Stanford

Mark A. Skylar-Scott

Assistant Professor of Bioengineering

CONTACT INFORMATION

- **Administrative Contact**

  Sarah Alinejad - Administrative Associate

  Email sarahali@stanford.edu

Bio

ACADEMIC APPOINTMENTS

- Assistant Professor, Bioengineering
- Member, Bio-X
- Member, Cardiovascular Institute
- Member, Institute for Stem Cell Biology and Regenerative Medicine
- Member, Maternal & Child Health Research Institute (MCHRI)
- Member, Wu Tsai Neurosciences Institute

PATENTS

- Samuel G Rodriques, Daniel Oran, Ruixuan Gao, Shoh Asano, Mark A Skylar-Scott, Fei Chen, Paul W Tillberg, Adam H Marblestone, Edward S Boyden. "United States Patent 11,214,661 Three-dimensional nanofabrication by patterning of hydrogels", Massachusetts Institute of Technology, Jan 4, 2022
- JA Lewis, MA Skylar-Scott, DB Kolesky, KA Homan, AHM Ng, GM Church. "United States Patent 11,214,768 Methods of generating functional human tissue", Harvard College, Jan 4, 2022
- JA Lewis, MA Skylar-Scott, J Mueller, D Kolesky. "United States Patent 10,946,588 Systems and methods for automated nozzle design and 3D printing", Harvard College, Harvard University, Mar 16, 2021
- Aaron K Remenschneider, Elliott Kozin, Nicole Leah Black, Michael J McKenna, Daniel J Lee, Jennifer A Lewis, John Rosowski, David B Kolesky, Mark A Skylar-Scott, Alexander D Valentine. "United States Patent 10,786,349 Artificial tympanic membrane devices and uses", Harvard College, Massachusetts Eye and Ear Infirmary, Jan 7, 2021
- Aaron K Remenschneider, Elliott Kozin, Nicole Leah Black, Michael J McKenna, Daniel J Lee, Jennifer A Lewis, John Rosowski, David B Kolesky, Mark A Skylar-Scott, Alexander D Valentine. "United States Patent 17/027,941 Artificial tympanic membrane devices and uses", Harvard College, Massachusetts Eye and Ear Infirmary, Jan 7, 2021
- JA Lewis, KA Homan, DB Kolesky, RL Truby, MA Skylar-Scott. "United States Patent 16/887,223 Tubular tissue construct and a method of printing", Harvard College, Nov 19, 2020
- M Skylar-Scott, S Uzel, J Lewis. "United States Patent 16/649,056 Tissue construct, methods of producing and using the same", Harvard College, Sep 17, 2020
- Kimberly A Homan, Navin R Gupta, Katharina T Kroll, David B Kolesky, Mark Skylar-Scott, Michael T Valerius, Joseph Bonventre, Ryuji Morizane, Jennifer Lewis. "United States Patent 16/620,225 Methods of enhancing development of renal organoids and methods of using the same", Harvard College, Brigham and Womens Hospital Inc, Aug 6, 2020
- Jennifer A Lewis, Kimberly A Homan, David B Kolesky, Ryan L Truby, Mark A Skylar-Scott. "United States Patent 10,702,630 Tubular tissue construct and a method of printing", Harvard College, Jul 7, 2020

- Katharina Theresa Kroll, Kimberly A Homan, Mark A Skylar-Scott, Sebastien GM Uzel, David B Kolesky, Patrick Lustenberger, Jennifer A Lewis. "United States Patent 16/631,677 Methods of producing multi-layered tubular tissue constructs", Harvard College, May 28, 2020
- JA Lewis, MA Skylar-Scott, J Mueller. "United States Patent 16/467,394 Valved nozzle with a compensator and massively parallel 3d printing system", Harvard College, Mar 19, 2020
- Jennifer A Lewis, David B Kolesky, Mark A Skylar-Scott, Kimberly A Homan, Ryan L Truby, Amelia Sydney Gladman. "United States Patent 16/143,050 Method of printing a tissue construct with embedded vasculature", Harvard College, Jan 24, 2019
- JA Lewis, DB Kolesky, MA Skylar-Scott, KA Homan, RL Truby, AS Gladman. "United States Patent 10,117,968 Method of printing a tissue construct with embedded vasculature", Harvard College, Nov 6, 2018

Teaching

COURSES

2025-26

- 3D Bioprinting Laboratory: BIOE 261 (Aut)
- Tissue Engineering: BIOE 260, ORTHO 260 (Spr)

2024-25

- 3D Bioprinting Laboratory: BIOE 261 (Aut)
- Tissue Engineering: BIOE 260 (Spr)

2023-24

- 3D Bioprinting Laboratory: BIOE 261 (Win)
- Tissue Engineering: BIOE 260 (Spr)

2022-23

- 3D Bioprinting Laboratory: BIOE 261 (Win)
- Tissue Engineering: BIOE 260 (Spr)

STANFORD ADVISEES

Elsa McElhinney

Med Scholar Project Advisor

Mathieu Chenier

Doctoral Dissertation Reader (AC)

Betty Cai, Nicolai Dorka, Andrea Flores Perez, Zinan Hu, Ana Masaltseva, Priya Nair, Lazaros Papamanolis, Abena Peasah

Postdoctoral Faculty Sponsor

Dong Gyu Hwang, Ju Yong Lee, Luca Rosalia, Dominic Ruetsche, Jeonghyun Son

Doctoral Dissertation Advisor (AC)

Jingru Che, Sophie Clarke, Yi Yi Du, Danielle Klinger, Annie Nguyen, Jack Rao, Joshua Sampson, Soham Sinha, Fredrik Samdal Solberg

Doctoral Dissertation Co-Advisor (AC)

Melissa Klein

Doctoral (Program)

Vin Armelin, Douglas Henze, Gokul Kannan, Samantha Mutiti, Abena Peasah, Joshua Sampson, Abhimanyu Sharma, William Yu, Brian Zhou

Publications

PUBLICATIONS

- **Hybrid Bioprinting for functionally graded tissue engineering constructs with patterned and localized biochemical signals.** *Advanced composites and hybrid materials*
  Li, J., Kim, C., Alizadeh, H. V., Garg, S., Bruyas, A., Zhao, P., Passos, I. S., Pan, C. C., Pérez, A. S., Skylar-Scott, M. A., Kim, S., Yang, Y. P.
  2026; 9 (1): 11

- **Ribbon-shaped microgels as bioinks for 3D bioprinting of anisotropic tissue structures.** *Bioactive materials*
  Lee, H. P., Tai, M., Jones, S. J., Tong, X., Kim, S., Jansman, M. M., Tam, T., Du, J., Skylar-Scott, M. A., Yang, F.
  2026; 59: 595-606

- **Gradient Multinozzle 3D Printing.** *bioRxiv : the preprint server for biology*
  Rosalia, L., Sinha, S., Weiss, J. D., Hsia, S., Solberg, F. S., Sharir, A., Shibata, M., Du, J., Mosle, K., Rutsche, D., Rao, Z. C., Tam, T., Rankin, et al
  2026

- **Triple-Scale Endothelialized Tubular Networks via Hybrid Biofabrication for Scalable Vascular Tissue Engineering.** *Advanced healthcare materials*
  Son, J., Kim, D., Choi, J., Eom, S., Skylar-Scott, M. A., Kim, D. S., Kang, H. W.
  2025: e03334

- **A human arteriovenous differentiation roadmap reveals vein developmental mechanisms and vascular effects of viruses.** *bioRxiv : the preprint server for biology*
  Ang, L. T., Zheng, S. L., Liu, K. J., Masaltseva, A., Winters, J., von Creytz, I., Jha, S. K., Yin, Q., Qian, C., Xiong, X., Dailamy, A., Xi, E., Alcocer, et al
  2025

- **Rapid model-guided design of organ-scale synthetic vasculature for biomanufacturing.** *Science (New York, N.Y.)*
  Sexton, Z. A., Rütsche, D., Herrmann, J. E., Hudson, A. R., Sinha, S., Du, J., Shiwarski, D. J., Masaltseva, A., Solberg, F. S., Pham, J., Szafron, J. M., Wu, S. M., Feinberg, et al
  2025; 388 (6752): 1198-1204

- **Multiphysics Simulations of a Bioprinted Pulsatile Fontan Conduit.** *Journal of biomechanical engineering*
  Hu, Z., Herrmann, J., Schwarz, E., Gerosa, F., Emuna, N., Humphrey, J., Feinberg, A. W., Hsia, T. Y., Skylar-Scott, M., Marsden, A.
  2025: 1-43

- **Development of a Novel Hybprinter-SAM for Functionally Graded Tissue Engineering Constructs with Patterned and Localized Biochemical Signals.** *Research square*
  Li, J., Kim, C., Alizadeh, H. V., Garg, S., Bruyas, A., Zhao, P., Passos, I. S., Pan, C. C., Pérez, A. S., Skylar-Scott, M. A., Kim, S., Yang, Y. P.
  2025

- **A Low-Cost, Open-Source 3D Printer for Multimaterial and High-Throughput Direct Ink Writing of Soft and Living Materials.** *Advanced materials (Deerfield Beach, Fla.)*
  Weiss, J. D., Mermin-Bunnell, A., Solberg, F. S., Tam, T., Rosalia, L., Sharir, A., Rütsche, D., Sinha, S., Choi, P. S., Shibata, M., Palagani, Y., Nilkant, R., Paulvannan, et al
  2025: e2414971

- **Rapid Model-Guided Design of Organ-Scale Synthetic Vasculature for Biomanufacturing.** *Science*
  Sexton, Z. A., Rütsche, D., Herrmann, J. E., Hudson, A. R., Sinha, S., Du, J., Shiwarski, D. J., Masaltseva, A., Solberg, F. S., Pham, J., Szafron, J. M., Wu, S. M., Feinberg, et al
  2025; 388 (6752): 1198-1204

- **Scalable Human IPSC-to-3D Bioprinting Pipeline: Successful Large-Scale Production Using Automated Bioreactor Systems**
  Ladi, R., Ho, D., Lee, S., Du, J., Weiss, J., Tam, T., Sinha, S., Klinger, D., Devine, S., Hamfeldt, A., Leng, H., Herrmann, J., He, et al
  CELL PRESS.2024: 640

- **The Brainstorm Organoid Project: A Collaboration of Bioethics and Neuroscience to Advance Brain Organoid Research** *HUMAN BRAIN ORGANOIDS*
  Hyun, I., Lunshof, J. E., Aach, J. D., Baum, M. L., Khoshakhlagh, P., Kohman, R. E., Lowenthal, C., Lu, A., Ng, A. H. M., Pasca, S. P., Paulsen, B., Pigoni, M., Scharf-Deering, et al
  edited by Hyun, Lunshof, J. E.

2024; 4: 49-56

- **A Visual, In-Expensive, and Wireless Capillary Rheometer for Characterizing Wholly-Cellular Bioinks.** *Small (Weinheim an der Bergstrasse, Germany)*
  Du, J., Lee, S., Sinha, S., Solberg, F. S., Ho, D. L., Sampson, J. P., Wang, Q., Tam, T., Skylar-Scott, M. A.
  2023: e2304778
- **Rapid model-guided design of organ-scale synthetic vasculature for biomanufacturing.** *ArXiv*
  Sexton, Z. A., Hudson, A. R., Herrmann, J. E., Shiwarski, D. J., Pham, J., Szafron, J. M., Wu, S. M., Skylar-Scott, M., Feinberg, A. W., Marsden, A.
  2023
- **Special Issue on Biofabrication with Spheroid and Organoid Materials.** *Acta biomaterialia*
  Skylar-Scott, M., Declercq, H., Nakayama, K.
  2023
- **Large-Scale Production of Wholly-Cellular Bioinks via the Optimization of Human Induced Pluripotent Stem Cell Aggregate Culture in Automated Bioreactors.** *Advanced healthcare materials*
  Ho, D. L., Lee, S., Du, J., Weiss, J. D., Tam, T., Sinha, S., Klinger, D., Devine, S., Hamfeldt, A., Leng, H. T., Herrmann, J. E., He, M., Fradkin, et al
  2022: e2201138
- **How collaboration between bioethicists and neuroscientists can advance research.** *Nature neuroscience*
  Hyun, I., Scharf-Deering, J. C., Sullivan, S., Aach, J. D., Arlotta, P., Baum, M. L., Church, G. M., Goldenberg, A., Greely, H. T., Khoshakhlagh, P., Kohman, R. E., Lopes, M., Lowenthal, et al
  2022
- **Biomanufacturing human tissues via organ building blocks.** *Cell stem cell*
  Wolf, K. J., Weiss, J. D., Uzel, S. G., Skylar-Scott, M. A., Lewis, J. A.
  2022; 29 (5): 667-677
- **Programming Cellular Alignment in Engineered Cardiac Tissue via Bioprinting Anisotropic Organ Building Blocks.** *Advanced materials (Deerfield Beach, Fla.)*
  Ahrens, J., Uzel, S., Skylar-Scott, M., Mata, M., Lu, A., Kroll, K., Lewis, J. A.
  2022: e2200217
- **BIOMANUFACTURING OF PERFUSABLE ENGINEERED CARDIAC TISSUES**
  Uzel, S., Skylar-Scott, M., Lu, A., Lewis, J.
  MARY ANN LIEBERT, INC.2022: S248
- **Orthogonally induced differentiation of stem cells for the programmatic patterning of vascularized organoids and bioprinted tissues.** *Nature biomedical engineering*
  Skylar-Scott, M. A., Huang, J. Y., Lu, A., Ng, A. H., Duenki, T., Liu, S., Nam, L. L., Damaraju, S., Church, G. M., Lewis, J. A.
  2022
- **Bioprinted microvasculature: progressing from structure to function.** *Biofabrication*
  Seymour, A. J., Westerfield, A. D., Cornelius, V. C., Skylar-Scott, M. A., Heilshorn, S.
  1800
- **Reconstructing the heart using iPSCs: Engineering strategies and applications.** *Journal of molecular and cellular cardiology*
  Cho, S., Lee, C., Skylar-Scott, M. A., Heilshorn, S. C., Wu, J. C.
  2021
- **Flow-enhanced vascularization and maturation of kidney organoids in vitro** *NATURE METHODS*
  Homan, K. A., Gupta, N., Kroll, K. T., Kolesky, D. B., Skylar-Scott, M., Miyoshi, T., Mau, D., Valerius, M., Ferrante, T., Bonventre, J. V., Lewis, J. A., Morizane, R.
  2019; 16 (3): 255-+
- **Voxelated soft matter via multimaterial multinozzle 3D printing.** *Nature*
  Skylar-Scott, M. A., Mueller, J. n., Visser, C. W., Lewis, J. A.
  2019; 575 (7782): 330–35
- **Biomanufacturing of organ-specific tissues with high cellular density and embedded vascular channels.** *Science advances*

Skylar-Scott, M. A., Uzel, S. G., Nam, L. L., Ahrens, J. H., Truby, R. L., Damaraju, S. n., Lewis, J. A.
2019; 5 (9): eaaw2459

- **In Vitro Human Tissues via Multi-material 3-D Bioprinting** *ATLA-ALTERNATIVES TO LABORATORY ANIMALS*
  Kolesky, D. B., Homan, K. A., Skylar-Scott, M., Lewis, J. A.
  2018; 46 (4): 209–15
- **3D printed structures for modeling the Young's modulus of bamboo parenchyma** *ACTA BIOMATERIALIA*
  Dixon, P. G., Muth, J. T., Xiao, X., Skylar-Scott, M. A., Lewis, J. A., Gibson, L. J.
  2018; 68: 90-98
- **3D nanofabrication by volumetric deposition and controlled shrinkage of patterned scaffolds.** *Science (New York, N.Y.)*
  Oran, D. n., Rodriques, S. G., Gao, R. n., Asano, S. n., Skylar-Scott, M. A., Chen, F. n., Tillberg, P. W., Marblestone, A. H., Boyden, E. S.
  2018; 362 (6420): 1281–85
- **Multi-photon microfabrication of three-dimensional capillary-scale vascular networks**
  Skylar-Scott, M. A., Liu, M., Wu, Y., Yanik, M.
  edited by VonFreymann, G., Schoenfeld, W. V., Rumpf, R. C.
  SPIE-INT SOC OPTICAL ENGINEERING.2017
- **Bioprinting of 3D Convoluted Renal Proximal Tubules on Perfusable Chips** *SCIENTIFIC REPORTS*
  Homan, K. A., Kolesky, D. B., Skylar-Scott, M. A., Herrmann, J., Obuobi, H., Moisan, A., Lewis, J. A.
  2016; 6: 34845
- **Laser-assisted direct ink writing of planar and 3D metal architectures** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Skylar-Scott, M. A., Gunasekaran, S., Lewis, J. A.
  2016; 113 (22): 6137–42
- **Guided Homing of Cells in Multi-Photon Microfabricated Bioscaffolds** *ADVANCED HEALTHCARE MATERIALS*
  Skylar-Scott, M. A., Liu, M., Wu, Y., Dixit, A., Yanik, M.
  2016; 5 (10): 1233–43
- **Three-dimensional bioprinting of thick vascularized tissues** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Kolesky, D. B., Homan, K. A., Skylar-Scott, M. A., Lewis, J. A.
  2016; 113 (12): 3179–84
- **Synchronous Symmetry Breaking in Neurons with Different Neurite Counts** *PLOS ONE*
  Wissner-Gross, Z. D., Scott, M. A., Steinmeyer, J. D., Yanik, M.
  2013; 8 (2): e54905
- **Electrokinetic confinement of axonal growth for dynamically configurable neural networks** *LAB ON A CHIP*
  Honegger, T., Scott, M. A., Yanik, M. F., Voldman, J.
  2013; 13 (4): 589-598
- **Ultra-rapid laser protein micropatterning: screening for directed polarization of single neurons** *LAB ON A CHIP*
  Scott, M. A., Wissner-Gross, Z. D., Yanik, M.
  2012; 12 (12): 2265-2276
- **Synapse microarray identification of small molecules that enhance synaptogenesis** *NATURE COMMUNICATIONS*
  Shi, P., Scott, M. A., Ghosh, B., Wan, D., Wissner-Gross, Z., Mazitschek, R., Haggarty, S. J., Yanik, M.
  2011; 2: 510
- **Large-scale analysis of neurite growth dynamics on micropatterned substrates** *INTEGRATIVE BIOLOGY*
  Wissner-Gross, Z. D., Scott, M. A., Ku, D., Ramaswamy, P., Yanik, M.
  2011; 3 (1): 65-74
- **Construction of a femtosecond laser microsurgery system** *NATURE PROTOCOLS*
  Steinmeyer, J. D., Gilleland, C. L., Pardo-Martin, C., Angel, M., Rohde, C. B., Scott, M. A., Yanik, M.

2010; 5 (3): 395-407

- **Visor Scratch Repair and Prevention** *The Journal of Conventional Weapons Destruction*
  Heafitz, A., Linder, B., Luczynska, M., Scott, M.
  2006; 10 (2)