

JENNIFER PATTERSON, PH.D.

CURRICULUM VITAE

Contact Information: jennifer.patterson@kuleuven.be pattersn@alumni.princeton.edu

EDUCATION

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

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

B.S.E., Department of Chemical Engineering, Princeton University, USA, 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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ACADEMIC AWARDS AND HONORS

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

National Science Foundation Graduate Fellowship (USA) – 2003-2006

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

Society of 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

RESEARCH AND WORK EXPERIENCE

Assistant Professor, Department of Materials Engineering, KU Leuven, Leuven, Belgium – 2011-2017

Voluntary Researcher, Department of Materials Engineering, KU Leuven, Leuven, Belgium – 2017-present

- Head of research group on ‘Materials-Biology Interface Science’
- Research interests include development of biomimetic hydrogel systems for controlled presentation/delivery of bioactive molecules, peptide-functionalized materials, patterned scaffold design, and applications in tissue engineering

Postdoctoral 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 – Prof. Jeffrey Hubbell
- Developed and tested molecularly engineered polyethylene glycol (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, USA – 2001-2007

- Thesis advisor – Prof. 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 Prof. Xingde Li for OCT imaging)
- Initial gene therapy research project with Prof. Jeffrey Bonadio to examine the ability of adeno-associated virus (AAV) vectors to transduce mesenchymal stem cells

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

Research Associate, Therics, Inc., Princeton, NJ, USA – 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, USA – 1997-1998

- Senior thesis advisor – Prof. 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, USA – Summers 1996, 1997

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

RESEARCH FUNDING

FWO (Research Foundation – Flanders) research projects

- Development of a biomimetic cornea combining additive manufacturing and stem cell technologies, G.0B39.14, Marie-José Tassignon, Eleonora Ferraris, Jennifer Patterson, Nadia Zakaria (University of Antwerp and KU Leuven) – 2014-2017
- Development and fabrication of clinically relevant polymer-based stents for chronic rhinosinusitis, G.0831.17N, Peter Dubruel, Eleonora Ferraris, Jennifer Patterson, Sandra Van Vlierberghe, Thibaut Van Zele (University of Ghent, Free University of Brussels, and KU Leuven) – 2017-2020

KU Leuven internal funding of research projects

- Characterization and re-creation of the hematopoietic stem cell (HSC) niche, IDO/13/016, Catherine Verfaillie, Jennifer Patterson, Herman Ramon, Hans Van Oosterwyck – 2014-2018
- Controlled spatial patterning of ligand presentation within hydrogels, CREA/13/017, Jennifer Patterson – 2013-2016

FWO/TÜBITAK international exchange project

- Computational model-informed strategies for the bio-manufacturing of 3D patterned constructs for the treatment of large, non-healing bone defects, VS.056.14N, Hans Van Oosterwyck, Eleonora Ferraris, Bahattin Koç, Jennifer Patterson (KU Leuven and Sabanci University) – 2014-2016

Fund for Research in Ophthalmology (FRO, Belgium)

- 3D printed human recombinant collagen scaffolds for corneal tissue engineering: an *in vivo* study of biocompatibility, Steffi Matthyssen, Eleonora Ferraris, Jennifer Patterson, Marie-José Tassignon, Nadia Zakaria (University of Antwerp and KU Leuven) – 2016-2017

- 3D printed human recombinant collagen scaffolds for corneal tissue engineering: determination of cell-scaffold interactions, Steffi Matthysen, Eleonora Ferraris, Jennifer Patterson, Nadia Zakaria (University of Antwerp and KU Leuven) – 2015-2016

MENTORING EXPERIENCE

Supervisor and co-supervisor, Department of Materials Engineering, KU Leuven, Leuven, Belgium – 2011 to present

- Postdoctoral fellows as supervisor
 - Dr. Susanna Piluso (10/2014-6/2017)
 - Dr. Al Halifa Soultan (10/2014-5/2017)
- Postdoctoral fellows as co-supervisor
 - Dr. Johanna Bolander (10/2016-3/2017)
 - Dr. Taíla de Oliveira Meiga (11/2014-9/2016)
- Ph.D. students as supervisor
 - Abhijith Kudva (6/2012 to present)
 - Laurien Van den Broeck (10/2013 to present)
 - Christian José García-Abrego (9/2016 to present)
- Ph.D. students as co-supervisor
 - Laurens Rutgeerts (1/2016 to present)
 - Rory Gibney (1/2016 to present)
- Predoctoral students as supervisor
 - Burak Toprakhisar (10/2016 to present)
 - Sally Homsy (10/2012-10/2014)
- Predoctoral students as co-supervisor
 - Kurt Coppens (4/2014-9/2015)
- Master students as supervisor
 - Ricardo Augusto (2017): Erasmus (exchange student)
 - Denise Willems (2015-2016): Master in Materials Engineering
 - Hui Shi (2015-2016): Master in Materials Engineering
 - Yafei Li (2015-2016): Master in Materials Engineering
 - Weitong Sun (2015-2016): Master in Materials Engineering
 - Merve Saygi (2015-2016): Erasmus (exchange student)
 - Shuqiong Liang (2014-2015): Master in Materials Engineering
 - Yujing He (2014-2015): Master in Materials Engineering
 - Kubra Burcu Akkaya (2013-2014): Erasmus (exchange student)
 - Çiğdem Demirkaya (summer 2013): Erasmus (exchange student)
- Master students as co-supervisor
 - Jasper Timmerman (2016-2017): Master in Nanoscience, Nanotechnology, and Nanoengineering
 - Maria Lucia Natali (2016-2016): University of Salento, Master in Materials Engineering and Nanotechnology
 - Christophe Kennis (2015-2016): Master in Engineering Technology
 - Maarten Kempnaers (2015-2016): Master in Engineering Technology
 - Xiomara Gislen Fernández Garibay (2015-2016): Erasmus Mundus Master of Science in Nanoscience and Nanotechnology
 - Hsiu-Yu Huang (2014-2015): Master in Materials Engineering
 - Jolien Schoofs (2014-2015): Master in Biomedical Engineering
 - Cedric Plettinx (2014-2015): Erasmus Mundus Master of Science in Nanoscience and Nanotechnology

- Rosario Amaris Guevara Garcia (2014-2015): Erasmus Mundus Master of Science in Nanoscience and Nanotechnology
- Stijn Wouters (2013-2014): Master in Engineering Technology
- Jenko Loret (2013-2014): Master in Engineering Technology
- Fang-Wei Liu (2013-2014): Erasmus Mundus Master of Science in Nanoscience and Nanotechnology
- Juan Ramirez (2013-2014): Erasmus Mundus Master of Science in Nanoscience and Nanotechnology
- Bachelor students as supervisor
 - Rutger Duflo (2014-2015): Bachelor in Materials Engineering
 - Evita Willems (2013-2014): Bachelor in Materials Engineering

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 student, and two bachelor students

Mentor, Department of Bioengineering, UW, Seattle, WA, USA – 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

TEACHING EXPERIENCE

Lecturer, H0T59A – Host Response to Implanted Materials, Department of Materials Engineering, KU Leuven, Belgium – Fall semester 2016

Lecturer, H00S5A – Biomaterials II, Department of Materials Engineering, KU Leuven, Belgium – Spring semesters 2014, 2015, and 2016

Lecturer, ATHENS KUL22 – Next Generation Biomaterials, Department of Materials Engineering, KU Leuven, Belgium – November 16-20, 2015; March 13-17, 2017

- Developed new courses on advanced topics in biomaterials science, including the host response to biomaterials, next generation biomaterials, and *in vitro* and *in vivo* characterization of biomaterials (biomaterials II)

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

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

- Responsibilities during 2004 and 2005 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, USA – 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

PROFESSIONAL MEMBERSHIPS AND SOCIETY SERVICE

Sigma Xi: The Scientific Research Honor Society (1998 to present) – Canadian/international representative on the nominating committee (2013-2016)

Society of Women Engineers (1994 to present) – international ambassador (2014-present); award and scholarship judge (2014 to present); women in academia committee chair (2014-2015) and chair-elect (2013-2014); international senator (2014-2015) and alternate (2012-2014); international member coordinator (2010-2012) and team membership lead (2008-2010); graduate student special interest group (2006-2008); outreach coordinator for UW chapter (2004-2006); Princeton University chapter president (1997-1998), secretary (1996-1997), vice president (1995-1996), activities chair (1994-1995)

Biomedical Engineering Society (2003 to present) – session chair and/or abstract reviewer for annual meetings (Tampa, USA, 7-10 October 2015; Minneapolis, USA, 5-9 October 2016; Phoenix, USA, 11-14 October 2017), member of international affairs subcommittee since 2016

Society for Biomaterials (2006 to present) – session chair for annual meeting (Charlotte, USA, 15-18 April 2015), abstract reviewer for annual meeting (Minneapolis, USA, 5-8 April 2017)

Tissue Engineering & Regenerative Medicine International Society (TERMIS; 2006 to present) – student session co-chair at conference (2006, 2010), session chair at TERMIS-AM (Washington, USA, 13-16 December 2014), session chair at TERMIS World Congress (Boston, USA, 8-11 September 2015)

Optical Society of America (2006 to present)

UNIVERSITY/PROFESSIONAL SERVICE

External Examiner for the University of Limerick (Ireland) master of science in biomedical device materials for the academic years 2015-2016 through 2018-2019

Grant Reviewer for Netherlands Ministry of Education, Culture and Science (OCW) for the program strategic scientific alliance between China and the Netherlands (2016); the Agence Nationale de la Recherche (ANR) in France for their project proposals in 2014, 2015, and 2017 and pre-proposals in 2015; the international fellowship program WHRI-ACADEMY (COFUND Marie Curie) for their 1st (2014), 4th (2015), 5th (2016), and 6th (2017) calls; the KU Leuven internal funds C3 proposals (2014-2015) and CREA proposals (2013-2014); and the Terry Fox Foundation for Cancer Research Project Grants (2013)

Guest Editor for *Journal of Functional Biomaterials* special issue on “Biomimetic Materials for Regenerative Medicine” (2017)

Member of the Review Editorial Board of Biomaterials, which is a specialty of *Frontiers in Bioengineering and Biotechnology* and *Frontiers in Materials* (since 2014)

Reviewer for manuscripts submitted to a number of journals in the areas of biomaterials, drug delivery, and nanotechnology, including *ACS Biomaterials Science & Engineering*, *Biomaterials* (IF 8.557), *Acta Biomaterialia* (IF 6.025), *Nanomedicine* (IF 5.413), *Journal of Tissue Engineering and Regenerative Medicine* (IF 4.710), *International Journal of*

Nanomedicine (IF 4.383), *Carbohydrate Polymers* (IF 4.074), *Bone* (IF 3.973), *Journal of the Royal Society Interface* (IF 3.917), *Tissue Engineering* (IF 3.892), *International Journal of Pharmaceutics* (IF 3.650), *Journal of Biomedical Materials Research: Part A* (IF 3.369), *Polymers* (IF 3.364), *International Journal of Pharmaceutics* (IF 3.649), *Materials* (IF 2.728), *Interface Focus* (IF 2.630), *Journal of Pharmacy and Pharmacology* (IF 2.264), *Nanomaterials* (IF 2.076), *Functional Materials Letters* (IF 1.606), and *Australian Journal of Chemistry* (IF 1.427)

During Ph.D. at the University of Washington: 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)

MEDIA ATTENTION AND HONORS

Selected by the European Commission, DG R&I, to be a ‘visual testimonial’ for non-European researchers who have come to work in the EU, which was incorporated in a booth ‘Destination Europe’ at the AAAS meeting in San Jose, USA, in February 2015

Featured on the front page of the Belgian newspaper *De Tijd* (May 27, 2015): Vlaamse universiteiten maken hoornvlies met 3D-printer (Flemish universities make cornea with 3D printer)

PUBLICATIONS (INTERNATIONALLY REVIEWED ACADEMIC JOURNALS)

Soultan, A.*, Verheyen, T.*, Smet, M., DeBorggraeve, W.#, **Patterson, J.#** Synthesis and peptide functionalization of hyperbranched polymers to create a versatile platform of novel biomaterials. Submitted. (#joint last author)

Kudva, A., Luyten, F., **Patterson, J.** (2017). Initiating human articular chondrocyte re-differentiation in a 3D system after 2D expansion. *Journal of Materials Science: Materials in Medicine*, in press.

Invited contribution for a special issue on “Emerging Group Leaders: Research and Reflections on Career Goals”

Kudva, A., Luyten, F., **Patterson, J.** (2017). RGD-functionalized polyethylene glycol hydrogels support proliferation and in vitro chondrogenesis of human periosteum-derived cells. *Journal of Biomedical Materials Research: Part A*, in press.

Chai, Y., Bolander, J., Papantoniou, I., **Patterson, J.**, Vleugels, J., Schrooten, J., Luyten, F. Harnessing the osteogenicity of in vitro stem cell-derived mineralized extracellular matrix as 3D biotemplate to guide bone regeneration. (2017). *Tissue Engineering Part A*, Epub ahead of print (citations: 0) (most recent IF: 3.89).

Leonidakis, K., Bhattacharya, P., **Patterson, J.**, Vos, B., Koenderink, G., Vermant, J., Lambrechts, D., Roeffaers, M., Van Oosterwyck, H. (2017). Fibrin structural and diffusional analysis suggests that fibers are permeable to solute transport. *Acta Biomaterialia*, 47, 25-39. (citations: 1) (most recent IF: 6.01)

Piluso, S.*, Soultan, A.*, **Patterson, J.*** (2017). Molecularly engineered polymer-based systems in drug delivery and regenerative medicine. *Current Pharmaceutical Design*, 23 (2), 281-294. (*contributed equally) (citations: 1) (most recent IF: 3.05)

Carlier, A., Akdeniz Skvortsov, G., Hafezi, F., Ferraris, E., **Patterson, J.**, Koç, B., Van Oosterwyck, H. (2016). Computational model-informed design and bioprinting of cell-patterned constructs for bone tissue engineering. *Biofabrication*, 8 (2), art.nr. 025009. (citations: 1) (most recent IF: 4.7)

Moreira Teixeira, L.*, **Patterson, J.***, Luyten, F. (2014). Skeletal tissue regeneration: where can hydrogels play a role?. *International Orthopaedics*, 38 (9), 1861-1876. (*contributed equally) (citations: 8) (IF publication year: 2.11) (most recent IF: 2.39)

Patterson, J., Hubbell, J. (2011). SPARC-derived protease substrates to enhance the plasmin sensitivity of molecularly engineered PEG hydrogels. *Biomaterials*, 32 (5), 1301-1310. (citations: 46) (IF publication year: 7.4) (most recent IF: 8.39)

Patterson, J., Hubbell, J. (2010). Enhanced proteolytic degradation of molecularly engineered PEG hydrogels in response to MMP-1 and MMP-2. *Biomaterials*, 31 (30), 7836-7845. (citations: 167) (IF publication year: 7.88) (most recent IF: 8.39)

Patterson, J., Siew, R., Herring, S., Lin, A., Guldborg, R., Stayton, P. (2010). Hyaluronic acid hydrogels with controlled degradation properties for oriented bone regeneration. *Biomaterials*, 31 (26), 6772-6781. (citations: 115) (IF publication year: 7.88) (most recent IF: 8.39)

Patterson, J.*, Martino, M.*, Hubbell, J. (2010). Biomimetic materials in tissue engineering. *Materials Today*, 13 (1-2), 14-22. (*contributed equally) (citations: 102) (IF publication year: 6.27) (most recent IF: 17.79)

Patterson, J., Stayton, P., Li, X. (2009). In situ characterization of the degradation of PLGA microspheres in hyaluronic acid hydrogels by optical coherence tomography. *IEEE Transactions on Medical Imaging*, 28 (1), 74-81. (citations: 11) (IF publication year: 3.54) (most recent IF: 3.76)

West, M., Wang, W., **Patterson, J.**, Mancias, J., Beasley, J., Hecht, M. (1999). De novo amyloid proteins from designed combinatorial libraries. *Proceedings of the National Academy of Sciences of the United States of America*, 96 (20), 11211-11216. (citations: 248) (IF publication year: 10.26) (most recent IF: 9.42)

BOOK CHAPTERS

Leonidakis, K., Soutan, A., Piluso, S., Van den Broeck, L., Meiga, T., Gibney, R., **Patterson, J.** (2017). Biomimetic Materials. In: Mishra M. (Eds.), *Encyclopedia of Biomedical Polymers and Polymeric Biomaterials, Concise Edition*, New York, USA: Taylor and Francis, 189-213.

Kudva, A., **Patterson, J.** (2014). Hyaluronic acid incorporation into scaffolds for bone and cartilage regeneration. In: Collins M. (Eds.), *Hyaluronic Acid for Biomedical and Pharmaceutical Applications*, Chapt. 2. Shawbury, UK: Smithers Rapra Publishing, 21-56.

Patterson, J. (2011). Imaging hydrogel implants in situ. In: Rimmer S. (Eds.), *Biomedical hydrogels: biochemistry, manufacture and medical applications*, Chapt. 10. England: Woodhead Publ. Ltd., 228-255.

Hecht, M., West, M., **Patterson, J.**, Mancias, J., Beasley, J., Broome, B., Wang, W. (2001). Designed combinatorial libraries of novel amyloid-like proteins. In: Aggeli A., Boden N., Zhang S. (Eds.), *Self-assembling peptide systems in biology, medicine and engineering*. Dordrecht, Netherlands: Springer, 127-138.

PATENTS

Beam, H., Bradbury, T., Chesmel, K., Gaylo, C., Litwak, A., Liu, Q., Materna, P., Monkhouse, D., **Patterson, J.**, Pryor, T., Saini, S., Surprenant, H., Wang, C., West, T., Yoo, J. (2006). Method and apparatus for engineered regenerative biostructures such as hydroxyapatite substrates for bone healing applications. US Patent #7,122,057.

CONFERENCE PROCEEDINGS PAPERS

Gibney, R., Matthyssen, S., **Patterson, J.**, Ferraris, E., Zakaria, N. (2017). The human cornea as a model tissue for additive biomanufacturing: a review. *Procedia CIRP*. 3rd CIRP Conferenc on BioManufacturing. Chicago, IL, USA, 11-13 July 2017.

Patterson, J., Herring, S., Stayton, P., Li, X. (2006). In vivo imaging of bone regeneration induced by angiogenic and osteoinductive hydrogel scaffolds. *Biomedical Optics, Technical Digest*. Biomedical Optics Meeting (Optical Society of America). Fort Lauderdale, FL, USA, March 2006.

CONFERENCE ABSTRACTS

Author or co-author of 55 abstracts that were presented as oral or poster presentations at conferences including Sigma Xi Annual Meeting and Student Research Conference, World Biomaterials Congress, TERMIS World Congress, Society for Biomaterials Annual Meeting, Biomedical Engineering Society Annual Meeting, International Conference on Biofabrication, European Society for Biomaterials Annual Conference, TERMIS-EU, TERMIS-AM, Belgian Symposium on Tissue Engineering, CIRP, Orthopedic Research Society, Biomaterials for Healthcare: Biomaterials for Tissue and Genetic Engineering and the Role of Nanotechnology, CellMatrix, EuCornea Congress, Association for Research in Vision and Ophthalmology (ARVO), DOPS: Dutch Ophthalmology PhD Students Conference Meeting, COATIM Conference: Anti-infective strategies for medical devices, Advanced Materials for Biomedical Applications, BSRT PhD Symposium, Advances in Tissue Regeneration 2013 Conference, BIOMED Symposium 2013, Bioengineering Congress, Summer School on Biomaterials and Regenerative Medicine, The American Society for Cell Biology 2005 Summer Meeting on Engineering Cell Biology—The Cell in Context, and BIOS 2005.