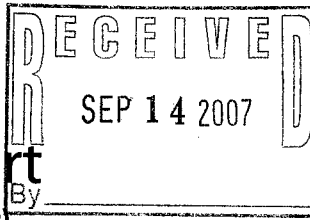


DEPARTMENT OF MATHEMATICS



VIGRE Funding Report

(due 30 days after semester of support)

Semester/Summer and Year:

Summer 2007

Name: Benjamin Dyhr

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:

[Empty box for listing talks]

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.

I am researching a stochastic process that is closely related to Schramm Loewner Evolution (SLE). SLE can be thought of a conformal-map valued stochastic process that is given by a solution to a (2-d) stochastic differential equation. This stochastic differential equation is defined by taking the classical Loewner different equation and letting the driving function be defined by Brownian motion. Much is known about SLE, but when a linear drift is added to the Brownian motion, some methodologies analogous to those used to analyze SLE no longer give results that are easy to work with. In particular the Kolmogorov equation for the so-called left-crossing probability that has been solved for SLE is no longer solvable for the nonzero drift case. This summer, I completed some probabilistic estimates that allow us to bound the left-crossing probability and gain insight about the nature of the solution. These estimates have lead me to the current direction of my research: investigating wether the flow in the nonzero drift case asymptotically converges to a stationary process in some sense.

List publications, if any.

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)

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

Research: In the proposed plan of study within my departmental VIGRE grant application, I described my intent on studying a stochastic process related to Schramm Loewner Evolution (SLE_κ). In particular, the stochastic differential equation that defines SLE_κ includes a Brownian motion without drift (multiplied by the square root of κ); I have worked to analyze the variation of the SLE_κ process in which the Brownian motion does have a nonzero drift coefficient.

For every positive value of κ , there is a random curve, called the *generating curve*, contained in the closed upper half plane that can be associated with SLE_κ . This result carries over to the case where the Brownian motion driving the SLE_κ process has a drift term. The so-called Girsanov transformation can be used to show this.

I spent Summer 2007 finishing estimates that show there exists a corridor paralleling the real axis the generating curve of SLE_κ with drift is contained in with some nontrivial probability that is given for each positive real number. The highlight of the summer was my attendance of the three week long graduate school at the 2007 Park City Mathematics Institute in Statistical Mechanics. Two founders of SLE_κ theory, Greg Lawler and recent fields-medalist Wendlin Werner presented short courses on SLE_κ , and almost all of the experts in the field were in attendance and giving seminars. The seminars and the discussions I had outside of the seminars at this conference were invaluable to my research.

My dissertation research will now move on to identifying stationarity properties of the long term behavior of the generating curve for SLE_κ with drift.

Vertical integration activities: None during Summer 2007; note that I did a multitude of Vertical Integration activities in my Spring 2007 VIGRE funding period directly preceding the summer. These are detailed in my VIGRE report for Spring 2007.