

Dear Friends,

I welcome you to the Scholarship Report for the Department of Chemical Engineering at Northeastern University – the private university which received more undergraduate applications annually than any other university in the United States (earning NU the title of the most applied-to private university in the United States). As you might have noticed, our Department has been on fire over the past three years. For example, over the past 3 years, our undergraduate student body has tripled, our graduate student body has doubled, our research expenditures have increased by over 50%, and our faculty size has grown by over 85%. This has all culminated into our recognition by the U.S. News and World Report that over this three year period, we have experienced the greatest increase in graduate school rankings for any department ever on record. It is clear that our impact in chemical engineering education and research is at a record level and is poised for continual unprecedented growth in the years ahead.

We offer degrees at all levels (bachelor of science, master of science and doctor of philosophy) and are internationally renowned for high quality classroom-based education in conjunction with industrial work experience. Our top-rated (and one of the nation's largest) cooperative education program was one of the first in the country and the Chemical Engineering co-op program currently places students in over 55 companies spanning the areas of consumer products, plastics, biotechnology, nanotechnology, alternative energy, and petrochemicals, to name a few. We even place students in International co-op locations in the UK, France, Switzerland, China, and Vietnam. It is not hard to see why we have been ranked four times as the Best Internship/Career Service University by the Princeton Review.

Our undergraduate program is accredited by the Engineering Accreditation Commission (EAC) of ABET, Inc. ensuring that our program meets the quality standards established by the profession of Chemical Engineering. Our award-winning undergraduate student chapter of the American Institute of Chemical Engineers is very active in many outreach programs, such as the ChemE Car competition and hosting regional AIChE annual conferences. Our graduate program is very interdisciplinary and offers students opportunities to work with outstanding faculty to attain research experience and achieve their career goals in a variety of sub-fields of Chemical Engineering. Collectively, our graduate students and faculty have organized over 14 conferences in the past 3 years demonstrating our leadership across chemical engineering.



I invite you to explore the NU Department of Chemical Engineering through this Scholarship Report and find out why we have been listed among the top “up-and-coming national universities” by the U.S. News and World Report.

Sincerely,

Thomas J. Webster
Art Zafiropoulos Chair and Professor
Department Chair, Chemical Engineering

DEPARTMENT OF CHEMICAL ENGINEERING

QUICK FACTS

**FASTEST-RISING
RANKED GRADUATE
ENGINEERING
PROGRAM IN U.S.
NEWS AND WORLD
REPORT HISTORY**

**8
YOUNG
INVESTIGATOR
AWARDS**

**27
TENURED/
TENURE TRACK
FACULTY**

**86
GRADUATE
STUDENTS**

DEPARTMENT OF CHEMICAL ENGINEERING

313 Snell Engineering Center
Northeastern University
360 Huntington Avenue
Boston, MA 02115

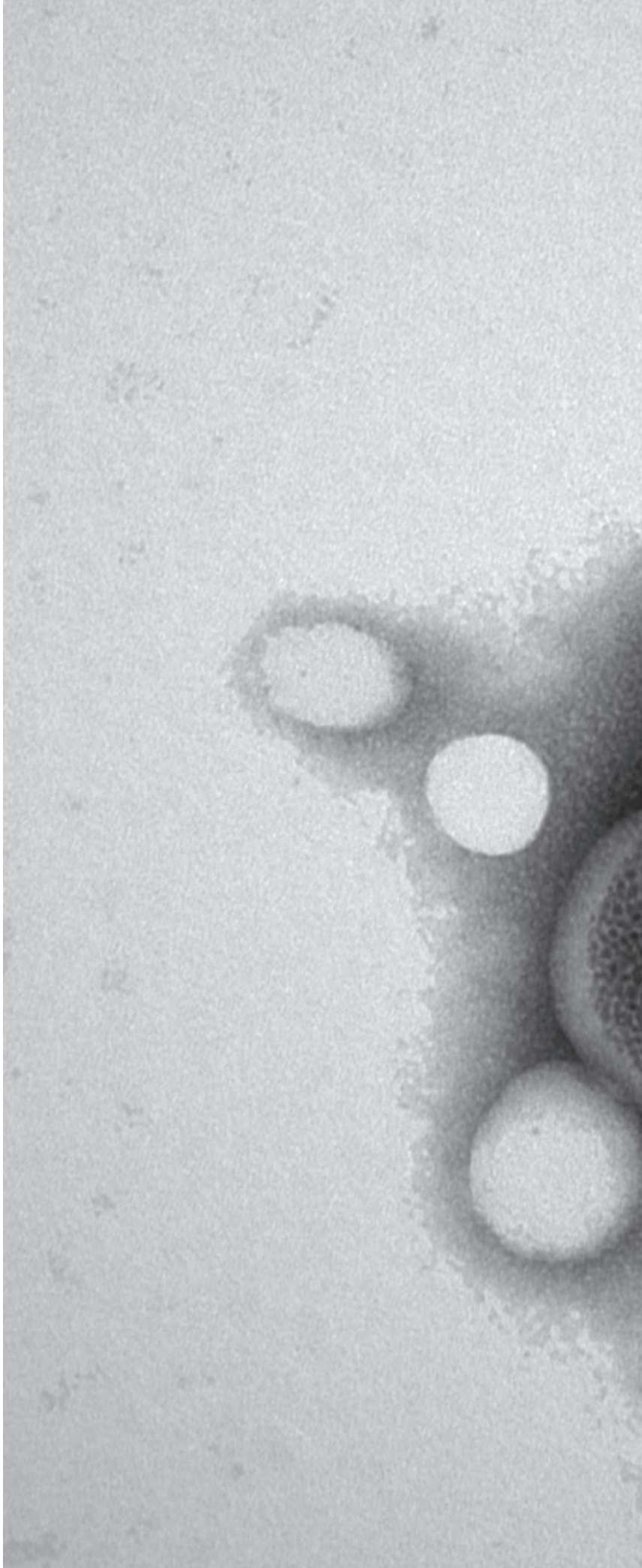
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F 617.373.2209

che.neu.edu
coe.neu.edu

COVER IMAGE

In the Webster lab, various antibacterial and anti-viral nanoparticles (such as silver, selenium, magnesium, zinc oxide, gold, etc.) have been encapsulated in polymersomes to safely and specifically target various microorganisms, including antibiotic resistant bacteria. Once attaching, the polymersome releases its content to kill the microorganism and/or can be externally excited to heat up to kill the microorganism. This was reported in *Nanoscale* in the paper entitled "Silver Nanoparticle-embedded Polymersome Nanocarriers for the Treatment of Antibiotic-resistant Infections," 2015, 7, 3511.

Learn more at websternano.org





Northeastern University
College of Engineering

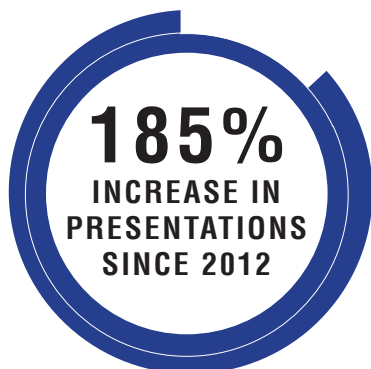
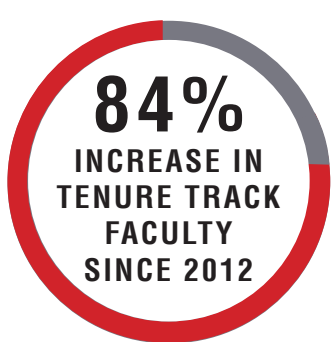
CHEMICAL ENGINEERING

2014 | 2015

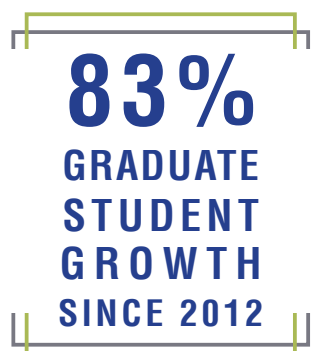
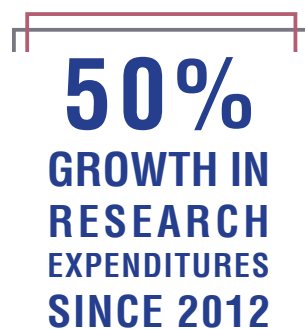
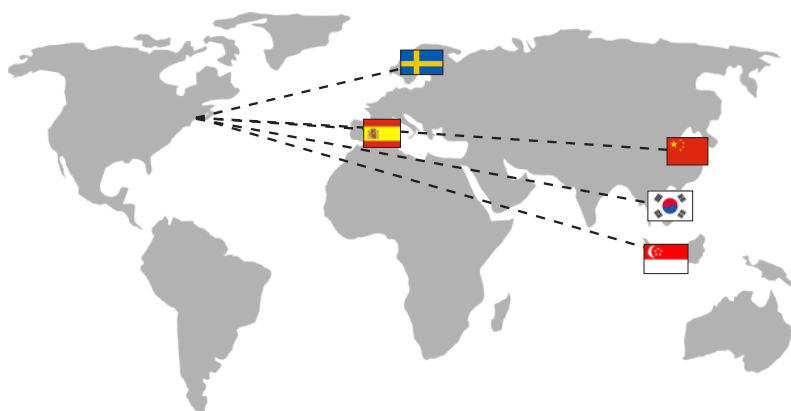
SCHOLARSHIP REPORT

QUICK FACTS

DEPARTMENT OF CHEMICAL ENGINEERING



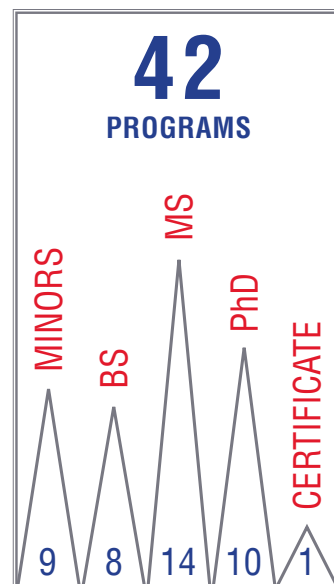
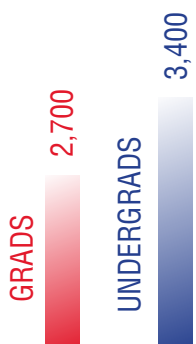
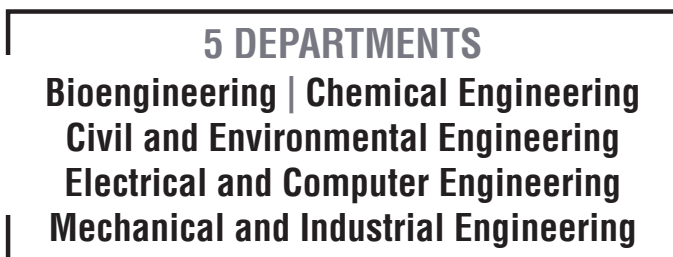
CHEMICAL ENGINEERING SUMMER RESEARCH EXCHANGE PROGRAMS



QUICK FACTS

COLLEGE OF ENGINEERING

12 Federally Funded Multi-Institutional Research Centers



HONORS

ACHIEVEMENTS

ACHIEVEMENTS

Shashi Murthy, Professor of Chemical Engineering and Founding Director of the Michael J. and Ann Sherman Center for Engineering Entrepreneurship Education, has been awarded a 4-year, **\$1.4M grant** from the National Institutes of Health.

Vincent Harris, Professor of Chemical Engineering and Electrical and Computer Engineering, has been selected as a Fulbright Fellow at the Nano-technology Research Lab at the Wayamba University in Sri Lanka.

Thomas Webster, Professor and Art Zafiropoulos Chair in Engineering, was elected to the International College of Fellows - Biomaterials Science and Engineering.

Edgar Goluch, Assistant Professor of Chemical Engineering, was awarded a **\$770K** grant by the National Science Foundation to create a Nano-constriction Device to automatically isolate and cultivate microbes in their own habitat.

Nasim Annabi, Assistant Professor of Chemical Engineering, has developed a new protein-based gel for wound healing, in collaboration with professor Ali Khademhosseini at Brigham and Women's Hospital/Harvard Medical School.

Rebecca Carrier, Associate Professor and Associate Chair for Research, has been selected as this year's recipient for the Dove Press International Journal of Nanomedicine Outstanding Researcher Award.

Matthew Eckelman, Assistant Professor of Civil and Environmental Engineering and Chemical Engineering affiliated faculty, was awarded a **\$503K NSF CAREER Award** for "Building Chemical

Synthesis Networks for Life Cycle Hazard Modeling."

PATENTS

Vincent Harris, Professor of Electrical and Computer Engineering, was awarded a patent for creating Cobalt Carbide-based Nanoparticle Permanent Magnet Materials.

Elizabeth Podlaha-Murphy, Professor of Electrical and Computer Engineering, was awarded a patent for "Photocatalyst with enhanced stability for hydrogen production and oxidative reactions."

Ron Willey, Professor of Electrical and Computer Engineering, was awarded a patent for his method of creating "Titania Nanotubes Prepared by Anodization in Chloride-containing Electrolytes."

STUDENTS

Alumna Kassi Stein, ChE'14, was awarded a NSF Graduate Research Fellowship. Kassi is currently working on a PhD at MIT.

Thomas Webster, Professor and Art Zafiropoulos Chair in Engineering, along with **PhD student Mian Wang** and **PhD graduate Wenwen Liu**, have coauthored a chapter to the newly published book, Trace Metals and Infectious Diseases.

Emma Kaeli, an undergraduate in Chemical Engineering, was named a 2015 Goldwater Scholar.

FACULTY BY RESEARCH AREAS

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Faculty

ADVANCED MATERIALS RESEARCH

Nasim Annabi
Sunho Choi
Arthur Coury
Matthew Eckelman
Adam Ekenseair
Hicham Fenniri
Andrew Gouldstone
Vincent Harris
Barry Karger
Lucas Landherr
Laura Lewis
Courtney Pfluger
Elizabeth Podlaha-Murphy
Ming Su
Thomas Webster
Richard West
Ronald Willey
Katherine Ziemer

19

Faculty

BIOLOGICAL ENGINEERING

Mansoor Amiji
Nasim Annabi
Anand Asthagiri
Rebecca Carrier
Heather Clark
Arthur Coury
Paul DiMilla
Eno Ebong
Adam Ekenseair
Hicham Fenniri
Edgar Goluch
Abigail Koppes
Ryan Koppes
Carolyn W.T. Lee-Parsons
Shashi Murthy
Nikolai Slavov
Srinivas Sridhar
Ming Su
Thomas Webster

MANSOOR AMIJI



Distinguished Professor and Chair, Pharmaceutical Sciences; affiliated faculty, Chemical Engineering, Bioengineering

PhD, Purdue University, 1992
che.neu.edu/people/amiji-mansoor

Scholarship focus: polymeric biomaterials, drug delivery systems, nanomedical technologies

Honors and awards: Fellow, American Association of Pharmaceutical Scientists; Fellow, Controlled Release Society; T. Nagai Award, Controlled Release Society

SELECTED PUBLICATIONS

M. Talekar, Q. Ouyang, M. Goldberg, M.M. Amiji
Co-silencing of PKM-2 and MDR-1 Sensitizes Multidrug Resistant Ovarian Cancer Cells to Paclitaxel in a Murine Model of Ovarian Cancer, *Molecular Cancer Therapeutics*, 14(7), 2015, 1521-1531

A. Singh, M. Talekar, A. Raikar, M.M. Amiji
Macrophage-targeted Delivery Systems for Nucleic Acid Therapy in Inflammatory Diseases, *Journal of Controlled Release*, 190, 2014, 515-530

S. Ganta, A. Singh, T.P. Coleman, D. Williams, M. Amiji
Pharmaceutical Nanotechnology: Overcoming Drug Delivery Challenges in Contemporary Medicine, *Nanomedicine: Principles and Perspectives*, Published by Springer Publishing, New York, NY, Chapter 10, 2014, 191-236

M.M. Amiji
Nanotechnology for Cancer Therapy, Published by CRC Press, LLC, Boca Raton, FL, 2007

M.M. Amiji
Polymeric Gene Delivery: Principles and Applications, Published by CRC Press, LLC, Boca Raton, FL, 2004

SELECTED RESEARCH PROJECTS

Combinatorial-designed Nano-platforms to Overcome Tumor Drug Resistance

Principal Investigator, National Institutes of Health

Multi-modal Gene Therapy for Pancreatic Cancer with Targeted Nanovectors

Principal Investigator, National Institutes of Health

IGERT: Nanomedical Science and Technology

Co-Investigator, National Science Foundation

Integrated Image-guided Targeted Therapy for Refractory Ovarian Cancer

Principal Investigator, Nemucore Medical Innovations, Inc.

Impact of Lipids on Compound Absorption: Mechanistic Studies and Modeling

Co-Investigator, National Institutes of Health

Hepatic Insulin Resistance and Metabolic Disease

Principal Investigator, National Institutes of Health

Targeted Platinates/siRNA Combination Therapy for Resistant Lung Cancer

Principal Investigator, National Institutes of Health

NASIM ANNABI



Assistant Professor, Chemical Engineering

PhD, University of Sydney, Australia, 2010
che.neu.edu/people/annabi-nasim

Scholarship focus: engineering advanced biomaterials for cardiovascular tissue engineering applications

SELECTED PUBLICATIONS

N. Annabi, A. Tamayol, J. Alfredo Uquillas, M. Akbari, L. Bertassoni, C. Cha, G. Camci-Unal, M. Dokmeci, N.A. Peppas, A. Khademhosseini

25th Anniversary Article: Rational Design and Applications of Hydrogels in Regenerative Medicine, *Advanced Materials*, 26(1), 2013, 85-124

N. Annabi, S.M. Mithieux, G. Camci-Unal, M.R. Dokmeci, A.S. Weiss, A. Khademhosseini

Elastomeric Recombinant Protein-based Biomaterials, *Biochemical Engineering*, 77, 2013, 110-118

N. Annabi, S.M. Mithieux, P. Zorlutuna, G. Camci-Unal, A.S. Weiss, A. Khademhosseini

Engineered Cell-laden Human Protein-based Elastomer, *Biomaterials*, 34(22), 2013, 5496-5505

N. Annabi, Š. Selimovic, J.P.A. Cox, D. Heintze, D. Cropek, A.S. Weiss, A. Khademhosseini

Extracellular Matrix Coated Microfluidic Channels for Cardiomyocyte Culture, *Lab Chip*, 13, 2013, 3569-3577

N. Annabi, K. Tsang, S.M. Mithieux, M. Nikkhah, A. Ameri, A. Khademhosseini, A.S. Weiss

Highly Elastic Micropatterned Hydrogels for Engineering Functional Cardiac Tissues, *Advanced Functional Materials*, 23(39), 2013, 4950-4959

ANAND ASTHAGIRI



Associate Professor, Bioengineering; jointly appointed, Chemical Engineering

PhD, Massachusetts Institute of Technology, 1995
bioe.neu.edu/people/asthagiri-anand

Scholarship focus: elucidates design principles for engineering living cells and tissues

SELECTED PUBLICATIONS

D.I. Walsh III, M.L. Lalli, J.M. Kassas, A.R. Asthagiri, S.K. Murthy
 Cell Chemotaxis on Paper for Diagnostics, *Analytical Chemistry*, 87(11), 2015, 5505-5510

M.L. Lalli, A.R. Asthagiri
 Collective Migration Exhibits Greater Sensitivity but Slower Dynamics of Alignment to Applied Electric Fields, *Cellular and Molecular Bioengineering*, 8(2), 2015, 247-257

J.H. Kim, L.J. Dooling, A.R. Asthagiri
 Intercellular Mechanotransduction During Multicellular Morphodynamics, *Royal Society Interface*, 7(3), 2010, 341-350

K.S. Kushiro, A. Chang, A.R. Asthagiri
 Reprogramming Directional Cell Motility by Tuning Micropattern Features and Cellular Signals, *Advanced Materials*, 22, 4516, 2010, 4516-4519

C.A. Giurumescu, A.R. Asthagiri
 Systems Approaches to Developmental Patterning, *Systems Biomedicine*, Eds: Douglas A. Lauffenburger, Edison Liu and Garry Nolan, Elsevier Press, 2010

S.A. Chapman, A.R. Asthagiri
 Quantitative Role of Scaffolding on Signal Propagation, *Molecular Systems Biology*, 5(313), 2009

C.A. Giurumescu, P.W. Sternberg, A.R. Asthagiri
 Predicting Phenotypic Diversity and the Underlying Quantitative Molecular Transitions, *PLoS Computational Biology*, 5(4), 2009, 1-13

SELECTED RESEARCH PROJECTS

Multi-scale Complex Systems Transdisciplinary Analysis of Response to Therapy

Co-Principal Investigator, National Institutes of Health

Quantitative Analysis of Epithelial Cell Scatter

Principal Investigator, National Institutes of Health

REBECCA CARRIER



Associate Professor, Chemical Engineering;
 Associate Chair of Research; affiliated faculty,
 Bioengineering

PhD, Massachusetts Institute of Technology, 2000
che.neu.edu/people/carrier-rebecca

Scholarship focus: interaction between biological systems and materials, with specific applications in drug delivery and regenerative medicine; intestinal and retinal engineering; oral lipid systems

Honors and awards: College of Engineering Faculty Fellow;
 National Science Foundation CAREER Award

SELECTED PUBLICATIONS

H.M. Yildiz, L. Speciner, C. Ozdemir, D.E. Cohen, R.L. Carrier
 Food-associated Stimuli Enhance Barrier Properties of Gastrointestinal Mucus, *Biomaterials*, 54, 2015, 1-8

H.M. Yildiz, T.L. Carlson, A.M. Goldstein, R.L. Carrier
 Mucus Barriers to Microparticles and Microbes are Altered in Hirschsprung's Disease, *Macromol Biosci*, 5(5), 2015, 712-718

P. Baranov, A. Michaelson, J. Kundu, R.L. Carrier, M. Young
 Interphotoreceptor Matrix-poly(caprolactone) Composite Scaffolds for Human Photoreceptor Differentiation, *Journal of Tissue Engineering*, 5, 2014

C.A. Pfluger, B.J. McMahon, R.L. Carrier, D.D. Burkey
 Precise, Biomimetic Replication of the Multiscale Structure of Intestinal Basement Membrane using Chemical Vapor Deposition, *Tissue Engineering*, 19(5-6), 2013, 649-656

S. diMaio, R.L. Carrier
 Gastrointestinal Contents Post-lipid Ingestion: In vivo Measurements and in Vitro Models for Studying Oral Drug Delivery, *Journal of Controlled Release*, 151(2), 2011, 110-122

SELECTED RESEARCH PROJECTS

Combinatorial-designed Nano-platforms to Overcome Tumor Drug Resistance

Co-Principal Investigator, National Institutes of Health

Impact of Lipids on Compound Absorption: Mechanistic Studies and Modeling

Principal Investigator, National Institutes of Health

Impact of Lipids on Intestinal Mucus Transport and Structural Properties

Principal Investigator, National Institutes of Health

Interphotoreceptor Matrix Based Cell Delivery Vehicle for Retinal Regeneration

Principal Investigator, National Institutes of Health

Intestinal Mucus Barrier: Role in Necrotizing Enterocolitis (NEC) and Prophylactic "Mucus-strengthening" Treatment to Prevent NEC

Principal Investigator, March of Dimes

SUNHO CHOI



Assistant Professor, Chemical Engineering

PhD, University of Minnesota, 2008
che.neu.edu/people/choi-sunho

Scholarship focus: demonstrating innovative processing strategies for nanostructured materials and functional hybrids engineered for challenging applications in clean and renewable energy

SELECTED PUBLICATIONS

S. Choi, M. L. Gray, C. W. Jones

Amine-tethered Solid Adsorbents Coupling High Adsorption Capacity and Regenerability for CO₂ Capture Applications Including the air Capture, *ChemSusChem*, 4(5), 2011, 628-635

S. Choi, J. Drese, M. Gray, R.R. Chance, P. Eisenberger, C. Jones
Application of Amine-tethered Solid Sorbents for Direct CO₂ Capture from the Ambient Air, *Environmental Science and Technology*, 45(6), 2011, 2420-2427

W. Kim, S. Choi, S. Nair

Swelling, Functionalization, and Structural Changes of the Nanoporous Layered Silicates AMH-3 and MCM-22, *Langmuir*, 27(12), 2011, 7892-7901

J.H. Lee, P.I. Zapata, S. Choi, J.C. Meredith

Effect of Nanowhisker-modified Zeolites on Mechanical and Thermal Properties of Poly(vinyl acetate) Composites with Pure-silica MFI, *Polymer*, 51(24), 2010, 5744-5755

L. Wei, C.S. Gill, S. Choi, C.W. Jones

Recoverable & Recyclable Magnetic Nanoparticle Supported Aluminum Isopropoxide for Ring-opening Polymerization of ϵ -Caprolactone, *Dalton Transactions*, 39(6), 2010, 1470-1472

SELECTED RESEARCH PROJECTS

Amino-pillared Nanosheet (APN) Adsorbents for High Performance CO₂ capture

Principal Investigator, Northeastern University

HEATHER CLARK



Associate Professor, Pharmaceutical Sciences;
affiliated faculty, Bioengineering, Chemical Engineering

PhD, University of Michigan, 1999
bioe.neu.edu/people/clark-heather

Scholarship focus: optical nanosensors for biological analysis

Honors and awards: Young Faculty Award, Defense Advanced Research Projects Agency

SELECTED PUBLICATIONS

K.J. Cash, C. Li, L.V. Wang, H.A. Clark

Photoacoustic Imaging of Nanosensors for Therapeutic Drugs, *In Vivo*, 9(2), 2015, 1692-1698

M.K. Balaconis, H.A. Clark

Gel Encapsulation of Glucose Nanosensors for Prolonged in Vivo Lifetime, *Journal of Diabetes Science and Technology*, 7(1), 2013, 53-61

T.T. Ruckh, A.A. Mehta, J.M. Dubach, H.A. Clark

Polymer-Free Optode Nanosensors for Dynamic, Reversible, and Ratiometric Sodium Imaging in the Physiological Range, *Scientific Reports*, 3(3366), 2013

K.J. Cash, H.A. Clark

Phosphorescent Nanosensors for in Vivo Tracking of Histamine Levels, *Analytical Chemistry*, 85(13), 2013, 6312-6318

T.T. Ruckh, H.A. Clark

Implantable Nanosensors: Toward Continuous Physiologic Monitoring, *Analytical Chemistry*, 86(3), 2013, 1314-1323

K.J. Cash, H.A. Clark

In Vivo Histamine Optical Nanosensors, *Sensors*, 12(9), 2012, 11922-11932

SELECTED RESEARCH PROJECTS

Polymer-free Nanosensors to Visualize Biochemical Dynamics in Dendritic Spines

Principal Investigator, National Institutes of Health

ARTHUR COURY



University Distinguished Professor, Chemical Engineering

PhD, University of Minnesota, 1965
che.neu.edu/people/coury-arthur

Scholarship focus: polymeric biomaterials for medical products such as implantable electronic devices, hydrogel-based devices and drug delivery systems

Honors and awards: Fellow, American Chemical Society; Fellow, American Institute for Medical and Biological Engineering; Fellow, Biomaterials Science and Engineering; Member, National Academy of Engineering

SELECTED PUBLICATIONS

A. Coury

Forces and Imperatives in Translating Medical Concepts to the Marketplace, BE 502 "From Lab Bench to Marketplace" Department of Bioengineering, University of Pennsylvania, 2013

A. Coury

Issues in Translation of Advanced Composites from the Bench to the Medical Marketplace, MRS Conference, Boston, MA, 2013

A. Coury

Progress in the Prevention of Tissue Adhesions, Tenth International Symposium on Frontiers in Biomedical Polymers, Vancouver, British Columbia, Canada, 2013

A. Coury

Organic Chemistry: Passport to a "Hybrid" Career, Presentation to Department of Chemistry, University of Minnesota, upon Receipt of Distinguished Alumni Award, 2013

A. Coury

Technology, Service and Bucking Convention: A Prescription for a Rewarding Biomaterials Career, Transactions of Society for Biomaterials, 2(3), 101S-110S, in conjunction with receipt of 2013 C. William Hall Award, Boston, MA, 2013

A. Coury, P. Jarrett

Tissue Adhesives and Sealants for Surgical Applications, in Joining and Assembly of Medical Materials and Devices, Edited by Y.N. Zhou and M.D. Breyen (Woodhead Publishing Limited), 2013, 449-490

A. Coury

Tissue Engineering: Scope, Products, and Commercialization Strategies, Chapter 17, Scaffolds for Tissue Engineering: Biological Design, Materials, and Fabrication, Edited by Claudio Migliaresi and Antonella Motta, CRC Press (Taylor & Francis), 2014, 614-625

PAUL DiMILLA



Associate Teaching Professor, Chemical Engineering; jointly appointed: Chemistry and Chemical Biology

PhD, University of Pennsylvania, 1991
che.neu.edu/people/dimilla-paul

Scholarship focus: chemical and engineering education; molecular cell bioengineering; biomaterials and nanotechnology; biophysical chemistry; in silico modeling

SELECTED PUBLICATIONS

E.O. Wisniewski, R. Shapiro, E. Kaeli, K.B. Coletti, S. Selvamani, P.A. DiMilla, R. Reisberg

The Impact of Supplemental Instruction on the Performance of Male and Female Engineers in a Freshmen Chemistry Course, Proceedings of the 122nd ASEE Annual Conference and Exposition, Seattle, WA, 2015

K. Coletti, E.O. Wisniewski, R. Shapiro, P.A. DiMilla, R. Reisberg, M. Covert

Correlating Freshman Engineers' Performance in a General Chemistry Course to Their Use of Supplemental Instruction, Proceedings of the 121st ASEE Annual Conference and Exposition, Indianapolis, IN, 2014

P.A. DiMilla

General Chemistry for Engineers, 1st ed. San Diego, CA: Cognella Academic Publishing, 2013

K. Coletti, M. Covert, P.A. DiMilla, L. Gianino, R. Reisberg, E.O. Wisniewski

Improving Student Retention, Academic Success, and Satisfaction Using Persistence Advising and Structured Peer Tutoring, Proceedings of the 120th ASEE Annual Conference and Exposition, Atlanta, GA, 2013

ENO EBONG



Assistant Professor, Chemical Engineering
affiliated faculty, Bioengineering

PhD, Rensselaer Polytechnic Institute, 2006
che.neu.edu/people/ebong-eno

Scholarship focus: studying the means by which endothelial cell mechanotransduction occurs in order to prevent or promote

atherosclerosis

SELECTED PUBLICATIONS

E. Ebong, S.V. Lopez-Quintero, V. Rizzo, D.C. Spray, J.M. Tarbell
Shear-induced Endothelial NOS Activation and Remodeling via Heparin Sulfate, Glypican-1, and Syndecan-1, *Integrative Biology: Quantitative Biosciences from Nano to Macro*, 6(3), 2014, 338-347

M. Thi, E. Ebong, D. Spray, S. Suadicani
Interaction of the Glycocalyx with the Actin Cytoskeleton, *Neuromethods*, Springer Publishing, 79, 2013, 43-62

E. Ebong, N. Depaola
Specificity in the Participation Of Connexin Proteins in Flow-Induced Endothelial gap Junction Communication, *European Journal of Physiology*, 465(9), 2013, 1293-302

Y. Zeng, E. Ebong, B. Fu, J. Tarbell
The Structural Stability of the Endothelial Glycocalyx after Enzymatic Removal of Glycosaminoglycans, *PLoS ONE*, 7(8), 2012, e43168

E. Ebong, F. Macaluso, D. Spray, J. Tarbell
Imaging the Endothelial Glycocalyx In Vitro by Rapid Freezing/Freeze Substitution Transmission Electron Microscopy, *Arteriosclerosis Thrombosis and Vascular Biology*, 31(8), 2011, 1908-1915

E. Ebong, F. Macaluso, D. Spray, J. Tarbell
Life-like Preservation and TEM Visualization of the Glycocalyx Reveals that it is Substantial in Vitro, *Proceedings of the 2011 IEEE 37th Annual Northeast Bioengineering Conference*, 2011, 1-2

SELECTED RESEARCH PROJECTS

Atheroprotective vs Atherogenic Glycocalyx Mechanotransduction Mechanisms

Principal Investigator, National Institutes of Health

MATTHEW ECKELMAN



Assistant Professor, Civil and Environmental Engineering; affiliated faculty: Chemical Engineering, Public Policy and Urban Affairs

PhD, Yale University, 2009
civ.neu.edu/people/eckelman-matthew

Scholarship focus: environmental engineering and sustainability; life cycle assessment; energy efficiency and emissions modeling; environmental assessment of bio and nanomaterials; material and energy use in urban buildings and infrastructure

Honors and awards: National Science Foundation CAREER Award; International Laudise Prize in Industrial Ecology

SELECTED PUBLICATIONS

P. Nuss, M.J. Eckelman
Life Cycle Assessment of Metals: A Scientific Synthesis, *PLoS ONE*, 9(7), 2014, e101298

M.J. Eckelman, M. Altonji, A. Clark, M. Jenkins, B. Lakin
Life Cycle Environmental and Economic Assessment of Municipal Water Storage Options: Infrastructure Refurbishment Versus Replacement, *ASCE Journal of Infrastructure Systems*, 20(3), 2014, e05014004

M. Saha, M.J. Eckelman
Urban Scale Mapping of Concrete Degradation From Projected Climate Change, *Urban Climate*, 9, 2014, 101-114

R. Wang, M.J. Eckelman, J.B. Zimmerman
Consequential Environmental and Economic Life Cycle Assessment of Green and Gray Stormwater Infrastructures for Combined Sewer Systems, *Environmental Science and Technology*, 47(19), 2013, 11189-11198

M.J. Eckelman
Life Cycle Assessment in Support of Sustainable Transportation, *Environmental Research Letters*, 8, 2013, 021004

M.J. Eckelman, M.S. Mauter, J.A. Isaacs, M. Elimelech
New Perspectives on Nanomaterial Aquatic Ecotoxicity: Production Impacts Exceed Direct Exposure Impacts for Carbon Nanotubes, *Environmental Science and Technology*, 46(5), 2012, 2902-2910

SELECTED RESEARCH PROJECTS

CAREER: Building Chemical Synthesis Networks for Life Cycle Hazard Modeling

Principal Investigator, National Science Foundation

Ethics Education in Life Cycle Design, Engineering, and Management

Principal Investigator, National Science Foundation

Designing and Integrating Life Cycle Assessment Methods for Nanomanufacturing Scale-up

Co-Principal Investigator, National Science Foundation

ADAM EKENSEAIR



Assistant Professor, Chemical Engineering;
affiliated faculty, Bioengineering

PhD, University of Texas at Austin, 2010
che.neu.edu/people/ekenseair-adam

Scholarship focus: synthesis and application of novel polymeric biomaterials for tissue engineering and regenerative medicine applications

SELECTED PUBLICATIONS

- A.K. Ekenseair, F.K. Kasper, A.G. Mikos
Perspectives on the Interface of Drug Delivery and Tissue Engineering, *Advanced Drug Delivery Reviews*, 65, 2013, 89-92
- A.K. Ekenseair, N.A. Peppas
Network Structure and Methanol Transport Dynamics in Poly(methyl methacrylate), *AIChE Journal*, 58(5), 2012, 1600-1609
- A.K. Ekenseair, K.W.M. Boere, S.N. Tzouanas, T.N. Vo, F.K. Kasper, A.G. Mikos
Structure-Property Evaluation of Thermally and Chemically Gelling Injectable Hydrogels for Tissue Engineering, *Biomacromolecules*, 13, 2012, 2821-2830
- A.K. Ekenseair, K.W.M. Boere, S.N. Tzouanas, T.N. Vo, F.K. Kasper, A.G. Mikos
Synthesis and Characterization of Thermally and Chemically Gelling Injectable Hydrogels for Tissue Engineering, *Biomacromolecules*, 13, 2012, 1908-1915
- A.K. Ekenseair, R.N. Seidel, N.A. Peppas
Tuning the Transport Dynamics of Small Penetrant Molecules in Glassy Polymers, *Polymer*, 53(18), 2012, 4010-4017

HICHAM FENNIRI



Professor, Chemical Engineering

PhD, Université Louis Pasteur, 1994
che.neu.edu/people/fenniri-hicham

Scholarship focus: nanotechnology for biomedical applications, nanoscale materials for drug delivery, and cell therapeutics and regenerative medicine

Honors and awards: National Science Foundation CAREER Award; Cottrell Teacher-Scholar Awardee

SELECTED PUBLICATIONS

- K. Ong, T. MacCormack, R. Clark, J. Ede, L. Felix, V. Ortega, M. Dang, G. Ma, H. Fenniri, J. Veinot, G. Goss
Widespread Nanoparticle-assay Interference: Implications for Nanotoxicity Testing, *PLoS One*, 9(3), 2014, e90650
- E. Fine, L. Zhang, H. Fenniri, T.J. Webster
Enhanced Endothelial Cell Functions on Helical Rosette Nanotubes Coated Titanium Vascular Stents, *International Journal of Nanomedicine*, 4, 2009, 91-97
- W.S. Journeay, S.S. Suri, J.G. Moralez, H. Fenniri, B. Singh
Macrophage Inflammatory Response to Self-assembling Rosette Nanotubes, *Small*, 5, 2009, 1446-1452
- S.S. Singh, F. Rakotondradany, A.J. Myles, H. Fenniri, B. Singh
The Role of RGD-Tagged Rosette Nanotubes in the Induction of Inflammation and Apoptosis in Human Adenocarcinoma Cells Through p38 MAP Kinase, *Biomaterials*, 30, 2009, 3084-3090
- W.S. Journeay, S.S. Singh, J.G. Moralez, H. Fenniri, B. Singh
Low Inflammatory Activation by Self-assembling Rosette Nanotubes in Human Calu-3 Pulmonary Epithelial Cells, *Small*, 4(6), 2008, 817-823

SELECTED RESEARCH PROJECTS

- Assembling Functional Organic Nanomaterials Using Novel Supramolecular Synthetic Strategies
Principal Investigator, Natural Sciences and Engineering Research Council of Canada
- NCC-Reinforced Foam-core Sandwich Composite Structures
Principal Investigator, American Institute of Biological Sciences
- Raman Flow Cytometry for Diagnostics and Drug Discovery
Co-Principal Investigator, National Institutes of Health
- Targeted Delivery of Oligonucleotides into Plant Cells Using Self-assembled Rosette Nanotubes
Principal Investigator, Nuclear Regulatory Commission

EDGAR GOLUCH



Di Pietro Assistant Professor, Chemical Engineering; affiliated faculty, Bioengineering

PhD, University of Illinois, 2007
che.neu.edu/people/goluch-edgar

Scholarship focus: detection of biomolecules at the nanoscale, specifically inside micro and nanofluidic channels. This is applied to a broad range of scientific fields including: biophysics, micro and systems biology, ecology, environmental sensing, and analytical instrumentation

SELECTED PUBLICATIONS

- G.E. Aninwene II, P.N. Abadian, V. Ravi, E.N. Taylor, D.M. Hall, A. Mei, G.D. Jay, E.D. Goluch, T.J. Webster
Lubricin: a Novel Means to Decrease Bacterial Adhesion and Proliferation, *Journal of Biomedical Materials Research, Part A*, 103, 2015, 451-462
- P.N. Abadian, E.D. Goluch
Using Surface Plasmon Resonance Imaging (SPRi) to Evaluate Bacterial Adhesion on Surface Coatings, *Analytical Methods*, 7, 2015, 115-122, *featured as a hot article in *Analytical Methods*
- P.N. Abadian, C.P. Kelley, E.D. Goluch
Cellular Analysis and Detection using Surface Plasmon Resonance (SPR) Techniques, *Analytical Chemistry*, 86, 2014, 2799-2812
- T.A. Webster, H.J. Sismaet, J.L. Conte, I.J. Chan, E.D. Goluch
Detection of *Pseudomonas aeruginosa* in Human Samples via Pyocyanin, *Biosensors and Bioelectronics*, 60, 2014, 265-270
- N. Tandogan, P.N. Abadian, S. Epstein, Y. Aoi, E.D. Goluch
Isolation of Microorganisms using Sub-micrometer Constrictions, *PLoS ONE*, 9(6), 2014, e101429
- H.J. Sismaet, T.A. Webster, E.D. Goluch
Up-regulating Pyocyanin Production by Amino Acid Addition for Early Identification of *Pseudomonas aeruginosa*, *Analyst*, 139, 2014, 4241-4246, *featured as a hotarticle in the *Analyst*
- P.N. Abadian, N. Tandogan, J.J. Jamieson, E.D. Goluch
Using Surface Plasmon Resonance Imaging (SPRi) to Study Bacterial Biofilms, *Biomicrofluidics*, 8(2), 2014, 021804

SELECTED RESEARCH PROJECTS

- Breath and Saliva Based Nano-bio Sensing System for Disease Diagnosis and Monitoring
Co-Investigator, Northeastern University
- IDBR: TYPE A Nano-constriction Devices for Isolation and Cultivation of Environmental Microbes
Principal Investigator, National Science Foundation

ANDREW GOULDSTONE



Associate Professor, Associate Department Chair and Program Director of Mechanical Engineering; affiliated faculty, Bioengineering, Chemical Engineering

PhD, Massachusetts Institute of Technology, 2001
mie.neu.edu/people/gouldstone-andrew

Scholarship focus: biomechanics; material science; engineering mechanics

Honors and awards: College of Engineering Faculty Fellow; National Science Foundation CAREER Award

SELECTED PUBLICATIONS

- T. Hu, S. Zhalehpour, A. Gouldstone, et al.
A Method for the Estimation of the Interface Temperature in Ultrasonic Joining, *Metallurgical And Materials Transactions A-Physical Metallurgy And Materials Science*, 45A(5), 2014, 2545-2552
- C.T. Nguyen, H.M. Gonnermann, Y. Chen, A. Gouldstone
Film Drainage and the Lifetime of Bubbles, *Geochemistry Geophysics Geosystems*, 14(9), 2013, 3616-3631
- J.H. Kim, A. Gouldstone, C.S. Korach
Analysis of Spherical Indentation of an Elastic Bilayer Using a Modified Perturbation Approach, *MEMS and Nanotechnology*, 4, 2011, 53-57
- B. Choi, Y. Wu, S. Sampath, A. Gouldstone
Modified Indentation Techniques to Probe Inelasticity in Ni5%Al Coatings from Different Processes, *Journal of Thermal Spray Technology*, 18(1), 2009, 65-74
- L.H. Weng, A. Gouldstone, Y.H. Wu, W.L. Chen
Mechanically Strong Double Network Photocrosslinked Hydrogels from N,N-Dimethylacrylamide and Glycidyl Methacrylated Hyaluronan, *Biomaterials*, 29(14), 2008, 2153-2163

SELECTED RESEARCH PROJECTS

- Fundamentals of Bonding in Kinetic Consolidation Processes
Co-Principal Investigator, National Science Foundation
- Garde: An Interdisciplinary Approach to Accommodate Fine Motor Control Disorders
Co-Principal Investigator, National Science Foundation
- IDR/Collaborative Research: Activities in Thermal Spray Processing and Volcanology
Principal Investigator, National Science Foundation

VINCENT G. HARRIS



University Distinguished Professor, William Lincoln Smith Professor, Electrical and Computer Engineering; jointly appointed, Chemical Engineering

PhD, Northeastern University, 1990
ece.neu.edu/people/harris-vincent

Scholarship focus: design and processing of advanced materials with emphasis on high frequency device applications for radar, communication, and sensing

Honors and awards: Fellow, Institute of Electrical and Electronics Engineers; Fellow, American Physical Society; Fellow, Institute of Physics; Fellow, Institute of Engineering and Technology; Institute of Metal Research's Lee Hsun Lecture Award; Fulbright Senior Fellow; Søren Buus Outstanding; Research Award, College of Engineering

SELECTED PUBLICATIONS

- Y. Peng, X. Wu, Z. Chen, F. Wang, X. Wang, V.G. Harris, et al. BiFeO₃ Tailored Low Loss M-type Hexaferrite Composites Having Equivalent Permeability and Permittivity for Very High Frequency Applications, *Journal of Alloys and Compounds*, 630, 2015, 48-53
- T. Zhou, D. Zhang, L. Jia, F. Bai, L. Jin, V.G. Harris, et al. Effect of NiZn Ferrite Nanoparticles Upon the Structure, Magnetic, and Gyromagnetic Properties of Low-Temperature Processed LiZnTi Ferrites, *Journal of Physical Chemistry C*, 119(23), 2015, 13207-13214
- X. Wang, Q. Li, Z. Su, W. Gong, R. Gong, Y. Chen, V.G. Harris Enhanced Microwave Absorption of Multiferroic Co₂Z Hexaferrite-BaTiO₃ Composites with Tunable Impedance Matching, *Journal of Alloys and Compounds*, 643, 2015, 111-115
- M. Zamanpour, S.P. Bennett, L. Majidi, Y. Chen, V.G. Harris Process Optimization and Properties of Magnetically Hard Cobalt Carbide Nanoparticles via Modified Polyol Method, *Journal of Alloys and Compounds*, 625, 2015, 138-143
- Z. Su, Q. Li, X. Wang, B. Hu, Z. Feng, Y. Chen, V.G. Harris Tunable Permittivity and Permeability of Low Loss Z⁺-Y-type Ferrite Composites for Ultra-high Frequency Applications, *Journal of Applied Physics*, 117(17), 2015, 17E506

SELECTED RESEARCH PROJECTS

- Accelerated Development of Magnetodielectrics Having Equivalent Permeability and Permittivity for RF Applications
Principal Investigator, Rogers Corp
- Design and Development of Multifunctional Electromechanical Ceramics
Principal Investigator, Army Research Office
- Magnetodielectric Heterostructures and Composites
Principal Investigator, Rogers Corp
- Nonlinear Properties of Ferrite Materials
Principal Investigator, Raytheon
- The Northeastern University Program in Strategic Materials
Co-Principal Investigator, Army Research Office

BARRY L. KARGER



Professor and James L. Waters Chair in Analytical Chemistry; affiliated faculty, Bioengineering, Chemical Engineering

PhD, Cornell University, 1963
bioe.neu.edu/people/karger-barry

Scholarship focus: analytical chemistry, bioanalysis, proteomics

Honors and awards: Arnold O. Beckman Medal; Csaba Horváth Memorial Award; Heyrovsky Medal (Czech Republic); Michael Widmer Award of the New Swiss Chemical Society; 3 American Chemical Society Awards

SELECTED PUBLICATIONS

- Z. Liu, S. Dai, B.L. Karger, J.J. Li, et al.
A Quantitative Proteomic Analysis of Cellular Responses to High Glucose Media in Chinese Hamster Ovary Cells, *Biotechnology Progress*, 31(4), 2015, 1026-1038
- S. Li, B.D. Plouffe, B.L. Karger, A.R. Ivanov, et al.
An Integrated Platform for Isolation, Processing and Mass Spectrometry-based Proteomic Profiling of Rare Cells in Whole Blood, *Molecular and Cellular Proteomics*, 14(6), 2015, 1672-1683
- H. Arthanari, Y. Gao, S.-L. Wu, B.L. Karger, et al.
Constitutively Oxidized CXXC Motifs within the CD3 Heterodimeric Ectodomains of the T Cell Receptor Complex Enforce the Conformation of Juxtaposed Segments, *Journal of Biological Chemistry*, 290(1), 2015, 18880-18892
- S. Li, T. Nakayama, A. Akinc, S.-L. Wu, B.L. Karger
Development of LC-MS Methods for Quantitation Of Hepcidin And Demonstration of siRNA-Mediated Hepcidin Suppression in Serum, *Journal of Pharmacological and Toxicological Methods*, 71, 2015, 110-119
- S. Rodig, J.L. Kutok, E.K. Jackson, B.L. Karger, et al.
Immunological Mechanisms of the Antitumor Effects of Supplemental Oxygenation, *Science Translational Medicine*, 7(277), 2015, 277

SELECTED RESEARCH PROJECTS

- Development of an Analytical Platform for Comprehensive Characterization of Biotherapeutic Proteins Top down, middle down and bottom up LC and CE-MS of Biopharmaceuticals
Principal Investigator, Biogen Idec
- Proteomic Analysis of Cell Lines, Drug Target Identification and Host Cell Impurity
Principal Investigator, Industrial Collaborations

ABIGAIL KOPPES



Assistant Professor, Chemical Engineering

PhD, Rensselaer Polytechnic Institute, 2013
che.neu.edu/people/koppes-abigail

Scholarship focus: bioelectric medicine, development of novel interventions and tissue engineered platforms for nerve regeneration and repair

SELECTED PUBLICATIONS

- D. Thompson, A. Koppes, J. Hardy, C. Schmidt
 Electrical Stimuli in the Central Nervous System Microenvironment, *Annual Review of Biomedical Engineering*, 16, 2014, 397-430
- A. Koppes, N. Zaccor, C. Rivet, et al.
 Neurite Outgrowth on Electrospun PLLA Fibers is Enhanced by Exogenous Electrical Stimulation, *Journal of Neural Engineering*, 11(4), 2014, 046002
- A.N. Koppes, A.L. Nordberg, G. Paolillo, H. Darwish, et al.
 Electrical Stimulation of Schwann Cells Promotes Sustained Increases in Neurite Outgrowth, *Tissue Engineering A*, 20(3-4), 2014, 494-506
- B. Behan, D. DeWitt, D. Bogdanowicz, A.N. Koppes, et al.
 Cytotoxicity of Single Walled Carbon Nanotubes on Schwann Cells in 2D and 3D Microenvironments towards the Development of an Electrically Conductive Hydrogel for Neural Engineering, *Journal of Biomedical Materials Research Part A*, 96(1), 2011, 46-57
- A.N. Koppes, A.M. Seggio, D.M. Thompson
 Neurite Outgrowth is Significantly Increased by the Simultaneous Presentation of Schwann Cells and Moderate Exogenous Electric Fields, *Journal of Neural Engineering*, 8(4), 2011, 046023

RYAN KOPPES



Assistant Professor, Chemical Engineering

PhD, Rensselaer Polytechnic Institute, 2013
che.neu.edu/people/koppes-ryan

Scholarship focus: neural interface technology; tissue engineering; and musculoskeletal biomechanics

SELECTED PUBLICATIONS

- R. Koppes, D. Swank, et al.
 A New Experimental Model to Study Force Depression: The *Drosophila* Jump Muscle, *Journal of Applied Physiology*, 166(12), 2014, 1543-1550
- C. Lu, U.P. Froriep, R. Koppes, et al.
 Polymer Fiber Probes Enable Optical Control of Spinal Cord and Muscle Function in Vivo, *Advanced Functional Materials*, 24(42), 2014, 6594-6600 *Cover Art
- N. Schiele, R. Koppes, D. Chrisey, D.T. Corr
 Engineering Cellular Fibers for Musculoskeletal Soft Tissues Using Directed Self-assembly, *Tissue Engineering: Part A*, 19(9-10), 2013, 1223-1232
- S. Park, R.A. Koppes, U.P. Froriep, X. Jia, A. Harapanahalli, B. McLaughlin, P. Anikeeva
 Optogenetic Control of Nerve Growth, *Scientific Reports*, 5(9669), 2015
- A. Canales, X. Jia, U.P. Froriep, R.A. Koppes, C.M. Tringides, J. Selvidge, C. Lu, C. Hou, L. Wei, Y. Fink, P. Anikeeva
 Multimodality Fibers for In-Vivo Simultaneous Optical, Electrical and Chemical Communications with Neural Circuits, *Nature Biotechnology*, 33(3), 2015, 277-284

LUCAS LANDHERR



Assistant Teaching Professor, Chemical Engineering

PhD, Cornell University, 2010
che.neu.edu/people/landherr-lucas

Scholarship focus: development of research-inspired STEM experiments for K-12 classrooms; integration of inquiry-based learning into all levels of K-12 and undergraduate education

Honors and awards: Omega Chi Epsilon Faculty Member of the Year Award; Dick Sioui Teaching Award

SELECTED PUBLICATIONS

- L.J.T. Landherr, W. Zhang, C. Cohen, L.A. Archer
Effect of Pendent Chains on the Interfacial Properties of Thin Polydimethylsiloxane (PDMS) Networks, *Langmuir*, 27, 2011, 5944-5952
- L.J.T. Landherr, C. Cohen, P. Agarwal, L.A. Archer
Interfacial Friction and Adhesion of Polymer Brushes, *Langmuir*, 27, 2011, 9387-9395
- L.J.T. Landherr, W. Zhang, C. Cohen, L.A. Archer
Interfacial Friction of Thin PDMS Network Films, *Journal of Polymer Science B*, 46, 2008, 1773-1787

CAROLYN LEE-PARSONS



Associate Professor, Chemical Engineering;
jointly appointed, Chemistry; affiliated faculty,
Bioengineering

PhD, Cornell University, 1995
che.neu.edu/people/lee-parsons-carolyn

Scholarship focus: production of valuable pharmaceutical compounds from plant cell cultures, specifically the production of important anti-cancer drug molecules from cell cultures of *Catharanthus roseus*

Honors and awards: National Science Foundation CAREER Award; College of Engineering Outstanding Teaching Award

SELECTED PUBLICATIONS

- N. Rizvi, M. Cornejo, K. Stein, J. Weaver, E.J. Cram, C.W.T. Lee-Parsons
An Efficient Transformation Method for Estrogen-inducible Transgene Expression in *Catharanthus roseus* Hairy Roots, *Plant Cell, Tissue and Organ Culture (PCTOC)*, 120(2), 2015, 475-487
- J. Weaver, S. Goklany, N. Rizvi, E.J. Cram, C.W.T. Lee-Parsons
Optimizing the Transient Fast Agro-mediated Seedling Transformation (FAST) Method in *Catharanthus roseus* Seedlings, *Plant Cell Reports*, 33(1), 2014, 89-97
- S. Goklany, N. Rizvi, R.H. Loring, E.J. Cram, C.W.T. Lee-Parsons
Jasmonate-dependent Alkaloid Biosynthesis in *Catharanthus roseus* is Correlated with the Relative Expression of Orca and Zct Transcription Factors, *Biotechnology Progress*, 29(6), 2013, 1367-1376
- N. Rizvi, S. Goklany, E.J. Cram, C.W.T. Lee-Parsons
Rapid Increases of Key Regulators Precede the Increased Production of Pharmaceutically Valuable Compounds in *Catharanthus roseus*, *Pharmaceutical Engineering*, 33(6), 2013, 1-8
- R.M. Gathungu, J.T. Oldham, S.S. Bird, C.W.T. Lee-Parsons, P. Vouros, R. Kautz
Application of an Integrated LC-UV-MS-NMR Platform to the Identification of Secondary Metabolites from Cell Cultures: Benzophenanthridine Alkaloids from Elicited *Eschscholzia Californica* (California poppy) Cell Cultures, *Analytical Methods*, 4, 2012, 1315-1325
- M. Shulman, M. Cohen, A. Soto-Gutierrez, H. Yagi, H. Wang, J. Goldwasser, C.W.T. Lee-Parsons, O. Benny-Ratsaby, M.L. Yarmush, Y. Nahmias
Enhancement of Naringenin Bioavailability by Complexation with Hydroxypropyl- β -cyclodextrin, *PLoS ONE*, 6(4), 2011, e18033

SELECTED RESEARCH PROJECTS

- Transcriptional Control of Alkaloid Biosynthesis in *Catharanthus roseus* Cultures
Principal Investigator, National Science Foundation
- Zinc Finger Transcription Factors: Regulators of Growth, Development, and Alkaloid Biosynthesis
Principal Investigator, National Science Foundation

LAURA H. LEWIS



Cabot Professor, Chemical Engineering; jointly appointed, Mechanical and Industrial Engineering

PhD, University of Texas, 1993
che.neu.edu/people/lewis-laura

Scholarship focus: structure-property relationships in magnetofunctional materials including advanced permanent magnetic magnetocaloric materials; strategic materials for technological application

Honors and awards: Northeastern University Excellence in Research and Creative Activity Award; Fulbright Specialist; NATO Technical Team Member of AVT-231 on “Scarcity of Rare Earth Materials for Electrical Power Systems”, appointed by U.S. National Coordinator

SELECTED PUBLICATIONS

- B.D. Plouffe, S.K. Murthy, L.H. Lewis
Fundamentals and Application of Magnetic Particles in Cell Isolation and Enrichment: A Review, Reports on Progress in Physics, 78(1), 2015, 016601
- L.H. Lewis, F.E. Pinkerton, et al.
De Magnete et Meteorite: Cosmically-motivated Materials, IEEE Magnetics Letters, 5, 2014
- R. McCallum, L.H. Lewis, R. Skomski, M.J. Kramer, I.E. Anderson
Practical Aspects of Modern and Future Permanent Magnets, Annual Review of Materials Research, 44(1), 2014, 451-477
- L.H. Lewis, F. Jiménez-Villacorta
Perspectives on Permanent Magnetic Materials for Energy Conversion and Power Generation, Metallurgical and Materials Transactions A, 44(1), 2013, 2-20
- G. Srajer, L.H. Lewis, S.D. Bader, et al.
Advances in Nanomagnetism via X-ray Techniques, Review Article, Journal of Magnetism and Magnetic Materials, 307(1), 2006, 1-31

SELECTED RESEARCH PROJECTS

- Multiscale Development of L1₀ Materials for Rare-Earth-Free Permanent Magnets
Principal Investigator, Department of Energy
- Nanomedicine Science and Technology
Co-Principal Investigator, National Science Foundation
- Rare-Earth-Free Permanent Magnets
Principal Investigator, Office of Naval Research

SHASHI MURTHY



Professor, Chemical Engineering; affiliated faculty; Bioengineering, Mechanical and Industrial Engineering

PhD, Massachusetts Institute of Technology, 2003
che.neu.edu/people/murthy-shashi

Scholarship focus: microfluidic isolation of stem and progenitor cells, point-of-care diagnostics, cell surface phenomena during microfluidic flow, nanoscale probes for cell stimulation, and biopassive/bioactive coatings for neurological implants

Honors and awards: College of Engineering Faculty Fellow; National Science Foundation CAREER Award; Søren Buus Outstanding Research Award, College of Engineering

SELECTED PUBLICATIONS

- D.A.L. Vickers, E. Chory, S.K. Murthy
Separation of Two Phenotypically Similar Cell Types via a Single Common Marker in Microfluidic Channels, Lab on a Chip, 12, 2012, 3399-3407
- D.A.L. Vickers, S.K. Murthy
Receptor Expression Changes as a Basis for Endothelial Cell Identification Using Microfluidic Channels, Lab on a Chip, 10, 2010, 2380-2386
- B.D. Plouffe, T. Kniazeva, J.E. Mayer, S.K. Murthy, V.L. Sales
Development of Microfluidics as Endothelial Progenitor Cell Capture Technology for Cardiovascular Tissue Engineering and Diagnostic Medicine, FASEB Journal, 23, 2009, 3309-3314
- J.V. Green, S.K. Murthy
Microfluidic Enrichment of a Target Cell Type from a Heterogeneous Suspension by Adhesion-Based Negative Selection, Lab on a Chip, 9, 2009, 2245-2248
- B.D. Plouffe, D.N. Njoka, J. Harris, J. Liao, S.K. Murthy, et al.
Peptide-Mediated Selective Adhesion of Smooth Muscle and Endothelial Cells in Microfluidic Shear Flow, Langmuir, 23, 2007, 5050-5055

SELECTED RESEARCH PROJECTS

- CAREER: Understanding the Role of Cell Surface Markers in Microfluidic Cell Separation-An Integrated Research and Education Program
Principal Investigator, National Science Foundation
- Cleavable Surface Coatings for Microfluidic Devices
Principal Investigator, US-Israel Binational Science Foundation
- Identification and Measurement of Biomarkers to Predict and Prevent Behavioral Mental Illness
Co-Principal Investigator, Northeastern University
- Microfluidic Cell Separation for Tissue Engineering and Regenerative Medicine
Principal Investigator, National Institutes of Health

COURTNEY PFLUGER



Assistant Teaching Professor, First Year Engineering Program; affiliated faculty, Chemical Engineering

PhD, Northeastern University, 2011
coe.neu.edu/people/pfluger-courtney

Scholarship focus: Gateway Faculty with a focus on chemical engineering

SELECTED PUBLICATIONS

- B. McMahon, C.A. Pfluger, B. Sun, K. Ziemer, D. Burkey, R. Carrier
 Photoinitiated Chemical Vapor Deposition Of Cytocompatible Poly(2-Hydroxyethyl Methacrylate) Films, *Journal of Biomedical Materials Research Part A*, 201(7), 2014
- C.A. Pfluger, D.D. Burkey, L. Wang, B. Sun, K. Ziemer, R. Carrier
 Biocompatibility of Plasma Enhanced Chemical Vapor Deposited Poly(2-hydroxyethyl methacrylate) Films for Biomimetic Replication of the Intestinal Basement Membrane, *Biomacromolecules*, 11(6), 2010, 1579-1584
- C.A. Pfluger, R. Carrier, B. Sun, K. Ziemer, D.D. Burkey
 Cross-linking and Degradation Properties of Plasma Enhanced Chemical Vapor Deposited Poly(2-hydroxyethyl methacrylate), *Macromolecular Rapid Communications*, 30(2), 2009, 126-132
- C.A. Pfluger, R. Carrier, D.D. Burkey
 Plasma Enhanced Chemical Vapor Deposited Poly (2-hydroxyethyl methacrylate) for Fabricating a Degradable, Biocompatible Intestinal Tissue Culture Substrate, *AIChE Annual Meeting*, 2008

ELIZABETH PODLAHA-MURPHY



Professor, Chemical Engineering

PhD, Columbia University, 1992
che.neu.edu/people/podlaha-murphy-elizabeth

Scholarship focus: understanding, discovering, and developing novel electrodeposited nanomaterials

Honors and awards: National Science Foundation CAREER Award; Vice Chair of the Division of Electrodeposition, The Electrochemical Society

SELECTED PUBLICATIONS

- H. Cesiulis, T. Maliar, N. Tsyntsar, F. Wenger, P. Ponthiaux, E.J. Podlaha
 Anodic Titanium Oxide Films: Photoelectrochemical and Tribocorrosion Behavior, *Journal of Nanoelectronics and Optoelectronics*, 9, 2014, 265-270
- E.J. Podlaha-Murphy, A. Almansur, A. Kola, K. Duarte
 Electrodeposition of Ni-Fe-Mo-W Alloys-Part 4, *Products Finishing*, 79(2), 2014, 1-14
- S. Sun, E.J. Podlaha
 Examination of Ni-W Induced Codeposition by Intensity Modulated Photocurrent Spectroscopy (IMPS), *Journal of the Electrochemical Society*, 161(6), 2014, D362-D366
- D. Pinisetty, D. Davis, E.J. Podlaha-Murphy, M.C. Murphy, A.B. Karki, D.P. Young, R.V. Devireddy
 Characterization of Electrodeposited Bismuth-Tellurium Nanowires and Nanotubes, *Acta Materialia*, 59(6), 2011, 2455-2461
- D. Davis, M. Zamanpour, M. Moldovan, D. Young, E.J. Podlaha
 Electrodeposited, GMR CoNiFeCu Nanowires and Nanotubes from Electrolytes Maintained at Different Temperatures, *Journal of Electrochemical Society*, 157, 2010, D317-D322

SELECTED RESEARCH PROJECTS

- Electrodeposition of NiFeMoW Alloys
 Principal Investigator, National Association for Surface Finishing
- Gigabyte Biomolecular Processor for Comprehensive Diagnostics and Precision
 Co-Principal Investigator, Cornell University
- Induced Electrodeposition of Molybdenum and Tungsten Alloys
 Principal Investigator, National Science Foundation

SRINIVAS SRIDHAR



CAS Distinguished Professor, Physics; affiliated faculty, Bioengineering, Chemical Engineering

PhD, California Institute of Technology, 1984
che.neu.edu/people/sridhar-srinivas

Scholarship focus: nanomedicine; neurotechnology; nanophotonics

SELECTED PUBLICATIONS

- S. Kumar, J. Belz, S. Markovic, T. Jadhav, S. Sridhar, et al.
Nanoparticle-based Brachytherapy Spacers for Delivery of Localized Combined Chemoradiation Therapy, *International Journal of Radiation Oncology*, 91(2), 2015, 393-400
- R. Tangutoori, P. Baldwin, S. Sridhar
Parp Inhibitors: A New Era of Targeted Therapy, *Maturitas*, 81(1), 2015, 5-9
- B.M. Geilich, A.L. van de Ven, G.L. Singleton, L.J. Sepúlveda, S. Sridhar, T.J. Webster
Silver Nanoparticle-embedded Polymersome Nanocarriers for the Treatment of Antibiotic-resistant Infections, *Nanoscale*, 7(8), 2015, 3511-3519
- A. van de Ven, M. Shann, S. Sridhar
Essential Components of a Successful Doctoral Program in Nanomedicine, *International Journal of Nanomedicine*, 10, 2014, 23-30
- C.A. Gharagouzloo, P.N. McMahon, S. Sridhar
Quantitative Contrast-enhanced MRI with Superparamagnetic Nanoparticles using Ultrashort Time-to-Echo Pulse Sequences, *Magnetic Resonance in Medicine*, 74(2), 2014, 431-441
- Y. Petrov, J. Nador, C. Hughes, S. Tran, O.Yavuzcetin, S. Sridhar
Ultra-dense EEG Sampling Shows Two-fold Increase of Functional Brain Information, *NeuroImage*, 90, 2014, 140-145

SELECTED RESEARCH PROJECTS

- CaNCURE: Cancer Nanomedicine Co-ops for Undergraduate Research Experiences
Principal Investigator, National Institutes of Health
- Integrative Graduate Education and Research Training
Principal Investigator, National Science Foundation
- Nanoscale Magnetism In Next Generation Magnetic Nanoparticles
Sub-project II: Organically Modified Magnetic Nanoparticles
Principal Investigator, Asian Office of Aerospace Research and Development
- PARP Inhibitor Nanotherapy for Ovarian Cancer
Principal Investigator, Department of Defense, Ovarian Cancer Research Program

MING SU



Associate Professor & Associate Chair of Graduate Studies, Chemical Engineering

PhD, Northwestern University, 2004
che.neu.edu/people/su-ming

Scholarship focus: phase change nanoparticles, nanomedicines, in vitro biomarker detections, nanoparticle-enhanced radiation therapy, biological heat transfer, covert thermal barcodes

Honors and awards: National Science Foundation CAREER Award; Nation Institute of Health Director's New Innovator Award

SELECTED PUBLICATIONS

- B. Duong, H. Liu, L. Ma, M. Su
Covert Thermal Barcodes Based on Phase Change Nanoparticles, *Scientific Reports*, 4, 5170, 2014
- Y. Qiao, P. Zhang, C. Wang, L. Ma, M. Su
Reducing X-ray Induced Oxidative Damages in Fibroblasts with Graphene Oxide, *Nanomaterials*, 4(2), 2014, 522-534
- Y. Luo, M. Hossain, C. Wang, Y. Qiao, J. An, L. Ma, M. Su
Targeted Nanoparticles for Enhanced X-ray Radiation Killing of Multidrug Resistant Bacteria, *Nanoscale*, 5(2), 2013, 687-694
- M. Hossain, M. Su
Nanoparticle Location and Materials Dependent Enhancement of X-ray Radiation Therapy, *Journal of Physical Chemistry C*, 116(43), 2012, 23047-23052
- C. Wang, Z. Sun, L. Ma, M. Su
Simultaneous Detection of Multiple Biomarkers With Several Orders of Concentration Difference Using Phase Change Nanoparticles, *Analytical Chemistry*, 83(6), 2011, 2215-2219
- M. Zhang, Y. Hong, S. Ding, J. Hu, Y. Fan, A. Voevodin, M. Su
Encapsulated Nano-Heat-Sinks for Thermal Management of Heterogeneous Chemical Reactions, *Nanoscale*, 2(12), 2010, 2790-2797
- Y. Hong, S. Ding, W. Wu, M. Su, et al.
Enhancing Heat Capacity of Colloidal Suspension Using Nanoscale Encapsulated Phase Change Materials for Heat Transfers, *Applied Materials and Interfaces*, 2(6), 2010, 1685-1691

SELECTED RESEARCH PROJECTS

- CAREER: Biosensing in Thermal Space
Principal Investigator, National Science Foundation
- Enhanced Radiation Therap with Nanoscale Frequency Modulator
Principal Investigator, National Institutes of Health

THOMAS WEBSTER



Professor and Department Chair, Chemical Engineering; Art Zafiropoulos Chair in Engineering; affiliated faculty, Bioengineering

PhD, Rensselaer Polytechnic Institute, 2000
che.neu.edu/people/webster-thomas

Scholarship focus: design, synthesis, and evaluation of nanomaterials for various medical applications, including self-assembled chemistries, nanoparticles, nanotubes, and nanostructured surfaces

Honors and awards: Fellow, Biomaterials Science and Engineering; Fellow, American Institute for Medical and Biological Engineers; Fellow, American Society for Nanomedicine; Fellow, Biomedical Engineering Society; Fellow, Ernst Strungmann Foundation; Wenzhou 580 Elite Scientist Award, China

SELECTED PUBLICATIONS

- P. Tran, L. Sarin, R. Hurt, T.J. Webster
Titanium Surfaces with Adherent Selenium Nanoclusters as a Novel Anti-cancer Orthopedic Material, *Journal of Biomedical Materials Research*, 93(4), 2014, 1417-1428
- P. Tran, L. Sarin, R. Hurt, T.J. Webster
Opportunities for Nanotechnology-enabled Bioactive Bone Implants, *Journal of Materials Chemistry*, 19, 2009, 2653-2659
- E.M. Christenson, K. Anseth, T.J. Webster, A.G. Mikos, et al.
Nanobiomaterial applications in orthopaedics, *Journal of Orthopaedic Research* 25, 2007, 11-22
- G. Balasundaram, T.J. Webster
A Perspective on Nanophase Materials for Orthopedic Implant Applications, *Journal of Materials Chemistry*, 16, 2006, 3737-3745
- A. Chun, J. G. Moralez, H. Fenniri, T.J. Webster
Helical Rosette Nanotubes: A More Effective Orthopaedic Implant Material, *Nanotechnology*, 15, 2004, 234-239
- T.J. Webster, J.U. Ejirofor
Increased Osteoblast Adhesion on Nanophase Metals, *Biomaterials*, 25, 2004, 4731-4739

SELECTED RESEARCH PROJECTS

- Development and Commercialization of Nanostructured Resorbable Urogenital Grafts
Principal Investigator, National Institutes of Health
- Developing Injectable Materials for Cartilage Applications: Part 1
Principal Investigator, Audax, Inc.
- Long-term Prevention of Peri-implantitis via Nano-textured, TiO/Ag Surfaces
Co-Principal Investigator, National Institutes of Health
- Nanomedicine Academy of Minority Serving Institutions
Co-Principal Investigator, National Science Foundation
- Testing Orthopedic Materials for Ionic Fusion, Inc.
Principal Investigator, Ionic Fusion, Inc.
- Testing RTI Materials for Orthopedic Applications
Principal Investigator, RTI, Inc.

RICHARD WEST



Assistant Professor, Chemical Engineering

PhD, University of Cambridge, 2009
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Scholarship focus: development of detailed microkinetic models for complex reacting systems; automating the discovery and calculation of reaction pathways

Honors and awards: American Chemical Society Doctoral New Investigator

SELECTED PUBLICATIONS

- R. Van de Vijver, N.M. Vandewiele, G.B. Marin, R.H. West, et al.
Automatic Mechanism and Kinetic Model Generation for Gas- and Solution-Phase Processes: A Perspective on Best Practices, Recent Advances, and Future Challenges, *International Journal of Chemical Kinetics*, 47(4), 2015, 199-231
- A. Jalan, R.W. Ashcraft, R.H. West, W.H. Green
Predicting Solvation Energies for Kinetic Modeling, *Annual Reports Section "C"*, 106, 2010, 211-258
- M. Sander, R.H. West, M.S. Celnik, M. Kraft
A Detailed Model for the Sintering of Polydispersed Nanoparticle Agglomerates, *Aerosol Science and Technology*, 43(10), 2009, 978-989
- R. Shirley, Y. Liu, T.S. Totton, R.H. West, M. Kraft
First-principles Thermochemistry for the Combustion of a TiCl₄ and AlCl₃ Mixture, *Journal of Physical Chemistry A*, 113(49), 2009, 13790-13796
- W. Phadungsukanan, M. Sander, R.H. West, M. Kraft, et al.
First-principles Thermochemistry for Silicon Species in the Decomposition of Tetraethoxysilane, *Journal of Physical Chemistry A*, 113(31), 2009, 9041-9049
- R.H. West, R.A. Shirley, M. Kraft, C.F. Goldsmith, W.H. Green
A Detailed Kinetic Model for Combustion Synthesis of Titania from TiCl₄, *Combustion and Flame*, 156(9), 2009, 1764-1770

SELECTED RESEARCH PROJECTS

- Identifying and Resolving Discrepancies in Kinetic Models of Hydrocarbon Combustion
Principal Investigator, National Science Foundation
- Transition-State Prediction for High-throughput Calculation of Accurate Chemical Reaction Rates
Principal Investigator, American Chemical Society

RONALD WILLEY



Professor and Associate Chair, Chemical Engineering

PhD, University of Massachusetts, Amherst, 1984
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Scholarship focus: process safety and catalysis (industrial)

Honors and awards: Fellow, American Institute of Chemical Engineers; Norton H. Walton/Russell L. Miller Award in Safety/Loss Prevention, American Institute of Chemical Engineers

SELECTED PUBLICATIONS

- J. Murphy, D. Hendershot, S. Berger, A.E. Summers, R.J. Willey
Bhopal Revisited, *Process Safety Progress*, 33(4), 2014, 310-313
- R.J. Willey
Consider the Role of Safety Layers in the Bhopal Disaster, *Chemical Engineering Progress*, 110(12), 2014, 22-27
- R. J. Willey
Layer of Protection Analysis, *Procedia Engineering*, 84, 2014, 12-22
- R. J. Willey
Novel ways to Present Process Safety Concepts, *Process Safety Progress*, 33(3), 2014, 207-207
- R. Willey, J. H.-C. Hsiao, R. E. Sanders, A. Kossoy, C.-M. Shu
A Focus on Fire Fundamentals Including Emergency Response Training at the National Fire Agency in Taiwan, *Process Safety Progress*, 32(1), 2013, 2-7
- R. Willey, J. Murphy
Process Safety Progress, American Institute of Chemical Engineers, 32(3), 2013, 229-229
- T.O. Spicer, R. J. Willey, D. A. Crowl, W. Smades
The Safety and Chemical Engineering Education Committee—Broadening the Reach of Chemical Engineering Process Safety Education, *Process Safety Progress*, 32(2), 2013, 113-118

KATHERINE ZIEMER



Professor, Chemical Engineering; Vice Provost for Curriculum

PhD, West Virginia University, 2001
che.neu.edu/people/ziemer-katherine

Scholarship focus: engineering surfaces in order to integrate wide bandgap semiconductors with functional and multi-functional oxides, organic molecules, and/or biomaterials

Honors and awards: College of Engineering Faculty Fellow

SELECTED PUBLICATIONS

- 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*, 9(5/6), 2013, 407-430
- Z. Ji, M. Ismail, D.M. Callahan Jr., E. Pandowo, K.S. Ziemer, et al.
The Role of Silver Nanoparticles on Silver Modified Titanosilicate ETS-10 in Visible Light Photocatalysis, *Applied Catalysis B: Environmental* 102, 2011, 323-333
- V. K. Lazarov, Z. Cai, K. Yoshida, P. J. Hasnip, K.S. Ziemer
Growth and Interface Phase Stability of Barium Hexaferrite Films on SiC(0001), *Journal of Applied Physics*, 109, 2011, 07E520
- M. Liu, O. Obi, Z. Cai, J. Lou, G. Yang, K.S. Ziemer, N.X. Sun
Electrical Tuning of Magnetism in Fe₃O₄/PZN-PT Multiferroic Heterostructures Derived by Reactive Magnetron Sputtering, *Journal of Applied Physics*, 107(7), 2010, 073916
- Z. Cai, T. L. Goodrich, B. Sun, Z. Chen, V. G. Harris, K.S. Ziemer
Epitaxial Growth of Barium Hexaferrite Film on Wide Bandgap Semiconductor 6H-SiC by Molecular Beam Epitaxy, *Journal of Physics D: Applied Physics*, 43(9), 2010, 095002

SELECTED RESEARCH PROJECTS

- STTR Phase 2: The Use of Hydrogen for Defect Reduction in Large Format Infrared Detectors
Principal Investigator, Department of Defense

George Ejiofor Aninwene II

PhD 2014, Chemical Engineering; Advisor, Thomas Webster

LUBRICIN AND NANO-BASO₄: NOVEL METHODS TO PREVENT SURFACE BIOFOULING

This dissertation addresses the issue of biofouling by proposing novel surface preparation methods using lubricin and/or nano-BaSO₄ as non toxic agents to prevent biofouling by inhibiting initial cellular adhesion to surfaces. Preventing initial unwanted cellular attachment and accumulation will dramatically improve outcomes and reduce instances of life threatening infections and bio-adhesions.

Lubricin is a an anti-adhesive glycoprotein that is found in the synovial fluid, which acts as a natural barrier within the body, lubricating surfaces and preventing undesirable cellular adhesion on cartilage. BaSO₄ is a common additive used to make medical plastics radio opaque. Nano-formulations would retain similar radiopaque properties while imbuing the medical plastic with nano surface features which would change surface interactions with biological agents.

See full dissertation at coe.neu.edu/iris/GeorgeAninwene

Radhika Barua

PhD 2014, Chemical Engineering; Advisor, Laura H. Lewis

PATHWAYS FOR TAILORING THE MAGNETOSTRUCTURAL RESPONSE OF FeRh-BASED SYSTEMS

In this work, the near-equiatomic phase of FeRh serves as a test bed for understanding the magnetostructural phenomena in intermetallic alloys due to its relatively simple crystal structure (cubic with B2 (CsCl)-type ordering) and its reported ability to undergo a first-order magnetic phase change from antiferromagnetic (AF) to ferromagnetic (FM) ordering, with an accompanying 1 % volume expansion in the unit cell near room temperature ($T_t \sim 350$ K). Overall, three interrelated but largely unexplored aspects concerning the FeRh system have been examined here: (1) influence of nanostructuring on the magnetostructural response; (2) influence of simultaneous application of pressure and magnetic field on the magnetostructural response; (3) correlations between chemical modification of the lattice and the magnetostructural response. Bulk FeRh-based samples in this study were synthesized using the arc-melting technique and nanostructuring of the system was achieved via rapid solidification processing (melt-spinning) of the arc-melted precursor.

See full dissertation at coe.neu.edu/iris/RadhikaBarua

Selena Di Maio

PhD 2014, Chemical Engineering; Advisor, Rebecca L. Carrier

MECHANISTIC STUDIES AND MODELING OF EFFECTS OF INGESTED LIPIDS ON ORAL DRUG ABSORPTION

The specific four aims of the proposed experimental approach were the followings. 1) Design and characterize biorelevant in vitro lipid digestion models able to simulate fundamental features of human intestinal contents in post-prandial conditions. Basic back-titration has been used to establish associated chemical composition characterizing products of the lipolysis process. 2) Investigate the ultra-structure and composition of colloidal species existing in the GI tract upon ingestion of lipids and their dynamic behavior. Dynamic light scattering (DLS), and small angle neutron scattering (SANS) have been employed to characterize the colloidal structures (emulsion droplets, vesicles, micelles) present throughout digestion. 3) Establish kinetics and thermodynamics of drug transport into and out of colloidal structures in the GI tract, based on a model drug that was selected to represent poorly water-soluble drug compounds.

See full dissertation at coe.neu.edu/iris/SelenaDiMaio

Adam Hatch

PhD 2014, Chemical Engineering; Advisor, Shashi K. Murthy

MICROFLUIDIC ISOLATION OF ENDOTHELIAL PROGENITOR CELLS FOR VASCULAR TISSUE ENGINEERING

The principal goal of this dissertation is to create microfluidic cell separations systems to isolate or enrich key cell types for tissue engineering applications. In tissue engineering functional cell types must be enriched prior to seeding onto scaffolds. In cell based approaches to tissue repair and regeneration stem and progenitor cells present in certain types must be isolated and characterized prior to use. The adhesion of cells to a functionalized surface is the basis for this type of separation. This work demonstrated the viability of using a PEG-alginate hydrogel for the purification of EPCs. Further it was shown that the coating is agnostic to substrate type. Cells isolated via this hydrogel behaved as expected both in vitro and in vivo. This demonstrates the ability to use this platform for tissue engineering applications, basic research, and cellular based therapies to isolate EPCs in a rapid, rigorous, and inexpensive fashion. This represents a step forward in cell purification methods.

See full dissertation at coe.neu.edu/iris/AdamHatch

Sean Henry Kevlahan

PhD 2014, Chemical Engineering; Advisors, Shashi K. Murthy, Rebecca L. Carrier

A MICROFLUIDIC CAPTURE AND RELEASE METHOD FOR ISOLATION INTESTINAL PROGENITOR AND STEM CELLS FROM NATIVE RAT TISSUE ENABLING ADVANCES IN VASCULOGENIC CO-CULTURES

This dissertation describes a novel microfluidic cell capture and release platform to enrich for rare tissue specific stem and progenitor cells within native conditions without the need of a FACS instrument. The platform incorporates the use of a microfluidic post array coupled with an alginate-PEG moiety containing a bound capture protein which allows for selective capture and release of target cells with a simple chelation step. Illustrated in chapter 3, incorporates anti-CD133 into the hydrogel for selective intestinal progenitor cell enrichment where as chapter 4 demonstrates stem cell isolation implementing anti-GPR49 as the capture protein. This approach has lead to a novel cell separation prototype to isolate intestinal stem cells from native tissue digestate without the need for conventional genetic hybridization techniques. In addition, the approach provides a greater throughput (35,000 cells/min) and higher viability (93%) in comparison to the state of the art.

See full dissertation at coe.neu.edu/iris/SeanKevlahan

Melissa Germaine Loving

PhD 2014, Chemical Engineering; Advisor, Laura H. Lewis

UNDERSTANDING THE MAGNETOSTRUCTURAL TRANSFORMATION IN FERH THIN FILMS

In this dissertation, sputter deposited FeRh thin films have been grown to study the role of intrinsic (chemical modification by thermally driven Au-capping layer diffusion) and extrinsic (strain/film lattice distortion and nanostructuring) factors on the FOPT character. Further, magnetic studies coupled with kinetic analysis have been employed to develop an understanding of the phase transformation kinetics (energy barriers and nucleation and growth mechanism associated with the AF-FM FOPT) in FeRh thin films. Results exposed in this dissertation have been obtained with laboratory and synchrotron-based magnetic and structural probes to advance the understanding of the spin-lattice coupling in the FeRh system with information that allows FOPT tailoring. Specifically, results obtained in this dissertation reveal that thermally-driven Au diffusion, out-of-plane lattice distortion, and nanostructuring lead to a stabilized FM phase in the (bulk) AF regime.

See full dissertation at coe.neu.edu/iris/MelissaLoving

Pegah Mohammad Hosseinpour

PhD 2014, Chemical Engineering; Advisor, Laura H. Lewis

STRUCTURE-MAGNETIC PROPERTY CORRELATIONS IN TiO₂ NANOTUBE ARRAYS

This Dissertation aims at investigating the correlations of the morphology, crystallinity, crystal structure, electronic structure and magnetic properties of TiO₂ nanotubes, with potential relevance to their functionality. Self-ordered arrays of amorphous TiO₂ nanotubes (pure and Fe-doped with cationic concentration of ~2.1 at%) were synthesized by the electrochemical anodization technique, followed by subjecting them to thermal treatments up to 450 °C to crystallize these nanostructures. A variety of probes—morphological, structural, magnetic and spectroscopic—were used to characterize the properties of these nanostructures as functions of their processing conditions and the dopant content. Structure-functionality relationships in these nanostructures were verified by examining the photodegradation rate of methyl orange (a model water pollutant) in presence of TiO₂ nanotubes under UV-Visible light irradiation.

See full dissertation at coe.neu.edu/iris/PegahMohammad

Linlin Sun

PhD 2014, Chemical Engineering; Advisor, Thomas Webster

SELF-ASSEMBLED ROSETTE NANOTUBES FOR BONE TISSUE ENGINEERING AND DRUG DELIVERY APPLICATIONS

This thesis will first cover recent advances in fabricating and using nanostructured metals, ceramics, and polymers for numerous orthopedic applications and discuss future research that is needed for the field to progress. Then, this thesis elucidates several promising tissue engineering applications of rosette nanotubes (RNTs), a biomimetic self-assembled nanomaterial composed of DNA base-pairs. Rosette nanotubes have unique properties, including self-assembling into stable nanotubes in physiological environments, forming a viscous gel at body temperatures, and having a great affinity and enhanced bioactivity with many types of tissues (e.g., bone, cartilage, skin, heart, blood vessels, etc.). With a similarity to collagen molecules in bone and extracellular matrices in other organs, rosette nanotubes were used in this thesis for orthopedic applications in terms of enhancing bone cell functions, promoting in-vivo bone growth, delivery of bone morphogenetic protein (BMP) 7 derived short peptides, and anti-cancer drug delivery for bone cancer treatment.

See full dissertation at coe.neu.edu/iris/LinlinSun

Shaopeng Sun

PhD 2014, Chemical Engineering; Advisor, Elizabeth J. Podlaha

INDUCED CODEPOSITION OF Mo AND W FROM AQUEOUS ELECTROLYTES

In the work presented here, Mo induced codeposition with Ni was explored when the concentration of nickel ions in the electrolyte was much lower than molybdate. Their composition and deposit thickness were characterized by X-ray fluorescence. Mo-rich alloys were obtained, setting a new record, with > 80 wt. % Mo content. Catalytic properties were investigated and exhibited Tafel behavior consistent with their hallmark feature as a catalyst for electrolytic hydrogen evolution. NiMoW alloys were also electrodeposited, where the nickel preferentially induced the deposition of molybdenum over that of tungsten. The tungsten partial current density, hence reaction rate, was inhibited when deposition was compared to a molybdenum free electrolyte. A mechanism to describe this observation was raised for both Mo and W induced codeposition...In this work, the composition range of electrodeposited NiMo from aqueous solution was expanded to a new limit, 80 wt.%. Also, a new mechanism of Mo and W induced codeposition was suggested, where adsorbed intermediates was identified as the key species that induces molybdate and tungstate ion reduction.

See full dissertation at coe.neu.edu/iris/ShaoPengSun

Thaddaeus Webster

PhD 2015, Chemical Engineering; Advisor, Edgar Goluch

MONITORING OF PSEUDOMONAS AERUGINOSA TOXINS VIA MINIATURIZED ELECTROCHEMICAL ASSEMBLIES

In this dissertation the production of pyocyanin from the opportunistic pathogen *Pseudomonas aeruginosa* was probed using a variety of miniaturized electrochemical systems. Goal 1 used disposable screen printed carbon electrodes to measure pyocyanin in medically relevant samples showing for the first time that pyocyanin can be detected at medically relevant concentrations (1-100 μ M) without sample processing. Goal 2 coupled these same electrodes with Polydimethylsiloxane growth chambers to expose *P. aeruginosa* biofilms to varying concentrations of colistin sulphate...Goal 3 addresses the question of detecting *P. aeruginosa* in patient samples if the concentration of pyocyanin is initially low/non-existent in patient samples...Goal 4 looks at the miniaturization of the reference electrode using palladium as a novel pseudo reference material. The reference electrode was fabricated in a nanofluidic chamber housing a gold working electrode.

See full dissertation at coe.neu.edu/iris/ThaddaeusWebster

Hasan Mahmut Yildiz

PhD 2014, Chemical Engineering; Advisor, Rebecca Carrier

FOOD-ASSOCIATED STIMULI ENHANCE BARRIER PROPERTIES OF MUCUS

The main objective of this project was to examine the impact of physicochemical changes occurring upon food ingestion on gastrointestinal (GI) mucus barrier properties. The motivation for studying these phenomena includes understanding how drug delivery and microbe transport through mucus may change upon food exposure, and how these effects may be exploited to enable more efficient drug delivery or block pathogen transport. Lipid content associated with fed state intestinal contents significantly enhanced mucus barrier properties, as indicated by 10 - 140-fold reduction in the transport rate of 200 nm microspheres through mucus, depending on surface chemistry. Physiologically relevant increases in $[Ca^{2+}]$ resulted in 3-fold, 4-fold and 2-fold reduction of amine-, carboxylate- and sulfate modified particle transport rates, respectively, likely due to binding of $[Ca^{2+}]$ to mucin glycoproteins and thus enhanced cross-linking of the mucus gel network. Reduction of pH from 6.5 to 3.5 also affected mucus viscoelasticity, reducing particle transport rates approximately 5-fold for amine-modified particles and 10-fold for carboxylate- and sulfate modified microspheres.

See full dissertation at coe.neu.edu/iris/HasanMahmut

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