

Meeting Overview
McGowan Institute Retreat

March 9, 10, 11, 2009

Nemacolin Woodlands Resort

Sunday March 8:

3:00 PM *Hotel check-in available* *Main Lobby*
(Self park, or valet park at participant's expense)

Note: Dinner is available at the hotel until:

Autumn Restaurant: Seating until 9 PM (reservations recommended)

The Tavern: Seating until 10 PM (reservations optional)

The Wild-Side: Food service until 11 PM (like Dave & Busters-requires a shuttle ride)

(Note this meal is not a retreat-sponsored function)

6– 9 PM *Meeting Registration* *Marquis Ballroom Foyer*
Registration: Meet the Commercial Participants (Speed Dating)

7– 9 PM *Informal mixer (with refreshments and light snacks)* *Marquis Ballroom*

Monday March 9:

7-8:15 AM *Meeting Registration* *Marquis Ballroom Foyer*
Registration: Meet the Commercial Participants (Speed Dating)

Breakfast *Marquis Ballroom*

8:30 AM ***Plenary Session*** *Lecture Hall*
McGowan Institute Distinguished Lecture
Biofunctional Materials in Regenerative Medicine and Immunotherapeutics
Jeffrey A Hubbell, PhD
Regenerative Medicine and Pharmacobiology Laboratory
Ecole Polytechnique Fédérale de Lausanne, Switzerland

The McGowan Institute: Past, Present and Future
Alan Russell, PhD

10:00 AM Break

10:30 AM ***Working Session 1*** *Lecture Hall*
Clinical Translation of Biologic Scaffold Materials

Working Session 2 *Grand Ballroom*
Ocular Regeneration: Applied Fundamentals

12:30 PM *Address to the attendees by:*
Congressman John Murtha (via video teleconference) *Lecture Hall*

1:00 PM ***Lunch*** *Marquis Ballroom*

2:30 PM	<u>Working Session 3</u> AFIRM-Selected Topics	<i>Lecture Hall</i>
	<u>Working Session 4</u> Applications and Approaches for Optical Imaging; From Single Molecules to the Whole Animal	<i>Grand Ballroom</i>
	<u>Working Session 5</u> Biomechanics in Regenerative Medicine Training Program	<i>Nemacolin 1-6</i>
5:00 PM	<u>Poster Session and Reception</u>	<i>Marquis Ballroom</i>
6:30 PM	<u>Dinner</u> Speaker: Arthur S. Levine, MD Senior Vice Chancellor for the Health Sciences, and Dean of the School of Medicine University of Pittsburgh	

Tuesday March 10:

7-8 AM	<i>Breakfast</i>	<i>Marquis Ballroom</i>
8:00 AM	<u>Working Session 6</u> New Cardiovascular Technologies	<i>Lecture Hall</i>
	<u>Working Session 7</u> Bioreactor Technologies and Applications	<i>Grand Ballroom</i>
10:00 AM	<u>Break</u>	
10:30 AM	<u>Working Session 8</u> Translational Systems Biology: Applications to Regenerative Medicine	<i>Grand Ballroom</i>
	<u>Working Session 9</u> Translating Regenerative Technologies for Commercial Delivery Session A: Focus on Discovery, Development, and Evaluation	<i>Lecture Hall</i>
12:30 PM	<u>Lunch</u> Speaker: Reverend Gary Wilburn ALS Patient Via Video from Baja, Mexico	<i>Marquis Ballroom</i>
2:00 PM	<u>Working Session 10</u> Translating Regenerative Technologies for Commercial Delivery Session B: Focus on Delivery of a Viable Commercial Product or Technology	<i>Lecture Hall</i>
	<u>Working Session 11</u> Damage Associated Molecular Pattern Molecules and Regenerative Medicine	<i>Grand Ballroom-Salon A</i>
	<u>Working Session 12</u> Cardiovascular Bioengineering Training Program Note: 2 PM to 5 PM	<i>Nemacolin 1-6</i>

4:00 PM	<u>Break</u>	
4:30 PM	<u>Working Session 13</u> Meet the Commercial Participants (a.k.a. Speed Dating)	<i>Grand Ballroom-Salon D</i>
7:00 PM	<u>Informal dinner</u> (indoor picnic) in poster session area Speaker: Representative Jake Wheatley The New Bioscience Corridor in Pittsburgh	
8:30 PM	Exploring Training Opportunities for Young Scientists, and an Introduction to the Resources Provided by the Office of Academic Career Development Presentation by: Joan Lakoski, PhD	<i>Lecture Hall</i>
<u>Wednesday March 11:</u>		
7-8 AM	<u>Breakfast</u>	<i>Marquis Ballroom</i>
8:00 AM	<u>Working Session 14</u> Stem Cells and Potential Therapies	<i>Lecture Hall</i>
	<u>Working Session 15</u> NSF ERC for Revolutionizing Metallic Biomaterials	<i>Grand Ballroom</i>
10:00 AM	Break	
10:30 AM	<u>Working Session 16</u> Assessment of 3-D Printing Technologies	<i>Lecture Hall</i>
	<u>Working Session 17</u> Neural Engineering	<i>Grand Ballroom</i>
12:30 PM	<u>Lunch</u>	<i>Marquis Ballroom</i>
	<i>Poster Session Award Presentations-Kacey Marra, PhD</i>	
2:00 PM	<u>Depart (for most)</u>	
2:00 PM	“NSF ERC for Revolutionizing Metallic Biomaterials”	<i>Nemacolin 1-6</i>

Detailed Agenda Follows

Agenda
McGowan Institute Retreat

March 9, 10, 11, 2009

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7– 9 PM *Informal mixer (with refreshments and light snacks)* *Marquis Ballroom*

Monday March 9:

8:30 AM *McGowan Institute Distinguished Lecture* *Lecture Hall*

Biofunctional Materials in Regenerative Medicine and Immunotherapeutics

Jeffrey A Hubbell, PhD

Regenerative Medicine and Pharmacobiology Laboratory

Ecole Polytechnique Fédérale de Lausanne, Switzerland

The McGowan Institute: Past, Present and Future

Alan Russell, PhD

10:00 AM Break

10:30 AM *Working Session I* *Lecture Hall*

Clinical Translation of Biologic Scaffold Materials

Organizer and Moderator:

Stephen F. Badylak, DVM, PhD, MD

Speakers:

- **Overview of Biologic Scaffolds and Commercially Available Products**
Stephen F. Badylak, DVM, PhD, MD
- **Orthopedic Applications of Biologic Scaffolds**
Carl Basamania, MD; The Polyclinic, Seattle, WA
- **GI and Respiratory Applications of Biologic Scaffolds**
Alex Nieponice, MD
- **Reconstructive Surgical Applications of Biologic Scaffolds**
Christopher D. Prevel, MD, FACS; CEO, Florida Plastic Surgery Institute; Clinical Associate Professor of Plastic Surgery, University of Central Florida College of Medicine

Working Session 2

Grand Ballroom

Ocular Regeneration: Applied Fundamentals

Organizers and Moderators:

Joel S. Schuman, MD, FACS and Gale S. Pollock, Major General (Ret), CRNA, FACHE, FAAN

Speakers:

- **Introduction and Panel Moderator**
Joel Schuman, MD, FACS
- **Regulation of Gene Expression During Development And Maintenance of The Ocular Surface**
Shivalingappa K. Swamynathan, PhD
- **Stem Cell-Based Approaches to Ocular Regenerative Therapy**
James L Funderburgh, PhD
- **Intact RPE Is Essential for Retinal Epithelial Polarity and Cellular Patterning in Zebrafish: Implications For Retinal Engineering**
Xiangyun Wei, PhD
- **Quality of Life and Economics**
Gale S. Pollock, Major General (Ret.), CRNA, FACHE, FAAN

12:30 PM Address to the attendees by:
Congressman John Murtha (via video teleconference) Lecture Hall

1:00 PM Lunch Marquis Ballroom

2:30 PM Working Session 3 Lecture Hall

AFIRM-Selected Topics

Organizer and Moderator:

W.P. Andrew Lee, MD

Speakers:

- **AFIRM Introduction**
W. P. Andrew Lee, MD
- **A Blastema-like Approach to Limb and Digit Reconstruction**
Stephen Badylak, DVM, MD, PhD
- **Development of Biological Approaches to Improve Angiogenesis and Decrease Fibrosis: Implication for Tissue Healing After Compartment Syndrome**
Johnny Huard, PhD
- **Scaffolds for Reconstruction of the Abdominal Wall in the Setting of Abdominal Compartment Syndrome**
William Wagner, PhD
- **Regulation of Inflammation, Fibroblast Recruitment and Activity for Regenerative Healing**

Patricia Hebda, PhD

- **Skin Cell-Based Therapy Concept Development Involving Single Cell Spray Transplantation for Burn Patients**
Jörg Gerlach, MD, PhD
- **Cellular Therapy in Hand Transplantation: Translational Research and Clinical Trial**
W. P. Andrew Lee, MD

Working Session 4

Grand Ballroom

Applications and Approaches for Optical Imaging; From Single Molecules to the Whole Animal

Organizer and Moderators:

Simon Watkins, PhD and Donna Stolz, PhD

Speakers:

- **Overview of the Center for Biologic Imaging**
Simon Watkins, PhD
- **Limits for Light Microscopy**
Simon Watkins, PhD
- **The Use of Fluorescent Sensors to Study Molecular Behavior in Living Systems**
Claudette Marie St. Croix, PhD
- **Limits for Electron Microscopy**
Donna Stolz, PhD

Working Session 5

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Biomechanics in Regenerative Medicine Training Program

Organizer and Moderator:

Michael Sacks, PhD

Speakers:

- **Introduction**
Michael Sacks, PhD
- **Effect of Increasing *in vitro* Cyclic Strain on Aortic Valve Interstitial Cell Phenotype and Subsequent Gene Expression of Extracellular Matrix Constituents**
Chris Carruthers
- **Assessment of Mandibular Condylar Cartilage Shear Properties and Tissue Engineering Using 3D Printing**
Sarah Henderson
- **Quantifying Collagen Fiber Orientation in the TCL through the Use of Small Angle Light Scattering (SALS)**
Ryan Prantil
- **Flexible Microfiber Environment to Probe Mechanotransduction in Calcium Signaling**
Warren Ruder

- **Performance Assessment of Embolic Protection Filters: Towards the Development of a Novel Cerebral Protection Device**
Gail Siewiorek
- **Extracellular Matrix Bioscaffolds to Improve Anterior Cruciate Ligament Healing**
Matthew Fisher
- **A Tissue Engineering Approach to ACL Regeneration**
Kwang Kim

Note: Although this session is a bioengineering graduate student-related activity, ALL are welcome.

5:00 PM *Poster Session and Reception* *Marquis Ballroom*

6:30 PM *Dinner*

Speaker: Arthur S. Levine, MD
Senior Vice Chancellor for the Health Sciences, and
Dean of the School of Medicine
University of Pittsburgh

Tuesday March 10:

8:00 AM *Working Session 6* *Lecture Hall*

New Cardiovascular Technologies

Organizers and Moderators:

Harvey Borovetz, PhD and Giovani Speziali, MD

Speakers:

Innovations in Minimally Invasive Approaches to Heart Valve Repair

Giovani Speziali, MD

Novel Therapies for the Treatment and Diagnosis of Coronary Artery Disease

Marc Simon, MD and John J. Pacella, MD

Functionalised Scaffolds for Gene Delivery

Abhay Pandit, PhD, Professor in Biomedical Engineering, Network of Excellence in Functional Biomaterials, National Centre for Biomedical Engineering Science, National University of Ireland, Galway, Ireland

Working Session 7

Grand Ballroom

Bioreactor Technologies and Applications

Organizers and Moderators:

David Vorp, PhD and Jörg Gerlach, MD, PhD

Speakers:

- **Compartmentalized Perfusion Bioreactor Technology for Tissue Density Culture of Primary Parenchymal Cells and Stem Cells - Example Liver**
Jörg Gerlach, MD, PhD

- **Bioreactors for Tubular Tissue Engineering**
David Vorp, PhD
- **Use of Controlled Physiological Stimuli to Modulate ECM Production in Engineered Heart Valve Tissues**
Michael Sacks, PhD
- **Physiologic Loading for Strategies of Cartilage Repair**
Clark Hung, PhD, Columbia University

10:00 AM Break

10:30 AM Working Session 8 *Grand Ballroom*
Translational Systems Biology: Applications to Regenerative Medicine
Organizer and Moderator:
 Yoram Vodovotz, PhD

Speakers:

- **The Need for Novel Approaches to Healing, Regeneration, and Rehabilitation**
Cliff Brubaker, PhD
- **Translational Systems Biology of Inflammation and Healing**
Gary An, MD
- **Computational Simulations of Inflammation and Healing in the Skin, Vasculature, Lung, and Liver**
Qi Mi, PhD
- **Modeling and Modulating Inflammation in Mice and Men**
Yoram Vodovotz, PhD

Working Session 9 *Lecture Hall*
Translating Regenerative Technologies for Commercial Delivery
 Session A: Focus on Discovery, Development, and Evaluation
Organizer and Moderator:
 Patrick Cantini

The secret to success of translational research is teamwork because the research endeavor requires that different skills be brought to bear on a unified goal. Translational research demands an understanding of both scientific and business related mechanisms. The process is complex, and it requires the participation of clinicians, scientists, regulatory consultants, legal advisors, industry specialists, and multiple government agencies.

This series of sessions, entitled: “Translating Regenerative Technologies for Commercial Delivery,” is designed to provide attendees with an overview of the resources and expertise available to support the bench to bedside to bench to industry process. The sessions will focus on the concepts of discovery, development, evaluation, and delivery with particular emphasis on performance/management of pre-clinical and clinical studies, regulatory management and clearance by the FDA, protection of intellectual property, licensing of technology to industry, commercial delivery of the new therapy, and sufficient fiscal reimbursement to support commercialization.

Speakers:

- Denise Capozzi, VMD, Research Conduct and Compliance Office, Education and Compliance for Animal Subjects, University of Pittsburgh
- Kelly Dornin, MPPM, RN, CIP, Research Conduct and Compliance Office, Education and Compliance for Human Subjects, University of Pittsburgh
- Dennis Swanson, PhD, Research Conduct and Compliance Office, Office of Investigator Sponsored IND and IDE, University of Pittsburgh

12:30 PM

Lunch

Marquis Ballroom

Speaker: Reverend Gary Wilburn
ALS Patient
Via Video from Baja, Mexico

2:00 PM

Working Session 10

Lecture Hall

Translating Regenerative Technologies for Commercial Delivery

Session B: Focus on Delivery of a Viable Commercial Product or Technology

Organizer and Moderator:

Patrick Cantini

Speakers:

- Patsy Trisler, JD, Trisler Consulting
- Alexander P. Ducruet, PhD, Office of Technology Management, University of Pittsburgh
- David Smith, JD, Pepper Hamilton LLC

Working Session 11

Grand Ballroom-Salon A

Damage Associated Molecular Pattern Molecules and Regenerative Medicine

Moderator:

Michael Lotze, MD

Speakers:

- **DAMPs in Trauma, Bone Fracture, Hypotension, and Infection – the Acute Response**
Timothy Billiar, MD
- **The Response to Wounding and Xenogeneic Scaffolding is Dependent on DAMPs and DNA**
Stephen Badylak, DVM, MD, PhD
- **Modifying Matrices to Limit IL-1 and DAMPs**
Newell Washburn, PhD
- **Modulating DAMP Receptors as a Strategy to Enhance Mucosal Restitution in Diseases of Intestinal Inflammation**
David J. Hackam, MD, PhD

- **Chronic Inflammation and Cancer are Dependent on DAMPs – You Eat What You Are**

Michael Lotze, MD

Working Session 12

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Note: 2 PM to 5 PM

Cardiovascular Bioengineering Training Program

Organizer and Moderator:

Sanjeev Shroff, PhD

Speakers:

- **Introduction**
Sanjeev Shroff, PhD
- **Effects of PKC-Mediated Phosphorylation of cTnI on Myofilament Dynamics**
Jonathan Kirk
- **Cardiomyocyte Induction in Skeletal Muscle-Derived Stem Cells: Role of Mechanical Forces**
Kelly Clause
- **Matrix Synthesis of Bone Marrow-Derived Stem Cells in Fibrous Elastomeric Scaffolds: Effects of Mechanical Stimulation**
John Stella
- **Biological Scaffolds for Cardiac Tissue Engineering**
John Wainwright
- **Modeling Cytokine Adsorption Dynamics in Hemoadsorption Beads as a Treatment for Sepsis**
Jeremy Kimmel
- **Temporal Delivery of Angiogenic Growth Factors**
Jillian Tengood
- **Assessment of Thrombosis, Thromboembolism and Immunological Mechanisms in Ventricular Assist Devices**
Josh Woolley
- **Implications of Profilin-1 on Endothelial Barrier Function: Insights into Cytoskeletal Modulation of Junctional Integrity**
William Veon
- **Regenerative Potential of Wild-Type and Mdx Muscle Derived Stem Cells: A Comparative Characterization**
Sarah Beckman
- **Controlled Drug Delivery from Injectable Thermoresponsive Polymers for Cardiac Therapy**
Devin Nelson
- **Functional Imaging of Heart Valves for Biomechanics**
Brandon Mikulis

Notes:

- Session runs from 2 PM to 5 PM
- Although this session is a bioengineering graduate student-related activity, ALL are welcome

4:00 PM Break

4:30 PM Working Session 13 *Grand Ballroom-Salon D*
Meet the Commercial Participants (a.k.a. Speed Dating)
Organizer and Moderator:
Andrew Remes, PhD
Registration at Nemaclin

7:00 PM Informal dinner (indoor picnic) in poster session area

Speaker: Representative Jake Wheatley
The New Bioscience Corridor in Pittsburgh

8:30 PM **Exploring Training Opportunities for Young Scientists, and an Introduction to the Resources Provided by the Office of Academic Career Development**
Introduction by: Sanjeev Shroff, PhD
Presentation by: Joan Lakoski, PhD

This session has been organized by the Cardiovascular Bioengineering Training Program. Target audience is graduate students and post docs...ALL are welcome.

Wednesday March 11:

8:00 AM Working Session 14 *Lecture Hall*

Stem Cells and Potential Therapies

Organizer and Moderator:

Johnny Huard, PhD

Speakers:

Adult Stem Cells and Nanomaterials for Skeletal Tissue Engineering and Regeneration

Rocky Tuan, PhD

A Perivascular Origin for Mesenchymal Stem Cells in Human Organs

Bruno Peault, PhD

Regenerative Medicine Based on Muscle Stem Cells

Johnny Huard, PhD

Dedifferentiation Enlarges Population of Stem Cells in Skeletal Muscle

Yong Li, MD, PhD

Human Liver Progenitor Cell Transplantation (CTx) for Endstage Liver Failure - Initial Report From a Clinical Feasibility Study

Bruno Gridelli, MD and Joerg Gerlach, MD, PhD (Presented by Joerg Gerlach)

NSF ERC for Revolutionizing Metallic Biomaterials

Organizers and Moderators:

Prashant Kumta, PhD and Charles Sfeir, DDS, PhD

Speakers:

- **Revolutionizing Metallic Biomaterials (RMB)**
Jagannathan Sankar, PhD, Director of the Center for Advanced Materials and Smart Structures, Professor of Mechanical Engineering, North Carolina A & T University
- **Biodegradable Metals in Musculoskeletal Applications**
Frank Witte, PhD, Hannover Medical School
- **The Magnesium Stent. From Bench to Bedside**
Bodo Gerold, PhD, Biotronik
- **Development of Responsive Biosensors for Implants**
Mark Schulz, PhD, Associate Professor of Mechanical Engineering, University of Cincinnati
- **First Principles Studies of Biodegradable Metallic Alloys: Design and Corrosion**
Prashant Kumta, PhD
- **Group Discussion**

10:00 AM Break

10:30 AM Working Session 16

Lecture Hall

Assessment of 3-D Printing Technologies

Organizer and Moderator:

Kimimasa Tobita, MD, Assistant Professor, Pediatrics and Bioengineering

Speakers:

- **3D Engineered Cardiac Tissue from Stem Cell Derived Muscle Cells: Hurdles Need to Be Overcome Towards Functioning Muscle**
Kimimasa Tobita, MD, Assistant Professor, Pediatrics and Bioengineering
- **Directing Tissue Formation Through The Use of Printed Heterologous 3D Spatial Patterns of Signaling Molecules**
Phil Campbell, PhD, Professor, Institute for Complex Engineered Systems, Carnegie-Mellon University
- **3D Organ Printing: Status and Future Prospects**
Thomas Boland, PhD, Associate Professor, Department of Bioengineering, Clemson University
- **3D Micro-Fabrication by Ink-Jet Printer for 3D Tissue Engineering**
Makoto Nakamura, MD, PhD, Professor, Department of Science and Engineering, Toyama University, Toyama City, Japan

Neural Engineering

Organizers and Moderators:

Tracy Cui, PhD and Andrew Schwartz, PhD

Speakers:

- **Advances in Neural Prosthetic Control**
Steven M. Chase, PhD; Post-Doctoral Research Associate, Department of Statistics, Carnegie Mellon University

- **The Road to a Practical Human Brain Computer Interface**
Elizabeth Tyler-Kabara, MD, PhD; Assistant Professor, Neurological Surgery, Bioengineering, and Physical Medicine and Rehabilitation, University of Pittsburgh

- **Increasing Reliability of Chronic Neural Recordings – Musings from a Biocompatibility Perspective**
Ravi V. Bellamkonda, PhD; GCC Distinguished Scholar and Professor of Biomedical Engineering, Georgia Institute of Technology/Emory University, Atlanta, GA.

- **In Vitro Model for Gliosis Reaction to Electrode Materials**
William M. Reichert, PhD
Professor of Biomedical Engineering & Chemistry and Director, Center for Biomolecular & Tissue Engineering, Duke University

12:30 PM

Lunch

Marquis Ballroom

Poster Session Award Presentations-Kacey Marra, PhD

2:00 PM

Depart (for most)

“NSF ERC for Revolutionizing Metallic Biomaterials” Session

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