

DEPARTMENT OF MATHEMATICS

Mathematics is a vast and vibrant enterprise with theory at its core. It thrives today on its traditional interaction with the physical sciences and engineering, as well as the more recent connections to computing, information, and communication. It is increasingly inspired by emerging applications in fields as diverse as biology and finance.



The zipper algorithm, developed by UW mathematicians Donald Marshall and Steffen Rohde, builds angle-preserving maps of the exterior of a circle onto the exterior of tree-like sets in order to numerically classify finite planar graphs.

Highlights

Recent faculty honors including a Packard Fellowship in Science and Engineering, an invitation to talk to the Swedish Academy in their Academy Lecture series, a Carver Medal from the Institute of Mathematical Statistics, and several Simons Foundation Fellowships.

Department faculty, working with UW students and hundreds of contributors around the world, continue to develop SageMath, an open-source mathematical software project that seamlessly integrates various software packages into a common experience. In 2013, it received the Jenks Prize for Excellence in Software Engineering applied to Computer Algebra.

Through the department's new Washington Experimental Mathematics Lab, faculty collaborate with graduate students, undergraduates, and community members on projects that are experimental, computational, and often visual, coming to understand mathematics as a creative discipline.

The department's Math Study Center provides a supportive and active learning environment for precalculus and calculus students. Graduate and advanced undergraduate students help them get unstuck, in a model that has since been adopted elsewhere.

Research

Department faculty do fundamental research in classical fields of mathematics and lead the way in newer areas (see list at right). In addition to intrinsic mathematical research, they collaborate on interdisciplinary projects with Applied Mathematics, Statistics, Computer Science and Engineering, Bioengineering, Genome Sciences, Electrical Engineering, Mechanical Engineering, Physics, and the Applied Physics Laboratory. Some examples:

- One faculty member has solved a longstanding open problem in the geometry of Riemannian manifolds, showing that knowledge of the distance function on the boundary determines distance overall. This work, featured in *Nature*, would allow one in principle to determine what is inside an object—the earth for instance—without destroying it.
- Another recently discovered a formula for counting all tanglegrams of a given size. Tanglegrams are combinatorial objects that arise in subjects as varied as the study of cospeciation in biology and analysis of software projects in computer science.
- In work with chemists at UW and beyond, a faculty member solved a probability problem about crystal deposits on a flat surface, thereby providing the theoretical justification for a procedure that may be used for cancer detection.
- To develop a procedure for packing objects of different weights and sizes into the smallest number of boxes in the fastest time, a suitable algorithm will be slow and inefficient. One of our faculty made a major advance by finding an efficient algorithm producing solutions that, if not optimal, are demonstrably close to optimal ones.

AREAS OF RESEARCH INCLUDE:

- Algebraic geometry
- Algebraic topology
- Combinatorics
- Complex Analysis
- Differential geometry
- Ergodic Theory and Dynamical Systems
- Inverse Problems
- Noncommutative algebra
- Non-smooth analysis
- Number theory
- Numerical analysis
- Optimization
- Partial differential equations
- Probability
- Representation theory

Faculty

Department of Mathematics faculty honors include:

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| 7 Guggenheim Fellowships | 1 John von Neumann Theory Prize, INFORMS |
| 10 Sloan Foundation Fellowships | 1 Rollo Davidson Prize |
| 8 NSF CAREER Awards | 1 Dantzig Prize, SIAM |
| 1 Haimo Award, MAA | 2 Leroy P. Steele Prizes, AMS |
| 5 Centennial Fellowships, AMS | 1 Academy of Arts & Sciences Fellow |
| 1 Louise Hay Award, AWM | 1 SIAM Fellow |
| 2 Education Prizes, PIMS | 2 Bôcher Prizes, AMS |
| 1 Kleinman Prize, SIAM | 6 Simons Foundation Fellowships |
| 4 UW Distinguished Teaching Awards | 1 Packard Foundation Fellowship |
| 21 AMS Fellows | 2 Washington State Academy of Sciences Members |
| 1 Stefan Bergman Prize, AMS | |

Education

The department offers an undergraduate degree program in Mathematics and an interdisciplinary program—joint with the Departments of Applied Mathematics, Computer Science & Engineering, and Statistics—in Applied and Computational Mathematical Sciences. More than 75 students are engaged in undergraduate research in the department. The department is also a major service department, with over 15,000 students enrolled in its courses annually. The department received the University of Washington 2005 Brotman Award for Instructional Excellence.

Outreach

Through Mathday, an annual event, more than 1,500 high school students visit the University for a day of engaging mathematics-related events led by Mathematics faculty and students.

The NSF-funded summer Research Experience for Undergraduates program, now in its 30th year, brings promising undergraduates together from UW and afar to work for eight weeks at the UW on research projects under the guidance of department faculty.

Ongoing activities, such as a weekly after-school program for students who want to expand their mathematical horizons (UW Math Circle) and a weekend lecture series on the UW campus (Monthly Math Hour), introduce middle and junior high school students to the exciting world of mathematics.

The Summer Institute for Mathematics at the University of Washington is a privately funded summer program for talented high school students in the Pacific Northwest that introduces them to the depth and beauty of mathematics.



A UW Math Hour Olympiad participant discusses her solution.



Students chat in the department's lounge. Photo by Dorothée Brand.

FACULTY (Winter 2017)

- 35 Professors
- 5 Associate Professors
- 3 Assistant Professors
- 2 Principal Lecturers
- 3 Senior Lecturers
- 2 Lecturers
- 14 Acting Assistant Professors

STUDENTS (Winter 2017)

- 508 Undergraduate majors
- 2 Master's students
- 94 PhD students

DEGREES AWARDED (July 2015-June 2016)

- 350 Bachelor's degrees
- 8 Master's degrees
- 18 PhD degrees

MAJOR STUDENT AWARDS (Since 2005)

- 4 UW Freshman Medals
- 4 UW Sophomore Medals
- 4 UW Junior Medals
- 9 A&S Dean's Medals
- 1 A&S Graduate Medal
- 1 President's Medal
- 1 Astronaut Foundation Scholarship
- 1 Davidson Fellowship
- 7 Goldwater Scholarships
- 3 INFORMS Awards
- 1 Marshall Scholarship
- 3 Mathematical Association of America (MAA) Awards
- 11 NSF Graduate Research Fellowships
- 8 NSF Postdoctoral Research Fellowships
- 12 Outstanding Winners of the COMAP Mathematical Contest in Modeling
- 1 Rhodes Scholarship
- 2 Sloan Fellowships
- 1 Putnam Fellowship

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