

## Sam Kriegman

## Curriculum Vitae

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[Google Scholar Profile](#)

### APPOINTMENTS

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- 2021– **Postdoctoral Fellow**, Wyss Institute, Harvard Medical School  
Advisor: [Michael Levin](#)
- 2021– **Postdoctoral Fellow**, Allen Discovery Center, Tufts University  
Advisor: Michael Levin
- 2020–2021 **Postdoctoral Associate**, University of Vermont  
Advisor: [Josh Bongard](#)
- 2011–2014 Data Scientist, Chubb Insurance

### EDUCATION

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- 2016–2020 **Ph.D.**, Computer Science, University of Vermont, USA  
[Design for an Increasingly Protean Machine](#).  
Advisor: Josh Bongard
- 2014–2016 **M.S.**, Statistics, University of Vermont, USA
- 2006–2010 **B.S.**, Applied Mathematics, Ohio University, USA

### AWARDS

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- 2021 [The Cozzarelli Prize](#), National Academy of Sciences  
[Outstanding Doctoral Dissertation Award](#), University of Vermont  
[Outstanding Paper of 2020 Award](#), International Society for Artificial Life
- 2020 Computer Science Graduate Award, University of Vermont  
[Top 10 Most Influential BioTech Projects](#), Project Management Institute  
[Beazley Designs of the Year](#), The Design Museum

### ARTICLES

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7. D Blackiston, E Lederer, S Kriegman, S Garnier, J Bongard, M Levin (2021).  
[A cellular platform for the development of synthetic living machines](#).  
*Science Robotics*, 6(52): eabf1571.
6. D Shah, J Powers, L Tilton, S Kriegman, J Bongard, R Kramer-Bottiglio (2021).  
[A soft robot that adapts to environments through shape change](#).  
*Nature Machine Intelligence*, 3, 51-59.
5. D Shah, B Yang, S Kriegman, M Levin, J Bongard, R Kramer-Bottiglio (2020).  
[Shape Changing Robots: Bioinspiration, Simulation, and Physical Realization](#).  
*Advanced Materials*, 2002882.

4. S Kriegman, D Blackiston, M Levin, J Bongard (2020).  
[A scalable pipeline for designing reconfigurable organisms.](#)  
*Proceedings of the National Academy of Sciences*, 117(4): 1853-1859.  
(A perspective article on this work by P. Ball can be found [here](#).)
3. S Kriegman (2019).  
[Why virtual creatures matter.](#)  
*Nature Machine Intelligence*, 1(10): 492.
2. S Kriegman, N Cheney, J Bongard (2018).  
[How morphological development can guide evolution.](#)  
*Nature Scientific Reports*, 8(1): 13934.
1. F Corucci, N Cheney, S Kriegman, J Bongard, C Laschi (2017).  
[Evolutionary developmental soft robotics as a framework to study intelligence and adaptive behavior.](#)  
*Frontiers in Robotics and AI*, 4(34).

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PEER-REVIEWED CONFERENCE PUBLICATIONS

11. S Kriegman, A-M Nasab, D Blackiston, H Steele, M Levin, R Kramer-Bottiglio, J Bongard (2021).  
[Scale invariant robot behavior with fractals.](#)  
*Robotics: Science and Systems (RSS)*, 10.15607/RSS.2021.XVII.059
10. J Powers, R Grindle, S Kriegman, L Frati, N Cheney, J Bongard (2020).  
[Morphology dictates learnability in neural controllers.](#)  
*Artificial Life Conference Proceedings*, 52-59.
9. S Kriegman, A-M Nasab, D Shah, H Steele, G Branin, M Levin, J Bongard, R Kramer-Bottiglio (2020).  
[Scalable sim-to-real transfer of soft robot designs.](#)  
*IEEE Conference on Soft Robotics (RoboSoft)*, 359-366, 10.1109/RoboSoft48309.2020.9116004.
8. D Matthews, S Kriegman, C Cappelle, J Bongard (2019).  
[Word2vec to behavior: morphology facilitates the grounding of language in machines.](#)  
*IEEE/RSJ Conference on Intelligent Robots and Systems (IROS)*
7. S Kriegman, S Walker, D Shah, M Levin, R Kramer-Bottiglio, J Bongard (2019).  
[Automated shapeshifting for function recovery in damaged robots.](#)  
*Robotics: Science and Systems (RSS)*, 10.15607/RSS.2019.XV.028  
(A perspective article on this work by H. Hauser can be found [here](#).)
6. S Beaulieu, S Kriegman, J Bongard (2018).  
[Combating catastrophic forgetting with developmental compression.](#)  
*Genetic and Evolutionary Computation Conference (GECCO)*, 386-393.
5. S Kriegman, N Cheney, F Corucci, J Bongard (2018).  
[Interceptive robustness through environment-mediated morphological development.](#)  
*Genetic and Evolutionary Computation Conference (GECCO)*, 109-116, 10.1145/3205455.3205529.
4. J Powers, S Kriegman, J Bongard (2018).  
[The effects of morphology and fitness on catastrophic interference.](#)  
*Artificial Life Conference Proceedings*, 606-613.
3. S Kriegman, C Cappelle, F Corucci, A Bernatskiy, N Cheney, J Bongard (2017).  
[Simulating the evolution of soft and rigid-body robots.](#)

*Genetic and Evolutionary Computation Conference (GECCO)*, 1117-1120.

2. S Kriegman, N Cheney, F Corucci, J Bongard (2017).  
[A minimal developmental model can increase evolvability in soft robots.](#)  
*Genetic and Evolutionary Computation Conference (GECCO)*, 131-138, 10.1145/3071178.3071296.
1. S Kriegman, M Szubert, J Bongard, C Skalka (2016).  
[Evolving spatially aggregated features from satellite imagery for regional modeling.](#)  
*Parallel Problem Solving from Nature (PPSN)*, 707-716.  
(Nominated for Best Paper Award.)

#### PATENTS

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*pending* Engineered Multicellular Organisms.

#### SERVICE

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- 2019– Co-developer, [Voxcraft](#): a low cost, open source soft robot design and construction kit for ages 12+  
2017– Co-organizer, [Virtual Creatures Competition](#)

#### EDITORSHIPS

- 2020– Review Editorial Board, *Frontiers Robotics and AI*

#### REVIEWER

RSS, RoboSoft, GECCO, ALife.

#### ADVISING

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- 2020–2021 [Sida Liu](#), Master's: Multi-robot reinforcement learning.  
2019– [Caitlin Grasso](#), PhD: Awarded a NSF GRFP to study reconfigurable organisms.  
2018– [David Matthews](#), Undergrad: Differentiable physics.

#### INVITED TALKS

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- July, 2021 “[Evolutionary robotics in a nutshell](#)”. ISAL Summer School.  
July, 2021 “[Sim2Life: AI-generated biological constructs](#)”. Cross Roads.  
Mar, 2021 “Protean machines”. IT University of Copenhagen.  
Mar, 2021 “Living robots”. *The Int'l Workshop on Embodied Intelligence*.  
Mar, 2021 “How to evolve your robot”. Guest lecture, Introduction to Soft Robotics, Yale University.  
  
Oct, 2020 “[Living deepfakes](#)”. Guest lecture for the MIT Media Lab's Deepfakes course (MAS.S60).  
Apr, 2020 “[Computer designed organisms](#)”. *Artificial Life Virtual Seminar Series*.

#### RECORDED PRESENTATIONS

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- July, 2021 “[Fractal robots](#)”. *Robotics: Science and Systems (RSS)*.  
May, 2020 “[Design for soft robot blocks](#)”. *IEEE International Conference on Soft Robotics (RoboSoft)*.  
June, 2019 “[Shapeshifting robots](#)”. *Robotics: Science and Systems (RSS)* in Freiburg, Germany.

#### INTERVIEWS

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- Jun, 2021** “[Biological Robots May Soon Build You a Better Heart](#)”. *Bloomberg Moonshot*  
Apr, 2021 “[Xen and the Art of Motorcell Maintenance](#)”. *AI with AI*  
Apr, 2021 “[How UVM researchers revamped their groundbreaking living robots](#)”. *WCAX (CBS 3)*

Feb, 2021 “Evolving robot forms”. *Time Horizons Podcast*

Sep, 2020 “Tiny, Programmable, Living Robots”. *Constant Wonder*

Apr, 2020 “Soft Robotics with Sam Kriegman”. *IEEE Soft Robotics Podcast*

Mar, 2020 “Xenobots”. *Futureproof*

Feb, 2020 “Living Robots”. *TalkSport Radio*

Jan, 2020 “UVM researchers develop tiny living robots”. *WCAX (CBS 3)*

Jan, 2020 “UVM aids in creating living robots”. *WPTZ (NBC 5)*

Jan, 2020 “Forscher haben erstmals ‘lebende’ Mini-Roboter erschaffen”. *Die Welt*

#### SELECTED MEDIA COVERAGE

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Apr, 2021 “Frog stem cell research changes what we know about how organisms are built”. *Washington Post*

Apr, 2021 “Robots made out of frog cells”. *Science Friday*

Mar, 2021 “Scientists create new ‘living robots’ that have memory and assemble themselves”. *The Independent*

Mar, 2021 “Cells Form Into ‘Xenobots’ on Their Own”. *Quanta Magazine*

Mar, 2021 “Living robots made from frog skin cells can sense their environment”. *New Scientist*

Mar, 2021 “Frog skin cells turned themselves into living machines”. *Science News*

Dec, 2020 “The big scientific breakthroughs of 2020”. *The Week*

Dec, 2020 “The 10 Most Spectacular Scientific Advances of 2020”. *La Razón (Spain)*

Dec, 2020 “Part Robot, Part Frog: Xenobots Are the First Robots Made From Living Cells”. *Discover Magazine*

Nov, 2020 “The Xenobot Future Is Coming – Start Planning Now”. *Wired*

**Apr, 2020** “Meet the Xenobots: Virtual Creatures Brought to Life”. *New York Times*

Feb, 2020 “Giant Moon rocket, living robots and quantum computer – January’s best science images”. *Nature*

Feb, 2020 “Tiny machines made from the stem cells of frogs”. *The Intelligence (Economist Radio)*

Feb, 2020 “Meet the Xenobot, the World’s First-Ever ‘Living’ Robot”. *Seeker*

Jan, 2020 “The religious, moral, and ethical implications of Xenobots”. *BBC Radio 4 Sunday*

Jan, 2020 “A research team builds robots from living cells”. *The Economist*

Jan, 2020 “Scientists use stem cells from frogs to build first living robots”. *The Guardian*

Jan, 2020 “Meet the xenobot: world’s first living, self-healing robots created from frog stem cells”. *CNN*

**Jan, 2020** “Scientists create first living, self-healing robots (on-air with Fredricka Whitfield)”. *CNN*

Jan, 2020 “Meet Xenobot, an Eerie New Kind of Programmable Organism”. *Wired*

Jan, 2020 “Scientists Assemble Frog Stem Cells Into First ‘Living Machines’”. *Smithsonian Magazine*

Jan, 2020 “World’s First ‘Living Machine’ Created Using Frog Cells and Artificial Intelligence”. *Scientific American*

Jan, 2020 “These tiny living robots could help science eavesdrop on cellular gossip”. *Popular Science*

Jan, 2020 “These Are the First Living Robots: Machines Made from Frog Stem Cells”. *Popular Mechanics*

Jan, 2020 “Behold the xenobots – part frog, part robot. But are they alive?”. *Christian Science Monitor*

Jan, 2020 “Scientists at UVM, Tufts create ‘living robots’”. *Boston Globe*

Jan, 2020 “How tiny ‘biobots’ could enter bodies to clean arteries and administer drugs”. *The Times*

Jan, 2020 “Living robots created as scientists turn frog cells into ‘entirely new life-forms’”. *The Telegraph*

Jan, 2020 “Living Robots, Designed By Computer”. *Science Friday*

Jan, 2020 “Living robots”. *BBC World Service*

Jan, 2020 “These ‘xenobots’ are living machines designed by an evolutionary algorithm”. *MIT Technology Review*

Jan, 2020 “The ‘xenobot’ is the world’s newest robot – and it’s made from living animal cells”. *CTV News*

Jan, 2020 “World’s First ‘Living Robot’ Invites New Opportunities And Risks”. *Forbes*

Jan, 2020 “Tiny ‘xenobots’ made from cells could heal our bodies and clean the environment”. *Fox News*

Jan, 2020 “Scientists Create First ‘Living Robots’ in Major Breakthrough”. *The Independent*

Jan, 2020 “World’s first ‘living robots’ are made from the stem cells of frogs”. *New York Post*

Jan, 2020 “Algorithm Designs Robots Using Frog Cells”. *The Scientist*

Jan, 2020 “Xenobots: 1st living robots made from stem cells”. *ESPN*

Jan, 2020 “Xenobot”. *Wikipedia*