Department of Applied Mathematics

APPLIED MATH

MAKING NONLINEAR WAVES
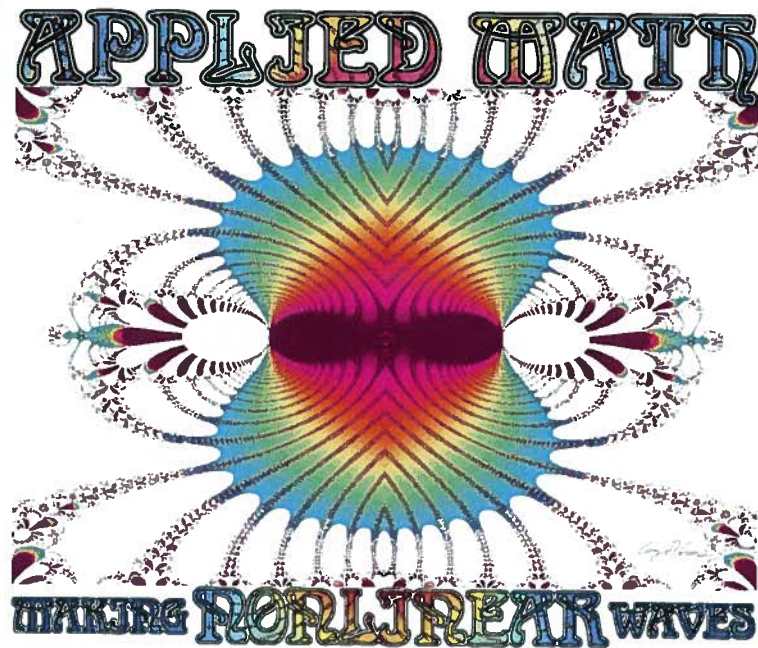
Annual Report
2005-2006

University of Colorado at Boulder
Boulder, CO 80309

James H. Curry, Chair
June 30, 2006

The Department of Applied Mathematics
CU Boulder

Vision

The vision of the Department of Applied Mathematics at the University of Colorado is to be an internationally leading department in Applied Mathematics in research and education.

Mission

The Department of Applied Mathematics at the University of Colorado strives to provide excellent teaching, research, and service to the university community and to the world in the application of mathematics to other disciplines.

Objectives

The Department of Applied Mathematics has four primary objectives:
- *to teach our students well*;
- *to seek out and develop new, interesting applications of mathematics in other disciplines*;
- *to provide each student with a rich educational experience*; and
- *to create new mathematics*.

We interpret this to mean:

Provide undergraduate and graduate students with a high quality education and training in applied mathematics and prepare them for careers in government, industry, laboratories, and the academic professions;

Offer and monitor degree programs leading to BS, MS and PhD degrees in Applied Mathematics;

Nourish and maintain a professional environment in which excellence in teaching, learning, scholarship and creativity are of central importance;

Assure teaching and research expertise in a number of key areas of applied mathematics including the methodology of applied mathematics, computational mathematics and algorithms, industrial applications, applied probability and statistics.

Cover Art: This year's images were produced by Applied Math graduate student/PhD recipient, Cory Ahrens. Each year, the Department of Applied Mathematics at the University of Colorado at Boulder creates a t-shirt that illustrates aspects of current research in the department. Cory Ahrens, an Applied Mathematics Ph.D. student working with Professors Mark Ablowitz and Silvana De Lillo (from the University of Perugia, Italy), designed this year's t-shirt. Cory's research focuses on nonlinear dispersive wave equations.

The "Making Nonlinear Waves" t-shirt shows an artists rendering of a fractal. This fractal arose in the study of how to discretize the integrable nonlinear partial differential equation, called the Eckhaus equation. Nonlinear partial differential equations are normally extremely difficult to solve analytically, but the Eckhaus equation, discovered in the 1980's, is solvable using special techniques and is hence termed integrable. Since the mid 1970s, the area of integrable nonlinear differential-difference equations (the discrete analog of nonlinear partial differential equations) has been a vibrant area of research, with applications in, to name two applications: photonic waveguides (a way to guide light) and Bose-Einstein condensates (a subject of great interest at CU since Carl Wiemann and Eric Cornell won the Nobel prize in physics in 2001).

TABLE OF CONTENTS

OVERVIEW

The core vision, mission and objectives of the Department are teaching, research, and service. Further, APPM's core mission is carried out at multiple levels and continues to lead to significant interactions between students, faculty, postdoctoral associates, and collaborators. We believe that Applied Math is honoring the precept that education should be transformative.

This past year, the department explored many avenues of research innovation, taught and transformed some of its courses, and educated its students well. It did so in the presence of tight resources. Nonetheless, the faculty continue to establish principles, policies and procedures that we hope and expect will facilitate it becoming a top 10 department in the Mathematical Sciences. Goals include establishing a "named" Visiting Assistant Professorship program, continuing to attract external grant dollars, and working with our alumni and donors to develop an Advisory Board.

In this annual report, the department's many activities are described. However, I would like to point out a few highlights:
I am very pleased to report that the Department of Applied Mathematics was notified by the National Science Foundation that its proposal, Mentoring through Critical Transition Points: Colorado Advantage, is being funded. The $1.3 million dollar grant will support some of our best undergraduate students over the next 5 years. We continue to build excellence and community among our undergraduates and the MCTP grant will help.

For the third year in a row one of the department's Mathematical Contest in Modeling teams scored outstanding! I believe that this is the first time in the history of the contest that such a feat has been accomplished by any team of three individuals!

Our graduate students also continue to excel: Mark Hoefer received a Graduate Student Research and Creative Work Award from the Graduate School. This is the first time a graduate student from our department has received this award! Further, Doug Baldwin received a 3-year National Defense Science and Engineering Award and Maribeth Oscamou was awarded an AAUW scholarship.

Professor Mark J. Ablowitz was awarded the title of College Professor of Distinction. This honor was given for the first time this year. Mark was one of 4 faculty members in the College of Arts and Sciences to be so honored. Dr. Mary Nelson was awarded the Peebles Innovation in Education Award. This is a first ever in the Department and demonstrates that Dr. Nelson is not only an excellent classroom instructor but also that innovations that we are propagating at the undergraduate level are beginning to have both recognition and impact.

I am also pleased to announce that the department successfully recruited two new faculty members: Assistant Professor David Bortz, whose expertise is in mathematical biology, and Dr. Anca Radalescu, whose expertise is in dynamical systems and coding theory.

Due to the support of our donors, the Applied Mathematics Department's Faculty Lecture Series was endowed. The first Faculty Lecture was given by Professor David Donoho of the Department of Statistics at Stanford University. Professor Donoho is a leading expert in data analysis. We are successfully connecting with donors who are supporting students and department programs. However, I expect that the best is yet to come. In addition to getting the Faculty Lecture Series to endowment level, a new goal is that within the next three years to get the Undergraduate Applied Mathematics Scholars Fund to endowment level.

A special thank you goes out to our Undergraduate Chair, Anne Dougherty, our Graduate Chair, Tom Manteuffel, and our Colloquium Chair, Bengt Fornberg, for all of their hard work this past year. And last but not least, a thank you the entire staff of the Applied Math Department for their hard work day in and day out. We could not do what we do without their doing what they do!

We believe the University is being well served by the students, faculty and staff in the Department of Applied Mathematics at the University of Colorado. I believe that the department has the required agility and integrity as well as the strong sense of its vision, mission and objectives that allows it to look forward to the opportunities that it must continue to seize in order to achieve its very bright future.

Jim Curry, Chair   Anne Dougherty, Associate Chair

1. DEPARTMENTAL ACTIVITIES

A. Undergraduate Education

Undergraduate education in the Department of Applied Mathematics provides students with broad-based preparation for the challenges and opportunities of today and tomorrow. Through courses, projects, research and other educational activities, the Department provides unique experiences to its majors and minors. The Department also has a large teaching commitment since most undergraduate engineering majors are required to take four courses in applied mathematics. The Department taught a total of 3650 undergraduate and graduate students in 2005-2006. See §5 for a detailed list of the courses taught.

We had 105 undergraduate majors in 2005-2006, with 27 students receiving their baccalaureate degrees this year, our largest class ever. (See §1D for a list of our graduates, 2 with BS/MS degrees and 25 receiving the BS.) We are proud that 44 students in the fall and 38 in the spring semester made the Dean's List for academic achievement, with grade-point averages of 3.6 or better. Our minor program continues to attract students from other majors who are interested in more in-depth training in applied mathematics. Fifty-four students have declared an Applied Math minor (a 26% increase over the previous year), and even more are taking at least some of the upper division courses towards it.

The undergraduate student chapter of SIAM (the Society for Industrial and Applied Mathematics) is responsible for promoting interactions between applied math faculty and majors. It also sponsors activities and presentations that introduce undergraduates to the use of mathematics in engineering and the sciences. Events this past year included student presentations, invited speakers and the "ever-popular" mentor lunches. (For a complete list of presentations, please see §3F.) **Brad Klingenberg** served as Chapter President and was assisted by **Kris Tucker, Lauren Anderson, Rachel Danson, Kye Taylor,** and **Brandon Booth**. These students will continue as officers for the 2006-07 academic year. Anne Dougherty was the faculty advisor for 2005-06 and will continue in that capacity next year.

The primary activity of the undergraduate SIAM chapter this year was the organization, together with the SIAM chapters of CU-Denver and CU-Colorado Springs, of the Front Range Applied Mathematics Student Research Conference. This conference was held on March 11, 2006 and Professor David Donoho, from Stanford, was the keynote speaker. The conference had 55 attendees including 20 student presentations from 6 universities along the Front Range.

The art of creating and testing mathematical models of real-world problems is an important part of our undergraduate training. Undergraduate students are given an opportunity to showcase their mathematical, computational and communication skills in the annual Mathematical Contest in Modeling (MCM), an international contest sponsored by COMAP (The Consortium for Mathematics and its Applications). Students from all science, math and engineering majors are encouraged to enter. In 2006, the Applied Math Department entered five teams. The contest ran from 6:00 pm February 2, 2006 until 6:00 pm February 6, 2006 and drew entries from 970 teams from around the world. Each team chose one of three open-ended problems. Over the past seven years, the Applied Math teams have done extremely well, receiving an Outstanding designation seven times. This year, one team achieved an Outstanding, the highest possible designation. This designation was received by only 15 of the 970 teams! Our students' continued success in the modeling contest is a tribute to their abilities and CU's strong academic programs. Advisors are Bengt Fornberg and Anne Dougherty.

Fifteen students from CU participated in the modeling contest this year. The MCM paper submitted by the team consisting of **Brian Camley** (Math and Physics double major), **Pascal Getreuer** (APPM BS-MS student), and **Brad Klingenberg** (APPM major) was Outstanding on Problem A. Problem A involved positioning and moving sprinker systems for irrigation. This Outstanding paper was also named the winner for BOTH the SIAM and MAA paper awards. To the best of our knowledge, this is the only team to win Outstanding for three consecutive years in the history of the contest.

Congratulations are also due to:

1) **Ben Barrow** (APPM and CSEN double major)**, Thomas Josephson** (APPM and CSEN), and **Laura Waterbury** (APPM), a Meritorious on Problem A (top 16% of all papers submitted).

2) **Michael Gurshtein** (EPEN and APPM minor)**, Josh Destree** (PHYS), and **Edwin Eng** (CSEN), a Meritorious on Problem B.

3) **Brandon Booth** (APPM and CSEN)**, Rachel Danson** (APPM), and **Benjamin Safdi** (EPEN and APPM), a Meritorious on Problem C.

4) **Christopher-Ian Davis** (APPM)**, Ramsey Majzoub** (EPEN), and **Brennan Dayberry** (ECEN), an Honorable Mention on Problem A (25% of all papers submitted).

The VIGRE grant, from the National Science Foundation, has fundamentally changed the character of our undergraduate major. This past year, 7 of our more advanced undergraduates participated in a research project with a faculty member. See §1G for more information about VIGRE. Additionally, several other students worked in research labs outside of the department. While the VIGRE grant ended in April, 2006, we are pleased to have received an NSF Mentoring Through Critical Transitions (MCTP) award. The MCTP grant will allow us to continue and expand the research experiences of our undergraduates.

This year's class of graduating seniors was outstanding! **Ashley Moore** graduated "summa cum laude" (cumulative GPA must be at least 3.90); Nate Aragon, Vincent Ferreri, Pascal Getreuer, Paul Kolesnikoff, and Kolt Peightal graduated "magna cum laude" (cumulative GPA at least 3.8) and Matthew Martin, Ian Scholfield and Daniel Washington graduated "cum laude" (cumulative GPA at least 3.7). Ashley Moore was recognized as the College of Engineering and Applied Science's Outstanding Senior for Research Excellence and as the Department's Outstanding Senior for Academic Excellence. Pascal Getreuer was selected as the Department's Outstanding Senior for Research Excellence. Nate Balk, Rachel Danson, Brad Klingenberg and Kris Tucker received Henri-James Awards, a cash award given to outstanding Applied Math graduating seniors who are continuing on to graduate school. In addition, Brad Klingenberg received a Goldwater Scholarship for the 2006-2007 academic year.

The members of the Undergraduate Committee were Mark Ablowitz, Anne Dougherty (Chair), James Meiss and Adam Norris. The duties of this committee are to advise and recruit undergraduates to the major and the minor, and to supervise all aspects of the undergraduate curriculum. Special thanks to the undergraduate committee and especially Anne Dougherty for her successful efforts in working with undergraduate students!

B. Graduate Education

The role of the graduate program is to give students in-depth training in applied mathematics and to provide the skills necessary for success in industry, government laboratories, or academia. Different departments around the country use different definitions of "applied mathematics". In this department, the areas of mathematical expertise are: scientific computation, physical applied mathematics, dynamical systems, analysis, statistics/probability, and mathematical biology. In addition, the department maintains an active program of affiliated faculty. These are faculty members in other departments with an interest in applying mathematics within their own disciplines. (Currently, there are 46 affiliated faculty, see §2B.) A graduate student in APPM can pursue a doctorate in Applied Mathematics with an affiliated faculty member as the thesis advisor, along with an APPM co-advisor. In fact, 7 APPM graduate students are currently working under the supervision of affiliated faculty. A basic goal of this department is to seek out and develop new areas of application of mathematics, and our affiliated faculty members play a crucial role in that process.

Some of the demographics of the graduate program in the Applied Math Department are:

- In 2005-2006, the department had 70 graduate students.
- The entering class in fall 2005 had 14 new students. In spring 2006, we welcomed one new graduate student to our program.
- We continue to attract a large fraction of U.S. citizens: in 2005-2006, 90% of the incoming students with financial support were U.S. citizens.
- 16 of our graduate students are women.
- Our graduate program had two under-represented minority students in 2005-2006.
- 6 students completed their PhDs in 2005-2006. 15 students received MS degrees, with 9 continuing towards the PhD at CU. See §2D for a list of this year's graduates.
- Funding: Slightly less than half of our graduate students (32) were Teaching Assistants (TAs) in the fall semester (includes both full time and part time TAs) and 28 served as TAs in the spring. Additionally, 14

graduate students were supported with research assistantships (RAs) with faculty in Applied Math, 5 had RAs with affiliated faculty, and 2 had fellowships.

The department offers three formal interdisciplinary programs, all at the MS level.

1. *A Combined MA/MS with the Molecular, Cellular, and Developmental Biology Department (MCDB)*. The combined MA/MS is a three-year interdisciplinary program designed to produce students trained both in applied mathematics and in molecular biology. A student who completes this program can begin a career in the biological sciences with a very desirable combination of skills, or can continue on to a PhD either in APPM or in MCDB.

2. *An MS with a Computational Science and Engineering Track*. This track is designed for a student in a participating department in science or engineering, with a strong interest in scientific computation and mathematical analysis. Under this plan, the student obtains an MS in APPM on the way to a PhD in the other department. Six other departments now participate in this program.

3. *Teacher-Licensure Option*. An APPM graduate student can fulfill the outside-sequence requirement in the School of Education. By also meeting the requirements of that School, a student can obtain both an MS in applied mathematics and a license to teach mathematics in a secondary school (i.e., in middle through high school). More information about the graduate program is available at <http://amath.colorado.edu/programs/grad.html>

The Graduate Committee for 2005-2006 consisted of Jem Corcoran, Keith Julien, Tom Manteuffel (Chair) and Steve McCormick. The main business of the committee is to advise the current graduate students, recruit and admit students to the graduate program, and administer the preliminary exams. Special thanks to the graduate committee and especially Tom Manteuffel for his successful efforts in working with graduate students! We welcome Keith Julien who will take over as grad chair next year.

C. Enrollment Statistics

Enrollment in the courses offered by the Department continues at extremely high levels. It is particularly noteworthy, given the faculty's small size, that the Department teaches so many students. The statistics over the past fifteen years are as follows:

Year	Total Enrollment in courses	Number of Graduate Students	Number of Undergraduate Majors	Number of Undergraduate Minors
1991-92	2781	27	50	
1992-93	2797	28	47	
1993-94	2809	33	47	
1994-95	2670	39	51	
1995-96	2734	40	54	
1996-97	2973	46	52	
1997-98	3108/**3323***	51	44	
1998-99	3172/**3566***	49	54	
1999-00	3166/**3529***	50	60	21
2000-01	3091/**3517***	61	63	28
2001-02	3275/**3701***	63	66	40
2002-03	3417/**3878***	70**	69**	44**
2003-04	3414/**3978***	75**	97**	44**
2004-05	3187/**3664***	73**	108**	43**
2005-06	3650/**4118***	70**	105**	54**

*The totals in bold include all Calculus I & II Work Study Groups, as well as Calculus III Labs & Differential Equations Labs. Enrollment in our upper division courses has continued to increase. With projected increases in undergraduate enrollment we continue to foresee enrollment increases in applied mathematics courses.
**Number of unduplicated students.

APPM Upper-Division Student Credit Hours
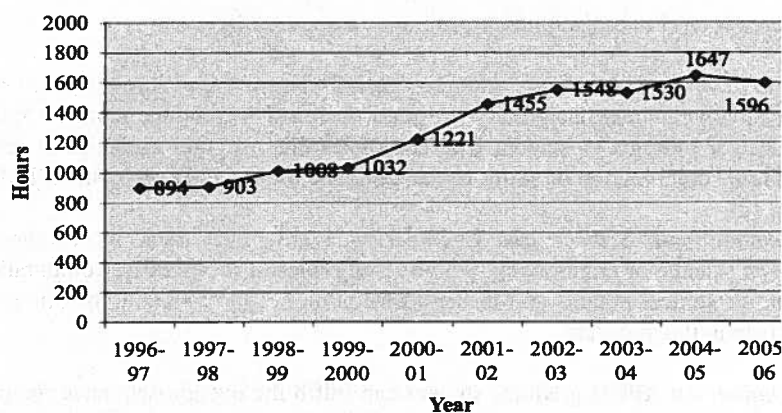
APPM Graduate Student Credit Hours
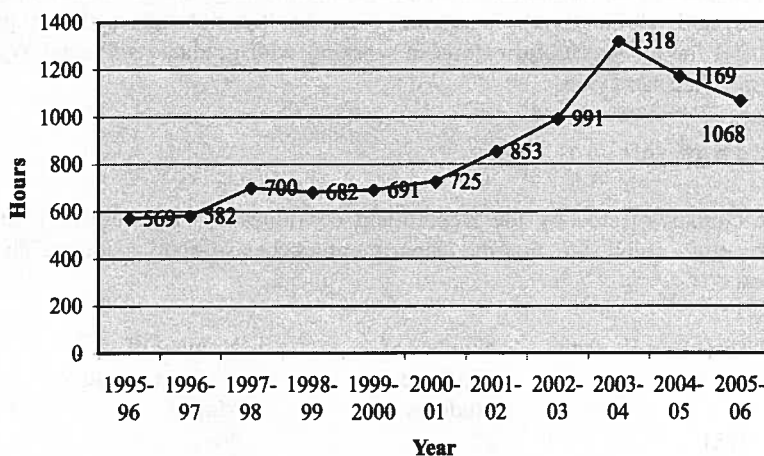
D. Graduates:

We congratulate our students who graduated this past year with a degree in Applied Mathematics. They are:

PhD degree (See §6D for thesis titles and advisors)

August 2005	**December 2005**	**May 2006**
Eunjung Lee	James Brannick	Mark Hoefer
Paki Suwannajan	Daniel Cooley	
Derin Wysham		

Master's degree

August 2005	**December 2005**	**May 2006**
Jonathan Graham *	Qianlong Liu	James Adler*
	Erin Byrne*	Elizabeth Green
	Craig Faulhaber	Bradley Huntting*
	Wilfred Thompson	Holly Lewis
		Si Liu*
		Maribeth Oscamou*
		Dragan Plakalovic*
		Jason Sherman*

8

Bachelor's/Masters degree

December 2005	May 2006
Nathan Aragon	Pascal Getreuer

Bachelor's degree

August 2005	December 2005	
Cathleen Dewald (Ferrell)	Chris Barrow	Jacklyn Gorsett
Anh Minh Dang	Donovan Levinson	Mark Winter
Joshua Pflum		

May 2006

Thomas Bailey	Vincent Ferreri	Andrew McGraw	Danny Su
Jill Blecha	Paul Kolesnikoff	Ashley Moore	Daniel Washington
Erik Brechun	Gi Hyun Lee	Kolt Peightal	Derrick Wildhaber
Travis Curtis	Edmund Lewis	Kristen Pfannenstiel	
Natalie Cushman	Matthew Martin	Ian Scholfield	

*Continuing with PhD

E. Faculty Awards and Honors - 2005-2006

Mark Ablowitz: Mark received the Marinus G. Smith Recognition Award from the CU Boulder Parents Association and the Residence Life Academic Teaching Award, 2006. Mark continues to be listed as one of the most highly cited researchers in the field of Mathematics by ISI.

But wait, there's more! Professor Ablowitz was designated College of Arts and Sciences Professor of Distinction. From the College's web site:

<http://www.colorado.edu/ArtsSciences/facultystaff/administration/professordistinction.html>

A candidate for designation as College Professor of Distinction shall be judged by the following criteria:

1. The candidate must be recognized nationally or internationally as a distinguished scholar or artist of exceptional quality. They should enjoy evidence of national recognition for their position in their discipline beyond individual testimonials, such as by prestigious lectureships, elected positions, awards, and honors.

2. The candidate should exhibit evidence of superior accomplishment as a teacher and mentor to both graduate and undergraduate students, and should exhibit enthusiasm for teaching through their activities as a teacher-scholar.

3. The candidate should exhibit a record of superior service to their discipline, their department, and their College and University.

4. The candidate should exhibit a strong record in each domain, but a record that overall can be judged to be exceptional.

This means that:

1. Selected candidates shall be authorized to use the honorific title "College Professor of Distinction" during the remainder of their career in the College.

2. Each College Professor of Distinction shall present a public lecture to the faculty of the College and attend a reception in their honor in the inaugural year of their appointment.

3. The College shall suitably honor and feature its Distinguished Fellows, including a public display of the roster of current College Professor of Distinction.

The Department is very, very pleased that Professor Mark J. Ablowitz was selected as a very prestigious Professor of Distinction. Congratulations to Mark! We will post pictures of Mark's presentation on the department's web site.

Jem Corcoran: Promoted to Associate Professor with tenure beginning August, 2005. Invited to participate in the Pan American Games in May 2006.

James Curry: Serves as the J.R. Woodhull/Logicon Teaching Professor in Applied Mathematics.
Trustee of the CU Foundation.
PI on proposal to NSF, EMSW21-MCTP: Colorado Advantage. This proposal, to enhance and foster research for undergraduate applied math majors was submitted 10/12/05 and awarded in 2006.

Anne Dougherty:
Residence Life Academic Teaching Award, spring 2005, from the Committee on Learning and Academic Support Services at the University of Colorado. Students nominate faculty who have had a significant impact on their learning.
MVT (Math Visualization Toolkit) was awarded the 2005 Editor's Choice Award from MERLOT (Multimedia Educational Resource for Learning and Online Teaching) for being an exemplary online learning resource model for all disciplines.
Anne Dougherty and Mary Nelson helped Boulder Valley School District land a $600,000 three year grant from the Colorado Department of Education. The grant is for for K-12 teacher professional development and enhancement.
Co-PI on proposal to NSF, EMSW21-MCTP: Colorado Advantage. This proposal, to enhance and foster research for undergraduate applied math majors, was submitted 10/12/05. Awarded 2006.

Keith Julien:
Co-PI on proposal to NSF, EMSW21-MCTP: Colorado Advantage. This proposal, to enhance and foster research for undergraduate applied math majors was submitted 10/12/05. Awarded 2006.

Tom Manteuffel: Council of Research and Creative Works Faculty Fellowship, 2006.

Per-Gunnar Martinsson: Recipient of Junior Faculty Development Award, 2006.

James Meiss: Nominated for the Sullivan-Carlson Teaching Award, 2005. Jim will be appointed Research Professor at the Mathematics Science Research Institute (MSRI) in Berkeley for Spring 2007.
Co-PI on proposal to NSF, EMSW21-MCTP: Colorado Advantage. This proposal, to enhance and foster research for undergraduate applied math majors was submitted 10/12/05. Awarded 2006.

Mary Nelson: Recipient of John and Merceds Peebles Innovation in Education Award, spring 2006. This award recognizes faculty of the College of Engineering and Applied Sciences who have shown a unique commitment to students demonstrated through innovations in education.
DACOWITS committee in 2005 (Defense Agency Committee on Women in the Services).
Chairmanship of Defense Agency Committee on Women in the Services, DACOWITS, 2005-2008
Mary and Anne Dougherty helped Boulder Valley School District land a $600,000 three year grant from the Colorado Department of Education. The grant is for for K-12 teacher professional development and enhancement.
Research project, Oral Assessments: Improving Conceptual Understanding," was selected by the Presidential Teaching Scholars as a PTLC supported project. The Presidential Teaching Scholars have created a program to support researchers in educational research on the campuses of the University of Colorado. About 6 projects were selected. The researchers are given the support of a faculty coach and a content expert to carry out the project and publish their results.

Adam Norris: 2005 CU-LEAD Alliance Faculty Appreciation Award recipient. Received Marinus G. Smith Recognition Award from the CU Boulder Parents Association for having an impact on the lives of undergraduate students.
Spring 2005, Residence Life Academic Teaching Award, from the Committee on Learning and Academic Support Services.
Spring 2005, Nominated for the Peebles Award for Innovation in Teaching.

Harvey Segur: 97th Distinguished Lectureship on Research: The University of Colorado awarded Harvey a Faculty Fellowship for 2005-06.
Co-PI on proposal to NSF, EMSW21-MCTP: Colorado Advantage. This proposal, to enhance and foster research for undergraduate applied math majors was submitted 10/12/05. Awarded 2006.

Matthew Tearle: 2005 CU-LEAD Alliance Faculty Appreciation Award,

F. Research

The faculty in the Department continue to demonstrate appreciable accomplishments in research. Harvery Segur and Tom Manteuffel were awarded University of Colorado-Boulder Faculty Fellowships which provide them with the opportunity to focus on their research for an academic year. Jim Meiss was invited for a year-long stay at the University of California-Berkeley's Mathematical Sciences Research. Assistant Professor Per-Gunnar Martinsson (Gunnar) was awarded a University of Colorado Junior Faculty Development Award. Gunnar was also awarded his first National Science Foundation competitive research grant to support his research in numerical methods for solving partial differential equations.

Other indicators of faculty accomplishments are that 2 faculty members were included among the most highly cited researchers in the Mathematical Sciences (http://isihighlycited.com/) : Mark J. Ablowitz (2003, 2004, 2005) and Gregory Beylkin (2005).

Further indications of faculty engagement in research are:
- Research productivity of our thirteen TTT faculty is high;
- Editors or Associate editors of 11 journals/3 editorial boards;
- 2 patents (Ablowitz, Lladser);
- 2 Monographs (Ablowitz, Meiss).

Editorships

An important aspect of the faculty's role in the national and international scholarly effort in applied mathematics is service as editors, associate editors, and advisory board members of archival journals and textbook series. During 2005-2006, the faculty in the department served in such capacities on 11 journals/periodicals and 3 editorial boards, which include:

Applied and Computational Harmonic Analysis Advisory Editorial Board, Beylkin
Applied Mathematics: Proceedings of the American Mathematical Society, Coordinating Editor, Ablowitz
Cambridge University Press Texts in Applied Mathematics, Editor, Ablowitz
Cambridge University Press Combined Editorial Board in Applied Mathematics (Monographs Series, Text Series, and Computational Math Series. Ablowitz
Communication on Pure and Applied Analysis, Editor, Li
Dynamics of Partial Differential Equations, Editor, Ablowitz
Electronic Transactions in Numerical Analysis, Associate Editor, Manteuffel
Journal of Numerical Linear Algebra and Applications Editorial Board, Manteuffel
Mathematical Association of America Monthly Journal, Associate Editor, Curry
Multiscale Modelling and Simulation, SIAM Press, Associate Editors, Manteuffel and McCormick
SIAM Journal of Applied Dynamical Systems, Associate Editor, Meiss
SIAM Journal of Numerical Analysis, Associate Editor, Manteuffel
SIAM News, Editorial Board, Manteuffel
Studies in Applied Mathematics, Editor, Ablowitz

Copper Mountain Conference, April 2 – 7, 2006

Tom Manteuffel and Steve McCormick organize the Copper Mountain Conference in the spring of each year. This year the conference was on Iterative Methods and was held during April 2 - 7, 2006. There were 175 participants and 135 lectures. A special feature of this conference is the support of students, which usually amounts to free lodging and registration, and travel assistance in some cases. This year 55 students attended the conference. Student participation has made the Copper Mountain Conferences a central contributor to the fields of multigrid and iterative methods.

The Inaugural Lecture of the Applied Math Endowed Faculty Lecture Series, March 10, 2006

We were honored to have Dr. David Donoho from the Department of Statistics at Stanford University present the inaugural lecture of the Applied Mathematics Endowed Faculty Lecture Series on Friday, March 10th, 2006. The title of his lecture was "More Unknowns than Equations? Bring it on!". Thanks to alumni, friends, and supporters of the Department, we were able to endow this lecture series and will present this lecture on an annual basis.

G. Department-wide Grants

VIGRE by the Numbers

The Department of Applied Mathematics at the University of Colorado was awarded its VIGRE (Vertical Integration of Research and Education) grant by the National Science Foundation in 1998 and was among the first group of six departments to receive such an award. The grant actually began in the summer 1999, and continued through this past April. Thus it is with fond memories that we write this last report of our VIGRE experiences.
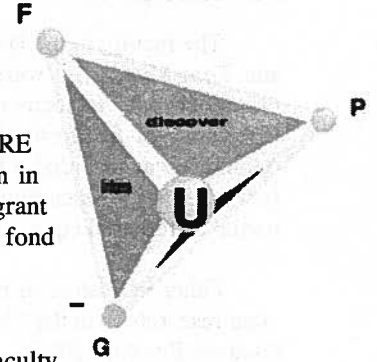
Our VIGRE program was organized around four *tetrahedral* research groups consisting of faculty, postdoctoral fellows, and graduate and undergraduate students in the areas of dynamical systems, multilevel computation, nonlinear waves, and fast algorithms. Over its seven years, VIGRE supported 11 postdoctoral fellows, 36 graduate students, and 53 undergraduate researchers. Virtually every faculty member in the Department (16), as well as two of its affiliated faculty, served as mentors for the VIGRE supported fellows. Apart from their participation in the tetrahedra, six of the postdoctoral fellows served as mentors for undergraduates in individual or group research projects as did a number of graduate students. Indeed, a number of postdocs and graduate students who did not receive VIGRE support participated as mentors and through the teaching, learning, informing, and of course the discovery aspects of VIGRE.

2005-2006 VIGRE Fellows		
Postdoctoral Fellows	**Graduate Students**	**Undergraduates**
Jamison Moeser	Cory Ahrens	Brandon Booth
Michael Sprague	Maribeth Oscamou	Rachel Danson
	Erin Byrne	Tom Josephson
	Dan Cooley	Pascal Getreuer
	Terry Haut	Brad Klingenberg
	Mark Hoefer	Kye Taylor
	Ben Jamroz	Kris Tucker
	Chris Kurcz	
	Josh Nolting	
	Geoffrey Sanders	
	Brendan Sheehan	
	Mike Watson	

Eight of the VIGRE supported postdoctoral fellows have tenured or tenure track faculty positions, one is working in industry, one in a federally supported research laboratory, and one as a postdoctoral fellow. A number of the postdoctoral fellows have noted that their VIGRE experience was decisive in shaping their career choice—for example to teach at an undergraduate institution or to move from academics to industry.

Eighteen of the graduate students supported by VIGRE have received PhD's. Of these, three are currently assistant professors, and the remainder have postdoctoral or instructor positions. Twelve of the students are continuing their studies and making progress towards are PhD, while six students earned an MS degree and left for positions in industry or are teaching mathematics at the college level. So, of the students who have graduated, 75% attained the PhD, and we have every expectation that the remaining six students will raise that graduation rate to 83%.

The original plan for VIGRE was to support one to two undergraduates working in each tetrahedral group. These research positions were viewed as highly desirable by our undergraduates and the program was expanded, supporting on average nine students each semester, with a peak of twelve. By any measure, our undergraduates are remarkable and the VIGRE supported students corroborate this. Twenty have gone on to graduate school in the mathematical sciences, and fourteen have positions in industry. One student has taken time off to explore his Olympic bicycle career. Nine students are continuing at CU Boulder, expecting their BS or BS/MS degrees in the next few years. We have lost track of a few students (though we hope they will respond to our request for information in our newsletter), and several are just graduating with job offers not yet accepted. So, if one goal of VIGRE was to increase the number of students in graduate programs, at least 45% of our students have gone on in this direction.

Anecdotally, many of these students cited their VIGRE research experience as key in their decision to seek an advanced degree. The success of the undergraduate component of VIGRE has lead to the NSF awarding the department an MCTP grant that will soon begin.

VIGRE has had a remarkable multiplier effect throughout the department. For example, the structure of many seminars has changed from the traditional hour of formal lectures to interactive sessions during which students, postdoctoral researchers, and faculty interact and discuss their research in both formal and informal ways. Under VIGRE new research seminars have formed and will continue. The tetrahedral model certainly will endure. Moreover a number of other Universities and Departments at CU have adopted our model in their programs and grant proposals, and several other grants in which the department is involved owe their structure and success to the VIGRE model.

U   P

F   Inform

G

Thus, while VIGRE is now formally over, we can only say, "Long live VIGRE!"
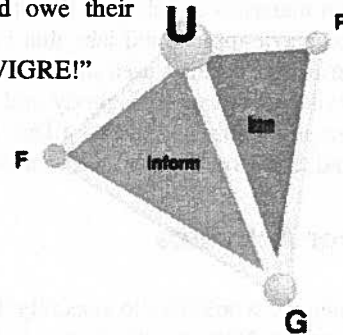
H. Outreach

Outreach activities help to share the knowledge and enthusiasm of a department with others. The outreach efforts of the Department are an extension of its mission to provide education and training in applied mathematics. These efforts are focused in two areas: (1) professional development for secondary math teachers; and (2) mathematical encouragement and enrichment for high school students.

The summer of 2006 marks the seventh summer in which the Department of Applied Mathematics has offered content-based, professional development workshops for secondary mathematics teachers. These workshops are designed to offer a balance between in-depth review and technology-based activities that participants can take back to their classrooms. This year, we offered one workshop in calculus, which was supported by the CU-Boulder Outreach Committee.

In addition, in March 2006, Applied Math began a three-year collaboration with Boulder Valley School District (BVSD), CU's School of Education, and the Freudenthal Institute. This collaboration is called the Boulder Partnership for Excellence in Mathematics Education and is funded by a grant from the Colorado Department of Education. The goals of this project include significant improvement in mathematical achievement among low-income and minority population groups in grades 6-8. The project involves two-week summer workshops and monthly half-day training sessions for participating middle school math teachers in BVSD. We hope this project will form the foundation for additional collaborations with area school districts. Mary Nelson and Anne Dougherty will lead the effort from our Department.

Applied Mathematics also participates in a number of programs targeted towards high school students. The purpose of these programs is to encourage students to continue their study of mathematics. Each of the following programs was designed to give students some understanding of, and appreciation for, a specific mathematical application:

- College of Engineering's High School Honors Institute; July 25-27, 2005. Presenters included undergraduate students Nate Balk and Brandon Booth, graduate students James Adler and Jason Sherman, visiting faculty Ben Herbst, and Applied Math faculty Anne Dougherty and Adam Norris.

- Engineering Open House, October 29, 2005. Presenters were Anne Dougherty and Adam Norris, and undergraduate Brad Klingenberg.

- Explore Engineering for Admitted Students, March 18, 2006. Presenters were Anne Dougherty, Adam Norris.

Additionally, in 2005-2006, Applied Math provided support for the Colorado ARML (American Regions Math League) team, a math club for area high school students interested in advanced math topics. The team participated in the ARML competition in Las Vegas in June 2006 and took first place in the B division. Next year, the Colorado ARML group will continue and expand with additional support from Applied Math and the CU-Outreach Committee.

In 2002, the University of Colorado/Boulder and Dillard University (an historically black university in New Orleans) established a formal partnership, funded by the Carnegie Foundation. The PI on the Boulder campus is Associate Vice Chancellor Bobby Schnabel. The goal of this project is to develop and utilize a model that will improve collaboration between diverse, dissimilar institutions. This involves developing technologically-based, shared curriculum materials in calculus, literature and humanities. In Applied Math, these materials have taken the form of web-based, Java applets and labs that help students understand some of the more difficult concepts in Calculus 2. The materials, now being used in CU Boulder's APPM classrooms, were developed by students at CU Boulder under the supervision of Anne Dougherty and Jim Curry and by programmers at Dillard, working with Dillard professors Peter Frempong-Miraku and Hong Dai. Due to the devastation caused by Hurricane Katrina, collaboration has been put on hold, however further collaboration will hopefully resume once Dillard has recovered.

I. Donor Activities

Again, we would like to sincerely thank all donors for their continuing contributions and support for activities in the department. Very special thanks to Dr. Dave Eberly for generously supporting the Faculty Lecture Series and helping it achieve endowment level. Special thanks to Mr. Peter Teets and family for their generous support of the newly initiated Undergraduate Applied Mathematics Scholars Program. A goal is to get that scholarship fund to endowment level in the next 4 years. And a very special thanks to Mr. Jack Woodhull for his continuing support of the department's activities through the College of Engineering and Applied Sciences' J.R. Woodhull/Logicon Teaching Professorship of Applied Mathematics.

J. Changes in Personnel

We are pleased to welcome two new faculty members in August, 2006. Dr. David Bortz, from the University of Michigan, will join us as an assistant professor. David's area of expertise is in applied math with application to biological and medical sciences. Dr. Anca Radulescu, formerly an assistant professor at SUNY Brooklyn College, will join us as instructor with areas of expertise in dynamical systems and biomathematics. Welcome to both of them!

2. FACULTY, INSTRUCTORS, RESEARCH ASSOCIATES, VISITORS, and STAFF

A. Core Faculty, Instructors, and Research Associates

Mark J. Ablowitz, College of Arts and Sciences Professor of Distinction; PhD, Massachusetts Institute of Technology. Partial Differential Equations, Solitons, Nonlinear Waves.

Jerrold Bebernes, Professor Emeritus; PhD, University of Nebraska. Differential Equations, Reaction Diffusion Systems, Combustion Theory, Analysis.

Meredith Betterton, Assistant Professor; PhD, Harvard University. Mathematical Biology, Geophysical Modeling, Physical Mathematics. (transferred to Physics January, 2006).

Gregory Beylkin, Professor; PhD, New York University. Computational Methods, Wavelets, Geophysical Inverse Scattering.

Cathy Bishop, Lecturer; (Spring, 2006); M.S., University of Colorado, Computer Science, Software Development and Training.

Marian Brezina, Postdoctoral Research Associate; PhD, University of Colorado at Denver. Multigrid Methods, Scalable Algorithms, Parallel Computing.

Jem Corcoran, Associate Professor; PhD, Colorado State University. Applied Stochastic Processes, Perfect Simulation, Statistical Physics.

James H. Curry, Chair, Professor, and J. R. Woodhull Logicon Teaching Professor of Applied Mathematics; PhD, University of California at Berkeley. Dynamical Systems, Numerical Methods, Nonlinear Equations.

Andrew Docherty, Lecturer; PhD, University of New South Wales, Australia, Timing Shifts of Pulses in Long-Haul Optical Communications Systems with Strong Dispersion Management.

Anne Dougherty, Associate Chair & Senior Instructor; PhD; University of Wisconsin, Madison. Applied Probability, Stochastic Processes.

Robert Easton, Professor Emeritus; PhD, University of Wisconsin. Dynamical Systems, Hamiltonian Mechanics.

Bengt Fornberg, Professor; PhD, Uppsala University, Sweden. Numerical Analysis, Computations of Wave Phenomena.

Susan Hallowell, Lecturer, PhD, University of Pennsylvania, Transportation and Telecommunications Operations and Service Design, Network Optimization.

Berend Herbst, Visiting Professor/Lecturer, University of Stellenbosch, South Africa, Mathematical and Computational Analysis of Nonlinear Waves.

Keith Julien, Associate Professor; PhD, Cambridge University, U.K. Mathematical and Computational Fluid Dynamics, Dynamical Systems Theory.

Eunjung Lee, Postdoctoral Research Associate; PhD University of Colorado at Boulder. Numerical field theory, Fast Numerical Algorithms.

Congming Li, Associate Professor; PhD, New York University. Elliptic Partial Differential Equations.

Manuel Lladser, Assistant Professor, PhD, The Ohio State University. Probability Theory.

Jeffrey T. Luftig, W. Edwards Deming Professor of Management, Lockheed Martin Engineering Management Program, and Dept. of Applied Mathematics Adjunct Professor; PhD, University of Minnesota, Minneapolis/St. Paul. Applied Statistics, Business and Industrial Research, Statistical Methods in the Quality Sciences, Data Mining.

Thomas Manteuffel, Professor; PhD, University of Illinois, Urbana. Computational Math, Numerical Linear Algebra, Iterative Mathematics, Numerical Solution of PDE's, Parallel Computation, Computational Fluid Dynamics.

Per-Gunnar Martinsson, Assistant Professor; PhD, University of Texas at Austin. Numerical Analysis, Modelling of Heterogeneous Media, Computational Biochemistry.

Stephen McCormick, Professor; PhD, University of Southern California. Computational Math, Numerical Partial Differential Equations, Multigrid Methods, Parallel Computation, Computational Fluids, Tomography, Electromagnetics. Biomathematics.

James D. Meiss, Professor; PhD, University of California at Berkeley. Dynamical Systems, Hamiltonian Mechanics, Plasma Physics.

Lucas Monzón, Postdoctoral Research Associate; PhD, Yale University. Harmonic Analysis, Wavelets.

Paul Mullowney, Lecturer; PhD, University of Colorado at Boulder, Dynamical Systems, Stochastic Models in Neuroscience.

Philippe Naveau, Adjunct Assistant Professor; PhD, Colorado State University. Applied Probability and Statistics.

Mary Nelson, Instructor; PhD, University of Colorado at Bouler, Assessment.

J. Adam Norris, Instructor; PhD, University of Colorado, Boulder. Phase Change Kinetics, Perturbation Methods, Numerical Methods.

Fernando Perez, Postdoctoral Research Associate; PhD, University of Colorado at Boulder. Numerical field theory, Fast Numerical Algorithms.

John Prentice, Lecturer; PhD, University of New Mexico. Stochastic protein folding, Cardiac biophysics, Shock waves in condensed matter, Exploration geophysics, Entrepreneurship.

John Ruge, Postdoctoral Research Associate; PhD, Colorado State University. Algebraic Multigrid Methods.

Kristian Sandberg, Postdoctoral Research Associate; Ph.D., Dept. of Applied Math, CU at Boulder. Wave propagation, tomography, image processing.

Harvey Segur, Professor; PhD, University of California at Berkeley. Nonlinear Waves, Fluid Dynamics, Asymptotic Methods.

Matthew Tearle, Lecturer; PhD, University of Colorado at Boulder. Hydrodynamic Stability Theory, Computational Fluid Dynamics.

Stephen Thomas, Lecturer; PhD, University of Montreal. Numerical Methods, Geophysical Fluid Dynamics.

John Williamson, Professor Emeritus; PhD, University of Minnesota. Statistical Methods in Genetics, Applied Probability, Mathematical Statistics.

B. Affiliated Faculty--Graduate Department

Steve C. Arendt (Colorado Research Associates), Theoretical Fluid Dynamics.

Mark Balas (Aerospace Engineering, Electrical Engineering), Control of large-scale and distributed parameter systems, system identification and adaptive control, Nonlinear PDE's, Numerical Methods for model reduction, controller synthesis and stability analysis.

Elizabeth Bradley (Computer Science), Scientific Computation, Artificial Intelligence, Nonlinear Dynamics.

Richard Byrd (Computer Science), Numerical Computation, Optimization Algorithms.

Xiao-Chuan Cai, (Computer Science), Numerical and Parallel Computations.

John Cary (Physics), Nonlinear Dynamics, Plasma Physics, Accelerator and Space Physics.

Claudio Cioffi-Revilla, (Political Science), Long-Range Analysis of War.

Senarath deAlwis (Physics), Theoretical Physics, String Theory, Quantum Gravity.

Thomas DeGrand (Physics), Numerical Methods for Quantum Field Theory.

Fred Glover (Graduate School of Business), Large-scale Systems, Applied Artificial Intelligence, Optimization Models.

Martin Goldman (Physics), Plasma Physics, Nonlinear Waves, Turbulence.

Vijay Gupta (Geological Sciences; CIRES), Hydrology, Stochastic Processes, Fluid Dynamics.

Weiqing Han (Atmosheric and Oceanic Sciences), Dynamics of the Tropical Ocean Circulation, Coupled Ocean-Atmospheric Dynamics, Process Studies, Numerical Modeling.

Ute Christina Herzfeld (INSTAAR, Geomathematics), Geostatistical Analysis of Remote Sensing Data, Applications in Glaciology, Marine Geophysics and Global Change Research.

Christine M. Hrenya (Chemical Engineering), Gas-Particle Fluidization, Granular Flow Mechanics, Turbulent Flows, Computational Fluid Mechanics.

Tissa Illangasekare (Environmental Science and Engineering Division, Colorado School of Mines), Mathematical Modeling of Flow and Transport in Porous and Fractured Media, Computational Methods, Numerical Modeling.

Elizabeth Jessup (Computer Science), Numerical Computation, Parallel Computation.

Lakshmi Kantha (Aerospace Engineering, CCAR, ATOC), Numerical Models of the Oceans and Related Physical Processes.

David Kassoy (Mechanical Engineering), Fluid Dynamics, Combustion Theory, Thermal Science.

Manual Laguna (College of Business), Exact and Heuristic Methods for Combinatorial Optimization Problems, Network Flow Programming, Applied Artificial Intelligence.

Michael Lightner (Electrical Engineering), VLSI, Discrete Mathematics, Graph Theory.

Oliver McBryan (Computer Science), Parallel Computation, Graphics and Visualization, Computational Fluid Dynamics.

Andrew Moore (Atmospheric and Oceanic Sciences; CIRES), Ocean-Atmosphere Modeling.

Kamran Mohseni (Aerospace Engineering), Physical Applied Math, Computational Fluid Mechanics.

Douglas Nychka (National Center for Atmospheric Research), Geophysical Statistics.

Lev Ostrovsky (CIRES/NOAA Environmental Technology Laboratory), Nonlinear Waves, Fluid Dynamics, Oceanography, Acoustics.

K.C. Park (Aerospace Engineering) Parallel computation, Structural vibrations.

Scott Parker (Physics), Plasma Physics.

Carl Patton (Physics, Colorado State University), Solid State Physics.

Annick Pouquet (National Center Atmospheric Research), Physical Applied Math, Weather Prediction Models.

Harihar Rajaram (Civil, Environmental and Architectural Engineering), Fluid Flow, Transport Phenomena and Reactive Processes in Geologic/Geochemical Phenomena.

Barbara Robles (Economics), Econometrics and Monetary Theory and Policy.

Thomas F. Rutherford (Economics), Formulation and Analysis of Large-Scale Economic Equilibrium Models.

Robert Sani (Chemical Engineering), Computational Fluid Dynamics, Free and Moving Boundary Problems, Stability of Systems.

Robert Schnabel (Computer Science – Associate Vice Chancellor for Academic and Campus Technology), Numer. Methods for Optimization, Nonlinear Equations, Parallel Scientific Computation.

J. Michael Shull (Astrophysical and Planetary Sciences), Theoretical Astrophysics.

Rex Skodj (Chemistry and Biochemistry; Joint Institute for Laboratory Astrophysics), Nonlinear Dynamics, Quantum Chaos, Molecular Dynamics.

Renjeng Su (Electrical Engineering), Nonlinear Dynamics Modeling, Control, Robotics.

Juri Toomre (Astrophysical and Planetary Sciences; Joint Institute for Laboratory Astrophysics), Astrophysics, Mathematical Modeling, Numerical Simulation.

Henry Tufo (Computer Science) Computational science, parallel algorithms for high performance computers

Oleg Vasilyev (Mechanical Engineering), Computational Fluid Mechanics, Large Eddy Simulations of Turbulent Flow, Wavelet Methods for Modeling and Simulation of Complex Multi-Scale Phenomena, Thermal Convection Flows.

Thomas Warner (Atmospheric and Oceanic Sciences) Numerical modeling of mesoscal atmospheric phenomena; Marine meteorology.

Patrick Weidman (Mechanical Engineering), Hydrodynamic stability, solitary waves and their interaction, counterrotating vortex rings, Stokes flow on dendrite models, similarity flows in natural convection, fluid sloshing in freely suspended containers.

Jeffrey B. Weiss (Astrophysical and Planetary Sciences; Atmospheric and Oceanic Sciences), Geophysical Fluid Mechanics, Turbulence, and Climate predictability.

Joseph Werne (Colorado Research Associates), Fluid dynamics.

Ellen Zweibel (Astrophysical and Planetary Sciences), Plasma Physics, Astrophysics.

C. Visitors, 2005-2006

Antar, Nalan, Istanbul Technical University, June 1 – September 15, 2005.

Bakirtas, Ilkay, Istanbul Technical University, June 1 – September 15, 2005.

Bochev, Pavel, Sandia National Laboratories, NM, February 9 - 12, 2006.

Chakravarty, Sarbarish, CU Colorado Springs, January - June, 2006.

DeLillo, Silvana, Universita de Perugia, April 5 - 23, 2006.

Donoho, David, Stanford University, Professor of Statistics, March 10-11, 2006. The Inaugural Lecture of the Endowed Faculty Lecture Series.

Dullin, Holger, Loughborough University, UK, August 2 - September 12, 2005, December 14 - January 23, March 28- April 12, 2006.

Ecke, Robert, Los Alamos National Lab, May 5, 2006.

Elcrat, Alan, Wichita State University, April 20-21, 2006.

Gonchenko, Vladimir, University of Nizhny Novgorod, Russia, May 26 - Jume 6, 2006.

Herbst, Ben, University of Stellenbosch, South Africa, June 1 – December 31, 2005, June - July, 2006.

Hou, Tom, California Institute of Technology, July 27 - 31, 2005.

Ilan, Boaz, University of California, Merced, October 22 - 27, 2005.

Jegat, Cyrille, Ecole des Mines de Paris, June 20 – September 10, 2005.

Kim, Sang Dong, Kyungpook National University, South Korea, August 1-31, December 27 – February 26, 2006.

Knobloch, Edgar, University of Leeds, UK, June, 2006.

Kutz, J. Nathan, University of Washington, June 19, 2006.

Lee, Chang Ock, Computational Mathematics Lab. Division of Applied Mathematics, KAIST, February 16-17, 2006.

MacKay, Robert, University of Warwick, England, October 26 - 28, 2005.

Mahmoud, Hasam, George Washington University, April 19 - 22, 2006.

Maier, Robert, University of Arizona, January – August, 2005.

Naveau, Philippe, Laboratoire des Sciences du Climat et l'Environnement (LSCE), France, October 4-31, 2005, March 1-14, 2006.

Oh, Hee-Seok, University of Alberta, Edmonton, Canada, July 1-31, 2005.

Percival, Ian, Department of Physics, Queen Mary, University of London, June, 2006.

Prinari, Barbara, Universite de Lecce, Italy, May 27 – August 1, 2005, October 7 - November 2, 2005, January 15 - February 23, 2006.

Shin, Byeong-Chun, Dept of Mathematics, Chonnam National University, Gwanju, South Korea, 7/2/05 - 8/20/06.

Sprague, Michael, University of California, Merced, June, 2006.

Swift, Randy, CA State Polytechnic Univ. Pomona, November 10 - 12, 2005.

Villarroel, Javier, Universidad do Salamanca, Spain, September 19 - October 10, 2005.

Xu Jinchao, The Pennsylvania State University, February 13 - 15, 2006.

D. Staff

Marcia Flynt, Office Manager.

Karen Hawley, Student Coordinator.

Jan Kaufman, Office Coordinator.

Jennifer Qualteri, Accounting Technician/Faculty Coordinator.

Salomee Fisher and Salina Salazar, part-time student assistants.

3. WEEKLY COLLOQUIA AND SEMINARS 2005-2006

A. Applied Mathematics Colloquium, 2005-2006

Our Applied Mathematics Colloquium series continues to be held on Friday afternoons during the academic year at 3:00 p.m., with refreshments preceding at 2:30 PM outside the APPM conference room, ECOT 226. A special thank you to Bengt Fornberg for chairing and organizing the Colloquium Series this past year. Bengt will continue in the same capacity next year.

Holger Dullin, Loughborough University, UK, September 2, 2005, "Topology of Integrable Hamiltonian Systems".

Ben Herbst, Univ. of Stellenbosch, South Africa, September 9, 2005, "3D Reconstructions from 2D Images".

Roger Billham, CU Geology, September 16, 2005, "Unprecedented Massive earthquakes in the Himalaya driven by Elastic Strain stored within the Tibetan Plateau?"

Cecile Penland, NOAA-CIRES, September 23, 2005, "A Stochastic View of El Nino".

Simon Tavener, CSU, September 30, 2005, "Numerical bifurcation using time steppers".

Todd Murphey, CU Boulder, ECE, October 7, 2005, "Geometric Methods in Modeling and Control of Friction-Dominated Mechanical Systems".

John Prentice, Colorado Physics Consultants, CU Applied Math, October 21, 2005, "Multicanonical Statistical Mechanics Applied to the Protein Folding Problem".

Robert MacKay, University of Warwick, England, October 28, 2005, "A uniformly chaotic mechanical system: the triple linkage".

Randall J. Swift, CA State Polytechnic Univ. Pomona, November 4, 2005, "Population Processes".

Steve Sain, CU Denver, Mathematics, November 11, 2005, Models for Multivariate Spatial Lattice Data and Assessing Climate Change".

Bill Briggs, CU Denver, Mathematics, November 18, 2005, "Inside the DFT (Discrete Fourier Transform)".

Jeffrey Forbes, CU Boulder, ASEN, December 2, 2005, "Solar Semidiurnal Tide in the Dusty Atmosphere of Mars".

Mevin Hooten, Univ. of Missouri - Columbia, Dept. of Statistics, January 20, 2006, "Non-linear process specifications in hierarchical spatio-temporal models".

Jing Wang, Michigan State Univ., Dept. of Stat. & Prob., January 27, 2006, "Spline-backfitted kernel smoothing of additive regression model".

Steve Shkoller, UC Davis, Dept. of Mathematics, February 3, 2006, "Well-posedness of the free-surface incompressible Euler equations with or without surface tension".

Pavel Bochev, Sandia National Laboratory, February 10, 2006, "Mimetic discrete models with weak material laws, or least squares principles revisited".

David Bortz, University of Michigan, Dept. of Mathematics, February 17, 2006, "Klebsiella pneumoniae flocculation dynamics".

Piotr Smolarkiewicz, NCAR, February 24, 2006, "Numerical simulation of geophysical turbulence".

Barbara Bailey, CU Denver, Dept. of Mathematics, March 3, 2006, "Quantifying the predictability of noisy nonlinear biogeochemical systems (slides for presentation)".

David Donoho, First speaker in APPM Faculty Lecture Series, Stanford University, Dept. of Statistics, March 10, 2006, "More Unknowns than Equations? Bring it on!".

Mark Ablowitz, University of Colorado, Dept. of Applied Math, March 17, 2006, "What you always wanted to know about solitons...".

Jeesun Jung, University of Pittsburgh, Dept. of Human Genetics, March 23, 2006, "Gene-dropping vs. empirical variance estimation: A comparative study of standardization methods for allele-sharing statistics".

Steve Thomas, NCAR and CU Applied Math, April 7, 2006, Integration factor splitting for the Euler equations".

Lakhsmi Kantha, University of Colorado, Aerospace Engineering, April 14, 2006, "Variability in oceanic circulation as seen in numerical hindcasts".

Hosam Mahmoud, George Washington University, Department of Statistics, April 21, 2006, "Polya process and applications".

Mark Rast, University of Colorado, LASP, April 28, 2006, "Lagrangian statistics in point vortex flows".

Robert Ecke, Los Alamos Natl. Lab., Center for Nonlinear Studies, May 5, 2006, "Exciting frontiers in fluid turbulence".

B. Seminars in Applied Mathematics (Nonlinear Waves Seminar), 2005-2006

The Department maintained the Applied Mathematics Seminar, a weekly seminar series at 4:00 p.m. on Tuesday afternoons. A list of visiting speakers and the titles of their talks follows:

Ethan Schonbrun, Electrical Engineering, C.U. Boulder, September 13, 2005, "Holographic Generation of Crystalline Optical Potentials".

Javier Villarroel, Fac. de Ciencias, Universidad de Salamanca, September 27, 2005, " Linear Integral Equations and Solutions of the Kadomtsev-Petviashili II Equation".

Barbara Prinari, Dipartimento di Fisica and Sezione INFN, Università di Lecce, October 11, 2005, " Inverse Scattering Transform for the Vector Nonlinear Schrodinger Equation with Non-Vanishing Boundary Conditions".

Douglas Baldwin, Applied Mathematics. C.U. Boulder, October 18, 2005, "An Introduction to Painleve Analysis".

Douglas Baldwin, Applied Mathematics, C.U. Boulder, October 25, 2005, " Symbolic Software for the Painleve Test".

Cory Ahrens, Applied Mathematics, C.U. Boulder, November 1, 2005, "Introduction to the Concentration-Compactness Principle as Applied to Nonlinear Wave Equations, Part 1".

Cory Ahrens, Applied Mathematics, C.U. Boulder, November 8, 2005, " Introduction to the Concentration-Compactness Principle as Applied to Nonlinear Wave Equations, Part 2".

Cory Ahrens, Applied Mathematics, C.U. Boulder, November 15, 2005, " Introduction to the Concentration-Compactness Principle as Applied to Nonlinear Wave Equations, Part 3".

Boaz Ilan, School of Natural Sciences, University of California, Merced, November 22, 2005, "Noise-Induced Linewidth in Frequency Combs".

Lev A. Ostrovsky, Zel Technologies/University of Colorado, January 31, 2006, " Wave Propagation and Interaction in Media with Hysteresis".

Cory Ahrens, Applied Mathematics, C.U. Boulder, February 7, 2006, "Introduction to the Concentration-Compactness Principle as Applied to Nonlinear Wave Equations, Pt. 4".

Mark Hoefer, Applied Mathematics, C.U. Boulder, February 14, 2006, "Dispersive and Classical Shock Waves I".

Mark Hoefer, Applied Mathematics, C.U. Boulder, February 21, 2006, "Dispersive and Classical Shock Waves II".

Mark Hoefer, Applied Mathematics, C.U. Boulder, March 1, 2006, "Interactions of Dispersive Shock Waves".

Jennifer Mueller, Department of Mathematics, Colorado State University, March 7, 2006, "Inverse Schrodinger Scattering in R^2 for Conductivity-type Potentials".

Sarbarish Chakravarty, Department of Mathematics, C.U. Colorado Springs, March 15, 2006, "Line-soliton solutions of the Kadomtsev-Petviashvili II equation (Part I)".

Yuji Kodama, Department of Mathematics, Ohio State University, March 21, 2006, "Geometry of Water Waves".

Piotr Grinevich, L. D. Landau Institute for Theoretical Physics, Moscow State University, April 11, 2006, "An integrable at one energy discretization of the 2-D Schrodinger operator and discrete Novikov-Veselov equations".

Silvana Delillo, Department of Physics, University of Perugia, April 18, 2006, "A Cauchy Problem in Nonlinear Heat Conduction ".

Andrew Docherty, Applied Mathematics, C.U. Boulder, May 2, 2006, "A demonstration of a new numerical method for calculating localized traveling modes of nonlinear wave equations".

Sarbarish Chakravarty, Department of Mathematics, C.U. Colorado Springs, May 16, 2006, "Line-soliton solutions of the Kadomtsev-Petviashvili II equation (Part II)".

Theodoros P. Horikis, Northwestern University, June 15, 2006, "Modeling of Modern Lightwave Systems".

C. Seminar in Computational Mathematics, 2005-2006

Most of the meetings this year consisted of general discussion on Tuesdays from 10 to 11:30 am surrounded by special research meetings. However, we continued to have an occasional lecture as shown below. All meetings were held at 1320 Grandview--on the northwest corner of campus near University and Broadway.

Ben Herbst, University of Stellenboch, South Africa, September 13, 2005, "Kalman filters and 3D reconstruction from video streams".

Per-Gunnar Martinsson, CU Applied Math, September 20, 2005, "The fast multipole method".

Karin Hunter, University of Stennenboch, South Africa, November 8, 2005, "An alternative convergence proof for a class of interpolatory subdivision schemes".

James Brannick, CU Applied Math, November 15, 2005, "Adaptive algebraic multigrid coarsening strategies".

Hari Rajaram, CU Civil Engineering, November 22, 2005, "Anisotropy of the aperture correlation structure and effective transmissivity in fractures generated by sliding between self-affine surfaces".

Oren Livne, University of Utah, November 28, 2006, "Multilevel Evaluation of Radial Basis Function Expansions".

Jinchoa Xu, Penn State University, February 14, 2006, "Multilevel Subspace Correction Methods for Large Scale Algebraic Systems".

Ludmil Zikatanov, Penn State, April 18, 2006, "On the convergence of multilevel methods for Elliptic Problems".

D. Dynamical Systems Seminars, 2005-2006

The weekly Dynamical Systems Seminar is a research working group led by James Meiss, held on Thursday afternoons at 2:00. The following is a list of the speakers and the titles of their talks:

Holger Dullin, Loughborough University, September 8, 2005, "Semi-global symplectic invariants".

Mike Field, University of Houston, September 15, 2005, "Geometry, symmetry and bifurcation theory".

Rex Skodje, Chemistry and Biochemistry, CU Boulder, September 22, 2005, "Invariant Manifold Methods for Chemical Kinetic Equations".

Weiqing Han, PAOS, CU Boulder, September 29, 2005, "Equatorial wave dynamics and their role in affecting tropical climate".

Bob Easton, CU Boulder Applied Math, October 6, 2005, "Economic Games".

David Clarke, Chemistry and Biochemistry CU, October 20, 2005, "Modeling a Cellular Signaling Pathway: Adventures in Parameter Space".

Robert MacKay, University of Warwick, October 27, 2005, "Some robustly mixing fluid flows".

Glen Stewart, LASP, November 3, 2005, "Development of Rossby Wave Critical Layers in Protoplanetary Disks".

Jim Howard, CIPS, November 10, 2005, "A Family of Generalized Henon Maps with Strange Attractors".

Mike Watson, CU Applied Math, December 1, 2005, "Some Asymptotic and Experimental Results for a Rotating Differentially Heated Annulus".

Holger Dullin, Loughborough University, January 19, 2006, "From Molecules to Gymnasts: How to rotate without angular momentum".

David Simpson, CU Boulder Applied Math, January 26, 2006, "Slow Manifolds: What are they and how can they be computed".

Robert Krasny, Univ. of Michigan, February 2, 2006, "Lagrangian Particle Simulations for Vortex Sheets".

Alexandros Alexakis, NCAR, February 16, 2006, "On the stability of stratified shear flows".

Laura Miller, University of Utah, February 21, 2006, "The significance of intermediate Reynolds number flows to biological form and development".

Melvin Leok, University of Michigan, February 23, 2006, "Computational Geometric Mechanics and Geometric Optimal Control Theory".

Will Heuett, Physics, CU Boulder, March 16, 2006, "A Stochastic Model of Oscillatory Blood Testosterone".

Patrick Weidman, Mech. Eng., CU Boulder, April 13, 2006, "Sloshing in Suspended Containers".

John Crimaldi, Civil Eng., CU Boulder, April 20, 2006, "Stirring and Mixing of Reactive Scalars in the Context of Coral Spawning".

Ralph Milliff, Colorado Research Assoc., April 27, 2006, "Ocean and Atmosphere Signals of the Madden-Julian Oscillation".

Kamran Mohseni, Aerospace Eng., CU Boulder, May 4, 2006, "Lagrangian Coherent Structures".

Vladimir Gonchenko, Institute of Applied Mathematics and Cybernetics, Nizhny Novgorod University, June 1, 2006, "Symmetric heteroclinic tangency in two-dimensional reversible diffeomorphisms".

E. Joint Probability and Statistics Seminars, 2005-2006

These sessions were organized jointly with the Math Department, and were held on Wednesday afternoons at 3:30 pm. in Math 220.

Brian Rider, CU Boulder, Department of Mathematics, September 7, 2005, "Determinantal processes and random matrices".

Sergei Kuznetsov, CU Boulder, Department of Mathematics, September 21, 2005, "Super-Brownian Motion vs. Brownian Snake".

Manuel Lladser, CU Boulder, Department of Applied Mathematics, October 5, 2005, "Distribution of arrival patterns in compounded queues".

Michael Mahoney, Yale University, Department of Computer Science, Yahoo Research Labs, October 19 2005, "Fast Monte Carlo Algorithms for Matrix Operations and Massive Data Set Analysis".
Nicholas Nagle, CU Boulder, Department of Geography, November 2, 2005, "The Change of Support Problem and Variance Estimation for Spatially Aggregated Data".

Greg Morrow, Univ of Colo, Colorado Springs, Department of Mathematics, November 16, 2005, "Critical Percolation and the Distribution of Cut Points in SLE_6".

Rinaldo Schinazi, Univ of Colo, Colorado Springs, Department of Mathematics, November 30, 2005, "Mass extinctions: living in a big flock can be bad for you!".

Hosam Mahmoud, Department of Statistics, George Washington University, April 19, 2006, "Phase Changes in Subtree Varieties in Random Trees".

F. Undergraduate and Graduate Seminars, 2005-2006

SIAM Undergraduate Chapter/Undergraduate Seminars

The CU Boulder undergraduate chapter of SIAM was founded to promote interactions between Applied Math students and faculty. Society functions include technical presentations by students, faculty, and industry speakers, field trips and student/faculty social events---all designed to introduce undergraduates to the widespread use of applied mathematics in engineering and the sciences. All interested students, from any major, are encouraged to participate in SIAM-sponsored events.

President: Brad Klingenberg	UCEC Representative: Kye Taylor
Vice-President: Kris Tucker	Webmaster: Brandon Booth
Secretary/Treasurer: Lauren Anderson	
Public Relations: Rachel Danson	Faculty Advisor: Anne Dougherty

September 1, 2005, Welcome Back Picnic. A get-together for incoming students to meet returning students.

October 19, 2005, Grant Writing Seminar. A seminar directed toward undergraduates preparing NSF Graduate Fellowship applications.

October 25, 2005, Statistics, Economics and Finance in one Profession! A talk given by Rob Ridge and Ryan Cox from Mercer HR in Denver on the actuarial profession.

November 1, 2005, Scholarship Meeting. CU Top Scholarship Advisor Lori Goodman spoke about exciting scholarship opportunities for students studying mathematics and engineering.

November 3, 2005, Advising Luncheon.

February 2-6, 2006, Mathematical Contest in Modeling,

April 4, 2006, Advising Luncheon.

March 11, 2006, Front Range Applied Mathematics Student Reserach Conference - an all day event where students from six Front Range universities gave presentations on their research.

April 27, 2006, Modeling Contest Presentations. Each team that participated in the Mathematical Contest in Modeling gave a short presentation on their solution. SIAM officer election.

Graduate SIAM Chapter

The CU Boulder graduate chapter of SIAM was founded as an organization to meet the needs of graduate students interested in mathematics and its applications. Society functions include a graduate student seminar, given mainly by students, addressing topics of interest to grad students. All interested students, from any department, are encouraged to participate in SIAM-sponsored events.

2005-2006 SIAM Officers, Graduate Student Chapter:
Co-President: Erin Byrne   Co-President: Josh Nolting   Faculty Advisor: Tom Manteuffel

November 10, 2005, Brendan Sheehan, Transport Systems.

February 2, 2006, Geoff Sanders, How to Solve Ax=b Efficiently When A is Non-symmetric.

February 16, 2006, Cory Ahrens, multiple-scale asymptotics of a certain nonlinear Schroedinger equation and its relation to "light-bullets.

March 9, 2006, Josh Nolting, Local Adaptive Refinement.

Women in Math

This semester, Erin Byrne, Maribeth Oscamou, and Amanda Norton began a **Women in Math** group at CU. This is a joint group of undergraduates, graduates, and faculty from the Applied Math and Math Departments that meets once a month. This semester our meetings included a panel presentation by women professors in applied math and math, discussing their career paths and also research presentations by 4 female graduate students from both Departments.

The goals of the group include promoting women in mathematical research and providing a network between undergraduates, graduates, and faculty in both departments. In addition to their monthly meetings (which are open to all) they plan to incorporate K-12 outreach activities. They also plan on becoming a student chapter of the Association of Women in Mathematics and will formally elect officers this month.

4. FACULTY SERVICE TO THE UNIVERSITY, DEPARTMENT AND SOCIETIES, CALENDAR YEAR 2005

Mark Ablowitz:
APPM undergraduate committee, 2005.
APPM instructor search committtee, Fall 2005.
APPM anaysis search committee, Spring 2005.
Member of the Vice Chancellors Advisory Committee, 2005.
Coordinating Editor of Applied Mathematics: Procedings of American Math Society.
Editor: Studies in Applied Mathematics.
Editor: Dynamics of Partial Differential Equations.
Editor: Cambridge University Press: Texts in Applied Math series. Cambridge University Press is one of the leading mathematics publishers in the world.
Reviewer for NSF grants.
Reviewer for Hong Kong grants.
Reviewer for the following journals: Studies in Applied Mathematics, Optics Letters, Physical Review Letters Physical Review E., Procedings of the American Mathematics Society, Physica D.

Gregory Beylkin:
Consultant for GeoEnergy, Inc.
Consultant for Fast Mathematical Algorithms and Hardware, Corp.
Department Representative for Biotech Initiative Committee.
Member of the search committee.
Reviewed a proposal for the U.S.-Israel Binational Science Foundation.
Reviewed proposals for the NSF.
Member of the Advisory Editorial Board of Applied and Computational Harmonic Analysis.

Jem Corcoran:
Consulting: design of experiments advising for the Alpine Clinical Research Center, Boulder, CO.
Consulting: data analysis for Professor Robert Davies at the CU Health Sciences Center.
Co-organizer of departmental probability and statistics seminar series.
Member of graduate committee.
Member of a faculty (prob/stat) search committee.
Referee for the Journal of Applied Probabiity, and Journal of Statistical Computation and Simulation.

James Curry:
Chair for the Department of Applied Mathematics, July 1, 2003 to the present.
Member of Applied Math Department's search committees.
Serves as an Associate Editor of the Mathematical Association of America (MAA) monthly journal.
Serves as the J. R. Woodhull/Logicon Teaching Professor in Applied Mathematics.
Three-year term representing SIAM on the selection committee for the AMS Frank and Brennie Morgan Prize selection committee for Outstanding Research in Mathematics by an undergraduate student.
American Mathematical Society Committee on Exemplary Program of Achievement by a Mathematical Department Award Committee (2005 to 2007).
AMS Committee on the Profession-Charge: The Committee is to take a long range view of and provide major direction for Society activities on issues of a broad professional nature.
SIAM Education Committee.
Manage the Afro Americans in the Mathematical Science listserve.
Reviewed numerous NSF proposals related to the Math Science Partnership, STEM activities.

Anne Dougherty:
Associate Chair for Department of Applied Mathematics, July 1, 2000 to present.
Faculty advisor for the CU Boulder SIAM undergraduate chapter.
Probability and Statistics prelim committee member in the Department of Applied Mathematics.
Undergraduate committee chair in the Department of Applied Mathematics.
Member of probability and statistics faculty search committee, fall 2005.

Applied Math's representative to several College of Engineering programs: Explore Engineering for Admitted Students, March 12, 2005; Engineering Career Day for Women, March 12, 2005; Engineering Orientation August 17-18, 2005; Engineering Open House October 29, 2005.

Wrote an article on the Department of Applied Mathematics for CU Engineering, 2004 magazine.

Applied Math's representative to the Undergraduate Education Council and the Honors Subcommittee in the College of Engineering.

Organized and delivered, together with several undergraduate and graduate students (James Adler, Jason Sherman, Nate Balk, Brandon Booth), and faculty (Adam Norris and Ben Herbst) Applied Math's presentation for the College of Engineering's High School Honors Institute, July 25-27, 2005.

Member of Women in Engineering Program external review committee, November and December 2005.

Actuarial Studies and Quantitative Finance Certificate Program committee member.

CU campus representative for the Goldwater Scholarship. Four CU undergraduate students, majoring in science, math or engineering, are selected each year for the national competition. In spring 2005, three of the four nominated students (Ashley Moore, Amy Reppert, Kelsi Singer) received the Goldwater scholarship for the 2005-2006 academic year.

Online tutoring coordinator for the Department of Applied Mathematics.

Outreach activity: Summer Institute in Applied Mathematics. Organized three, 2-credit, two-week professional development classes for 22 high school teachers, June 20 - 30, 2005.

Outreach activity: APPM/BVSD Partnership. Organized a 6-week (15 contact hours) seminar for Boulder Valley School District (BVSD) middle and high school teachers of mathematics. The topic was "Incorporating mathematical software into algebra/precalc/calculus courses". It was taught by Adam Norris from Feb 8 through March 15, 2005.

Faculty coordinator for GEEN 1350 and GEEN 1360.

Faculty advisor for the Mathematical Contest in Modeling teams, February 3-7, 2005.

Bengt Fornberg:

Member of the Undergraduate Committee. Advisor for juniors (spring 2005).

Served on Primary Unit Evaluation Committees for a promotion case.

Member of two search committees (spring 2005: statistics, fall 2005: mathematical biology / dynamical systems).

Member of Department's ad hoc executive committee.

Chair of Colloquium Committee (fall 2005).

Faculty advisor for EEF (Engineering Excellence Fund), College of Engineering (spring 2005; then reached 2-year term limit).

Regularly reviewed proposals for NSF and its counterparts in some other countries. This includes Sweden (where he served on a panel for Swedish Research Council), Canada, South Africa, Singapore, and Hong Kong.

Refereed about 20 articles during the year for various journals.

Keith Julien:

PI and Coordinator of Itanium Computing Environment.

Graduate Committee.

Ad-hoc Computer & IT Committee.

Math/Bio and Dynamics search.

Arts & Science Committee.

Arts & Science Budget Committee.

Reviewer for 2 Journal of Fluid Dynamics, 1 Physics of Fluids.

Congming Li:

Hiring Committee.

Colloquium Committee, Spring 2005.

Editor of: Communication on Pure and Applied Analysis.

Adviser for Fairview High School Math club since 2004. For Peak to Peak High School 2001-2004. This is mainly a community service for outreach activities.

Manuel Lladser:

Spring 2005, Graduate Committee.

Spring 2005, assisted in Stat/Probability Search.

Spring and Fall 2005, Stat/Probability Prelimn Committee.

Spring 2005, assisted in Analysis Search.

Fall 2005, Ad-hoc Science Education Initiative Committee.

Referee of journal article: "The Random Bisection Problem, Traveling Waves, and the Distribution of the Height of Binary Search Trees", authors: B.Chauvin and M.Drmota. Submitted to Algorithmica special issue on Analysis of Algorithms.

Non-referee reviewer of journal article: "Twenty combinatorial examples of asymptotics derived from multivariate generating functions", authors: R.Pemantle and M.Wilson. Submitted to SIAM Review.

Recommendation letters for: professors, staff, graduate students, and undergraduate students.

Tom Manteuffel:

SIAM Publication Committee.

Consulting Activities - DOE, Office of Science, Advanced Sceintific Computing Advisory Committee. and Lawrence Livermore National Laboratory.

Spring 2005, Department Numerical Anaysis Prelim Committee.

Hiring Committee, Analysis.

Associate Chair for Graduate Studies.

Associate Editor: Electronic Transactions in Numerical Analysis, SIAM Journal on Numerical Analysis, and Multiscale Modelling and Simulation, SIAM Press.

Editorial Board: Numerical Linear Algebra and Applications and SIAM News.

Reviewed papers for Numerical Methods for Partial Differential Equations.

Reviewed proposals for DOE and NSF.

Reviewed papers for SIAM Journal on Scientific Computing, SIAM Journal on Numerical Analysis. Journal of Mathematical Analysis & Applications, Numerical Methods for Partial Differential Equations.

Program Committee: 12th Copper Mountain Conference on Multigrid Methods, Copper Mountain, CO April 3 - April 8, 2005.

Chair of the Review Panel, DOE ASCI Alliance Center, C-SAFE, University of Utah on October 3-4, 2005.

Per-Gunnar Martinsson:

Member of search committee for instructor position.

Reviewed the manuscript "A matrix-free two-grid preconditioner for solving boundary integral equations in electromagnetism" by B. Carpentieri for "Computing".

Reviewed the manuscript "Multilevel Evaluation of Multidimensional Integral Transforms with Asymptotically Smooth Kernels" by E.H. van Brummelen and C.H. Venner for "Journal of Computational Physics".

Reviewed the manuscript "Lattice Green's functions in analysis of non-linear defects" by S. Haq, A.B. Movchan, and G.J. Rodin for "ASME Journal of Applied Mechanics".

Reviewed the manuscript ""Efficient algorithm for edge cracked geometries" by Jonas Englund for "International Journal for Numerical Methods in Engineering".

Steve McCormick:

IMACS Conference Committee on CFD.

Member of 3-person SIAM/ACM Prize in Computational Science and Engineering Selection Committee.

Consultant for Lawrence Livermore National Lab.

Graduate Committee.

Associate Editor of the SIAM Journal Multiscale Modeling and Simulation.

Reviewed many proposals for NSF and DOE.

Reviewed many papers for SISC, SINUM, J. Comp. Physics, AMS Reviews, and Zentralblatt.

Organizing Committee, 12th Copper Mountain Conferece on Multigrid Methods, Copper Mountain, Colorado, April 2-7.

Editor, Multiscale Modeling and Simulation, SIAM Publications.

Chair, AMG and FOSLS Summits, Lake City, CO, September 12-19.

James Meiss:
"Symposium on Mixing in Fluid Flows," co-organized with I. Mezic, SIAM Dynamical Systems Meeting, Snowbird Utah, 5/05.
Preliminary Examination Committee, Jan and Aug., 2005 Wrote and graded the PDE preliminary exam for MS and Ph.D. students.
Member Undergraduate Committee.
Advisor for sophomore majors in Applied Mathematics.
Co-Chair Committee for 5th Year review of 5 Tenured Faculty in Applied Mathematics.
Math Department search committee member, Fall 2005.
Active member of the CU Connect "FACULTYTOOLKIT" group, evaluating the new web site.
Member Dean's Committee on Promotion and Tenure, 2004.
Center for Integrated Plasma Studies, Fellow.
Associate Editor for SIAM Journal on Applied Dynamical Systems.
Reviewer for Physica D, Nonlinearity, Physical Review Letters, Chaos (AIP Journal), Regular and Chaotic Dynamics, Dynamical Systems, Journal of Nonlinear Science, Journal of Marine Research.
Reviewer for Research proposal to Netherlands Organisation for Scientific Research
Reference Letters six former undergraduate students and two former PhD Students.
Letters of reference for two colleagues looking for jobs.

Mary Nelson:
Member of the Defense Agency Committee on Women in the Services (DACOWITS). We research issues important to military women and families and conduct focus groups at about 12 military installations throughout the United States and abroad. Based on our research, we advise the Secretary of Defense on these issues.
Consultant for ASA NSF grant through the School of Mines. We have created a concept inventory for the thermal sciences and I am testing the validity and reliability of the instrument.
Supervised Nathan Balk, BS/MS student, in the creation of concept questions to be used by Calculus I instructors as clicker questions.
Supervised the work of two students who are writing a book about the transformations taking place in the Applied Mathematics Department.
Support the Colorado STEM-TP effort; counseling prospective K-12 mathematics teachers and assisting in the transformation of classes in Applied Mathematics.
Reviewed two articles for the Journal of Engineering Education and one for Journal of Teacher Education.

Adam Norris:
Recruited and organized hired exam graders for APPM 1350, 1360, 2350, 2360 and 2380.
Arrange for the collection and distribution of special needs exams for all scheduled exams for APPM 1350, 1360, 2350, 2360 and 2380.
Arranged for the proctoring of the special needs exam room for APPM 1350, 1360, 2350, 2360 and 2380.
Fall 2005, Member of the APPM Undergraduate Committee.
Spring 2005, served on an ad hoc grade appeal committee.
During both the Spring and Fall 2005 semesters, was very involved with issues directly related to upholding the CU Honor Code.
During the Spring, Summer and Fall 2005 semesters, helped mentor and coordinate the activities of the APPM learning assistants. In several cases, worked on a one-to-one basis with the learning assistants.
Summer 2005, helped revise the 2005-2006 APPM Undergraduate Curriculum Guide.
Fall 2005, Faculty Advisor for Theta Tau (a professional engineering fraternity).
Fall 2005, Panel member on classroom and academic expectations of engineering freshman.
Summer 2005, High School Honors Institute, represented APPM by preparing presentations and activities illustrating the mathematical modeling of mechanical systems and bio-mechanical systems.
Fall 2005, Engineering Open House, represented APPM through presentations and activities illustrating the use of infinite series to solve real-world problems.

Harvey Segur:
Advisor for International Workshop on Tsunami and Nonlinear Waves, Calcutta, India, March 6-10, 2006.
Reviewer for Journal of Physics A (2 papers). Journal of Fluid Mechanics (5 papers), Journal of Compuational and Applied Mathematics, Physical Review Letters.

5. TEACHING ACTIVITIES

A. Courses Taught by Department Faculty, Academic Year 2005-2006

(i) Undergraduate Courses

APPM 1350	Carroll, Hallowell, Nelson, Norris, Calculus I for Engineers
APPM 1360	Ablowitz, Ahrens, Nelson, Norris, Calculus 2 for Engineers
APPM 2350	Norris, Tearle, Prentice, Calculus 3 for Engineers
APPM 2360	Docherty, Fornberg, Herbst, Hoefer, Julien, Thomas, Introduction to Linear Algebra & Differential Equation
APPM 2450	Baldwin, Loughry, Norgard, Sherman, Thompson, Calculus 3: Computer Lab
APPM 2460	Baldwin, Barker, Levy, Liu, Young, Differential Equations: Computer Lab
APPM 2750	Bishop, Java 2
APPM 3010	Meiss, An Introduction to Nonlinear Systems: Chaos
APPM 3050	Tearle, An Introduction to Symbolic and Numerical Computation
APPM 3310	Dougherty, Meiss, Matrix Methods and Applications
APPM 3570	Dougherty, Applied Probability
APPM 4120	Goodrich, Professor, Mathematics, Introduction to Operations Research
APPM 4350	Curry, Methods in Applied Mathematics: Fourier Series and Boundary Value Problems
APPM 4360	Fornberg, Methods in Applied Mathematics: Complex Variables and Applications
APPM 4380	Fornberg, Modeling in Applied Mathematics
APPM 4520	Corcoran, Kuznetsov, Professor, Mathematics, Introduction to Mathematical Statistics
APPM 4540	Corcoran, Introduction to Time Series
APPM 4560	Lladser, Introduction to Probability Models
APPM 4570	Lladser, Luftig, Statistical Methods
APPM 4580	Luftig, W. Edwards Deming Professor of Management, Statistical Applications: Software and Methods
APPM 4650	Clellland, Professor, Mathematics, Norris, Intermediate Numerical Analysis I
APPM 4660	Norris, Intermediate Numerical Analysis II
APPM 4950	Curry, Dougherty, Seminar in Applied Mathematics
GEEN 1340/1345	Nelson, Calculus I with Algebra

(ii) Graduate Courses

APPM 5120	Goodrich, Professor, Mathematics, Operations Research
APPM 5350	Curry, Methods in Applied Mathematics: Fourier Series and Boundary Value Problems
APPM 5360	Fornberg, Methods in Applied Mathematics: Complex Variables
APPM 5380	Fornberg, Modeling in Applied Mathematics
APPM 5440	Martinsson, Applied Analysis 1
APPM 5450	Martinsson, Applied Analysis 2
APPM 5460	Meiss, Methods in Applied Math, Dyn. Sys., Diff. Eq. and Chaos
APPM 5470	Li, Methods in Applied Mathematics: Partial Differential and Integral Equations
APPM 5520	Corcoran, Kuznetsov, Professor, Mathematics, Introduction to Mathematical Statistics
APPM 5540	Corcoran, Introduction to Time Series
APPM 5560	Lladser, Introduction to Probability Models
APPM 5570	Lladser, Luftig, Statistical Methods
APPM 5580	Luftig, W. Edwards Deming Professor of Management, Statistical Applications: Software and Methods
APPM 5600	Julien, Numerical Analysis 1
APPM 5610	Beylkin, Numerical Analysis 2
APPM 6610	Manteuffel, Numerical PDEs
APPM 7400	Beylkin, Corcoran, Dougherty. Thomas, Seminar—special topics
APPM 8000	Fornberg, Colloquium

APPM 8100	Ablowitz Seminar - Nonlinear Equations
APPM 8100	Meiss, Seminar - Dynamical Systems
APPM 8600	Manteuffel, McCormick - Seminar in Computational Mathematics

B. Summer Courses, 2006

APPM 1350	Byrne, Calculus I for Engineers
APPM 1360	Mullowney, Calculus II for Engineers
APPM 2350	Herbst, Tearle, Calculus III for Engineers
APPM 2360	Jamroz, Sherman, Intro. Linear Algebra and Differential Equations
APPM 2450	Young, Calculus III: Computer Lab
APPM 2460	Plakalovic, Differential Equations: Computer Lab
APPM 3310	Herbst, Matrix Methods
APPM 4650	Norris, Intermediate Numerical Analysis I
APPM 5040	Nelson, Norris, Calculus Applications for High School Teachers

6. Research Activities for Calendar Year 2005

A. Research Publications for Calendar Year 2005

Mark Ablowitz

Solvability of the direct and inverse problems for the nonlinear Schrdoinger equation, J Villarroel M.J. Ablowitz, and B. Prinari, Acta Applic. Math., 87 (2005) 240.

Dynamics of nonlinear and dispersion managed soltions, Q. Quraishi, S. Cundiff, B. Ilan and M.J. Ablowitz, Phys. Rev. Lett., 94, (2005), 243904.

Spectral renormalization method to compute nonlinear self-localized solutions to nonlinear systems, M. J. Ablowitz, Z. Musslimani, Opt.Lett., 30, (2005), 2140.

On a quasi integrable discrete Eckhaus equation, M.J. Ablowitz, C.D. Ahrens and S. DeLillo, J. Nonlinear Math. Phys., 30, (2005) 1.

Wave dynamics in optically modulated waveguide arrays, M.J. Ablowitz, K. Julien, Z. Musslimani and M. Weinstein, Phys. Rev. E, 71, (2005), 055602.

Periodic-group delay dispersion compensation reduces collision-induced timing shifts in dispersion managed quasi-linear systems, M.J. Ablowitz, C. Ahrens, G. Biondini, S. Chakravarty and A. Docherty, Theor. and Math Phys., 144, (2005). p. 881.

Calculation, characterization, and application of the time shift function in wavelength division multiplexed return to zero systems, O.V. Sinkin, V.S. Gregorian, J. Zweck, C.R. Menyuk, A. Docherty and M.J Ablowitz, Opt. Lett., 30, (2005). p. 2056.

Wave collapse in nonlocal nonlinear Schrodinger systems, M.J. Ablowitz, I. Bakirtas, and B. Ilan, Phys. D, 207, (2005), p. 230.

Asymptotic analysis of collision-induced timing shifts in return to zero quasi-linear systems with pre- and post-dispersion compensation, Cory D. Ahrens, Mark J. Ablowitz, Andrew Docherty, Oleg V. Sinkin, Vladimir Gregorian and Curtis R. Menyuk, Opt. Lett., 30, (2005). p. 2056.

Theory of magnetodynamics induced by spin torque in perpendicularly magnetized thin films, M. A. Hoefer, M.J. Ablowitz, B. Ilan, M.R. Pufall, and T.J. Silva, Phys. Rev. Lett., 95, (2005), 267206.

Invited article for encyclopedia: Nonlinear Wave Propagation, M.J. Ablowitz, Encyclopedia of Physics, Eds. R.G. Lerner and G.L. Trigg, Wiley-VCH, Berlin, Germany (2005).

Gregory Beylkin

G. Beylkin and M. J. Mohlenkamp, Algorithms for numerical analysis in high dimensions, SIAM J. Sci. Comput., 26 (6) (2005) 2133-2159.

G. Beylkin and K. Sandberg, Wave propagation using bases for bandlimited functions, Wave Motion 41 (3) (2005) 263-291.

G. Beylkin and L. Monzon, On approximation of functions by exponential sums, Applied and Computational Harmonic Analysis, 19 (2005) 17-48.

F. Andersson and G. Beylkin, The fast Gauss transform with complex parameters, J. Comput. Phys. 203 (2005) 274-286.

Jem Corcoran

J.N. Corcoran and U. Schneider. Pseudo-Perfect and Adaptive Variants of the Metropolis-Hasting Algorithm with an Independent Candidate Density. Journal of Statistical Computation and Simulation, 2005, 75 (6) 459- 475.

Bengt Fornberg

N. Flyer, B. Fornberg, S. Thomas and B.C. Low, Magnetic field confinement in the solar corona. II. Field-plasma interaction, The Astrophysics Journal 631 (2005), 1239-1259.

E. Larsson and B. Fornberg, Theoretical and computational aspects of multivariate interpolation with increasingly flat radial basis functions, Computers and Mathematics with Applications, 49 (2005), 103-130.

B. Fornberg and N. Flyer, Accuracy of radial basis function interpolation and derivative interpolation on 1-D infinite grids, Advances in Computational Mathematics, 23 (2005), 5-20.

A. Elcrat, B. Fornberg and K. Miller, Stability of vortices in equilibrium with a cylinder, J. Fluid Mech. 544 (2005), 53-68.

Keith Julien

Saturation of the magnetorotational instability Knobloch and Julien Phys. Fluids 17, 094106 (2005).

Wave dynamics in optically modulated waveguide arrays. Ablowitz MJ, Julien K, Musslimani ZH, Weinstein MI PHYSICAL REVIEW E 71 (5): Art. No. 055602 Part 2, MAY 2005.

Blinking rolls: Chaotic advection in a three-dimensional flow with an invariant. Mullowney P, Julien K, Meiss JD. SIAM JOURNAL ON APPLIED DYNAMICAL SYSTEMS 4 (1): 159-186 2005.

Pattern Formation in Rayleigh-Benard Convection in a Rapidly Rotating Cylinder, Proceedings of the Fourth International Symposium on Turbulence and Shear Flow Phenomena, 2005, Sprague, M., K. Julien, E. Serre, J. Sanchez-Alvarez, and E. Crespo del Arco, Williamsburg, VA.

Congming Li

H. Segur, D. Henderson, J. Carter, J. Hammack, C. Li, D. Pheiff, K. Socha, Stabilizing the Benjamin-Feir Instability, J. Fluid Mech. , 539(2005) 229-271.

W. Chen, C. Jin, C. Li, Jisun Lim, "Weighted Hardy-Littlewood-Sobolev inequalities and Systems of integral equations. Disc. & Cont. Dynamics Sys. S(2005) 164-173.

W. Chen, C. Li, and B. Ou, Classification of Solutions for a System of Integral Equations, Comm. in Partial Differential Equations, 30(2005) 59-65.

W. Chen, C. Li, and B. Ou, Qualitative Properties of Solutions for an Integral Equation, Disc. & Cont. Dynamics Sys. 12(2005) 347-354.

W. Chen, C. Li, Regularity of Solutions for a System of Integral Equations, Comm. Pure & Appl. Anal., 4(2005), 1-8.

T. Y. Hou, C. Li, Global Well-Posedness of the Viscous Boussinesq Equations, Disc. & Cont. Dynamics Sys, 12(2005), 1-12.

Tom Manteuffel

A technique for accelerating the convergence of GMRES, (A.H. Baker, E.R. Jessup, and T.A. Manteuffel), SIAM J. Mat. Anal. \& App., Vol 26, No. 4, pp. 962--984 (2005).

Analysis of first-order system least-squares (FOSLS) for elliptic problems with discontinuous coefficients: part I, (M. Berndt, T.A. Manteuffel, S.F. McCormick and G. Starke), SIAM J. Numer. Anal., Vol. 42, pp. 386-408 (2005).

Analysis of first-order system least-squares (FOSLS) for elliptic problems with discontinuous coefficients: part II, (M. Berndt, T.A. Manteuffel and S.F. McCormick), SIAM J. Numer. Anal., Vol. 42, pp. 409-436 (2005).

Numerical Conservation Properties of $H(div)$-Conforming Least-Squares Finite Element Methods for Scalar Conservation Laws, (H. De Sterck, T.A. Manteuffel, S.F. McCormick, and L. Olson), SIAM J. Sci. Comput., Vol. 26, No. 5, pp. 1573--1597, (2005).

Adaptive Smoothed Aggregation (aSA), SIAM review SIGEST, (M. Brezina, R. Falgout, S. MacLachlan, T.A. Manteuffel, S.F. McCormick, and J. Ruge), Vol. 47 (2005), pp. 317-346.

New Multigrid algorithms in TOPS, (R. D. Falgout, J. Brannick, M. Brezina, T. A. Manteuffel, S. F. McCormick), Proc. of SciDAC 2005 held in San Francisco, CA, June 26--30, 2005, Journal of Physics: Conference Series, Institute of Physics.

Gunnar Martinsson

P.G. Martinsson, V. Rokhlin, M. Tygert "A fast algorithm for the inversion of general Toeplitz matrices". Computers and Mathematics with Applications, 50(5), pp 741 - 752, 2005.

P.G. Martinsson and V. Rokhlin "A fast direct solver for boundary integral equations in two dimensions". Journal of Computational Physics, 205(1), pp. 1-23, 2005.

H. Cheng, Z. Gimbutas, P.G. Martinsson, V. Rokhlin, "On the compression of low rank matrices". SIAM Journal of Scientific Computing, 26(4), pp. 1389-1404, 2005.

Steve McCormick

Analysis of first-order system least squares (FOSLS) for elliptic problems with discontinuous coefficients: Part I, SIAM J. Numer. Anal. 43 (2005), pp.386-408(with M. Berndt and T. Manteuffel).

Analysis of first-order system least squares (FOSLS) for elliptic problems with discontinuous coefficients: Part II, SIAM J. Numer. Anal. 43 (2005), pp.409-436 (with M. Berndt and T. Manteuffel).

Numerical conservation properties of H(div)-conforming least-squares finite element methods for the Burgers equation, SIAM J. Sci. Comp. 26 (2005), pp. 1573-1597 (with H. de Sterck, T. Manteuffel, and L. Olson).

Adaptive smoothed aggregation (aSA), SIAM Review SIGEST 47 (2005), pp 317-346 (with M. Brezina, R. Falgout, S. MacLachlan, T. Manteuffel, and J. Ruge).

New multigrid solver advances in TOPS, Proceedings of SciDAC 2005, Journal of Physics: Conference Series, Institute of Physics, San Francisco, CA, June 26-30 (2005) (with R. Falgout, J. Brannick, M. Brezina, and T. Manteuffel).

James Meiss

P. Mullowney, K. Julian and J.D. Meiss, "Blinking rolls: chaotic advection in a 3D flow with an Invariant," SIAM J. Dynamical Systems, 4 159-186 (2005)

H. Dullin, J.D. Meiss, D. Sterling, "Symbolic Codes for Rotational Orbits," SIAM J. Dynamical Systems, 4 515-562 (2005).

Harvey Segur

"Progressive waves with persistent two-dimensional surface patterns in deep water", with J.L. Hammack & D.M. Henderson, J. Fluid Mech, vol 532, pp. 1-51, 2005.

"Stabilizing the Benjamin-Feir instability", with D. Henderson, J.Carter, J. Hammack, C-M Li, D. Pheiff, & K. Socha, J. Fluid Mech., vol 539, pp. 229-271, 2005.

"Can the Benjamin-Feir instability spawn a rogue wave?", with D.M. Henderson &J.L. Hammack, Proceedings of 14th Aha Huliko'a Winter Workshop, on Rogue Waves, 2005.

B. Invited Lectures and Meetings Attended for Calendar Year 2005

Mark Ablowitz

Invited Lecture: Conference "Nonlinear waves and applications", University of Tokyo, Tokyo, Japan, February 14-18, 2005, "Wave Collapse in Nonlocal Nonlinear Schrodinger Systems", February 14, 2005.

Invited Lecture: Department of Mathematics, University of Wyoming, "WWW: waves, water and the web", February 24, 2005.

Invited lecture: Department of Mathematics, Rutgers University, "Solitary waves: from optics to water waves", September 15, 2005.

Invited Lecture: Department of Mathematics, Yale University, "Solitary waves: from optics to water waves", September 19, 2005

Invited Lecture: Workshop: Nonlinear Optics, University of Arizona, October 4-5, 2005, "Ultrashort Optical Pulses: Dynamics and Noise", October 5, 2005.

Gregory Beylkin

Gregory Beylkin, Separated representations and their applications, California Institute of Technology, April 18, 2005.

Gregory Beylkin, Separated representations and their applications, Stanford University April 21, 2005.

Gregory Beylkin, Separated representations and their applications, University of Texas at Austin, April 26, 2005.

Gregory Beylkin, On approximation of functions by exponential sums, Conference "Nonlinear Waves, Integrable Systems and Applications", UCCS, June 7, 2005.

Gregory Beylkin, A Multiresolution Strategy For Numerical Homogenization in High Dimensions, The Eighth U.S. National Congress on Computational Mechanics, University of Texas at Austin, July 26, 2005.

Gregory Beylkin (with Martin Mohlenkamp, Lucas Monzn and Fernando Perez), Towards a direct solution of the multiparticle Schrodinger equation, DARPA PROM Program Review, San Francisco, CA, March 8, 2005.

Gregory Beylkin and Fernando Perez, Computing with Green's functions, DOE Molecular Electronics Meeting at ORNL. Oak Ridge, TN, February 25, 2005.

Gregory Beylkin, Lucas Monzon and Fernando Perez, Computing with separated representations of Green's functions, DOE Molecular Electronics Meeting, Nashville, TN, October 7, 2005.

Gregory Beylkin, Methods and Algorithms for Solving Multiparticle Problems, Computational Chemistry and Material Science in the DoD, Arlington, VA, September 20, 2005.

Jem Corcoran

"Perfect and Pseudo-Perfect Algorithms for ARCH Models", invited talk in the Department of Mathematical Sciences Colloquium at Clemson University.

"An Adaptation of the Transform Likelihood Ratio Method for Simulation of Heavy-Tail Events", invited talk in the Department of Statistics at the University of Georgia.

James Curry

Presentation at the 2005 SIAM Annual Meeting in New Orleans: "It's not Applied Mathematics if You Don't Have Communications, Computations and Mathematics".

Anne Dougherty

"Mathematical Visualization Toolkit (MVT): Not Just a Permutation of MTV" presented on July 13, 2005 at the annual SIAM conference in New Orleans, on July 27, 2005 at the MERLOT conference in Nashville, and on November 10, 2005 at the National Council of Teachers of Mathematics Western Regional Conference.

Bengt Fornberg

Eight colloquia, given in the following locations: in Sweden: Uppsala University, in Finland: University of Joensuu, in the US: UC Colorado Springs, University of Washington-Seattle, University of Delaware, University of Central Florida, Army Research Institute (Washington DC), and State University of New York - Buffalo.

Keith Julien

Invited Speaker: Institute for Mathematics Applied to Geosciences (IMAGe) Rotationally Constrained Rayleigh-Benard Convection. May 2005.

Invited Talk: Applied Mathematics Program, University of Arizona.Rotationally Constrained Rayleigh-Benard Convection. April 2005.

Systems Seminar: APPM, Colorado 2005. Problems in Dynamics.

Invited Paper: Mixing in the Kuppers-Lortz Mode. SIAM Dynamical Systems Conference, Snowbird, Utah May 2005.

Invited Paper: American Physical Society Division of Fluid Dynamics Meeting, Chicago. Reduced Equations for Rapidly Rotating Convection on a tilted f-plane, 2005. Julien, K., Knobloch, E., Milliff, R.,, Sprague, M., and J. Werne..

Congming Li

The 2nd East China Partial Differential Equations Conference, East China Normal Univ., ShangHai, China Summer 2005.

HuaZhong International Conference on Nonlinear Partial Differential Equations, ZhangJiaJie, China. Fall 2005.

1011th Meeting of American Math. Society at University of Nebraska, Lincoln, Nebraska.

Colloquium, University of Connecticut, Storrs-Manisfield, CT.

Analysis Seminar, Rutgers University, New Brunswick, NJ.

Geometric Analysis Seminar, Princeton University, Princeton.

Workshop, 5 two hours long lecture series, Dept. of Math., Graduate School, the Chinese Academy of Sciences, Beijing, China.

PDE Seminar, Institute of Applied Mathematics, the Chinese Academy of Sciences, Beijing China.

Analysis seminar, Dept. of Mathematical Sciences, TsingHua Univ., Beijing, China.

Analysis Seminar, XuZhou Normal Univ., XuZhou, China.

Analysis seminar, Dept. of Mathematics, UC.

Colloquium, Dept. of Math., UC Santa Cruz.

CAM Colloquium, Dept. of Mathematics, Penn. State Univ.

Manuel Lladser

Spring 2005, presentation, Bioinformatics Supergroup at CU-Boulder, title: "Assesing the significance of genomewide motif searches", date: Monday, Feb 7th 2005.

Spring 2005, presentation, Special Seminar at the Applied Math Department at CU-Boulder, title: "Multiple Pattern Matching: a Markov Chain Approach", date: February 15th 2005.

Summer 2005, presentation, First Cornell Summer School in Probability, title: "Multiple pattern frequencies for Markovian sequences", date: July 22nd 2005.

Summer 2005, poster, IMA: New Directions in Probability Theory, title: "A state machine approach to study pattern frequencies in markovian sequences", August 5th 2005.

Fall 2005, presentation, Prob/Stat Seminar at CU-Boulder, title: "Distribution of arrival patterns in compounded queues", date: October 5th 2005.

Fall 2005, poster, 2005 NIST Fall Symposium, title: "Distribution of arrival patterns in non-homogeneous Poisson processes", date: November 14th 2005.

Tom Manteuffel

Minisymposium Speaker, SIAM Anual Meeting, New Orleans, July 11, 2005.

Per-Gunnar Martinsson

"Fast direct solvers for integral equations", 8th US Congress on Computational Mechanics, Austin, TX, July 2005.

"Multiscale modelling of materials with periodic micro-structures", 8th US Congress on Computational Mechanics, Austin, TX, July 2005.

"Bandgap phenomena in materials with periodic skeletal micro-structures", 8th US Congress on Computational Mechanics, Austin, TX, July 2005.

"Fast Multipole Methods", numerical analysis seminar, department of applied mathematics, Boulder, CO, October, 2005.

James Meiss

"Normal Form for Fold and Cusp Singularities of Symplectic Maps." Topical Problems Nonlinear Wave Physics, Russia, 8/05.

"Fold and Cusp Singularities for Symplectic Maps," SIAM Dynamical Systems Meeting, Snowbird, Utah, 5/05

"Rotational Codes," Midwest Dynamical Systems Meeting, 4/05 Univ. Minnesota.

Mary Nelson

Ruth A. Streveler, Ronald L. Miller, Mary A. Nelson, Monica R. Geist, Barbara M. Olds. (2005, June) Concept Inventories Meet Cognitive Psychology: Using Beta Testing as a Mechanism for Identifying Engineering Student Misconceptions. Paper presented at ASEE Annual Conference, Portland Oregon.

Mary A. Nelson, Monica R. Geist, Ruth A. Streveler, Ronald L. Miller, Barbara M. Olds, Candace S. Ammerman, and Ravel F. Ammerman. (2005, April). From Practice to Research: Using Professional Expertise to Inform Research about Engineering Students Conceptual Understanding. Presented at the Annual Meeting of the American Educational Research Association, Montreal, Canada.

Pittman, M. & Nelson, M. A.(2005, January). Increasing Teacher Content Knowledge: Multiple Solution Strategies. Paper presented at the Annual Meeting of the Association of Mathematics Teacher Educators, Dallas, Texas.

Mary A. Nelson. (November, 2005). Calculus I: A Reform Approach. Presented at NCTM Regional Conference, Denver Colorado.

James Curry, Anne Dougherty, Mary A. Nelson. (November, 2005). Mathematical Visualization Toolkit (MVT). Paper presented at NCTM Regional Conference, Denver Colorado.

Harvey Segur

"Waves in the Ocean", 97th Distinguished Lecture on Research, University of Colorado, Boulder, March 9, 2005.

"From FPU recurrence to downshifting", presented at CNLS Annual conference - 50 Years of the Fermi-Pasta-Ulam Problem, Santa Fe, NM, May 16, 2005.

"Stabilizing the Benjamin-Feir instability", presented at International Conference on Nonlinear Waves, Integrable Systems and Applications, Colorado Springs, CO, June 5, 2005.

"Stable patterns of surface waves in deep water", presented at NCAR Workshop on Coherent Structures in Atmosphere and Ocean, NCAR, Boulder, CO, July 13, 2005.

"Soliton models of waves in shallow water" presented at Conference on Solitons, Singularities, Surreals and Such, Rutgers University, New Brunswick, NJ, Sept. 15, 2005.

"Waves in shallow water", presented at Conference on Probability, Geometry and Integrable Systems, MSRI, Berkeley, CA, December 7, 2005.

C. Research Grants Active in 2005

Mark Ablowitz

NSF-DMS: ``Collaborative Research: Mathematical and computational methods for high-data-rate optical fiber communication", 2001--2006: P.I. M.J. Ablowitz; this is one part of a three-way focused research group grant. The other two P.I.s with separate awards are from Northwestern University and University of Maryland.

NSF-DMS: "Nonlinear wave motion", 2003--2006: P.I. M.J. Ablowitz.

NSF-DMS: ``Collaborative Research: 2005--2008: P.I. M.J. Ablowitz, "Mathematical and computational methods for high-performance light-wave systems", This is one part of a two-way research group grant. The other P.I. with separate award is from SUNYAB.

Air Force Office of Scientific Research, Mathematics Division, Award: "Nonlinear wave propagation", 2003-2006.

Gregory Beylkin

DOE: "Integrated Multiscale Modeling of Molecular Computing Devices", Award No.: DE-FG02-03ER25583, 9/15/2003--9/14/2006,

DARPA/DOD Army ARO "Separated Representations for Computational Materials Science" Award No.: W911NF-04-1-0281; 7/1/2004--10/31/2005

DOE/UT-Battelle/ORNL: "Multiresolution Adaptive Numerical Evaluation and Scientific Simulation", Award No.: 4000038129, 1/15/2005--1/14/2010,

Jem Corcoran

UCAR, "Behavior of Extreme Values on Different Spatial Scales."

James Curry

CO-PI for NSF Science, Technology, Engineering Mathematics-Teacher Preparation (STEM-TP) funded June 2003. PI is Dick McCray, Astrophysics.

CO-PI on the NSF funded Noyce Fellowships. July 2004 through December 2008.

EEF Wind Tunnel Proposal with Trudy Schwartz.

Bengt Fornberg

NSF: "Pseudospectral Methods and Radial Basis Functions", 8/1/03-7/31/06.

NASA: "Numerical Algorithms for Astrophysical Computing", (support of Graduate Student Julia Zuev), 7/1/01-6/30/05.

ARO (Army Research Office): "Training Knowledge and Skills for the Networked Battlefield", 05/01/05-04/30/10.

Keith Julien

NSF Ocean Sciences: Rotationally Constrained Conv.: Investigation of a New Class of Reduced Eq'ns, 2002--05.

Modeling Magneto-Inertial-Gravity waves in the Lower Convection Zone. NASA Solar Heliospheric. Community Hounds and Hares Exercises in Local Helioseismology. NASA Living with a Star Program. Guest Investigator Program.

Congming Li

Principle Investigator: "Qualitative properties of nonlinear differential and integral equations" NSF DMS-0401174, 2005-2007. Individual Grant.

Tom Manteuffel

0/02-12/05 Sandia National Laboratories, Project title: Fast and Accurate Numerical Solution of Maxwell Equations, grant no. 1100.12.1512B. (PI: Tom Manteuffel, Co-PI: Steve McCormick).

9/15/03-9/14/06 DOE. Project Title: First-order system least-squares (FOSLS): fundamentals and applications. grant no. DE-FG02-03ER25574. (PI: Tom Manteuffel, Co-PI:Steve McCormick).

10/04 - 9/07, NSF, Project: hp-adaptive FOSLS methods for nonlinear problems with singularities, (CO PI: Steve McCormick).

7/01-6/05 DOE Co-Investigator. Project title: Terascale optimal PDE systems (TOPS),Grant no: DE-FC02-01ER25479, Total award: (PI: Steve McCormick, Co-PI: Tom Manteuffel, Xiao-Chuan Cai).

7/03-3/05 Lawrence Livermore National Laboratory, FAC, Adaptive AMG, and Compatible Relaxation for solving problems that arise in LLNL applications. (PI; Steve McCormick, Co-PI: Tom Manteuffel).

10/04-9/05 IBM Shared University Research (SUR) Proposal, Gift of Linux Cluster:Occam (PI Henry Tufo).

11/04 - 12/07, NSF MRI Grant, (PI: Henry Tufo).

Steve McCormick

7/01-6/06 DOE Principal Investigator. Project title: Terascale optimal PDE systems (TOPS), (PI: Steve McCormick, Co-PI: Tom Manteuffel, Xiao-Chuan Cai).

7/04-3/05 LLNL Principal Investigator. Project Title: FAC, Adaptive AMG, and Compatible Relaxation for Solving Problems That Arise in LLNL Applications.

10/02-9/05 Sandia National Laboratories Co-Investigator. Project title: Fast and Accurate Numerical Solution of Maxwell Equations, grant no. 1100.12.1512B.

7/03-6/06 DOE Co-Investigator. Project title: First-order system least squares (FOSLS): fundamentals and applications (fast algorithms for transport models), (PI: Tom Manteuffel, Co-PI:Steve McCormick).

10/04-9/07 NSF Co-Investigator, Project title: hp-adaptive FOSLS methods for nonlinear PDE problems with singularities, (PI: Tom Manteuffel, Co-PI: Steve McCormick).

James Meiss

Nearly Hamiltonian dynamics, CRDF grant # 13314, 2004-2006, With. V. Koslov, Moscow State Univ. Geometry and Computation of Dynamics for Conservative Systems," J.D. Meiss, National Science Foundation, DMS-0202032, 2002-2007, (Note: Special 5 year grant).

"Vertical Integration in Research and Education for Applied Mathematics," J.D. Meiss, H. Segur, B. Fornberg, and J.H. Curry, National Science Foundation, DMS-9810751, 1999-2006.

Harvey Segur

NSF-FRG: "Collaborative Research: Fully nonlinear, three-dimensional waves in water of arbitrary depth", NSF-DMS-0139742, 2002-2005.

D. Dissertations for Academic Year 2005 – 2006

Eunjung Lee
"FOSLL* for eddy current problems with three-dimensional edge singularities," Advisor: Tom Manteuffel – Ph.D. August, 2005.

Paki Suwannajan
"Evaluating the Performance of Latent Semantic Indexing," Advisor: Elizabeth Jessup, CSCI – Ph.D. August, 2005.

Derin Wysham
"Reducibility, Manifolds, and Bifurcations of Invariant Tori in Dynamical Systems," Advisor: James Meiss – Ph.D. August, 2005

James Brannick
"Adaptive Algebraic Multigrid Coarsening Strategies," Advisor: Steve McCormick – Ph.D. December, 2005.

Daniel Cooley
"Statistical Analysis of Extremes Motivated by Weather and Climate Studies: Applied and Theoretical Advances," Advisors: Phillipe Naveau and Doug Nychka, NCAR – Ph.D. December, 2005.

Mark Hoefer
"Dispersive Shock Waves in Bose-Einstein Condensates and Nonlinear Nano-oscillators in Ferromagnetic Thin Films," Advisor: Mark Ablowitz – Ph.D. May, 2006.

Master's Theses for Academic Year 2005-2006

Jonathan Graham
"Turbulent Intermittency in the Lagrangian-Averaged Alpha Model," Advisors: Keith Julien and Annick Pouquet, NCAR – M.S. August, 2005.

Pascal Getreuer
"ENO Schemes with General Discretizations," Advisors: Anne Dougherty and Francois Meyer, ECEN – M.S. May, 2006.

---

7. PREPRINTS OF THE DEPARTMENT: ACADEMIC YEAR 2005-2006

The following is a list of preprints developed by Department faculty and visitors during this academic year. If you would like a copy of any preprint, please request a copy in writing from Jan Kaufman, University of Colorado at Boulder, Department of Applied Mathematics, 526 UCB, Boulder, CO 80309-0526 (janis.kaufman@colorado.edu).

536.   *A Pseudospectral Fictitious Point Method for High Order Initial-Boundary Value Problems*, Fornberg, B., January, 2005.

537.   *Extrapolation Methods for Solving Wave Equations*, Fornberg, B., Zuev, J. and Lee, J., January, 2005.

544.   *Localization Properties of RBF Expansion Coefficients for Cardinal Interpolation. I. Equispaces Nodes*, B. Fornberg, N. Flyer, S. Hovde, C. Piret, September, 2005.

545.   *The Gibbs Phenomenon for Radial Basis Functions*, B. Fornberg, N. Flyer, September 28, 2005.

546.   *Efficient Solution of Poisson's Equation With Free Boundary Conditions*, Luigi Genovese, Thierry Deutsch, Alexey Neelov, Stefan Goedecker, Gregory Beylkin, May 16, 2006.

547.   *Pade-Based Interpretation and Correction of the Gibbs Phenomenon*, T. Driscoll and B. Fornberg, April 5, 2006.