

Ted Ashton

Contact Information

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Education

Ph.D., Mathematics, University of Georgia, 12 May 2007

- GPA: 4.0
- Member $\Phi\Kappa\Phi$
- Graduate School Dissertation Completion Assistantship, 2005–2006
- Graduate School Nonteaching Assistantship, 2002–2004
- VIGRE Research Assistantship, 2002–2003, 2004–2005, Spring 2007
- Teaching Assistantship, Summers of 2004, 2005, 2006, Fall 2006
- Outstanding Teaching Assistant Award (top 10% university-wide)
- Pythagoras Award (for excellence in graduate studies)



B.S., Mathematics, Southern Adventist University, 16 Dec 1999, *magna cum laude*

- Outstanding Mathematics Senior Award
- Passed first Actuarial exam

B.S.E., Electrical Engineering, Walla Walla College, 31 Dec 1993, *magna cum laude*

- Passed Engineer In Training examination
- Who's Who Among Students in American Universities and Colleges
- National Merit Finalist Scholarship
- Alma Louise Potter Grammar Award (for exceptional achievement in Linguistics and Advanced English Grammars)

A.S., Engineering Studies, Southern College of Seventh-day Adventists, 6 May 1990, *magna cum laude*

- National Merit Finalist Scholarship
- Calculus Award for Outstanding Achievement in the Basic Calculus Sequence (Calculus I through Differential Equations)

Teaching and Tutoring

Introduction to Higher Math, Fall 2007

Calculus II for Science and Engineering, Fall 2007

Calculus I for Science and Engineering, Summer 2007

Analytic Geometry and Calculus, University of Georgia, Summer & Fall 2006
 Mathematics of Decision Making, University of Georgia, Summer 2005

Introduction to Mathematical Modeling, University of Georgia, Summer 2004

- Developed new versions of the previous two courses using in-class worksheets and computer-based homework instead of the traditional lecture format. Students responded positively to this teaching method.

Survey of Math, Southern Adventist University, Fall 1996

- Served as substitute teacher for one month.

English as a Second Language/Drama Teacher, Strisuksa School, Roi-Et Thailand

Mathematics Tutor, Fall 2003-present

- Departmental Tutor, UGA Math Department Study Hall, primarily for Precalculus and Calculus I, Fall 2003, 2005–2006 School Year and Fall 2006
- Private tutoring, 50 students ranging from 6th grade through graduate level on a variety of topics, including GRE and Praxis preparation.

Publications

- [1] Ted Ashton, *Exploring Continuous Tensegrities*, Ph. D. Thesis, University of Georgia, 2007, arXiv: 0704.2784 [math.MG].
- I introduce a generalization of the tensegrity framework described in “Tensegrity Frameworks” by Roth and Whiteley. The new “continuous tensegrities” can have arbitrarily many vertices and edges. I extend a key lemma from that paper to many continuous tensegrities and also derive a closely related theorem which applies to all continuous tensegrities.
- [2] Ted Ashton and Jason Cantarella, *A Fast Octree-based Algorithm for Computing Ropelength*, Physical and Numerical Models in Knot Theory, Series on Knots and Everything, vol. 36, World Scientific Publishing, River Edge, NJ, 2005, available at arXiv:math.DG/0409416.
- We present a new algorithm for finding the self-contacts of a tube around a space polygon of n sides in (best case) $O(n \log n)$ steps. The resulting code is faster than all previous algorithms.
- [3] Ted Ashton, Jason Cantarella, Michael Piatek, and Eric Rawdon, *Self-contact Sets for 50 Tightly Knotted and Linked Tubes*, unpublished, available at arXiv:math.DG/0508248.
- Here we present the results of our work in computer-simulated knot tightening, giving new ropelength bounds for 212 tight knots and links as well as pictures and strut plots for 50 selected knots and links.
- [4] ———, *Knot Tightening by Constrained Gradient Descent*, in revision.
- In this paper we present experimental and theoretical results on the simulation of the (conjectured) “knot tightening flow”: a version of the curvature flow for space curves which is constrained by an embedded tube around the core curve. The software used in this paper, RidgeRunner is built around liboctrope.
- [5] Otto Krötenheerdt and Sigrid Veit, *Zur Theorie massiver Knoten*, 1976; English transl. in *On the Theory of Solid Knots*, translated by Ted Ashton, Series on Knots and Everything, vol. 36, World Scientific Publishing, River Edge, NJ, 2005.
- In this 1976 paper, which I translated from the German, Krötenheerdt and Veit examine solid knots constructed of congruent components (spheres, cubes and “kalottes”) and knots of uniform thickness. They establish upper bounds on the minimum number of components and the minimum core length (for uniform-thickness knots) needed to tie $T(m, 2)$ torus knots.

Software

liboctrope

- Ted Ashton and Jason Cantarella. Open-source implementation of the algorithm from [2], available for download under the GPL at <http://ada.math.uga.edu/research/software/octrope/index.html>.

Devel::SmallProf

- Perl profiler crafted from code suggested by Philippe Verdret. Allows one to profile one’s code line-by-line instead of routine by routine as with Devel::DProf.

MPE::Image

- A module to make the native database system, IMAGE, in the MPE operating system accessible to Perl.

Presentations

- 19 Mar 2007 “Exploring Continuous Tensegrities,” 60 min. Dissertation Defense
- 7 Jan 2007 “A Glimpse of Continuous Tensegrities,” 10 min. AMS & MAA Joint Mathematics Meetings, New Orleans, LA
- 1 Sep 2006 “A Brief Introduction to Tensegrity Theory,” 60 min. Geometry Seminar, UGA
- 15 Jan 2006 “A New Way to Tighten Knots: From Hunting the Thimble to Stumbling in the Dark,” 10 min., AMS & MAA Joint Mathematics Meetings, San Antonio, TX
- 1 Apr 2005 “Passage to Pentagonia,” 60 min., Geometry Seminar, UGA
- 18 Mar 2005 “Approximating Curvature,” 20 min., AMS Spring Southeastern Sectional Meeting, Bowling Green, KY
- 30 Nov 2005 “Approximating Curvature,” 60 min., Geometry Seminar, UGA
- 12 Mar 2004 “Octrope: A Fast Algorithm for Computing Ropelength,” 20 min., AMS Spring Southeastern Sectional Meeting, Tallahassee, FL
- 31 Jan 2003 “The Ropelength-minimal Clasp,” 60 min., Geometry Seminar, UGA

Research Experience

- VIGRE research group on tight composite knots, 2005–2007
- VIGRE research group on computational knot theory, 2004–2005
- VIGRE research group studying locked polygonal linkages, 2003–2004
- VIGRE research group on multi-robot navigation systems, 2003
- VIGRE research group studying the simple clasp, 2002–2003
- My work in the simple clasp group contributed to the following paper:
 - Jason Cantarella, Joseph H.G. Fu, Robert B. Kusner, John M. Sullivan, and Nancy Wrinkle, *Criticality for the Gehring Link Problem*, *Geometry & Topology* **10** (2006), 2055–2115, available at [arXiv:math.DG/0402212](https://arxiv.org/abs/math/0402212).

Employment

- Programmer/Systems Analyst/HP3000 System Manager, Southern Adventist University, 1995–2002
 - Developed and supported tools and applications written in Pascal, SPL, BASIC/V, COBOL, SLS, Cognos Powerhouse, C and Perl on the HP3000 and managed HP3000 and Linux systems. Also developed online applications using HTML and CGI (Perl).
- Adjunct Instructor, Math Department, Southern Adventist University, Fall 1996
 - Served as substitute teacher for a month in Survey of Math.
- Unix System Manager/Programmer, Walla Walla College, 1990–1993 (student), 1994–1995 (staff)
 - Managed Sun/Sparc, HP-UX, SCO and DellSVR4 Unix systems. Did trouble-shooting and training for Internet connection and utilities, C and Perl programming under Unix, and C programming on an HP3000 (both application and library development).
- Student Missionary (ESL and Drama teacher), Strisuksa School, Roi-Et, Thailand, 1991–1992
 - Taught English as a second language at the junior-high and high school levels and high school drama. Developed a PC-based test analysis program.
- Student Programmer (Records, Computer Service, Accounting), Southern College of SDA, 1985–1990
 - Did HP3000 support and programming in Cognos Powerhouse, SLS, Pascal, BASIC/V, SPL and COBOL.