



Jeffrey I Lipton

Curriculum Vitæ (October 23, 2020)

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EDUCATION AND APPOINTMENTS

Director of the Center for Digital Fabrication (DFab) Current
University of Washington

Assistant Professor of Mechanical Engineering Current
University of Washington

With Courtesy Appointment in Computer Science and Engineering

Adjunct Assistant Professor of Mechanical Engineering 2018-2019
University of Washington

With Courtesy Appointment in Computer Science and Engineering

Postdoctoral Fellow 2015-2019
Massachusetts Institute of Technology

Computer Science and Artificial Intelligence Laboratory, Daniela Rus Lab: Research on robotics and 3D printing for automatic fabrication and manufacturing

PhD and MS in Mechanical Engineering 2010-2015
Cornell University

“3D Printing Food, Foam and Forces”

Thesis advisor: Hod Lipson

BS Applied and Engineering Physics 2006-2010
Cornell University

Academic/Research advisors: Hod Lipson, Darren Dale

PEER-REVIEWED JOURNAL PAPERS

9. J. I. Lipton, R. MacCurdy, Z. Manchester, L. Chin, D. Celluci, and D. Rus, “Handedness in Shearing Auxetics Creates Rigid and Compliant Structures”, *Science* **360**, 632-635 (2018).
8. J. I. Lipton, A.J.Fay, and D. Rus, “Baxter’s Homunculus: Virtual Reality Spaces for Teleoperation in Manufacturing”, *IEEE Robotics and Automation Letters* **179-186**, (2017).
7. J. I. Lipton, S. Angle, R. E. Banai, E. Peretz, and H. Lipson, “Electrically Actuated Hydraulic Solids”, *Advanced Engineering Materials* **1527-2648**, (2016).

6. J. I. Lipton, and H. Lipson, “3D Printing Variable Stiffness Foams Using Viscous Thread Instability”, *Nat. Sci. Rep.* **6**, 29996 (2015).
5. J. I. Lipton, J. Witzleben, V. Green, C. Ryan, and H. Lipson, “Demonstrations of Additive Manufacturing for the Hospitality Industry”, *3D Printing and Additive Manufacturing* **2(4)**, 204-208 (2015).
4. J. I. Lipton, M. Cutler, F. Nigl D. Cohen, and H. Lipson, “Additive Manufacturing for the Food Industry”, *Trends in Food Science & Technology* **43(1)**, 114–123 (2015).
3. D. L. Cohen, J. I. Lipton, L. J. Bonassar, and H. Lipson, “Additive manufacturing for in-situ Repair of Osteochondral Defects”, *Biofabrication* **2(3)**, 035004 (2010).
2. C. L. Pearson, D. S. Dale, P. W. Brewer, P. I. Kuniholm, J. I. Lipton, and S. W. Manning, “Dendrochemical Analysis of a Tree-Ring Growth Anomaly Associated with the Late Bronze Age Eruption of Thera”, *Journal of Archaeological Science* **36(6)**, 1206-1214 (2009).
1. C. L. Pearson, D. S. Dale, P. W. Brewer, M. W. Salzer, J. I. Lipton, and S. W. Manning, “Dendrochemistry of White Mountain Bristlecone Pines: An Investigation via Synchrotron Radiation Scanning X-Ray Fluorescence Microscopy”, *Journal of Geophysical Research: Biogeosciences* **114(G1)**, (2009).

PEER-REVIEWED CONFERENCE PAPERS

21. A. Amini, J. I. Lipton, D.Rus, “Uncertainty Aware Texture Classification and Mapping Using Soft Tactile Sensors”, *International Conference on Intelligent Robots and Systems* , (2020).
20. J. I. Lipton, J. DelPreto, L. Sanneman, A. Fay, C. Fourie, C. Choi and D.Rus, “Helping Robotics Lean: A Human-Robot Master-Apprentice Model using Demonstrations via Virtual Reality Teleoperation”, *IEEE International Conference on Robotics and Automation* , (2020).
19. C Wu, H. Zhao, C. Nandi, J. I. Lipton, Z. Tadlock, and A. Schultz, “Carpentry Compiler”, *SIGGRAPH* , (2019).
18. J. I. Lipton,L.Chin, J. Miske, and D.Rus, “Modular Volumetric Actuators Using Motorized Auxetics”, *IEEE International Conference on Robotics and Automation*) , (2019).
17. L. Chin,J. I. Lipton, M. Yuen, , R. Kramer-Bottiglio, and D.Rus, “Automated Recycling Separation Enabled by Soft Robotic Material Classification (Best Poster Winner)”, *IEEE International Conference on Soft Robotics (RoboSoft)* , (2019).
16. L. Chin, M. Yuen, J. I. Lipton, L. Trueba, R. Kramer-Bottiglio, and D.Rus, “A Simple Electric Soft Robotic Gripper with High-Deformation Haptic Feedback”, *IEEE International Conference on Robotics and Automation* , (2019).
15. J. I. Lipton, A. Schulz, A. Spielberg, L. Trueba, W. Matusik and D. Rus, “Robot Assisted Carpentry for Mass Customization”, *IEEE International Conference on Robotics and Automation* , (2018).
14. L. Chin, J. I. Lipton, R. MacCurdy, J. Romanishin, C. Sharma, D. Rus, “Compliant electric actuators based on handed shearing auxetics”, *IEEE International Conference on Soft Robotics (RoboSoft)* , 100-107 (2018).

13. J. I. Lipton, Z. Manchester, and D. Rus, “Planning Cuts for Mobile Robots with Bladed Tools”, *IEEE International Conference on Robotics and Automation* , 572-579 (2017).
12. S.Claici, J. Romanishin, J. I. Lipton, S. Bonardi, K. Gilpin, and D. Rus, “Distributed Aggregation for Modular Robots in the Pivoting Cube Model”, *IEEE International Conference on Robotics and Automation* , 1489-1496 (2017).
11. Z.Manchester, J. I. Lipton, R. Wood, and S. Kuindersma, “A Variable Forward-Sweep Wing Design for Improved Perching in Micro Aerial Vehicles”, *AIAA SciTech Forum* , (2017).
10. J. I. Lipton, R. MacCurdy, S. Li, and D. Rus, “Printable Programmable Viscoelastic Materials for Robots”, *IEEE/RSJ International Conference on Intelligent Robots and Systems* , 2628-2635 (2016).
9. J. I. Lipton, S. Angle, and H. Lipson, “3D Printable Wax-Silicone Actuators”, *International Solid Freeform Fabrication Symposium* **25**, 4-6 (2014).
8. J. I. Lipton, A. P. Tow, I. Burbank, A. Vazquez, and H. Lipson, “Solid Freeform Fabrication of Soft Tissue Simulators for Needle Injection”, *International Solid Freeform Fabrication Symposium* **25**, 1012 (2014).
7. J. I. Lipton, et al, “Fab@Home Model 3: A More Robust, Cost Effective and Accessible Open Hardware Fabrication Platform”, *International Solid Freeform Fabrication Symposium* **23**, 125-135 (2012).
6. J. I. Lipton, M. Boban, J. Hiller, and H. Lipson, “Freeform Fabrication of Stochastic and Ordered Cellular Structures”, *International Solid Freeform Fabrication Symposium* **21**, 756-763 (2010).
5. J. I. Lipton, D. Arnold, F. Nigl, N. Lopez, D. Cohen, N. Norén, and H. Lipson, “Multi-Material Food Printing with Complex Internal Structure Suitable for Conventional Post-Processing”, *International Solid Freeform Fabrication Symposium* **21**, 809-815 (2010).
4. J. I. Lipton, K. Gluck, and H. Lipson, “Extensible Digital Fabrication Language for Digital Fabrication Processes”, *International Solid Freeform Fabrication Symposium* **21**, 693-704 (2010).
3. J. I. Lipton, et al, “Fab@Home Model 2: Towards Ubiquitous Personal Fabrication Devices” , *International Solid Freeform Fabrication Symposium* **20**, 70-81 (2009).
2. D. L. Cohen, J. I. Lipton, M. Cutler, D. Coulter, A. Vesco, and H. Lipson, “Hydrocolloid Printing: A Novel Platform for Customized Food Production”, *International Solid Freeform Fabrication Symposium* **20**, 807-818 (2009).
1. J. I. Lipton, D. L. Cohen, and H. Lipson, “Brick Printing: Freeform Fabrication of Modular Architectural Elements with Embedded Systems”, *International Solid Freeform Fabrication Symposium* **20**, 711-723 (2009).

INVITED PAPERS AND ARTICLES

2. Printable Food: The Technology and its Application in Human Health, Current Opinion in Biotechnology, 2016
1. Adventures in Printing Food, IEEE Spectrum, 2013

INVITED TALKS AND WORKSHOPS

18. Fabrication via Mobile Robotics and Digital Manufacturing, DUB Seminar, 2020
17. Fabrication via Mobile Robotics and Digital Manufacturing, Stanford Robotics Seminar, 2019
16. Robotics in the supply chain, NextGen Supply Conference, Chicago, IL, 2019
15. 3D Printing Foam, Saint-Gobain Foam Day, Saint-Gobain Research & Development Center, Northborough MA, 2017
14. The Machine and Morality, CHR Technology Entrepreneurship Roundtable, Ithaca NY, 2017
13. 3D Printing for The Food and Beverage Industry, CHR Technology Entrepreneurship Roundtable, Ithaca NY, 2016
12. Electrically Actuated Hydraulic Solids: A New High Force Actuator, US-Israel Emerging Technology Discussion, Boston MA, 2015
11. Demystifying Digital Food: 3-D printing , Food Innovation Program, Reggio Emilia, Italy, 2015
10. Tools for the Development of Bioprinting Technology, Tissue Engineering and Bioprinting, Boston, MA, 2015
9. The Future of Apps, Automation, and 3D Printing in the Hospitality Industry, Pillsbury Institute's Hospitality Entrepreneurship Roundtable, Ithaca NY, 2015
8. Science and Principles of Food Printing, 3D Food Printing Conference, 2015
7. Digital Cuisine, 3D Print Show, London, 2014
6. 3D Printing for The Food and Beverage Industry, Food & Beverage Innovation Forum, Shanghai China, 2014
5. Digital Cuisine, SUNY Stonybrook, Stonybrook NY, 2013
4. Digital Cuisine, Inside 3D Printing, New York NY, 2013
3. Digital Cuisine, Cornell Hospitality Innovation Network at Google, 2010
2. Fab@School, NYSCATE, 2010
1. Brick Printing Technologies for In-Situ Smart Structure Fabrication , Archibots at UbiComp, Orlando Florida, 2009

FUNDING [≈\$1.6M]

- NSF-FM, “FMSG: Rapidly Repurposing and Scaling Assembly Lines Through the Co-design of Tooling and Controls of Robotic Work Cells”, \$500,000 (Co-PI, 10/20 - 9/22).
- NSF-CISE, “FMitF: Track 1: Retargetable, Verifiable, Optimizable Computer-Aided Manufacturing”, \$750,000 (Co-PI, 10/20 - 12/23).

- Department of Defense, “Anatomic 3D Synthetic Tissue Printer for Medical Training”, \$150,000 (PI, 6/13 - 6/14).
- Department of Health and Human Services, “Three Dimensional Printing of Custom Foot Orthoses to Treat Flexible Flat Feet”, \$225,000 (PI, 6/14- 6/15).

PATENTS

- Issued U.S. Patent 9079337, “Systems and Methods for Freeform Fabrication of Foamed Structures”
- Issued U.S. Patent 9723866 B2, “System and Method for Solid Freeform Fabrication of Edible Food ”
- Issued U.S. Patent US9993104 B2, “System and Method for Controlling the Salinity of Water in a Culinary Application”
- Issued U.S. Patent Application US 13/981,169, “Deposition of Materials for Edible Solid Freeform Fabrication ”
- U.S. Patent Application US 13/542,114, “Modular Fabrication Systems and Methods ”
- U.S. Patent Application US 15/008,815, “3D Printing Syringe-Cartridge Dispensing Apparatus and Methods ”
- U.S. Patent Application US 13/981,213, “Deposition Tool with Interchangeable Material Bay”
- U.S. Patent Application US 2017 0326785A1, “Additive Manufacturing of Viscoelastic Materials”
- U.S. Patent Application US 2018 0311833A1, “Non-planar shearing auxetic structures, devices, and methods”
- U.S. Patent Application US 15/575327, “System and Methods for Fabricating Actuators and Electrically Actuated Hydraulic Solid Materials ”

TEACHING

University of Washington:

- Fall 2019, 2020: **ME 480 Computer-Aided Engineering**
Re-developed a course for seniors introducing them to programming python from first principles through the lens of 3D printing. 80 person lab class
- Winter 2020: **ME 498/599 Special Topics in Additive Manufacturing**
60 Person grad and undergraduate lab class on polymer AM. Covered FDM, SLA, SLS, and polyjet processes.

Cornell MAE Dept Teaching Assistant:

- Spring 2014, 2015: **MAE 2250 Mechanical Synthesis**
Oversaw 20 undergraduate TA’s for a core lab class of the mechanical engineering major. Was responsible for ordering supplies, coordinating labs, shop access and grading across 7 sections.

- Fall 2013, 2014: **MAE 1170 Introduction to Mechanical Engineering**
Ran labs for 40 freshman with a wide range of skill levels.
- Spring 2011: **MAE 4170/5170: Introduction to Robotics Dynamics, Control, Design**
Provided recitation, office hours and grading for a class of 20 seniors and masters students

Teaching Awards:

- Stanford University Teacher Tribute Award (2017)

SERVICE

- UW School of Medicine COVID-19 Innovation Taskforce: Developed and produced open-source PPE including face shields, face masks, isolation gowns, boot covers, bouffants, non-re-breathers, and vacuum masks. All designs were vetted by medical professionals and posted on the NIH print exchange.

GUEST EDITOR

- Robotics and Automation Magazine (Journal)

REVIEWER

- Science (Journal)
- Nature (Journal)
- Trends in Food Science and Engineering (Journal)
- 3D Printing and Additive Manufacturing (Journal)
- Solid Freeform Fabrication Symposium
- IEEE/RSJ International Conference on Intelligent Robots and Systems
- IEEE International Conference on Robotics and Automation
- IEEE Robotics and Automation Letters (Journal)

PUBLIC OUTREACH

- USA Science & Engineering Festival 2012
- AAAS Meeting 2011
- World Science Festival 2011
- ISTE 2011 conference
- Maker Faire NYC 2010, 2011
- Maker Faire Bay Area 2010

INDUSTRIAL AND ENTREPRENEURIAL ACTIVITIES

Co-Founder and CTO

2016-2017

GEMS Boxes

Developed the GEMS platform for distributing Naloxone for fighting the opioid epidemic ◊ Won awards from the GE Foundation and Microsoft ◊ Finalist in the Harvard Presidents Innovation Challenge ◊ Accepted into MassChallenge ◊ Covered by New York Times

Co-Founder and CTO

2011-2015

Seraph Robotics

Developed the Seraph Scientist and Fab@Home Model 4 Bio printers ◊ Oversaw two SBIR grants for research in 3D printing techniques. ◊ Successfully licensed my own technology from Cornell University

Project Lead

2009-2012

Fab@Home Project

Oversaw a team of 10+ students each year to develop the Fab@Home Models 2 and 3 3D printers, which were installed in bio-research labs around the world ◊ Assisted in developing software and hardware used for multiple fabrication purposes. ◊ Oversaw several students research projects ◊ Transitioned project from academic pursuit to commercial entity.

SELECTED PRESS

Food Printing

- **New York Times:** *Dinner is printed*
- **BBC:** *The printed future of Christmas dinner*
- **Americas Test Kitchen Radio (PRX):** *Will 3D Food Printers Change How We Cook and Eat*
- **Wired:** *Feeding The Final Frontier: 3-D Printers Could Make Astronaut Meals*
- **Popular Mechanics:** *Will 3D Printers Manufacture Your Meals?*
- **NBC News:** *The scientific quest to print food*
- **The Australian Broadcasting Network:** *3D food printing*
- **Fast Company:** *Ramen by HP? The Wild Possibilities Of Printing Food*

Viscoelastics

- **MIT News:** *3-D-printed robots with shock-absorbing skins*
- **Fast Co.Design:** *MIT Wants To Make Broken Robots (And Shattered iPhones) A Thing Of The Past*
- **Inc:** *Why This 3-D-Printed Rubber Material Could Save the Drone Industry*
- **Popular Science:** *Now Robots Can Be 3D Printed With Customized Shock Absorbers*
- **Popular Mechanics:** *New Shock-Absorbing Material Could Help Robots Take a Real Beating*

REFERENCES

Daniela Rus

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MIT CSAIL

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Hod Lipson

Professor

Columbia University

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Robert Shepherd

Assistant Professor

Cornell University

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Robert MacCurdy

Assistant Professor

University of Colorado Boulder

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Cynthia Sung

Assistant Professor

University of Pennsylvania

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