

# Erik R. Tou

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## Education

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**Ph.D. Mathematics**, Dartmouth College, 2007.

Advisor: Dorothy I. Wallace

Dissertation title: *Zeta Functions for a Class of Cocompact Arithmetic Lattices in  $SL(3, \mathbb{R})$*

**M.A. Mathematics**, Dartmouth College, 2004.

**B.A. Mathematics Honors**, Gustavus Adolphus College, 2002. Summa Cum Laude. Minor in philosophy.

## Teaching Experience

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### *University of Washington – Tacoma*

**Assistant Professor of Mathematics**, 2016-Present.

**Lecturer in Mathematics**, 2014-2016.

Courses taught: Pre-Calculus, Calculus I and II, Introduction to Differential Equations, History of Mathematics, Discrete Structures I, Fundamentals of Geometry, Foundations of Mathematical Reasoning

### *St. Martin's University*

**Lecturer in Mathematics and Computer Science**, 2014-2015.

Courses taught: Introduction to Programming in C#, Pre-Calculus, Introduction to Statistics

### *Pacific Lutheran University*

**Visiting Assistant Professor of Mathematics and Computer Science**, 2013-2014.

Courses taught: Solve It With Computers, Introduction to Calculus

### *Carthage College*

**Associate Professor of Mathematics** (promoted with tenure), 2013.

**Assistant Professor of Mathematics**, 2007-2013.

Courses taught:

Applied Mathematics	Finite Mathematics	Calculus I & II	Modern Geometry
Discrete Structures	History of Mathematics	Multivariate Calculus	Abstract Algebra I & II
Cryptography	Principles of Modern Math	Research Topics in Number Theory	

## Current Research Interests

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**History of Mathematics:** The number theory of Joseph-Louis Lagrange

**Number Theory:** Computational number theory on the Gaussian integers

**Number Theory:** The mathematics of juggling

## Publications

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Abstracts and preprints may be found on my personal web site: <http://faculty.washington.edu/etou/>

### Peer-Reviewed

"Quadratic Prime-Generating Polynomials over the Gaussian Integers," *The Pi Mu Epsilon Journal* **14** (2017), no. 6, pp. 365–372. With undergraduate students Frank Fuentes of Seattle University and Monta Meirose of Morningside College.

"Measuring the Accuracy of an Ancient Area Formula," *Mathematical Spectrum* **46** (2014), no. 3, pp. 107–116.

"A Typology for Finite Groups," *The College Mathematics Journal* **44** (2013), no. 5, pp. 432–436.

"A Zeta Function for Juggling Sequences," *Frontiers of Combinatorics and Number Theory, Volume 4*. Nova Publishers, 2013. (Reprint of "A Zeta Function for Juggling Sequences"; see below.)

"A Zeta Function for Juggling Sequences," *Journal of Combinatorics and Number Theory* **4** (2012), no. 1, pp. 53–65. With Dominic Klyve of Central Washington University and Carsten Elsner of FHDW Hannover.

"Explicit Constructions of Arithmetic Lattices in  $SL(n, \mathbb{R})$ ," *International Journal of Mathematics and Computer Science* **4** (2009), no. 1, pp. 53–64. With Lee Stemkoski of Adelphi University.

### For a General Audience

"Math Origins: Orders of Growth," *Convergence* (January 2018). Part of a regular series.

"Math Origins: The Totient Function," *Convergence* (October 2017). Part of a regular series.

"The Farey Sequence: From Fractions to Fractals," *Math Horizons* (February 2017), pp. 8–11.

"Juggling With Numbers," *The Best Writing on Mathematics 2015*, Princeton University Press. (Reprint of "Do the Math!: Juggling With Numbers"; see below.)

"Do the Math!: Juggling With Numbers," *Math Horizons* (February 2014), pp. 5–7.

"A Graeco-Latin Sudoku Puzzle," *FOCUS: The Newsmagazine of the Mathematical Association of America* (August/September 2011), p. 2.

"Teaching and Research Using Original Sources from the Euler Archive," *Loci: Convergence* (April 2011). With Lee Stemkoski of Adelphi University and Dominic Klyve of Central Washington University.

### Under Review

"Bertrand's Postulate over the Gaussian Integers." Submitted to *The Pi Mu Epsilon Journal*. Joint work with Steven Klee of Seattle University, et al.

"The Role of Geometry in Leonhard Euler's Early Fluid Mechanics." Submitted to *Historia Mathematica*.

"Asymptotic Counting Theorems For Primitive Juggling Patterns." Submitted to *International Journal of Number Theory*.

## In Preparation

Al Karaji's *Treatise on the Extraction of Hidden Waters*, translation project with Abigail Owen of the University of Pittsburgh and Heather Sweetser of the University of New Mexico, to appear from Brill Publishers.

"How Inefficient Was Rhumb Line Navigation?" A comparison of loxodrome and great circle routes on a sphere and an ellipsoid.

## Selected Undergraduate Research Projects

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### *Ethnomathematics and the History of Quantity*, Winter/Spring 2017.

Capstone research project with Victor Fontaine, at University of Washington Tacoma. Searched history and ethnomathematics literature to develop a broad history of the development of zero, negative numbers, and complex numbers across cultures and time periods. Emphasized the cognitive history of these ideas (how did people think of these ideas at the time?) and cross-cultural communication (how did these ideas spread?).

### *Number Theory on the Gaussian Integers*, SUMMER REU at Seattle University, Summer 2015.

The SUMMER Research Experience for Undergraduates is an intensive 8-week research program at Seattle University. Research mentors prepared introductory lectures and material for students, and directed multiple research projects in Knot Theory and Number Theory. This program was supported by NSF grant DMS-1460537, the Seattle University College of Science & Engineering, and the Henry Luce Foundation.

### *Efficiency of Navigational Routes on Riemannian Surfaces*, Summer 2013.

SURE (Summer Undergraduate Research Experience) project with Samuel Hoffmann and Steven Metallo, funded through Carthage College. Examined the geometry of the rhumb line (a path of constant bearing) on a spherical Earth, and then generalized the concept to the ellipsoid and the torus. The primary topic was the rhumb line's relative efficiency when compared to the geodesic curve (on a sphere, the *great circle* path).

### *The Mathematics of Juggling*, Summer 2011.

SURE (Summer Undergraduate Research Experience) project with Josh Collins, funded through Carthage College. Explored the number-theoretic and combinatorial properties of juggling patterns, including the feasibility of transitioning between patterns requiring a different number of balls.

## Selected Presentations

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### *Research Presentations*

*The Prime Number Theorem for Juggling Patterns*, January 11, 2018. AMS/MAA Joint Mathematics Meetings, San Diego, California.

*Thousand-Year-Old Geometry: al-Karaji's Treatise on the Extraction of Hidden Waters*, January 6, 2017. AMS/MAA Joint Mathematics Meetings, Atlanta, Georgia.

*Euler's Publication Record During the Seven Years' War*, July 26, 2016. Euler Society 2016 Conference, Adelphi University, Garden City, New York.

*The Role of Geometry in Early Fluid Mechanics*, March 8, 2014. Columbia History of Science Group Annual Meeting, Friday Harbor, Washington.

*Did Bernoulli Discover the Bernoulli Equation?*, January 9, 2013. AMS/MAA Joint Mathematics Meetings, San Diego, California.

*A Zeta Function for Juggling Patterns*, August 4, 2012. MAA MathFest, Madison, Wisconsin.

*Accuracy of Quadrilateral Area Measurement in the Ancient World*, January 8, 2011. AMS/MAA Joint Mathematics Meeting, New Orleans, Louisiana.

*Opera Omnia Anglicae Reddit*, July 20, 2010. Euler Society 2010 Conference, Adelphi University, Garden City, New York.

*Navigation in the Time of Euler*, March 3, 2010. Invited to speak at Frederick V. Pohle Colloquium, Adelphi University, Garden City, New York.

*Euler and the Longitude Problem*, July 14, 2009. Euler Society 2009 Conference, Roger Williams University, Bristol, Rhode Island.

*Euler, Dollond, and the Achromatic Telescope Controversy*, October 14, 2008. Invited to speak at Mathematics Colloquium, University of Wisconsin – Oshkosh.

*Some Extensions of the Basel Problem*, November 19, 2007. Invited to speak at Buena Vista University, Storm Lake, Iowa.

*Zeta Functions on Cocompact Arithmetic Subgroups of  $SL(3, \mathbb{R})$* , January 5, 2007. AMS/MAA Joint Mathematics Meetings, New Orleans, Louisiana.

*A History of Riemann's Zeta Function on the Positive Integers*, October 27, 2006. Invited to speak at Keene State College Mathematics Seminar, Keene, New Hampshire.

### Other Presentations

*Communicating With Students Outside the Classroom*, August 25, 2011. Carthage College Fall Conference on Teaching and Learning, Kenosha, Wisconsin.

*Iterative Mathematics*, April 28, 2011. Mathematics Appreciation Week Colloquium at Carthage College, Kenosha, Wisconsin.

*Using Google Docs in the Classroom*, August 27, 2010. Carthage College Technology Day, Kenosha, Wisconsin.

*A Book That Changed my Life: Lies My Teacher Told Me*, by James Loewen, April 28, 2009. Philosophy Club Seminar, Carthage College, Kenosha, Wisconsin.

## Course Development

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### Designed course: *Fundamentals of Geometry* (2017)

This is an upper-level course for math majors. The course begins with an analysis of the deductive method employed by Euclid of Alexandria in the *Elements*. After identifying some limitations of Euclid's approach, students examine axiomatic systems in more general settings, then return to plane geometry and see how modern techniques (in particular the use of the real numbers) can improve the logical foundations of plane geometry. Attention is also given to different models of Euclidean and hyperbolic geometry, with a particular emphasis on the Poincaré disk and half-plane models. Finally, fractals are explored as an example of contemporary research in geometry.

### Designed course: *History of Mathematics* (2016)

This is an upper-level course for math majors. Material is presented chronologically and geographically, with a particular goal of including non-Western mathematical thought. A partial topic list is: Bronze Age Egypt & Mesopotamia; Classical and Hellenistic Greece, with emphasis on Euclid & Archimedes; Han Dynasty China and the *Nine Chapters on the Mathematical Art*; Medieval India, with emphasis on Aryabhata and Brahmagupta; origins of algebra in the Abbasid Middle East; Tartaglia, Cardano, and the European Renaissance; Descartes, Newton, Leibniz, and the origins of Calculus; the Enlightenment: Bernoulli, Euler, etc.; Systemization and Foundations: 19th and 20th centuries. As a writing course, special attention is given to research methods and historiography. Additional assignments include historical problem-solving techniques, biographies of famous mathematicians, and oral presentation of important mathematical problems & concepts from history.

### Created course: *Cryptography* (2013)

This course is designed for a general audience, and explores the practice of cryptology in different cultures and time periods. Some topics are: the use of mathematics in encrypting information (permutations, exponentiation, modular arithmetic, prime numbers); strategies behind cryptanalysis (frequency analysis, Kasiski's method, history of Allied efforts to break Enigma); popular and/or useful methods of encryption throughout history (Caesar's cipher, Vigenère cipher, ADFGVX cipher, Enigma, RSA); applications of cryptography (political uses, Internet security, and games). Students complete two projects in this course: the first requires students to create their own cryptosystem, while the second requires students to break a series of unknown ciphers throughout the term using techniques discussed in class.

### Redesigned course: *Finite Mathematics* (2011)

This course is designed for a general audience, and is tailored to the needs of those in the business, finance, economics, and computer science programs. Topics covered are: equation-solving, matrices, the simplex method, basic computer programming and logic, financial mathematics, and probability. For the first time, attention was given to the use of collaborative documents (specifically, Google Spreadsheets) and the use of formulas in spreadsheets for both calculation and problem-solving.

## Professional Activities

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### *Associate Editor, Convergence, 2017-Present.*

*Convergence* is an electronic publication of the MAA that focuses on the history of mathematics and its use in the classroom.

URL: <http://www.maa.org/press/periodicals/convergence/>

### *Reviewer Activities*

*Mathematical Reviews (MathSciNet)*, 2014. MathSciNet is an electronic publication offering access to a carefully maintained and easily searchable database of nearly 3 million items—reviews, abstracts and bibliographic information for much of the mathematical sciences literature.

Rogawski/Adams' *Calculus*, 3rd ed, 2013. Provided feedback on typographical errors, pedagogy, clarity, and organization for the third edition of the textbook. Publisher: W. H. Freeman & Company.

*Loci: Convergence*, 2012. *Loci: Convergence* (now *Convergence*) is an electronic publication of the MAA. URL: <http://www.maa.org/press/periodicals/convergence/>

### *Chair, AMS Session on the History of Mathematics, AMS/MAA Joint Math. Meetings, 2013.*

### *Organizer, Euler Society Conference, 2011 and 2014.*

The Euler Society meets biannually. The organizer arranges for meeting space and meals, in addition to reviewing submitted abstracts and composing the conference program.

### *Secretary, The Euler Society, 2010–Present.*

The Euler Society is an international scholarly organization devoted to the life and legacy of Leonhard Euler. Its mission includes: examination of Euler's legacy in the context of the Enlightenment, 18th century science and mathematics, and the promotion of English translations of Euler's writings. Responsibilities of the secretary include: maintenance of the society membership rolls, management of all Society communications, taking minutes for all meetings, membership in the executive committee.

URL: [www.eulersociety.org](http://www.eulersociety.org)

*Director, The Euler Archive, 2017–Present.*

*Co-Director, The Euler Archive, 2003–2017.*

The Euler Archive is an online collection of the original works of Leonhard Euler (1707-1783), and is hosted by the Mathematical Association of America (MAA). Also included are descriptions of the majority of Euler's publications, historical background on the people and academies that featured in the life of Euler, and an extensive search capability.

Activities as director include research into period journals, the St. Petersburg and Berlin academies, management the review process for translations into modern languages, site design and maintenance, and communication of newly discovered manuscripts.

URL: <http://eulerarchive.maa.org>

## Service Activities

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*Calculus Coordinator, University of Washington Tacoma, 2017–Present.*

As Calculus coordinator, I provide support for new Calculus instructors, including textbooks, sample syllabi, sample exams, and feedback on exam drafts. I also lead bi-quarterly meetings with all Calculus instructors to ensure consistency of content across all sections. In Autumn 2017 quarter I arranged for math faculty to meet with representatives from Cengage Learning to review and discuss their online learning system.

### *Committee Memberships*

Mathematics Education Assistant Professor Search, University of Washington Tacoma, 2016-17.

Faculty Committee on Budget and Compensation, Carthage College, 2012-13.

Science Building Liaison Team, Carthage College, 2011-13.

Finance Assistant Professor Search, Carthage College, 2011-12.

*Tutoring Coordinator, Freedom Education Project – Puget Sound (FEPPS), Summer 2014.*

FEPPS offers an Associate's degree program in the Washington Correctional Center for Women (WCCW), in Gig Harbor, WA. Before beginning the program, students participate in a summer-long tutoring program, Math Boot Camp, which provides them with review and support services for many introductory math topics ranging from fractions to basic algebra.

Tutoring coordinators are responsible for providing materials for instruction, organizing the schedule and prison check-in process for tutors, grading exams, and providing general support to students.

URL: [www.fepps.org](http://www.fepps.org)

*Macintosh Computer Upgrade Coordinator, Carthage College, Summer 2012.*

Worked on a part-time basis to coordinate computer upgrades for Carthage College's Macintosh users. This included scheduling of faculty appointments, distribution of data backup systems, conducting data migration to new machines, installation of software, and management of student workers.

*Technology Fellow, Carthage College, 2009–13.*

The primary responsibility is to provide one-on-one technology support for Carthage faculty, including support for Carthage's on-line course management system. In addition to this, Technology Fellows contribute to campus workshops on technology, on-line documentation for various technologies used by faculty, and the piloting of new technologies (both hardware and software) to recommend their use in the future.

## Professional Development

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### *Safer Zone Training, September 2016.*

The Safe Zone Project is run through the University of Washington Q Center, and supports faculty and staff to become allies for Q students and colleagues. The Project is designed to reduce prejudice and discrimination on the basis of sexual orientation, gender identity, and gender expression at UW campuses, and promote a more positive campus climate.

### *SEED Institute: Strengthening Educational Excellence with Diversity, June 2016.*

The SEED workshop is organized by the Office of Diversity & Equity at the University of Washington – Tacoma, and helps faculty members build and deliver university courses that use best practices for inclusive classrooms. Questions of equity and access were addressed, particularly as they apply to historically marginalized communities. In the end, participants prepared and critiqued action plans, in order to implement them in the following academic year.

### *MAA-PREP Workshop: Integrating Emerging Technologies, June 2011.*

This workshop was organized by Erick Hofacker, Kathryn Ernie, and Sherrie Serros, all from the University of Wisconsin – River Falls, with sponsorship and funding from the Mathematical Association of America. The workshop was designed to assist faculty who have plans or desires to integrate new emerging technologies into their undergraduate mathematics courses.

Sessions concentrated on a different focus for using technology in the classroom, including: Communication (instructor- and student-produced podcasts, interactive white boards, digital pens & slates), Visualization (readily available web-based tools, applets and animations, WolframAlpha), and Assessment (clicker questions, online homework and quizzing, and online testing).

### *MAA Minicourse: Learning Discrete Mathematics via Historical Projects, January 2011.*

This minicourse was organized by Jerry Lodder, Guram Bezhanishvili, and David Pengelley, New Mexico State University; and Janet Barnett, Colorado State University, Pueblo. Its goal was to introduce curricular modules in discrete mathematics, combinatorics, logic, abstract algebra, and computer science based entirely on primary historical source material. Sessions required participants to “test drive” various historical projects developed by the organizers.

### *Project NExT Fellow, 2007–2009.*

*Project NExT (New Experiences in Teaching)* is a professional development program for new Ph.D.’s in the mathematical sciences. A program of the Mathematical Association of America, it addresses all aspects of an academic career: improving the teaching and learning of mathematics, engaging in research and scholarship, and participating in professional activities. It also provides participants with a network of peers and mentors as they assume these responsibilities.

## Additional Information

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Professional Memberships: *Sigma Xi*, *Mathematical Association of America (MAA)* [SigMAAs: HoM], *The Euler Society*, *American Mathematical Society (AMS)*, *Phi Beta Kappa*.

Mathematical Software: Maple, Mathematica, Python, Sage, L<sup>A</sup>T<sub>E</sub>X

Learning Management Systems: Blackboard, Canvas, eRacer, Sakai

Computer Programming Skills: HTML, Java, C#

## References

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Available upon request.