

VIGRE Report - Fall 2000
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This fall I was completely supported by a VIGRE fellowship. I took two courses, Electromagnetic Waves (OptSci 501) through the Optical Sciences Department, and the IGERT Lab through the Physics Department.

The IGERT Lab was a wonderful experience. We met three times a week, two four hour sessions and one one hour session. It was doubly fascinating. I was able to get firsthand experience in running experiments dealing with phenomena I was not familiar with. Also, we dealt with some phenomena that I had studied in an Applied Mathematics setting. Being able to observe these phenomena first-hand was a great benefit in seeing how the methods I had learned in an abstract setting are applied to a real world situation. Also, working with students in varied disciplines gave me insight into how mathematics is related to widely differing studies.

These two courses completed my course work requirements. Now that I have completed these requirements, I am left with passing the foreign language exam, and writing my dissertation to complete my degree requirements.

In addition to these two courses I also attended a seminar on Spectral Theory. This seminar was a continuation of a seminar, which had run last spring. We met once a week for one to two hours.

VIGRE support also allowed me the time to spend on my research. Briefly, my research is in the area of filamentary dynamics. The static structure of a filament is modeled by a six-dimensional dynamical system,
 $X'(s) = f(X)$,
where X is a six-dimensional vector and f is a nonlinear function of X .

Via center manifold and normal form theory we obtain a simplified system as an approximation to the original system:

$x'' = x[-\psi + x^2 + (x')^2]$,
where $x(s)$ is a function of one variable.

We are able to completely describe the behavior of this system. The remaining questions were then regarding the conditions under which the simplified system correctly models the original system.

This fall Dr. Goriely, my advisor, and I were able to make strides with an understanding of this system. We are currently finishing work on a paper to be published shortly.

In addition to this we have begun a study on the phenomenon of whip cracking. We are studying the motion of a whip in terms of the Kirchhoff equations for elastic filaments. As far as we know this phenomenon has not been studied in this context. We are very excited about this new study.

