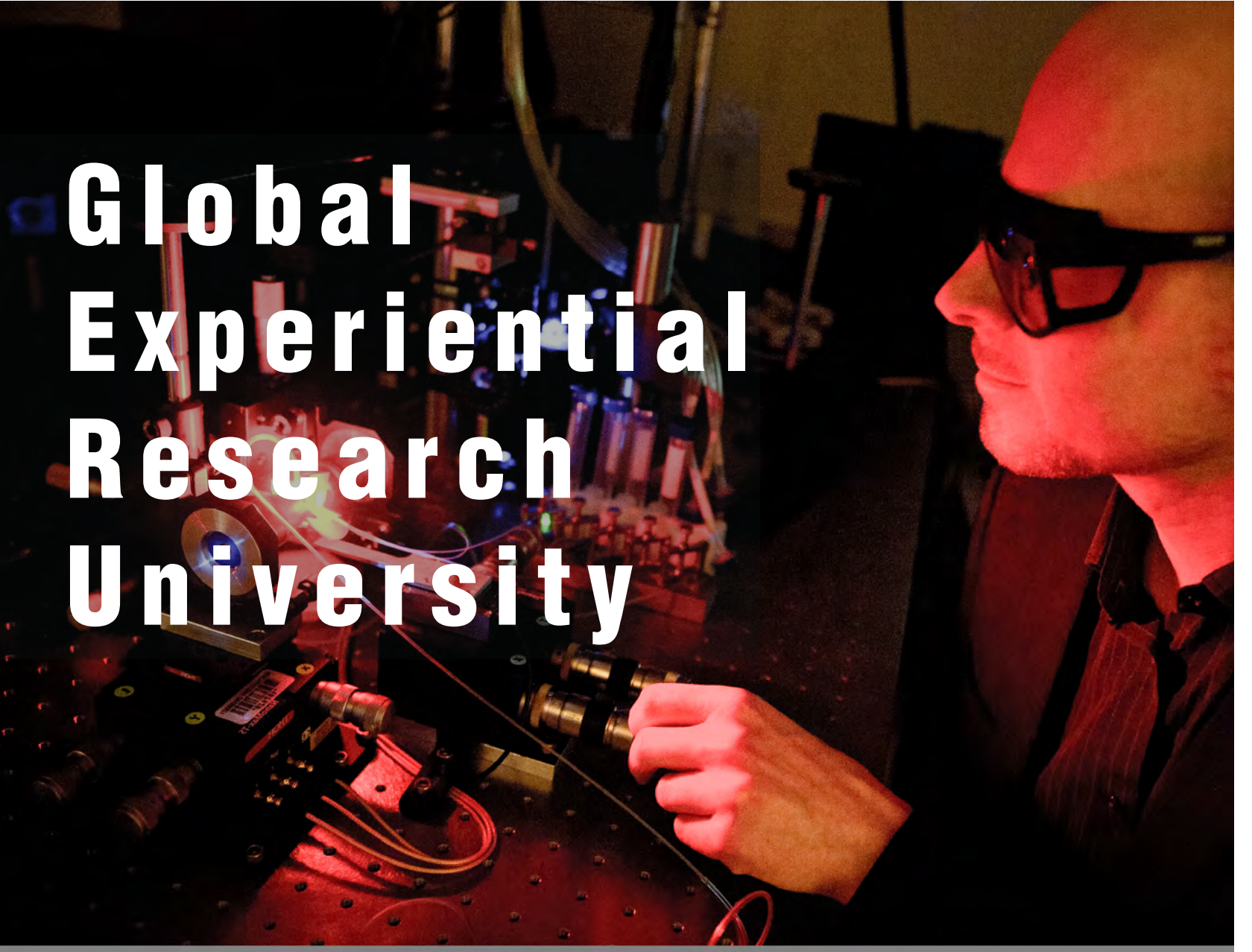
Northeastern University
College of Engineering

CHE 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 Chemical Engineering «

Dear Friends,

This first annual scholarship report reflects the exceptional academic and professional accomplishments of the chemical engineering faculty and PhD candidates for the 2013-2014 year. With $59 million in annual research expenditures, and 134 faculty members (31 in chemical engineering) the college is expanding in both size and research abilities. We look forward to a new infrastructure in 2016, adding a 220,000 square foot interdisciplinary science and engineering complex which will provide state-of-the art teaching and research labs.

Since I began at Northeastern in 2012, I have been dedicated to increasing the number of research faculty and strengthening partnerships with industry and alumni. Northeastern's outstanding academic engineering program and its experiential learning programs create a superior environment for learning, research, discovery, and innovation.

Our scholars strive to use today's discoveries 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 report, and we look forward to sharing our future accomplishments in our annual scholarship reports.

Sincerely,

Tom Webster
Chair of Chemical Engineering
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inside

Key Contacts

Chair
Tom Webster, th.webster@neu.edu

Graduate Studies Director
Hicham Fenniri, h.fenniri@neu.edu

Co-op Coordinator
Janice Vanselow, j.vanselow@neu.edu

Business Manager
Brandon Mennillo, b.mennillo@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; a National Institute of Standards and Technology (NIST) Technology Innovation Program project

CHEMICAL ENGINEERING
Faculty by Scholarship Focus

Advanced Materials Research

Choi, Sunho
Eckelman, Matthew
Ekenseair, Adam
Gouldstone, Andrew
Landherr, Lucas
Lewis, Laura
Murthy, Shashi
Podlaha-Murphy, Elizabeth
Webster, Thomas
West, Richard
Willey, Ron
Ziemer, Katherine

Biological Engineering

Amiji, Mansoor
Asthagiri, Anand
Carrier, Rebecca
Clark, Heather
Coury, Arthur
Ebong, Eno
Fenniri, Hicham
Goluch, Edgar
Lee-Parsons, Carolyn
Murthy, Shashi
Pfluger, Courtney
Ruberti, Jeffrey
Sridhar, Srinivas
Webster, Thomas

How Nanotechnology Could Keep Your Heart Healthy

Since the heart is such a delicate and critical organ, clinicians usually opt not to intervene with the dead cells that remain after a heart attack or cardiac disease. “But we think that all heart attacks deserve some kind of treatment because it puts so much stress on the rest of the heart,” said Thomas Webster, professor and chair of the Department of Chemical Engineering. Even a square centimeter of dead heart tissue can put significant strain on the rest of the heart, which has to pick up the slack, he said.

Webster’s earlier work demonstrated that adding nanofeatures to an implanted medical device like a titanium knee or hip joint helps the cartilage cells adhere to the device. This promotes tissue growth and allows the patient to heal more readily, he explained. While his team members don’t know exactly why this happens, they have a good idea. They think the nanofeatures allow the surface to more accurately mimic the natural environment in the body, thus providing more habitable accommodations for the new cells.

But titanium hearts aren’t a viable option. Instead, they utilized a hydrogel, which they’d developed previously, to mimic the heart cells themselves. They added carbon nanotubes to the hydrogel, making it conductive, and then injected the material into the heart, where it solidifies at body temperature. Because the hydrogel is “super sticky,” it adheres extremely well to the tissue surface and immediately begins expanding and contracting in sync with the beating of the heart. While the team hasn’t yet tested the material in an animal model, it has simulated these conditions in the lab.

Once again, by mimicking the natural environment, they saw “improved ability of cardiomyocytes [cardiac muscle cells] to attach, to proliferate, and then to secrete the chemicals they secrete during normal, healthy heart function,” Webster said. They also saw better blood vessel production. Further, the material seemed to dampen the function of fibroblast cells, which are formed in scar tissue. Since scar tissue is thick and inflexible, it is not particularly well suited for the heart, which is constantly changing shape, Webster said.

“We think we’ve gone as far as we can in vitro, perfecting it hopefully every step of the way,” Webster said.

See faculty page 34

The Ultimate Molecular Chess Match

For the last two decades, it's been said that carbon nanotubes hold the promise to transform a range of fields, from alternative energy to drug delivery. But making that happen has proved difficult, according to Hicham Fenniri, an international leader in nanotechnology and new professor in Northeastern's College of Engineering.

"Carbon nanotubes are fascinating materials," said Fenniri, who also serves as a Director of the Biomedical Engineering Research Center in Doha, Qatar. "They have amazing chemical and physical properties, but they are challenging from a synthetic point of view." Controlling their size, purity, and electrical properties, he explained, are just a few of the challenges standing in the way of realizing the material's high-value added applications.

In the early 90s, Fenniri decided to take matters into his own hands. "I was thinking, how can we develop a material from the ground up so we can control all these properties," he said. Since then, his work has led to the development of the world's first self-assembling organic nanotube, a signature accomplishment that established him as one of the field's leading innovators.

In contrast to carbon nanotubes, Fenniri's truly organic tubes consist not only of carbon but also other elements that make up all living things—oxygen, hydrogen, nitrogen, and many others. The tubes are biocompatible, making them a prime material to use as a coating for a medical implant or as a vehicle for drug delivery. Fenniri is also using them as components in novel electronic and photonic devices.

Historically, a conductive organic supramolecular nanowire has been an elusive target. But in recent years, Fenniri and his colleagues have been hard at work attempting to use their nanotubes as carriers for electrons, just as conductive metal wires do;. Their preliminary reports have confirmed the feasibility of their innovative strategy. The potential achievement, he said, could transform the alternative energy sector. He is also exploring potential medical applications for his materials, including whether they would make effective antibacterial agents.

"With organic chemistry, you can construct essentially any molecule by a combination of reactions and processes," Fenniri explained. "Really, you can liken it to a chess game: you can look at the target molecules and design a strategy to get there."

This is exactly the approach his team is taking in the development of new applications for their self-assembling nanotubes, which comprise smaller chemical components that have been adapted to fit their particular needs. Fenniri compared the synthetic approach to a set of Lego bricks—instead of different colors you have different chemistries. With this arsenal of building blocks and the natural tendency of molecules to obey certain organizational laws, he's winning a host of molecular chess games.

See faculty page 19

A Storm in Our Veins

Suppose you're hiking through the forest on a sunny afternoon as a light breeze passes through the trees, gently grazing your skin. Suddenly the sky opens up and a rainstorm ensues. The trees keep you dry, but the weather worsens and 50 mile-per-hour winds start knocking down trees, leaving you unprotected.

This is similar to what it's like inside our blood vessels, explained Eno Ebong, a new assistant professor in the Department of Chemical Engineering. Her research focuses on studying the effects of the mechanical forces of blood flow on the endothelial cells that line and protect our blood vessels—work that is aimed at advancing vascular disease treatment.

Under normal circumstances, the environment inside our blood vessels resembles a quiet, breezy day. But sometimes, it gets a little stormy. For instance, at branches, constrictions, or curvatures the geometry of a vessel becomes askew. Another way to think of it is like the plumbing of a house, when water flow problems occur at the pipes' curves. The same is true in the human body's plumbing, Ebong said. Geometry changes cause flow disruptions, effect the endothelial cells lining and protecting the vessel, and can eventually lead to plaque build up.

Thankfully, the vessels' endothelial cell lining has its own protective miniature forest, called the glycocalyx. Consisting mostly of sugar molecules and proteins, this structure stands on end like a forest of tiny trees. It's also the primary focus of Ebong's work.

"I study the structure of the glycocalyx under different flow conditions," said Ebong, who served as a post-doctoral researcher and professor at the Albert Einstein College of Medicine before coming to Northeastern. "I try to make the connection between glycocalyx structure and its function—or dysfunction—as a protective coat on top of the endothelial cells."

In previous and ongoing studies, Ebong's group has confirmed and defined the means by which the glycocalyx plays a role in endothelial cell protection. When new enzymes or manipulated genes were introduced and broke down different components in the glycocalyx, her team observed significant disruptions to the way the endothelial cells lining the blood vessels were impacted by flow. "The glycocalyx appears to be so much more complicated than we expected," she said.

By understanding the roles that the different glycocalyx components play in the material's protective function, Ebong said, she hopes to identify new targets and develop new tools to prevent, diagnose, or treat vascular disease.

See faculty page 17

MANSOOR AMIJI

Distinguished Professor and Chair, Pharmaceutical Sciences; affiliated faculty, Chemical Engineering, Bioengineering, PhD, Purdue University, 1992. Joined Northeastern in 1993
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Scholarship Focus

- Synthesis of novel polymeric materials for medical and pharmaceutical applications
- Preparation and characterization of polymeric membranes and microcapsules with controlled permeability properties for medical and pharmaceutical applications
- Target-specific drug, gene, and vaccine delivery systems for diseases of the gastro-intestinal tract
- Delivery of DNA and siRNA to mucosal surfaces for gene therapy and vaccination
- Localized delivery of cytotoxic and anti-angiogenic drugs, siRNA, and genes for solid tumors in novel biodegradable polymeric nanoparticles

Honors and Awards

- Fellow, American Association of Pharmaceutical Scientists
- Fellow, Controlled Release Society
- T. Nagai Award, Controlled Release Society

Selected Recent Publications

Book and book chapters

C.R. Fontana, M.A. Lerman, N. Patel, C. Grecco, C.A. Costa, M.M. Amiji, V.S. Bagnato, N.S. Soukos
Safety Assessment of Oral Photodynamic Therapy in Rats, Lasers in Medicine and Surgery, (2): 479-486, 2013

E. Kobayashi, A.K. Iyer, F.J. Hornicek, M.M. Amiji, Z. Duan
Lipid-Functionalized Dextran Nanosystems to Overcome Multidrug Resistance in Cancer: a Pilot Study, Clinical Orthopaedics and Related Research, 471 (3): 915-925, 2013

C. Kriegel, H. Attarwala, M. Amiji
Multi-Compartmental Oral Delivery Systems for Nucleic Acid Therapy in the Gastrointestinal Tract, Advanced Drug Delivery Reviews, 65: 891–901, 2013

S. Ganesh, A. Iyer, D. Morrissey, M. Amiji
Hyaluronic Acid-Based Self-Assembling Nanosystems for CD44 Target Mediated siRNA Delivery to Solid Tumors, Biomaterials, 34 (13): 3489-3502, 2013

C.A. Dehelean, S. Feflea, D. Gheorgheosu, S. Ganta, A.M. Cimpean, D. Muntean, M.M. Amiji
Anti-Angiogenic and Anti-Cancer Evaluation of Betulin Nanoemulsion in Chicken Chorioallantoic Membrane and Skin Carcinoma in Balb/c Mice, Journal of Biomedical Nanotechnology, 9 (4): 577-589, 2013

J. Xu, F. Gattacceca, M. Amiji
Biodistribution and Pharmacokinetics of EGFR-Targeted Thiolated Gelatin Nanoparticles Following Systemic Administration in Pancreatic Tumor-Bearing Mice, Molecular Pharmaceutics, 10 (5): 2031-2044, 2013

MANSOOR AMIJI continued

L. Shah, S. Yadav, M. Amiji
Nanotechnology for CNS Delivery of bio-Therapeutic Agents, Drug Delivery and Translational Research, 3: 336–351, 2013

D. Deshpande, D.R. Janero, M. Amiji
Engineering of an w-3 Polyunsaturated Fatty Acid-Containing Nanoemulsion System for Combination C6-Ceramide and 17ß-estradiol Delivery and Bioactivity in Human Vascular Endothelial and Smooth Muscle Cells, Nanomedicine: Nanotechnology, Biology, and Medicine, 9 (7): 885-894, 2013

M. Talekar, S. Ganta, A. Singh, M. Amiji, S. Garg
Development of PIK-75 Nano-Suspension Formulation with Enhanced Delivery Efficiency and Cytotoxicity for Targeted Anti-Cancer Therapy, Int. Journal of Pharmaceutics, 450 (1-2): 278-89, 2013

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.

Pharm Sci Industrial Graduate Fellowship Program
Principal Investigator, Novartis Vaccine and Diagnostics

Evaluating Synergy Between Inhibition of Replication and Promotion of Apoptosis in the Treatment of Ovarian Cancer
Principal Investigator, Northeastern University

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

ANAND ASTHAGIRI

Associate Professor, Bioengineering; jointly appointed, Chemical Engineering
PhD, Massachusetts Institute of Technology, 1995. Joined Northeastern in 2011
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Scholarship Focus

- Cell and tissue engineering
- Biomaterials
- Cancer biology
- Systems and synthetic biology

Honors and Awards

Frontiers in Bioengineering Young Investigator Award

Selected Recent Publications

Papers in refereed journals

K. Blagovic, E.S. Gong, D.F. Milano, R.J. Natividad, A.R. Asthagiri
Engineering Cell-Cell Signaling, Current Opinion in Biotechnology, Oct, 24 (5):940-7, 2013

Research Projects

Quantitative Analysis of Epithelial Cell Scatter
Principal Investigator, National Institutes of Health

Multi-Scale Complex Systems Transdisciplinary Analysis of Response to Therapy
Co-Principal Investigator, National Institutes of Health

REBECCA CARRIER

Associate Professor, Chemical Engineering; affiliated faculty, Bioengineering
PhD, Massachusetts Institute of Technology, 2000. Joined Northeastern in 2003
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Scholarship Focus

- Drug delivery
- Biomaterials
- Regenerative medicine

Honors and Awards

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

Selected Recent Publications

Papers in refereed journals

F. Buyukozturk, S. Di Maio, D.E. Budil, R.L. Carrier
Effect of Ingested Lipids on Drug Dissolution and Release with Concurrent Digestion: A Modeling Approach, Pharm Res, 2013, (12), 3131-3144

E.D. Gamsiz, A.G. Thombre, I. Ahmed, R.L. Carrier
Model Predicting Impact of Complexation with Cyclodextrins on Oral Absorption, Biotechnol. Bioeng, 2013

L. Wang, M.A. Acosta, J.B. Leach, R.L. Carrier
Spatially Monitoring Oxygen Level in 3D Microfabricated Cell Culture Systems Using Optical Oxygen Sensing Beads, Lab Chip, 2013, 13 (8), 1586-1592

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 Part A, 2013 March, 19 (5-6), 649-656

M. Gu, H. Yildiz, R. Carrier, G. Belfort
Discovery of Low Mucus Adhesion Surfaces, Acta Biomaterialia, 2013, 9 (2), 5201-5207

T. Chernenko, F. Buyukozturk, M. Miljkovic, R. Carrier, M. Diem, M. Amiji
Label-Free Raman Microspectral Analysis for Comparison of Cellular Uptake and Distribution Between Non-Targeted and EGFR-Targeted Biodegradable Polymeric Nanoparticles, Drug Deliv. Transl. Res, 2013

Research Projects

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

CAREER: Mechanistic Studies and Modeling of Self-Emulsifying Drug Delivery Systems
Principal Investigator, National Science Foundation

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

Completed Dissertations Supervised

Sean Henry Kevlahan
A Microfluidic Capture and Release Method for Isolation Intestinal Progenitor and Stem Cells from Native Rat Tissue Enabling Advances in Vasculogenic Co-Cultures (see p 40)

Selena Di Maio
Mechanistic Studies and Modeling of Effects of Ingested Lipids on Oral Drug Absorption (see p 40)

SUNHO CHOI

Assistant Professor, Chemical Engineering
PhD, University of Minnesota, 2008. Joined Northeastern in 2011
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Scholarship Focus

- Advanced separation
- Clean energy
- Heterogeneous catalysts
- Nanomaterials

Selected Recent Publications

Papers in refereed journals

R.N. Murugana, J.-E. Parkb, D. Limc, M. Ahna, C. Cheonga, T. Kwon, K.-Y. Namg, S. Choi, B.Y. Kimf, D.-Y. Yoone, M. B. Yaffec, D.-Y. Yud, K.S. Leeb, J.K. Banga

Development of Cyclic Peptomer Inhibitors Targeting the Polo-box Domain of Polo-Like Kinase 1, Bioorganic and Medicinal Chemistry, vol. 21, issue 9, May 1, 2013

S. Choi, G.-T.Jeong, W. Kim

Design of a Compact Hexa-Band Coupling Antenna for 4g Mobile Handset Using a Small Element with Two Slots, Microwave and Optical Technology Letters, vol. 55, issue 8, August 2013

W.-S. Kim, S. Choi, G.-T. Jeong

A Low-Profile WLAN Antenna with Inductor and Tuning Stub for Broadband Impedance Matching, International Journal of Antennas and Propagation, vol. 2014, article 452160, April 8, 2014

G.-T. Jeong, S. Choi, K.-H. Lee, W.-S. Kim

Low-Profile Dual-Wideband MIMO Antenna with Low ECC for LTE and Wi-Fi Applications, International Journal of Antennas and Propagation, vol. 2014, article ID 158028, May 22, 2014

HEATHER CLARK

Associate Professor, Pharmaceutical Sciences; affiliated faculty, Chemical Engineering
PhD, University of Michigan, 1999. Joined Northeastern in 2010
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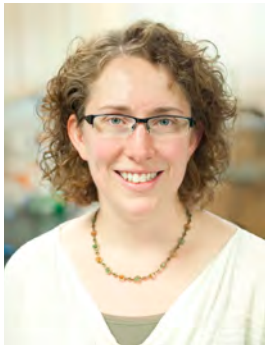

Scholarship Focus

- Optical nanosensors for biological analysis
- Novel sensor development
- Application of nanosensors to biological systems

Honors and Awards

Young Faculty Award, Defense Advanced Research Projects Agency

Selected Recent Publications

Papers in refereed journals

M.K. Balaconis, H.A. Clark

Gel Encapsulation of Glucose Nanosensors for Prolonged In Vivo Lifetime, J Diabetes Sci. Technol., 7 (1), 53-61, 2013

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, 2013

K.J. Cash, H.A. Clark

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

T.T. Ruckh, H.A. Clark

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

ARTHUR COURY

Professor, Chemical Engineering
PhD, University of Minnesota, 1965. Joined Northeastern in 2013
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Scholarship Focus

Polymeric biomaterials for medical products

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 Recent Publications

Book and book chapters

A. Coury

Tissue Adhesives and Sealants for Surgical Applications, P. JARRETT, Ocular Therapeutix, USA, and A. COURY, Coury Consulting Services, USA, in Joining and Assembly of Medical Materials and Devices, Edited by Y N Zhou and M D Breyen (Woodhead Publishing Limited), p 449-490, 2013

A. Coury

Tissue Engineering: Scope, Products, and Commercialization Strategies, Chapter 17, Arthur J. Coury, Coury Consulting Services, Boston, MA, USA, in Scaffolds for Tissue Engineering: Biological Design, Materials, and Fabrication, Edited by Claudio Migliaresi and Antonella Motta, CRC Press (Taylor & Francis), p 614-625, 2014

Papers in refereed conferences

A. Coury

Technology, Service and Bucking Convention: A Prescription for a Rewarding Biomaterials Career, in conjunction with receipt of 2013 C. William Hall Award, Boston, MA, April 10-13, 2013

A. Coury

Progress in the Prevention of Tissue Adhesions, Tenth International Symposium on, Frontiers in Biomedical Polymers, Vancouver, British Columbia, Canada, June 3, 2013

A. Coury

Issues in Translation of Advanced Composites from the Bench to the Medical Marketplace, MRS Conference, Boston, MA, December 2, 2013

PAUL DIMILLA

Associate Academic Specialist, Chemical Engineering; jointly appointed: Chemistry, Chemical Biology
PhD, University of Pennsylvania, 1991. Joined Northeastern in 2004
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Scholarship Focus

- Molecular cell bioengineering
- Biomaterials and nanotechnology
- Biophysical chemistry
- In silico modeling

Selected Recent Publications

Books and book chapters

P.A. DiMilla

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

Papers in refereed conferences

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, Georgia, 2013

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

Understanding the Factors Influencing Student Participation in Supplemental Instruction in Freshman Chemistry, Proceedings of the 120th ASEE Annual Conference and Exposition, June 23, 2013

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

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, 2014

MATTHEW ECKELMAN

Assistant Professor, Civil and Environmental Engineering; affiliated faculty, Chemical Engineering
PhD, Yale University, 2009. Joined Northeastern in 2012
617.373.4256 | m.eckelman@neu.edu

Scholarship Focus

- Environmental impacts of metals production, use, emissions, and recovery
- Life cycle assessment of novel materials and devices
- Systems modeling of bioenergy and bio-based industrial chemicals
- Material and energy use in urban environments and civil infrastructure

Honors and Awards

International Laudise Prize in Industrial Ecology

Selected Recent Publications

Papers in refereed journals

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 & Technology, 47 (19), 2013

M.J. Eckelman, M.R. Chertow
Life Cycle Energy and Environmental Benefits of a U.S. Industrial Symbiosis, International Journal of Life Cycle Assessment, 18 (8), 2013

L. Dahlben, M.J. Eckelman, A. Hakimian, S. Somu, J.A. Isaacs
Environmental Life Cycle Assessment of a Carbon Nanotube-Enabled Semiconductor Device, Environmental Science & Technology, 47 (15), 2013

M.J. Eckelman
Life Cycle Assessment in Support of Sustainable Transportation, Environmental Research Letters, 8 (2), 2013

R.J. Lifset, M.J. Eckelman
Material Efficiency in a Multi-Material World, Philosophical Transactions of the Royal Society, 371 (1986), 2013

L. Sima, E. Kelner-Levine, M.J. Eckelman, K.M. McCarty, M. Elimelech
Water Flows, Energy Demand, and Market Analysis of the Informal Water Sector in Kisumu, Kenya, Ecological Economics, 87, 2013, 137-144

L. Ciacci, W. Chen, F. Passarini, M.J. Eckelman, I. Vassura, L. Morselli
Historical Evolution of Anthropogenic Aluminum Stocks and Flows in Italy, Resources, Conservation, and Recycling, 72, 2013, 1-8

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, 2014

MATTHEW ECKELMAN continued

M.J. Eckelman, Y. Arakaki, W.A. Ashton, K. Hanaki, L.C. Malone-Lee, S. Nagashima
Island Waste Management and Industrial Ecology, Journal of Industrial Ecology 18 (2), 2014, 306-317

L. Soh, M. Montazeri, M.J. Eckelman, B. Haznedaroglu, J. Peccia, J.B. Zimmerman
Evaluating Microalgal Integrated Biorefinery Schemes: Empirical Controlled Growth Studies and Life Cycle Assessment, Bioresource Technology 151, 2014, 19-27

Research Projects

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

UV-Curable Biobased Wood Flooring Coatings
Co-Principal Investigator, U.S. Dept. of Agriculture Critical Agricultural Materials

Transformation of Lignin into Building Blocks for Protective Coatings
Senior Personnel, U.S. Dept. of Agriculture Critical Agricultural Materials

ENO ESSIEN EBONG

Assistant Professor, Chemical Engineering; affiliated faculty, Bioengineering
PhD, Rensselaer Polytechnic Institute, 2006. Joined Northeastern in 2013
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Scholarship Focus

- Biomedical engineering
- Identifying mechanically-regulated cellular and molecular targets to prevent, diagnose and treat vascular disease
- Biofluids
- Vascular mechanotransduction and mechanobiology

Selected Recent Publications

Papers in refereed journals

E.E. Ebong, S. Lopez-Quintero, V. Rizzo, D.C. Spray, J. Tarbell
Shear Induced Endothelial NOS Actication and Remodeling via Heparan Sulfate, Glypican-1, and Syndecan, Integrative Biology, Epub 2014 Jan 30

Y. Zeng, M. Waters, A. Andrews, P. Honarmandi, E.E. Ebong, V. Rizzo, J.M. Tarbell
Fluid Shear Stress Induces the Clustering of Heparan Sulfate via Mobility of Glypican-1 in Lipid Rafts, American Journal of Physiology Heart and Circle Physiology, Sep 15, 2013

E.E. Ebong, N. Depaola
Specificity in the Participation of Connexin Proteins in Flow-Induced Endothelial Gap Junction Communication, Pflugers Arch, Sep 2013

Papers in refereed conferences

E.E. Ebong, D.C. Spray, J.M. Tarbell
Glycocalyx Core Proteins Selectively Mediate Endothelial NOS Activation and Cell Alignment in Response to Shear Stress, FASEB Journal, April 9, 2013

Y. Zeng, E.E. Ebong, V. Rizzo, J.M. Tarbell
Fluid Shear Stress Induces the Clustering of Heparan Sulfate via Mobility of Glypican-1 in Lipid Rafts, FASEB J, April 9, 2013

L.M. Cancel, E.E. Ebong, J.M. Tarbell
Endothelial Apoptosis and Glycocalyx Morphology in Plaque and Non-plaque Areas of the Mouse Atherosclerotic Brachiocephalic Artery, FASEB Journal, April 9, 2013

E.E. Ebong, D.C. Spray, J.M. Tarbell
Glycocalyx Core Protein-Dependent Endothelial Mechanotransduction, Biomedical Engineering Society Annual Fall Meeting, Seattle, WA 2013 September 25-28

L.M. Cancel, E.E. Ebong, J.M. Tarbell
Endothelial Glycocalyx and Apoptosis in the Brachiocephalic Artery of a High Fat Fed ApoE-/- Mouse, Biomedical Engineering Society Annual Fall Meeting, Seattle (BESA) WA 2013 September 25-28

S. Mensah, E.E. Ebong, J.M. Tarbell
The Role of Flow Patterns and Apoptosis on Atherosclerosis Plaque Formation, BESA, 2013

S. Russell-Puleri, E.E. Ebong, J.M. Tarbell
Mechanisms of Flow-Dependent Endothelial COX-2 and PGI2 Expression, Proceedings of the 2014 IEEE 40th Annual Northeast Bioengineering Conference, 2014 April 25-27

S. Mensah, L. Cancel, J.M. Tarbell, E.E. Ebong
The Effect of Flow and Cell Death on the Growth of Atherosclerotic Plaques, Proceedings of the 2014 IEEE 40th Annual Northeast Bioengineering Conference, 2014 April 25-27

E.E. Ebong, J.M. Tarbell
Glycocalyx Mechanisms of Shear Stress Conversion into Endothelial Cell Responses, Proceedings of the 9th International Symposium on Biomechanics in Vascular Biology and Cardiovascular Disease, 2014 April 28-29

ADAM EKENSEAIR

Assistant Professor, Chemical Engineering; affiliated faculty, Bioengineering
PhD, University of Texas at Austin, 2010. Joined Northeastern in 2013
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Scholarship Focus

- Tissue engineering
- Polymer science
- 3-D Bioprinting
- Biomaterials
- Drug delivery

Selected Recent Publications

Papers in refereed journals

A.K. Ekenseair, F.K. Kasper, A.G. Mikos
Perspectives on the Interface of Drug Delivery and Tissue Engineering, Advanced Drug Delivery Reviews, vol. 65 (1): 89-92, 2013

S.N. Tzouanas, A.K. Ekenseair, F.K. Kasper, A.G. Mikos
Mesenchymal Stem Cell and Gelatin Microparticle Encapsulation in Thermally and Chemically Gelling Injectable Hydrogels for Tissue Engineering, Journal of Biomedical Materials Research, Part A, 102 (5): 1222-1230, 2014, April 16-19, 2014, Denver Colorado
*Manuscript Awarded the 2014 Society for Biomaterials Student Award for Outstanding Research in the Undergraduate Category

T.N. Vo, A.K. Ekenseair, F.K. Kasper, A.G. Mikos
Synthesis, Physicochemical Characterization, and Cytocompatibility of Bioresorbable, Dual-Gelling Injectable Hydrogels, Biomacromolecules, 15: 132-142, 2014

Papers in refereed conferences

T.N. Vo, A.K. Ekenseair, P.P. Spicer, B.M. Watson, F.K. Kasper, A.G. Mikos
Biocompatibility Evaluation of Poly (N-Isopropylacrylamide)-Based Hydrogels for Craniofacial Bone Regeneration, Transactions of the Annual Meeting of the Society for Biomaterials, vol. 35, 2013

A.K. Ekenseair, S.N. Tzouanas, T. Vo, P.P. Spicer, B.M. Watson, P.M. Mountziaris, F.K. Kasper, A.G. Mikos
Spontaneous Mineralization of Hydrophobic Hydrogels for Craniofacial Bone Tissue Regeneration, Abstracts of the AIChE Meeting, 2013

S.N. Tzouanas, A.K. Ekenseair, F.K. Kasper, A.G. Mikos
Mesenchymal Stem Cell and Gelatin Microparticle Encapsulation in Thermally and Chemically Gelling Injectable Hydrogels for Tissue Engineering, Transactions of the Annual Meeting of the Society for Biomaterials, vol. 36, 2014
*Student Award Winner in the Undergraduate Category

T.N. Vo, A.K. Ekenseair, F.K. Kasper, A.G. Mikos
Promoting Mineralization and Mesenchymal Stem Cell Differentiation in Injectable, Physically and Chemically Gelling Hydrogels for Craniofacial Tissue Engineering, Transactions of the Annual Meeting of the Society for Biomaterials, vol. 36, 2014

HICHAM FENNIRI

Professor, Chemical Engineering
PhD, Université Louis Pasteur, 1994. Joined Northeastern in 2013
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Scholarship Focus

- Supramolecular engineering
- Nanostructured functional materials
- Theranostics

Honors and Awards

- National Science Foundation CAREER Award
- Cottrell Teacher-Scholar Awardee

Selected Recent Publications

Books and book chapters

R.L. Beingessner, A. Alsbaiee, B. Singh, T.J. Webster, H. Fenniri

Bioactive Rosette Nanotubes for Bone Tissue Engineering and Drug Delivery, Peptide Materials: From Nanostructures to Applications, Mariano Venanzi, Carlos Aleman, Alberto Bianco, Editors, John Wiley & Sons, Ltd, Chichester, West Sussex, UK, 2013

L. Sun, U.D. Hemraz, H. Fenniri, T.J. Webster

Bioactive Rosette Nanotube Composites for Cartilage Applications. Biomaterials Science: Processing, Properties and Applications III: Ceramic Transactions, vol. 242, Susmmita Bose, Roger Narayan, Amit Bandiyopadhyay, Editors, John Wiley & Sons, 2013

Papers in refereed journals

A. Childs, U.D. Hemraz, N.J. Castro, H. Fenniri, L.G. Zhang

Novel Biologically-Inspired Rosette Nanotube PLLA Scaffolds for Improving Human Mesenchymal Stem Cell Chondrogenic Differentiation, Biomed. Mater, 2013

L. Sun, D. Li, U.D. Hemraz, H. Fenniri, T.J. Webster

Self-Assembled Twin Base Linker and Poly (2-Hydroxyethyl Methacrylate) Hydrogels Promote Skin Cell Functions, J. Biomed, Mater, Res. Part A 2013

A. Durmus, G. Gunbas, S.C. Farmer, M.M. Olmstead, M. Mascal, B. Legese, J.-Y.Cho, R.B. Beingessner, T. Yamazaki, H. Fenniri

Synthesis of N-Substituted Pyrido [4,3-d] Pyrimidines for the Large Scale Production of Self-Assembled Rosettes and Nanotubes, J. Org. Chem. 2013

U.D. Hemraz, M. El Bakkari, T. Yamazaki, J.Y. Cho, R.L. Beingessner, H. Fenniri

Chiromers: Conformation-Driven Mirror-Image Supramolecular Chirality Isomerism Identified in a new Class of Helical Rosette Nanotubes, Nanoscale, 2014

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 March 11, 2014

HICHAM FENNIRI continued

Papers in refereed conferences

M.R. Hassan, M. El-Bakkari, A. Alsbaiee, J.-Y. Cho, H. Fenniri

Size Tuning of Palladium Nanoparticles on Rosette Nanotube Scaffoldings: Effect of Aging and Surface Chemistry, Proceedings of the XXII International Materials Research Congress 2013

M.R. Hassan, H. Fenniri

Rosette Nanotube-Supported Palladium Nanoparticles: Application to the Synthesis of Benzothiadiazole Based Optoelectronic Materials, Proceedings of the XXII International Materials Research Congress 2013

J.-Y. Cho, T. Yamazaki, J.G. Duque, S. Doorn, S. Das, M. Green, H. Fenniri

Microscopic Characterization of Nanocomposite Based on the Mixture of Carbon Nanotube and Rosette Nanotube, Proceedings of the 2013 NSTI Nanotechnology Conference and Exhibition, 2013

Research Projects

From Small Molecules to Complex Supramolecular Architectures: Underlying Physical Concepts and Phenomena

Principal Investigator, Northeastern University

Targeted Delivery of Nucleic Acids Using Self-Assembled Rosette Nanotubes

Principal Investigator, Northeastern University

Functional Nanomaterials for Diagnostic Imaging an Targeted therapy

Principal Investigator, Northeastern University

Bioactive Rosette Nanotubes for Bone Cancer Therapy and Tissue Regeneration

Principal Investigator, Northeastern University

Electronic Materials for Organic Photovoltaics

Principal Investigator, Northeastern University

Self-Assembled Artificial Antibodies

Principal Investigator, Northeastern University

EDGAR GOLUCH

Di Pietro Assistant Professor, Chemical Engineering; affiliated faculty, Bioengineering
PhD, University of Illinois at Urbana-Champaign, 2007. Joined Northeastern in 2010
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Scholarship Focus

- Biosensors
- Biophysics
- Microfluidics
- Nanotechnology

Selected Recent Publications

Papers in refereed journals

T.A. Webster, H.J. Sismaet, E.D. Goluch
Amperometric Detection of Pyocyanin in Nanofluidic Channels, Nano LIFE, vol. 3, 2013, p 1340011

E.D. Goluch, A.R. Hall
Nanotechnology in Biological Detection and Characterization, Nano LIFE, vol. 3, 2013, p 1302001

P.N. Abadian, C.P. Kelley, E.D. Goluch
Cellular Analysis and Detection Using Surface Plasmon Resonance Techniques, Analytical Chemistry, 86 (6), p 2799-2812, 2014

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 & Bioelectronics, 60, p 265-270, 2014

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 Profileration, Journal of Biomedical Materials Research, Part A, 2014

P.N. Abadian, N. Tandogan, J.J. Jamieson, E.D. Goluch
Using Surface Plasmon Resonance Imaging (SPRi) to Study Bacterial Biofilms, Biomicrofluidics, 8, 021804, 2014

Research Projects

Exploring the Link Between Bacterial DNA Damage Response and Bio-Film Disassembly
Co-Principal Investigator, Northeastern University

Nano-Constriction Devices for Isolation and Cultivation of Environmental Microbes
Principal Investigator, Northeastern University

BRIGE: Microfabricated Bacterial Environments with Integrated Nanofluidic Electrochemical Sensors for Systems Biology Applications
Principal Investigator, National Science Foundation

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 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

VINCENT HARRIS

University Distinguished Professor, William Lincoln Smith Professor, Electrical and Computer Engineering; affiliated faculty, Chemical Engineering, PhD, Northeastern University, 1990. Joined Northeastern in 2003
617.373.7603 | harris@ece.neu.edu | www.cm3ic.neu.edu/people/harris/Harris

Scholarship Focus

- Design and processing of advance magnetic materials with emphasis on materials for high frequency applications
- Understanding the structure, processing and magnetism relationship of materials
- Synchrotron radiation characterization of materials with emphasis on extended x-ray absorption fine structure

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 Sensor Scientist Award
- Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Books and Book Chapters

Y. Chen, V. Harris

Impact of Structural and Magnetic Anisotropies on Microwave Ferrites, Chapter 9 in Recent Advances in Magnetic Insulators - From Spintronics to Microwave Applications, Solid State Physics, vol. 64, Elsevier Inc., p 331-347, 2013

Papers in refereed journals

L. Jiang, J. Yang, H. Hao, G. Zhang, S. Wu, Y. Chen, O. Obi, T. Fitchorov, V. Harris

Giant Enhancement in the Magnetostrictive Effect of FeGa Alloys Doped with Low Levels of Terbium, Applied Physics Letters, 102 (22), 2013

Z. Wang, Y. Li, R.Viswan, B. Hu, V. Harris, J. Li, D. Viehland

Engineered Magnetic Shape Anisotropy in $BiFeO_3$–$CoFe_2O_4$ Self-Assembled Thin Films, ACS Nano, 7, 3447-3456, 2013

Z. Su, Y. Chen, B. Hu, A. Sokolov, S. Bennett, L. Burns, X. Xing, V. Harris

Crystallographically Textured Self-Biased W-Type Hexaferrites for X Band Microwave Applications, Journal of Applied Physics, 113 (17), 2013

V.G. Harris, Y. Chen, Z. Chen, A.L. Geiler

Crystallographic Texture and Magnetic Anisotropy and Their Role in Microwave Ferrite Devices, Journal of Metals, 65 (7), p 883-889, 2013

VINCENT HARRIS continued

O. Obi, L. Burns, Y. Chen, S. Bennett, M. Sawicki, D. Kaplan, A. Arango, L. Lewis, V. Harris
Effect of Ambient Aging on Heat-Treated Mechanically Alloyed Mn-Al-C Powders, IEEE Transactions on Magnetics, 49, 3372-3374, 2013

B. Hu, Y. Chen, Z. Su, S. Bennett, L. Burns, G. Uddin, K. Ziemer, V. Harris
Magnetocrystalline Anisotropy and FMR Linewidth of Zr and Zn-Doped Ba-Hexaferrite Films Grown on MgO (111), IEEE Transactions on Magnetics, 49, 4234-4237, 2013

Research Projects

Design and Development of Multifunctional Electromechanical Ceramics
Co-Principal Investigator, Army Research Office

Carbide Based Permanent Magnet Materials as Replacements for Rare Earth Based Permanent Magnets
Co-Principal Investigator, Advanced Research Projects Agency

Rare Earth Free Permanent Magnet Materials for Alternative Energy Technologies
Co-Principal Investigator, Advanced Research Projects Agency

Broadband Metamaterial Integrated Circulator/Antenna
Co-Principal Investigator, Office of Naval Research

Realizing Room Temperature Magnetoelectric Materials
Co-Principal Investigator, National Science Foundation

BARRY L. KARGER

Professor and James L. Waters Chair in Analytical Chemistry; affiliated faculty, Bioengineering, Chemical Engineering, PhD, Cornell University, 1963. Joined Northeastern in 1963
617.373.2867 | b.karger@neu.edu | northeastern.edu/barnett

Scholarship Focus

- Development and application of microscale separations and MS analysis to problems of biological relevance
- Comprehensive characterization of complex proteins at the low fmole level
- Bioanalysis
- Proteomics

Honors

- 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 Recent Publications

Papers in refereed journals

W. Ni, M. Lin, P. Salinas, P. Savickas, S.-L. Wu, B.L. Karger
Complete Mapping of a Cystine Knot and Nested Disulfides of Recombinant Human Arylsulfatase A by Multi-Enzyme Digestion and LC-MS Analysis Using CID and ETD, Journal of the American Society for Mass Spectrometry, vol. 24, issue 1, p 125-133, 2013

S. Dai, W. Ni, A.N. Patananan, S.G Clarke, B.L. Karger, Z.S. Zhou
Integrated Proteomic Analysis of Major Isoaspartyl-Containing Proteins in The Urine of Wild Type and Protein L-Isoaspartate O-Methyltransferase-Deficient Mice, Analytical chemistry, vol. 85, p 2423-2430, 2013

W. Ni, J. Bones, B.L. Karger
In-Depth Characterization of N-Linked Oligosaccharides Using Fluoride-Mediated Negative Ion Microfluidic Chip LC–MS, Analytical chemistry, vol. 85, issue 6, p 3127-3135, 2013

S. Tummala, M. Titus, L. Wilson, C. Wang, G. Thill, D. Foster, C. Li, Z. Szabo, A. Guttman, B.L. Karger, et al.
Evaluation of Exogenous siRNA Addition as a Metabolic Engineering Tool for Modifying Biopharmaceuticals, Biotechnology Progress, vol. 29, issue 2, p 415-424, 2013

C. Li, A. Rossomando, S.-L. Wu, B.L. Karger
Comparability Analysis of Anti-CD20 Commercial (Rituximab) and RNAi-Mediated Fucosylated Antibodies by two LC-MS Approaches, MAbs, vol. 5, p 565-575, 2013

K. Brazin, R. Mallis, C. Li, D. Keskin, H. Arthanari, Y. Gao, S.-L. Wu, B.L. Karger, G. Wagner, E.L. Reinherz
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, 2014

Research Projects

Separation and Analytical Technologies for Proteomics
Principal Investigator, National Institutes of Health

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. Joined Northeastern in 2013
617.373.2989 | a.koppes@neu.edu

Scholarship Focus

- Tissue engineering
- Regenerative medicine
- Neural engineering

Selected Recent Publications

Papers in refereed journals

A. N. Koppes, A.L. Nordberg, G. Paolillo, H. Darwish, N. Goodsell, D. Thompson
Electrical Stimulation of Schwann Cells Promotes Sustained Increases in Neurite Outgrowth, Tissue Engineering A, p 494-506, 2013

A.N. Koppes, M. Kamath, C. A. Pfluger, D.D. Burkey, M. Dokmeci, L. Wang, R. L. Carrier
Complex, Irregular, Multi-Scale Topographical Replicas Fabricated via Chemical Vapor Deposition Enhance Epithelial Differentiation, Journal of Materials Chemistry B, June 2014

A. N. Koppes, K. Keating, R. Koppes, A. McGregor, D. Thompson
Electrically Conductive Single Walled Carbon Nanotube – Collagen I Hydrogels for Peripheral Nerve Repair, Nano Life, July 2014

A. N. Koppes, C. Rivet, N. Zaccor, R. Gilbert, D. Thompson
Neurite Outgrowth on Electrospun PLLA Fibers Is Enhanced By Exogenous Electrical Stimulation, Journal of Neural Engineering, 11, June 3, 2014

A.N. Koppes, J.G. Hardy, C.E. Schmidt, D.M. Thompson
Electrical Stimuli in the Central Nervous System Microenvironment, Annual Review of Biomedical Engineering 16.1, 2014

CAROLYN LEE-PARSONS

Associate Professor, Chemical Engineering; jointly appointed, Chemistry; affiliated faculty, Bioengineering
PhD, Cornell University,1995. Joined Northeastern in 1999
617.373.3634 | ca.lee@neu.edu | northeastern.edu/lee-parsons

Scholarship Focus

- Bioprocessing
- Cell culture
- Metabolic engineering

Honors and Awards

- National Science Foundation CAREER Award
- College of Engineering Outstanding Teaching Award

Selected Recent Publications

Papers in refereed journals

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): 1367-76, Epub 2013

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): 1-8, 2013

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): 89-97, Epub, 2013

Research Projects

Engineering Increased Biodiesel Productivity from Microalgae
Principal Investigator, Massachusetts Clean Energy Center

Engineering the Production Oils from Microalgae as a Renewable and Sustainable Source of Biofuels
Principal Investigator, Northeastern University

Regulation of Alkaloid Biosynthesis by Transcription Factors, MYC2 and WRKY1
Principal Investigator, National Science Foundation

Transcriptional Control of Alkaloid Biosynthesis in Catharanthus roseus Cultures
Principal Investigator, National Science Foundation

LAURA LEWIS

Cabot Professor, Chemical Engineering
PhD, University of Texas, 1993. Joined Northeastern in 2007
617.373.3419 | lhlewis@neu.edu | northeastern.edu/nanomagnetism

Scholarship Focus

- Electronic nanomaterials
- Magnetic materials
- Strategic materials

Selected Recent Publications

Papers in refereed journals

L. Lewis, F. Jiménez-Villacorta
Perspectives on Permanent Magnetic Materials for Energy Conversion and Power Generation, Metallurgical and Materials Transactions A January 2013, vol. 44, issue 1 Supplement, p 2-20

L.H. Lewis, F.E. Pinkerton, N. Bordeaux, A. Mubarok, E. Poirier, J.I. Goldstein, R. Skomski, K. Barmak
De Magnete et Meteorite: Cosmically-Motivated Materials, IEEE Magnetics Letters, vol. 5, art. 5500104, 2014

R. W. McCallum, L. H. Lewis, R. Skomski, M. J. Kramer and I. E. Anderson
Practical Aspects of Modern and Future Permanent Magnets, invited article, Annual Review of Materials Research, 44 (1), 2014

Research Projects

Multiscale Development of $L1_0$ Materials for Rare-Earth-Free Permanent Magnets
Lead, Department of Energy

Collaborative Research: Towards Rare-Earth-Free Advanced Permanent Magnets—High-Anisotropy $L1_0$ Materials
Principal Investigator, National Science Foundation

Magnetic and Optical Properties of Titania Nanotubes
Principal Investigator, National Science Foundation

Effects of Intensive Variables and Nanostructuring in Magnetostructural Materials
Principal Investigator, Department of Energy

The Magnetostructural Response in Heterostructured Systems: a US-UK Collaboration
Principal Investigator, National Science Foundation

Nanomedicine Science and Technology
Co-Principal Investigator, National Science Foundation

Rare-Earth-Free Permanent Magnets
Principal Investigator, Office of Naval Research

Completed Dissertations Supervised

Melissa Germaine Loving
Understanding the Magnetostructural Transformation in FeRh Thin Films (see p 41)

Radhika Barua
Pathways for Tailoring the Magnetostructural Response of FeRh-based Systems (see p 39)

Pegah Mohammad Hosseinpour
Structure-Magnetic Property Correlations in TiO2 Nanotube Arrays (see p 41)

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

SHASHI MURTHY continued

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.

Completed Dissertations Supervised

Sean Henry Kevlahan

A Microfluidic Capture and Release Method for Isolation Intestinal Progenitor and Stem Cells from Native Rat Tissue Enabling Advances in Vasculogenic Co-Cultures (see p 40)

ELIZABETH PODLAHA-MURPHY

Professor, Chemical Engineering
PhD, Columbia University, 1992. Joined Northeastern in 2007
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Scholarship Focus

- Electrochemical processes
- Nanomaterials
- Photoelectrochemistry

Honors and Awards

- National Science Foundation CAREER Award
- Vice Chair of the Division of Electrodeposition, The Electrochemical Society

Selected Recent Publications

Papers in refereed journals

S. Sun, T. Bairchanya, E.J. Podlaha,
Induced Codeposition Behavior of Electrodeposited NiMoW Alloys, Journal of The Electrochemical Society, 160 (10) D434-D440, 2013

S. Sun, E.J. Podlaha
Examination of Ni-W Induced Codeposition by Intensity Modulated Photocurrent Spectroscopy (IMPS), Journal of The Electrochemical Society, 161 (6) D362-D366, 2014

H. Cesiulis, T. Maliar, N. Tsyntsaru, F. Wenger, P. Ponthiaux, E. Podlaha
Anodic Titanium Oxide Films: Photoelectrochemical and Tribocorrosion Behavior, Journal of Nanoelectronics and Optoelectronics, 9 1-4, 2014

Papers in refereed conferences

H. Kim, S. A. Soper, E.J. Podlaha
Pulse Electrodeposition of Multi-Segmented Super Invar/Au Nanowires, 223rd Meeting of The Electrochemical Society, Toronto, Canada, May 2013.

S. Sun, E.J. Podlaha
Pulse Electrodeposition of NiMoW Alloys, 223rd Meeting of The Electrochemical Society, Toronto, Canada, May 2013 ECS Transactions, 2013 53(11): 27-35

Research Projects

Induced Electrodeposition of Molybdenum and Tungsten Alloys
Principal Investigator, National Science Foundation

Open Study Addressing Alloy and Composite Deposition Themes of Interest to Tyco Electronics Corp
Principal Investigator, Tyco Electronics Corp Gifts

New Genome Sequencing Technology for the $1000 Genome Project: Polymer-Based Modular Systems with Nanosensors for Dna and Rna Sequencing
Principal Investigator, National Human Genome Research Institute

Electrodeposition of NiFeMoW Alloys
Principal Investigator, National Association for Surface Finishing

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, Plastic and Reconstruction Surgery, 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

SRINIVAS SRIDHAR

Distinguished Professor, Physics, affiliated faculty, Chemical Engineering, Bioengineering
PhD, California Institute of Technology, 1984. Joined Northeastern in 1986
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Scholarship Focus

- Nanotechnology for drug delivery and multi-modal imaging
- Cancer nanotherapies
- Smart drug releasing implants

Selected Recent Publications

Papers in refereed journals

W. Ngwa, H. Korideck, A. Kassis, R. Kumar, S. Sridhar, G. Makrigiorgos, R. Cormack
In Vitro Radiosensitization by Gold Nanoparticles During Continuous Low Dose Rate Gamma Irradiation with I-125 Brachytherapy Seeds, Nanomedicine-Nanotechnology Biology and Medicine, vol. 9, p 25-27, 2013

D. Rivera-Chacon, M. Alvarado-Velez, C. Acevedo-Morantes, D. Nagesha, S. Sridhar, J. E. Ramirez-Vick, et al.
Fibronectin and Vitronectin Promote Human Fetal Osteoblast Cell Attachment and Proliferation on Nanoporous Titanium Surfaces, Journal of Biomedical Nanotechnology, vol. 9, 2013

Y. Petrov, S. Sridhar
Electric Field Encephalography: Electric Fields and Their Application to Functional Brain Imaging, PLOSOne, July, 2013

S. Chapman, M. Dobrovolskaia, A. Joshi, H. Lee, T. Meade, M. Pomper, K. Ptak, J. Rao, R. Singh,
S. Sridhar, S. Stern, A. Wang, J. Weaver, G. Woloschak, L. Yang
Nanoparticles for Cancer Imaging: the Good, the Bad, and the Promise, NanoToday, vol. 8, p 454-460, 2013

S. Faegh, N. Jalili, S. Sridhar
A Self-Sensing Piezoelectric Micro Cantilever Biosensor for Detection of Ultrasmall Adsorbed Masses: Theory and Experiments, Sensors, vol.13, p 6089-6108, 2013

S. Faegh, N. Jalili, O. Yavuzcetin, D. Nagesha, R. Kumar, S. Sridhar
A Cost-Effective Self-Sensing Biosensor for Detection of Biological Species at Ultralow Concentrations, Journal of Applied Physics, vol. 113, p 224905, 2013

R. Kumar, A. Kulkarni, J. Nabulsi, D. Nagesha, R. Cormack, M. Makrigiorgos, S. Sridhar
Facile Synthesis of PEGylated PLGA Nanoparticles Encapsulating Doxorubicin and its In Vitro Evaluation as Potent Drug Delivery Vehicle, Drug Delivery and Translational Research, vol. 3, issue 4, p 299-308, 2013

G. Navarro, R. Sawant, S. Essex, S. Biswas, C. Otro, D. Nagesha, S. Sridhar, V. Torchilin
Phospholipid-Modified Polyethylenimine-Based Nanopreparations for SiRNA-Mediated Gene Silencing: Implications for Transfection and the Role of Lipid Components, Nanomedicine: Nanotechnology, Biology, and Medicine, 2013

O. Yavuzcetin, N.R. Perry, S.T. Malley, R.L. Dally, H.P. Novikov, B. Ozturk, S. Sridhar
Fabrication and Characterization of Single Mode Annealed Proton Exchanged Waveguides in -X-cut Lithium Niobate, Optical Materials, vol. 36, issue 2, p 372-375, 2013

THOMAS WEBSTER

Professor and Chair, Chemical Engineering; affiliated faculty, Bioengineering
PhD, Rensselaer Polytechnic Institute, 2000. Joined Northeastern in 2012
617.373.2989 | th.webster@neu.edu | webster-nano.com

Scholarship Focus

- Nanotechnology for inhibiting infection
- Nano-sensors
- Human toxicity of nano-materials

Honors and Awards

- Fellow, American Institute for Medical and Biological Engineers
- Fellow, American Society for Nanomedicine
- Fellow, Biomedical Engineering Society
- Fellow, Ernst Strungmann Foundation

Selected Recent Publications

Papers in refereed journals

B.M. Geilich, T. Webster
Reduced Adhesion of Staphylococcus Aureus to ZnO/PVC Nanocomposites, International Journal of Nanomedicine, 2013, 8, 1177-1184

Q. Wang, T. Webster
Short Communication: Inhibiting Biofilm Formation on Paper Towels Through the use of Selenium Nanoparticle Coatings, International Journal of Nanomedicine 2013, 8, 407-411

K. Leuba, N. Durmus, E. Taylor, T. Webster
Short Communication: Carboxylate Functionalized Superparamagnetic Iron Oxide Nanoparticles (SPION) for the Reduction of S. Aureus Growth Post Biofilm Formation, International Journal of Nanomedicine 2013 (8), 731-736

K. Kummer, E. Taylor, N. Durmas, K. Tarquinio, B. Ercan, T. Webster
Effects of Different Sterilization Techniques and Varying Anodized TiO_2 Nanotube Dimensions on Bacteria Growth, Journal of Biomedical Materials Research Part B: Applied Biomaterials 2013, 101B (5), 677-688

S. Jain, T.J. Webster, A. Sharma, A. Ashutosh
Intracellular Reactive Oxidative Stress, Cell Proliferation and Apoptosis of Schwann Cells on Carbon Nanofibrous Ssubstrates, Biomaterials, 2013, 34 (21), 4891-4901

N. Tran, T.J. Webster
Understanding Magnetic Nanoparticle Osteoblast Receptor-Mediated Endocytosis Using Experiments and Modeling, Nanotechnology, 24 (18), 185102, 2013

P.A. Tran, T.J. Webster
Antimicrobial Selenium Nanoparticle Coatings on Polymeric Medical Devices, Nanotechnology, 24 (15),155101, 2103

T.J. Webster
Interview Nanomedicine: Past, Present and Future, Nanomedicine, 8 (4), 525-529, 2013

X. Meng, D. A. Stout, L. Sun, T.J. Webster
Novel Injectable Biomimetic Hydrogels with Carbon Nanofibers and Self Assembled Rosette

Nanotubes for Myocardial Applications, Journal of Biomedical Materials Research, 101 (4), 1095-1102, 2013

S. Kalmodia, B. Basu, T.J. Webster
Gene Expression in Osteoblast Cells Treated with Submicron to Nanometer Hydroxyapatite-Mullite Eluate Particles, Journal of Biomaterials Applications, 27 (7), 891-908, 2013

Q. Wang, T.J. Webster
Nanostructured Selenium - A Novel Biologically-Inspired Material for Antibacterial Medical Device Applications, Biomimetics: Advancing Nanobiomaterials and Tissue Engineering, 203-220, 2013

X. Liu, T.J. Webster
Nanoinformatics for Biomedicine: Emerging Approaches and Applications, International Journal of Nanomedicine, 8 (1), 1-5, 2013

B. Ercan, D. Khang, J. Carpenter, T.J. Webster
Using Mathematical Models to Understand the Effect of Nanoscale Roughness on Protein Adsorption for Improving Medical Devices, International Journal of Nanomedicine, 8 (1), 75-81, 2013

A. Qubaisi, M. Sadiq, R. Abdullah, M.H. Flaifel, T.J. Webster
Induction of Apoptosis in Cancer Cells by NiZn Ferrite Nanoparticles Through Mitochondrial Cytochrome C Release, International Journal of Nanomedicine, 8, 4115-4130, 2013

C. Yao, M. Hedrick, G. Pareek, T.J. Webster
Nanostructured Polyurethane-Poly-Lactic-co-Glycolic Acid Scaffolds Increase Bladder Tissue Regeneration: an in Vivo Study, International Journal of Nanomedicine, 8, 3285-3296, 2013

Q. Wang, J.M. Perez, T.J. Webster
Inhibited Growth of Pseudomonas Aeruginosa by Dextran- and Polyacrylic Acid-Coated Ceria Nanoparticles, International Journal of Nanomedicine, 8, 3395-3399, 2013

L. Zhang, T.J. Webster
Effects of Chemically Modified Nanostructured PLGA on Functioning of Lung and Breast Cancer Cells, International Journal of Nanomedicine, 8, 1907-1919, 2013

P.A. Tran, T.J. Webster
Understanding the Wetting Properties of Nanostructured Selenium Coatings: the Role of Nanostructured Surface Roughness and Air-Pocket Formation, International Journal of Nanomedicine, 8, 2001-2009, 2013

L. Weng, T.J. Webster
Nanostructured Magnesium has Fewer Detrimental Effects on Osteoblast Function, International Journal of Nanomedicine, 8, 1773-1781, 2013

Completed Dissertations Supervised

George Ejiofor Aninwene II
Lubricin and Nano-BaSO4: Novel Methods to Prevent Surface Biofouling (see p 39)

Linlin Sun
Self-Assembled Rosette Nanotubes for Bone Tissue Engineering and Drug Delivery Applications (see p 42)

RICHARD WEST

Assistant Professor, Chemical Engineering
PhD, University of Cambridge, 2009. Joined Northeastern in 2011
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Scholarship Focus

- Kinetics
- Multiscale modeling

Honors and Awards

American Chemical Society Doctoral New Investigator

Selected Recent Publications

Papers in refereed journals

A. Jalan, R.H. West, W.H. Green
An Extensible Framework for Capturing Solvent Effects in Computer Generated Kinetic Models, Journal of Physical Chemistry B, vol. 117, 2013, p 2955-2970

Papers in refereed conferences

R.H. West
Building Detailed Kinetic Models of Combustion Chemistry, Eastern States Section of the Combustion Institute Fall Technical Meeting, Clemson SC, October 2013

F. Seyedzadeh Khanshan, R.H. West
Using Reaction Mechanism Generator (RMG) to Build Detailed Kinetic Model of Biofuels, Proceedings of the AIChE Annual Meeting, San Francisco, CA, November 2013

P. Bhoorasingh, R.H. West
Automatic Transition State Searches for on-the-Fly Kinetic Calculations, Proceedings of the AIChE Annual Meeting, San Francisco, CA, November 2013

B. Slakman, R.H. West
Automatic Mechanism Generation for Liquid-Phase Reaction Kinetics, Proceedings of the AIChE Annual Meeting, San Francisco, CA, November 2013

Research Projects

Transition-State Prediction for High-Throughput Calculation of Accurate Chemical Reaction Rates
Principal Investigator, American Chemical Society

Identifying and Resolving Discrepancies in Kinetic Models of Hydrocarbon Combustion
Principal Investigator, National Science Foundation

RONALD WILLEY

Professor, Chemical Engineering
PhD, University of Massachusetts, Amherst, 1984. Joined Northeastern in 1983
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Scholarship Focus

- Process safety
- Catalysis (Industrial)
- Chemical Materials Engineering
- Adsorption and reaction of molecules on metal oxides
- Adiabatic reaction calorimetry
- Aerogel mixed oxide synthesis

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 Recent Publications

Papers in refereed journals

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, vol. 32/1, 2013, p 2-7

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, vol. 32/2, 2013, p 113-118

R. Willey, J. Murphy
Process Safety Progress, American Institute of Chemical Engineers, vol. 32/3, 2013, p 229-229

KATHERINE ZIEMER

Associate Professor and Associate Department Chair, Chemical Engineering
PhD, West Virginia University, 2001. Joined Northeastern in 2001
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Scholarship Focus

- MBE processing of advanced electronic materials
- Surface and interface analysis

Honors and Awards

College of Engineering Faculty Fellow

Selected Recent Publications

Papers in refereed journals

B. McMahon, C. Pfluger, B. Sun, K.S. Ziemer, D. Burkey, R. Carrier
Photoinitiated Chemical Vapor Deposition of Biocompatible Poly (2-Hydroxyethyl Methacylate) Films, Journal of Biomedical Materials Research, Part A, 2013

W. Tao, K.S. Ziemer, H.S. Gill
Gold Nanoparticle-M2e Conjugate Coformulated with CpG Induces Protective Immunity Against Influenza A Virus, Nanomedicine, 2013, vol. 9, no. 2, p 237-251

D. Gilks, L. Lari, Z. Cai, O. Cespedes, A. Gerber, S. Thompson, K. Ziemer, V. Lazarov
Magnetism and Magnetotransport in Symmetry Matched Spinels $Fe_3O_4/MgAl_2O_4$, Journal of Applied Physics, 113, 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, p 407-430, 2013

D. Gilks, L. Lari, J. Naughton, O. Cespedes, Z. Cai, A. Gerber, S.M. Thompson, K. Ziemer, V. Lazarov
Origin of Anomalous Magnetite Properties in Crystallographic Matched Heterostructures: $Fe_3O_4(111)/MgAl_2O_4(111)$, Journal of Physics: Condensed Matter, 2013

B. Hu, Y. Chen, Z. Su, S. Bennett, L. Burns, G. Uddin, K. Ziemer, V.G. Harris
Magnetocrystalline Anisotropy and FMR Linewidth of Zr and Zn-doped Ba-hexaferrite Films Grown on MgO (111), IEEE Transactions on Magnetics, 2013

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
Advisors, Thomas J. Webster | Biomaterials

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 **iris.lib.neu.edu/chemical_eng_diss/20**

RADHIKA BARUA

PhD, 2014 Chemical Engineering
Advisors, Laura H. Lewis | Materials Science and Engineering

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 (Tt ~ 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. Structure-property correlations between the parent equiatomic FeRh compound and its nanostructured/chemically-modified counterparts were examined using a variety of structural and magnetic probes including x-ray diffraction (synchrotron and laboratory based), transmission electron microscopy (TEM) and magnetometry. Overall, the results achieved in this work provide predictive capability and pathways for tailoring the magnetostructural behavior and the associated functional response of FeRh systems for potential technological applications such as magnetic refrigeration and heat-assisted magnetic recording media.

See full dissertation at **iris.lib.neu.edu/chemical_eng_diss/21**

SELENA DI MAIO

PhD, 2014 Chemical Engineering
Advisors, Rebecca L. Carrier | Chemical Engineering

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.... (4) Examine kinetics of compound transport across the intestinal membrane in the presence of food-associated lipids. The Caco-2 and HT29-MTX cell culture models were employed to investigate drug permeability proprieties in post-prandial conditions. The outcome was a mechanistic and kinetic model of intestinal absorption in the presence of ingested lipids.

See full dissertation at **iris.lib.neu.edu/chemical_eng_diss/22**

SEAN HENRY KEVLAHAN

PhD, 2014 Chemical Engineering
Advisors, Shashi K. Murthy, Rebecca L. Carrier | Biochemical and Biomolecular Engineering

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 **iris.lib.neu.edu/chemical_eng_diss/18**

MELISSA GERMAINE LOVING

PhD, 2014 Chemical Engineering
Advisor, Laura H. Lewis | Mechanics of Materials

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. Further, the results achieved in this dissertation indicate that the degree of undercooling of the FM phase (phase metastability), AF/FM phase coexistence, and the energy barrier associated with the AF-FM transition may be modified with intrinsic and extrinsic properties, thereby creating a variety of pathways to tailor the FOPT.

See full dissertation at **iris.lib.neu.edu/chemical_eng_diss/19**

PEGAH MOHAMMAD HOSSEINPOUR

PhD, 2014 Chemical Engineering
Advisor, Laura H. Lewis | Materials Science and Engineering

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 **iris.lib.neu.edu/chemical_eng_diss/23**

LINLIN SUN

PhD, 2014 Chemical Engineering
Advisor, Thomas Webster | Biomedical Engineering and Bioengineering

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... Moreover, RNTs combined with carbon nanofibers in polymer composites enhanced myocardial cell functions. Therefore, this thesis provided evidence that the self-assembling biomimetic material, RNT, is promising for injectable bone, skin, and heart applications.

See full dissertation at **iris.lib.neu.edu/chemical_eng_diss/24**

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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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