

Jennifer Nicole Hanson

University of Illinois
3009 Materials Research Laboratory (MRL)
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Education

University of Illinois at Urbana-Champaign, IL

PhD candidate, Material Science and Engineering, expected graduation date: December 2009
Dissertation Adviser: Professor Ralph Nuzzo
GPA: 3.53/4.00
Research Interests: biomaterials, microfluidics, cell culture, tissue engineering, soft lithography

University of Illinois at Urbana-Champaign, IL

Strategic Technology Management (STM) Graduate Certification Program, expected completion: May 2009

University of Michigan at Ann Arbor, MI

B.S.E. Material Science and Engineering, with honors, 2004
GPA: 3.4/4.0

Research Experience

- **Research Assistant, University of Illinois at Urbana-Champaign** **2004-Present**
 - Involved in the multi-collaboration project (Professor Ralph Nuzzo, Professor Jonathan Sweedler, and Professor Martha Gillette) "Neural Repair in Microcircuit Domain" funded by the Keck Foundation that combines microfluidic platforms with primary cell culture to elucidate characteristic behavior (August 2004-August 2008)

Textural Guidance Cues for Controlling Process Outgrowth of Mammalian Neurons

- Created microfabricated conical arrays of PDMS (polydimethylsiloxane) via modified decal transfer lithography technique of various dimensions, with features as large as 100 μm considered
- Primary hippocampal neurons were plated on the substrates and processed for 7 DIV
- Resulting neuronal outgrowth was intensely analyzed using manual neuron tracing software, NeuroLucida
- Found that large feature sizes (100 μm) can significantly affect process outgrowth in a fundamentally different way than smaller feature sizes (10 μm)

Microfluidic Contact Printing: A Versatile Printing Platform for Patterning Biomolecules on Hydrogel Substrates

- Collaboratively developed novel, reusable platform to decorate hydrogel substrates with biomolecules
 - System utilizes streptavidin/biotin linkage to create long-term patterns/gradients
 - Have shown that the system is capable of printing representative examples of peptides, polysaccharides and proteins
 - System has high patterning efficiency, as the device and substrate to be patterned are separate entities
 - Current work involves optimization of printing parameters to make the substrates compatible for cell growth

Direct-Write Assembly of 3D Hydrogel Scaffolds for Guided Cell Growth

- Collaboratively working with Dr. Jennifer Lewis to use scaffolds created through direct-ink writing for directed cell growth
 - Initially, cultured murine fibroblast cells on scaffolds, to determine biocompatibility of the hydrogel material
 - Current work involves investigating the potential for the scaffold to serve as 3D growth environment for primary hippocampal neurons

- We will explore the potential to functionalize the hydrogel scaffolds in different ways (such as through chemical incorporation of a small peptide sequence, like RGD or increasing/decreasing the cross-linking density to change the elastic moduli)
- We will also investigate the partitioning of different proteins, growth factors or anti-inflammatory drugs into the scaffold to determine the potential as a drug delivery vehicle
- **Undergraduate research assistant** (Professor David Martin, University of Michigan, May 2003-July 2004)
 - Researched cell/hydrogel interactions
 - Manipulated Neuroblastoma cells with concurrent treatment of retinoic acid (RA) and nerve-growth factor (NGF) to promote neuron-like behavior
 - Treated cells were encapsulated in alginate hydrogels, infused with NGF

Consulting Experience

- “Business Technical Consulting” (Instructor Adjunct Lecturer Jeffrey Kurtz), spring 2007
 - Evaluated available opportunities to expand client base, increase revenue and maximize advertising budget for small online business
 - Conducted online survey to assess client/non-client background, knowledge (of industry) and satisfaction
 - Responsibilities included: organizing client interactions, coordinating efforts of team on project goals, and compiling final report and presentation for client
 - Determined that company website needed to be improved, provided suggestions for that and assembled list of seven potential advertising opportunities that fell within the client’s advertising budget
- OTCR (Office of Technical Consulting Resources)
 - Conducted a study on Generation Y that would be sold to clients to improve recruitment and retention of these young workers
 - Conducted a national survey of college age students to gain insight on their values, habits, etc.
 - Created a summarized report of our findings

Awards

University of Illinois

- One of four students selected from UIUC to attend first annual GEM4 conference held at MIT (Global Enterprise for Micro-Mechanics and Molecular Medicine)
 - Topic: Cell and Molecular Mechanics in Biomedicine with a focus on infectious diseases (*specifically Malaria*)
 - Two week summer school session that featured guest speakers from technical experts around the world
- Hamer Fellowship, awarded to exceptional incoming graduate students, Department of Material Science and Engineering, University of Illinois (Aug. 2004-Aug. 2005)

University of Michigan

- Caterpillar Inc. National Scholarship for Women in Engineering (Nov. 2003)
- Society of Plastics Engineers Scholarship (Aug. 2003)
- Selected recipient of J. Freeman Scholarship from Material Science Department, University of Michigan (June 2002, 2003)
- Foundry Education Foundation Scholarship (May 2003)
- Marian Sarah Parker Scholar, University of Michigan (Nov. 2002)
 - Awarded to select women based on both GPA and their potential to enter graduate school
 - Honorary program sponsored by College of Engineering
 - Program supports engineering research project
- Citizen’s Foundation of America Scholarship (April 2002)
- Consern National Scholarship (Aug. 2000)

Professional Affiliations

- Alpha Sigma Mu, Materials Honor Society
- Materials Research Society (MRS)

Publications

- Jennifer N. Hanson, Michael J. Motola, Michael L. Heien, Martha Gillette, Jonathan Sweedler and Ralph G. Nuzzo, Textural Guidance Cues for Controlling Process Outgrowth of Mammalian Neurons, Lab Chip, 2009, 9 (1), 122-131.
- Robert A. Barry III, Robert F. Shepherd, Jennifer N. Hanson, Jennifer A. Lewis, Ralph G. Nuzzo, Pierre Wiltzius, Direct-Write Assembly of 3D Hydrogel Scaffolds for Guided Cell Growth, accepted Advanced Materials.

Presentations

- Selected to give talk, Spring MRS, San Francisco, CA: J.N. Hanson, et al, "Textural Guidance Cues for Controlling Process Outgrowth of Mammalian Neurons"
- Co-presentation, poster, Fall 2009 MRS, Boston, MA: S.T. Parker, J.N. Hanson, et al, "Direct-Write Assembly of 3D Microperiodic Hydrogel Scaffolds for Tissue Engineering Applications"
Best Poster Nominee

Patent Disclosures

- R.F. Shepherd, R.A. Barry, J.N. Hanson, S. Parker, J.A. Lewis, R.G. Nuzzo, P. Wiltzius, "Direct Writing of 3D Tissue Engineering Scaffolds" (filed January 2009)

Community Involvement

- Serve as outreach event volunteer for Champaign County Humane Society
 - Interact with community members as knowledgeable source concerning shelter practices and policies

References

Ralph Nuzzo, Professor of Chemistry
University of Illinois at Urbana-Champaign
(217) 244-0809, r-nuzzo@uiuc.edu

Jeffrey Kurtz, Adjunct Lecturer, Business Administration
University of Illinois at Urbana-Champaign
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