

# RAMILLE N. SHAH, Ph.D.

Assistant Professor

Departments of Materials Science & Engineering and Surgery, Northwestern University

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Email: [ramille-shah@northwestern.edu](mailto:ramille-shah@northwestern.edu)

## EDUCATION

- 9/01-6/06**      **MASSACHUSETTS INSTITUTE OF TECHNOLOGY**      **Cambridge, MA**  
**Ph.D. in Biomaterials, Department of Materials Science and Engineering**  
Thesis: *Gene-Supplemented Collagen-Glycosaminoglycan Scaffolds for Nonviral Gene Delivery in Articular Cartilage Tissue Engineering*  
Advisor: Myron Spector, Ph.D.  
Minor: Business/Management in Biotech/Biomedical Industries
- 9/97-6/00**      **NORTHWESTERN UNIVERSITY**      **Evanston, IL**  
**B.S. in Materials Science and Engineering (Specialization in Biomaterials), Cum Laude**  
Honors Thesis: *Characterization of Poly(L-Lactic Acid) Scaffolds Coated with Cholesteryl(L-Lactic Acid)<sub>25</sub> Self-Assembling Biomolecules for Use in Tissue Engineering*  
Advisor: Samuel I. Stupp, Ph.D.

## EXPERIENCE

- 09/09-present**      **NORTHWESTERN UNIVERSITY**      **Chicago, IL**  
*Assistant Professor, Materials Science and Engineering*      **(09/09-present)**  
*Assistant Professor, Surgery – Transplant Division*      **(04/12-present)**  
*Assistant Professor, Orthopaedic Surgery*      **(09/09-04/12)**  
**Research Interests:** development of new 3D printable functional materials for biomedical and non-biomedical applications, complex tissue and organ engineering, self-assembling biomaterials, mechanical stimulation of cells in scaffolding systems.
- 6/06-08/09**      **NORTHWESTERN UNIVERSITY**      **Chicago, IL**  
*Research Assistant Professor, Materials Science and Engineering*      **(3/08-8/09)**  
*Assistant Director for Research, Institute for BioNanotechnology in Medicine (IBNAM)*      **(3/08-8/09)**  
*Postdoctoral Associate*      **(6/06-2/08)**  
Postdoc Advisor: Samuel I. Stupp, Ph.D.  
➤ Developed self-assembling peptide amphiphile gel scaffolds for regenerative medicine and tissue engineering applications (i.e. articular cartilage, bone, and cardiovascular applications).  
➤ Discovered novel biopolymer/peptide amphiphile systems that form self-assembling hybrid structures in the form of membranes, sacs, and strings for various biomedical applications.
- 11/01-6/06**      **MASSACHUSETTS INSTITUTE OF TECHNOLOGY**      **Cambridge, MA**  
**BRIGHAM AND WOMEN'S HOSPITAL**  
**VA BOSTON HEALTHCARE SYSTEM**      **Boston, MA**  
➤ Created novel approaches for the development of orthopedic biodegradable implants wedding gene transfer, tissue engineering, and nanotechnology strategies.
- 9/98-9/09**      **METAL COATINGS TECHNOLOGIES**      **Evanston, IL**  
**Laboratory Coordinator, Researcher, and Consultant**  
➤ Optimized the chemical composition and coating procedures for developing an environmentally friendly corrosion resistant protective glass coating on metal substrates.

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9/97-6/00

**NORTHWESTERN UNIVERSITY**

**Evanston, IL**

- Established successful procedures to coat polymer scaffolds with unique self-assembling molecules to enhance cell attachment and tissue regeneration.

## TEACHING EXPERIENCE

09/12-

Materials Science and Engineering Course at Northwestern University: *Introduction to Materials Science and Engineering Principles* (MSC301, Fall 2012 and 2013, Spring 2016).

03/12-

Materials Science and Engineering Course at Northwestern University: *Engineering Strategies in Tissue Engineering and Regenerative Medicine* (MSC372, Spring 2012, 2013, 2015, 2017).

03/10

Materials Science and Engineering Course at Northwestern University: *Design of Biomaterials for Tissue Engineering and Regenerative Medicine* (MSC395, Spring 2010).

04/09

Lectured in the Northwestern University Chemical/Bio-Engineering graduate course on: "Self-Assembling Bioactive Nanostructures for Regenerative Medicine."

10/07

Lectured in the Northwestern University Biomaterials graduate course on: "Cell function and differentiation, tissues and cell-matrix interactions, tissue response to injury, and cell-biomaterial interactions."

4/06

Gave guest lectures in the MIT Design of Medical Devices/Implants graduate course on "Biomaterial Scaffolds for Articular Cartilage Tissue Engineering and Regenerative Medicine."

## PUBLICATIONS

**\*Please note the name change from R.M. Capito to R.N. Shah in 2009.**

### **Submitted Peer-Reviewed Journal Articles**

1. Jakus, A.E., Geisendorfer, N.R., Lewis, P.L., **Shah, R.N.** "3D-Printing Porosity: A New Approach to Creating Elevated Porosity Materials and Structures". Submitted Nov 2017.

### **Accepted Peer-Reviewed Journal Articles**

2. Taylor, S.L., Jakus, A.E., Koube, K.D., Geisendorfer, N.R., Ibeh, A.J., **Shah, R.N.**, Dunand, D.C., "Sintering of Micro-Trusses Created by Extrusion-3D-Printing of Lunar Regolith Inks" *Acta Astronautica* **2017**.
3. Taylor, **Shah, R.N.**, Dunand, D.C., "Ni-Mn-Ga Micro-trusses via Sintering of 3D-printed Inks Containing Elemental Powders" *Acta Materialia*, **2017**.
4. Stranford, D., Hung, M., Gargus, E., **Shah, R.N.**, Leonard, J. "A Systematic Evaluation of Factors Affecting Extracellular Vesicle Uptake by Breast Cancer Cells". *Tissue Engineering – Part A*, **2017**.

### **Published Peer-Reviewed Journal Articles**

5. Jakus, A.E., Laronda, M.M., Rashedi, A.S., Robinson, C.M., Lee, C., Jordan, S.W., Orwig, K.E., Woodruff, T.K., **Shah, R.N.** "Tissue Papers" from Organ-Specific Decellularized Extracellular Matrices". *Advanced Functional Materials*, **2017** (in press, published online August 7, 2017).
6. Jakus, A.E., Koube, K.D., Geisendorfer, N.R., **Shah, R.N.** "Robust and Elastic Lunar and Martian Structures from 3D-Printed Regolith Inks". *Scientific Reports* **2017**, 7, 44931.

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7. Laronda, M.M. and Rutz, A.L., Whelan, K.A., Roth, E.W., Woodruff, T.K.\*, **Shah, R.N.\***. "A Bioprosthetic Ovary Created Using 3D Printed Microporous Scaffolds Restores Ovarian Function in Sterilized Mice". *Nature Communications* **2017**, 8, 15261.
8. Taylor, S.L., Jakus, A.E., **Shah, R.N.**, Dunand, D.C. "Iron and Nickel Cellular Structures by Sintering of 3D-Printed Oxide or Metallic Particle Inks" *Advanced Engineering Materials*, **2016**.
9. Jakus, A.E., Rutz, A.L., Jordan, S.W., Kannan, A., Mitchell, C., Yun, C., Koube, K.D., Yoo, S.C., Whiteley, H.E., Richter, C.P., Galiano, R.D., Hsu, W.K., Stock, S.R., Hsu, E.L., **Shah, R.N.** "Hyperelastic "Bone": A Highly Versatile, Growth Factor-Free, Osteoregenerative, Scalable, and Surgically Friendly Biomaterial". *Science Translational Medicine*, **2016**, 8(358).
10. Jakus, A.E., **Shah, R.N.**, "Multi- and Mixed 3D-Printing of Graphene-Hydroxyapatite Hybrid Materials for Complex Tissue Engineering". *Journal of Biomedical Research: Part A*. **2016**, 105(1), 274.
11. Lewis, P.L., **Shah, R.N.**, "3D Printing for Liver Tissue Engineering: Current Approaches and Future Challenges" *Current Transplantation Reviews*. **2016**, 3(100).
12. Wang, B., Jakus, A.E., Baptista, P.M., Soker, S., Soto-Gutierrez, A., Abecassis, M.M., **Shah, R.N.**, Wertheim, J.A. "Functional maturation of iPSC-hepatocytes in extracellular matrix — A comparative analysis of bioartificial liver microenvironments". *Stem Cells Translational Medicine* **2016**, 5(9), 1257.
13. Frolich, S., Leemreize, H., Jakus, A.E., Xiao, X., **Shah, R.N.**, Birkedal, H., Almer, J.D., Stock, S.R., "Diffraction Tomography and Rietveld Refinement of a Hydroxyapatite Bone Phantom" *Journal of Applied Crystallography* **2016**, 49, 103.
14. Jakus, A.E., Rutz, A., **Shah, R.N.**, "Advancing the Field of 3D Biomaterial Printing" *J Biomedical Materials* **2016**, 11(1).
15. Jakus, A.E., Taylor, S.L., Geisendorfer, N.R., Dunand, D.C., **Shah, R.N.**, "Metallic Architectures from 3D-Printed Powder-Based Liquid Inks" *Advanced Functional Materials* **2015**, 25, 6985.
16. Jakus, A.E., Secor, E., Rutz, A., Jordan, S., Hersam, M.\*, **Shah, R.N.\***, "Three Dimensional Printing of High-Content Graphene Scaffolds for Electronic and Biomedical Applications" *ACS Nano* **2015**, 9(4), 4636 – Cover.
17. Rutz, A.L., Hyland, K.E., Jakus, A.E., Burghardt W.R., **Shah, R.N.**, "A Tunable Bioink Method for Multi-Material 3D Printing of Cell-Laden Extracellular Matrix Hydrogels" *Advanced Materials* **2015**, 27(9), 1607.
18. Laronda, M.M., Jakus, A.E., Whelan, K.A., Wertheim, J.A., **Shah, R.N.**, Woodruff, T.K., "Initiation of Puberty in Mice Following Decellularized Ovary Transplant" *Biomaterials* **2015**, 50, 20.
19. Lee, S.S., Hsu E.L., Mendoza, M., Ghodasra, J., Nickoli, M.S., Ashtekar, A., Polavarapu, M., Babu, J., Riaz, T.M., Nicolas, J.D., Nelson, D., Hashmi, S.Z., Kaltz, S.R., Earhart, J.S., Merk, B.R., McKee, J.S., Bairstow, S.F., **Shah, R.N.**, Hsu, W.K., Stupp, S.I., "Gel Scaffolds of BMP-2-Binding Peptide Amphiphile Nanofibers for Spinal Arthrodesis" *Advanced Healthcare Materials* **2015**, 4(1), 131.
20. Ramji, K., **Shah R.N.**, "Electrospun Soy Protein Nanofiber Scaffolds for Tissue Regeneration" *J Biomaterials Application* **2014**, 29(3), 411.
21. Chien, K.B., Chung, E.J., **Shah R.N.**, "Investigation of Soy Protein Hydrogels for Biomedical Applications: Materials Characterization, Drug Release, and Biocompatibility" *J Biomater App* **2014**, 28(7), 1085.
22. Chien, K.B., Makridakis, E., **Shah R.N.**, "Three-Dimensional Printing of Soy Protein Scaffolds for Tissue Regeneration" *Tissue Eng Part C* **2013**, 9(11), 8983.
23. Chien, K.B., Aguado, B., Bryce, P.J., **Shah R.N.**, "Acute and Humoral Response to Three Dimensional Porous Soy Protein Biomaterial Scaffolds" *Acta Biomaterialia* **2013**, 9(11), 8983.

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24. Chung, E.J, Chien, K.B., Aguado, B.A., **Shah, R.N.**, "Osteogenic Potential of BMP-2-Releasing Self-Assembled Membranes" *Tissue Engineering Part A* 2013, 19(23-24), 2664.
25. Lee, S.S., Huang, B.J, Kaltz, S.R., Sur, S., Newcomb, C.J., Stock, S.R., **Shah, R.N.**, Stupp, S.I., "Bone Regeneration with Low Dose BMP-2 Amplified by Biomimetic Supramolecular Nanofibers within Collagen Scaffolds." *Biomaterials* 2013, 34(2), 452.
26. Chung, E.J., Jakus, A.E., **Shah, R.N.**, "In Situ Forming Collagen-Hyaluronic Acid Membrane Structures: Mechanism of Self-Assembly and Applications in Regenerative Medicine" *Acta Biomaterialia* 2013 9(2), 5153.
27. Chien, K.B., **Shah, R.N.**, "Novel Soy Protein Scaffolds for Tissue Regeneration: Material Characterization and Interaction with Human Mesenchymal Stem Cells" *Acta Biomaterialia* 2012, 8(2), 694.
28. Murphy, M.B., Blashki, D., Buchanan, R.M., Fan, D., De Rosa, E., **Shah, R.N.**, Stupp, S.I., Weiner, B.K., Simmons, P.J., Ferrari, M., Tasciotti, E., "Multi-Composite Bioactive Osteogenic Sponges Featuring Mesenchymal Stem Cells, Platelet-Rich Plasma, Nanoporous Silicon Enclosures, and Peptide Amphiphiles for Rapid Bone Regeneration" *Journal of Functional Materials* 2011, 2 (2), 39.
29. **Shah, R.N.**, Shah, N.A., Del Rosario Lim, M.M., Hsieh, C., Nuber, G.W., Stupp, S.I., "Supramolecular Design of Self-Assembling Nanofibers for Cartilage Regeneration" *Proceedings of the National Academy of Science* **2010**, 107, 3293.
30. Mata, A., Hsu, L., **Capito, R.M.**, Aparicio, C., Henrikson, K., Stupp, S.I., "Micropatterning of Bioactive Self-Assembling Gels" *Soft Matter* **2009**, 5, 1228.
31. **Capito, R.M.**, Azevedo, H., Velichko, Y., Mata, A., Stupp, S.I., "Self-Assembly of Large and Small Molecules into Hierarchically Ordered Sacs and Membranes" *Science* **2008**, 319, 1812.
32. Xu, X., **Capito, R.M.**, Spector, M., "Delivery of Plasmid IGF-1 to Chondrocytes Via Cationized Gelatin Nanoparticles" *J. Biomed. Mat. Res. A.* **2008**, 73A, 73.
33. Xu, X., **Capito, R.M.**, Spector, M., "Plasmid Size Influences Chitosan Nanoparticle Mediated Gene Transfer to Chondrocytes" *J. Biomed. Mat. Res. A.* **2008**, 84A, 1038.
34. Gotterbarm, T., Niska, J., **Capito, R.M.**, Vickers, S.M., Spector, M., "P115 IGF-1 Gene-Supplemented Type II Collagen Scaffolds for Mesenchymal Stem Cell-Driven Chondrogenesis In Vitro" *Osteoarthritis and Cartilage* **2007**, 15(2), B116.
35. **Capito, R.M.** and Spector, M., "Collagen Scaffolds for Nonviral IGF-1 Gene Delivery in Articular Cartilage Tissue Engineering" *Gene Therapy* **2007**, 14, 721.
36. **Capito, R.M.** and Spector, M., "Effect of Expansion Medium on Ex Vivo Gene Transfer and Chondrogenesis in Type II Collagen-Glycosaminoglycan Scaffolds In Vitro" *Osteoarthritis and Cartilage* **2007**, 14, 1203.
37. Steinert, A.F., Palmer, G.D., Capito, R.M., Hofstaetter, J.G., Pilapil, C., Ghivizzani, S.C., Spector, M.S., Evans, C.H., "Genetically Enhanced Engineering of Meniscus Tissue Using Ex Vivo Delivery of Transforming Growth Factor- 1 Complementary Deoxyribonucleic Acid" *Tissue Engineering* **2007**, 13, 2227.
38. Kinner, B., **Capito, R.M.**, and Spector, M., "Regeneration of Articular Cartilage" *Adv. Biochem. Engin./Biotechnol.* **2005**, 94, 91.
39. **Capito, R.M.** and Spector, M., "Scaffold-Based Articular Cartilage Repair: Future Prospects Wedding Gene Therapy and Tissue Engineering" *IEEE Eng. Med. Biol.* **2003**, 22, 42.

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### **Book Chapters**

40. Rutz, A.L., **Shah, R.N.**, "Protein-Based Hydrogels" *Polymeric Hydrogels as Smart Biomaterials*. Springer International Publishing Switzerland, S. Kalia (ed.); **2016**, 73-104.
41. Chung, E.J., Shah N.A., **Shah, R.N.**, "Nanomaterials for Cartilage Tissue Engineering" *Nanomaterials in Tissue Engineering: Fabrication and Application*. Woodhead Publishing, A.K. Gaharwar (ed.); **2013**, 301-334.
42. **Capito, R.M.**, Mata, A., Stupp, S.I., "Self-Assembling Peptide Based Nanostructures for Regenerative Medicine" *Nanotechnology, Volume 5: Nanomedicine*. Weinheim: WILEY-VCH Verlag GmbH & Co. KGaA; **2009**, 385-412.

### **PATENTS**

1. **Shah, R.N.**, Dunand, D.C., Jakus, A.E., "Methods for Fabricating Three-Dimensional Metallic Objects Via Additive Manufacturing Using Metal Oxide Pastes" (US9327448). Northwestern University, issue date May 2016.
2. **Capito, R.M.**, Azevedo, H., Stupp, S.I. "Self-Assembling Membranes and Related Methods Thereof" (12/031,421). Northwestern University, issue date August 2013.
3. **Shah, R.N.**, Shah N.A., Stupp, S.I. "Peptide-Based Scaffolds for Cartilage Regeneration and Methods for Their Use" (US8450271). Northwestern University, issue date May 2013.
4. Jennings, H., **Capito, R.M.**, and Thomas, J.J. "Protective Coatings for Metals" (US8173221). Metal Coating Technologies, LLC, issue date May 2012.

### **Invention Disclosures/Provisional and Non-Provisional Patents**

1. **Shah, R.N.**, Jakus, A.E., Geisendorfer, N. "Water-Soluble Salt Particle Containing Compositions and Porous Materials Made Therefrom" Northwestern University. Provisional Patent Application Filed November 2017.
2. **Shah, R.N.**, Jakus, A.E., Koube, K.D., Taylor, S.L. "Ink Compositions for Fabricating Objects from Extraterrestrial Soils and Methods of Forming the Objects" Northwestern University. Full PCT/US Patent Application Filed May 2016. Awaiting initial USPTO office action.
3. **Shah, R.N.**, Jakus, A.E. Hersam, M., Secor, E.B. "High-Content Graphene Ink Compositions and Related Composites" Northwestern University. Full US patent application Filed December 2015. Awaiting initial office action.
4. **Shah, R.N.**, Jakus, A.E. "Inks Compositions for Three-Dimensional Printing and Methods of Forming Three-Dimensional Objects Using the Ink Compositions" Northwestern University. Full US Patent Application May 2015. Awaiting initial USPTO office action.
5. **Shah, R.N.**, Jakus, A.E. "Ceramic-Containing Bioactive Inks and Printing Methods for Tissue Engineering Applications" Northwestern University. Full US Patent Application Filed August 2014. Awaiting initial USPTO office action.
6. **Shah, R.N.**, Rutz, A.L. "Poly(Ethylene glycol) Cross-Linking of Soft Materials to Tailor Viscoelastic Properties for Bioprinting" Northwestern University. PCT/US Patent Application Filed October 2014. 14/497,274
7. **Shah, R.N.**, Woodruff, T.K., Rutz, A.L., Laronda, M.M. "Artificial Ovary" PCT/US Patent Application Filed



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October 2014. PCT/US2016/015398.

8. **Shah, R.N.**, Jakus, A.E., Geisendorfer, N.R., Gao, Z., Barnett, S.A. "Monolithic, Multi-Component Solid Oxide Fuel Cells from Multi-Material 3D-Printing and Dip-coating or Tape-Casting of Ceramic Particle-Laden Inks Followed by Co-Firing" Northwestern University. Provisional Patent awarded July 2016.
9. **Shah, R.N.**, Jakus, A.E. "Method for Fabricating Tissue and Organ-Specific Biomaterials from Decellularized Extracellular Matrices" Northwestern University. Invention Disclosure Submitted July 2016.

## **PRESENTATIONS**

### **INVITED TALKS**

1. **R.N. Shah.** "New Materials for Transforming the Medical 3D-Printing World and Beyond" *11<sup>th</sup> Annual AWIS Chicago Innovator and Motivator Awards*, Chicago, IL, November 2017.
2. **R.N. Shah.** "Hyperelastic Bone: A New Class of Osteogenic Materials Enabled Through 3D Printing" *ISMR-AAMP Conference*, San Francisco, CA, October 2017.
3. **R.N. Shah.** "New Materials for Transforming the Medical 3D-Printing World: Turning Hype into Reality" *Cavendish Global: The Chicago Health Impact Forum*, Chicago, IL, July 2017.
4. **R.N. Shah.** "New Biomaterial Platforms for 3D Printing and Their Promise in Medicine" *Ability Lab Research Seminar Series*, Shirley Ryan Ability Lab, Chicago, IL, June 2017.
5. **R.N. Shah.** "New Materials for 3D Printing in Medicine: What's Next is Closer Than You Think" *RAPID 2017 – Medical Manufacturing and Innovations – Medical Keynote*, Pittsburg, PA, May 2017.
6. **R.N. Shah.** "Creating and Developing New, Functional 3D-Printable Materials for Biomedical and Non-Biomedical Applications" *Women's Initiative of Northwestern Spring Event*, New York, NY, March 2017.
7. **R.N. Shah.** "3D Printing for Regenerative Medicine: New Advances and Future Promise" *GE LifeSciences Hackathon - Keynote*, Chicago, IL, January 2017.
8. **R.N. Shah.** "Engineering New Functional Materials for 3D Printing: From Cells and Biomaterials to Metals, Ceramics, Lunar Dust, and More" *MSE Colloquium*, Northwestern University, Evanston, IL, October 2016.
9. **R.N. Shah.** "New Biomaterial Platforms for 3D Printing and Their Promise in Medicine" *Bioengineering Technology Seminar*, Northwestern University, Evanston, IL, October 2016.
10. **R.N. Shah.** "A Biomaterial Ink Synthesis Platform for 3D Printing Customizable, Cell-Laden Hydrogels" *American Chemical Society Symposium*, Philadelphia, PA, August 2016.
11. **R.N. Shah, A.E. Jakus.** "A New Class of 3D-Printable Particle-Laden Inks for Biomedical Applications" *American Ceramic Society*, Chicago, IL July 2016.
12. **R.N. Shah.** "Expanding the 3D Printing Biomaterial Palette: New Approaches to Material Design and Development" *Materials Research Society Conference*, Phoenix, AZ, April 2016.
13. Jakus, A.E., **Shah, R.N.** "A 3D-Painted Future: New Materials for Tissue Engineering, Energy, Advanced Structure and More". *2016 Additive Manufacturing Users Group Annual Meeting*, St. Louis, MO, April 2016.
14. A.E. Jakus, **R.N. Shah.** "3D Printing Biologic Scaffolds: The Promise of Engineered Tissues" *North American Spine Society Annual Meeting*, Chicago, IL, October 2015.
15. **Shah, R.N.**, "Materials Innovation in 3D Printing for Medical Applications" *Comprehensive Transplant Center Advisory Meeting*, Chicago, IL, September 2015.
16. Jakus, A.E., **Shah, R.N.** "3D-Printing graphene from liquid Inks." *Physical Sciences Symposia*, Boston, MA, September 2015.

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17. **Shah, R.N.**, “3D Printing Functional Biomaterials” *Simpson Querrey Institute Advisory Meeting*, Chicago, IL, August 2015.
18. **Shah, R.N.**, “Materials Innovation in 3D Printing” *3M Seminar*, Evanston, IL, May 2015.
19. **Shah, R.N.**, “Materials Innovation in 3D Printing: Impact on Human Health” *Northwestern’s Lawrence B. Dumas Domain Dinner on Topic: New Technologies That Will Be Transformative*, Evanston, IL, April 2015.
20. **Shah, R.N.**, “Expanding the Material Toolbox for 3D Printing: From Biomedical to Energy Applications” *Argonne Physics Division Colloquium*, Lemont, IL, April 2015.
21. Jakus, A.E., **Shah, R.N.** “New Biomedical 3D-Printable Materials for Tissue Engineering and Regenerative Medicine.” *University of Chicago Illinois Life Sciences Seminar Series*. Chicago, IL, October 2014. Oral
22. **Shah, R.N.**, “3D Printable Biomaterials: New Advances and Future Promise” *Simpson Querrey Institute for Bionanotechnology Seminar*, Chicago, IL, Nov 2014.
23. **Shah, R.N.**, “Hyperelastic Bone: A New Class of Osteogenic Bone Substitute Scaffolds Enabled Through 3D Printing” *American Association for Dental Research/Chicago Section Seminar*, Chicago, IL, July 2014.
24. **Shah, R.N.**, “New Advances in Biomaterials for 3D Printing of Artificial Organs and Tissues” *Transplant Research (NUCTRIBE) Seminar*, Northwestern University, Chicago, IL, June 2014.
25. **Shah, R.N.**, “Expanding the Material Toolbox for 3D Printing: From Medicine to Energy Applications” *Materials Science and Engineering Advisory Board Meeting*, Northwestern University, Chicago, IL, May 2014.
26. **Shah, R.N.**, Keynote Address: “3D Printing Bioartificial Tissues and Organs: Integrating a Tissue Engineering and Additive Manufacturing (TEAM) Approach in Research and Education” *Biotechnology Symposium: Bringing Biotech from Bench to the K-12 Classroom*, Northwestern University, Chicago, IL May 2014.
27. **Shah, R.N.**, “Tissue Engineering and Additive Manufacturing (TEAM) Lab” *Masters in Biotechnology Program*, Northwestern University, Chicago, IL November 2013.
28. **Shah, R.N.**, “A Near Universal Technique for Fabricating Complex, Ordered, and Functional 3D Structures Via 3D Printable Particle-Based Inks” *Northwestern-Argonne Meeting*, Northwestern University, Chicago, IL September 2013.
29. **Shah, R.N.**, “The Use of 3D Bioplotted Scaffolds and Ultrasonic Stimulation for Tissue Engineering” *Oral Biology Legacy Centennial Conference*, University of Illinois at Chicago, Chicago, IL June 2013.
30. **Shah, R.N.**, “3D Printing of Biomaterial Scaffolds for Tissue Engineering” *NU/CDI/IBNAM-CRN International Workshop – Building a Kidney*, Northwestern University, Chicago, IL April 2013.
31. **Shah, R.N.**, “Elucidating Optimal 3D Bioplotted Scaffold Parameters for Enhancing the Viability, Growth, and Function of Mature and IPS Cell-Derived Hepatocytes” *Comprehensive Transplant Center Seminar – Northwestern University*, Chicago, IL, July 2012.
32. **Shah, R.N.**, “Ultrasound Stimulation of Cells in 3D Scaffolds” *Alumni Association – Northwestern University*, Evanston, IL, March 2012.
33. **Shah, R.N.**, “Soy-Based Biomaterials for Tissue Engineering and Regenerative Medicine” *Bio Interest Group Seminar, Mechanical Engineering Department – University of Illinois*, Urbana, IL, March 2012.
34. **Shah, R.N.**, “3D Printing of Composite Materials for Tissue Engineering Applications” *Cellgene*, Warren, NJ, October 2011.

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35. **Shah, R.N.**, “New Biomaterial Strategies in Orthopaedic Tissue Engineering and Regenerative Medicine” *Biomedical Engineering Seminar – Northwestern University*, Evanston, IL, January 2011.
36. **Shah, R.N.**, “New Frontiers in Orthopaedic Tissue Engineering and Regenerative Medicine” *Orthopaedic Surgery Grand Rounds – University of Texas Medical School*, Houston, TX, October 2009.
37. **Shah, R.N.**, “Tissue Engineering and Regenerative Medicine Strategies for Articular Cartilage Regeneration” *Covidien*, North Haven, CT, April 2009.
38. **Capito, R.M.**, “Self-Assembling Nanostructures for Regenerative Medicine” *Minisymposium on Stem Cell Biology and Regenerative Medicine*, Chicago, IL, April 2009.
39. **Capito, R.M.** and Stupp, S.I., “Bioactive Nanostructures for Regenerative Medicine” *2009 Annual Meeting of the American Association for the Advancement of Science*, Chicago, IL, February 2009.
40. **Capito, R.M.**, “Self-Assembling Peptide Amphiphile (PA) Systems for Regenerative Medicine” *Institute for Bioengineering of Catalonia*, Barcelona, Spain, June 2008. **Capito, R.M.**, “Self-Assembling Peptide Systems for Regenerative Medicine” *Johns Hopkins University*, Baltimore, MD, June 2008.
41. **Capito, R.M.**, “Self-Assembling Peptide Systems for Regenerative Medicine” *Rice University*, Houston, TX, March 2008.
42. **Capito, R.M.**, “Self-Assembling Peptide Amphiphiles for Articular Cartilage Regeneration” *Göteborg University Institute of Laboratory Medicine & Department of Clinical Chemistry and Transfusion Medicine*, Gothenburg, Sweden, March 2008.

### **CONFERENCES/MEETINGS**

43. **Shah, R.N.**, Steele, T., “3D-Printing of Electro-Curing Nanocomposite Living Electrodes for Cardiac Tissue Regeneration.” *NTU-NU Institute for Nanomedicine (NNIN) Workshop*, Santa Barbara, CA, November 2016.
44. **Shah, R.N.**, Jakus, A.E., “Multi- and Mixed 3D-Printing of Graphene-Hydroxyapatite Hybrid Materials for Complex Tissue Engineering.” *World Biomaterials Congress*, Montréal, QC, CA, May 2016. Oral
45. Lewis, P.L. **Shah, R.N.**, “3D-Printed Gelatin Scaffolds of Differing Pore Geometry Modulate Hepatocyte Function and Gene Expression.” *World Biomaterials Congress*, Montréal, QC, CA, May 2016. Oral.
46. Lewis, P.L., Alpini, G.D., Green, R.M., **Shah, R.N.** “Liver-Derived Decellularized Extracellular Matrix Gels Induce Complex Branching and Bile Ductule Network Formation of Cholangiocytes *In Vitro*.” *World Biomaterials Congress*, Montréal, QC, CA, May 2016. Poster.
47. Rutz, A.L., Setty, A., Hyland, K.E., Lewis, P.L., Burghardt, W.R., **Shah, R.N.** “PEG Cross-linking Bioink Method for 3D Printing Hydrogels of Diverse Cross-linking Chemistries.” *World Biomaterials Congress*, Montréal, QC, Canada, May 2016. Oral.
48. Rutz, A.L., Laronda, M.L., Xiao, S., Whelan, K.A., Woodruff, T.K., **Shah, R.N.** “Engineering a Functional Ovary with 3D Biomaterial Printing.” *World Biomaterials Congress*, Montréal, QC, Canada, May 2016. Poster.
49. Su, J., Wertheim, J.A., and **Shah, R.N.** “Renal Extracellular Matrix-Derived Hydrogels for Cell Culture.” *World Biomaterials Congress*, Montréal, QC, Canada, May 2016. Oral.
50. Laronda, M.M., Rutz, A.L., Jakus, A.E., Xiao, S., Whelan, K.A., **Shah, R.N.**, Woodruff, T.K., “Engineering a Functional Ovary Bioprosthesis.” *European Society of Endocrinology ECE 2016*, Munich, Germany, May 2016. Oral.



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51. Jakus, A.E., **Shah, R.N.** "Multi- and Mixed 3D-Printing of Graphene-Hydroxyapatite Hybrid Materials for Complex Tissue Engineering." *RAPID 2016*, Orlando, FL, May 2016. Poster.
52. Taylor, S.L., Jakus, Adam E., Dunand, David C., **Shah, Ramille, N.** "3D-Printing of Particle-Laden Metal Oxide and Metal Inks." *RAPID 2016*, Orlando, FL, May 2016. Oral.
53. Laronda, M.M., Rutz, A.L., Xiao, S., Whelan, K.A., **Shah, R.N.**, Woodruff, T.K., "A 3D Printed Ovarian Bioprosthesis Restores Estrous Cyclicity and Supports Natural Ovulation, Live Birth and Lactation." *Endocrine Society's 98th Annual Meeting*, Boston, MA, April 2016. Late-Breaking Oral.
54. Hsu, E.L., Cook, R., Jakus, A.E., Chun, D.S., Weiner, J., Kannan, A., Mitchell, S., Yun, C., Stock, S.R., **Shah, R.N.**, Hsu, W. "The Development of a 3D-Printed Hyperelastic Bone Graft Substitute for Spinal Fusion." *Orthopaedic Research Society Annual Meeting (2016)*. Orlando, FL. March 2016. Oral. *Best Tissue Engineering Presentation Award*
55. Geisendorfer, N.R., Jakus, A.E., Barnett, S.A., **Shah, R.N.** "Fabrication of Many-Layered Solid Oxide Fuel Cell Architectures via Multi-Material 3D-Printing of Liquid Inks." *2016 Materials Research Society (MRS) Annual Spring Meeting*, Phoenix, AZ, March 2016. Poster.
56. Lewis, P.L. **Shah, R.N.**, "3D-Printed Gelatin Scaffolds of Differing Pore Geometry Modulate Hepatocyte Function and Gene Expression." *2016 Materials Research Society (MRS) Annual Spring Meeting*, Phoenix, AZ, March 2016. Oral.
57. Jakus, A.E. **Shah, R.N.**, "Decellularized Extra Cellular Matrix Derived Tissue Papers: Creating Simple and Complex, Tissue-Specific Constructs Through Integration of 2D Casting and 3D-Printing Technologies." *2016 Materials Research Society (MRS) Annual Spring Meeting*, Phoenix, AZ, March 2016. Oral
58. Rutz, A.L., Hyland, K.E., Jakus, A.E., Burghardt, W.R., **Shah, R.N.** "A Multi-Material Bioink Method for 3D Printing Tunable and Cell-Compatible Hydrogels." *2015 Materials Research Society (MRS) Annual Fall Meeting*, Boston, MA, November 2015. Oral.
59. Jakus, A.E., **Shah, R.N.**, "3D-Printable Particle-Laden Inks Update: A Single, Extrusion-Based Materials Platform for Fabrication of Functional Energy, Structural, and Medical Materials and Devices." *2015 Materials Research Society (MRS) Annual Fall Meeting*, Boston, MA, November 2015. Oral.
60. Jakus A.E., **Shah, R.N.**, "Decellularized Extra Cellular Matrix Derived "Filo" and "Puff" Tissues: Creating Simple and Complex, Tissue-Specific Regenerative Medicine Constructs Through Integration of 2D and 3D Fabrication Technologies" *Materials Research Society Fall Meeting*, Boston, MA, November 2015. Poster.
61. Laronda, M.M., Rutz, A.L., Xiao, S., Whelan, K.A., **Shah, R.N.**, Woodruff, T.K., (INVITED) "3D Printed Scaffold Architecture Influences Ovarian Follicle Function." *Tissue Engineering and Regenerative Medicine International Society-World Congress*, Boston, MA, November 2015. Oral.
62. Dunand, D.C., Jakus, A.E., Taylor, S.L. **Shah, R.N.**, "Metallic Scaffolds by Reduction of 3D-Printed Oxide Inks" *MS&T Conference*, Columbus, OH, October 2015. Oral.
63. Taylor, S.L., Mullner, P., **Shah, R.N.**, Dunand, D.C., "3D-Printed NiMnGa Magnetic Shape Memory Alloy Scaffolds" *MS&T Conference*, Columbus, OH, October 2015. Oral.
64. Dunand, D.C., **Shah, R.N.**, Jakus, A.E. "Metallic Architectures by Reduction of 3D-Printed Oxide Inks" (KEYNOTE), *Metfoam 2015*, Barcelona, Spain, September 2015. Oral.
65. Taylor, S.L., Mullner, P., **Shah, R.N.**, Dunand, D.C., "3D-Printed NiMnGa Magnetic Shape Memory Alloy Scaffolds" *Metfoam Conference*, Barcelona, Spain, August 2015. Oral.

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66. Laronda, M.M., Rutz, A.L., Xiao, S., Whelan, K.A., **Shah, R.N.**, Woodruff, T.K., "Ovary-mimetic 3D printed follicle niches (3DP-FNs) support survival, hormone production and oocyte maturation." *Illinois Symposium on Reproductive Science*, Champagne, IL, August 2015. Poster.
67. Laronda, M.M., Rutz, A.L., Xiao, S., Whelan, K.A., **Shah, R.N.**, Woodruff, T.K., "Ovary-mimetic 3D printed follicle niches (3DP-FNs) support survival, hormone production and oocyte maturation." *48th Annual Society for the Study of Reproduction Meeting*, June 2015. Poster.
68. Wang, H., Gao, Z., Barnett, S.A., **Shah, R.N.** "Anode-supported Solid Oxide Fuel Cell Fabricated by Single-step Reduced-temperature Co-firing." *227<sup>th</sup> Electrochemical Society Meeting*, Chicago, IL, May 2015. Oral.
69. Jakus, A.E., **Shah, R.N.**, "3D-Printing Graphene via Direct Ink Writing: Electrical and Biological Properties." *RAPID 2015*. Long Beach, CA, May 2015. Oral.
70. Jakus, A.E., **Shah, R.N.**, "Hyperelastic Bone: A New Class of Bone Substitute." *RAPID 2015*. Long Beach, CA, May 2015. Poster.
71. Jakus A.E., Secor, E.B., Jordan, S.W., Hersam, M.C., **Shah, R.N.**, "3D-Printed High-Content Graphene Composites for Tissue Engineering" *Society for Biomaterials Annual Meeting*, Charlotte, NC, April 2015. Poster.
72. Jakus A.E., **Shah, R.N.**, "3D-Printed Osteo-Electro Hydroxyapatite-Graphene Composites" *Society for Biomaterials Annual Meeting*, Charlotte, NC, April 2015. Oral.
73. Rutz, A.L., Hyland, K.E., Jakus, A.E., Burghardt, W.R., **Shah, R.N.** "A Multi-Material Bioink Method for 3D Printing Tunable and Cell-Compatible Hydrogels." *Society for Biomaterials 2015 Annual Meeting*, Charlotte, NC, April 2015. Oral. Awarded "Student Travel Achievement Recognition Award" by the Society of Biomaterials.
74. Rutz, A.L., Laronda, M.M., Whelan, K.A., Woodruff, T.K., **Shah, R.N.** "Bioengineering an Artificial Ovary with 3D Printing." *Society for Biomaterials 2015 Annual Meeting*, Charlotte, NC, April 2015. Poster. Awarded "Engineering Cells and their Microenvironments Poster Award" by the Special Interest Group (SIG) Engineering Cells and their Microenvironments, Society of Biomaterials.
75. Laronda, M.M., Rutz, A.L., Jakus, A.E., Xiao, S., Whelan, K.A., **Shah, R.N.**, Woodruff, T.K., "Engineering an artificial ovary utilizing natural and 3D bioplotted scaffolds." *Center for Reproductive Sciences Reproduction Research Reports*, Chicago, IL, January 2015. Oral.
76. Jakus A.E., Jordon S.W., **Shah, R.N.**, "3D-Printing Enabled Osteogenic Hyperelastic Bone Substitute" *TERMIS Americas Annual Conference and Exposition*, Washington, DC, December 2014. Oral.
77. Jordan, S.W., Xu, W., Jakus, A.E., Chavez-Munoz, C., Hong, S.J., Mustoe, T.A., **Shah, R.N.**, Galiano, R.D., "Negative Pressure-Assisted Decellularization of Skeletal Muscle For Regenerative Surgery". *TERMIS Americas Annual Conference and Exposition*, Washington, DC, December 2014. Poster.
78. Laronda, M.M., Rutz, A.L., Jakus, A.E, Xiao, S., Whelan, K.A., Wertheim, J.A., **Shah, R.N.**, Woodruff, T.K., "Ovarian Follicles Develop and Ovulate within a Bioengineered Artificial Ovary" *TERMIS Americas Annual Conference and Exposition*, December 2014. Oral.
79. Jakus, A.E., **Shah, R.N.** "3D-Printing Enabled Osteogenic Hyperelastic Bone Substitute." *Tissue Engineering and Regenerative Medicine International Society Americas Annual Conference and Exposition 2014*. Washington DC, December 2014. Oral.

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80. **Shah, R.N.**, Jakus, A.E., "3D-Printable Particle Laden Inks: A New Class of Materials for Biological, Energy, and Advanced Structural Applications" *Materials Research Society*, Boston, MA, Nov 2014. Oral.
81. Jakus, A.E., Secor, E.B., Rutz, A.L., Jordan, S.W., Hersam, M.C., **Shah, R.N.**, "3D-Printed Graphene Structures: Electrical and Biological Properties" *Materials Research Society*, Boston, MA, Nov 2014. Oral.
82. Jakus, A.E., Rutz, A.L., Jordan, S.W., **Shah, R.N.**, "3D-Printing Enabled Osteogenic Hyperelastic Bone Substitute" *Materials Research Society*, Boston, MA, Nov 2014. Oral.
83. Jakus, A.E., Taylor, S.L., Dunand, D.C., **Shah, R.N.**, "3D-Printed Metal and Alloys: An Oxide Ink and Thermochemical Reduction Approach" *Materials Research Society*, Boston, MA, Nov 2014. Poster. *Recipient: Best Poster Award*
84. Jakus, A.E., Gao, Z., Barnett, S.A., **Shah, R.N.**, "3D-Printed Solid Oxide Fuel Cells From High Particle Content Liquid Inks" *Materials Research Society*, Boston, MA, Nov 2014. Oral.
85. Laronda, M.M., Jakus, A.E., Whelan, K.A., **Shah, R.N.**, Woodruff, T.K., "Engineered endocrine organ transplant utilizing a decellularized ovary scaffold." *Illinois Symposium on Reproductive Science*, Chicago, IL, October 2014. Oral.
86. Laronda, M.M., Jakus, A.E., Whelan, K.A., **Shah, R.N.**, Woodruff, T.K., "Engineered endocrine organ transplant utilizing a decellularized ovary scaffold" *16<sup>th</sup> International Congress of Endocrinology*, June 2014. Oral.
87. **Shah, R.N.**, Jakus, A.E., Rutz, A.L., "Hyperelastic Osteogenic Bone Substitute Scaffolds Enabled Through 3D Printing" *RAPID Conference*, Detroit, MI, June 2014. Oral.
88. Laronda, M.M., Rutz, A.L., Whelan, K.A., **Shah, R.N.**, Woodruff, T.K., "Engineering a 3D printed scaffold as the foundation for an artificial ovary." *33rd Annual Minisymposium on Reproductive Biology*, Chicago, IL, April 2014. Oral.
89. **Shah, R.N.**, Jakus, A.E., Rutz, A.L., "Hyperelastic Osteogenic Bone Substitute Scaffolds Enabled Through 3D Printing" *World Biomaterials Conference*, Denver, CO, April 2014. Oral.
90. Xu, W., Zhong, A., Jakus, A.E., Jia, S., Xie, P., Chavez-Munoz, C., Hong, S.J., **Shah, R.N.**, Galiano, R., Mustoe, T.A., "Application of a Three Dimensional Human Keratinocyte-Fibroblast Cell Culture Model in the Study of Cutaneous Wound Healing" *Wound Heal Society Meeting*, Orlando, FL April 2014. Poster.
91. Rutz, A.L., **Shah R.N.**, "A Cross-linking Technique for Rapid Prototyping of 3D Micropatterned Cell-Laden Hydrogels" *Biomedical Engineering Society 2013 Annual Meeting*, Seattle, WA, September 2013. Oral.
92. Jakus, A.E., **Shah, R.N.** "Bioplotted 'Elastic' Hydroxyapatite-Based Tissue Engineering Scaffolds." *TMS Pacific Rim International Conference on Materials*. Waikoloa, HA, August 2013. Oral.
93. Jakus, A.E., Dunand, D.C. **Shah, R.N.** "Bioplotted Ceramics and Metals: A Universal Technique For Fabricating Complex, Ordered, and Functional Scaffolds." *TMS Pacific Rim International Conference on Materials*. Waikoloa, HA, August 2013. Oral.
94. Rutz, A.L., **Shah, R.N.**, "Extrusion-based Rapid Prototyping 3D Micropatterned Hydrogels for Tissue Engineering" *John E. Hilliard Symposium*, Evanston, IL, May 2013. Oral.
95. Jakus, A.E., **Shah R.N.** "From Medicine to Energy: 3D-Printing-Enabled Materials from Particle-Laden Inks" *2014 NU Materials Science and Engineering Annual Hilliard Symposium*, Evanston, IL, May 2014. Oral.
96. Jakus, A.E., **Shah R.N.** "3D-Printed Hyperelastic Bone for Hard-Tissue Engineering Applications" *2014 NU Materials Science and Engineering Annual Hilliard Symposium*, Evanston, IL, May 2014. Poster.

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97. Laronda, M.M., Jakus, A.E., Whelan, K.A., Wertheim, J.A. **Shah, R.N.**, Woodruff, T.K., "Engineered endocrine organ transplant utilizing a decellularized ovary scaffold." *Center for Reproductive Sciences Reproduction Research Reports*, Chicago, IL, January 2014. Oral.
98. Jakus, A.E., Rutz, A.L., **Shah R.N.**, "Custom Design and Fabrication of 3D-Scaffolds: Everything From Living Gels to Novel Composites and Metals" *Northwestern University's First 60<sup>th</sup> Anniversary Class Reunion*, Evanston, IL, October 2013. Oral.
99. Rutz, A.L., **Shah R.N.** "A Cross-linking Technique for Rapid Prototyping of 3D Micropatterned Cell-Laden Hydrogels" *Biomedical Engineering Society 2013 Annual Meeting*, Seattle, WA, September 2013. Poster.
100. Jakus, A.E., Yoo S.C., **Shah, R.N.**, "3D-Printed Bioactive and Mechanically Resilient Hydroxyapatite Composite Scaffolds" *1st Annual Northwestern Post-Doctoral Forum*, Evanston, IL, September 2013. Poster.
101. Jakus, A.E., Yoo S.C., **Shah R.N.**, "3D-Printed Elastic Hydroxyapatite Scaffolds for Osteochondral Tissue Engineering Applications" *UIC Centennial Oral Biology Conference*, Chicago, IL, June 2013. Poster.
102. Jakus, A.E., Rutz, A.L., **Shah, R.N.**, "Bioplotted 'Elastic' Hydroxyapatite-Based Tissue Engineering Scaffolds" *TMS Pacific Rim International Conference on Materials*, Waikoloa, HI, August 2013. Oral.
103. Jakus, A.E., **Shah, R.N.**, Dunand, D.C., "Bioplotted Metals and Alloys: A Near Universal Technique For Fabricating Ordered Scaffolds" *TMS Pacific Rim International Conference on Materials*, Waikoloa, HI, August 2013. Oral.
104. Jakus, A.E., **Shah, R.N.**, "A Single Platform 3D-Printing Approach for Fabricating Tissue Engineering Bio Scaffolds from Multiple Material Systems". *2013 NU Materials Science and Engineering Annual Hilliard Symposium*, Evanston, IL, May 2013. Poster.
105. Chien, K., Jakus, A.E., **Shah, R.N.**, "3D Transdifferentiation of Human Mesenchymal Stem Cells into Hepatocyte-Like Cells Using Bioprinted Scaffolds" *Biomaterials Conference*, Boston, MA, April 2013. Poster.
106. **Shah, R.N.**, Rutz, A.L., Jakus, A.E., and Chien, K.B., "Viability and Function of Induced Pluripotent Stem (IPS) Cell-Derived Hepatocytes on Bioprinted Gelatin Scaffolds" *Biomaterials Conference*, Boston, MA, April 2013. Oral.
107. Rutz, A.L., Jakus, A.E., Chien K.B., **Shah, R.N.**, "Bioprinted Gelatin Hydrogels for Liver Tissue Engineering" *Northwestern University Biotechnology Day*, Evanston, IL, October 2012. Poster.
108. Jakus, A.E., **Shah, R.N.** "Ultrasonically Stimulated Microporous Soy Scaffolds for Tissue Regeneration," *Tomographers Anonymous*, Evanston, IL, October 2011. Oral.
109. Chien, K. and **Shah, R.N.**, "Novel Porous Soy Protein Scaffolds Support Human Mesenchymal Stem Cell Viability and Proliferation" *Materials Research Society Conference*, San Francisco, CA, April 2011. Oral.
110. Chien, K. and **Shah, R.N.**, "Effect of Chemical and Enzymatic Crosslinking of Novel Porous Soy Protein Scaffolds on Human Mesenchymal Stem Cell Morphology and Growth" *Society for Biomaterials Conference*, Orlando, FL., April 2011.
111. **Capito, R.M.** and Stupp, S.I., "Bioactive Nanostructures for Regenerative Medicine" *Tissue Engineering and Regenerative Medicine Conference*, San Diego, CA, December 2008.
112. **Capito, R.M.**, Shah, N.A., Gordan, N., and Stupp, S.I., "Self-Assembling Peptide Amphiphiles for Articular Cartilage Regeneration" *Tissue Engineering and Regenerative Medicine International Society Conference*, Porto, Portugal, June 2008. Selected for the "50 Best Abstracts Award."



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113. **Capito, R.M.**, Azevedo, H.S., Velichko, Y., Mata, A., and Stupp, S.I., "Self-Assembly of Biomaterials at an Interface: Formation of Sacs, Membranes, and Strings" *8<sup>th</sup> World Biomaterials Congress*, Amsterdam, The Netherlands, May 2008.
114. **Capito, R.M.** and Stupp, S.I., "Regenerative Scaffold Technologies for Central Nervous System and Diabetes" *NIH Bioengineering Research Partnership PI Meeting*, Bethesda, MD, July 2007.
115. **Capito, R.M.** and Stupp, S.I., "Nanotechnology for Regenerative Medicine and Cancer Therapies" *Pfizer Meeting*, Northwestern University, Evanston, IL, June 2007.
116. **Capito, R.M.** and Spector, M., "Collagen Scaffold-Based IGF-1 Gene Delivery Incorporating Transfection Enhancers: Lipid Transfection Reagents and Gelatin Nanoparticles" *Annual Orthopedic Research Society Conference*, San Diego, CA, February 2007.
117. **Capito, R.M.** and Spector, M., "Localized and Prolonged IGF-1 Expression by Non-Viral Gene Transfer to Chondrocytes Via Type II Collagen Scaffolds In Vitro" *International Cartilage Repair Society Conference*, San Diego, CA, January 2006.
118. **Capito, R.M.** and Spector, M., "Nonviral IGF-1 Gene Transfer to Chondrocytes Via Type II Collagen Scaffolds for Localized and Prolonged Expression in Cartilage Tissue Engineering" *Tissue Engineering Society International Conference*, Shanghai, China, October 2005.
119. **Capito, R.M.** and Spector, M., "Nonviral IGF-1 Gene Transfer to Chondrocytes In Vitro Using Type II Collagen Scaffolds" *International Cartilage Repair Society Conference*, Gent, Belgium, May 2004.
120. **Capito, R.M.** and Spector, M., "Effects of Selected Growth Factors on Monolayer Expansion of Adult Canine Articular Chondrocytes and Subsequent Growth in Type II Collagen-Glycosaminoglycan Matrices In Vitro" *7<sup>th</sup> World Biomaterials Congress*, Sydney, Australia, May 2004.
121. **Capito, R.M.**, Palmer, G., Ghivizzani, S., Spector, M., "IGF-1 Gene-Supplemented Collagen Scaffolds Enhance IGF-1 Synthesis by Chondrocytes" *Annual Orthopedic Research Society Conference*, San Francisco, CA, March 2004.

## **AWARDS and ASSOCIATIONS**

Innovator Award - Association for Women in Science Chicago Chapter (July 2017)  
The Clarence Ver Steeg Graduate Faculty Award (March 2016)  
Karl Rosengren Faculty Mentoring Award (2015-2016)  
National Science Foundation ICORPs Program Grant Awardee (January 2015)  
Crain's Chicago Business 40 Under 40 (December 2014)  
Google Research Gift (September 2013)  
Center for Regenerative NanoMedicine Grant Awardee (August 2013)  
Mark Pescovitz Memorial Grant Awardee (August 2012)  
Searle Fellow – Searle Center for Teaching Excellence (June 2011)  
Scientist of the Month – Association for Women in Science, Chicago Chapter (October 2011)  
Northwestern Alumnae Gift Awardee (August 2011)  
American Society for Engineering Education Fellow (MIT), 2001-2004  
Society for Biomaterials  
Tissue Engineering and Regenerative Medicine International Society  
Association for Women in Science, *President of Outreach* (2010-2012)  
Society for Women Engineers



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### **SYNERGYSTIC ACTIVITIES**

- 10/14** Developed and executed a Science Café workshop at the Chicago Museum of Science and Industry on *3D Printing of Materials*.
- 10/14** Participated in strategic planning breakout session on Clean Manufacturing during the Institute for Sustainability and Energy at Northwestern (ISEN) semiannual Executive Council meeting.
- 07/14** Developed and taught a new Center for Talent Development Equinox highschool course, "Engineering Strategies in Tissue Engineering and Regenerative Medicine", Summer 2014.
- 06/10-07/12** Member of the Program Planning Committee for the *Women in Science Symposium in 2012*.
- 01/10-09/12** Served as the Vice President for Outreach in the Association for Women in Science – Chicago Chapter.
- 10/11** Co-organized symposium entitled, "Mechanics of Mineralized Tissues and Implants" for the *48<sup>th</sup> Annual Technical Meeting of Society of Engineering Sciences 2011*.
- 03/11** Participated as a Special Awards judge for the Association for Women in Science – Chicago Chapter at the *61<sup>st</sup> Annual Chicago Public School Student Science Fair* held at the Museum of Science and Industry.
- 10/10** Lectured in a *Continuing Adult Education Program* course sponsored by Northwestern's Alumnae Board on "Nanotechnology in Medicine".
- 06/10** Participated in a panel for Science Careers in the *Opportunities for the Future Conference* sponsored by Northwestern's Center for Talent Development.
- 04/10** Gave invited talk at the *Women in Science Symposium 2010: Building an Identity Program* sponsored by Women in Science and the Chicago Council on Science and Technology.
- 03/10** Developed a new Materials Science and Engineering course in "Design of Biomaterials for Tissue Engineering and Regenerative Medicine", Spring 2010.
- 02/10** Participated in the *39<sup>th</sup> Annual Career Day for Girls*, an outreach event to promote female student interests in science and engineering sponsored by Northwestern's McCormick School of Engineering.

### **SERVICE**

- 2012-pres** Member of the editorial board for the journal *Organogenesis*
- 2010-pres** Simpson Querrey Institute (SQI) for BioNanotechnology Executive Committee
- 2009-pres** SQI Faculty Advisor of the Core Facilities
- 2012-2017** Materials Science Undergraduate Advisor
- 2013-2016** Member of the Committee on Animal Resources (CAR)
- 2011-2016** Chair of MSE Undergraduate Recruiting Committee
- 2011-2015** Faculty Advisory Committee for Advancing the Biophysical and Biochemical Sciences
- 2010-2015** Biotechnology Training Program Steering Committee
- 02/15** Reviewer for NIH P41 Center grant

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<b>06/14</b>	Reviewer for the NIH Skeletal Biology Structure and Regeneration study section (grant review meeting 6/12/14-6/13/14)
<b>06/14</b>	Reviewer for the Office for Research's Spring 2014 Equipment Proposal competition
<b>02/13</b>	Reviewer for the NSF Biomaterials Panel (grant review meeting 2/25/13-2/26/13)
<b>05/12</b>	Reviewer for the PESO NSF-NCI Panel (grant review meeting 5/29/12-5/31/12)
<b>2009-12</b>	NuFab Advisory Committee
<b>2010-12</b>	Scientific Grant Committee – Orthopaedic Surgery Department (NU)
<b>2010-11</b>	McCormick Freshman Advisor
<b>2009-10</b>	Materials Science & Engineering (MSE) graduate admissions committee

## **RESEARCH SUPERVISION**

### ***Postdoctoral Fellows:***

1. Adam Jakus (Jan 2015-2017) – Chief Technology Officer for Dimension Inx, LLC
2. Eunji Chung-Yoo (2011-2012) - Gabilan Assistant Professor of Biomedical Engineering at University of Southern California
3. Karpagavalli Ramji (2009-2012) – postdoc at Seton Hall University

### ***PhD Students:***

1. Nicholas Geisendorfer (expected graduation June 2021)  
Thesis: *Development and Characterization of 3D Printable Materials for Energy Applications*
2. Kelly Parker (co-advised with Vanayak Dravid - expected graduation June 2021)  
Thesis: *Developing New Imaging Techniques for In Situ Characterization of Tissue Engineering Constructs*
3. Emma Gargus (co-advised with Teresa Woodruff - expected graduation June 2020)  
Thesis: *Engineering Ovarian Prostheses With Tunable Biomaterial Inks and 3D Printed Architectures*
4. Jimmy Su (co-advised with Jason Wertheim - expected graduation June 2020)  
Thesis: *Microenvironmental Signaling Cues to Model Glomerular Endothelial Cells and Podocyte Interactions*
5. Shannon Taylor (co-advised with David Dunand - expected graduation December 2018)  
Thesis: *Microstructural and Porosity Evolution in 3D-Printed Ni-Mn-Ga Magnetic Shape Memory Alloy Scaffolds*
6. Phillip Lewis (expected graduation June 2018)  
Thesis: *3D Printing and Matrix Culture Strategies for Intrahepatic Bile Duct and Liver Tissue Engineering*
7. Alexandra Rutz (graduated PhD September 2016)  
Thesis: *Engineering customizable hydrogel inks for 3D tissue and organ printing*
8. Sungsoo Lee (co-advised with Sam Stupp - graduated PhD Dec 2014)–postdoc in Stupp Lab, NU

## **RAMILLE N. SHAH, Ph.D.**

Assistant Professor

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Thesis: *Self-Assembling Peptide Amphiphiles for Therapeutic Delivery of Proteins, Drugs, and Stem Cells*

9. Adam Jakus (graduated PhD December 2014) – postdoc in Shah Lab, NU  
Thesis: *Development and Implementation of Functional 3D-Printed Material Systems for Tissue Engineering, Energy, and Structural Applications*
10. Karen Chien (graduated PhD March 2013) – Associate Medical Writer at Complete HealthVizion  
Thesis: *Soy Protein Scaffold Biomaterials for Tissue Engineering and Regenerative Medicine*

### **MS Students:**

Lazura Krasteva

Clayton Rische

Seth Feder

Max Greenberg

Margaret Hammersely

Ming Yan

Jonathan Rosini (graduated MS June 2015) – R&D Test Engineer at Becton Dickinson

Mark Enselmen (graduated MS June 2014) – Surgical Technologist at Northwestern Memorial Hospital

An-Tu Xie (graduated MS 2011) – Petroleum Engineering M.S. Student, Texas A&M

Mayank Vijayvergia (graduated MS 2011) – Co-founder Briteseed, LLC and Craseal, LLC

### **Undergraduate Students:**

Tyler Frye

Saruchi Batra

Nicholas Geisendorfer (Graduated June 2016)

Kelly Hyland (Graduated June 2016)

Christina Robinson (Graduated June 2016)

Christopher Lee (Graduated June 2016)

Aalap Herur-Raman (Graduated June 2015)

John Jeevarajan (Graduated June 2015)

Katie Jaycox (Graduated June 2014)

Sung Chan Yoo (Graduated June 2014)

Emmanuella Makridakis (Graduated June 2014)

Divya Kathuria (Graduated June 2014)

Alex Evanoff (Graduated June 2013)

Mirasbek Kuterbekov (Graduated June 2013)

Vikram Kalkarni (Graduated June 2013)

Siddarth Dalta (Spring 2011)

Rachel Edwards (Graduated June 2011)

Wang Sheng (Summer 2011)

Justin Liu (Graduated June 2011)

Alexandra Davis (Graduate June 2010)

### **Medical School Students:**

Thomas (TJ) Smith (Summer 2011)

### **High School Students:**

Akaash Setty (Summer 2015, 2016)

Sean Gray (Summer 2015, 2016)

Nilesh Kavthekar (2009-2011)

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### **GRADUATE STUDENT COMMITTEES**

Hunter Rogers  
Nicholas Karabin  
Charlotte Chen  
Alexandra Kolberg  
Jacqueline Godbe  
Linda Guiney  
Min Zhang  
Ethan Secor (PhD – June 2017)  
Emilie Campbell (MS – May 2017)  
Nikhita Mansukhani (PhD – February 2017)  
Kayla Culver (PhD – December 2016)  
Yang Tang (PhD – November 2016)  
Kayla Culver (PhD – November 2016)  
Miranda So (MS – June 2016)  
Sungsoo Lee (PhD - November 2014)  
Catherine Tupper (PhD - May 2014)  
Ching-Hsuan Wu (PhD - October 2013)  
Christina Newcomb (PhD - December 2012)  
Stuart Kaltz (MS - October 2010)

### **Shah Lab Member Awards**

#### **Graduate Students and Postdoctoral Scholars**

##### **2016-05**

Phillip Lewis

Northwestern University Biomedical Engineering Department Richard W. Jones Research Progress Award in Biomaterials

##### **2016-04**

Alexandra Rutz

Whitaker International Post-doctoral Scholar

##### **2016-03**

Alexandra Rutz

Selected Northwestern Speaker for Midwest Biomedical Engineering Speaker Exchange Program

##### **2016-03**

Danielle Duggins

National Science Foundation Graduate Research Fellowship Honorable Mention

##### **2016**

Adam E. Jakus

Northwestern University Simpson Querrey Institute “Rising Star”

Project Title: A 3D-Painted Future

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### **2015-09**

Jimmy Su

Northwestern University Biotechnology Training Program – Trainee Position

### **2015-09**

Phillip Lewis

Northwestern University Biotechnology Training Program – Cluster Grant

### **2015-04**

Jimmy Su

National Science Foundation Graduate Research Fellowship Honorable Mention

### **2015**

Adam E. Jakus

The Hartwell Foundation Postdoctoral Research Fellowship

Project Title: Developing an Array of Highly Scalable, Economical and Functional 3D-Printable Bioinks for Just-In-Time and Long-Term Treatment of Neonatal and Pediatric Individuals

Description: "...The Hartwell Foundation grants awards to individuals for innovative and cutting-edge biomedical applied research that will potentially benefit children"

### **2015-06**

Alexandra Rutz

2<sup>nd</sup> Tier Baxter Young Investigator Award

Project Title: A Multi-Material Bioink Method for 3D Printing Tunable and Cell-Compatible Hydrogels

Description: "To celebrate and promote innovative research, Baxter sponsors an annual award program open to graduate students and postdoctoral fellows. Baxter's Young Investigator Awards seek to stimulate and reward research applicable to the development of therapies and medical products that save and sustain patients' lives."

### **2015**

Adam E. Jakus

1<sup>st</sup> Tier Baxter Young Investigator Award

Project Title: A Liquid Ink 3D-Printing Platform for Rapidly Producing Biomedical Ceramics, Metals, Bio-Regenerative, and Filter Materials

Description: "To celebrate and promote innovative research, Baxter sponsors an annual award program open to graduate students and postdoctoral fellows. Baxter's Young Investigator Awards seek to stimulate and reward research applicable to the development of therapies and medical products that save and sustain patients' lives."

### **2015-05**

Alexandra Rutz

Northwestern University Biomedical Engineering Department Research Progress Award

### **2015-04**

Alexandra Rutz

Society for Biomaterials Student Travel Achievement Recognition Award

### **2015-04**

Alexandra Rutz



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Society for Biomaterials Engineering Cells and their Microenvironments Poster Award

### **2015**

Adam E. Jakus

Northwestern University 3rd Annual Northwestern Post-Doctoral Forum Best Oral Presentation

Project Title: 3D-Printing Beyond Plastic: From Ovaries to the Moon and Beyond

### **2015**

Adam E. Jakus

Northwestern University Science as Art for “*Supporting Potential Life*” 1<sup>st</sup> place

### **2014**

Adam E. Jakus

Materials Research Society Meeting Best Poster

Project Title: Metallic Architectures from 3D-Printed Oxide Inks

### **2014**

Adam E. Jakus

Northwestern University Science as Art for “3D-Graphene” Honorable Mention

### **2013-04**

Alexandra Rutz

National Science Foundation Graduate Research Fellowship

### **2013-04**

Shannon Taylor

National Science Foundation Graduate Research Fellowship

### **2013**

Adam E. Jakus

Northwestern 1st Annual Post-Doctoral Forum Best Poster

Project Title: Hyperelastic Bone: A New Class of 3D-Printable, Osteogenic Biomaterial

### **2013**

Adam E. Jakus

Oral Biology Centennial at University of Illinois Chicago 1<sup>st</sup> Place Poster (Tissue Engineering)

Project Title: 3D-Printed Hyperelastic Bone

### **2013**

Adam E. Jakus

Northwestern University Materials Science and Engineering Annual Hilliard Symposium Outstanding Oral Presentation

Project Title: A Single Platform 3D-Printing Approach for Fabricating Tissue Engineering Bio-Scaffolds from Multiple Material Systems

### **2012-07**

Alexandra Rutz

Northwestern University Biotechnology Training Program – Cluster Grant

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### **2010**

Adam E. Jakus

National Defense Science and Engineering Graduate (NDSEG) Fellowship

Description: "The DoD offers these fellowships to individuals who have demonstrated the ability and special aptitude for advanced training in science and engineering."

### **2010**

Adam E. Jakus

Honorable Mention - National Science Foundation Graduate Research Fellowship Honorable Mention

### **Undergraduate and Highschool Students**

#### **2016-05**

Melis Ozkan (Maine South High School, Park Ridge, IL)

Illinois Junior Academy of Science, State Competition - Gold Medal

Project Title: The Effect of ECM Concentration on the Metabolic Activity/Estimated Cell Number and Morphology of RCTE Cells

#### **2016-06**

Nicholas R. Geisendorfer

Selected to Present at Northwestern University Undergraduate Research and Arts Exposition

#### **2016-03**

Kelly Hyland

National Science Foundation Graduate Research Fellowship Honorable Mention

#### **2016**

Christina Robinson

Northwestern University Materials Science and Engineering Gotaas Award for Undergraduate Research Finalist

Project Title: Surgically-Friendly 'Tissue Papers' Derived from Organ-Specific Decellularized Extracellular Matrices

#### **2016**

Nicholas Geisendorfer

Northwestern ISEN Undergraduate Research Award

Project Title: Efficient and Scalable Fabrication of Solid Oxide Fuel Cells via 3D-Printing

#### **2015**

Nicholas R. Geisendorfer

Northwestern University Office of Undergraduate Research Fletcher Award

Project Title: 3D-Printing of Multi-Ceramic Solid Oxide Fuel Cells

#### **2015-04**

Nicholas R. Geisendorfer

Selected to Present at Northwestern University Undergraduate Research and Arts Exposition

#### **2015-04**

Kelly Hyland

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Selected to Present at Northwestern University Undergraduate Research and Arts Exposition

### **2015-04**

Kelly Hyland

Northwestern University Undergraduate Research and Arts Exposition Best Presentation in “Advancements in Science and Engineering”

### **2014-05**

John Jeevarajan

Northwestern University Weinberg College of Arts and Sciences Summer Grant

### **2014**

Katie D. Jaycox

Northwestern University Materials Science and Engineering Gotaas Award for Undergraduate Research

Project Title: Direct Ink Write (DIW) 3D-Printing of Lunar and Martian Dust Simulant

### **2013-04**

Mirasbek Kuterbekov

Selected to Present at Northwestern University Undergraduate Research and Arts Exposition

### **2013-04**

Mirasbek Kuterbekov

Northwestern University Undergraduate Research Grant

Project Title: Optimizing non-viral gene delivery using polymer-functionalized diamond nanoparticles