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

CONTACT INFORMATION
• Administrator
  Naomi Tudor - Administrative Associate
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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)
- Introductory Science of Materials: OSPBER 50M (Aut, Win)
- Introductory Science of Materials: OSPFLOR 50M (Win)
- Introductory Science of Materials: OSPPARIS 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, Anthony Yu

Postdoctoral Faculty Sponsor
Patrik Johansson, Michael Kratochvil, Sungchul Shin

Doctoral Dissertation Advisor (AC)
GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

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

Publications

- **Designer, injectable gels to prevent transplanted Schwann cell loss during spinal cord injury therapy.** *Science advances*
  2020; 6 (14): eaaz1039

- **Engineering the Microenvironment for Heart Muscle Cell Mechanobiology**
  Castillo, E. A., Lane, K., Chirikian, O., Feinstein, S., Blair, C., Schroer, A., Pardon, G., Grancharova, T., Gunawardane, R., Heilshorn, S., Pruitt, B. L.
  CELL PRESS.2020: 154A

- **THE HYPOXIC TUMOR-MESOTHELIAL NICHE PROMOTES OVARIAN CANCER METASTASIS THROUGH COLLAGEN REMODELING**
  AMER ASSOC CANCER RESEARCH.2019: 168

- **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*
  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*
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

Definition of bioinks and their distinction from biomaterial inks BIOFABRICATION
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
2019

Engineering Regenerative Thymic Tissues to Restore Long-Term T Cell Lymphopoiesis
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
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
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
  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
  2018; 91: 1–23

• Engineered stem cell mimics to enhance stroke recovery. Biomaterials
2018; 178: 63–72

- **Dynamic Light Scattering Microrheology Reveals Multiscale Viscoelasticity of Polymer Gels and Precious Biological Materials**  
  ACS CENTRAL SCIENCE  
  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  
  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  
  2017

- **Protein-Nanoparticle Hydrogels That Self-assemble in Response to Peptide-Based Molecular Recognition**  
  ACS BIOMATERIALS SCIENCE & ENGINEERING  
  2017; 3 (5): 750-756

- **Elastin-like protein-hyaluronic acid (ELP-HA) hydrogels with decoupled mechanical and biochemical cues for cartilage regeneration.**  
  Biomaterials  
  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  
  2017; 115: 155-166

- **Hyaluronan content governs tissue stiffness in pancreatic islet inflammation.**  
  The Journal of biological chemistry  
  2017
• Photoacoustic Imaging of Embryonic Stem Cell-Derived Cardiomyocytes in Living Hearts with Ultrasensitive Semiconducting Polymer Nanoparticles. *Advanced Functional Materials*

• The Diverse Roles of Hydrogel Mechanics in Injectable Stem Cell Transplantation. *Current opinion in chemical engineering*

• Immobilization of growth factors to collagen surfaces using visible light. *Biomacromolecules*

• Quantitative criteria to benchmark new and existing bio-inks for cell compatibility. *Biofabrication*

• Micro- and nano-patterned elastin-like polypeptide hydrogels for stem cell culture. *Soft matter*

• Maintenance of neural progenitor cell stemness in 3D hydrogels requires matrix remodelling. *Nature materials*

• Regulating Stem Cell Secretome Using Injectable Hydrogels with In Situ Network Formation. *Advanced healthcare materials*

• Dual-Stage Crosslinking of a Gel-Phase Bioink Improves Cell Viability and Homogeneity for 3D Bioprinting. *Advanced healthcare materials*

• Integrating concepts of material mechanics, ligand chemistry, dimensionality and degradation to control differentiation of mesenchymal stem cells. *CURRENT OPINION IN SOLID STATE & MATERIALS SCIENCE*

• An artificial niche preserves the quiescence of muscle stem cells and enhances their therapeutic efficacy. *Nature biotechnology*

• Bio-Orthogonally Crosslinked, Engineered Protein Hydrogels with Tunable Mechanics and Biochemistry for Cell Encapsulation. *ADVANCED FUNCTIONAL MATERIALS*

• Multifunctional coatings to simultaneously promote osseointegration and prevent infection of orthopaedic implants. *Biomaterials*

• A Comparative Study of Collagen Matrix Density Effect on Endothelial Sprout Formation Using Experimental and Computational Approaches. *ANNALS OF BIOMEDICAL ENGINEERING*

• Engineered protein coatings to improve the osseointegration of dental and orthopaedic implants. *Biomaterials*
• 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.

• 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

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
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 LICAM-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*  
  Mulyasasmita, 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*  
  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*  
  2014; 15 (9): 3421-3428

  Mulyasasmita, 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*  
  2014; 10 (33): 6219-6227

- Small-molecule axon-polarization studies enabled by a shear-free microfluidic gradient generator. *Lab on a chip*  
  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., Kao, 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.  

- A microfluidic-based genetic screen to identify microbial virulence factors that inhibit dendritic cell migration *Integrative Biology*  
  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*  
  2014; 2 (5): 757-65
• 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): 1627-1639

• One-pot synthesis of elastin-like polypeptide hydrogels with grafted VEGF-mimetic peptides *BIOMATERIALS SCIENCE*
  2014; 2 (5): 757-765

• Design of three-dimensional engineered protein hydrogels for tailored control of neurite growth *ACTA BIOMATERIALIA*
  2013; 9 (3): 5590-5599

• Protein-Engineered Injectable Hydrogel to Improve Retention of Transplanted Adipose-Derived Stem Cells *ADVANCED HEALTHCARE MATERIALS*
  Parisi-Amon, A., Mulyasasmita, W., Chung, C., Heilshorn, S. C.
  2013; 2 (3): 428-432

• Microfluidic Investigation of BDNF-Enhanced Neural Stem Cell Chemotaxis in CXCL12 Gradients *SMALL*
  Xu, H., Heilshorn, S. C.
  2013; 9 (4): 585-595

• Sequence-Specific Crosslinking of Electrospun, Elastin-Like Protein Preserves Bioactivity and Native-Like Mechanics *ADVANCED HEALTHCARE MATERIALS*
  2013; 2 (1): 114-118

• Engineered clathrin nanoreactors provide tunable control over gold nanoparticle synthesis and clustering. *Journal of materials chemistry. B*
  Schoen, A. P., Huggins, K. N., Heilshorn, S. C.
  2013; 1 (48): 6662-69

• Chemotaxis of human induced pluripotent stem cell-derived endothelial cells *AMERICAN JOURNAL OF TRANSLATIONAL RESEARCH*
  Huang, N. F., Dewi, R. E., Okogbaa, J., Lee, J. C., Jalilrufaihah, A., Heilshorn, S. C., Cooke, J. P.
  2013; 5 (5): 510-U96

• Spontaneous cardiomyocyte differentiation of mouse embryoid bodies regulated by hydrogel crosslink density *BIOMATERIALS SCIENCE*
  Chung, C., Pruitt, B. L., Heilshorn, S. C.
  2013; 1 (10): 1082-1090

• Spontaneous cardiomyocyte differentiation of mouse and embryoid bodies regulated by hydrogel crosslink density. *Biomaterials Science*
  Chung, C., Pruitt, B. L., Heilshorn, S. C.
  2013; 10 (1): 1082-1090

• Dynamic remodelling of disordered protein aggregates is an alternative pathway to achieve robust self-assembly of nanostructures *SOFT MATTER*
  2013; 9 (38): 9137-9145

• Chemotaxis of human induced pluripotent stem cell-derived endothelial cells. *American journal of translational research*
  Huang, N. F., Dewi, R. E., Okogbaa, J., Lee, J. C., Jalilrufaihah, A., Heilshorn, S. C., Cooke, J. P.
  2013; 5 (5): 510-520

• Tuning colloidal association with specific peptide interactions *SOFT MATTER*
  Schoen, A. P., Hommersom, B., Heilshorn, S. C., Leunissen, M. E.
• Complex chemoattractive and chemorepellent Kit signals revealed by direct imaging of murine mast cells in microfluidic gradient chambers INTEGRATIVE BIOLOGY
Shamloo, A., Manchandia, M., Ferreira, M., Mani, M., Nguyen, C., Jahn, T., Weinberg, K., Heilshorn, S.
2013; 5 (8): 1076-1085

• Engineered Protein Templates Synthesize Inorganic Nanomaterials CHEMICAL ENGINEERING PROGRESS
2012; 108 (12): 47-50

• Tetrakis(hydroxymethyl) Phosphonium Chloride as a Covalent Cross-Linking Agent for Cell Encapsulation within Protein-Based Hydrogels BIOMACROMOLECULES
Chung, C., Lampe, K. J., Heilshorn, S. C.
2012; 13 (12): 3912-3916

• Protein-Engineered Biomaterials to Generate Human Skeletal Muscle Mimics ADVANCED HEALTHCARE MATERIALS
Sengupta, D., Gilbert, P. M., Johnson, K. J., Blau, H. M., Heilshorn, S. C.
2012; 1 (6): 785-789

• Multifunctional Materials through Modular Protein Engineering ADVANCED MATERIALS
Dimarco, R. L., Heilshorn, S. C.
2012; 24 (29): 3923-3940

• Building stem cell niches from the molecule up through engineered peptide materials NEUROSCIENCE LETTERS
Lampe, K. J., Heilshorn, S. C.
2012; 519 (2): 138-146

• Improving Viability of Stem Cells During Syringe Needle Flow Through the Design of Hydrogel Cell Carriers TISSUE ENGINEERING PART A
Aguado, B. A., Mulyasasmita, W., Su, J., Lampe, K. J., Heilshorn, S. C.
2012; 18 (7-8): 806-815

• Mechanisms of Vascular Endothelial Growth Factor-Induced Pathfinding by Endothelial Sprouts in Biomaterials TISSUE ENGINEERING PART A
Shamloo, A., Xu, H., Heilshorn, S.
2012; 18 (3-4): 320-330

• The intestinal stem cell markers Bmi1 and Lgr5 identify two functionally distinct populations PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA
2012; 109 (2): 466-471

• Hydrogel crosslinking density regulates temporal contractility of human embryonic stem cell-derived cardiomyocytes in 3D cultures SOFT MATTER
Chung, C., Anderson, E., Pera, R. R., Pruitt, B. L., Heilshorn, S. C.
2012; 8 (39): 10141-10148

• Photoreactive elastin-like proteins for use as versatile bioactive materials and surface coatings. Journal of materials chemistry
Raphel, J., Parisi-Amon, A., Heilshorn, S.
2012; 22 (37): 19429–37

• Hydrogels from Protein Engineering Biomimetic Approaches for Biomaterials Development
Greenwood-Goodwin, M., Heilshorn, S. C.
edited by Mano, J. F.
Mannheim, Germany, Wiley-VCH Verlag.2012: 1

• Engineered Protein Biomaterials. Biomedical Engineering Handbook
Paris-Amon, A., Heilshorn, S. C.
edited by Bronzino, J. D., Peterson, D. R., Fisher, J. P.
Boca Raton, FL, CRC Press.2012; 4th: 1

• Protein-Engineered Hydrogels. Biomaterials Surface Science
Raphel, J., Parisi-Amon, A. P., Heilshorn, S. C.
Photoreactive elastin-like proteins for use as versatile bioactive materials and surface coatings. *Journal of Materials Chemistry*
Raphel, J., Parisi-Amon, A., Heilshorn, S. C.
2012; 22 (37): 19429-19437

2011; 133 (45): 18202-18207

Molecular-Level Engineering of Protein Physical Hydrogels for Predictive Sol-Gel Phase Behavior. *Biomacromolecules*
Mulyasasmita, W., Lee, J. S., Heilshorn, S. C.
2011; 12 (10): 3406-3411

Protein-engineered biomaterials: Nanoscale mimics of the extracellular matrix. *Biochimica et Biophysica Acta-General Subjects*
Romano, N. H., Sengupta, D., Chung, C., Heilshorn, S. C.
2011; 1810 (3): 339-349

Vacuum soft lithography to direct neuronal polarization. *Soft Matter*
2011; 7 (2): 343-347

Protein-Engineered Biomaterials: Synthesis and Characterization. *Comprehensive Biomaterials*
Mulyasasmita, W., Heilshorn, S. C.
edited by Ducheyne, P., Healy, K., Hutmacher, D. W.

Essential Regulation of CNS Angiogenesis by the Orphan G Protein-Coupled Receptor GPR124. *Science*
2010; 330 (6006): 985-989

High Speed Water Sterilization Using One-Dimensional Nanostructures. *Nano Letters*
2010; 10 (9): 3628-3632

Protein-Engineered Biomaterials: Highly Tunable Tissue Engineering Scaffolds. *Tissue Engineering Part B-Reviews*
Sengupta, D., Heilshorn, S. C.
2010; 16 (3): 285-293

Local and Long-Range Reciprocal Regulation of cAMP and cGMP in Axon/Dendrite Formation. *Science*
Shelly, M., Lim, B. K., Cancedda, L., Heilshorn, S. C., Gao, H., Poo, M.
2010; 327 (5965): 547-552

Matrix density mediates polarization and lumen formation of endothelial sprouts in VEGF gradients. *Lab on a Chip*
Shamloo, A., Heilshorn, S. C.
2010; 10 (22): 3061-3068

Protein Engineered Biomaterials. *Protein Engineering.*
Wong, C. P., Heilshorn, S. C.
edited by Park, S. J., Cochran, J. R.
Boca Raton, FL, CRC Press. 2010: 1

The Interplay between Biomechanical and Biochemical Factors Regulates Lumen Formation and Navigation of Endothelial Cell Sprouts. *12th ASME Summer Bioengineering Conference*
Shamloo, A., Heilshorn, S. C.
AMER SOC MECHANICAL ENGINEERS. 2010: 429–430

Biomaterial Design Strategies for the Treatment of Spinal Cord Injuries. *Journal of Neurotrauma*
Straley, K. S., Foo, C. W., Heilshorn, S. C.
2010; 27 (1): 1-19

- Two-component protein-engineered physical hydrogels for cell encapsulation. *Proceedings of the National Academy of Sciences of the United States of America*
  
  Foo, C. T., Lee, J. S., Mulyasasmita, W., Parisi-Amon, A., Heilshorn, S. C.
  
  2009; 106 (52): 22067-22072

- Dynamic, 3D-Pattern Formation Within Enzyme-Responsive Hydrogels. *Advanced Materials*
  
  Straley, K. S., Heilshorn, S. C.
  
  2009; 21 (41): 4148-?

- Gradient lithography of engineered proteins to fabricate 2D and 3D cell culture micro environments. *Biomedical Microdevices*
  
  Wang, S., Foo, C. W., Warrier, A., Poo, M., Heilshorn, S. C., Zhang, X.
  
  2009; 11 (5): 1127-1134

- Formation and properties of magnetic chains for 100nm nanoparticles used in separations of molecules and cells. *7th International Conference on Scientific and Clinical Applications of Magnetic Carriers*
  
  Wilson, R. J., Hu, W., Fu, C. W., Koh, A. L., Gaster, R. S., Earhart, C. M., Fu, A., Heilshorn, S. C., Sinclair, R., Wang, S. X.
  
  Elsevier Science BV 2009: 1452–58

- Designer Protein-Based Scaffolds for Neural Tissue Engineering. *Annual International Conference of the IEEE-Engineering-in-Medicine-and-Biology-Society*
  
  Straley, K., Heilshorn, S. C.
  
  IEEE.2009: 2101–2102

- Independent tuning of multiple biomaterial properties using protein engineering. *Soft Matter*
  
  Straley, K. S., Heilshorn, S. C.
  

- Independent tuning of multiple biomaterial properties using protein engineering. *Soft Matter*
  
  Straley KS, Heilshorn SC
  
  2009; 5: 114-124

- Dynamic, three-dimensional pattern formation within enzyme-responsive hydrogels. *Advanced Materials*
  
  Straley KS, Heilshorn SC
  
  2009; 21 (41): 4148-4152

- Design and adsorption of modular engineered proteins to prepare customized, neuron-compatible coatings. *Frontiers in neuroengineering*
  
  Straley, K. S., Heilshorn, S. C.
  
  2009; 2: 9-?

- Endothelial cell polarization and chemotaxis in a microfluidic device. *Lab on a Chip*
  
  Shamloo, A., Ma, N., Poo, M., Sohn, L. L., Heilshorn, S. C.
  
  2008; 8 (8): 1292-1299

- LKB1/STRAD promotes axon initiation during neuronal polarization. *Cell*
  
  Shelly, M., Cancendia, L., Heilshorn, S., Sumbre, G., Poo, M.
  
  2007; 129 (3): 565-577

- Lithographic patterning of photoreactive cell-adhesive proteins. *Journal of the American Chemical Society*
  
  
  2007; 129 (16): 4874-?

- Cell-binding domain context affects cell behavior on engineered proteins. *Biomacromolecules*
  
  Heilshorn, S. C., Liu, J. C., Tirrell, D. A.
  
  2005; 6 (1): 318-323
- **Comparative cell response to artificial extracellular matrix proteins containing the RGD and CS5 cell-binding domains** *Biomacromolecules*
  Liu, J. C., Heilshorn, S. C., Tirrell, D. A.
  2004; 5 (2): 497-504

- **Endothelial cell adhesion to the fibronectin CS5 domain in artificial extracellular matrix proteins** *Biomaterials*
  2003; 24 (23): 4245-4252

- **Liquid personal cleansing compositions which contain a complex coacervate for improved sensory perception** Assignee: The Procter & Gamble Company.
  Glenn, R. W., Sine, M. R., Evans, M. D., Carethers, M. E., Heilshorn, S. C.
  2000