

PROF. DR. IR. JENNIFER PATTERSON

CURRICULUM VITAE

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EDUCATION

Ph.D., Department of Bioengineering, University of Washington (UW), 2001-2007

- Dissertation: Regenerative Matrices for Oriented Bone Growth in Craniofacial and Dental Repair

B.S.E., Department of Chemical Engineering, Princeton University, 1994-1998

- Undergraduate Thesis: Characterization of *De Novo* β -Sheet Proteins by Electron Microscopy
 - Certificate (minor) in the Program in Theatre and Dance
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AWARDS AND HONORS

Whitaker International Scholarship (post-doctoral fellowship) – 2007-2009

National Science Foundation Graduate Fellowship – 2003-2006

Henry L. Gray Memorial Fellowship (UW) – 2001-2002

Sigma Xi Grant-in-Aid-of-Research – 2006

Society of Women Engineers (SWE) Outstanding Graduate Female Award for Department of Bioengineering (UW) – 2006

Finalist in National Student Poster Competition (SWE National Conference) – 2006

Student Travel Award (BMES Annual Meeting) – 2003

FUNDED RESEARCH PROJECTS

Principal Investigator, CREA-financiering/Bijzonder Onderzoeksfonds (BOF), KU Leuven, for ‘Controlled spatial patterning of ligand presentation within hydrogels’

RESEARCH AND WORK EXPERIENCE

Assistant Professor (tenure track), Department of Metallurgy and Materials Engineering, KU Leuven, Leuven, Belgium – 2011 to present

- PI in research division Prometheus with a focus on biomaterials development for skeletal tissue engineering
- Research interests include development of biomimetic hydrogel systems for controlled presentation/delivery of bioactive molecules, peptide-functionalized materials, patterned scaffold design, and application of *in situ* imaging technologies

Post-doctoral Fellow, Laboratory for Regenerative Medicine and Pharmacobiology, Institute for Bioengineering, Ecole Polytechnique Fédérale de Lausanne (Swiss Federal Institute of Technology), Lausanne, Switzerland – 2007-2011

- Mentor – Dr. Jeffrey Hubbell

- Developed and tested molecularly engineered PEG hydrogel scaffolds for angiogenesis and for other tissue regeneration applications
- Incorporated new peptide sequences (cell adhesive ligands, protease sensitive substrates, growth factor binding ligands) into these polymer-peptide hydrogels to tailor their cell-responsive properties
- Developed drug delivery systems for cartilage repair in collaboration with a major pharmaceutical company

Graduate Research Associate, Department of Bioengineering, UW, Seattle, WA – 2001-2007

- Thesis advisor – Dr. Patrick Stayton
- Designed degradable hyaluronic acid hydrogel scaffolds for the controlled spatial and temporal release of growth factors to aid in bone regeneration
- Developed an animal model to allow non-invasive imaging of healing in the rat calvarial bone critical size defect using optical coherence tomography (OCT) (collaboration with Dr. Xingde Li for OCT imaging)
- Initial gene therapy research project with Dr. Jeffrey Bonadio to examine the ability of adeno-associated virus (AAV) vectors to transduce mesenchymal stem cells (MSCs)

Technical Project Coordinator, Therics, Inc., Princeton, NJ – 2000-2001

Research Associate, Therics, Inc., Princeton, NJ – 1998-2000

- Designed scaffolds for bone repair applications using 3-dimensional printing (3DP) technology, varying scaffold composition and architecture to influence bone ingrowth
- Generated prototypes based on a product concept, which has resulted in Therics' initial product, the TheriLok™ bone void filler
- Established a tissue culture facility for the *in vitro* evaluation of scaffolds

Undergraduate Research Project, Princeton University, Princeton, NJ – 1997-1998

- Senior thesis advisor – Dr. Michael Hecht
- Discovered that members of a subset of a library of *de novo* β -sheet proteins designed by combinatorial methods adopt a structure similar to amyloid fibrils

Research Assistant, MIT, Cambridge, MA – Summers 1996, 1997

- Undergraduate summer research projects (NSF REU) with Dr. Jonathan King
- Utilized transmission electron microscopy to probe the structure of folding intermediates of the bacteriophage P22 tailspike protein

TEACHING AND MENTORING EXPERIENCE

Guest Lecturer, BIOEN 305 – Introduction to Bioengineering Analysis of Physiology II, Department of Bioengineering, UW, Seattle, WA – Winter 2006

Teaching Assistant, BIOEN 305, Department of Bioengineering, UW, Seattle, WA – Winters 2004 and 2005

- Responsibilities during 2004 included maintaining class website, grading homework assignments and lab reports, running lab sections, holding office hours, and giving two lectures during the quarter (developed new lecture topic on bone)
- Responsibilities during 2005 also included developing a module on the renal system, including preparing and giving lectures, designing a lab experiment, and writing problem set and exam questions

- In 2006, served as a guest lecturer and delivered module on the renal system, modifying the lectures to encourage class participation and include current examples as well as modifying the problem set and exam questions to be more challenging and include engineering calculations in addition to basic physiology topics

Instructor, Communications Class, UWEB REU Program, UW, Seattle, WA – Summers 2004 and 2005

- Class was designed to introduce undergraduate students conducting summer research projects to aspects of scientific communication
- As primary instructor, responsibilities included preparation and delivery of lectures as well as design and evaluation of practice exercises

Mentor, Laboratory for Regenerative Medicine and Pharmacobiology, Institute for Bioengineering, Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland – 2008-2011

- Mentored two visiting Ph.D. students, one Master's student, and two Bachelor's students

Mentor, Department of Bioengineering, UW, Seattle, WA – 2003-2006

- Mentored two students for year-long undergraduate research projects
- Mentored two additional undergraduate students: one working with image processing and one through Temple University's Physician Scientist Training Program

PROFESSIONAL MEMBERSHIPS AND UNIVERSITY SERVICE

Society of Women Engineers – women in academia committee (2012 to present), international member coordinator (2010-2012), international member team membership lead (2008-2010), graduate student special interest group (2006-2008), outreach coordinator for UW student chapter (2004-2006), presented sessions as part of academic track for the national conference (2006, 2009, 2010), Princeton University chapter president (1997-1998), secretary (1996-1997), vice president (1995-1996), and activities chair (1994-1995), member (1994 to present)

Society of Sigma Xi (1998 to present)

Optical Society of America (2006 to present)

Society for Biomaterials (2006-2007, 2009-2011)

Tissue Engineering & Regenerative Medicine International Society (TERMIS) – session student co-chair at conference (2006, 2010), member (2006-2007, 2010-2011)

Faculty Council on Faculty Affairs (UW) – graduate student representative (2006-2007)

Council on Educational Policy (College of Engineering, UW) – graduate student representative (2004-2005)

Curriculum Committee (Department of Bioengineering, UW) – graduate student representative (2004-2006)

Student Leadership Council (UWEB, UW) – social chair (2002-2006)

Bioengineering Students Association (UW) – secretary (2002-2003)

IEEE Transactions on Medical Imaging, Journal of Biomedical Optics, Journal of Biomedical Materials Research: Part A, and European Polymer Journal – reviewer (2009 to present)

PUBLICATIONS

Patterson J, Pak MG, Huber P, Takeno MM, Herring SW, Gross TS, Hauch KD, Stayton PS & Li X. Optical coherence tomography for *in situ* temporal characterization of bone regeneration induced by angiogenic and osteoinductive hydrogel scaffolds. In preparation.

Patterson J & Hubbell JA. SPARC-derived protease substrates to enhance the plasmin sensitivity of molecularly engineered PEG hydrogels. *Biomaterials*. 2011 Feb; 32(5):1301-10. (Impact factor: 7.404; # citations: 8)

Patterson J & Hubbell JA. Enhanced proteolytic degradation of molecularly engineered PEG hydrogels in response to MMP-1 and MMP-2. *Biomaterials*. 2010 Oct; 31(30):7836-45. (Impact factor: 7.404, # citations: 32)

Patterson J, Siew R, Herring SW, Lin ASP, Guldberg R & Stayton PS. Hyaluronic acid hydrogels with controlled degradation properties for oriented bone regeneration. *Biomaterials*. 2010 Sep; 31(26):6772-81. (Impact factor: 7.404; # citations: 39)

Patterson J*, Martino MM* & Hubbell JA. Biomimetic materials in tissue engineering. *Materials Today*. 2010 Jan-Feb; 13(1):14-22. (*contributed equally) (Impact factor: 5.565; # citations: 38)

Patterson J, Stayton PS & Li X. *In situ* characterization of the degradation of PLGA microspheres in hyaluronic acid hydrogels by optical coherence tomography. *IEEE Trans Med Imaging*. 2009 Jan; 28(1):74-81. (Impact factor: 3.643; # citations: 7)

West MW, Wang W, **Patterson J**, Mancias JD, Beasley JR & Hecht MH. *De novo* amyloid proteins from designed combinatorial libraries. *Proc Natl Acad Sci U S A*. 1999 Sep 28; 96(20):11211-6. (Impact factor: 9.681; # citations: 208)

BOOK CHAPTERS

Patterson J. (2011) Imaging hydrogel implants *in situ*. Pages 228-256 in *Biomedical Hydrogels: Biochemistry, Manufacture, and Medical Applications*, (edited by S. Rimmer) Woodhead Publishing Ltd., UK.

Hecht MH, West MW, **Patterson J**, Mancias JD, Beasley JR, Broome BM & Wang W. (2001) Designed combinatorial libraries of novel amyloid-like proteins. Pages 127-138 in *Self-assembling Peptide Systems in Biology, Medicine and Engineering*, (edited by A. Aggeli, N. Boden, S. Zhang) Kluwer Academic Publishers, The Netherlands.

PATENTS

Beam HA, Bradbury TJ, Chesmel KD, Gaylo CM, Litwak AA, Liu Q, Materna PA, Monkhouse D, **Patterson J**, Pryor TJ, Saini S, Surprenant HL, Wang CC, West TG, & Yoo J. Method and apparatus for engineered regenerative biostructures such as hydroxyapatite substrates for bone healing applications. US Patent #7,122,057 (October 2006).

CONFERENCE ABSTRACTS

Patterson J, & Hubbell JA. Engineered PEG hydrogels with enhanced proteolytic degradation for presentation of angiogenic signals. Society for Biomaterials; April 2011, Orlando, FL, USA. (*Oral Presentation*)

Patterson J, & Hubbell JA. Tunable proteolytic degradation of molecularly engineered PEG hydrogels to enhance cellular invasion. Biomedical Engineering Society; October 2010, Austin, TX, USA. (*Oral Presentation*)

Patterson J, & Hubbell JA. Enhancing the proteolytic degradation of molecularly engineered PEG hydrogels for angiogenesis applications. TERMIS-EU; June 2010, Galway, Ireland. (*Rapid-fire Presentation*)

Patterson J, & Hubbell JA. Tunable proteolytic degradation of molecularly engineered PEG hydrogels for enhanced cellular invasion. Society for Biomaterials Annual Meeting; April 2010, Seattle, WA, USA. (*Oral Presentation*)

Patterson J, & Hubbell JA. Tunable proteolytic degradation of molecularly engineered PEG hydrogels. European Society for Biomaterials; September 2009, Lausanne, Switzerland. (*Oral Presentation*)

Patterson J, & Hubbell JA. Molecularly engineered PEG hydrogels with enhanced proteolysis. Society for Biomaterials Annual Meeting; April 2009, San Antonio, TX, USA. (*Oral Presentation*)

Patterson J, Siew R, Lin ASP, Guldberg RE, Herring SW, & Stayton PS. Degradable hyaluronic acid hydrogels for oriented bone regeneration. World Biomaterials Congress; May 2008, Amsterdam, Netherlands. (*Oral presentation*)

Patterson J, Siew R, Pak MG, Herring SW, Li X, & Stayton PS. Angiogenic and osteoinductive hydrogel scaffolds for bone regeneration. Society of Women Engineers' National Conference; October 2006, Kansas City, MO, USA. (*Poster competition finalist*)

Patterson J, Siew R, Herring SW & Stayton PS. Angiogenic and osteoinductive hydrogel scaffolds for bone regeneration. Society for Biomaterials Annual Meeting; April 2006, Pittsburgh, PA, USA. (*Oral presentation*)

Patterson J, Siew R, Herring SW, Li X & Stayton PS. Temporal characterization of bone regeneration induced by angiogenic and osteoinductive hydrogel scaffolds. Regenerate World Congress on Tissue Engineering and Regenerative Medicine; April 2006, Pittsburgh, PA, USA. (*Poster presentation*)

Patterson J, Herring SW, Stayton PS & Li X. *In vivo* imaging of bone regeneration induced by angiogenic and osteoinductive hydrogel scaffolds. Biomedical Optics Meeting (Optical Society of America); March 2006, Fort Lauderdale, FL, USA. (*Poster presentation*)

Siew R, **Patterson J**, McGonigle J, Scatena M, Herring S & Stayton PS. Characterization of hyaluronic acid hydrogels with OPG for bone regeneration. Sigma Xi Annual Meeting and Student Research Conference; November 2005, Seattle, WA, USA. (*Gold ribbon awarded to Ruth in undergraduate poster competition*)

McGonigle JS, Huynh D, **Patterson J**, Stayton PS, Hoffman AS, Giachelli CM & Scatena M. Controlled release of osteoprotegerin for the promotion of angiogenesis. The American Society for Cell Biology 2005 Summer Meeting on Engineering Cell Biology—The Cell in Context; July 2005, Seattle, WA, USA.

Patterson J, Herring SW, Stayton PS & Li X. Optical coherence tomography of bone tissue engineering scaffolds. BIOS 2005 (The International Society for Optical Engineering); January 2005, San Jose, CA, USA. (*Oral presentation*)

Patterson J, Li X, Herring SW & Stayton PS. Regenerative matrices for the controlled release of osteogenic factors. Regenerate; June 2004, Seattle, WA, USA. (*Oral presentation*)

Patterson J & Stayton PS. Regenerative matrices for oriented craniofacial bone growth. Biomedical Engineering Society; October 2003, Nashville, TN, USA. (*Oral presentation*)

Simon JL, Parsons JR, Rekow ED, Chesmel K, **Patterson J**, Thompson VP, Kemnitzer J & Ricci JL. Effect of pore architecture on bone in-growth in 3-D printed scaffolds. Society for Biomaterials Annual Meeting; April 2002, Tampa, FL, USA.

Dutta Roy T, **Patterson J**, Chesmel K, Simon J, Rekow D, Thompson V, Ricci J & Parsons R. *In vivo* histological response of ceramic structures created via three-dimensional fabrication techniques. Society for Biomaterials Annual Meeting; April 2002, Tampa, FL, USA.

Dutta Roy T, **Patterson J**, Chesmel K, Payumo F, Doshi A, Choi J & Parsons JR. An *in vivo* analysis of bone repair products made by three-dimensional fabrication techniques. Orthopedic Research Society; February 2001, San Francisco, CA, USA.

Dutta Roy T, **Patterson J**, Chesmel K, Payumo F, Sabatino C, Nadkarni P, Hoonjan A & Parsons JR. *In vivo* analysis of materials for bone repair products made by three-dimensional fabrication techniques. Society for Biomaterials Annual Meeting; April 2001, Saint Paul, MN, USA.