

DEPARTMENT OF MATHEMATICS

**VIGRE Funding Report****(due 30 days after semester of support)****Semester/Summer and Year:**

FALL 2008

Name: Jordan Schettler

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

Course	Title	Grade	Instructor
MATH 599	Independent Study	A	Bill McCallum
MATH 536A	Algebraic Geometry	A	Doug Ulmer
MATH 519 002	Tate's Thesis	A	David Savitt
PHYS 569	General Relativity	A	Dimitrios Psaltis

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

"A Riemann-Hurwitz Formula for Number Fields," Algebra and Number Theory Seminar, UA, November 2008

"The Lower Algebraic  $S$ -Groups," Graduate Student Colloquium, UA, September 2008

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 have made significant progress on my comprehensives which culminated in an ANTS talk on the 25th of November (as mentioned above). As planned I will be finished with all non-thesis requirements by the end of the spring semester 2009. I hope to use the following summer in finding an advisor and choosing a series of possible thesis problems related to my orals.

List publications, if any.

Check all activities you completed during the funded period:

Academics:

Professional development and outreach:

Independent Study

AP Calculus Visit

Oral Comprehensive Exam

High School Workshops

Commence Thesis Research

Undergraduate Research Project

Conference attendance

Undergraduate Research Seminar

Conference participation

Super TA

Complete PhD

Mentoring junior graduate students for the qualifying exams

RTG (help organize)

Research Seminar (help organize)

Other (please specify)

Completed outside the department course requirement (General Relativity). Participated in VIGRE site visit. Created a CV.

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

## VIGRE REPORT PART II FALL 2008

JORDAN SCHETTLER

### 1. ACADEMIC DEVELOPMENT

This past fall semester I made significant progress on several of my non-thesis requirements including a great start on my comprehensives, knocking out half of my outside the department courses, and enriching my knowledge in number theory (my desired area of specialization).

1.1. **Research.** I began doing background research on Iwasawa theory for an orals project with William McCallum over the summer of 2008. In the fall semester, we narrowed the focus towards investigating a generalization of the classical Riemann-Hurwitz formula to number fields (as more deeply explained in my VIGRE applications for the fall and spring semesters). The formula for number fields was first derived by Kida in 1979, but the relationship between his theorem and the well-known statement for Riemann surfaces was not made entirely clear and there were a few hypotheses for Kida's result which were not fully satisfying (for example, Kida's formula requires CM-fields rather than more general number fields and excludes  $p$ -extensions for the prime  $p = 2$ ). In an effort to rectify this, Iwasawa used representation theory and cohomology to establish a more general statement about Galois representations that did not exclude the prime  $p = 2$  nor need the CM-field assumption and from which the aforementioned formula of Kida followed as an easy corollary.

This semester I focused primarily on Kida's paper to get a grasp of the original proof and help prepare for tackling the more opaque paper of Iwasawa. My work culminated in a talk on the 25th of November in the Algebra and Number Theory Seminar (ANTS). The slides for that presentation can be found at following url (as linked from my website): <http://math.arizona.edu/~jschettler/Riemann-HurwitzSlides.pdf>. The content of these slides will constitute the first part of the written component, while the spring semester's work on Iwasawa's paper should round out the rest.

The work I've already done puts me in great shape to complete both the oral and written comprehensive components by the end of the spring semester. In fact, I'd very much like to schedule my oral exam for around spring break. Also, last semester's independent study left possible avenues for thesis work; in particular, it's worth searching for a single proof which covers both function fields and number fields.

**1.2. Outside the Department Courses.** I obtained a letter grade of A in PHYS 569: General Relativity and wrote a term paper on Møller energy and wormholes. Thus half of my required outside courses has been completed. Moreover, there is a follow up course PHYS 577: Gravitation and Cosmology which I'm now prepared for that will close out this requirement.

**1.3. Other Coursework.** I also received an A in MATH 536A: Algebraic Geometry and wrote a term paper on Hilbert functions (the pdf of which will soon be available to the public on Dr. Ulmer's website). This course presented invaluable tools to number theorists and geometers alike. It is the first half of a sequence I need in the geometry area to complete the 2 non-core sequence requirements (I have already completed 3 other non-core sequences in algebra and number theory). I also attended David Savitt's intriguing topics course on Tate's thesis.

## 2. PROFESSIONAL DEVELOPMENT

I used VIGRE funding to take advantage of several professional development opportunities which included being the super TA for the core algebra sequence (MATH 511A-B), making a CV, and regularly attending/participating in talks.

**2.1. Super TA.** Indeed, as a super TA for the algebra sequence, I held once-weekly meetings where the students and I discussed questions about homework problems or other questions about the course. I had occasion to lecture on a couple of topics related to but not significantly overlapping with course material. When there were no questions, I put up exercises which I had selected from quals and textbooks other than the required one and had students work on these; with 10 minutes or so remaining, I asked for volunteers to explain their solutions or ideas. I also held office hours two days a week, made special arrangements to meet students at additional times, and answered questions via email. I'm very grateful for this opportunity to refresh my own core skill set and gain teaching experience on such a high level where there are exceptionally gifted and motivated students; it's precisely the kind of course I would love to take the reigns of one day.