

# Sam Calisch, PhD

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## BIO

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Sam Calisch uses his background in applied physics, computational design, and advanced manufacturing to develop elegant solutions to engineering challenges in the manufacturing and energy spaces. During his PhD, Sam invented manufacturing methods and design tools for morphing composite airframes, extremal origami metamaterials to replace foams and honeycombs, and distributed actuation and sensing methods for hydrodynamic boundary layer control. Previously, Sam worked at independent R&D firm Otherlab, developing robotics, renewable energy, and advanced manufacturing technologies; several projects he helped start there have been successfully commercialized. He has led successful technical collaborations both in academia as well as with major companies, including Nike, Toyota, Airbus, Moog Inc., Philips, Dassault, and VSP. Sam has helped teach multiple courses at MIT, as well as in Fab Labs on five continents. Sam's work has been covered by MIT News, Wired, PBS, Wall Street Journal, and Smithsonian magazine.

## EDUCATION

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- PhD, Massachusetts Institute of Technology, Cambridge, MA** *September 2019*  
Center for Bits and Atoms, Dept. of Media Arts and Sciences. Thesis: *Folded Functional Foams*
- MS, Massachusetts Institute of Technology, Cambridge, MA** *September 2014*  
Center for Bits and Atoms, Dept. of Media Arts and Sciences. Thesis: *Physical Finite Elements*
- BA, Grinnell College, Grinnell, IA.** Mathematics with Honors. *May 2010*

## WORK

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- Founder, Elmworks**, 2020-Present. Next-generation electric motors and electromagnetic devices.
- Founder, Foli Research**, 2019-Present. Rapid analysis, design, and manufacturing for data-driven hardware.
- Entrepreneurial Research Fellow, Activate**, 2020-Present. Activate supports leading entrepreneurial scientists to advance technology projects with potential for global impact.
- Junior Scientist, Otherlab**, 2010-2012. Analytical tools for energy and manufacturing technologies.

## PUBLICATIONS

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- Fabrication and characterization of folded foils supporting streamwise traveling waves*, S. Calisch, N. Gershenfeld, D. Fan, G. Jodin, and M. Triantafyllou, *Journal of Fluids and Structures*, 91 (102563), 2019.
- Kirigami fabrication of shaped, flat-foldable cellular materials based on the Tachi-Miura polyhedron*, S. Calisch and N. Gershenfeld, 7th International Meeting on Origami in Science, Mathematics and Education, 2018.
- Towards continuous production of shaped honeycombs*, S. Calisch and N. Gershenfeld, *Proceedings of ASME Manufacturing Science Engineering Conference*, 2018.
- Digital morphing wing: Active wing shaping concept using composite lattice-based cellular structures*, B. Jenett, S. Calisch, D. Cellucci, N. Cramer, N. Gershenfeld, S. Swei, and K.C. Cheung, *Soft Robotics*, 4 (1), 2016.
- Macrofabrication with digital materials: Robotic assembly*, N. Gershenfeld, M. Carney, B. Jenett, S. Calisch, S. Wilson, *Architectural Design* (85) 2015.
- Origami interleaved tube cellular materials*, K.C. Cheung, T. Tachi, S. Calisch, and K. Miura, *Smart Materials and Structures* 23 (9), 2014.

## PATENTS

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- 852711, *Corrugated curved crease energy absorbers*. 2019
- 852731, *Precision planar coil placement for three-dimensional inductive sensors*. 2019.
- 024101, *Curved crease honeycombs with tailorable stiffness and dynamic properties*. 2018
- 178643, *Differential magnetic load cells for compact low-hysteresis force and torque measurements*. 2018.
- 391745, *Fabrication of three-dimensional Kirigami structures with tunable properties*. 2017.
- 960825, *Production of composite parts*. 2015.
- 201781, *Flexural digital material construction and transduction*. 2014.
- 859058, *Three-dimensional printing preparation*. 2013.
- 029353, *Nesting using rigid body simulation*. 2013.
- 859051, *Decomposition of 3D geometry into developable surface patches and 2D cut patterns*. 2012.
- 887201, *Conformable natural gas storage*. 2012.