

# Fumiko Futamura

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Department of Mathematics and Comp. Science  
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## EDUCATION

*Ph.D.*, Mathematics, Vanderbilt University May 2007  
Advisor: Professor Akram Aldroubi  
Dissertation: Localized Operators and the Construction of Localized Frames

*B.A.*, Mathematics, Summa Cum Laude, University of Louisville May 2002  
Minor: Fine Arts  
Advisor: Professor Robert Powers  
Honors thesis: On the Use of Polygonal Diagrams to Depict Finite Affine Planes

## POSITIONS HELD

Associate Professor of Mathematics, Southwestern University 2013-present  
Assistant Professor of Mathematics, Southwestern University 2007-2013

## PUBLICATIONS

A. Crannell, M. Frantz, F. Futamura, *Factoring a Homography Using Squares*. submitted.

F. Futamura, R. Lehr, *Finding the Viewpoint at a Museum: a How-to Guide*. submitted.

A. Crannell, M. Frantz, F. Futamura, *The cross ratio as a shape parameter for Dürer's solid*.  
J. Math. Arts 8 (2014), no. 3-4, 111–119.

A. Crannell, M. Frantz, F. Futamura, *Dürer: Disguise, Distance, Disagreements, and Diagonals!*  
Math Horiz. 22 (2014), no. 2, 8–11, 25.

R. Denman, F. Futamura, K. Richards, *On sharp frame diagonalization*, Lin. Alg. Appl., 438  
no. 5, (2013) 2210-2224.

F. Futamura, *Frame diagonalization of matrices*, Lin. Alg. Appl., 436 no. 9, (2012) 3201-3214.

F. Futamura, *Localizable operators and the construction of localized frames*, Proc. Amer. Math.  
Soc., 137 (2009) 4187-4197.

F. Futamura, *Symmetrically localized frames and the removal of subsets of positive density*, J.  
Math. Anal. Appl., 326 no. 2, (2007) 1225–1235.

F. Futamura, *Banach framed, decay in the context of localization*, *Sampl. Theory Signal Image Process.*, 6 no. 2, (2007) 151–166.

## GRANTS AND AWARDS

- Awarded \$500, Visual Thinking for Engaged Learning Grant* 2014  
A grant, part of the Presidential Innovation Grant, to incorporate visual thinking into Geometry and give a community presentation.
- Awarded \$69,432, NSF grant DUE-1140113* 2012  
A two-year grant to write a textbook, *Perspective Geometry: Projective Geometry Applied to Perspective Art* (together with co-PI Annalisa Crannell's portion, \$108,414), one of 125 awards out of 1050 TUES-I proposals submitted in May 2011
- Awarded \$4000, AIBL Small Grant* 2011  
A summer grant to develop an inquiry-based learning math and art course, Educational Advancement Foundation
- Awarded \$850, Competitive Faculty Development Grant* 2010  
Internal grant to attend a conference, Southwestern University
- Awarded \$700, Abercrombie Faculty Enrichment Fund* 2009  
Internal grant to do research with colleagues in Nashville, TN, Southwestern University
- Awarded \$7590, Faculty-Student Project Research Grant* 2009  
Internal grant to do research with a student for 8 weeks, Southwestern University
- Awarded \$9000, Brown Innovations in Teaching Award* 2008  
Internal grant to organize a departmental pedagogical seminar, Southwestern University
- B.F. Bryant Prize for Excellence in Teaching* 2007  
Graduate student teaching award, Vanderbilt University
- Graduate Teaching Assistantship* 2002-07  
Vanderbilt University
- Summer Research Assistantship with A. Aldroubi* 2005-06  
Vanderbilt University
- Selected visual artist participant* 2006  
Judy Chicago and Donald Woodman's participatory art pedagogy project, the Multimedia Project of Discovery, Vanderbilt University
- Research Assistantship with M. Neamtu* 2002-03  
Vanderbilt University
- Phi Beta Kappa Award* 2002  
University of Louisville

*Mary Ruth Brookover Award*, Top Senior in Mathematics 2002  
University of Louisville

*Robert J. Bickel Scholarship*, Top Junior in Mathematics 2001  
University of Louisville

## PRESENTATIONS

### Conference Talks:

*Harmonic ratios: music and art in an inquiry-based Geometry course.* Jan 2015  
Joint Mathematics Meetings, San Antonio, TX

*Frame multipliers and commutative Banach algebras* Apr 2010  
AMS Sectional Meeting, St. Paul, MN

*Approximate Joint Diagonalization of Matrices* Oct 2009  
AMS Sectional Meeting, Boca Raton, FL

*Drawing Humpty Dumpty in Perspective: Side Topics in Projective Geometry* Aug 2009  
MAA MathFest 2009, Portland, OR

*Creating a Culture of Pedagogical Learning,* Aug 2009  
MAA MathFest 2009, Portland, OR

*Localized Frames and Localizable Operators* Aug 2007  
Wavelets XII Conference, SPIE Optics and Photonics, San Diego, CA, invited talk

*Localized Operators and the Construction of Localized Frames*  
International Conference of Harmonic Analysis and Applications  
San Luis, Argentina May 2006

*Symmetrically Localized Frames* May 2006  
Current Trends in Harmonic Analysis and Its Applications: Wavelets and Frames  
University of Colorado at Boulder

*On Localized Frames*  
International Conference on Modern Methods of Time-Frequency Analysis  
Strobl, Austria May 2005  
Southeastern Sectional Meeting, Western Kentucky University Mar 2005

### Seminar Talks:

*How to Mathematically Immerse Yourself in a Work of Art* Apr 2015  
Infinite Horizons Lecture Series, Kennesaw State University  
Mathematics and Statistics Colloquium, Sam Houston State University Mar 2015

*Harmonics in Math, Art and Music* Nov 2013  
THINK! Series, Southwestern University

<i>Drawing Chords in Perspective: Harmonic Sets in Math, Music &amp; Art</i> , invited talk Department Seminar, Franklin & Marshall College	Mar 2012
<i>The Mathematics of Wonderland</i> MAA Student Chapter, Southwestern University	Feb 2012
<i>Drawing Humpty Dumpty in Perspective, Philosophy, Math, Art and Music</i> MAA Student Chapter, Southwestern University	Feb 2011
<i>Exploring Diagonalizable and Localizable Operators</i> , invited talk Analysis Seminar, University of Houston	Jan 2011
<i>On Diagonalizable and Almost Diagonalizable Operators</i> , invited talk Analysis Seminar, University of Houston	Sept 2007
<i>Localized Frames and Localizable Operators</i> Department Seminar, Southwestern University	Sept 2007
<i>Intersections and Parallels, How an Artist Sees Mathematics</i> MAA Student Chapter, Sam Houston State University	Oct 2006
<i>Localized Operators and the Construction of Localized Frames</i> Analysis Seminar, Texas A&M University	Oct 2006
Computational Mathematics Seminar, Sam Houston State University.	Oct 2006
Analysis Seminar, University of Houston	Oct 2006
Computational Analysis Seminar, Vanderbilt University	Sept 2006
<i>How to Win at Dots and Boxes Using Combinatorial Game Theory</i> Vanderbilt Math Club, Vanderbilt University	Sept 2006
<i>Mathematical Influences in Art, from Picasso to Escher to Man Ray</i> Undergraduate Seminar in Mathematics, Vanderbilt University	Oct 2005
<i>Whistling Girls and Crowing Hens: Women in Mathematics from Ancient to Modern Times</i> joint talk with Dr. Jo Ann Staples, Undergraduate Seminar in Mathematics, Vanderbilt University	May 2005
<i>On Localized Frames</i> Computational Analysis Seminar, Vanderbilt University	Mar 2005
<i>The Poincaré Conjecture</i> Vanderbilt Math Club, Vanderbilt University	Mar 2005
<i>Phi = 1.61803399...</i> Undergraduate Seminar in Mathematics, Vanderbilt University	Nov 2004

**Workshops and Minicourses Organized:**

Seeing the Abstract: Visual Thinking for Discovery Learning Apr 2015  
Southwestern University

Hyperbolic Crochet community workshop Dec 2014  
Art.Science.Gallery, Austin, TX

Mathematical Origami Ornaments community workshop Dec 2013, 2014  
Art.Science.Gallery, Austin, TX

MAA Minicourse with Annalisa Crannell and Marc Frantz  
*Visualizing Projective Geometry Through Photographs and Drawings*,  
Joint Mathematics Meetings, Baltimore, MD Jan 2014  
Joint Mathematics Meetings, New Orleans, LA Jan 2013

Brown Innovations in Teaching Workshop on Teaching and Learning Fall 2009  
Southwestern University

**Invited Participant:**

Workshop, "Frames for the finite world: Sampling, coding and quantization" Aug 2008  
American Institute of Mathematics, Palo Alto, CA

Poster presentation, *Localized Operators and the Construction of Localized Frames* Jan 2007  
AWM Workshop for Women Graduate Students and Recent PhDs,  
Joint Mathematics Meetings, New Orleans, LA

**Art Exhibits:**

*Dissected Pigeon* Mar 2012  
crocheted sculpture, yarn and polyfill, 6 in×3 in  
Interdisciplinary Craft as Art, a King Creativity Project  
headed by M.A. Atkins, A. Budincich, and E. Manning, Southwestern University

*Self-Portraits as Other People's Preconceptions* Apr 2006  
installation of eight paintings, oil on canvas, 60 in×36 in  
Evoke/Invoke/Provoke, A Multimedia Project of Discovery  
headed by Judy Chicago and Donald Woodman, Vanderbilt University

*Meret's Nambu* Apr 2004  
painting, oil on canvas, 50 in×30 in,  
Sarratt Student Art Show, Vanderbilt University

*Mentally bound* Apr 2002  
sculpture piece, wax; cheesecloth; wood; chicken wire, 52 in×25 in×28 in  
Student Art Show, University of Louisville

**TEACHING EXPERIENCE**

**Courses:**

*Explorations in Mathematics (Paideia Representing Gender cluster course)*  
*Mathematical Concepts (as Mathematical Influences in Art)*  
*Introduction to Statistics*  
*Elementary Function Theory*  
*Hidden Perspectives: Mathematics in Art and Art in Mathematics*, First Year Seminar  
*Mathematical Influences in Art*, London Semester Program  
*Victorian Mathematics and Society in Wonderland and Flatland*, London Semester Program  
*Calculus I*  
*Calculus II*  
*Calculus III*  
*Accelerated Calculus I*, Vanderbilt University  
*Accelerated Calculus II*, Vanderbilt University  
*Linear Algebra*  
*Real Analysis I*  
*Real Analysis II*  
*Algebraic Structures I*  
*Algebraic Structures II*  
*Projective Geometry*  
*Geometry*  
*Frame Theory*

**Independent Study:**

*Quaternion Julia Sets*  
*Mathematics of Wonderland*  
*Mathematical Background for an Android App: Geometry and Music*  
*Image Processing: Fourier Analysis, Wavelet Analysis and Compressed Sensing*  
*Projective Geometry: Perspective Drawing, Philosophy, Axiomatic Proof, Algebraic Geometry*

**Paideia Program:**

*10 student cohort. Theme: Creativity* 2012-2015  
*Participant in the pilot for the new Paideia. Theme: Representing Gender* 2013-2015

**Honors Thesis Advising:**

*On the Convergence of Infinite Series and Products*, Sean Watson 2010  
*Super Resolution Image Construction*, Tommy Rogers 2010

**Project Advising:**

*Solar Powered Lounge Chair* 2014-2015  
 Creativity Paideia Cohort, Chandler Johnson, Keeley Coburn, Amir Hessabi

King Creativity Project, *AIDS Through Music* 2013  
 Phil Wozny, Winston Myers, Rachel DeLong, Michelle Moses, Stinson Seuser

**Professional training:**

*Inquiry Based Learning Workshop* Jul 2009  
 Austin, TX

*MAA minicourse: Perspective Viewing and Drawing Make Good Math Problems* Jul 2008

MAA MathFest 2008, Madison WI

*Project NExT (New Experiences in Teaching) workshop,* Jul 2008  
 Cooperative Learning in Undergraduate Mathematics  
 MAA MathFest 2008, Madison, WI

*Texas Section Project NExT Fall Meeting* 2007-08  
 Sam Houston State University

*Texas Section Project NExT Fellow* 2007-08

*Professor 101, workshop for new professors* Apr 2007  
 Vanderbilt University Center for Teaching

*GradSTEP (Graduate Student Teaching Event for Professional Development)* 2005-07  
 Vanderbilt University Center for Teaching

*Professional Development Working Group* 2005  
 Vanderbilt University Center for Teaching

## COMMUNITY INVOLVEMENT

### Southwestern University:

*Natural Sciences Representative,* Enrollment and Retention Committee 2014-present

*Hiring Committee Member,* Visiting Assistant Professor Position 2014

*Natural Sciences Representative,* Staff Affairs Council 2009-2010, 2014

*Natural Sciences Representative,* Brown Scholars Committee 2012-2013

*Webmaster,* Department Website 2008-2014

*Faculty advisor,* Southwestern University Math Club MAA Chapter 2007-2014

*Natural Sciences Representative,* President's Retirement-Events Planning Committee 2012-2013

*Faculty Representative,* Paideia Committee 2010-2011

*Natural Sciences Representative,* Interdisciplinary QEP Proposal Committee 2010

*Editor,* Staff Affairs Council Newsletter 2009-2010

*Natural Sciences Representative,* Student Media Board 2008-2009

*Hiring Committee Member,* Tenure-track Computer Science Position 2007

### Beyond Southwestern:

- Advisory board member* 2015-present  
Studio 360 Science and Creativity Series, Sloan Foundation, New York, NY
- Advisory board member,* 2013-present  
Art.Science.Gallery, Austin, TX
- Volunteer with FYS students to teach mathematics through origami and perspective drawing,* 2010  
Benold Middle School, Georgetown, TX
- Volunteer to teach origami and platonic solids,* 2010  
After school program at Cooper Elementary and Forbes Middle School, Georgetown, TX
- Volunteer math tutor and mentor* 2007-08  
Migrant Program at Georgetown High School, Georgetown, TX
- Panel member, Mathematics and Mingling: The Undergraduate Math Club* Aug 2006  
Project NExT session at Mathfest 2006, Knoxville, TN
- Graduate student advisor, Vanderbilt University High School Mathematics Competition* 2006  
Vanderbilt University
- Co-founder, graduate student advisor, Vanderbilt Math Club* 2005-07  
Vanderbilt University
- Volunteer math tutor and mentor through the Pencil Foundation* 2005-06  
Rose Park Metro Public Middle School, Nashville TN

## CONFERENCES ATTENDED

- Operator Algebras, Frames, and Undergraduate Research, In Honor of David Larson's 70th Birthday, College Station, TX July 2012
- Joint Mathematics Meeting, Boston, MA Jan 2012
- ISAMA Conference on Math and Art, Chicago, IL Jun 2010
- From Banach Spaces to Frame Theory and Applications, In Honor of Pete Casazza's 65th Birthday, College Park, MD May 2010
- 12th Annual Legacy of R.L. Moore Conference, Austin, TX Jul 2009
- Mathematical Association of America (MAA) MathFest, Madison, WI Jul 2008
- National Institute for Technology and Liberal Education (NITLE) Summit San Francisco, CA Apr 2008
- February Fourier Talks University of Maryland, College Park Feb 2008



- Joint Mathematics Meeting, San Diego, CA Jan 2008
- The 3rd Annual Spring Institute on Noncommutative Geometry and Operator Algebras May 2005  
Vanderbilt University
- Southeastern Sectional Meeting, Special Session on Wavelets and Multiwavelets Mar 2005  
Western Kentucky University
- MGA Workshop V: Math Analysis and Multiscale Geometric Analysis Nov 2004  
Institute of Pure and Applied Mathematics (IPAM) at UCLA
- Southeastern Section Meeting, Special Session on Wavelets, Frames, and Sampling Oct 2004  
Vanderbilt University
- Workshop in Knots and 3-Manifolds Jul 2004  
Pacific Institute for the Mathematical Sciences, University of British Columbia  
Vancouver, Canada
- 2nd International Conference on Computational Harmonic Analysis May 2004  
Vanderbilt University

**PROFESSIONAL SOCIETIES**

American Mathematical Society, Mathematical Association of America

**ADDITIONAL INFORMATION**

Citizenship: Japan; U.S. permanent resident.

Computer Skills: html, css, Matlab, LaTeX, Maple, Mathematica

Languages Spoken: English (native), Japanese (proficient), Spanish (basic)