Customization for Personalization of Diagnosis, Care and Cure
Co-Principal Investigator, Northeastern University

Dissertations Supervised

Jessica Selina Cho Chin
Investigating a Systems Approach to the Predictive Modeling and Analysis of Time-Varying Wound Progression and Healing (see p 63)

MARY BALACONIS

PhD, 2014 Mechanical and Industrial Engineering
Advisor, Heather Clark | Nanoscience and Nanotechnology

The Development and Design of Fluorescent Sensors for Continuous in Vivo Glucose Monitoring

This dissertation details the design of novel fluorescent glucose-sensitive sensors for monitoring glucose levels noninvasive and continuously after initial implantation. Sensing components were selected for appropriate response at physiological concentrations and were fully characterized for dynamic range, sensitivity, and lifetime in vitro. In pre-clinical testing, glucose-sensitive sensors tracked changes in glucose levels in mice, but sensor monitoring was limited to one hour. Sensor design was further improved after these studies to prolong in vivo lifetime, increase response at hypoglycemic levels, and enhance sensor biocompatibility. These efforts resulted in vivo lifetimes greater than one hour, incorporation of more advance sensing moieties, and a biodegradable sensor platform. Future work with these sensors will involve Clark Error Grid Analysis and biodistribution studies to address clinical application requirements.

See full dissertation at **iris.lib.neu.edu/mech_eng_diss/54**

PARNIAN BOLOORI ZADEH

PhD, 2013 Mechanical and Industrial Engineering
Advisor, Andrew Gouldstone | Biomechanical Engineering

The Evaluation of Pulmonary Surfactant Mechanics Under Different Inhaled Environments via Surface Tension Studies and Light Scattering

This dissertation focuses on the effects of using an indenter tip on the OCT images obtained from an excised lung (ii) the effects of oxygen on PS by confirming the results obtained from LW experiments using light scattering technique (iii) the effects of isoflurane (a commonly used sedative anesthetic) in reducing the toxic effect of oxygen on the function of PS and (iv) the effects of a single deep breath on the re-spreading process of PS. Findings from the last two studies can be very valuable in critical care and systematic utilization of isoflurane and deep breaths may be beneficial for patients in need of ventilator-based treatments.

See full dissertation at **iris.lib.neu.edu/mech_eng_diss/49**

HANCHUL CHO

PhD, 2014 Mechanical and Industrial Engineering
Advisor, Ahmed Busnaina | Nanoscience and Nanotechnology

Development of High-Rate Nano-Scale Offset Printing Technology for Electric and Bio

This dissertation presents newly developed `damascene template,' reusable and versatile template, for high-rate directed assembly and transfer of nanomaterials. In addition, a flexible damascene template based on a polymer substrate has been developed to apply to the roll to roll system for continuous assembly and transfer. The governing parameters for assembly and transfer were investigated to achieve the uniform assembly and high transfer yield. Our approaches demonstrate that the combination of reusable damascene template and directed assembly and transfer is significantly compatible with various nanomaterials such as polymer, silica, semiconductor nanoparticles and SWNTs by controlling the surface energy of the template, assembly and transfer parameters. This process and template will enable high-rate manufacturing of flexible devices such as a flexible transistor, display, bio and chemical sensors, energy harvesting.

See full dissertation at **iris.lib.neu.edu/mech_eng_diss/58**

JESSICA SELINA CHO CHIN

PhD, 2014 Mechanical and Industrial Engineering
Advisor, Ibrahim Zeid | Molecular, Cellular, and Tissue Engineering

Investigating a Systems Approach to the Predictive Modeling and Analysis of Time-Varying Wound Progression and Healing

This dissertation presents three predictive statistical models, namely, multiple linear regression, non-linear regression, and neural networks, and compares their performance. These models take wound parameters such as length, width, and depth as inputs and produce the remaining time to heal as an output. These predictive models also allow us to determine the wound parameters that are most influential on wound healing. These models are developed and analyzed with insight gained from four major wound clinics around the country.

See full dissertation at **iris.lib.neu.edu/ind_eng_diss/16**

SAMIRA FAEGH

PhD, 2013 Mechanical and Industrial Engineering
Advisor, Nader Jalili | Biomechanical Engineering
faegh.s@husky.neu.edu

A Novel Self-Sensing Piezoelectric Microcantilever-Based Sensor for Detection of Ultrasmall Masses and Biological Species

This dissertation presents a unique self-sensing piezoelectric MC-based sensor for the purpose of detecting ultrasmall masses and biological species. The entire developmental process is covered and presented which includes: development of comprehensive mathematical modeling framework, numerical simulation, designing, building and testing the sensor. In the beginning chapters of this dissertation, the main focus is on analytical studies investigating modeling and simulation of piezoactive MC-based systems with diverse applications along with the relative experimental verification. Sophisticated comprehensive mathematical modeling frameworks capable of describing static and dynamic behavior of MCs are presented.

See full dissertation at **iris.lib.neu.edu/mech_eng_diss/52**

BABAK HAGHPANAH JAHROMI

PhD, 2014 Mechanical and Industrial Engineering
Advisor, Ashkan Vaziri | Cellular structures

Mechanics of Regular, Chiral and Hierarchical Honeycombs

This dissertation presents approaches to obtain analytical closed-form expressions for the macroscopic elastic, plastic collapse, and buckling response of various two-dimensional cellular structures. First, it will provide analytical models to estimate the effective elastic modulus and Poisson's ratio of hierarchical honeycombs using the concepts of mechanics of materials and compare the analytical results with finite element simulations and experiments. The work generalizes previous studies on plastic collapse analysis of lattice structures, which are limited to very simple loading conditions. Finally, the method for calculation of buckling strength is based on classical beam-column end-moment behavior expressed in a matrix form.

See full dissertation at **iris.lib.neu.edu/mech_eng_diss/55**

FEYZA KAZANC

PhD, 2013 Mechanical and Industrial Engineering
Advisor, Yiannis A. Levendis | Heat Transfer, Combustion

Gaseous and Particulate Emissions from Pulverized Coal and Biomass Combustion Under Different O2/N2 and O2/Co2 Environments

This dissertation examines the gaseous (NOx, SO2 and CO) and the particulate emissions (ash) from burning of pulverized coals and biomasses under either conventional combustion in air or oxy-fuel combustion conditions. Oxy-fuel combustion is a `clean-coal' process that takes place in O2/CO2 environments, which are achieved by removing nitrogen from the intake gases and recirculating large amounts of flue gases to the boiler. Removal of nitrogen from the combustion gases generates a high CO2-content, sequestration-ready gas at the boiler effluent. Flue gas recirculation moderates the high temperatures caused by the elevated oxygen partial pressure in the boiler. In this study, combustion of the fuels took place in a laboratory laminar-flow drop-tube furnace (DTF), electrically-heated to 1400 K, in environments containing various mole fractions of oxygen in either nitrogen or carbon-dioxide background gases.

See full dissertation at **iris.lib.neu.edu/mech_eng_diss/51**

REZA KHATAMI

PhD, 2014 Mechanical and Industrial Engineering
Advisor, Yiannis A. Levendis | Energy Systems

Ignition and Combustion of Pulverized Coal and Biomass Under Different Oxy-Fuel O2/N2 and O2/CO2 Environments

This dissertation studied the ignition and combustion of burning pulverized coals and biomasses particles under either conventional combustion in air or oxy-fuel combustion conditions. Oxy-fuel combustion is a 'clean-coal' process that takes place in O2/CO2 environments, which are achieved by removing nitrogen from the intake gases and recirculating large amounts of flue gases to the boiler. Removal of nitrogen from the combustion gases generates a high CO2-content, sequestration-ready gas at the boiler effluent. Flue gas recirculation moderates the high temperatures caused by the elevated oxygen partial pressure in the boiler. In this study, combustion of the fuels took place in a laboratory laminar-flow drop-tube furnace (DTF), electrically-heated to 1400 K, in environments containing various mole fractions of oxygen in either nitrogen or carbon-dioxide background gases.

See full dissertation at **iris.lib.neu.edu/mech_eng_diss/59**

BO LI

PhD, 2013 Mechanical and Industrial Engineering
Advisor, Yung Joon Jung | Electro-Mechanical Systems

Highly Organized Single-Walled Carbon Nanotube-Polymer Hybrid Architectures

This dissertation presents highly organized two-dimensional (2D) to three-dimensional (3D) SWCNT-polymer hybrid systems have been demonstrated with an unprecedented control over growth, assembly and transfer process of SWCNTs. First, a novel strategy has been developed to control direction transport properties of SWCNT network by creating the heterogeneity within network. Second, a highly effective and CMOS friendly transfer method, wet-contact printing, has been developed to achieve large scale suspended SWCNT architectures over flexible polymeric substrates with micro to nanoscale precision. Finally, various mechanically and electrically robust 2D and 3D organized and well-aligned SWCNT networks-polymer hybrid architectures have been demonstrated with the combination of different SWCNT architectures and different transfer technologies.

See full dissertation at **iris.lib.neu.edu/mech_eng_diss/42**

ALEXANDRE CONSUL MENDES

PhD, 2014 Mechanical and Industrial Engineering
Advisor, Nasser Fard | Statistics and Probability

Proportional Hazard Model Applications in Reliability

This dissertation proposes two main methods as a modification of the semi-parametric Proportional Hazard Model (PHM) with innovative application for reliability testing. The first method developed uses a median of lifetime survival history for subjects with multiple occurrences to be modeled using the non-recurrent PHM method. The second method developed proposes censoring of influential observations, applying recurrent PHM theory. Both methods are validated using small electromechanical appliances with covariates identifying typical user performance as part of accelerated reliability testing... Data set arrangements for recurrent events are available in the literature; however the author reviews additional techniques to separate failure modes and properly assign categorical and continuous time-dependent covariate values when both methods are used. A complete guide to the modeling steps for the Median and Censored PHM methods proposed for reliability modeling is presented in the conclusion of this study.

See full dissertation at **iris.lib.neu.edu/ind_eng_diss/18**

HANDE MUSDAL

PhD, 2014 Mechanical and Industrial Engineering
Advisor, James Benneyan | Operations Research, Systems Engineering

Systems Engineering Models for Signature Injuries of Modern Military Conflicts

This dissertation presents several systems engineering models to optimize the overall design, effectiveness, and capacity of healthcare systems for detecting and treating silent injuries, such as TBI and PTSD, as well as a general health problem that is common among veterans, sleep apnea, by addressing the following needs: (1) sequential screening processes, (2) categorical diagnostic methods, and (3) care services location-allocation (network optimization) models.

See full dissertation at **iris.lib.neu.edu/ind_eng_diss/17**

RYAN PATRICK HENNESSY

PhD, 2014 Mechanical and Industrial Engineering
Advisor, George G. Adams | Electro-Mechanical Systems

Exploration of Hot Switching Damage and Damage Mechanisms in MEMS Switch Contacts

This dissertation explores the effect of multi-domain coupling on the behavior of an electrical contact, what makes hot switching damaging, the making of contact under bias as it compares to the breaking of contact under bias (leading versus trailing edge hot switching), and the specific mechanisms that could be responsible for hot switching damage.

See full dissertation at **iris.lib.neu.edu/mech_eng_diss/53**

WEI QIAO

PhD, 2014 Mechanical and Industrial Engineering
Advisor, Rifat Sipahi | Control Systems and Mechatronics

Interplay Between Stability, Delays, and Graphs of a Class of Multi-Agent LTI System with Applications

In this dissertation, our objective is to reveal how network structures (graphs) and delays are correlated, to develop a mathematical framework to explain the interplay between stability, topology and delays, and to reveal the rules by which the topology of a multi-agent system can be designed to be more tolerant to destabilizing effects of time delays. These results will be extremely valuable in many fields, i.e., remote surgery, synthetic biology, design of new chemical molecules and drugs, design of the Smart Grid network.

See full dissertation at **iris.lib.neu.edu/mech_eng_diss/56**

MICHAEL CONRAD ROBITAILLE

PhD, 2014 Mechanical and Industrial Engineering
Advisor, Kai-Tak Wan | Biomedical Engineering and Bioengineering

Multi-Scaled Adhesion Mechanics of Hydrogel Contact Lenses

The first aim of this thesis focuses on macroscopic hydrogel lens adhesion characterization achieved via the Planar Adhesion Test (PAT). The PAT is a novel experimental technique that utilizes the lens native geometry to characterize both mechanical and adhesion properties...The second aim of this thesis focuses on characterizing hydrogel lens adhesion against more physiologically relevant samples; donated human corneas. Similar to the PAT, the lens is brought in contact with the cornea and retracted away, recording the “pull-off” force P* for each hydrogel material...The third and final aim of this thesis focuses on characterizing single cell adhesion behavior against the two hydrogel materials via Single Cell Force Spectroscopy (SCFS)...Additionally, this work contains an investigation into the mechanochemistry of native type I collagen via small angle light scattering (SALS), which is reviewed as an addendum at the end of this thesis.

See full dissertation at **iris.lib.neu.edu/mech_eng_diss/61**

QIAN SHENG

PhD, 2013 Mechanical and Industrial Engineering
Advisor, Sinan Muftu | Tribology
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Tribological and Mechanical Characterization of Thin Polymer Films

In this dissertation a toolbox of experimental techniques was developed to assess the quality of thin polymer films. These include assessment of friction, durability and interfacial adhesion. While this work is primarily focused on polytetrafluoroethylene (PTFE), assessments of perfluoroalkoxy (PFA) and poly(trivinyltrimethyl cyclotrisiloxane) (Poly(V3D3)) were also carried out.

See full dissertation at **iris.lib.neu.edu/mech_eng_diss/57**

XIN WANG

PhD, 2013 Mechanical and Industrial Engineering
Advisor, Kai-Tak Wan | Nanoscience and Nanotechnology
coe.neu.edu/~ktwan/Xin.html

Integrated Surface and Mechanical Characterization of Freestanding Bological and Other Nano-Structures Using Atomic Force Microscopy

This dissertation is focused on surface and mechanical characterization of freestanding biological and other nano-structures using atomic force microscopy including two parts: cell mechanics and nano-structure mechanics. The main purpose of this work is to investigate how the nano- / micro-scale mechanical properties affect macro-scale function.

See full dissertation at **iris.lib.neu.edu/mech_eng_diss/47**

YU-CHIAO WU

PhD, 2013 Mechanical and Industrial Engineering
Advisor, George G. Adams | Nanoscience and Nanotechnology

Nanomechanics Modeling of Carbon Nanotubes Interacting with Surfaces in Various Configurations

This thesis models the experiments by the continuum mechanics in two distinct scenarios. In the first situation, measurements are made of CNT configurations after manipulations. Modeling is then used to determine the interfacial properties during the manipulation which led to the observed configuration after manipulations. In the second situation, modeling is used in a more traditional fashion to make theoretical predictions as to how a device will operate.

See full dissertation at **iris.lib.neu.edu/mech_eng_diss/46**

BARAN YILDIRIM

PhD, 2013 Mechanical and Industrial Engineering
Advisor, Sinan Muftu | Manufacturing

Mechanistic Modeling of High Velocity Micro-Particle Impacts: Application to Material Deposition by Cold Spray Process

This dissertation investigates the mechanics of metal bonding upon high strain-rate deformation in order to improve the technological implementation of the process. The research covers a wider range of impact conditions than those directly associated with cold spray, in order to reveal the governing mechanisms of particle impact and rebound.

See full dissertation at **iris.lib.neu.edu/mech_eng_diss/45**

CIHAN YILMAZ

PhD, 2013 Mechanical and Industrial Engineering
Advisor, Ahmed Busnaina | Nanoscience and Nanotechnology

Precise Directed Assembly of Nanoparticles for Electronic, Optical and Biomedical Applications

In this dissertation experimentally and numerically investigated the fundamental mechanism of the electrophoretic directed assembly for different sizes and types of nanoparticles. The results showed that unlike large (such as 500nm) Polysterene Latex (PSL) particles, the electrophoretic assembly of 50 nm and smaller PSL particles is significantly influenced by the Brownian diffusion. This results in random and low yield assembly for the smaller nanoparticles. In order to overcome the Brownian diffusion-limited assembly of 50 nm or smaller particles, the electrophoretic velocity of the particles must be increased. This can be accomplished by increasing the electrophoretic force, which is a function of particle surface charge and applied voltage.

See full dissertation at **iris.lib.neu.edu/mech_eng_diss/44**

RAMIN ZAREIAN

PhD, 2013 Mechanical and Industrial Engineering
Advisor, Jeffrey Ruberti | Biomechanical Engineering

The Effect of Mechanics on Migration, Morphology and Matrix Production by Primary Human Corneal Fibroblasts: Long-Term Dynamic Observation

This dissertation focuses on DIC imaging, live cell fluorescent labeling, traction force microscopy and our previously designed mechanobioreactor, to locally and globally capture PHCF's behavior under cell culture conditions for up to two weeks. It directly tracks and observes the morphology and migration of PHCFs under physiological conditions in the presence of uniaxial mechanical load directly on the microscope. The behavior of human corneal fibroblasts is observed from initial seeding through matrix production. The orientation of cells, the magnitude and direction of their velocity as well as forces exerted by PHCFs were tracked on substrates every 6 minutes. The analyzed data demonstrates that corneal fibroblasts are induced to align on loaded substrates at a relatively fixed angle to the applied force while corneal fibroblasts on unloaded substrates exhibit only local alignment.

See full dissertation at **iris.lib.neu.edu/mech_eng_diss/43**

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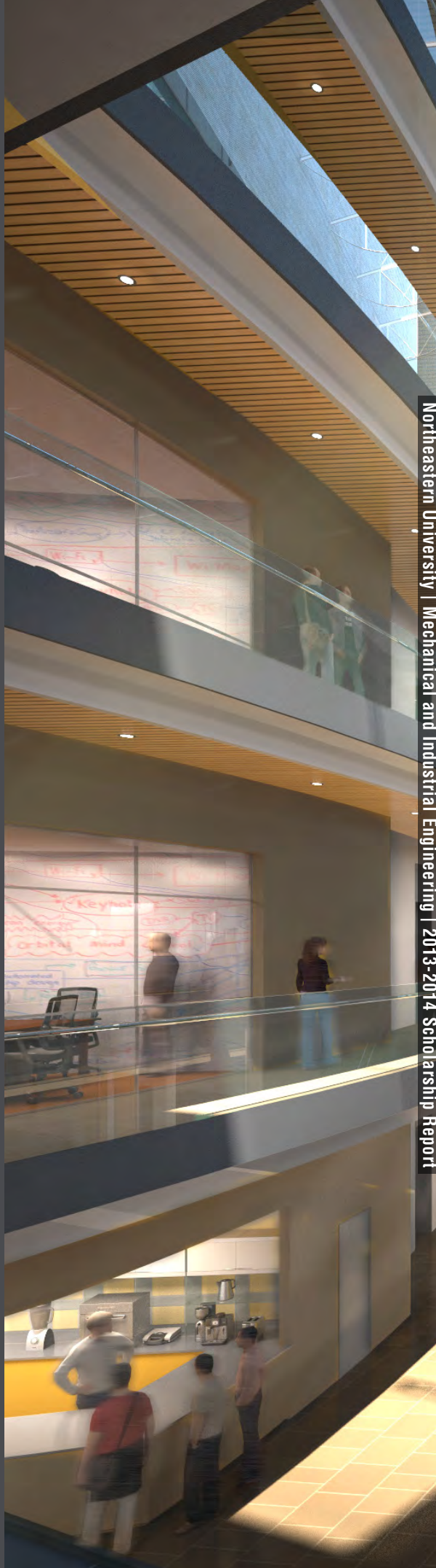
The Interdisciplinary Science and Engineering Complex (ISEC)

at Northeastern is a 220,000 square foot complex scheduled to open in 2016. This facility will help grow Northeastern's research by providing state of the art infrastructure, and increasing the capacity to attract top students, faculty and academic leaders. The ISEC will connect the main campus to the expanded area with a fly-over pedestrian bridge. The six story building will contain wet, dry, and computational research facilities plus interactive teaching and learning spaces. The project was recently featured in ASCE's Civil Engineering Magazine (bit.ly/NU_ASCE). **Learn more at northeastern.edu/isec.**

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