

DEPARTMENT OF MATHEMATICS

VIGRE Funding Report

(due 30 days after semester of support)

Semester/Summer and Year:

Summer 2008

Name: Carlos Chiquete

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:

None were given.

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.

We continued our research into detonation waves. Specifically during the summer, we worked on a specific case where asymptotic solutions in the vicinity of a singular point are needed. This was accomplished and submitted as an abstract for the American Physical Society's Division of Fluid Dynamics meeting in November of 2008.

List publications, if any.

None

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)

With respect to academics, we continued our ongoing research in detonation wave stability theory. As mentioned, I was able to submit two abstracts to the Fluid Dynamics meeting organized by the American Physical Society for work completed in the summer.

Also, I participated in the "Calculus Scholars" workshop for undergraduate students organized by David Morales of the Program in Applied Mathematics. It consisted of a week-long session of preparatory review for Calculus I, II and III.

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

VIGRE Final Narrative Report

Summer of 2008

CARLOS CHIQUETE
Program in Applied Mathematics

September 12th, 2008

1 Overview

The primary goal for the 2008 summer period of VIGRE funding was to meet some specific research objectives, and that the progress would be presented at the American Physical Society Division of Fluid Dynamics meeting in San Antonio in November of 2008. This was duly accomplished, and we submitted two abstracts for the conference. Also, I was to participate in some outreach activities involving undergraduate students at the University of Arizona.

2 Research

During the summer of 2008, I focused on my research into the stability theory of detonation waves. The work of this summer was a continuation of previous work in this subject. Specifically, we dealt with the so-called Chapman-Jouguet detonation wave which is a special case that requires more careful analysis than in previous work. The distinguishing characteristic of this work is that we must solve a system of differential equations that in contrast with previous work, the domain of solution includes a singular point. In our work we require asymptotic solutions in the vicinity of this point, and these were obtained with the techniques developed by W. Wasow¹.

Therefore, two different but related abstracts were submitted to the 61st Annual Meeting of the APS Division of Fluid Dynamics. The titles are as follows “Initial-value problem for small perturbations in an idealized CJ detonation” and “Multidomain spectral collocation method for three-dimensional perturbations in idealized CJ detonations”. The first talk is more theoretical and the second explains numerical implementation of a stability algorithm.

¹“Asymptotic expansions for ordinary differential equations”, Interscience, New York (1965)

3 Professional and outreach activities

I tutored for a intensive week-long workshop in calculus called “Calculus Scholars”. The programs takes place *before* the academic year starts in an effort to improve undergraduate’s performance in Calculus I, II and III. The program was mainly aimed at minority students but anyone was free to participate.

4 Conclusion

Over the summer, our major research objectives were met and we produced two talks that will be presented in November. This work will ultimately appear in my dissertation and so it is a step forward in graduating in a timely manner as well. Also, I participated in a workshop that aimed to help students succeed in college calculus. I would like to thank the VIGRE Fellowship for making this possible.