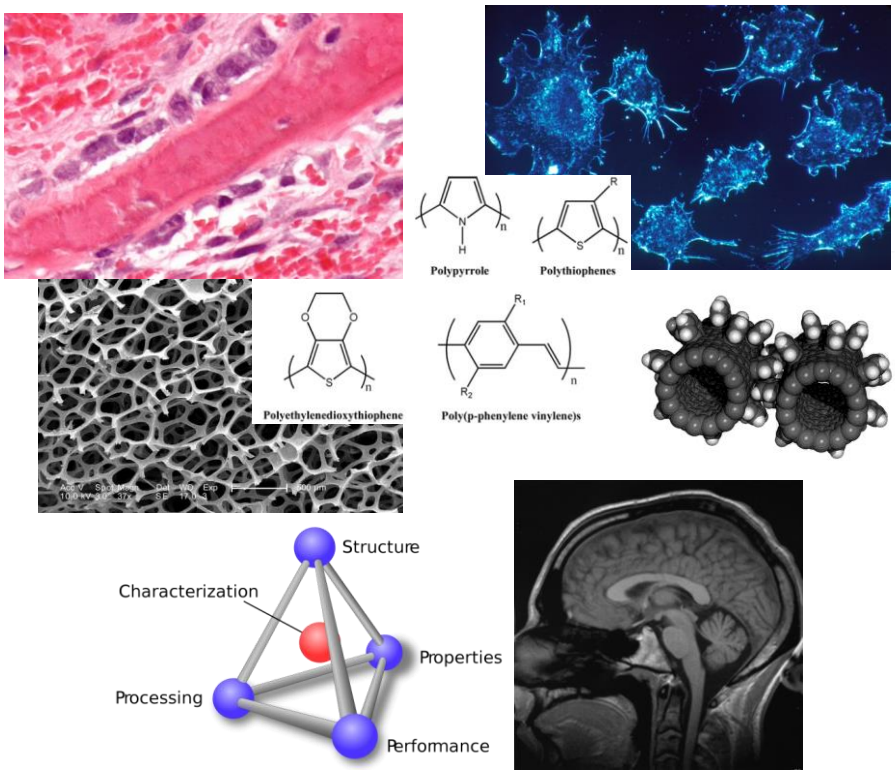
Society For Biomaterials

UF UNIVERSITY of FLORIDA

Biomaterials Day 2016

Medical Advancement Through Innovative Engineering

Hosted by the University of Florida Society for Biomaterials Student Chapter



Welcome to the University of Florida's Regional Biomaterials Day 2016!

On behalf of the Biomaterials Day Organizing Committee of the Society for Biomaterials, we would like to thank you for attending our fifth annual Biomaterials Day focused on "Medical Advancement through Innovative Engineering." The University of Florida's student SFB chapter is very proud to host this one day symposium and provide an opportunity for students, faculty members, and industry representatives from our region to interact and discuss some of the newest and most exciting advances in the field of biomaterials. We hope to promote interdisciplinary interactions amongst all of our attending guests.

Again, thank you for attending, and we hope you enjoy this exciting opportunity to learn about biomaterials and network with your colleagues and peers.

Regards,

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Acknowledgements

The Biomaterials Day Organizing Committee would like to acknowledge and thank our generous sponsors who, without their financial support, this event would not be possible. Their sponsorship allows us to offer this event completely free of charge, and it gives us the ability to bring in all of these great speakers from around the country.

Sponsors include:

Society for Biomaterials National Chapter
University of Florida Department of Sponsored Research
University of Florida College of Engineering
University of Florida Department of Materials Science and Engineering
University of Florida J. Crayton Pruitt Department of Biomedical Engineering
University of Florida Biomedical Engineering Society (BMES)

We would also like to thank all of the SFB student members and faculty who have helped with the event.

Special thanks go to our industry partners for their involvement and continued contribution to Biomaterials Day and the Society for Biomaterials.

Industry Partners include:

Schedule of Events

Friday March 11, 2016

Time	Event	Speakers	Area
7:30-8:30am	Registration/Breakfast	_____	Grand Ballroom
8:30-8:40	Welcome address	Dr. Gregory Hudalla (University of Florida Department of Biomedical Engineering)	Grand Ballroom
8:40-9:25	Oral Presentation 1	Dr. Barbara Boyan (Virginia Commonwealth University Dean of Engineering)	Grand Ballroom
9:25-10:10	Oral Presentation 2	Dr. Adam Katz (University of Florida Division of Plastic and Reconstructive Surgery)	Grand Ballroom
10:20-12:00	Poster/Industry Session with Snack/Coffee Break	_____	Grand Ballroom
12:00-1:00	Lunch	_____	Grand Ballroom
1:00-2:00	Keynote	Dr. Steven Little (University of Pittsburg McGowan Institute for Regenerative Medicine)	Auditorium
2:05-2:50	Oral Presentation 3	Dr. Kevin Healy (University of California, Berkeley Department of Materials Science and Engineering)	Auditorium
2:50-3:05	Snack/Coffee Break	_____	Auditorium
3:05-3:50	Oral Presentation 4	Dr. Candan Tamerler (University of Kansas Department of Mechanical Engineering)	Auditorium
3:50-4:35	Student Presentations (2)	_____	Auditorium
4:35-4:45	Closing Remarks and Awards	Dr. Anthony Brennan (University of Florida, SFB Faculty Advisor)	Auditorium

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Keynote Address Abstract

Steven Little, Ph.D.

William Kepler Whiteford Endowed Professor and Chair of the Department of Chemical Engineering, Bioengineering, Pharmaceutical Sciences, Ophthalmology, Immunology, and the McGowan Institute for Regenerative Medicine at the University of Pittsburgh.

Controlling Controlled Release to Make Medicine that Imitates Life

Biomimetics (loosely defined) is the emulation of biological elements or processes to solve human problems. Our research group intends to reproduce the basic spatio-temporal information transfer that naturally occurs between the cells in our body to regulate biological form and function. As it stands, such is out of the reach of modern medicine. Accordingly, this seminar will introduce the idea that it is now possible to engineer synthetic constructs that can mimic the prose and context of cell-driven "communication" with the goal of inducing and/or regulating key biological processes. As just one example, simple temporal control over the release of specific growth factors can induce robust formation of specific tissues that naturally regenerate via stage-wise processes. This is possible using recent advances in the precise design of controlled release formulations. In the same way, this concept can also be used to reproduce spatial information that cells (and even tumors) employ to manipulate immunological responses. Collectively, these new tools can effectively reproduce biological context and have already shown significant promise as next-generation medical treatments in a variety of disease models where current medical treatments have no answer.

Session Abstracts

Barbara Boyan, Ph.D.

Dean of the School of Engineering at Virginia Commonwealth University

How Surface Features of a Biomaterial Regulate Musculoskeletal Cells and Tissues: What Does This Mean for Implants in Bone?

Materials that are used in orthopedic and dental implants that interface with biological tissues are designed to be biocompatible and optimally, to not elicit a negative tissue response. For those devices that are intended to interface with bone, the goal is to achieve osseointegration, resulting in mechanical stability. This interface occurs at the macroscale via mechanical interlock, at the microscale via specific interactions with bone cells, and at the nanoscale, which serves as a fine tuning mechanism modulating cell activity. The properties of the material surface are critical in determining how cells interact with the implant and how they signal other cells in the surrounding clot and bone bed to facilitate bone formation and remodeling, thereby achieving optimal osseointegration. This presentation will focus on microscale and nanoscale physical properties and chemistry of materials commonly used in devices for dental reconstruction and interbody fusion and how they impact macrophage, MSC and osteoblast response, and ultimately bone remodeling.

Adam Katz, M.D.

Professor of surgery in the Division of Plastic and Reconstructive Surgery at the University of Florida

Translation and Commercialization of Adipose-derived Cell Therapies: What is Taking So Long?

Adipose-derived cells (SVF; ASCs) possess similar biological properties and therapeutic potential as other adult tissue-derived stem cells, but have relative advantages of accessibility, abundance, expendability and donor appeal. This presentation will provide an overview of the history, characterization, biology and therapeutic potential of human ASCs, including a summary of their use in clinical trials and varying therapeutic strategies. Additional attention will be given to the importance of collaboration, and various challenges related to the translation and commercialization of cell therapies.

Candan Tamerler, Ph.D.

Wesley G. Cramer Associate Professor in the Department of Mechanical Engineering at the University of Kansas

Self-Organized Bio-Nano Interfaces:
From Surfaces to Biologically Integrated Hybrid Materials

Biological material systems promise the possibility of developing innovative materials that simultaneously self-assembled, self-organized and self-regulated; characteristics that are difficult to achieve in purely synthetic systems. Proteins play an essential role in fabrication of biological materials due to their diverse functions ranging from structural to biochemical. The ability to mimic any of these functions can be a game changer in designing hybrid materials. There are several challenges in these strategies including replicating the hierarchical organization of biological materials, organization that provides multi-scale structure/property interdependence. The interfacial interactions become critical in tuning the individual components towards the functional needs. There is a need for strategies that can control self-organization at a molecular level and thus provide programming the biological and inorganic interfaces. In the recent years, there has been a proliferating interest in creating advanced bio-interfaces resolving protein modulated material surfaces that allow as well as enhance favorable interactions with the surrounding biological systems. Smaller protein domains, i.e. peptides, have been utilized as the key fundamental building blocks to mimic the molecular recognition as the basis of molecular scale interactions.

Following Nature's molecular footsteps, we explore tuning peptide directed interactions at the bio-interfaces to create functional bio-hybrid systems. Our approach includes decoding the peptide-material interactions, and using these foundations to develop self-organized and functional hybrid systems. Building upon the modularity of protein domains, we design single to multifunctional chimeric peptides or recombinant fusion proteins. Armed with an extensive array of multifunctional molecular units, we tackle different technological areas built upon designing biomolecular-inorganic interfaces. In this talk, I will describe some of our work on understanding the interactions of peptides with the surfaces as well as provide examples from our studies on different applications. The specific examples will include biofunctionalization of surfaces with bioactive as well as bio-repulsive attributes, protein/peptide based hybrid nanoassenblies for targeting and sensing, nanofibers that are integrated with fluorescence proteins and nanoparticles pairs and bioenabled mineralization. The integration of biological building blocks may allow harnessing the extraordinary diversity and protein functions to generate smart bio-hybrid materials for wide range of applications including sensing and tissue engineering applications.

Kevin Healy, Ph.D.

Jan Fandrianto Professor in the Material Science and Engineering Department at the University of California, Berkeley

Organs on a chip for high content drug screening
Microphysiological systems for high content drug screening

Drug discovery and development are hampered by high failure rates attributed to reliance on non-human animal models employed during safety and efficacy testing. With the discovery of patient-specific human induced pluripotent stem (iPS) cells, we can now develop *in vitro* disease specific tissue models to be used for high content drug screening and patient specific medicine. This presentation will discuss our progress in developing integrated *in vitro* models of human cardiac and liver tissue based on populations of normal and patient specific hiPS cells differentiated into cardiomyocytes or hepatocytes, respectively. Our *in vitro* integrated physiological system has the potential to significantly reduce both the cost and duration of bringing a new drug candidate to market.

Student Oral Presentation Abstracts

1. Primary Author: Tapomoy Bhattacharjee
Title: 3D Cell behavior in Liquid-Like Solids
Department: Mechanical and Aerospace Engineering

2. Primary Author: Daniel Stewart
Title: Viscoelastic Characterization of Brain Tissue Surrogates
Department: Biomedical Engineering

3. Primary Author: Cary Kuliasha
Title: Engineered Nanotopographies: A RAFT Mediated Polymerization for Grafted Anisotropic, Nanopatterns on PDMSe
Department: Materials Science and Engineering

Student Poster Presentation Abstracts

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1. Primary Author: Rachel Besser
Title: Engineering Microenvironmental Cues to Drive Maturation of Cardiomyocytes
Department: Biomedical Engineering, University of Florida

2. Primary Author: Benjamin Spearman
Title: Mechanically-tunable Natural Hydrogel Scaffolds for Peripheral Nerve Regeneration
Department: Biomedical Engineering, University of Florida

3. Primary Author: Samuel Jativa
Title: Peptide-functionalized PAMAM Dendrimers for Targeted Delivery of DNA Vaccines to Skeletal Muscle Cells
Department: Biochemistry and Molecular Biology, University of Miami

4. Primary Author: Evelyn Bracho-Sanchez, Kevin Koenders
Title: Induction of Antigen Specific Tolerance via Exogenous Delivery of Indoleamine 2,3-Dioxygenase
Department: Biomedical Engineering, University of Florida

5. Primary Author: Nikunj Agrawal
Title: Oligonucleotide hybridized hydrogels for sustained release of aptamer antagonists to promote axon growth
Department: Biomedical Engineering, University of Florida

6. Primary Author: Steven Wellman
Title: Harnessing Apoptosis for Enhanced Tissue Preservation during Decellularization
Department: Biomedical Engineering, University of Florida

7. Primary Author: Daniel Stewart
Title: Viscoelastic Characterization of Brain Tissue Surrogates
Department: Biomedical Engineering, University of Florida

8. Primary Author: Timothy Pham
Title: Surface Finishing of Biodegradable Stents
Department: Mechanical and Aerospace Engineering, University of Florida

9. Primary Author: Brian Wingender
Title: Self-Assembled Collagen for Better Bone Mimics via PILP Processing
Department: Materials Science and Engineering, University of Florida

10. Primary Author: Nicholas Abuid

Title: Bioactive Covalent Layer-by-Layer Platforms for Cellular Encapsulation
Department: Biomedical Engineering, University of Florida

11. Primary Author: Glendon Plumton
Title: Macroporous 3D Scaffolds for Studying MSC Migration and Differentiation within Cartilage Defects
Department: Biomedical Engineering, University of Florida

12. Primary Author: Shannon Brown
Title: Nanoparticle Targeting to Cartilage: Effects of Surface Charge on Nanoparticle Interactions with Joint Tissues
Department: Biomedical Engineering, University of Florida

13. Primary Author: Margaret Fettis
Title: Microgels with tunable affinity-controlled protein release via Desolvation of self-assembled peptide nanofibers
Department: Biomedical Engineering, University of Florida

14. Primary Author: Michael Kwan
Title: Inorganic Oxide Development of Radiopharmaceuticals
Department: Materials Science and Engineering, University of Florida

15. Primary Author: Kaileigh Rock
Title: Poly(Ethyleneglycol) as a Drug Delivery Vehicle to Mitigate Neural Inflammation
Department: Biomedical Engineering, University of Florida

16. Primary Author: Laura Villada
Title: Amphiphilic Hydrogels: Correlation Between Structure and Antifouling Performance
Department: Materials Science and Engineering, University of Florida

17. Primary Author: Maeve Budi
Title: Biophasic Ceramic Nanomaterials
Department: Materials Science and Engineering, University of Florida

18. Primary Author: Zachary Greenberg
Title: Copper Capillary Hydrogel Synthesis and Purification for Biomedical Applications
Department: Chemistry, University of Florida

19. Primary Author: Adrian Figg
Title: Efficient Polymer End Group Modifications for Use in Nanomedicine
Department: Chemistry, University of Florida

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Notes

Thank you

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J. Crayton Pruitt Family Department of Biomedical Engineering

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