

VIGRE Funding Report

(due 30 days after semester of support)

Semester/Summer and Year:

Summer 09

Name: Tom LaGatta

List the graduate courses you have taken this semester (including independent studies), your grades, and the instructors:

Course	Title	Grade	Instructor

List the title, date and location of any talks you have given, either here or elsewhere:

See Part II

If you are working on your dissertation, include a one paragraph description of your research progress. If you have not yet begun dissertation research, describe your progress toward finding a dissertation topic and advisor and beginning that research.

See Part II

List publications, if any.

See Part II

Check all activities you completed during the funded period:

Academics:

- Independent Study
- Oral Comprehensive Exam
- Commence Thesis Research
- Conference attendance
- Conference participation
- Complete PhD

Professional development and outreach:

- AP Calculus Visit
- High School Workshops
- Undergraduate Research Project
- Undergraduate Research Seminar
- Super TA
- Mentoring junior graduate students for the qualifying exams
- RTG (help organize)
- Research Seminar (help organize)

Other (please specify)

Mathematics Representative to the Associate Graduate Council of Science

Co-organizer for the Science Salon, a biweekly, interdepartmental event

Attach a brief statement about your academic progress and professional development during the period of support.

Name: Tom LaGatta

Semester: Summer 2009

Talks given:

Riemannian First-Passage Percolation

PIMS/UBC Summer School in Probability, Vancouver, BC, June 2009

Deterministic Motion in a Random Environment

Cornell Probability Summer School, Ithaca, NY, July 2009

Publications:

LaGatta, T. and Wehr, J. *A Shape Theorem for Riemannian First-Passage Percolation*. arXiv preprint: arxiv.org:0907.2228, July 2009.

Research progress:

I am researching a model of random geometry called Riemannian first-passage percolation. We begin with a class of random Riemannian metrics on the plane. We first prove a rather general shape theorem, which says that balls in this random metric grow asymptotically like Euclidean balls (see arXiv preprint). I am currently studying length-minimizing geodesics in this random setting. The claim is that the set of directions which yield length-minimizing geodesics has almost-surely zero Lebesgue measure on the circle. By assuming otherwise, we prove that a generic length-minimizing geodesic repeatedly sees new random territory, which is with positive probability sufficiently close to a hill, around which the geodesic wraps and loses the length-minimization property, a contradiction.

Summer activities:

In June I attended the UBC/PIMS Summer School in Probability in Vancouver, Canada. I attended the two courses offered: David Brydges' on renormalization group, and Don Dawson's on contact processes in biology. Brydges' course in particular was influential on my research, as many of the discretization techniques I use are similar to those in renormalization group.

In July I attended the Cornell Probability Summer School in Ithaca, New York. One of the most interesting lectures was Alexander Holroyd's on the two-color matching problem: given two sets of random points, labeled red and blue, come up with an algorithm to match each red point to a blue one. I proposed a Gibbs-type matching, where configurations are weighted according to a Gibbs measure as in statistical mechanics. When I asked Holroyd and later Daniel Ueltschi about this idea, both of them said that this was unstudied. While I am still a graduate student, my focus is on the Riemannian first-passage percolation problem described above, and working on my dissertation. However, I plan to do a postdoc after this, and would like to branch out in my research. This Gibbs-matching problem would be an ideal one to consider at that stage.

I also attended the Stochastic Processes and Applications conference at Technische Universität in Berlin, Germany. While there, I spoke with Songchol Ryom, a graduate student of Jean-Dominique Deuschel's at TU. Ryom is studying diffusion in random environment; his random diffusion operator generates a Riemannian metric. He needed some estimates which were exactly those we proved for our shape theorem result.