

# Cole A. DeForest

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## EDUCATION

- California Institute of Technology**, Pasadena, CA March 2012 – November 2013  
Postdoctoral research scholar under Prof. David Tirrell, Division of Chemistry and Chemical Engineering
- University of Colorado**, Boulder, CO June 2011  
Ph.D. in Chemical & Biological Engineering under Prof. Kristi Anseth, Certificate in Molecular Biophysics
- Princeton University**, Princeton, NJ June 2006  
B.S.E. in Chemical Engineering – *Magna Cum Laude* (class rank 3 of 30), Concentration in Bioengineering and Biotechnology, Certificate in Material Science and Engineering; Certificate in Engineering Biology

## PROFESSIONAL EXPERIENCE

- Adjunct Assistant Professor**, Department of Bioengineering 2014 –  
**Core Faculty**, Institute for Stem Cell & Regenerative Medicine 2014 –
- Assistant Professor**, Department of Chemical Engineering 2014 –
- Postdoctoral Research Scholar**, California Institute of Technology, Pasadena, CA 2012 – 2013
- Research Scientist**, GeoSynFuels, LLC, Golden, CO 2011 – 2012

## AWARDS

- Young Investigator Award**, Polymeric Materials: Science & Eng. Division, American Chemical Society 2017
- NSF CAREER Award**, National Science Foundation 2017
- Distinguished Teaching Award** (highest teaching award from UW, 1 awarded/year), University of Washington 2016
- Jaconette L. Tietze Young Scientist Award**, The John H. Tietze Foundation June 2015
- Distinguished Teaching Award Nominee**, University of Washington 2014 & 2015
- Ruth L. Kirschstein Postdoctoral Fellow (*declined*)**, National Institute of Health 2014
- Rising Star / Student Fellow Award**, Biomedical Engineering Society January 2013
- DSM Polymer Technology Award**, DSM and American Chemical Society August 2011
- Excellence in Graduate Polymer Research Award**, American Chemical Society 2010
- Graduate Student Research Gold Award**, Materials Research Society 2009
- Molecular Biophysics Training Grant**, National Institute of Health (NIH) 2007 – 2009
- Biomolecular GAANN Fellowship**, US Dept. of Education 2007 – 2010
- Outstanding Achievement Award**, Society for Biomaterials Annual Meeting April 2009
- First-Year Graduate Research Fellowship**, University of Colorado August 2006
- Material Science Student of the Year**, Princeton University June 2006
- Sigma Xi Chemical Engineering Book Award**, Princeton University June 2006
- Graduate Research Fellowship Honorable Mention**, National Science Foundation 2006 & 2007
- Tau Beta Pi Engineering Honor Society Induction**, Tau Beta Pi 2005
- Most Approachable Resident Advisor**, Princeton University June 2005
- Valedictorian**, Boulder High School, CO June 2002

## PUBLICATIONS (\*denotes corresponding authorship)

- Farahani, P.E., Adelmund, S.M., Shadish, J.A. & **DeForest, C.A.\*** Photomediated Oxime Ligation as a Bioorthogonal Tool for Spatiotemporally-Controlled Hydrogel Formation and Modification. *Journal of Materials Chemistry B*. DOI: 10.1039/c6tb03400d (2017)
- \*\* This article appears on the cover of the June 2017 issue of *Journal of Materials Chemistry B* and was selected for the journal's 2017 Emerging Investigator Award issue
- Swift, B.J., Shadish, J.A., **DeForest, C.A.** & Baneyx, F. Streamlined Synthesis and Assembly of a Hybrid Sensing Architecture with Solid Binding Proteins and Click Chemistry. *Journal of the American Chemical Society*, **139**, 3958-3961 (2017)
- Uto, K. & **DeForest, C.A.** 時空間制御バイオマテリアルを用いた細胞力学記憶メカニズムの解明 Spatiotemporally Tunable Biomaterials for Revealing the Mechanism of Cellular Mechanical Memory (Article in Japanese). *Journal of Japanese Biomaterials*, **35**, 36-41 (2017).
- Uto, K., Aoyagi, T., **DeForest, C.A.**, Hoffman, A.S. & Ebara, M. A Combinational Effect of “Bulk” and “Surface” Shape-Memory Transitions on the Regulation of Cell Alignment. *Advanced Healthcare Materials*, DOI: 10.1002/adhm.201601439 (2017).
- Uto, K., Tsui, J.H., **DeForest, C.A.\*** & Kim, D.H. Dynamically Tunable Cell Culture Platforms for Tissue Engineering and Mechanobiology. *Progress in Polymer Science*, **65**, 53-82 (2016).
- Arakawa, C.K. & **DeForest, C.A.\*** Designing Smart Biomaterials to Mimic & Control the Stem Cell Niche in *Biology and Engineering of Stem Cell Niches*, Elsevier. Oxford, UK. (2016).

- Tibbitt, M.W., Shadish, J.A. & **DeForest, C.A.\*** Photopolymers for Multiphoton Lithography in Biomaterials and Hydrogels. Appears in *Multiphoton Lithography: Techniques, Materials, and Applications*, Wiley Publishing, 183-220 (2016).
- Urrios, A., Parra-Cabrera, C., Bhattacharjee, N., Gonzalez-Suarez, A.M., Rigat-Brugarolas, L.G., Nallapatti, U., Samitier, J., **DeForest, C.A.**, Posas, F., Garcia-Cordero, J.L. & Folch, A. 3D-printing of Transparent Bio-Microfluidic Devices in PEG-DA. *Lab on a Chip*, **16**, 2287-2294 (2016).
- Uto, K., **DeForest, C.A.** & Kim, D.H. Soft Shape-Memory Materials in *Biomaterials Nanoarchitectonics*, Elsevier, Oxford, UK. (2016).
- DeForest, C.A.\*** & Tirrell, D.A. A Photoreversible Protein-Patterning Approach for Guiding Stem Cell Fate in Three-Dimensional Gels. *Nature Materials*, **14**, 523-531 (2015).
- Adzima, B.J., Kloxin, C.J., **DeForest, C.A.**, Anseth, K.S. & Bowman, C.N. 3D Photofixation Lithography in Diels-Alder Networks. *Macromolecular Rapid Communications*, **33**, 2092-2096 (2012).
- Kloxin, A.M., Lewis, K.J.R., **DeForest, C.A.**, Seedorf, G.J., Tibbitt, M.W., Balasubramaniam, V & Anseth, K.S. Responsive Culture Platform to Examine the Influence of Microenvironmental Geometry on Cell Function in 3D. *Integrative Biology*, **4**, 1540-1549 (2012).
- DeForest, C.A.** & Anseth, K.S. Advances in Bioactive Hydrogels to Probe and Direct Cell Fate. *Annual Review of Chemical and Biomolecular Engineering*, **3**, 421-444 (2012).
- DeForest, C.A.** & Anseth, K.S. Photoreversible Patterning of Biomolecules within Click-based Hydrogels. *Angewandte Chemie International Edition*, **51**, 1816-1819 (2012).
- \*\* This article appears on the cover of the February 2012 issue of *Angewandte* and was selected as a “Very Important Paper” by the journal editors. It also was featured in *Nature*, *Angewandte Chemie*, and *Lab on a Chip*.
- DeForest, C.A.** & Anseth, K.S. Cytocompatible Click-based Hydrogels with Dynamically-Tunable Properties through Orthogonal Photoconjugation and Photocleavage Reactions. *Nature Chemistry*, **3**, 925-931 (2011).
- \*\* This article appears on the cover of the December 2011 issue of *Nature Chemistry* and has been highlighted in *Chemistry World*.
- Adzima, B.J., Tao, Y., Kloxin, C.J., **DeForest, C.A.**, Anseth, K.S. & Bowman, C.N. Spatial and Temporal Control of the Alkyne-Azide Cycloaddition by Photoinitiated Cu(II) Reduction. *Nature Chemistry*, **3**, 256-261 (2011).
- Sims, E.A., **DeForest, C.A.** & Anseth, K.S. A Mild, Large-Scale Synthesis of 1,3-Cyclooctanedione: Expanding Access to Difluorinated Cyclooctyne for Copper-Free Click Chemistry. *Tetrahedron Letters*, **52**, 1871-1873 (2011).
- \*\*This article was featured by *Vertical News*
- DeForest, C.A.**, Sims, E.A. & Anseth, K.S. Peptide-Functionalized Click Hydrogels with Independently Tunable Mechanics and Chemical Functionality for 3D Cell Culture. *Chemistry of Materials*, **22**, 4783-90 (2010).
- Johnson, L.M., **DeForest, C.A.**, Pendurti, A., Anseth, K.S. & Bowman, C.N. Formation of Three-Dimensional Hydrogel Multilayers Using Enzyme-Mediated Redox Chain Initiation. *ACS Applied Material Interfaces*, **2**, 1963-1972 (2010).
- Lawson, M.C., Hoth, K.B., **DeForest, C.A.**, Bowman, C.N. & Anseth, K.S. Inhibition of *Staphylococcus epidermidis* Biofilms using Polymerizable Vancomycin Derivatives. *Clin Orthop Relat Res*, **468**, 2081-2091 (2010).
- DeForest, C.A.**, Polizzotti, B.D. & Anseth, K.S. Sequential Click Reactions for Synthesizing and Patterning 3D Cell Microenvironments. *Nature Materials*, **8**, 659-664 (2009).
- \*\* This article has been highlighted in *Nature*, *Chemistry World*, *F1000*, as well as others.
- Benton, J.A., **DeForest, C.A.**, Vivekanandan, V. & Anseth, K.S. Photocrosslinking of Gelatin Macromers to Synthesize Porous Hydrogels that Promote Valvular Interstitial Cell Function. *Tissue Engineering Part A*, **15**, 3221-3230 (2009).
- DeForest, C.A.**, Zhang, H., Memic, A., Dokmeci, M.R. & Khademhosseini, A. Research Highlights. *Lab on a Chip*, **12**, 3540-3542 (2012).
- \*\* Note: this is one of 6 Invited Research Highlights for Lab on a Chip

#### CONFERENCE PRESENTATIONS (representative subset of >40 total presentations)

- Shadish, J.A., Arakawa, C.K. & **DeForest, C.A.** Photoreversible Patterning of Hydrogel Biomaterials with Site-Specifically-Modified Proteins. *Gordon Research Conference – Signal Transduction by Engineered Extracellular Matrices* (Biddeford, ME, 2016). \*Invited Presentation
- Shadish, J.A., Arakawa, C.K. & **DeForest, C.A.** Photopatterned Immobilization of Site-Specifically Modified Proteins within 3D Gels. *Society for Biomaterials* (Charlotte, NC, 2015).
- DeForest, C.A.** Reversible Protein Patterning of 3D Hydrogels via Bioorthogonal Photochemistry. *International Symposium on Nanoarchitectonics for Mechanobiology* (Tsukuba, Japan, 2015) \*Invited Keynote Presentation
- Shadish, J.A., Arakawa, C.K. & **DeForest, C.A.** Directed Stem Cell Fate within Photoreversibly-Patterned Polymer-Based Hydrogels. *ACS Polymers in Medicine and Biology Meeting* (Santa Rosa, CA, 2015). \*Invited Presentation
- DeForest, C.A.** & Tirrell, D.A. Dynamic Protein-Patterned Hydrogels to Direct 4D Stem Cell Fate. *Gordon Research Conference – Signal Transduction by Engineered Extracellular Matrices* (Waltham, MA, 2014).
- DeForest, C.A.** & Tirrell, D.A. Photoreversible Protein Patterning for Dynamic Tailorability of the Stem Cell Niche. *ACS PMSE Tribute to Jeffrey Moore* (Indianapolis, IN, 2013). \*Invited Presentation

**DeForest, C.A.** Photoreversible Protein Patterning for Dynamic Tailorability of the Stem Cell Niche. *ACS Polymers in Medicine and Biology Meeting* (Santa Rosa, CA, 2013). \*Invited Presentation

**DeForest, C.A.**, Tibbitt, M.W., & **Anseth, K.S.** Biomaterials in the Fourth Dimension – Controlling Temporal Properties. *Society for Biomaterials* (Boston, MA, 2013). \*Invited Presentation

**DeForest, C.A.**, Tibbitt, M.W. & **Anseth, K.S.** Dynamic Cell Niches through Bioorthogonal Photochemical Reactions. *Materials Research Society* (San Francisco, CA, 2012).

Adzima, B.J., Kloxin, C.J., Scott, T.F., **DeForest, C.A.**, Anseth, K.S. & **Bowman, C.N.** Photoclick: 4D Control of Polymer Network Formation, Modification, and Properties via Click Reactions. *American Chemical Society* (Denver, CO, 2011). \*Invited Presentation

## PATENTS

**DeForest, C.A.**, Shadish, J.A. & Liu, L. Dynamic User-Programmable Materials from Photoresponsive Proteins, *Invention Disclosure filed 4/2017. Provisional Patent Filed 4/2017.*

**DeForest, C.A.** & Badeau, B. Molecular Logic Gates for Controlled Material Degradation, *Invention Disclosure filed 9/2016. Provisional Patent Filed 9/2016.*

**DeForest, C.A.** & Adelmund, S. Caged Amino Acids for Controlled Metabolic Incorporation, *Invention Disclosure filed 2/2016.*

Aimetti, A.A., **DeForest, C.A.** & Anseth, K.S. Method for Synthesizing Cyclic, Multivalent Peptides using Thiol-Mediated Reactions. *PCT Patent Application Filed 6/2010.*

Polizzotti, B.D., Anseth, K.S. & **DeForest, C.A.** Hydrogels and Methods for Producing and Using the Same. *US Patent Application (12678920) Filed 6/2010, PCT Patent Application Filed 9/2008.*

## GRANTS

**NSF CAREER**, National Science Foundation, “User-Programmable Hydrogel Biomaterials to Probe and Direct 4D Stem Cell Fate” (DeForest, PI) (1/2017 – 12/2021)

**Royalty Research Fund Grant**, University of Washington, “Spatiotemporally-resolved Subcellular Proteomics through Photomediated Protein Labeling” (DeForest, PI) (6/2016 – 5/2017)

**Jaconette L. Tietze Young Scientist Award**, John H. Tietze Foundation, “Spatiotemporal Regulation of Notch Signaling via Site-Specific Immobilization of Full-Length Delta-1 Protein” (DeForest, PI) (6/2015 – 5/2016)

**University of Washington Strategic Research Initiative Grant**, “Rapid Deployment of Designer Materials in Devices and Smart & Resilient Infrastructure (SRI) Enabled by Additive Manufacturing” (DeForest, Co-PI) (6/2015 – 6/2016)

**Biomaterials Day Conference Support Grant**, Society for Biomaterials (DeForest, PI) (11/2014)

**NIH F32**, NIBIB, Ruth L. Kirschstein National Service Award Individual Postdoctoral Fellowship (Percentile: 1, PI funding declined to accept faculty position at UW) (DeForest, PI)

**NSF**, DRM 1006711, “Spatiotemporal Regulated Click Hydrogels for 3D Cell Culture” (Anseth, PI) (6/2010 – 5/2012)

**Howard Hughes Medical Institute**, “Two-Photon Confocal Laser Scanning Microscope for 3D Gel Patterning” (Anseth, PI) (9/2008)

## TEACHING

<b>Faculty Fellows Program</b> , Participant, Univ. of Washington	Summer 2015
<b>Polymer Chemistry Laboratory</b> , Professor, Univ. of Washington, Teaching Score 4.9/5	2016, 2017
<b>Polymer Chemistry</b> , Professor, Univ. of Washington, Teaching Score 4.8/5	2015
<b>Biological Frameworks for Engineers</b> , Professor, Univ. of Washington, Teaching Score 4.8/5	2015, 2016, 2017
<b>Reactor Design</b> , Professor, Univ. of Washington, Teaching Score 4.7/5	2014, 2015, 2016, 2017
<b>Advanced Polymer Chemistry</b> , Professor, Univ. of Washington, Teaching Score 4.6/5	Winter 2014
<b>Tissue Engineering</b> , Teaching and Laboratory Assistant, Univ. of Colorado, Teaching Score N/A	Spring 2009
<b>Polymer Chemistry</b> , Advanced Teaching Assistant, Univ. of Colorado, Teaching Score 5.3/6	Spring 2008
<b>Chemistry for Engineers</b> , Teaching and Laboratory Assistant, Univ. of Colorado, Teaching Score 5.4/6	Spring 2007

## SERVICE

<b>Scientific Referee</b> , Variety of Peer-Reviewed Journals (14 including <i>Science</i> ) & Conference Abstracts	2006 –
<b>Member</b> , Variety of Professional Societies (AIChE, MRS, ACS, SFB, BMES, AHA, Tau Beta Pi, Sigma Xi)	2005 –
<b>Member, Education &amp; Professional Development Committee</b> , Society for Biomaterials	2016 –
<b>Founder &amp; Lead Organizer, Young Biomaterial Scientists Special Interest Group</b> , SFB	2016 –
<b>Faculty Mentor, Women in Science and Engineering (WiSE) Bridge Program</b> , Univ. of Washington	2016 –
<b>Area Chair for Biomaterials Division</b> , AIChE	2015 – 2018
<b>Lead Faculty Organizer, UW Distinguished Young Scholar Seminar Series</b> , Univ. of Washington	2015 –
<b>Faculty Mentor, Association of Chemical Engineering Graduate Students</b> , Univ. of Washington	2014 –
<b>Faculty Organizer, Graduate Recruitment</b> , Chemical Engineering, Univ. of Washington	2014 –
<b>Faculty Participant, Engineering Discovery Days</b> , Univ. of Washington	2014 –

<b>Faculty Mentor, Washington Aerospace Scholars</b> , Univ. of Washington	2014 –
<b>Lead Faculty Organizer, UW Biomaterials Days</b> , Univ. of Washington	2014 & 2015
<b>Lead Faculty Organizer, UW Chemical Engineering Graduate Student Symposium</b> , UW	2014 & 2015
<b>Session Chair</b> , Variety of Conferences (4 including SFB, MRS, AIChE, ACS)	2013 –
<b>Co-Organizer and Instructor, “Genes to Gels” High School Science Program</b> , Caltech	2013
Developed three-week-long, full-time summer hands-on laboratory pilot program to introduce high school students to concepts and research at the interface between biological and material science (with Prof. David Tirrell)	
<b>Graduate Board Member, Engineering Excellence Fund</b> , Univ. of Colorado	2009 – 2011
Allocated more than \$1,000,000 in annual support for the improvement of engineering educational opportunities	
<b>Graduate Student Representative</b> , Univ. of Colorado	2009
<b>Student Board Member, ABET Accreditation</b> , Univ. of Colorado	2007, 2010
<b>Co-Chair, Student Annual Research Symposium</b> , Univ. of Colorado	2008 – 2009
<b>Outreach Coordinator, High School Honors Institute</b> , Boulder, CO	2006 – 2011
<b>AIChE Vice President, Princeton Chapter</b> , Princeton, NJ	2005 – 2006
<b>Residential Adviser</b> , Mathey College, Princeton Univ.	2004 – 2006
<b>Tau Beta Pi</b> , New Jersey Delta Chapter, Senior Member	2005 – 2006
<b>Engineering Interactor Freshman Mentor</b> , Princeton Univ.	2004 – 2006

#### STUDENTS CURRENTLY MENTORED IN RESEARCH

1. Dr. Koichiro Uto, Bioengineering Senior Postdoctoral Researcher, JSPS Postdoctoral Fellow	2015 –
2. Barry Badeau, Chemical Engineering Ph.D. thesis student	2014 –
3. Jared Shadish, Chemical Engineering Ph.D. thesis student	2014 –
4. Christopher Arakawa, Bioengineering M.D./Ph.D. thesis student	2014 –
5. Steven Adelmund, Chemical Engineering Ph.D. thesis student	2015 –
6. Emily Ruskowitz, Chemical Engineering Ph.D. thesis student	2015 –
7. Eric Nealy, Molecular Medicine Ph.D. student	2016 –
8. Luman Liu, Chemical Engineering M.S. thesis student	2015 –
9. Gabrielle Benuska, Bioengineering undergraduate thesis student	2015 –
10. Payam Farahani, Chemical Engineering undergraduate thesis student	2015 –

#### PAST ADVISEES

1. Michael Comerford, January 2014 – June 2015, Graduated with MS Thesis, “Programmable Logic-Based Delivery of Small Molecule Therapeutics from Gels” (Staff Engineer, U.S. Coast Guard Marine Safety Center).	
2. Prathamesh Gawade, January 2015 – June 2016, Graduated with MS Thesis, “Logic-Based Delivery of Site-Specifically-Modified Proteins from Gels through Engineered Biomacromolecular Architecture” (Ph.D. Student, Ohio State University, Chemical Engineering).	
3. Austin Im, Chemical Engineering undergraduate thesis student	2015 – 2016
4. Mira Liu, Visiting undergraduate researcher (Claremont McKenna College, Chemistry/Economics)	Summer 2016