Ellie Baker
Email: **ellie.baker** at **post.harvard.edu**
www.ellie-baker.com

Ellie Baker holds a BFA in sculpture from the Rhode Island School of Design and a PhD in computer science from Harvard University. She has worked as a high-school fine arts teacher, a software engineer, and a computer science researcher, including positions at Harvard University and at computing pioneers Bolt, Beranek and Newman and Thinking Machines Corporation. In her research, Ellie's interest in blending analytic and visual thought led her to study facial image database search strategies and to develop the Drawing Evolver, an interactive system for creating drawings of faces and other subjects using simulated evolution. Independently and in collaboration with others, she has produced artworks exhibited in juried shows of mathematical art, such as the national Joint Mathematics Meetings, Bridges (an international mathematics and art interdisciplinary conference), and MoSAIC (Mathematics of Science, Art, Industry, and Culture).

RECENT PUBLICATIONS:

Crafting Conundrums: Puzzles and Patterns for the Bead Crochet Artist (a book on the mathematics of pattern design in bead crochet), Ellie Baker and Susan Goldstine, AK Peters/CRC Press, December 2014.

Infinitely Invertible Infinity, Ellie Baker, Daniel Baker, and Charles Wampler, Proceedings of Bridges 2020: Mathematics, Art, Music, Architecture, Education, Culture. *https://2020.bridgesmathart.org/regular/83.html*

Tessellated Seven-Color Tori, Ellie Baker and Kevin Lee, Proceedings of Bridges 2019: Mathematics, Art, Music, Architecture, Education, Culture.
https://archive.bridgesmathart.org/2019/bridges2019-517.pdf

Invertible Infinity: A Toroidal Fashion Statement, Ellie Baker and Charles Wampler Proceedings of Bridges 2017: Mathematics, Art, Music, Architecture, Education, Culture.
https://archive.bridgesmathart.org/2017/bridges2017-49.pdf

Ellie Baker and the Seamstress's Conundrum, puzzle featured in the New York Times Numberplay Blog by Gary Antonick, 2015
http://wordplay.blogs.nytimes.com/2015/08/24/baker-1/

Beading the Seven-Color Map Theorem, Susan Goldstine, Sophie Sommer, and Ellie Baker, Math Horizons, September 2013.
http://www.jstor.org/stable/10.4169/mathhorizons.21.1.22?seq=1#page_scan_tab_contents

Bead Crochet Bracelets: What Would Escher Do?, Ellie Baker and Susan Goldstine, Workshop paper, Bridges Towson 2012 (interdisciplinary mathematics and arts conference), Conference Proceedings, Towson University, Baltimore, MD, July 2012.
http://bridgesmathart.org/2012/cdrom/proceedings/122/paper_122.pdf

Building a better bracelet: Wallpaper patterns in bead crochet, Susan Goldstine and Ellie Baker, Journal of Mathematics and the Arts, Volume 6, Issue 1, March 2012.
http://www.tandfonline.com/doi/abs/10.1080/17513472.2012.654423

RECENT PRESENTATIONS:

Infinitely Invertible Infinity, Bridges 2020 Virtual Conference, video preview of paper by the same name. *We present our experiences crafting cloth objects with intriguing inversion properties and tell a story about how the design aspirations of a seamstress can drive a mathematical inquiry.* https://2020.bridgesmathart.org/regular/83.html

Tessellated Seven-Color Tori, Bridges Linz 2019, with Kevin Lee. *The seven-color torus map may be thought of as an artistic form, like haiku or the sonnet in poetry, with specific constraints within which there is artistic freedom. Many interesting variations on the map have been created, but they typically have stayed confined to representing "countries" with very simple polygonal tiles or abstract shapes. This talk explores the genre further with a design approach using Escher-like tessellations that produce seven-color torus maps suitable for printing on fabric and sewing into toroidal scarves.*

Invertible Infinity, Bridges Waterloo 2017, with Charles Wampler. *This talk describes the design of a uniquely constructed reversible "infinity scarf"—a specially made cloth torus such that its shape is invariant under inversion and it folds flat into a six-layer equilateral triangle. We present several fabric layouts that can be used to produce the scarf, along with sewing instructions, and show that, among all such layouts, the seam length of the hexagon is the shortest possible.*

Turning Infinity Inside Out: A Seamstress's Conundrum, Mathfest 2015, Themed Contributed Paper Sessions: Recreational Mathematics. *This talk describes my experience sewing an invertible toroidal scarf and the entertaining pitfalls and puzzles that ensued.*

Make Your Own Torus Knot – Crafty Constructions in Bead Crochet and Beyond, Joint Mathematics Meetings 2015, Session on Art and Mathematics. *This talk describes two thought experiments that help elucidate the elegant structure of torus knots and suggest design and construction techniques applicable to bead crochet and other materials.*

RECENTLY EXHIBITED MATHEMATICAL ARTWORKS:

Triply Invertible Toroidal Scarf, Bridges 2020 mathematical art exhibit
http://gallery.bridgesmathart.org/exhibitions/2020-bridges-conference/ellie-baker

Invertible Scarf with Tessellated Seven-Color Torus Map and K7 Graph and *Seven-Color Homage to Escher*, Bridges Linz 2019 mathematical art exhibit.
http://gallery.bridgesmathart.org/exhibitions/2019-bridges-conference/ellie-baker

Invertible Infinity II, Bridges Waterloo 2017 mathematical art exhibit.
http://gallery.bridgesmathart.org/exhibitions/2017-bridges-conference/ellie-baker

Invertible Infinity, Joint Mathematics Meetings Exhibition of Mathematical Art, Atlanta, January 2017. http://gallery.bridgesmathart.org/exhibitions/2017-joint-mathematics-meetings/ellie-baker

From Serenity to Monkey-Mind and Back (Two Twisted Tessellated Transforming Tori), Joint Mathematics Meetings Exhibition of Mathematical Art, Seattle, January 2016.
http://gallery.bridgesmathart.org/exhibitions/2016-joint-mathematics-meetings/ellie-baker

Fish Transformation Scarf and Necklace, Escher inspired designs in bead crochet and on fabric, Bridges Baltimore 2015 mathematical art exhibit.
http://gallery.bridgesmathart.org/exhibitions/2015-bridges-conference/ellie-baker

Linked or Knot: Do We Have Anything in Common?, Joint Mathematics Meetings Exhibition of Mathematical Art, San Antonio, January 2015
http://gallery.bridgesmathart.org/exhibitions/2015-joint-mathematics-meetings/ellie-baker

The Torus Traveler's Journey, torus knots in bead crochet, Joint Mathematics Meetings Exhibition of Mathematical Art, Baltimore, January 2014. This piece is also in the traveling mathematical art exhibit sponsored by MoSAIC Mathematics of Science, Industry, Art, Culture, 2014-2015.
http://gallery.bridgesmathart.org/exhibitions/2014-joint-mathematics-meetings/ellie-baker

Toroidal Tessellations, Escher inspired designs in bead crochet, Bridges Towson 2012 art exhibit, Baltimore, July 2012 (with Susan Goldstine).
http://gallery.bridgesmathart.org/exhibitions/2012-bridges-conference/ellie-baker

Crystallographic Bracelet Series, wallpaper group designs in bead crochet, Joint Mathematics Meetings Exhibition of Mathematical Art, Boston, January 2012 (with Susan Goldstine).
http://gallery.bridgesmathart.org/exhibitions/2012-joint-mathematics-meetings/ellie-baker

Seven-Color Torus Series, map-coloring designs in bead crochet, Joint Mathematics Meetings Exhibition of Mathematical Art, San Francisco, January 2010 (with Susan Goldstine and Sophie Sommer).
http://www.bridgesmathart.org/art-exhibits/jmm10/sommer.html

RECENT SEMINARS/WORKSHOPS:

Teaching Mathematics with Bead Crochet. (With Susan Goldstine), workshop at Mathfest 2015, Washington, D.C.

Bead Crochet Bracelets: What Would Escher Do? (with Susan Goldstine), workshop at *Bridges 2015: Math, Art, Architecture and Music* conference, Baltimore, MD.

PROFESSIONAL SERVICE:

Program Committee *Bridges: Math, Art, Architecture and Music* conference, 2016-2020