Ryan L. Truby, Ph.D.

2200 Campus Drive, Cook Hall, Room 1131 ▪ Northwestern University, Evanston, Illinois 60208 ▪ rtruby@northwestern.edu

Education

Doctor of Philosophy in Applied Physics **09/2012 – 03/2018**
Dissertation: *Embedded Three-Dimensional Printing of Autonomous and Somatosensitive Soft Robots*
Harvard University, Cambridge, Massachusetts

Bachelor of Science in Biomedical Engineering with Honors **08/2007 – 05/2012**
Minor in Physics
The University of Texas at Austin, Austin, Texas

Professional and Research Experience

Assistant Professor **09/2021 – Present**
Department of Materials Science and Engineering
Department of Mechanical Engineering
Core Member, Center for Robotics and Biosystems
Northwestern University, Evanston, Illinois

Schmidt Science Fellow, Postdoctoral Fellow **08/2018 – 08/2021**
Distributed Robotics Lab, MIT Computer Science and Artificial Intelligence Laboratory (CSAIL)
The Massachusetts Institute of Technology, Cambridge, Massachusetts
Advisor: Daniela Rus, Professor and Director of CSAIL

Graduate Research Assistant **06/2012 – 06/2018**
The Lewis Research Group, Paulson School of Engineering and Applied Sciences, Wyss Institute
Harvard University, Cambridge, Massachusetts
Advisor: Jennifer Lewis, Sc.D., Professor

Undergraduate Research Assistant **08/2008 – 08/2012**
Ultrasound Imaging & Therapeutics Research Lab
The University of Texas at Austin, Austin, Texas
Advisors: Stanislav Emelianov, Ph.D., Professor

Summer Intern, Biomedical Engineering Internship Program **05/2011 – 08/2011**
Department of Biomedical Engineering
The University of Texas at Austin, Austin, Texas
Advisor: Stanislav Emelianov, Ph.D., Professor

Summer Intern **06/2010 – 08/2010**
Center for Integrated Nanotechnologies
Sandia National Laboratories, Albuquerque, New Mexico
Advisors: Dale Huber, Ph.D., Principal Member of the Technical Staff

Summer Researcher **05/2008 – 08/2008**
MD Anderson Cancer Center Summer College Research Program
The University of Texas MD Anderson Cancer Center, Houston, Texas
Advisors: Paul Chiao, Ph.D., and Jason Fleming, M.D., Department of Surgical Oncology

Major Awards

Air Force Office of Scientific Research Young Investigator Award (AFOSR YIP), 2022
Outstanding Paper Award, 2019 IEEE International Conference on Soft Robotics, *IEEE/RAS, Seoul, South Korea, 2019*
Schmidt Science Fellowship, Schmidt Science Fellows Program, in Partnership with the Rhodes Trust, 2018-2020

Materials Research Society Graduate Student Gold Award, *Materials Research Society, Fall 2017 Annual Meeting*
National Science Foundation Vizzies Award for Scientific Visualization, *People's Choice Award in Photography for Octobot, 2017*
National Science Foundation Graduate Research Fellowship, *2012-2015*
George H. Mitchell Award for Academic Excellence, *The University of Texas at Austin, 2012*
Senate of College Councils Undergraduate Researcher of the Month, *The University of Texas at Austin,2012*
Undergraduate Research Fellowship, *The University of Texas at Austin, 2011*
Junior Fellow, *Junior Fellows Honors Program, The University of Texas at Austin, 2009-2012*
College Scholar, *Cockrell School of Engineering, TheUniversity of Texas at Austin, 2009 and 2010*
Senate of College Councils Undergraduate Research Award, *The University of Texas at Austin, 2009*
Texas Higher Education Coordinating Board Scholarship, *2008*
University Honors, *The University of Texas at Austin,for nine of ten semesters between 2007-2012*

Honors and Recognition

Viewpoint Article featured on Front Cover of Vol. 2, Issue 10 of *Accounts of Materials Research*, October 2021
Innovation and Technology Delegate, *53rd Annual International Achievement Summit*, *Academy of Achievement*, September 2019
***Science Robotics* highlights work in liquid crystal elastomers in "Ten robotics technologies of the year",** *January 2019*
Octobot is featured on the cover of the June 2018 Issue of *Nature Reviews Materials*, *June 2018*
Soft somatosensitive actuators featured on the Frontispiece of Vol. 30, Issue 15 of *Advanced Materials,* *April 2018*
Liquid crystal elastomer actuator work featured on the Cover of Vol. 30, Issue 10 of *Advanced Materials*, March 2018
Nature article on entirely soft robots named one of Nature Editor's Top 10 Articles of 2016, *December 2016*
Article on the Octobot is one of the Top 10 Stories of the Year, Harvard Gazette, *December 2016*
Work on the Octobot featured in a "Demo Article" by MIT Tech Review, *December 2016*
Interviewed by BBC News for Nature article on entirely soft robots, *August 25, 2016*
3D bioprinting work featured as #67 of *Discover Magazine's* Top 100 Stories of 2014, *December 2014*
Printed sensor work featured on the Inside Front Cover of Vol. 26, Issue 36 of *Advanced Materials,* *September 2014*
3D bioprinting work featured on the Inside Front Cover of Vol. 26, Issue 19 of *Advanced Materials,* *May 2014*
3D printing work featured in MIT Tech Review's Top 10 Breakthrough Technologies of the Year, *2014*
Hammer Graduate Fellowship (*Declined*), *Materials Science and Engineering Dept., University of Illinois at Urbana-Champaign, 2012*
First Place Poster Presentation, *Biomedical Engineering Undergraduate Research Forum, The University of Texas at Austin, 2011*
Fourth Place Poster Presentation, *Cockrell School of Engineering Poster Exhibition and Engineering Research Symposium, 2011*
Second Place Poster Presentation, *Biomedical Engineering Undergraduate Research Forum, The University of Texas at Austin, 2010*
Third Place Poster Presentation, *Biomedical Engineering Undergraduate Research Forum, The University of Texas at Austin, 2009*
Selected Participant for University of Cambridge Maymester Study Abroad Program, *The University of Texas atAustin, 2009*
King Foundation Summer Research Internship in Biomedical Sciences, *M.D. Anderson Cancer Center, 2007*

Peer-Reviewed Journal Articles

1. **R. L. Truby***, L. Chin*, D. Rus. "A Recipe for Electrically-Driven Soft Robots via 3D Printed Handed Shearing Auxetics," *IEEE Robotics and Automation Letters*, 6, 795-802. [* Denotes equal first authorship, accepted for dual publication in the *Proceedings of the 2021 IEEE International Conference on Soft Robotics (RoboSoft)*]

2. C. Della Santina*, **R. L. Truby***, D. Rus. "Data-Driven Disturbance Observers for Estimating External Forces on Soft Robots," *IEEE Robotics and Automation Letters*, 5, 5717-5724 (2020). [* Denotes equal first authorship, accepted for dual publication in the *Proceedings of the 2020 IEEE InternationalConference on Intelligent Robots and Systems (IROS)*]

3. **R. L. Truby***, C. Della Santina*, D. Rus. "Distributed Proprioception of 3D Configuration in Soft, Sensorized Robots via Deep Learning," *IEEE Robotics and Automation Letters*, 5, 3299-3306 (2020). [* Denotes equal first authorship, accepted for dual publication in the *Proceedings of the 2020 IEEEInternational Conference on Robotics and Automation* (ICRA).]

4. J. W. Boley*, W. M. van Rees*, C. Lissandrello, M. N. Horenstein, **R. L. Truby**, A. Kotikian, J. A. Lewis, L. Mahadevan. "Shape-shifting lattices via multi-material 4D printing," *PNAS*, 116, 20856-20862 (2019). [* Denotes equal first authorship.]

5. M. A. Skylar-Scott*, S. G. M. Uzel*, L. Nam, J. Ahrens, **R. L. Truby**, S. Damaraju, J. A. Lewis. "Biomanufacturing of organ-specific tissues with high cellular density and embedded vascular channels," *Science Advances*, 5(9) eaaw2459, 2019. [* Denotes equal first authorship.]

6. A. K. Grosskopf, **R. L. Truby**, H. Kim, A. Perazzo, J. A. Lewis, H. A. Stone. "Viscoplastic Matrix Materials for Embedded 3D Printing," *ACS Applied Materials and Interfaces*, 10, 23353-23361 (2018).

7. **R. L. Truby**, M. Wehner, A. K. Grosskopf, D. M. Vogt, S. G. M. Uzel, R. J. Wood, J. A. Lewis. "Soft Somatosensitive Actuators via Embedded 3D Printing," *Advanced Materials*, 30, 1706383 (2018). [Featured on Frontispiece, Research Highlights in *Nature*]

8. A. Kotikian, **R. L. Truby**, J. W. Boley, T. J. White, J. A. Lewis. "3D Printed Liquid Crystal Elastomer Actuators with Spatially Programmed Nematic Order," *Advanced Materials*, 30, 1706164 (2018). [Featured on Front Cover]

9. **R. L. Truby**, J. A. Lewis. "Printing Soft Matter in Three Dimensions," *Nature,* 540, 371-378 (2016).

10. M. Wehner*, **R. L. Truby***, D. J. Fitzgerald, B. Mosadegh, G. M. Whitesides, J. A. Lewis**, R. J. Wood**, "An integrated design and fabrication strategy for entirely soft, autonomous robots," *Nature*, 536, 451-455 (2016). [*/** Denotes equal first/corresponding authorship; highlighted on front cover, selected for Nature Editor's Choice article of 2016]

11. J. T. Muth*, D. M. Vogt*, **R. L. Truby**, Y. Mengüc, D. B. Kolesky, R. J. Wood,** J. A. Lewis,** "Embedded 3D Printing of Strain Sensors within Highly Stretchable Elastomers," *Advanced Materials,* 26, 6201-6353 (2014). [*/** Denotes equal first/corresponding authorship; featured on Inside Front Cover]

12. D. B. Kolesky, **R. L. Truby**, A. S. Gladman, T. A. Busbee, K. A. Homan, J. A. Lewis. "3D Bioprinting of Vascularized, Heterogeneous Cell-Laden Tissue Constructs," *Advanced Materials*, 26, 3124-3130 (2014). [Featured on Inside Front Cover]

13. M. Qu, M. Mehrmohammadi, **R. Truby**, I. Graf, K. Homan, S. Emelianov. "Contrast-enhanced magneto-photo-acoustic imaging *in vivo* using dual-contrast nanoparticles," *Photoacoustics*, 2, 55-62 (2014).

14. M. Mehrmohammadi, T.-H. Shin, M. Qu, P. Kruizinga, **R. L. Truby**, J.-H. Lee, J. Cheon, S. Y. Emelianov. "In vivo Pulsed Magneto-motive Ultrasound Imaging Using High-performance Magnetoactive Contrast Nanoagents," *Nanoscale*, 5, 11179-11186 (2013).

15. **R. L. Truby**, S. Y. Emelianov, K. A. Homan, "Ligand-Mediated Self-Assembly of Hybrid Plasmonic and Superparamagnetic Nanostructures," *Langmuir*, 29, 2465-2470 (2013).

16. K. A. Homan, M. Souza, **R. Truby**, G. P. Luke, C. Green, E. Vreeland, and S. Emelianov, "Silver nanoplate contrast agents for in vivo molecular photoacoustic imaging," *ACS Nano*, 6, 641-650 (2012).

17. M. Qu, S. Mallidi, M. Mehrmohammadi, **R. Truby**, K. Homan, P. Joshi, Y-S. Chen, K. Sokolov, S. Emelianov, "Magneto-photo-acoustic imaging," *Biomedical Optics Express*, 2, 385-395 (2011).

Peer-Reviewed Conference Proceedings Papers

18. A. Zhang, **R. L. Truby**, L. Chin, S. Li, D. Rus, "Seeing is Perceiving: Proprioception through Vision in Handed Shearing Auxetic Fingers," *in review*.

19. **R. L. Truby**, R. K. Katzschmann, J. A. Lewis, D. Rus, "Soft Robotic Fingers with Embedded Ionogel Sensors and Discrete Actuation Modes for Somatosensitive Manipulation," *Proceedings of the 2019 IEEE International Conference on Soft Robotics (RoboSoft),* 322-329, 2019. [with oral presentation, Recipient of Outstanding Conference Paper Award]

20. M. Qu, M. Mehrmohammadi, **R. Truby**, K. Homan, S. Emelianov, "Magneto-photo-acoustic imaging using dual-contrast agent," *Proceedings of the 2010 IEEE InternationalUltrasonics Symposium*, 511-514. [with oral presentation]

Editorials, Perspectives, and Other Non-Refereed Articles

21. **R. L. Truby**, "Designing Soft Robots as Robotic Materials," *Accounts of Materials Research*, 2, 854-857 (2021). [Featured on the Front Cover, Viewpoints Article, Invited]

22. **R. L. Truby*** and S. Li*, "Integrating chemical fuels and artificial muscles for untethered microrobots." *Science Robotics*, 5, eabd7338 (2020). [Focus Article, * indicates corresponding authors. Invited to co-author by Dr. Shuguang Li.]

Awarded Patents

1. J. A. Lewis, J. T. Muth, D. M. Vogt, **R. L. Truby**, Y. Menguc, D. B. Kolesky, R. J. Wood, "Printed Stretchable Strain Sensor," United States Patent No. 10,151,649, December 11, 2018.

2. J. A. Lewis, D. B. Kolesky, K. A. Homan, **R. L. Truby**, A. S. Gladman, M. A. Scott. "Method of Printing a Tissue Microstructure with Embedded Vasculature," United States Patent No. 10,117,968, November 6, 2018.

Filed Patent Applications

1. L. T. Chin, **R. L. Truby**, A. Zhang, D. Rus. "Distributed Proprioception in Soft, Architected Materials via Fluidic Innervation," U.S. Provisional Patent Application Filed November 30, 2021.

2. J. A. Lewis, **R. L. Truby**, M. Wehner, D. M. Vogt, R. J. Wood. "Soft Somatosensitive Actuators via Embedded Three-Dimensional Printing," U.S. Provisional Patent Application No. 62/578,038, filed October 27, 2017.

3. J. A. Lewis, **R. L. Truby**, M. Wehner, D. J. Fitzgerald, R. J. Wood. "Soft Robot and Method of Making a Soft Machine," provisional U.S. Patent Application, Case No. 14968-31, filed February 2, 2016.

4. J. A. Lewis, M. A. Skylar-Scott, D. B. Kolesky, K. A. Homan, **R. L. Truby**, "Embedding Cerebral Organoids within Perfusable Vascularized Matrices," provisional U.S. Patent Applications, Case No. 14968-44, filed on November 3, 2015.

5. J. A. Lewis, K. A. Homan, D. B. Kolesky, **R. L. Truby**, M. A. Skylar-Scott, "Tubular Tissue Construct and a Method of Printing," provisional U.S. Patent Application No. 62/157,239, filed May, 5 2015.

Invited Conference Presentations

1. **R. L. Truby**, "Printing Robotic Materials with Distributed Sensorimotor Capabilities," Spring 2022 Meeting of the Materials Research Society," to be presented May 2022. [Oral Presentation]

2. **R. L. Truby**, J. A. Lewis, "Embedded 3D Printing of Autonomous and Somatosensory Soft Robots," Spring 2018 Meeting of the Materials Research Society, April 5, 2018, Phoenix, AZ. [Oral presentation]

3. K. Homan, G. Luke, Y.-S. Chen, M. Souza, **R. Truby**, S. Emelianov, "Silver Nanoplates as Photoacoustic Contrast Agents and Biosensors," Biosensing and Nanomedicine II, SPIE Optics + Photonics, San Diego, CA, 2012.

Invited Conference Workshop Presentations

1. C. Della Santina* and **R. L. Truby***. "Tackling Brain-Body Challenges through Robotics-Materials Collaboration," IEEE ICRA 2020 Workshop "Beyond Soft Robotics: Pioneer Perspectives and Interdisciplinary Collaboration," May 31, 2020. [Tag-team "Interdisciplinary Collaborative Talk" presented live on IEEE.tv; invitation from workshop organizer Dr. F. Giorgio-Serchi]

Conference Presentations and Talks

1. **R. L. Truby**, L. Chin, D. Rus. "Fluidically Innervated Architected Materials," Fall 2021 Meeting for the Materials Research Society, November 30, 2021, Boston, MA. [Oral, in-person presentation.]

2. **R. L. Truby**, L. Chin, D. Rus. "Electrically-Driven Soft Robots via 3D Printed Handed Shearing Auxetics," Spring 2021 Meeting for the Materials Research Society, April 20, 2021. [Live, virtual oral presentation].

3. C. Della Santina, **R. L. Truby**, D. Rus. "Distributed Proprioception of 3D Configuration in Soft, Sensorized Robots via Deep Learning," 2020 IEEE International Conference on Intelligent Robots and Systems (IROS), October-December 2020, Virtual Conference. [Originally scheduled for 10-minute session talk, given as pre-recorded 10-minute virtual presentation]

4. **R. L. Truby**, C. Della Santina, D. Rus. "Distributed Proprioception of 3D Configuration in Soft, Sensorized Robots via Deep Learning," 2020 IEEE International Conference on Robotics and Automation (ICRA), May-June 2020, Virtual Conference. [Originally scheduled for 10-minute session talk, given as pre-recorded 10-minute virtual presentation]

5. J. W. Boley, W. M. van Rees, C. Lissandrello, M. N. Horenstein, **R. L. Truby**, A. Kotikian, J. A. Lewis, L. Mahadevan. "Shape-shifting structured lattices via multimaterial 4D printing," Gordon Research Conference on Multifunctional Materials and Structures, January 2020, Ventura, CA. [Poster presentation]

6. **R. L. Truby**, C. Della Santina, D. Rus. "Distributed Proprioception of 3D Configuration in Soft, Sensorized Robots via Deep Learning," Gordon Research Conference on Robotics, January 2020, Ventura, CA. [Poster presentation]

7. J. W. Boley, W. M. van Rees, C. Lissandrello, M. N. Horenstein, **R. L. Truby**, A. Kotikian, J. A. Lewis, L. Mahadevan. "Shape-shifting structured lattices via multimaterial 4D printing," Fall 2019 Meeting of the Materials Research Society, December 2019, Boston, MA. [Oral presentation]

8. J. W. Boley, W. M. van Rees, C. Lissandrello, M. N. Horenstein, **R. L. Truby**, A. Kotikian, J. A. Lewis, L. Mahadevan. "Shape-shifting structured lattices via multimaterial 4D printing," Society of Engineering Science Conference, October 2019, St Louis, MO. [Oral presentation]

9. **R. L. Truby**, R. K. Katzschmann, J. A. Lewis, D. Rus, "Soft Robotic Fingers with Embedded Ionogel Sensors and Discrete Actuation Modes for Somatosensitive Manipulation," 2019 IEEE International Conference on Soft Robotics (RoboSoft), April 15, 2019, Seoul, South Korea. [Oral presentation]

10. A. Kotikian, **R. L. Truby**, J. W. Boley, T. J. White, J. A. Lewis. "3D Printed Liquid Crystal Elastomer Actuators with Spatially Programmed Nematic Order," Fall 2018 Meeting of the Materials Research Society, November 2018, Boston, MA. [Oral presentation].

11. **R. L. Truby**, M. Wehner, R. J. Wood, J. A. Lewis, "Embedded 3D Printing of Soft Robotic Actuators with Integrated Sensors for Somatosensory Feedback," Gordon Research Conference on Multifunctional Materials, January 2018, Ventura, CA. [Poster presentation].

12. A. Kotikian, **R. L. Truby**, J. W. Boley, T. J. White, J. A. Lewis. "3D Printed Liquid Crystal Elastomer Actuators with Spatially Programmed Nematic Order," Gordon Research Conference on Multifunctional Materials, January 2018, Ventura, CA. [Poster presentation].

13. **R. L. Truby**, M. Wehner, R. J. Wood, J. A. Lewis, "Embedded 3D Printing of Soft Robotic Actuators with Integrated Sensors for Somatosensory Feedback," Fall 2017 Meeting of the Materials Research Society, November 30, 2017, Boston, MA. [Oral presentation, selected for MRS Graduate Student Gold Award].

14. **R. L. Truby**, J. A. Lewis, "3D Printing of Soft Materials for Robotics," Workshop on Robotic Materials, 2017 Robotics Science and Systems (RSS) Conference, Massachusetts Institute of Technology, July 15, 2017. [Oral & poster presentations]

15. **R. L. Truby**, M. Wehner, R. J. Wood, J. A. Lewis, "An Integrated Design and Fabrication Strategy for Entirely Soft Robots," MIT Robocon, Massachusetts Institute of Technology, February 11, 2017, Cambridge, MA. [Oral presentation]

16. **R. L. Truby**, M. Wehner, R. J. Wood, J. A. Lewis, "Toward Autonomous, Completely Soft Robots with Embedded 3D Printing," Fall 2016 Meeting of the Materials Research Society, December 2016, Boston, MA. [Oral presentation].

17. **R. L. Truby**, M. Wehner, R. J. Wood, J. A. Lewis, "Embedded Three-Dimensional Printing of Completely Soft Robots," Symposium on Computational Fabrication, Massachusetts Institute of Technology, April 2016, Cambridge, MA. [Poster presentation]

18. **R. L. Truby**, M. Wehner, R. J. Wood, J. A. Lewis, "Embedded Three Dimensional Printing of Soft Robots," Gordon Research Conference on Multifunctional Materials, January 2016, Ventura, CA. [Poster presentation]

19. D. B. Kolesky, K. A. Homan, A. S. Gladman, **R. Truby**, M. Bell, T. Busbee, J. A. Lewis, "3D Bioprinting of Multi-Material, Cell-Laden Tissue Constructs," MRS Fall Meeting, 2013.

20. M. Qu, **R. Truby**, M. Mehrmohammadi, K. Homan, S. Y. Emelianov, "Monitoring of nanoparticle delivery and endocytosis using magneto-photo-acoustic imaging," IEEE International Ultrasonics Symposium, 2012. [Oral presentation by S. Y. Emelianov]

21. M. Mehrmohammadi, S. Kim, M. Qu, **R. L. Truby**, P. Kruizinga, S. Y. Emelianov, "In-Vivo pulsed magneto-motive ultrasound imaging on tumor bearing small animals," IEEE International Ultrasonics Symposium, 2011. [Oral presentation]

22. K. Homan, M. Souza, **R. Truby**, Y-S. Chen, G. Luke, and S. Emelianov, "Silver Nanoplates for Enhanced Photoacoustic Imaging and Therapy of Pancreatic Cancer," Reporters, Markers, Dyes, Nanoparticles, and Molecular Probes for Biomedical Applications II Proc. SPIE 7910-20, Jan 24, 2011. [Oral presentation]

23. **R. L. Truby**, K. A. Homan, M. Qu, M. Mehrmohammadi, S. Emelianov "Synthesis of a Hybrid Plasmonic-Superparamagnetic Contrast Agent for Magneto-Photo-Acoustic Imaging", 2010 Annual Meeting of the Biomedical Engineering Society, Austin, TX, Oct 7, 2010. [Oral presentation]

24. K.A. Homan, S. Mallidi, J. Chen, M. Souza, **R. Truby**, S. Emelianov "Clinical Prospects for the Use of Nanoparticles in Imaging and Image-Guided Drug Delivery and Release", Central Texas Clinical Research Forum, Austin, TX, May 7, 2010. [Poster presentation]

25. K. Homan, S. Mallidi, J. Chen, M. Souza, **R. Truby**, L. Brannon-Peppas, and S. Emelianov "Using Nanocage Contrast Agents as Drug Carriers", World Molecular Imaging Congress, Montreal, Canada, Sep 24, 2009. [Poster presentation]

26. K. Homan, S. Mallidi, **R. Truby**, M. Souza, S. Emelianov "Photoacoustic and Ultrasound Imaging of Pancreatic Cancer in a Mouse Model", Central Texas Clinical Research Forum, Austin, Texas, May 7, 2009. [Poster presentation]

Presentations at University Events and Research Symposia

1. **R. L. Truby**, C. Della Santina, D. Rus. "Distributed Proprioception of 3D Configuration in Soft, Sensorized Robots via Deep Learning," ICRAxMIT, Virtual Event, Massachusetts Institute of Technology, June 9, 2020. [Oral presentation]

2. M. A. Skylar-Scott*, S. G. M. Uzel*, L. Nam, J. Ahrens, **R. L. Truby**, S. Damaraju, J. A. Lewis. "Embedded printing of vascularized organ-specific tissue at scale," 2017 Wyss Retreat, Wyss Institute for Biologically Inspired Engineering, Harvard University, November 16, 2017. [Oral and poster presentations]

3. **R. L. Truby**, Alexander D. Valentine, J. A. Lewis. "Soft Electronics and Sensors via Hybrid 3D Printing," 2017 Wyss Retreat, Wyss Institute for Biologically Inspired Engineering, Harvard University, November 16, 2017. [Oral presentation]

4. **R. L. Truby**, M. Wehner, D. Fitzgerald, B. Mosadegh, G. M. Whitesides, J. A. Lewis, R. J. Wood. "Realizing Autonomy in Completely Soft Robots," 2015 Wyss Retreat, Wyss Institute for Biologically Inspired Engineering, Harvard University, November 18, 2015. [Oral presentation]

5. D. B. Kolesky, **R. L. Truby**, A. S. Gladman, T. A. Busbee, K. A. Homan, J. A. Lewis. "3D Bioprinting of Vascularized, Heterogeneous Cell-Laden Tissue Constructs," 2013 Wyss Retreat, Wyss Institute for Biologically Inspired Engineering, Harvard University, November 16, 2013. [Poster presentation]

6. J. T. Muth, D. M. Vogt, **R. L. Truby**, Y. Mengüc, D. B. Kolesky, R. J. Wood, J. A. Lewis, "Embedded 3D-Printing of Monolithic, Highly Stretchable Sensors," 2013 Wyss Retreat, Wyss Institute for Biologically Inspired Engineering, Harvard University, November 16, 2013. [Given as poster and oral presentations]

7. **R. Truby**, K. Homan, M. Qu, M. Mehrmohammadi, S. Emelianov, "Hybrid Nanoparticle Contrast Agents for Magneto-Photo-Acoustic Imaging," Spring 2011 Biomedical Engineering Undergraduate Research Forum, The University of Texas at Austin, May 6, 2011. [Poster presentation, received 1st Place Presentation Award]

8. **R. Truby**, K. Homan, M. Qu, M. Mehrmohammadi, S. Emelianov, "Hybrid Nanoparticle Contrast Agents for Magneto-Photo-Acoustic Imaging," Cockrell School of Engineering Poster Exhibition and Engineering Research Symposium, The University of Texas at Austin, April 8, 2011, [Poster presentation, received 4th Place Poster Award and selected to present to the Cockrell School of Engineering External Advisory Board at its Spring 2011 Meeting]

9. **R. Truby**, "Hybrid Plasmonic-Superparamagnetic Contrast Agents for Magneto-Photo-Acoustic Imaging," Biomedical Optics Graduate Organization Seminar Series, The University of Texas at Austin, November 12, 2010. [Invited presentation]

10. **R. Truby**, M. Qu, K. Homan, M. Mehrmohammadi, S. Emelianov, "Synthesis of a Hybrid Plasmonic-Superparamagnetic Nanoparticle Contrast Agent for Magneto-Photoacoustic Imaging", Spring 2010 Biomedical Engineering Undergraduate Research Forum, The University of Texas at Austin, May 7, 2010. [Poster presentation, received 2nd Place Presentation Award]

11. **R. Truby**, M. Souza, K. Homan, E. Cooley, S. Emelianov, "Synthesis of Silver Nanodisc Contrast Agents for Photoacoustic Imaging of Pancreatic Cancer", Spring 2009 Biomedical Engineering Undergraduate Research Forum, The University of Texas at Austin, May, 8, 2009. [Poster presentation, received 3rd Place Presentation Award]

Invited University Seminars and Guest Lectures

1. "Thermodynamics of Soft, Responsive Materials," Guest Lecture for MATSCI401 – Thermodynamics, McCormick School of Engineering and Applied Science, Northwestern University, November 19, 2021. [Lecture, invitation from Prof. Ian McCue.]

2. "Designing Soft Robots with Soft Matter Mechanics in Mind," Guest Lecture for BME462/ME495 – Neural Engineering and Soft Robotics, McCormick School of Engineering and Applied Science, Northwestern University, April 29, 2021. [Lecture, invitation from Prof. Mitra J. Z. Hartmann]

3. "Soft, Bioinspired Robots and the Material Side of Machine Intelligence," Virtual Seminars in Biomedical Science, a weekly series of talks from rising stars in science founded during the COVID-19 pandemic, February, 18, 2021. [Virtual Seminar, invitation from Dr. James Armstrong, Research Fellow, Imperial College London]

4. "Towards Robotic Matter via the Design, Fabrication, and Control of Soft Robots," Department of Mechanical Engineering, Massachusetts Institute of Technology, March 5, 2020. [Special Seminar, invitation from Profs. John Leonard and Gareth McKinley]

5. "Towards Robotic Matter via the Design, Fabrication, and Control of Soft Robots," Department of Materials Science and Engineering, Northwestern University, February 10, 2020. [Seminar, invitation from Profs. Sossina Haile and Samuel Stupp]

6. "Towards Robotic Matter via the Design, Fabrication, and Control of Soft Robots," Department of Materials Science and Engineering, Cornell University, January 23, 2019. [MSE Seminar, invitation from Prof. Richard Robinson]

7. "Towards Robotic Matter via the Design, Fabrication, and Control of Soft Robots," Department of Materials, ETH Zürich, August 29, 2019. [Lecture, invitation from Prof. Nicholas Spencer]

8. "Embedded Three-Dimensional Printing of Autonomous and Somatosensitive Soft Robots," Department of Computer Science and Engineering, CITRIS and the Banatao Institute, University of California at Santa Cruz, April 6, 2018. [Seminar, invitation from Prof. Michael Wehner]

9. "3D Printing with Biomaterials." Guest Lecture for *BE 191 – Introduction to Biomaterials*. John A. Paulson School of Engineering and Applied Science, Harvard University, March 2018. [Lecture, invitation from Prof. Jennifer A. Lewis]

10. "An Integrated Design and Fabrication Strategy for Entirely Soft Robots." MIT Media Lab, Massachusetts Institute of Technology, April 2017. [Seminar, invitation from a student organization at the MIT Media Lab]

11. "Soft Matter as a Programmable Medium for Novel Tangible Interfaces." Guest Lecture for *MAS.834 – Tangible Interfaces*. MIT Media Lab, Massachusetts Institute of Technology, November 2016. [Lecture, invitation from Prof. Hiroshi Ishi]

12. "Mesoscale Three-Dimensional Printing of Functional Materials." Guest Lecture for *CHEM 165 – Experimental Physical Chemistry*. Harvard College, Harvard University, March 2016. [Lecture, invitation from Dr. William Wilson]

13. "Mesoscale Three-Dimensional Printing of Functional Materials." Guest Lecture for *MAS.650 – Design Across Scales and Disciplines*. MIT Media Lab, Massachusetts Institute of Technology, March 2016. [Lecture, invitation from Prof. Neri Oxman]

14. "Functional Three-Dimensional Printing." Guest Lecture for *GSD 6477 – Nano, Micro, Macro: Adaptive Material Laboratory*. Graduate School of Design, Harvard University, October 2015. [Lecture, invitation from Dr. James Weaver].

15. "Fundamentals, Grand Challenges, and Our Medical Future with 3D Printing." Guest Lecture for *BE 191 – Introduction to Biomaterials*. John A. Paulson School of Engineering and Applied Sciences, Harvard University, April 2015. [Lecture, invitation from Prof. Jennifer A. Lewis].

UNIVERSITY TALKS AND PODCAST INTERVIEWS FOR THE GENERAL PUBLIC

1. Panelist for the *2nd IEEE Soft Robotics Debate on "Bridging the Gap Between Soft Robots and Soft Materials: Discovering New Material Functionalities vs. Creating Architected Compliance,"* Soft Robotics Debates, IEEE, October 15, 2020.

2. Guest on *Soft Robotics Podcast*, "Soft Robotics with Ryan Truby," IEEE, April 27, 2020.

3. Guest on *Veritalk*, "Sensing Episode 2: Squish Goes the Robot!" Harvard University Graduate School of Arts and Sciences, December 9, 2019.

4. "How Soft Materials Can Revolutionize Robotics", *inSPIREd* Public Talks, Schmidt Science Fellows, in Partnership with the Rhodes Trust, Rhodes House, Oxford University, July 26, 2019. [Video link]

TEACHING ACTIVITIES

Teaching Fellow, BE 191 – Introduction to Biomaterials 02/2015 – 05/2015

Paulson School of Engineering and Applied Sciences
Harvard University, Cambridge, Massachusetts

- Developed and organized the in-class activities and demos
- Hosted laboratory sections and the final exam review session with other Teaching Fellows
- Received an Overall Teaching Fellow Performance Evaluation of "Very Good" (4.4/5.0) from student reviews

Teaching Fellow, BE 191 – Introduction to Biomaterials 08/2013 – 05/2014

Paulson School of Engineering and Applied Sciences
Harvard University, Cambridge, Massachusetts

- Worked with Prof. Jennifer Lewis to envision, design, and prepare lectures, assignments, interactive in-lecture activities, laboratory assignments, and exams for this new foundational course for undergraduate students concentrating in bioengineering at Harvard University

- Received an Overall Teaching Fellow Performance Evaluation of "Very Good" (4.0/5.0) from student reviews

MENTORING ACTIVITIES

Postdoctoral Researcher Supervision 09/2021 – Present

EunBi Oh, Ph.D., Northwestern University, Postdoctoral Scholar
- Materials Science and Engineering, October 2021 - Present

PhD Student Supervision

Alexander Evenchik, B.S., Northwestern University, PhD Student
- Materials Science and Engineering, November 2021 - Present

Alexander Kane, B.S., Northwestern University, PhD Student
- Materials Science and Engineering, November 2021 - Present

Masters Student Supervision

Pranav Kaarthik, B.S., Northwestern University, M.S. Student
- Mechanical Engineering, October 2021 - Present

Undergraduate Researcher Supervision

Anjali Shah, B.S., Northwestern University, B.S. Student in Mechanical Engineering
- Materials Science and Engineering, November 2021 - Present

Simona Fina, Northwestern, B.S. Student in Materials Science and Engineering
- Materials Science and Engineering, October 2021 - Present

Undergraduate Researcher Mentoring from PhD, Postdoctoral Training 06/2013 – 03/2020

At the Distributed Robotics Lab, MIT Computer Science and Artificial Intelligence Lab (CSAIL)
Massachusetts Institute of Technology, Cambridge, Massachusetts

Wendy Trattner, MIT, BS Student in Mechanical Engineering
- Mentored from September 2019 to March 2020 as a MIT Undergraduate Research Assistant

Olivia Siegel, MIT, BS Student in Computer Science
- Mentored from January 2019 to November 2019 as a MIT Undergraduate Research Assistant

At the Lewis Research Group, Paulson School of Engineering and Applied Sciences, Wyss Institute
Harvard University, Cambridge, Massachusetts

Julia Ernst, Harvard College, SB in Bioengineering, Fulbright Scholar
- Co-mentored Julia's Undergraduate Engineering Design Thesis at Harvard from September 2017 to May 2018
- Julia was awarded a 2018 Thomas T. Hoopes Prize for excellence in research and scholarly work from Harvard's Faculty of Arts and Science and one of four 2018 Dean's Awards for Outstanding Engineering Projects
  - Thesis: *Wearable Sensors for Assessment of StressDistribution in Prosthetic Sockets*

Abigail Grosskopf, Princeton University, BS in Chemical Engineering
- Co-mentored Abby's Undergraduate Thesis at Princeton from September 2016 to May 2017
- Abby received two top prizes – The Outstanding Materials Science Student Award from the Princeton Institute for the Science and Technology of Materials and the Air Products Chemical Engineering Senior Thesis Research Award from Princeton's Department of Chemical Engineering – and wrote a first-author peer-reviewed journal article on her findings
  - Thesis: *A Rheological Study of Matrix Materials Usedin Embedded Three-Dimensional Printing*
- Mentored Abby for two summers (June to September 2015, and June to September 2016) as an Undergraduate Researcher and Participant in Harvard's NSF MRSEC 2015 and 2016 REU Programs

Daniel Fitzgerald, Worcester Polytechnic Institute, BS in Robotics and Computer Science
- Mentored from June to August 2014 as a Summer Undergraduate Research Fellow

Leonard Chang, University of Illinois Urbana-Champaign, BS in Materials Science & Engineering
- Mentored from June to August 2013 as an Undergraduate Researcher and Participant in Harvard's NSF MRSEC 2013 REU Program

OUTREACH AND BROADER IMPACTS PROGRAMMING

Professional Outreach Activities 01/2019 – Present

- **Faculty Volunteer**, 2021 Chicagoland STEM Recruiting Event for Underrepresented and Minoritized Postdocs, in Partnership with Northwestern University, University of Chicago, and University of Illinois Chicago, Fall 2021
- **Judge**, 2019 National Collegiate Research Conference, Harvard University, January 26, 2019

Organizer and Course Instructor for "At the Frontiers" High School Seminar 01/2016 – 06/2016

The Innovation Institute, Newtonville, Massachusetts

- Organized and co-instructed, "At the Frontiers of Materials Engineering: Designing Matter that Matters," an 11-week introductory seminar course for high school students on materials science and engineering. Students attended weekly seminar-style lectures, participated in round-table discussion sessions brainstorming current and future directions of materials innovation, and explored fundamental materials engineering concepts or current state-of-the-art materials-enabled technologies with hands-on laboratory and design activities

Organizer and Instructor, 3D Printing and Soft Robotics Workshop 05/2015 – 07/2015

Materials Research Science and Engineering Center
Harvard University, Cambridge, Massachusetts

- Worked with the Harvard's MRSEC to host 23 middle school girls from the Boston-area Artemis Project Summer Program for an all-day outreach event. Activities included an interactive lecture on 3D printing, live demonstrations with researchers from the Lewis Lab at Harvard, hands-on CAD activities, and custom design of backpack tags that all program participants 3D printed.

Mentor, Student Engineers Educating Kids (SEEK) 08/2011 – 05/2012

Garcia Middle School, Austin, Texas

- Mentored at-risk minority students through weekly one-on-one engineering design and problem-solving projects, encouraging them to find a passion for science and engineering and aspire to work towards a college degree in STEM

PROFESSIONAL ACTIVITIES

Conference and Professional Society Service

- Session Chair, Rheology for Soft Robotics Session, *19th International Conference on Rheology*, Athens, Greece, 2023
- Associate Editor, *2022 IEEE International Conference on Soft Robotics (RoboSoft)*, 2022
- Lead Organizer, Robotic Materials for Advancing Machine Intelligence Symposium, *Spring 2022 Meeting of the Materials Research Society (MRS)*, Honolulu, HI
- Session Chair, "Soft Robotic Matter Session" in "Symposium SF03 – 3D Printing of Functional Materials and Devices," *Fall 2021 Meeting of the Materials Research Society (MRS)*, Boston, MA
- Co-Chair for the Session on Manipulation, *IEEE International Conference on Soft Robotics (RoboSoft) 2019*, April 2019, Seoul, South Korea

Grant Reviewer for Federal Funding Programs

- ETH Zurich Research Commission, 2021
- National Science Foundation's *Emerging Frontiers in Research and Innovation Program*, 2019

Journal Referee and Reviewer

- *Soft Robotics*
- *IEEE Robotics and Automation Letters*
- *International Journal of Robotics Research*
- *Science Robotics*
- *Nature Communications*
- *Science Advances*

Conference Referee and Reviewer

- *IEEE International Conference on Robotics and Automation (ICRA)*: 2020, 2021
- *IEEE International Conference on Soft Robotics (RoboSoft)*: 2019, 2020, 2021

External Activities

- Judge, ANA Avatar XPRIZE, XPRIZE Foundation, February 2021 – present
- Peer Mentor, Schmidt Science Fellows Program, September 2020 – present
- Cohort Co-Leader, Schmidt Science Fellows Program, September 2019 – present

ACADEMIC SERVICE ACTIVITIES

Thesis Committee Service
- S. Doruk Cezan, PhD Student, Materials Science and Engineering, Thesis Committee Member
- Lindsay Chaney, PhD Student, Materials Science and Engineering, Thesis Committee Member
- Namrata Ramani, PhD Student, Materials Science and Engineering, Thesis Committee Member

Student Group Advising
- Faculty Advisor, *The Northwestern University Research Program for High Schoolers (NURPH)*

Committee Service
- Materials Science and Engineering Future Leaders Committee, October 2021 – present
- Materials Science and Engineering Colloquium Committee, October 2021 – present
- Hilliard Symposium Judge, Spring 2021
- Schmidt Science Fellowship Selection Committee, Summer 2020

Affiliations
- International Institute of Nanotechnology
- Northwestern Initiative for Manufacturing Science and Innovation
- Center for Robotics and Biosystems

Selected Media Coverage and Highlights

Research in Soft Robotics
1. Softening Up Robots. Communications of the ACM. Esther Shein. December 2020.
2. MIT showcases soft robotic sensors made from flexible, off-the-shelf materials. TechCrunch. Brian Heater. Feb. 13, 2020.
3. Robotic fingers get touchy-feely. Nature. March 8, 2018.
4. We Now Have Soft Robots with a Sense of Touch. But Why? *You should be excited. They're cool. And also useful.* Futurism. Chelsea Gohd. March 2, 2018.
5. Meet the World's First Completely Soft Robot. MIT Technology Review. Julia Sklar. December 8, 2016.
6. Soft, Autonomous 'Octobot' a Breakthrough for Robotics. Newsweek. Himanshu Goenka. August 28, 2016.
7. This amazing robotic octopus is the first made entirely of squishy parts. Washington Post. Rachel Feltman. Aug. 26, 2016.
8. Meet Octobot: Squishy, Adorable and Revolutionary. The New York Times. Nicholas St. Fleur. August 26, 2016.
9. Meet Octobot, a dinky chemical reaction-powered soft robot. CNN. Emiko Jozuka. August 25, 2016.
10. Pneumatic octopus is first soft, solo robot. BBC News. Jonathan Webb. August 25, 2016.
11. 'Octobot' is a Soft, Chemical-Powered Robot with a Fluid Circuit Board. Popular Mechanics. Jay Bennett. Aug. 24, 2016.
12. Harvard 3D Printed a Soft Robot Octopus. Popular Science. Kelsey D. Atherton. August 24, 2016.
13. 'Octobot' is the world's first soft-bodied robot. Science. Michael Price. August 24, 2016.
14. Beyond Terminator: squishy 'octobot' heralds new era of soft robotics. Nature. Helen Shen. August 24, 2016.

Research in 3D Bioprinting
1. 3D-printed hearts with 'beating' tissue could ease organ donor shortage. Sony Salzman. September 23, 2019. NBC News.
2. The printed organs coming to a body near you. Heidi Ledford. April 15, 2015. Nature.
3. Print Your Heart Out. Matt Davenport. March 9, 2015. Chemical & Engineering News. Volume 93, Issue 10, p. 27-39.
4. 2014 in Materials: Rhubarb Batteries, the Gigafactory, and Printing Body Parts. Kevin Bullis. December 28, 2014. MIT Technology Review.
5. Just Press Print. Roff Smith. December 2014. National Geographic.
6. Blood Vessels Via Printer. #67 of Top 100 Stories of 2014. Lacy Schley. November 2014. Discover Magazine.
7. Print Thyself. November 17, 2014. Jerome Groopman. The New Yorker.
8. Artificial Organs May Finally Get a Blood Supply. Susan Young. March 6, 2014. MIT Technology Review. Online Article.
9. Tissue That's Fit to Print. Daniel Akst. March 8, 2014. Wall Street Journal. Page C4.
10. Breakthrough: print me a body part. Gail Sullivan. March 7, 2014. Washington Post. Online Article.

Undergraduate Teaching and Outreach
1. Fit to Print: How Travis Busbee and Ryan Truby, graduate students in the Lewis Lab, worked with Lewis to create an undergraduate course. March 27, 2015. Lusia Zaitseva. Harvard Graduate School of Arts and Sciences Bulletin.
2. An Introduction to Rebuilding the Body: Course on biomaterials puts undergrads on cutting edge. September 22, 2014. Caroline Perry. Harvard Gazette. Online Article.

Miscellaneous
1. The 10 best science images, videos, and visualizations of the year. Popular Science. March 29, 2017.