


Stanford



Sarah Heilshorn

Associate Professor of Materials Science and Engineering and, by courtesy, of Chemical Engineering and of Bioengineering

 NIH Biosketch available Online

 Curriculum Vitae available Online

CONTACT INFORMATION

- **Administrator**

Naomi Tudor - Administrative Associate

Email ntudor@stanford.edu

Bio

BIO

Heilshorn's interests include biomaterials in regenerative medicine, engineered proteins with novel assembly properties, microfluidics and photolithography of proteins, and synthesis of materials to influence stem cell differentiation. Current projects include tissue engineering for spinal cord and blood vessel regeneration, designing injectable materials for use in stem cell therapies, and the design of microfluidic devices to study the directed migration of cells (i.e., chemotaxis).

ACADEMIC APPOINTMENTS

- Associate Professor, Materials Science and Engineering
- Associate Professor (By courtesy), Chemical Engineering
- Associate Professor (By courtesy), Bioengineering
- Member, Bio-X
- Member, Cardiovascular Institute
- Member, Maternal & Child Health Research Institute (MCHRI)
- Affiliate, Precourt Institute for Energy
- Faculty Fellow, Stanford ChEM-H
- Member, Wu Tsai Neurosciences Institute

HONORS AND AWARDS

- New Innovator Award, National Institutes of Health (2009)
- CAREER Award, National Science Foundation (2009)
- New Investigator Award, Petroleum Research Fund, American Chemical Society (2009)

PROFESSIONAL EDUCATION

- PhD, Caltech , Chemical Engineering (2004)
- MS, Caltech , Chemical Engineering (2000)
- BS, Georgia Tech , Chemical Engineering (1998)

LINKS

- Heilshorn Laboratory Site: <http://www.stanford.edu/group/heilshorn/>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Protein engineering

Tissue engineering

Regenerative medicine

Biomaterials

Teaching

COURSES

2019-20

- Bioengineering Materials to Heal the Body: MATSCI 81N (Spr)
- Biomaterials in Regenerative Medicine: BIOE 361, MATSCI 381 (Aut)
- Introduction to Materials Science, Biomaterials Emphasis: ENGR 50M (Win)

2018-19

- Bioengineering Materials to Heal the Body: MATSCI 81N (Aut)
- Biomaterials in Regenerative Medicine: BIOE 361, MATSCI 381 (Spr)
- Introduction to Materials Science, Biomaterials Emphasis: ENGR 50M (Win)

2017-18

- Bioengineering Materials to Heal the Body: MATSCI 81N (Aut)
- Biomaterials in Regenerative Medicine: BIOE 361, MATSCI 381 (Spr)
- Introduction to Materials Science, Biomaterials Emphasis: ENGR 50M (Win)

2016-17

- Bioengineering Materials to Heal the Body: MATSCI 81N (Aut)
- Biomaterials in Regenerative Medicine: BIOE 361, MATSCI 381 (Spr)
- Introduction to Materials Science, Biomaterials Emphasis: ENGR 50M (Win)
- Introductory Science of Materials: OSPPARIS 50M (Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Erica Castillo, Doreen Chan, Payton Marshall, Alex Stahl

Orals Chair

Hong-pyo Lee, Sadaf Sobhani

Postdoctoral Faculty Sponsor

Patrik Johansson, Michael Kratochvil

Doctoral Dissertation Advisor (AC)

Dan Hunt, Katarina Klett, Bauer LeSavage, Chris Lindsay, Julien Roth, Alexis Seymour, Riley Suhar, Eric Teasley

Doctoral Dissertation Co-Advisor (AC)

Pam Cai, Theo Gao, Sarah Hull, Anton Molina, Abhinav Parakh, Alice Stanton

Master's Program Advisor

Connor Hum, Daoyuan Li, Yiming Li, Wenhui Xu

Doctoral (Program)

Edward Barks, Marina Chang, Chris Lindsay, Da Yoon No, Abhinav Parakh, Yaakov Tuchman, Wanxin Wang, Wen Zhang

Postdoctoral Research Mentor

Kelsea Hubka

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Bioengineering (Phd Program)
- Stem Cell Biology and Regenerative Medicine (Phd Program)

Publications

PUBLICATIONS

- **Rapid Diels-Alder Cross-linking of Cell Encapsulating Hydrogels** *CHEMISTRY OF MATERIALS*
Madl, C. M., Heilshorn, S. C.
2019; 31 (19): 8035–43
- **Bioprinting of stem cell expansion lattices** *ACTA BIOMATERIALIA*
Lindsay, C. D., Roth, J. G., LeSavage, B. L., Heilshorn, S. C.
2019; 95: 225–35
- **Engineered materials for organoid systems** *NATURE REVIEWS MATERIALS*
Kratochvil, M. J., Seymour, A. J., Li, T. L., Pasca, S. P., Kuo, C. J., Heilshorn, S. C.
2019; 4 (9): 606–22
- **Characterization of bioorthogonally crosslinked collagen gels with encapsulated corneal stromal stem cells**
Hull, S., Fernandes-Cunha, G., Putra, I., Eslani, M., Djalilian, A. R., Heilshorn, S., Myung, D.
ASSOC RESEARCH VISION OPHTHALMOLOGY INC.2019
- **Smart Bioinks as de novo Building Blocks to Bioengineer Living Tissues.** *Gels (Basel, Switzerland)*
Blaeser, A., Heilshorn, S. C., Duarte Campos, D. F.
2019; 5 (2)
- **Collagen Remodeling in the Hypoxic Tumor-Mesothelial Niche Promotes Ovarian Cancer Metastasis** *CANCER RESEARCH*
Natarajan, S., Foreman, K. M., Soriano, M., Rossen, N. S., Shehade, H., Fregoso, D. R., Eggold, J. T., Krishnan, V., Dorigo, O., Krieg, A. J., Heilshorn, S. C., Sinha, S., Fuh, et al
2019; 79 (9): 2271–84
- **Biomimetic polymers as custom bioinks for 3D printing**
Heilshorn, S.
AMER CHEMICAL SOC.2019
- **Matrix Remodeling Enhances the Differentiation Capacity of Neural Progenitor Cells in 3D Hydrogels** *ADVANCED SCIENCE*
Madl, C. M., LeSavage, B. L., Dewi, R. E., Lampe, K. J., Heilshorn, S. C.
2019; 6 (4): 1801716
- **A definition of bioinks and their distinction from biomaterial inks** *BIOFABRICATION*

- Groll, J., Burdick, J. A., Cho, D., Derby, B., Gelinsky, M., Heilshorn, S. C., Juengst, T., Malda, J., Mironov, V. A., Nakayama, K., Ovsianikov, A., Sun, W., Takeuchi, et al
2019; 11 (1): 013001
- **Bioprinting of stem cell expansion lattices.** *Acta biomaterialia*
Lindsay, C. D., Roth, J. G., LeSavage, B. L., Heilshorn, S. C.
2019
 - **Antibiofilm elastin-like polypeptide coatings:#functionality, stability, and selectivity.***Acta biomaterialia*
Atefyekta, S., Pihl, M., Lindsay, C., Heilshorn, S. C., Andersson, M.
2019; 83: 245–56
 - **An in Vivo miRNA Delivery System for Restoring Infarcted Myocardium.** *ACS nano*
Yang, H., Qin, X., Wang, H., Zhao, X., Liu, Y., Wo, H. T., Liu, C., Nishiga, M., Chen, H., Ge, J., Sayed, N., Abilez, O. J., Ding, et al
2019
 - **Engineering Regenerative Thymic Tissues to Restore Long-Term T Cell Lymphopoiesis**
Gai, H., Gras-Pena, R., Verma, Y., Fateh, V., Ikeda, K., Dejene, B., Min, D., Wang, J., Swigut, T., Weinberg, K. I., Hollander, G. A., Heilshorn, S., Roncarolo, et al
AMER SOC HEMATOLOGY.2018
 - **Tuning Bulk Hydrogel Degradation by Simultaneous Control of Proteolytic Cleavage Kinetics and Hydrogel Network Architecture** *ACS MACRO LETTERS*
Madl, C. M., Katz, L. M., Heilshorn, S. C.
2018; 7 (11): 1302–7
 - **Active DNA Olympic Hydrogels Driven by Topoisomerase Activity** *PHYSICAL REVIEW LETTERS*
Krajina, B. A., Zhu, A., Heilshorn, S. C., Spakowitz, A. J.
2018; 121 (14)
 - **Polymers at the Interface with Biology** *BIOMACROMOLECULES*
Deming, T. J., Klok, H., Armes, S. P., Becker, M. L., Champion, J. A., Chen, E., Heilshorn, S. C., van Hest, J. M., Irvine, D. J., Johnson, J. A., Kiessling, L. L., Maynard, H. D., de la Cruz, et al
2018; 19 (8): 3151–62
 - **Tunable Control of Hydrogel Microstructure by Kinetic Competition between Self-Assembly and Crosslinking of Elastin-like Proteins** *ACS APPLIED MATERIALS & INTERFACES*
Wang, H., Paul, A., Duong Nguyen, Enejder, A., Heilshorn, S. C.
2018; 10 (26): 21808–15
 - **Investigating the interplay between substrate stiffness and ligand chemistry in directing mesenchymal stem cell differentiation within 3D macro-porous substrates.** *Biomaterials*
Haugh, M. G., Vaughan, T. J., Madl, C. M., Raftery, R. M., McNamara, L. M., O'Brien, F. J., Heilshorn, S. C.
2018; 171: 23–33
 - **Effects of engineered cellular microenvironments on the secretome of human mesenchymal stem cells**
Hull, S., Fernandes-Cunha, G., Lee, H., Heilshorn, S., Myung, D.
ASSOC RESEARCH VISION OPHTHALMOLOGY INC.2018
 - **Mechanical properties of collagen gels crosslinked by copper-free click chemistry and their effects on encapsulated keratocytes**
Lee, H., Fernandes-Cunha, G., Heilshorn, S., Myung, D.
ASSOC RESEARCH VISION OPHTHALMOLOGY INC.2018
 - **Engineering Hydrogel Microenvironments to Recapitulate the Stem Cell Niche.** *Annual review of biomedical engineering*
Madl, C. M., Heilshorn, S. C.
2018; 20: 21–47
 - **Review: Bioengineering strategies to probe T cell mechanobiology** *APL BIOENGINEERING*
de la Zerda, A., Kratochvil, M. J., Suhar, N. A., Heilshorn, S. C.
2018; 2 (2)
 - **Production of Elastin-like Protein Hydrogels for Encapsulation and Immunostaining of Cells in 3D.** *Journal of visualized experiments : JoVE*

LeSavage, B. L., Suhar, N. A., Madl, C. M., Heilshorn, S. C.
2018

- **Bioengineering strategies to accelerate stem cell therapeutics** *NATURE*
Madl, C. M., Heilshorn, S. C., Blau, H. M.
2018; 557 (7705): 335–42
- **Dynamic Hyaluronan Hydrogels with Temporally Modulated High Injectability and Stability Using a Biocompatible Catalyst.** *Advanced materials (Deerfield Beach, Fla.)*
Lou, J., Liu, F., Lindsay, C. D., Chaudhuri, O., Heilshorn, S. C., Xia, Y.
2018; 30 (22): e1705215
- **Protein engineering of multi-functional biomaterials for regenerative medicine**
Heilshorn, S.
AMER CHEMICAL SOC.2018
- **Bioorthogonal Strategies for Engineering Extracellular Matrices** *ADVANCED FUNCTIONAL MATERIALS*
Madl, C. M., Heilshorn, S. C.
2018; 28 (11)
- **Protein-engineered hydrogels enhance the survival of induced pluripotent stem cell-derived endothelial cells for treatment of peripheral arterial disease** *BIOMATERIALS SCIENCE*
Foster, A. A., Dewi, R. E., Cai, L., Hou, L., Strassberg, Z., Alcazar, C. A., Heilshorn, S. C., Huang, N. F.
2018; 6 (3): 614–22
- **Interrogating Cell-Mediated Remodeling of the Extracellular Matrix by Dynamic Light Scattering Microrheology**
Krajina, B. A., Zhu, A., Heilshorn, S. C., Spakowitz, A. J.
CELL PRESS.2018: 371A–372A
- **Review: Bioengineering strategies to probe T cell mechanobiology.** *APL bioengineering*
de la Zerda, A., Kratochvil, M. J., Suhar, N. A., Heilshorn, S. C.
2018; 2 (2): 021501
- **Bioorthogonal Strategies for Engineering Extracellular Matrices.** *Advanced functional materials*
Madl, C. M., Heilshorn, S. C.
2018; 28 (11)
- **Active DNA Olympic Hydrogels Driven by Topoisomerase Activity.** *Physical review letters*
Krajina, B. A., Zhu, A., Heilshorn, S. C., Spakowitz, A. J.
2018; 121 (14): 148001
- **Biotemplated synthesis of inorganic materials: An emerging paradigm for nanomaterial synthesis inspired by nature** *PROGRESS IN MATERIALS SCIENCE*
Krajina, B. A., Proctor, A. C., Schoen, A. P., Spakowitz, A. J., Heilshorn, S. C.
2018; 91: 1–23
- **Engineered stem cell mimics to enhance stroke recovery.** *Biomaterials*
George, P. M., Oh, B., Dewi, R., Hua, T., Cai, L., Levinson, A., Liang, X., Krajina, B. A., Bliss, T. M., Heilshorn, S. C., Steinberg, G. K.
2018; 178: 63–72
- **Dynamic Light Scattering Microrheology Reveals Multiscale Viscoelasticity of Polymer Gels and Precious Biological Materials** *ACS CENTRAL SCIENCE*
Krajina, B. A., Tropini, C., Zhu, A., DiGiacomo, P., Sonnenburg, J. L., Heilshorn, S. C., Spakowitz, A. J.
2017; 3 (12): 1294–1303
- **Adaptable hydrogels with secondary reinforcement for regenerative medicine**
Heilshorn, S., Wang, H.
AMER CHEMICAL SOC.2017
- **Recombinant biomaterials for treatment of spinal cord injuries**
Dubbin, K., Marquardt, L., Plant, G., Heilshorn, S.
AMER CHEMICAL SOC.2017

- **Peptide-crosslinking of biomaterials for 3D bio-printing**
Heilshorn, S., Dubbin, K.
AMER CHEMICAL SOC.2017
- **Polypeptide scaffolds as engineered neural stem cell niches**
Madl, C., Heilshorn, S.
AMER CHEMICAL SOC.2017
- **A novel protein-engineered hepatocyte growth factor analog released via a shear-thinning injectable hydrogel enhances post-infarction ventricular function.** *Biotechnology and bioengineering*
Steele, A. N., Cai, L., Truong, V. N., Edwards, B. B., Goldstone, A. B., Eskandari, A., Mitchell, A. C., Marquardt, L. M., Foster, A. A., Cochran, J. R., Heilshorn, S. C., Woo, Y. J.
2017
- **Improvement of paracellular transport in the Caco-2 drug screening model using protein-engineered substrates** *BIOMATERIALS*
Dimarco, R. L., Hunt, D. R., Dewi, R. E., Heilshorn, S. C.
2017; 129: 152-162
- **Dynamic Rheology for the Prediction of Surgical Outcomes in Autologous Fat Grafting.** *Plastic and reconstructive surgery*
Luan, A., Zielins, E. R., Wearda, T., Atashroo, D. A., Blackshear, C. P., Raphel, J., Brett, E. A., Flacco, J., Alyono, M. C., Momeni, A., Heilshorn, S., Longaker, M. T., Wan, et al
2017
- **Protein-Nanoparticle Hydrogels That Self-assemble in Response to Peptide-Based Molecular Recognition** *ACS BIOMATERIALS SCIENCE & ENGINEERING*
Parisi-Amon, A., Lo, D. D., Montoro, D. T., Dew, R. E., Longaker, M. T., Heilshorn, S. C.
2017; 3 (5): 750-756
- **Elastin-like protein-hyaluronic acid (ELP-HA) hydrogels with decoupled mechanical and biochemical cues for cartilage regeneration.** *Biomaterials*
Zhu, D., Wang, H., Trinh, P., Heilshorn, S. C., Yang, F.
2017
- **Tyrosine-Selective Functionalization for Bio-Orthogonal Cross-Linking of Engineered Protein Hydrogels.** *Bioconjugate chemistry*
Madl, C. M., Heilshorn, S. C.
2017
- **YAP-dependent mechanotransduction is required for proliferation and migration on native-like substrate topography** *BIOMATERIALS*
Mascharak, S., Benitez, P. L., Proctor, A. C., Madl, C. M., Hu, K. H., Dewi, R. E., Butte, M. J., Heilshorn, S. C.
2017; 115: 155-166
- **Hyaluronan content governs tissue stiffness in pancreatic islet inflammation.** *The Journal of biological chemistry*
Nagy, N., de la Zerda, A., Kaber, G., Johnson, P. Y., Hu, K. H., Kratochvil, M. J., Yadava, K., Zhao, W., Cui, Y., Navarro, G., Annes, J. P., Wight, T. N., Heilshorn, et al
2017
- **Photoacoustic Imaging of Embryonic Stem Cell-Derived Cardiomyocytes in Living Hearts with Ultrasensitive Semiconducting Polymer Nanoparticles** *Advanced Functional Materials*
Qin, X., Chen, H., Yang, H., Wu, H., Zhao, X., Wang, H., Chour, T., Neofytou, E., Ding, D., Daldrup-Link, H., Heilshorn, S. C., Li, K., Wu, et al
2017
- **The Diverse Roles of Hydrogel Mechanics in Injectable Stem Cell Transplantation.** *Current opinion in chemical engineering*
Foster, A. A., Marquardt, L. M., Heilshorn, S. C.
2017; 15: 15–23
- **Immobilization of growth factors to collagen surfaces using visible light.** *Biomacromolecules*
Fernandes Cunha, G. M., Lee, H. J., Kumar, A., Kreymerman, A., Heilshorn, S. C., Myung, D.
2017
- **Quantitative criteria to benchmark new and existing bio-inks for cell compatibility.** *Biofabrication*
Dubbin, K., Tabet, A., Heilshorn, S. C.

2017; 9 (4): 044102

- **Micro- and nano-patterned elastin-like polypeptide hydrogels for stem cell culture.** *Soft matter*
Paul, A., Stührenberg, M., Chen, S., Rhee, D., Lee, W. K., Odom, T. W., Heilshorn, S. C., Enejder, A.
2017; 13 (34): 5665–75
- **Maintenance of neural progenitor cell stemness in 3D hydrogels requires matrix remodelling.** *Nature materials*
Madl, C. M., LeSavage, B. L., Dewi, R. E., Dinh, C. B., Stowers, R. S., Khariton, M., Lampe, K. J., Nguyen, D., Chaudhuri, O., Enejder, A., Heilshorn, S. C.
2017; 16 (12): 1233–42
- **Regulating Stem Cell Secretome Using Injectable Hydrogels with In Situ Network Formation.** *Advanced healthcare materials*
Cai, L., Dewi, R. E., Goldstone, A. B., Cohen, J. E., Steele, A. N., Woo, Y. J., Heilshorn, S. C.
2016
- **Dual-Stage Crosslinking of a Gel-Phase Bioink Improves Cell Viability and Homogeneity for 3D Bioprinting.** *Advanced healthcare materials*
Dubbin, K., Hori, Y., Lewis, K. K., Heilshorn, S. C.
2016; 5 (19): 2488-2492
- **Integrating concepts of material mechanics, ligand chemistry, dimensionality and degradation to control differentiation of mesenchymal stem cells** *CURRENT OPINION IN SOLID STATE & MATERIALS SCIENCE*
Haugh, M. G., Heilshorn, S. C.
2016; 20 (4): 171-179
- **An artificial niche preserves the quiescence of muscle stem cells and enhances their therapeutic efficacy.** *Nature biotechnology*
Quarta, M., Brett, J. O., DiMarco, R., de Morree, A., Boutet, S. C., Chacon, R., Gibbons, M. C., Garcia, V. A., Su, J., Shrager, J. B., Heilshorn, S., Rando, T. A.
2016; 34 (7): 752-759
- **Bio-Orthogonally Crosslinked, Engineered Protein Hydrogels with Tunable Mechanics and Biochemistry for Cell Encapsulation** *ADVANCED FUNCTIONAL MATERIALS*
Madl, C. M., Katz, L. M., Heilshorn, S. C.
2016; 26 (21): 3612-3620
- **Multifunctional coatings to simultaneously promote osseointegration and prevent infection of orthopaedic implants.** *Biomaterials*
Raphel, J., Holodniy, M., Goodman, S. B., Heilshorn, S. C.
2016; 84: 301-314
- **A Comparative Study of Collagen Matrix Density Effect on Endothelial Sprout Formation Using Experimental and Computational Approaches** *ANNALS OF BIOMEDICAL ENGINEERING*
Shamloo, A., Mohammadaliha, N., Heilshorn, S. C., Bauer, A. L.
2016; 44 (4): 929-941
- **Engineered protein coatings to improve the osseointegration of dental and orthopaedic implants.** *Biomaterials*
Raphel, J., Karlsson, J., Galli, S., Wennerberg, A., Lindsay, C., Haugh, M. G., Pajarinen, J., Goodman, S. B., Jimbo, R., Andersson, M., Heilshorn, S. C.
2016; 83: 269-282
- **Integrating Concepts of Material Mechanics, Ligand Chemistry, Dimensionality and Degradation to Control Differentiation of Mesenchymal Stem Cells.** *Current opinion in solid state & materials science*
Haugh, M. G., Heilshorn, S. C.
2016; 20 (4): 171–79
- **Use of protein-engineered fabrics to identify design rules for integrin ligand clustering in biomaterials.** *Integrative biology : quantitative biosciences from nano to macro*
Benitez, P. L., Mascharak, S., Proctor, A. C., Heilshorn, S. C.
2016; 8 (1): 50–61
- **Bio-Orthogonally Crosslinked, Engineered Protein Hydrogels with Tunable Mechanics and Biochemistry for Cell Encapsulation.** *Advanced functional materials*
Madl, C. M., Katz, L. M., Heilshorn, S. C.
2016; 26 (21): 3612–20
- **Design of Injectable Materials to Improve Stem Cell Transplantation.** *Current stem cell reports*

- Marquardt, L. M., Heilshorn, S. C.
2016; 2 (3): 207-20
- **Use of protein-engineered fabrics to identify design rules for integrin ligand clustering in biomaterials** *INTEGRATIVE BIOLOGY*
Benitez, P. L., Mascharak, S., Proctor, A. C., Heilshorn, S. C.
2016; 8 (1): 50-61
 - **Adaptable Hydrogel Networks with Reversible Linkages for Tissue Engineering** *ADVANCED MATERIALS*
Wang, H., Heilshorn, S. C.
2015; 27 (25): 3717-3736
 - **Matrix interactions modulate neurotrophin-mediated neurite outgrowth and pathfinding** *NEURAL REGENERATION RESEARCH*
Madl, C. M., Heilshorn, S. C.
2015; 10 (4): 514-517
 - **Injectable Hydrogels with In Situ Double Network Formation Enhance Retention of Transplanted Stem Cells** *ADVANCED FUNCTIONAL MATERIALS*
Cai, L., Dewi, R. E., Heilshorn, S. C.
2015; 25 (9): 1344-1351
 - **Protein-engineered hydrogel encapsulation for 3-d culture of murine cochlea.** *Otology & neurotology*
Chang, D. T., Chai, R., DiMarco, R., Heilshorn, S. C., Cheng, A. G.
2015; 36 (3): 531-538
 - **Microfluidic Gradients Reveal Enhanced Neurite Outgrowth but Impaired Guidance within 3D Matrices with High Integrin Ligand Densities** *SMALL*
Romano, N. H., Lampe, K. J., Xu, H., Ferreira, M. M., Heilshorn, S. C.
2015; 11 (6): 722-730
 - **Injectable Hydrogels with In Situ Double Network Formation Enhance Retention of Transplanted Stem Cells.** *Advanced functional materials*
Cai, L., Dewi, R. E., Heilshorn, S. C.
2015; 25 (9): 1344-51
 - **Protein-engineered scaffolds for in vitro 3D culture of primary adult intestinal organoids** *BIOMATERIALS SCIENCE*
Dimarco, R. L., Dewi, R. E., Bernal, G., Kuoc, C., Heilshorn, S. C.
2015; 3 (10): 1376-1385
 - **Microfluidic analysis of extracellular matrix-bFGF crosstalk on primary human myoblast chemoproliferation, chemokinesis, and chemotaxis** *INTEGRATIVE BIOLOGY*
Ferreira, M. M., Dewi, R. E., Heilshorn, S. C.
2015; 7 (5): 569-579
 - **Matrix RGD ligand density and L1CAM-mediated Schwann cell interactions synergistically enhance neurite outgrowth.** *Acta biomaterialia*
Romano, N. H., Madl, C. M., Heilshorn, S. C.
2015; 11: 48-57
 - **Multi-Site Functionalization of Protein Scaffolds for Bimetallic Nanoparticle Templating** *ADVANCED FUNCTIONAL MATERIALS*
Huggins, K. N., Schoen, A. P., Arunagirinathan, M. A., Heilshorn, S. C.
2014; 24 (48): 7737-7744
 - **Avidity-controlled hydrogels for injectable co-delivery of induced pluripotent stem cell-derived endothelial cells and growth factors.** *Journal of controlled release*
Mulyasmita, W., Cai, L., Dewi, R. E., Jha, A., Ullmann, S. D., Luong, R. H., Huang, N. F., Heilshorn, S. C.
2014; 191: 71-81
 - **Hybrid elastin-like polypeptide-polyethylene glycol (ELP-PEG) hydrogels with improved transparency and independent control of matrix mechanics and cell ligand density.** *Biomacromolecules*
Wang, H., Cai, L., Paul, A., Enejder, A., Heilshorn, S. C.
2014; 15 (9): 3421-3428
 - **Hybrid Elastin-like Polypeptide-Polyethylene Glycol (ELP-PEG) Hydrogels with Improved Transparency and Independent Control of Matrix Mechanics and Cell Ligand Density** *BIOMACROMOLECULES*
Wang, H., Cai, L., Paul, A., Enejder, A., Heilshorn, S. C.

2014; 15 (9): 3421-3428

- **Avidity-controlled delivery of angiogenic peptides from injectable molecular-recognition hydrogels.** *Tissue engineering, Part A*
Mulyasmita, W., Cai, L., Hori, Y., Heilshorn, S. C.
2014; 20 (15-16): 2102-2114
- **Rheology and simulation of 2-dimensional clathrin protein network assembly.** *Soft matter*
VanDersarl, J. J., Mehraeen, S., Schoen, A. P., Heilshorn, S. C., Spakowitz, A. J., Melosh, N. A.
2014; 10 (33): 6219-6227
- **Small-molecule axon-polarization studies enabled by a shear-free microfluidic gradient generator.** *Lab on a chip*
Xu, H., Ferreira, M. M., Heilshorn, S. C.
2014; 14 (12): 2047-2056
- **Designing ECM-mimetic materials using protein engineering** *ACTA BIOMATERIALIA*
Cai, L., Heilshorn, S. C.
2014; 10 (4): 1751-1760
- **Engineering of three-dimensional microenvironments to promote contractile behavior in primary intestinal organoids.** *Integrative biology*
Dimarco, R. L., Su, J., Yan, K. S., Dewi, R., Kuo, C. J., Heilshorn, S. C.
2014; 6 (2): 127-142
- **Presentation of BMP-2 Mimicking Peptides in 3D Hydrogels Directs Cell Fate Commitment in Osteoblasts and Mesenchymal Stem Cells** *BIOMACROMOLECULES*
Madl, C. M., Mehta, M., Duda, G. N., Heilshorn, S. C., Mooney, D. J.
2014; 15 (2): 445-455
- **A microfluidic-based genetic screen to identify microbial virulence factors that inhibit dendritic cell migration** *INTEGRATIVE BIOLOGY*
McLaughlin, L. M., Xu, H., Carden, S. E., Fisher, S., Reyes, M., Heilshorn, S. C., Monack, D. M.
2014; 6 (4): 438-449
- **Dual-stage growth factor release within 3D protein-engineered hydrogel niches promotes adipogenesis.** *Biomaterials science*
Greenwood-Goodwin, M., Teasley, E. S., Heilshorn, S. C.
2014; 2 (11): 1627-39
- **Biological biomaterials structure, function, property design across the molecular-nano-micro-macro scales.** *Acta biomaterialia*
Barker, T. H., Heilshorn, S. C.
2014; 10 (4): 1487
- **One-pot Synthesis of Elastin-like Polypeptide Hydrogels with Grafted VEGF-Mimetic Peptides.** *Biomaterials science*
Cai, L., Dinh, C. B., Heilshorn, S. C.
2014; 2 (5): 757-65
- **Dual-stage growth factor release within 3D protein-engineered hydrogel niches promotes adipogenesis** *BIOMATERIALS SCIENCE*
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