

Jonathan Sterling

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Education

Carnegie Mellon University

Ph.D. in Computer Science 2016 – Present
Supervisor: Robert Harper

University of California (Berkeley, CA)

Bachelor of Arts in Linguistics 2010 – 2013
DEAN'S HONORS

Research Synopsis

I research the syntax and semantics of programming languages and dependent type theories, with an aim to building better interactive proof assistants; I use semantic methods (categories, topoi, *etc.*) to prove important correctness theorems about type theories and programming languages. Most recently, I have proved *normalization* and *decidability of equality* for Cartesian cubical type theory (Sterling and Angiuli, 2021), a computational version of Homotopy Type Theory (HoTT) that my colleagues and I have implemented in the `redt t` proof assistant.¹

Publications

- Sterling, Jonathan (2021). *Higher-Order Functions and Brouwer's Thesis*. To appear, *Journal of Functional Programming, essays in honor of Robert Harper*. arXiv: [1608.03814](https://arxiv.org/abs/1608.03814).
- Gratzer, Daniel, Jonathan Sterling, and Lars Birkedal (July 2019). "Implementing a Modal Dependent Type Theory". In: *Proceedings of the ACM on Programming Languages* 3.ICFP, 107:1–107:29. ISSN: 2475-1421. DOI: [10.1145/3341711](https://doi.org/10.1145/3341711).
- Sterling, Jonathan, Carlo Angiuli, and Daniel Gratzer (2019). "Cubical Syntax for Reflection-Free Extensional Equality". In: *4th International Conference on Formal Structures for Computation and Deduction (FSCD 2019)*. Ed. by Herman Geuvers. Vol. 131. Leibniz International Proceedings in Informatics (LIPIcs). Dagstuhl, Germany: Schloss Dagstuhl–Leibniz-Zentrum fuer Informatik, 31:1–31:25. ISBN: 978-3-95977-107-8. DOI: [10.4230/LIPIcs.FSCD.2019.31](https://doi.org/10.4230/LIPIcs.FSCD.2019.31). arXiv: [1904.08562 \[cs.LO\]](https://arxiv.org/abs/1904.08562). URL: <http://drops.dagstuhl.de/opus/volltexte/2019/10538>.
- Angiuli, Carlo, Evan Cavallo, Kuen-Bang Hou (Favonia), Robert Harper, and Jonathan Sterling (2018). "The RedPRL Proof Assistant (Invited Paper)". In: *Proceedings of the 13th International Workshop on Logical Frameworks and Meta-Languages: Theory and Practice, LFMT@FSCD 2018, Oxford, UK, 7th July 2018*. Pp. 1–10. DOI: [10.4204/EPTCS.274.1](https://doi.org/10.4204/EPTCS.274.1).
- Sterling, Jonathan and Robert Harper (2018). "Guarded Computational Type Theory". In: *Proceedings of the 33rd Annual ACM/IEEE Symposium on Logic in Computer Science*. Oxford, United Kingdom: ACM. ISBN: 978-1-4503-5583-4. arXiv: [1804.09098 \[cs.LO\]](https://arxiv.org/abs/1804.09098).
- McAdams, Darryl and Jonathan Sterling (2016). "Dependent Types for Pragmatics". In: *Epistemology, Knowledge and the Impact of Interaction*. Ed. by Juan Redmond, Olga Pombo Martins, and Ángel Nepomuceno Fernández. Cham: Springer International Publishing, pp. 123–139. ISBN: 978-3-319-26506-3.

¹<http://www.redprl.org/>

Unrefereed Manuscripts

- Sterling, Jonathan and Carlo Angiuli (2021). *Normalization for cubical type theory*. Under review. arXiv: [2101.11479 \[cs.LO\]](#).
- Gratzer, Daniel and Jonathan Sterling (2020). *Syntactic categories for dependent type theory: sketching and adequacy*. arXiv: [2012.10783 \[cs.LO\]](#).
- Sterling, Jonathan, Carlo Angiuli, and Daniel Gratzer (2020). *A cubical language for Bishop sets*. Under review. arXiv: [2003.01491 \[cs.LO\]](#).
- Sterling, Jonathan and Robert Harper (2020). *Logical Relations As Types: Proof-Relevant Parametricity for Program Modules*. Under review. arXiv: [2010.08599 \[cs.PL\]](#).
- Sterling, Jonathan (Dec. 2018). *Algebraic Type Theory and Universe Hierarchies*. arXiv: [1902.08848 \[math.LO\]](#).
- Sterling, Jonathan and Bas Spitters (Sept. 2018). *Normalization by gluing for free λ -theories*. arXiv: [1809.08646 \[cs.LO\]](#).

Software Projects

I founded the **RedPRL Development Team**; we have produced a number of software artifacts as part of our research into interactive proof assistants for univalent, higher-dimensional type theory.

- RedPRL Development Team, The (2020). *cooltt*. URL: <https://www.github.com/RedPRL/cooltt>.
- (2018a). *RedPRL – the People’s Refinement Logic*. URL: <https://www.github.com/RedPRL/sml-redprl>.
- (2018b). *redtt*. URL: <https://www.github.com/RedPRL/redtt>.

Teaching

Constructive Logic (15-317) *Fall 2018*
Teaching assistant under Professor Karl Cray
Carnegie Mellon University

Constructive Logic (15-317) *Fall 2017*
Teaching assistant under Professor Frank Pfenning
Carnegie Mellon University

Academic Service

Refereeing

Computer Science Logic (CSL)	2021
European Symposium on Programming (ESOP)	2021
Formal Structures for Computation and Deduction (FSCD)	2019, 2020
Foundations of Software Science and Computation Structures (FoSSaCS)	2021
Logic in Computer Science (LICS)	2017, 2021
Mathematical Structures in Computer Science (MSCS)	2020

Mentorship

I am a mentor for the SIGPLAN long-term mentoring program for programming language researchers (SIGPLAN-M).

Awards & Honors

- 2019 *ICFP ’19 Distinguished Paper Award*
Gratzer, Sterling, and Birkedal (2019)
- 2019 *FSCD ’19 Best Paper Award for Junior Researchers*
Sterling, Angiuli, and Gratzer (2019)

2011 *W.K. Pritchett Prize in Elementary Greek*
Classics Department, U.C. Berkeley

Industrial Experience

SlamData

Software engineer

Functional programming; web application development for NoSQL database query engine.

2015–2016

PivotCloud (*née* AlephCloud)

Staff software engineer

Functional programming; cloud service development for email encryption using Haskell.

2014–2015

Yardsale

Software engineer

Mobile app & web service development using Objective-C, TypeScript, JavaScript, and Haskell.

2012–2014