

October 7-9, 2013 Hotel Sofitel Minneapolis | Minneapolis, MN | U.S.A



Surfaces in Biomaterials Foundation





From the President

Welcome Surface Science Professionals, Colleagues and Friends,

The Surfaces in Biomaterials Foundation is dedicated to exploring creative solutions to technical challenges at the biointerface by fostering education and multidisciplinary cooperation among industrial, academic, clinical, and regulatory communities. Our annual BioInterface Symposium and Workshop provides an encompassing overview of innovative biomaterials science applications and gives us the chance to meet and discuss important developments in our industry.

Corporations and educational institutions with products and services relevant to industrial engineers, research scientists, medical practitioners, and academicians in the fields of biomaterials and biomedical and diagnostic research come to this annual conference to network, learn, share information and enjoy the company of fellow professionals.

We hope your time at the 2013 BioInterface Symposium in Minneapolis, Minnesota will stimulate your thinking and provide a valuable experience that you can utilize in your ensuing endeavors.

Sincerely, Peter Edelman President, Surfaces in Biomaterials Foundation

2013 PROGRAM COMMITTEE

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Surfaces in Biomaterials 2013 Academic Members:

Cal Poly-San Luis Obispo University College Dublin University of Louisville

University of Minnesota University of Washington





Monday, October 7

BioInterface 2013 Workshop

Theme: Intell	igent Surfaces in Biotechnology Co-Chairs: Aylvin Dias, DSM Biomedical; Marcus Textor, ETH Zurich
7:30-8:30 a.m.	Pre-Registration and Continental Breakfast
8:30-8:45 a.m.	Welcome and Introduction
8:45-9:30 a.m.	Stefan Zauscher, Duke University "Programming Smart Macromolecular and Ferroelectric Surfaces for (Bio)sensing Applications"
9:30-10:15 a.m.	Phillip Messersmith, Northwestern University "Versatile Surface Modification Strategies Inspired by Polyphenols Found in Tea,

10:15-10:45 a.m.Exhibit Break

10:45–11:30 a.m.**Shaoyi Jiang, University of Washington,** Seattle "Nonfouling Hydrogel-based Surface Functionalization"

Chocolate and Wine"

11:30–12:15 p.m.**Robin Shandas, UC-Denver** "Shape Memory Polymers for Nextgeneration Minimally Invasive Biomedical Devices (Biomedical Devices and Design, Materials)"

- 12:15-1:15 p.m. Luncheon
- 1:15–2:00 p.m. Christopher Loose, Semprus Biosciences "A PolyBetaine Surface Modification Technology for Medical Devices"
- 2:00–2:45 p.m. Anthony Brennan, University of Florida, MSE "Physically Engineered Surfaces"
- 2:45-3:00 p.m. Exhibit Break
- 3:00 4:00 p.m. Applied Technology Workshops Co-Chairs: Mikki Larner, Plasma Technology Systems, LLC; Peg Palmer, SurfaceSolutions Labs
 3:00 - 3:30pm: Room 1: "The Use of Cluster Beams for Chemical Analysis of Newer Formulation Contact Lenses" Speaker: James Gibson, Evans Analytical Group

Room 2: "Emerging Technologies in Microporous Nonwoven and Bioabsorbable Polymers" Speaker: Josh Ridley, Zeus, Inc. 3:30 – 4:00pm: Room 1: "State-of-the Art in Surface Mechanical Properties Characterization Methods" Speaker: .Bo Zhou, CSM Instruments Inc.

> Room 2: "Regenerative Biomedical Textiles of the Next Generation" Speaker: Josh Simon, Secant Medical

- 4:00-4:30 p.m. Opening Reception
- 4:00-4:30 p.m. Keynote Presentation "Bioinspired Surface Functionalization: Concepts and Applications" by Marcus Textor, ETH Zurich, Switzerland

Tuesday, October 8

BioInterface 2013 Symposium

	7:30-8:25 a.m.	Registration and Continental Breakfast	
	7:30-8:25 a.m.	Student Poster Session Co-Chairs: Kristen O'Halloran Cardinal, Cal Poly-San Luis Obispo; Greg Haugstad, University of Minnesota	
	8:25-8:30 a.m.	President's Welcome	
	Session 1: SPONSOR:	Recent Developments in Ophthalmology Chair: Andrew Luk, CooperVision	
		BAUSCH+LOMB	
	8:30-9:00 a.m.	Invited Speaker: Lakshman Subbaraman, University of Waterloo "Incorporating Novel Agents to Improve the Wettability of Model Contact Lens Materials"	
	9:00-10:00 a.m.	William G. Pitt, Brigham Young University "Lipid Sorption on Contact Lenses"	
		Samuele Tosatti, SuSoS AG "Tribological Investigations Under Biologically Relevant Conditions of Natural and Man-Made Soft Materials"	
		Charles Lusignan, Bausch and Lomb "Characterizing the Friction of Soft Contact Lenses Fully Immersed in Saline"	
10:00-10:30 a.m.Exhibit Break			
Session 2: Mechanical Characterization of			

Chair: Bo Zhou, CSM Instruments

Biomaterials



10:30-11:00 a.m	Invited Speaker: Alison Dunn, University of Florida	We
	"No Longer Stuck Between a Rock and a Hard Place: Soft Probes"	Biolr
11:00–12:00 p.m	n. Gregory Freeborn, CSM Instruments "Characterization of Hydrogels Using a New Type of Low Load Nanoindentation Device'"	8:00-8
		Sessi
	Guigui Wang, CooperVision "Contact Lens Surface and Characterization"	
	Saju Nettikadan, Nanosurf Inc. "Automated Large Area Surface Mapping Tool for Characterization of Biomaterials"	8:30-9
12:00–1:00 p.m.	Student Town Hall Meeting and Attendee Luncheon	9:00–1
1:00–1:30 p.m.	Surfaces in Biomaterials Foundation Annual Business Meeting	
Session 3: Su Devices	Irface Treatment of Medical	
	Chair: Bob Hergenrother	
1:30-2:00 p.m.	Invited Speaker: Steve Rowland, OrbusNeich	
2:00–3:00 p.m.	Eric Guire, Innovative Surface Technologies, Inc.	10:00-
	"Stable and Facile Modification of Silicone Surfaces Using a High-Affinity Photopolymer"	Sessi Devic
	Terry W.J. Steele, Nanyang Tech.	
	University "Surface functionalization for On-demand Adhesion in Wet Environments"	SPON
	Joseph McGonigle, SurModics, Inc. "Surface Modification of Medical Devices with Fully Synthetic Coatings for Improved Hemocompatibility"	10:30-
3:00-3:30 p.m.	Exhibit Reception	
Session 4: Po "Surface Chara Medical Device of Clinical Outco	bint Counterpoint Debate: cterization Screening Tools Used by Manufacturers Are Poor Predictors omes and Are Therefore a Waste of	11:00 a -12:00
ncsources	Moderator: Rob Kellar, Northern Arizona University / Development Engineering	

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3:30–5:00 p.m Debater 1: Steven Badylak: McGowan Institute for Regenerative Medicine Debater 2: Michael Eppihimer: Boston Scientific

Wednesday, October 9

BioInterface 2013 Symposium

8:00-8:30 a.m. Pre-Registration and Continental Breakfast

Session 5: Tissue Engineering Model Systems

Co-Chairs: Kristen Cardinal; Cal Poly, San Luis Obispo; Benjamin Shepherd, Organovo, Inc.

8:30–9:00 a.m. Invited Speaker: Tetsuro Wakatsuki, In Vivo Sciences "Drug Discovery with Engineered Tissues: Screening to Personalized Medicine"

9:00–10:00 a.m. Briana N. Vogen, Innovative Surface Technologies, Inc. "Reproducible Tumor Cell Aggregate Size using SurSphere™ insert"

Benjamin Shepherd, Organovo, Inc. "Small-Scale Tissue Fabrication Through Bioprinting for In Vitro Use"

Jeremy Touroo,

Cardiovascular Innovation Institute "Macro and Micro Blood Vessel Mimics: In Vitro Models of the Vascular System"

10:00-10:30 a.m.Exhibit Break

Session 6: Pre-Clinical Evaluation of Medical Devices

Chair: Dick Bianco, University of Minnesota Experimental Surgical Services-
University of Minnesota

- 10:30–11:00 a.m.**Invited Speaker: Rusty Phillips, BioStable Science & Engineering, Inc.** "Aortic Valve Repair Technology-Engineering Vision, Product Development, and Initial Clinical Validation"
- 11:00 a.m.Nick Robinson, University of Minnesota-12:00 p.m."What is the Right Path for Preclinical
Device Analysis?"

Tim Kelley, Medtronic "Application of Risk Assessment to Heart Valve Substitutes"

David Mester: W.L. Gore + Associates "In Vitro Testing for Heart Valve Substitutes: an Evolving Process"

12:00–1:30 p.m. Awards Luncheon:

 Student Poster Winner Announcement
 Excellence in Surface Science Award Presentation-- 2013 Recipient: David Grainger, University of Utah



Session 7: Cardiovascular Devices

Co-Chairs: Savannah Gore, W.L. Gore + Associates; Jeanette Polkinghorne, Covidien

Scientific

1:30–2:00 p.m. Invited Speaker: Crystal Anderson-Cunanan, Boston Scientific Topic: Lotus[™] Valve System

2:00–3:00 p.m. Kiran Dyamenahalli, University of Colorado - Denver "Gold - Shape Memory Polymer Nanocomposite Materials for Transcatheter Cardiovascular Devices"

Terry W.J. Steele,

Nanyang Technological University "Bioadhesive, Drug Impregnated Thin Films for Vascular Restenosis Treatment"

Joseph McGonigle, SurModics, Inc. "Surface Modification of Endovascular Devices with Extracellular Matrix Peptide Coatings for Improved Endothelialization and Healing"

3:00-3:15 p.m. Exhibit Break

Session 8: Surface Characterization

Chair: Bonnie Tyler, National Physical Laboratory

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- 3:15–3:45 p.m. Invited Speaker: Morgan Alexander, University of Nottingham "High Throughput Materials Discovery Needs High Throughput Surface Characterization"
- 3:45–4:45 p.m. **Gregory L. Fisher, Physical Electronics** "TOF-SIMS Analysis of Skin Barrier Properties in the Layers of the Stratum Corneum"

Souhir Boujday, University Pierre and Marie Curie (UPMC)

"Investigating the Influence of SAMs Nature and Length on Protein Adsorption and Bioactivity"

C. W. Extrand, Entegris, Inc.

"Indirect Methods to Measure Wetting Interactions on Spherical Convex and Concave Surfaces"

4:45 p.m. Program Concludes

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Conference Agenda



Intelligent Surfaces in Biotechnology

Scientific and Engineering Concepts, Enabling Technologies, and Translation to Bio-Oriented Applications

Intelligent Surfaces in Biotechnology

Editors: H. Michelle Grandin & Marcus Textor

February 2012 List Price: \$125.00

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Point-Counterpoint Session:

"Surface characterization screening tools used by medical device manufacturers are poor predictors of clinical outcomes and are therefore a waste of resources"

Pro Side: Michael Eppihimer



Michael received his Ph.D. in Bioengineering at the Pennsylvania State University and subsequently completed a post-doctoral fellowship at the Louisiana State University Medical Center in the department of Molecular and Cellular Physiology with a research focus on leukocyte-endothelial cells interactions. Michael has worked in biopharmaceuticals at Genetics Institute and Wyeth Research in Cambridge, MA as a Principal Investigator. There he established a Vascular Inflammation Group to develop therapeutic compounds to treat cardiovascular, immune-related and respiratory diseases. Michael has also served as an Associate Professor of Bioengineering at the Pennsylvania State University, establishing a research program to investigate the relationship between inflammation and thrombosis in vascular disease. Currently,

Michael is Director of Preclinical Sciences at Boston Scientific Corporation where he leads the preclinical evaluation of medical device technologies in electrophysiology, cardiology and endosurgery, and the cell biology group in the company.

Con Side: Dr. Stephen Badylak, D.V.M., Ph.D., M.D



Dr. Stephen Badylak, D.V.M., Ph.D., M.D. is a Professor in the Department of Surgery, and deputy director of the McGowan Institute for Regenerative Medicine.

Dr. Badylak has practiced both veterinary and human medicine, and is now fully engaged in research. Dr. Badylak began his academic career at Purdue University in 1983, and subsequently held a variety of positions including service as the Director of the Hillenbrand Biomedical Engineering Center from 1995-1998.

Dr. Badylak holds more than 50 U.S. patents, 200 patents worldwide, has authored more than 275 scientific publications and 30 book chapters. He has served as the

Chair of several study sections at the National Institutes of Health (NIH), and is now a member of the College of Scientific Reviewers for NIH. Dr. Badylak has either chaired or been a member of the Scientific Advisory Board to several major medical device companies. More than four million patients have been treated with bioscaffolds developed in Dr. Badylak's laboratory.

Dr. Badylak is a Fellow of the American Institute for Medical and Biological Engineering, a member of the Society for Biomaterials, a charter member of the Tissue Engineering Society International, and immediate past president of the Tissue Engineering Regenerative Medicine International Society (TERMIS) and a Founding Fellow of TERMIS.

Dr. Badylak's major research interests include:

- Naturally occurring biomaterials, including extracellular matrix, and biomaterial/tissue interactions
- Developmental biology and its relationship to regenerative medicine
- \bullet Relationship of the innate immune response to tissue regeneration
- Biomedical engineering as it relates to device development and biomaterials
- Clinical translation of regenerative medicine



"A Tale of Two Elephants: Surface Analysis Connections to Biological Response" Presented by the 2013 Excellence in Surface Science Award Winner: David Grainger, University of Utah



David W. Grainger is a University Distinguished Professor, the inaugural George S. and Dolores Doré Eccles Presidential Endowed Chair in Pharmaceutics and Pharmaceutical Chemistry, and Department Chair in the Department of Pharmaceutics and Pharmaceutical Chemistry. He is also a full Professor of Bioengineering at the University of Utah. Grainger received his Ph.D. in Pharmaceutical Chemistry from the University of Utah in 1987 studying bloodcompatible polymers. He then received an Alexander von Humboldt Fellowship to perform postdoctoral research under Prof. Helmut Ringsdorf, University of Mainz, Germany. This training initiated more than 25 years of experience with various aspects of developing "materials in medicine". Grainger's research expertise is

focused on improving implanted medical device performance, drug delivery of new therapeutic proteins, nucleic acids and live vaccines, nanomaterials interactions with human tissues, low-infection biomaterials, and innovating diagnostic devices based on DNA and protein biomarker capture. Additionally, he is an expert in applications of surface analytical methods to biomedical interfaces, including analytical methods development for difficult organic surface patterns and nanomaterials, and also internationally recognized as an expert in perfluorinated thin films and biomaterials.

Grainger has published more than 160 full research papers and 21 book chapters at the interface of materials innovation in medicine and biotechnology, and novel surface chemistry. He has won several research awards, including the 2013 Excellence in Surface Science Award from the Surfaces in Biomaterials Foundation, the prestigious 2007 Clemson Award for Basic Research, Society for Biomaterials, and the 2005 American Pharmaceutical Research and Manufacturers Association's award for "Excellence in Pharmaceutics". He won a short-term visiting professorship in Tokyo from the Japanese Society for the Promotion of Science, and a CNRS Visiting Professorship in Paris, France. He has also received several teaching awards for outstanding mentoring and teaching service, including the University of Utah 2010 Distinguished Postdoctoral and Graduate Student Mentoring Award, the US West/Qwest Faculty Education Excellence Award (Colorado State University, 2000), Colorado State University College of Natural Sciences "Undergraduate Teacher of the Year", 2000, Colorado State University Alumni Associations. Grainger delivered the EU Madame Curie guest lectures at the Technical University-Aachen, Germany in 2009 and the 15th Annual Fritz Straumann lecture, AO Foundation, Davos, Switzerland, December, 2008.

Grainger is an elected Fellow of both the American Association for the Advancement of Science (AAAS) and the American Institute of Medical and Biological Engineering (AIMBE), and Inducted Honorary Fellow, International Union of the Societies of Biomaterials Science and Engineering, 2008. He has organized 23 international scientific symposia including the prestigious Gordon Research Conference in Biomaterials, and has presented more than 325 invited talks all over the world. Grainger also regularly lectures in international graduate summer schools and EU courses. He serves on editorial boards for 6 major research journals in the biomedical materials field, reviewing more than 50 manuscripts annually. He is Chair and standing member of Emerging Bioanalytical Technologies scientific review group (SRG) at NIH, past standing member on the NIH's Surgery and Bioengineering SRG, and over 20 other NIH and NSF review panels, some as chair. Additionally, he serves on the Scientific Advisory Boards of the Univ. Wisconsin-Madison NSF MRSEC on High Performance Nanostructured Materials, the NIH P41 National Research Center at the University of Washington (NESAC/ Bio) for surface analysis for biomedical problems, NSF Harvard/New Mexico NSF PREM MRSEC, and several international research foundations (AO Foundation, Davos, Switzerland, Swiss Center for Materials Competence, Zurich, the Willem S. Kolff Institute, Royal University of Groningen, The Netherlands, the Brandenburg Center for Regenerative Therapy at the Charité Research Center, Berlin, Germany, the Waseda University ASMeW Research Center, Tokyo, Japan). Grainger has helped to found 3 biomedical technology companies, sits on the Scientific Advisory boards for 4 biomedical companies, and actively consults internationally with industries in applications of materials in biotechnologies and medicine.



STUDENT POSTERS As of September 23, 2013

- "In Vitro Testing of Tropoelastin and Collagen Electro-spun Scaffolds" Robert Diller, Northern Arizona University
- "Gold-Shape Memory Polymer Nanocomposite Materials for Transcatheter Cardiovascular Devices" Kiran Dyamenahalli, University of Colorado Denver
- "The Effect of Proteing Pre-Coatings on the Adherence of Smooth Muscle Cells in Tissue Engineered Blood Vessel Mimics" Scott Herting, California Polytechnic State University
- "In Vitro Biocompatibility of Adipose-Derived Stem Cells on Coaxial Electrospun Nanofibers" Valerie M. Merkle, The University of Arizona
- "Human Annulus Fibrosis Lamellae Generate Significant Multi-Axial Forces and Moments in Biaxial Extension" Tina M. Nagel, University of Minnesota
- "Tubular Heart Valves from Decellularized Engineered Tissue" Jay M. Reimer, University of Minnesota
- "Shape Memory Polymer Foams for the Treatment of Intracranial Aneurysms: Implanted Biological Response" Jennifer Nicole Rodriguez, Texas A&M University
- "AFM: Material Characterization"
 Govind Saraswat, University of Minnesota
- "Adaptation of ERK Signaling Relative to Collagen Transcription in Response to Continuous Versus Intermittent Cyclic Stretching" Jillian Schmidt, University of Minnesota
- "Intracellular Calcium Mobilization in Osteoblasts in Dependence on Defined Surface Micro Structures" Susanne Stählke, Universität Rostock
- "Atmospheric Plasma Deposition of Polyethylene Oxide-like Films for Biomedical Applications" Charlie Stallard, University College Dublin
- "Electro-Spun Tropoelastin and Collagen BioScaffolds Used for Cellular Delivery in Full Thickness Wounds" Aaron J. Tabor, Northern Arizona University
- "Carbohydrate-Containing Cationic 'Click' Polymers for siRNA Delivery to Glioblastoma Cells" Lian Xue, University of Minnesota

INDUSTRY POSTERS

- "Finding the Interface: Investigating Inexpensive Means of Preparing Samples with Biological Contamination for TOF-SIMS" Lisa LaGoo, Medtronic, Inc.
- "One Step Bioactive and Pro-healing Coatings" Charles Lindall, CSIRO-Australia



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