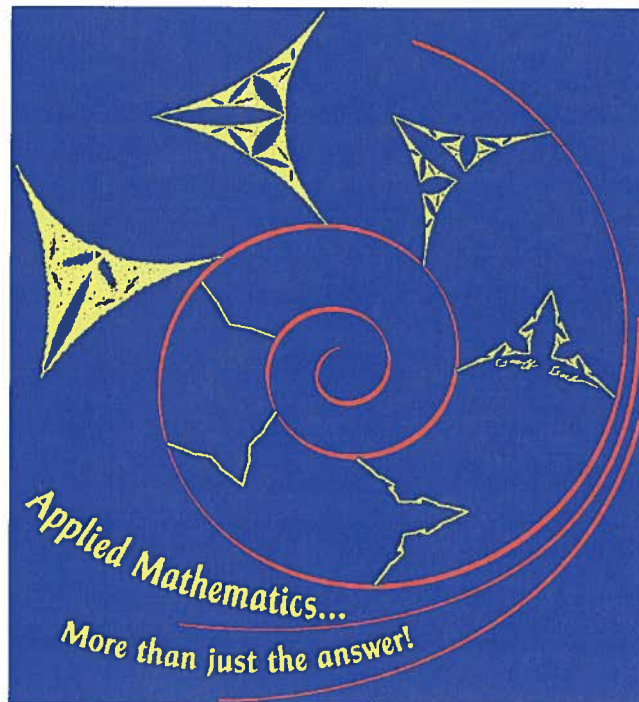


Department of Applied Mathematics



Annual Report 2002-2003

University of Colorado at Boulder
Boulder, CO 80309

Harvey Segur, Chair
June 30, 2003

Cover Art: This year's images were produced by undergraduate Geoff Goehle, in collaboration with Anne Dougherty and James Curry. It is the result of a corner cutting algorithm. Depending on the parameter value, iterations converge to a smooth curve or a fractal. The interior red spiral represents a range of parameter values. The fractals move from straight lines to filled-in "strange objects".

Geoff Goehle received a BS in May, 2002, and is currently a graduate student at Portland State University.

TABLE OF CONTENTS

OVERVIEW.....	2
1. ROLE AND MISSION.....	4
2. DEPARTMENTAL ACTIVITIES	4
A. Undergraduate Education.....	4
B. Graduate Education.....	6
C. Enrollment Statistics.....	8
D. Graduates.....	9
E. Faculty Awards and Honors.....	10
F. Research.....	10
G. Department-wide Grants	12
H. Outreach	14
I. Changes in Personnel.....	15
3. FACULTY, RESEARCH ASSOCIATES, VISITORS, AND STAFF.....	16
A. Core Faculty and Research Associates	16
B. Affiliated Faculty -- Graduate Department.....	18
C. Visitors, 2002-2003.....	20
D. Staff and Professional Research Assistants.....	22
4. WEEKLY COLLOQUIA and SEMINARS 2002-2003	22
A. Applied Mathematics Colloquium, 2002-2003.....	22
B. Seminars in Applied Mathematics, 2002-2003.....	24
C. University of CO at Boulder/University of CO at Denver/CO School of Mines Joint Seminars in Computational Mathematics, 2002-2003.....	25
D. Dynamical Systems Seminars, 2002-2003	25
E. Fast Algorithms Seminar 2002-2003.....	27
F. Probability & Statistics Seminars, 2002-2003	27
G. Mathematical Biology Reading Group.....	28
H. Undergraduate and Graduate Seminars	28
5. FACULTY SERVICE TO THE UNIVERSITY, DEPARTMENT AND SOCIETIES, CALENDAR YEAR 2002.....	29
6. TEACHING ACTIVITIES	32
A. Courses Taught by Department Faculty, Academic Year 2002-2003.....	32
B. Summer Courses 2003.....	34
7. RESEARCH ACTIVITIES FOR CALENDAR YEAR 2002.....	35
A. Research Publications for Calendar Year 2002	35
B. Invited Lectures and Meetings Attended for Calendar Year 2002.....	37
C. Outside Funding Active in 2002.....	39
D. Dissertations and Master 's Theses, Academic Year 2002-2003.....	40
E. Miscellaneous for Calendar Year 2002.....	41
8. PREPRINTS OF THE DEPARTMENT, 2002-2003.....	41

OVERVIEW

Applied Mathematics began as a "Program" on the Boulder campus in 1989. It became a "Department" in 1996. Two reasons for its creation were that CU's Engineering faculty wanted their students taught well, and that scientists in other disciplines wanted better access to mathematical expertise for their own research. Two current objectives of the Department of Applied Mathematics (APPM) reflect this history: we try (i) *to teach our students well*; and (ii) *to seek out and develop new, interesting applications of mathematics in other disciplines*. Many departments share the first objective; the second is a unique and essential part of applied mathematics. Two more objectives go along with these: (iii) *to provide each student with a rich educational experience*, in which they see both the beauty of mathematics and its practical value; (iv) *to create new mathematics*. The success of the department can be judged by its success in achieving these four objectives.

Do we teach our students well? APPM has two Presidential Teaching Scholars on its faculty. Separately, the quality of our teaching is indicated by increased student demand, at both upper-division and graduate levels.

- In upper-division courses in applied mathematics, student credit hours have tripled in the last ten years, and have doubled since 1995-96.
- At the graduate level, student credit hours have doubled in the last ten years, and have increased by 40% since 1995-96.
- Enrollment in our lower-division courses closely tracks the student population in the College of Engineering.

This increasing demand for advanced courses in applied mathematics always exceeds the teaching capacity of our faculty. Each semester, non-rostered instructors teach about half of our courses. Meeting this demand without sacrificing the quality that created the demand is an ongoing challenge for this department.

Do our students receive rich educational experiences? Our undergraduate major in Applied Mathematics, discussed in §2A, has several features in common with an honors program.

- The quality of our students is high. Nearly half of our majors made the Dean's List for academic achievement each semester in 2002-03. The combined GPA of our graduating seniors has been over 3.2 every year since 1995.
- Many of our majors participate in an intense, 4-day contest in mathematical modeling, competing with hundreds of other student groups from around the world. Our students

have won this international competition three times in the last four years.

- Even more of our students participate in nontrivial research projects, some of which lead to published papers in well-established scientific journals.
- A high percentage of our majors continue on to graduate school at prestigious universities.

A department-wide, NSF-sponsored VIGRE grant has provided the additional resources needed for this very successful program. See §2G for more information about VIGRE.

Because of our quest to seek out and develop new, interesting applications of mathematics, the department engages actively in interdisciplinary work at many levels.

- Every APPM graduate student must take a year-long graduate sequence in some other discipline, in which mathematics is applied.
- The department maintains an active program of Affiliated Faculty, who reside in other departments across campus, who apply mathematics in their own disciplines, and some of whom direct the PhD theses of graduate students in Applied Mathematics. See §3B for a list of our Affiliated Faculty.
- In 2001-02, the department developed two new interdisciplinary graduate programs. One is a combined MA/MS in mathematical biology, in which an interested student takes three years to earn two master's degrees, one from APPM and one from MCDB. The other program is in computational science and engineering (CSE); here a student earns a master's degree in applied math on the way to a PhD in another discipline. (See §2B.)

An ongoing challenge for an educational department like ours is to respond to the changing demands of our society, while retaining the core beliefs and practices that made the department successful. One change that affects the department directly is a change in leadership. James Curry will become Chair of the Department on July 1, while Harvey Segur returns to the regular faculty. Anne Dougherty will remain as Associate Chair. James Curry was instrumental in creating the Program in Applied Mathematics 15 years ago, and he served as Associate Chair under Mark Ablowitz for several years. The outgoing Chair wishes the incoming Chair great success in his new adventure.

Harvey Segur
Chair

Anne Dougherty
Associate Chair

1. ROLE AND MISSION

The objectives of the Department of Applied Mathematics at the University of Colorado at Boulder are summarized below:

- a) Provide undergraduate and graduate students with a high quality education and training in applied mathematics and prepare them for careers in industry, laboratories and the academic professions;
- b) Offer and monitor degree programs leading to BS, MS and PhD degrees in Applied Mathematics;
- c) Nourish and maintain a professional environment in which excellence in teaching, learning, scholarship and creativity are of central importance;
- d) 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.

2. DEPARTMENTAL ACTIVITIES

A. Undergraduate Education

Undergraduate education in the Department of Applied Mathematics provides our students with broad-based preparation for the challenges and opportunities of today. Through courses, projects, research and other activities, the Department provides unique educational experiences to our 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 3,430 undergraduate and graduate students in 2002-2003. See §6 for a detailed list of the courses taught.

We had 69 undergraduate majors in 2002-2003, with 16 receiving their baccalaureate degrees. (See §2D for a list of our graduates.) We are proud that 34 students in the fall and 32 in the spring semester made the Dean's List for academic achievement, with grade-point averages of 3.5 or better. Our minor program continues to grow, attracting students from other majors with an interest in more in-depth training in applied mathematics. Forty-one students, are pursuing minors in Applied Mathematics. This is 6 more than last year, and twice as many as in 1999-2000.

The student chapter of SIAM (the Society for Industrial and Applied Mathematics) is responsible for promoting interactions between applied math faculty and undergraduate 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 §4H.) **Jocelyn Renner** served as Chapter President; she was assisted by **Moorea Brega** and **Darin Gillis**. **Bruce Swihart** was the student representative to the Engineering Excellence Fund (EEF). The officers for the 2003-04 academic year will be **Moorea Brega** (President), **Alejandro Cantarero** and **Sarah Macumber**. Anne Dougherty was the faculty advisor for 2002-03 and will continue in that capacity next year.

The art of creating and testing mathematical models of real-world problems is an important part of undergraduate training. Undergraduate students are given an opportunity to showcase their mathematical, computational and communication skills in the annual Mathematical Contest in Modeling, 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 2003, the Applied Math Department entered three teams (9 students). The contest ran from 6:00 pm February 6, 2003 until 6:00 pm February 10, 2003 and drew entries from 638 teams from nine countries, including the US. The paper submitted by the team consisting of **Darin Gillis** (APPM and CSEN major), **Aaron Windfield** (APPM major) and **David Lindstone** (EEEN major, APPM minor) was designated as one of the Outstanding Papers for Problem B. This is the highest designation possible. The problem they worked on involved the use of a Gamma Knife in the treatment of tumor cells in brain tissue. Teams designed a model to provide the fewest and most direct doses in order to treat the tumor without going outside the target tumor itself. Their paper was also selected as the SIAM winner. They will travel to this summer's SIAM meeting in Montreal to give a presentation on their solution and will each receive a cash award. Their solution paper will be published in the fall 2003 issue of the UMAP Journal. Congratulations are also due to:

Moorea Brega (APPM major, physics minor), **Alejandro Cantarero** (CSEN, APPM, ECEN) and **Corry Lee** (APPM and EPEN) who received a Meritorious designation on Problem B.

Joe Carrafa (ECEN major), **Kimi Kano** (MCEN major) and **Ian Derrington** (APPM and EPEN) who received an Honorable mention on Problem C, which involved designing an efficient baggage scanning system for airports.

The VIGRE grant that the department received from the National Science Foundation has fundamentally changed the character of our undergraduate major. This past year, 21 of our more advanced undergraduates have participated in "tetrahedra", consisting of undergrads, grads, postdocs and faculty working together on a common research theme. See §2G for more information about VIGRE.

This year's class of graduating seniors was outstanding! Two students (**Darrin Gillis**, **Jocelyn Renner**) graduated "with high distinction" (cumulative GPA must be at least 3.90) and

two students (**Edith Hand, Kristine Henderson**) graduated “with distinction” (cumulative GPA at least 3.75). The department recognized three of its students: **Darrin Gillis** and **Jocelyn Renner** were selected as the Department’s Outstanding Seniors, and **Jocelyn Renner** and **Stefan Wild** received Henri-James Awards. The Henri-James scholarship is a cash award given to outstanding Applied Math graduating seniors who are continuing on to graduate school. Jocelyn will enter the graduate program in mechanical engineering at Northwestern University and Stefan will study operations research at Cornell.

This year, everyone agreed that **Jocelyn Renner** is outstanding:

- The College of Engineering selected her as its Outstanding Graduate.
- The Colorado Engineering Council awarded her its Silver Medal.
- As a double major in Russian Studies, Jocelyn also received a Jacob Van Ek award from the College of Arts & Sciences.

Jocelyn is the first Applied Math major chosen as the Outstanding Graduate in Engineering and the only student ever to receive all three honors from both Engineering and Arts & Sciences.

Corry Lee is also outstanding, even though she was not a senior in 2002-03. Corry will receive a prestigious Goldwater Scholarship in 2003-04. About 300 of these awards are given in the entire U.S. each year.

The members of the Undergraduate Committee were Mark Ablowitz, Anne Dougherty, Bengt Fornberg, Phillippe Naveau and John Williamson. The duties of this committee are to advise undergraduates and to supervise all aspects of the undergraduate curriculum.

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 40 Affiliated Faculty, see §3B) 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, 8 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.

The Graduate Committee for 2002-2003 consisted of Meredith Betterton, Cong-Ming Li, Tom

Manteuffel, and James Meiss (Chair). 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.

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

- In 2002-2003, the department had a record number (70) of graduate students.
- The entering class in fall 2002 had 16 new students. In spring 2003, we welcomed 7 new graduate students to our program.
- We continue to attract a large fraction of U.S. citizens: in 2002-2003, 85% of the incoming students with financial support were U.S. citizens.
- 19 of our graduate students are women.
- Our graduate program had 4 under-represented minority students in 2002-2003. Of these 4, 1 received a PhD in 2002-2003, and 2 received MS degrees.
- 3 students completed their PhDs in 2002-2003. 14 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 (29) were Teaching Assistants (TAs) in the fall semester (includes both full time and part time TAs). The teaching load was the same in the spring semester, when 29 served as TAs. Aside from TA support, the largest single source of funding for graduate students was NSF's VIGRE, which supported 16 (includes 4 from summer 2002) students in 2002-2003. (See §2G for more information about VIGRE.) Furthermore, 5 students were supported as research assistants within the department, 4 were supported by affiliated faculty in other departments on campus, and 10 held positions off campus (either in a government lab or in a private company).
- Two of our students won highly competitive summer fellowships in 2003: **Neil Burrell** at Woods Hole Oceanographic Institute, and **Mark Petersen** at NASA Goddard Space Flight Center.

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).

The outreach efforts of the department are an extension of its mission to provide education and training in applied mathematics and a response to the needs of the educational community. Since summer 2000, the department has offered content-based, professional development workshops for middle school and high school 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. These two-week workshops attracted 39 teachers in summer 2002. Evening seminars, initiated at the request of the Boulder Valley School District, are also provided during the academic year to local math teachers.

More information about the graduate program is available at
<http://amath.colorado.edu/programs/grad.html>

C. Enrollment Statistics

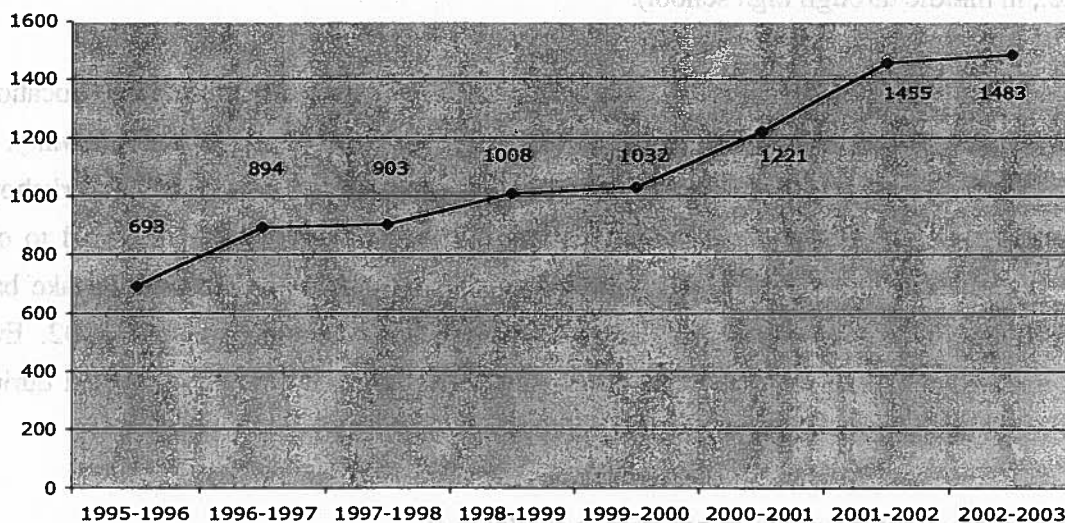
Enrollment in the courses offered by the Department continues at extremely high levels. It is particularly noteworthy, given the faculty's small size, that the Department teaches so many students. The statistics over the past twelve years are as follows:

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	3724/ 4188*	70**	69**	41**

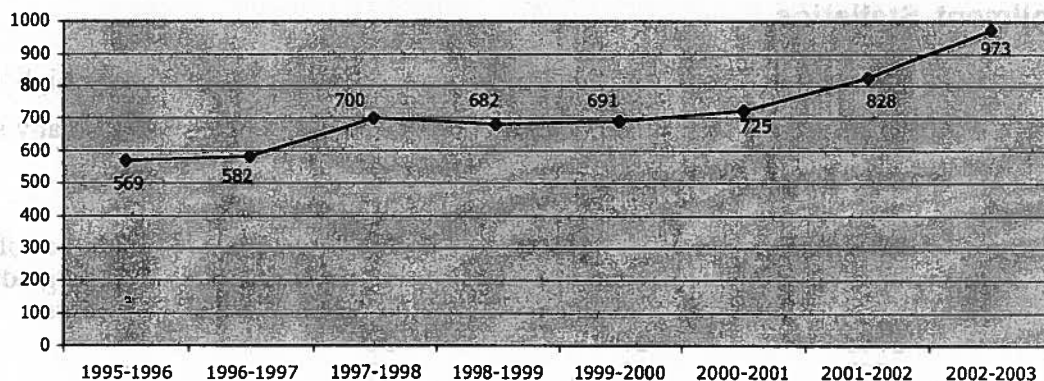
*The totals in bold include all Calculus I & II Work Study Groups, as well as Calculus III Labs & Differential Equations Labs. Enrollment in our upper division courses has continued to increase. With projected increases in undergraduate enrollment we continue to foresee enrollment increases in applied 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 §7D for thesis titles)

August 2002
May 2003

Eric Wright
Cristina Perez, Grady Wright

Master's degree

December 2002 Rian Bogle, Hong Liu*, Paul MULLowney*, Paul Wiedmann-Goiran
May 2003 Deborah Batista*, David Beltran del Rio*, Matthew Carroll*, Ryan Girard, Barbara Jennings*, Chao Jin*, Roberto Munoz-Alicea, Elizabeth Siewert, Srinath Vadlamani*, Keith Wojciechowski*

*Continuing with PhD

BS/MS degree

May 2003 Stefan Wild

Bachelor's degree

August 2002 Matthew Hayden, Marya Hillesland
December 2002 Leslie Leininger, Anaa Mansouri, Nancy Mezo, Kenzi Parton
May 2003 Derek Bendixen, Seungki Cho, Darin Gillis, Edith Hand, Kristine Henderson, Holly Lewis, Joshua Lopez, Grant Macklem, Josh Nolting, Jocelyn Renner

E. Faculty Awards and Honors

Meredith Betterton: Received Butcher Award for research in genomics and biotechnology.

Jem Corcoran: Successfully completed the Comprehensive Review for faculty.

James Curry: Serves as the J.R. Woodhull/Logicon Teaching Professor in Applied Mathematics.

Anne Dougherty: Successfully completed the Reappointment Review for Senior Instructors.

Keith Julien: Awarded tenure and promoted to Associate Professor of Applied Mathematics.

Tom Manteuffel: President of SIAM, an international organization of scientists and mathematicians with more than 9,000 members.
Received a highly competitive 2003 IBM Faculty Award recognizing the quality of his program and its importance to the industry.

F. Research

Research interests in the department currently include scientific computation, physical applied mathematics, dynamical systems, analysis, probability and statistics, and mathematical biology. While advancing all these research areas, we are actively developing statistics and of mathematical biology in the department.

The presence of a large number of postdoctoral researchers, affiliated faculty members, and distinguished visitors (15, 40, and 6, respectively for the 2002-2003 academic year) create a remarkably rich environment for collaboration and the exchange of ideas. This environment is

further enhanced by a continuous stream of short-term visitors provided by seminars and colloquia. In addition to the Applied Mathematics Colloquium Series, the department regularly runs seminar sessions in applied mathematics, dynamics, probability/statistics, and computational mathematics. These forums attract exceptional external speakers, whose presence is vital to keeping open lines of creative communication and to promoting national and international recognition for the department. § 4 includes a listing of all colloquia and seminars for 2002-2003.

Last year, core faculty members alone have published over 30 research publications, presented over 45 invited lectures, and brought in approximately \$2.4 million in grant funding from both federal and non-federal agencies. There were 18 new funding awards active in the 2002-2003 academic year. See the detailed list of grants, publications, and invited lectures for this year in § 7.

Editorships

An important aspect of the faculty's role in the national and international scholarly effort in applied mathematics is service as editors and advisory board members of archival journals and textbook series. During 2003-2003, the faculty in the department served in such capacities on 12 journals/periodicals, which include:

Applied and Computational Harmonic Analysis (Beylkin)
Cambridge University Press Texts in Applied Mathematics (Ablowitz)
Communication on Pure and Applied Analysis (Li)
Electronic Transactions in Numerical Analysis (Manteuffel)
Journal of Engineering Mathematics (Ablowitz)
Journal of Numerical Linear Algebra and Applications (Manteuffel)
Mathematical Association of America Monthly Journal (Curry)
Proceedings of the American Mathematical Society (Ablowitz)
SIAM Journal of Applied Dynamical Systems (Meiss)
SIAM Journal of Numerical Analysis (Manteuffel)
SIAM Journal Multiscale Modeling and Simulation (McCormick)
Studies in Applied Mathematics (Ablowitz)

Copper Mountain Conference - 2003

Tom Manteuffel and Steve McCormick organize the Copper Mountain Conference in the spring of each year. This year the conference was on Multigrid Methods and was held during March 30-April 4. There were 107 participants and 65 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 39 students attended the conference. Student participation has made the Copper Mountain conferences a central contributor to the fields of multigrid and iterative methods.

G. Department-wide Grants

VIGRE

In 1998, the department was awarded a major grant by the National Science Foundation for vertical integration of research and education (VIGRE), totaling \$2.3 million over a five-year period, beginning in the summer of 1999. The VIGRE program originally supported 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. Similar groups with the tetrahedral structure are beginning to develop in statistics and analysis. VIGRE has had a remarkable multiplier effect throughout the department, changing, for example, seminar structures from formal lectures to sessions during which undergraduate and graduate students, postdoctoral researchers, and faculty interact and discuss their research in both formal and informal ways. With the advent of VIGRE, new research seminars have formed and several grants in the department and the university owe their structure and success to the program.

Of course the strength of our program lies in the people, their hard work and their enthusiasm. In the past year the VIGRE grant supported *six* Postdoctoral Fellows, *sixteen* graduate students, and *twenty-one* undergraduates, listed here.

Postdoctoral Fellows	Graduate Students	Undergraduates
Brian Bloechle	Cory Ahrens	Ashok Basawapatna
Natasha Flyer	Neil Burrell	Moorea Brega
Jeffrey Heys	Matt Carroll	Alejandro Cantarero
Jamison Moeser	Dan Cooley	Ian Derrington
Panayotis Panayotaros	Mark Hoefler	Michael Franklin
Katherine Socha	Paul Mallowney	Geoff Goehle
	Roberto Munoz-Alicea	Kristine Henderson
	Matt Nabity	Patrick Hofmann
	Luke Olson	Philip Kent
	Mark Petersen	Arian Lalezari
	Christina Perez	Kevin Leder
	Srinath Vadlamani	Corry Lee
	Chad Westphal	Sarah Macumber
	Grady Wright	Nancy Mezo
	Keith Wojciechowski	Ahley Moore
	Derin Wysham	Josh Nolting
		Shane Passon
		Jocelyn Renner
		Dominic Thurmer
		Hilary Snyder
		Stefan Wild

A number of people supported by VIGRE are moving on to better things next year. Among the post-docs, Natasha Flyer will become a research scientist at NCAR, and Brian Bloechle will start his own company. Katherine Socha became an Assistant Professor at Michigan State. Three of our VIGRE-supported graduate students will go on to postdoctoral positions elsewhere: Christina Perez at Columbia, Luke Olson at Brown, and Grady Wright at Utah. Some of our undergraduates either have begun or will begin graduate study: Geoff Goehle at Portland State (in Mathematics & Statistics), Josh Nolting at CU/Boulder (in Applied Mathematics), Jocelyn Renner at Northwestern (in Mechanical Engineering), and Stefan Wild at Cornell (in Operations Research). Nancy Mezo is currently seeking employment.

The VIGRE program is scheduled to end in May of 2004, and the Department is looking forward to competing for a new grant in the recently announced NSF-EMSW21 program.

More information about the impact of VIGRE on the Applied Mathematics Department can be found at <http://amath.colorado.edu/vigre>.

CCHE Program of Excellence in Applied Mathematics

The CCHE (Colorado Commission on Higher Education) Program of Excellence in Applied Mathematics is designed to enhance the University of Colorado's program in Applied Mathematics on the Boulder and Denver campuses. The Program of Excellence advances our national/international stature and visibility in Applied Mathematics and improves comprehension of our efforts by Colorado students, parents and teachers.

A vertically integrated program, with collaborating faculty, postdoctoral researchers/instructors, graduate students and undergraduates has proven to be a valuable means to expand and enhance the teaching, education and research enterprise at all academic levels. One aspect of this program is a K-12 outreach program, created and expanded with CCHE grant funds. See the next section (§2H) for more details.

In the vertical integration model, postdoctoral researchers/instructors are actively engaged in both teaching and research efforts. In the field of applied mathematics, it is extremely beneficial to have postdoctoral mathematicians also work closely in the teaching and learning aspects of the unit's efforts. The postdoctoral researchers help the unit significantly because they both teach undergraduate courses and advance the research quality of the unit. When these researcher/instructors leave to take new positions, they carry forward the excellence of the applied mathematics effort at the University of Colorado.

Unfortunately this will be the last year of the CCHE Program of Excellence. Due to budget shortfalls, the Colorado state legislature decided to terminate all excellence programs as of June 30, 2003. We hope that when the budget situation improves, the legislature will restore the funds in accord with the original grant agreement.

H. Outreach

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 2003 marks the fourth summer in which the Department of Applied Mathematics will offer 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. In addition to the three workshops which have been offered in the past (calculus, discrete mathematics, and probability/statistics), we will add a fourth class on middle-school algebra. This course is offered in conjunction with the School of Education. A total of 40 teachers have registered for the four workshops. Several of these teachers have taken past workshops. We believe that this indicates strong support for the program from Colorado's secondary math teachers. The workshops are supported with major funding from a supplement to the department's VIGRE grant (see §2G). Additional funding comes from the CCHE Excellence Grant (see §2G) and the CU-Boulder Outreach Committee.

In addition to the summer workshops, the Department has also begun a partnership with Boulder Valley School District (BVSD) to offer seminars specifically designed for BVSD teachers. The first such course was given during spring, 2002. This was followed by a statistics seminar in fall, 2002 and two calculus seminars in spring, 2003. A discrete mathematics seminar is planned for fall, 2003.

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:

- Success Institute Presentations in July, 2002 by Anne Dougherty, James Curry, and Kari Tenfjord.
- Engineering Open House, November 9, 2002. Presenters were Kristian Sandberg and Anne Dougherty.
- Women in Engineering Career Day programs for high school girls, November 9, 2002 and March 1, 2003. Presenters were Ryan Girard and Keith Wojciechowski.
- High School Honors Institute; July 28 through July 31, 2002. Presenters were Keith Julien, Saverio Spagnolie, Paul Mallowney, and Paul Kunicki.

I. Changes in Personnel

The Department of Applied Mathematics experienced several changes in personnel in 2002-03. The only regretful change was John Williamson's retirement in December, 2002. (This was regretful for the department, not for John.) John came to the University of Colorado in 1967, as Assistant Professor in the Department of Mathematics. He became Professor of Mathematics in 1979, and joined the Program in Applied Mathematics in 1991. He was our department's only probabilist for some years, and he helped to set up the (still growing) research group in statistics/probability. During John's long and interesting career, he taught high school in Minnesota, and he also taught in Zambia (1956-57), England (1972-73), Italy (1979-80), and France (1989-90). Many of us lucky enough to have worked with John were inspired by his impressive example. We wish him and Valerie well in their richly deserved retirements.

The group in statistics/probability that John helped to form added a new member in 2002-03: Philippe Naveau became Assistant Professor of Applied Mathematics in August 2002. Philippe's expertise is in extreme-value theory (*i.e.*, the statistics of rare events). Our other faculty members in statistics/probability are Jem Corcoran and Anne Dougherty. As this research group has grown, student demand for courses in statistics has grown even faster, so we have been consistently short-handed in this area. We hope to hire a senior statistician to lead this group as soon as budget constraints permit.

Meredith Betterton, who uses mathematical models to study processes in molecular biology, joined the department as Assistant Professor in January 2003. Her arrival fits nicely with the department's new graduate program in mathematical biology, jointly administered by APPM and MCDB (Molecular, Cellular and Developmental Biology). It also fits nicely with a campus-wide initiative to develop more scientific expertise in modern biology. This is an exciting new area of applied mathematics, and we are happy that Meredith will represent us in it.

Keith Julien, who first joined the department in 1997, was promoted to Associate Professor with tenure in 2003. Keith uses numerical computation and analysis to study problems in geophysical or astrophysical fluid dynamics. These subjects have widespread interest in Boulder, and Keith worked as a scientist at JILA (Joint Institute for Laboratory Astrophysics) and at NCAR (National Center for Atmospheric Research) before moving to APPM. Congratulations, Keith!

Finally, 2003 is the final year in which Harvey Segur is Chairman of the Department. He looks forward to more research, more teaching, and less administration. (And after three years as Chairman, he marvels that Mark Ablowitz survived the job for eleven years.) James Curry will become the next Chairman of Applied Mathematics, in July 2003. Best wishes, James.

3. FACULTY, RESEARCH ASSOCIATES, VISITORS, AND STAFF

A. Core Faculty and Research Associates

Mark J. Ablowitz, Professor; 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.

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

Cathy Bishop, Instructor (Summer 2003); M.S., University of Colorado, Computer Science, Software Development and Training.

Brian Bloechle, Postdoctoral Research Associate; PhD, University of Colorado at Boulder. Least-Squares Methods for Partial Differential Equations, Modeling of Reactive Transport Processes.

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

Vani Cheruvu, Postdoctoral Research Associate; PhD, I.I.T. Madras, India. Wavelets, Fast Numerical Algorithms.

Mark Copeland, Instructor; PhD, Clemson University. Computational Learning Theory.

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

Robert Cramer, Postdoctoral Research Associate; PhD, University of Colorado at Boulder. Numerical Analysis, Wavelets, Potential Theory

James H. Curry, Professor; PhD, University of California at Berkeley. Dynamical Systems, Numerical Methods, Nonlinear Equations.

Douraid Daly, Instructor (fall 2002); PhD, Paris IX, France. Dynamical Systems.

Maurice de Gosson, Instructor (summer 2003); PhD, Universite de Nice. Hamiltonian Mechanics and Symplectic Geometry.

Hans De Sterck, Postdoctoral Research Associate; PhD, K.U. Leuven, Belgium. Numerical Analysis, Plasma Astrophysics.

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.

Natasha Flyer, Postdoctoral Research Associate; PhD, University of Michigan, Ann Arbor. Numerical Analysis, Nonlinear Waves.

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

Reinhard Furrer, Instructor (spring 2003) and Postdoctoral Fellow at NCAR; PhD, Swiss Federal Institute of Technology at Lausanne, Switzerland. Statistics.

Jeffrey J. Heys, Postdoctoral Research Associate; PhD, University of Colorado at Boulder. Biomechanics, FOSLS, Modeling Elastohydrodynamics.

Boaz Ilan, Postdoctoral Research Associate; PhD, Tel Aviv University, Tel Aviv, Israel; Applied Mathematics, Nonlinear Optics, Nonlinear Waves.

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

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

Jeffrey T. Luftig, Senior Instructor, Leeds School of Business 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.

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.

Jamison Moeser, Postdoctoral Research Associate; PhD, Brown University. Partial Differential Equations and Applications to Optical Communications.

Martin Mohlenkamp, Postdoctoral Research Associate (through August, 2002); PhD, Yale University. Computational Harmonic Analysis, Non-linear PDEs and Cryptography.

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

Ziad Musslimani, Postdoctoral Research Associate; PhD, Technion – Israel Institute of Technology. Mathematical and Physical Applications of Solitons.

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

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

Panayotis Panayotaros, Postdoctoral Research Associate; PhD, University of Texas at Austin. Nonlinear Waves, Fluid Mechanics, Hamiltonian Dynamical Systems.

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

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

Jens Georg Schmidt, Postdoctoral Research Associate, left Fall 2002; PhD, University of Karlsruhe, Germany. FOSLS/FOSLL, Structural Mechanics, Fluid Flow, Electromagnetics.

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

Peter Staab, Instructor (summer 2003); PhD, University of Colorado at Boulder. Fluid Dynamics, PDE's, Numerical Analysis.

David Sterling, Instructor (spring 2003); PhD, University of Colorado at Boulder. Dynamical Systems.

Michael Spivey, Instructor (summer, fall, 2002); PhD, Princeton University. Operations Research.

John Williamson, Professor Emeritus (as of December 2002); 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.

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.

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.

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.

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), Numerical 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.

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

Patrick Weidman (Mechanical Engineering), Hydrodynamic stability, solitary waves and their interaction, counter-rotating 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, 2002-2003

Slava Akmaev, Genzyme, December 9, 2002.

Chris Arney, College of St. Rose, November 14-17, 2002.

Dave Bader, Pacific Northwest National Lab, April 11, 2003.

Neil Balmforth, University of California, Santa Cruz, April 3-6, 2003.

William Bottke, Southwest Research Institute, November 14, 2002.

Alberto Bressan, S.I.S.S.A., Trieste, Italy, November 16-18, 2002.

Russel Cafilisch, University of California, Los Angeles, November 20-23, 2002.

Marcus Calhoun-Lopez, Iowa State University, April 2-4, 2003.

John Carter, Seattle University, June 20 – July 3, 2002.

Ke Chen, University of Liverpool England, August 13-16, 2002.

Edmund Chiang, Hong Kong University of Science and Technology, January 23-28, 2003.

Craig DeForest, Southwest Research Institute, September 5, 2002.

Andrew Docherty, University of New South Wales, Sydney, Australia, April 1-September 30, 2003.

Holger Dullin Loughborough University, UK, June 2-7, 2003.

Loris Faina, University of Perugia, Italy, May 14-June 15, 2003.

George Fann, Oak Ridge National Lab (ORNL), Oak Ridge, TN, October 14-18, 2002.

Dave Farrelly, Utah State University, April 24, 2003.
M. Gregory Forest, University of North Carolina at Chapel Hill, January 16-20, 2003.
Aime Fournier, UCAR, academic year visitor.
Michel Grundland, University of Montreal, October 30-November 2, 2002.
Max Gunzburger, Florida State University, April 17-18, 2003.
Rod Halburd, Loughborough University, UK, April 1-3, 2003.
Robert Harrison, Oak Ridge National Lab (ORNL), Oak Ridge, TN, October 14-18, 2002.
Laurie Heyer, Davidson College, December 9, 2002.
Daniel Hodyss, University of California, Davis, February 27-March 2, 2003.
Edgar Knobloch, University of Leeds, UK, June 1-30, 2003.
Tamara Kolda, Sandia National Labs, Livermore, CA, October 2, 2002.
Martin Kruskal, Rutgers University, August 28-September 02, 2002.
Jongwoo Lee, Kwangwoon University, Seoul, South Korea, August 1-23, 2002, January 13 - February 8, 2003.
Oren Livne, Stanford University, March 16-21, 2003.
Irakli Loladze, Princeton University, April 17-20, 2003.
Martin Mohlenkamp, Ohio University, December 4-17, 2002.
Christopher Newman, Virginia Tech and Sandia National Laboratories, April 21-22, 2003.
Monika Nitsche, University of New Mexico, February 28, 2003.
George Papanicolaou, Stanford University, April 24, 2003.
Barbara Prinari, Universite de Lecce, Italy, October 9-26, 2002, and April 11-May 11, 2003.
Naoki Saito, University of California, Davis May 4-6, 2003.
Scott Sarra, West Virginia University, April 2-4, 2003.
Mordechai Segev, Technion-Israel Institute of Technology and Princeton University, May 30-June 1, 2003.
Richard L. Smith, University of North Carolina, June 5, 2003
Michael Taksar, University of Missouri, Columbia, April 3, 2003.
David Trubach, U.S. Military Academy, West Point, N.Y., May 6-12, 2003.
Divakar Viswanath, University of Michigan, February 7, 2003.
Michael Weinstein, Bell Labs, January 21-23, 2003.

D. Staff and Professional Research Assistants

Laurie Conway, Student Coordinator

Bruce Fast, Systems Administrator

Victoria Fernandez, Accounting Technician/Faculty Coordinator

Katy Gryboski, Outreach Coordinator (since January, 2003)

Jan Kaufman, Office Coordinator

Catherine Larkins, Office Manager

Kari Tenfjord, Professional Research Assistant (through September 2002)

Sichia Bell (since January 2003), **Aurore Loranger** (through December 2002), and **Moriah Waterland**, part-time student assistants

4. WEEKLY COLLOQUIA and SEMINARS 2002-2003

A. Applied Mathematics Colloquium, 2002-2003

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.

Francois G. Meyer, Electrical and Computer Engineering, University of Colorado at Boulder, September 6, 2002, "Representation of Textured Images."

Tom Rutherford, Economics, University of Colorado at Boulder, September 13, 2002, "The Nonlinear Complementarity Problem and Its Application in Economics."

Xiao-Chuan Cai, Computer Science, University of Colorado at Boulder, September 20, 2002, "Two-level Nonlinear Additive Schwarz Preconditioned Inexact Newton Algorithms and Applications."

Stephen Thomas, Scientific Computing Division, National Center for Atmospheric Research, Boulder, CO, September 27, 2002, "Semi-Implicit Spectral Element Dynamical Core for Atmospheric General Circulation Models."

Tamara Kolda, Sandia National Labs, Livermore, California, Thursday, October 3, 2002, "An Asynchronous and Fault-Tolerant Pattern Search Method for Science and Engineering Optimization Applications." (co-sponsored with Computer Science)

Rob Knight, MCDB, University of Colorado at Boulder, October 4, 2002, "How Mutation Affects Genes and Genomes."

Robert Harrison, University of Tennessee/ORNL, October 18, 2002, "The Rise and Fall of the Gaussian Hegemony."

Karl Reinig, Center for Human Simulation, University of Colorado Health Sciences, October 25, 2002, "Counting on the Visible Human."

Jens Georg Schmidt, Department of Applied Mathematics, University of Colorado at Boulder, November 1, 2002, "Least-Squares Finite Element Methods for Elliptic Boundary Value Problems with Irregular Solutions."

Mary C. Hill, U.S. Geological Survey, November 8, 2002, "Guidelines for Effective Model Calibration (Any Model!)"

Chris Arney, Dean of the School of Mathematics and Sciences, College of St. Rose, Albany, N.Y., November 15, 2002, "Math Modeling: Applying Mathematics and Creativity to Problem Solving and More."

Alberto Bressan, S.I.S.S.A., Trieste, Italy, Monday, November 18, 2002, "Some Open Problems in the Theory of Conservation Laws."

Russel Caflisch, Department of Mathematics, UCLA, November 22, 2002, "Modeling and Simulation for Epitaxial Growth."

Martin Mohlenkamp, Mathematics Department, Ohio University, December 6, 2002, "An Attack on the Curse of Dimensionality."

M. Gregory Forest, University of North Carolina at Chapel Hill, Professor of Mathematics and Chair of Applied Mathematics, Co-Director of UNC-CH Institute of Advanced Materials, January 17, 2003, "Laminar Flows of Nematic Polymers: Issues Critical to High-Performance Materials."

Dave Wineland, NIST Time and Frequency Division, Boulder, CO, January 24, 2003, "Quantum Computation and Schroedinger's Cat."

Alex Goetz, CIRES and Department of Geological Sciences, January 31, 2003, "Spectral Remote Sensing, the Challenge of High Dimensionality and Data Inundation."

Divakar Viswanath, University of Michigan, February 7, 2003, "Symbolic Dynamics for the Lorenz Attractor and for a Resonance in the Solar System."

Kurt Maute, Center for Aerospace Structures, Department of Aerospace Engineering Sciences, February 21, 2003, "About Non-convex Functionals, Holes and Aircrafts or Topology Optimization for Non-linear Aeroelastic Fluid-Structure-Interaction Problems."

Monika Nitsche, University of New Mexico, Department of Mathematics and Statistics, February 28, 2003, "Evolution of Disturbances on Separate Pycnoclines."

Richard Byrd, Computer Science Department, University of Colorado at Boulder, March 7, 2003, "An Algorithm for General Constrained Optimization based on Successive Linear Programming."

Osama Mukdadi and Robin Shandas, Department of Mechanical Engineering, University of Colorado at Boulder, March 14, 2003, "Development of a Non-Intrusive Particle Image Velocimetry System for Opaque Flows: Modeling and Experiment."

Charbel Farhat and Marion Chandesris, Department of Aerospace Engineering Sciences, University of Colorado at Boulder, March 21, 2003, "Time-Decomposed ODE Integrators for Massively Parallel Time-Dependent PDE Solvers."

Neil Balmforth, University of California at Santa Cruz, April 4, 2003, "Coarsening."

Dave Bader, Pacific Northwest National Lab, visiting scientist at NCAR, April 11, 2003, "A Perspective on the Future of Climate Model Research in the United States."

Max D. Gunzburger, Florida State University, April 18, 2003, "Centroidal Voronoi Tessellations: Algorithms and Applications."

George C. Papanicolaou, Department of Mathematics, Stanford University, April 24, 2003, "Communications and Remote Sensing in Cluttered Media."

B. Seminars in Applied Mathematics, 2002-2003

The Department maintained the Applied Mathematics Seminar, a weekly seminar series on Thursday afternoons at 4:00 p.m. Each Thursday we used the Physics seminar room G-1B31 and had refreshments on the 11th floor of Duane Physics. We are grateful to the Physics department for allowing us to use their facilities. A list of visiting speakers and the titles of their talks follows:

Martin Kruskal, Mathematics Department, Rutgers University, August 29, 2002, "Surreal Numbers - A New Number System for the New Millennium."

Craig DeForest, Southwest Research Institute, September 5, 2002, "Fluxons: A New Approach to Magnetic Field Modeling." (Joint with Dynamical Systems Seminar)

Boaz Ilan, Department of Applied Mathematics, University of Colorado at Boulder, September 12, 2002, "Self-Focusing and Multiple Filamentation of Circularly Polarized Beams."

Jamison Moeser, Department of Applied Mathematics, University of Colorado at Boulder, September 19, 2002, "Higher Order Dispersion Managed Solitons."

Bengt Fornberg, Department of Applied Mathematics, University of Colorado at Boulder, September 24, 2002, "Some New Time Stepping Methods for the 3-D Maxwell's Equations." (Joint with Fast Algorithms Seminar)

Tamara Kolda, Sandia National Labs, Livermore, California, October 3, 2002, "An Asynchronous and Fault-Tolerant Pattern Search Method for Science and Engineering Optimization Applications." (Joint with Computer Science)

Simon Tavener, Colorado State University, October 22, 2002, "The Effect of Cylinder Rotation on Vortex Shedding." (Joint with Fast Algorithms Seminar)

Michel Grundland, Centre de Recherche de Montreal, University de Montreal, Canada, October 31, 2002, "Weierstrass Representations for Constant Mean Curvature Surfaces in Multi-Dimensional Spaces."

Russel Caffisch, Department of Mathematics, University of CA, Los Angeles, November 21, 2002, "Dynamics of Step Edges in Thin Film Growth."

Michael Weinstein, Fundamental Mathematics Research Department, Bell Laboratories, Lucent Technologies, Murray Hill, N.J., January 23, 2003, "Resonance Problems in Photonics."

Michael Taksar, Department of Mathematics, University of Missouri, Columbia, April 3, 2003, "Singular Stochastic Control and Related PDE with Gradient Constraints in Portfolio Optimization Models in Mathematical Finance."

Irakli Loladze, Mathematics Dept., Princeton University, Research Associate, April 17, 2003, "Elemental Dynamics Across Scales: From Models of Plankton to the Effects of Elevated CO₂ on Humans."

Barbara Prinari, University of Lecce, Italy, May 1, 2003, "Discrete Vector NLS Solitons and Soliton Interactions."

Mordechai Segev, Technion, Israel and Princeton University, May 30, 2003, "Solitons: Self-Localized Wavepackets Behaving Like Particles."

C. University of Colorado at Boulder/University of Colorado at Denver/Colorado School of Mines Joint Seminar in Computational Mathematics, 2002-2003

The Joint CU-Boulder/CU-Denver/CSM Computational Math Seminar continued the expanded form of last year, with the regular lecture on Tuesdays at 12:00 preceded by three hours of open discussion, with the location alternating between Denver, Golden, and Boulder. There were typically 20 or more faculty, students, and visitors from the three campuses attending the open discussions and regular lectures. A list of the CU-Boulder speakers and the titles of their talks follows:

Henry Tufo, Computer Science, University of Colorado at Boulder, September 10, 2002, "Terascale Spectral Element Algorithms and Implementations."

Hans De Sterck, Department of Applied Mathematics, University of Colorado at Boulder, October 1, 2002, "Least-Squares Finite Element Methods for Hyperbolic PDEs."

Dan Connors, Engineering, University of Colorado at Boulder, November 5, 2002, "Overview of Itanium Architecture Features."

Greg Poulos, Colorado Research Associates, December 3, 2002, "CASES-99: Intermittent turbulence sources and parameterization errors."

Jean Hertzberg, Department of Mechanical Engineering, University of Colorado at Boulder, February 4, 2003, "Modeling of Mitral Flow Data."

Christine Hrenya, University of Colorado at Boulder, Chemical Engineering, March 4, 2003, "On the Use of Computational Tools to Investigate the Flow Behavior of Particulate Systems."

Meredith Betterton, Department of Applied Mathematics, University of Colorado at Boulder, April 8, 2003, "DNA Enzyme-interactions: Modeling and Computational Possibilities."

D. Dynamical Systems Seminars, 2002-2003

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

Scott Parker, Department of Physics, University of Colorado at Boulder, August 29, 2002, "Kinetic Closure in Plasma Physics: An Applied Math/Computational Challenge."

Craig DeForest, Southwest Research Institute, September 5, 2002, "Fluxons: An New Approach to Magnetic Field Modeling."

Jamison Moeser, Department of Applied Mathematics, University of Colorado at Boulder, September 19, 2002, "Higher Order Dispersion Managed Solitons."

Cristina Perez, Department of Applied Mathematics, University of Colorado at Boulder and PAOS, September 26, 2002, "Simulating the Interaction Between Intraseasonal and Internannual Variability in the Tropical Pacific with a Conceptual Model."

R. Saravanan, NCAR and CGD, October 3, 2002, "Stochastic Models of Atmosphere-Ocean Interaction."

Brian Bloechle, Department of Applied Mathematics, University of Colorado at Boulder, October 24, 2002, "On the Influence of Irreversible Surface Reactions on Taylor Dispersion in a Parallel-Plate Channel."

Glen Stewart, University of Colorado at Boulder and LASP, October 31, 2002, "Diffusion Up Density Gradients in Planetary Rings."

Patrick Weidman, Department of Mechanical Engineering, University of Colorado at Boulder, November 4, 2002, "Gravitational Oscillations in a Capped Liquid-Air Column."

William Bottke, Southwest Research Institute, November 14, 2002, "The Dynamical Evolution of Asteroids and Meteoroids Via Yarkovsky Thermal Forces."

Juliana Oprea, Department of Mathematics, Colorado State University, November 21, 2002 "Dynamics of the Convective Dynamo in spherical Geometry: an Intermediate Model."

Neil Burrell, Derin Wysham, Department of Applied Mathematics, University of Colorado at Boulder, December 5, 2002, "Dynamics of a Quasigeostrophic Ellipsoidal Vortex Moment Model" and "Numerical Method to Determine Behavior Normal to an Invariant Curve."

Adriana Gomez, Paul MULLOWNEY, Department of Mathematics and Department of Applied Mathematics, University of Colorado at Boulder, December 10, 2002, "Reversibility in the Group of Polynomial Automorphisms." and "Blinking Rolls: Chaotic Advection in a 3D Flow with an Invariant."

Michael Weinstein, Fundamental Mathematics Research Department, Bell Laboratories, Lucent Technologies, Murray Hill, NJ, January 23, 2003, "Resonance Problems in Photonics."

Panos Panayotaros, Department of Applied Mathematics, University of Colorado at Boulder, January 30, 2003, "Birkhoff Normal Forms in the Periodic DMNLS Equation."

Meredith Betterton, Department of Applied Mathematics, University of Colorado at Boulder, February 6, 2003, "Opening of DNA by Helicases, Part 1."

Meredith Betterton, Department of Applied Mathematics, University of Colorado at Boulder, February 13, 2003, "Opening of DNA by Helicases, Part 2."

John Hart, Department of Physics, University of Colorado at Boulder, February 20, 2003, "Flow Instabilities in the Presence of Magnetic Gravity."

Daniel Hodyss, University of California, Davis, February 27, 2003, "Solitary Rossby Waves in Zonally Varying Atmospheric Flow."

Srinath Vadlamani and **Mark Petersen**, March 6, 2003, "The Nonlinear Ion-Temperature Gradient Instability and Verification of the Intermediate Quasi-Geostrophic Model."

James Meiss, Department of Applied Mathematics, University of Colorado at Boulder, March 13, 2003, "Volume Preserving Mappings: A Few Answers and Many Questions."

Tom Perkins, JILA and MCDB, University of Colorado at Boulder, March 20, 2003, "Watching Single Molecules Move Along DNA."

Dmitri Veras, LASP, April 10, 2003, "Outward Migration of Extrasolar Planets to Large Orbital Radii due to Gravitational Scattering."

Jim Howard, CIPS, April 17, 2003, "Dust Dynamics near Jupiter."

Dave Farrelly, Utah State University, April 24, 2003, "Chaos Assisted Capture of Irregular Moons and Kuiper-Belt Binary Formation (and what on Earth does this have to do with Chemistry?)."

Edgar Knobloch, Department of Applied Math, University of Leeds, June 19, 2003, "Dynamics near the 1:2 Spatial Resonance."

E. Fast Algorithms Seminars, 2002-2003

Bengt Fornberg, Department of Applied Mathematics, University of Colorado at Boulder, September 24, 2002, "Some New Time Stepping Methods for the 3-D Maxwell's Equations."

Simon Tavener, Colorado State University, October 22, 2002, "The Effect of Cylinder Rotation on Vortex Shedding."

F. Probability and Statistics Seminars, 2002-2003

Reinhard Furrer, Department of Applied Mathematics, University of Colorado at Boulder and Geophysical Statistics Project National Center for Atmospheric Research, October 30, 2002, "Covariance Functions and Nonstationary Processes."

Mike Spivey, Department of Applied Mathematics, University of Colorado at Boulder, November 12, 2002, "The Dynamic Assignment Problem."

Philippe Naveau, Department of Applied Mathematics, University of Colorado at Boulder, November 20, 2002, "Two Statistical Methods for Improving the Analysis of Large Climatic Data Sets: General Skewed Kalman Filters and Distributions of Distributions."

Matt Pocernich, Research Applications Group, National Center for Atmospheric Research, December 4, 2002, "Application of Extreme Value Theory and Threshold Models to Hydrological Events."

Claudia Tebaldi, Research Applications Program, National Center for Atmospheric Research, December 11, 2002, "Probabilistic assessment of regional climate change. Reconciling different general circulation models' predictions by a Bayesian analysis."

François Meyer, Electrical and Computer Engineering, University of Colorado at Boulder, January 22, 2003, "Wavelet Based Estimation of a Semi Parametric Model of Brain Imaging Time-Series."

Reinhard Furrer, Geophysical Statistics Project, National Center for Atmospheric Research and Department of Applied Mathematics, University of Colorado at Boulder, January 29, 2003, "State-Space Decomposition of Geostatistical Processes."

Jem Corcoran, Department of Applied Mathematics, University of Colorado at Boulder, February 19, 2003, "Empirical Likelihood Based Hypothesis Testing."

Marcio Carvalho, Department of Applied Mathematics, University of Colorado at Boulder, February 26, 2003, "An Analysis of the Implementation of Head of the Line Priority in an M/M/1 Queue."

Jan Hannig, Department of Statistics, Colorado State University, March 4, 2003, "Integrated Brownian motions, Laplace transforms of $\$L_2\$$ ball and Exact $\$L_2\$$ -small balls."

Richard L. Smith, University of North Carolina, June 5, 2003, "The Statistics of Extremes."

G. Mathematical Biology Reading Group, 2002-2003

Meredith Betterton, "Basics of Statistical Mechanics, Part 1", June 3, 2003.

Meredith Betterton, "Basics of Statistical Mechanics, Part 2", June 10, 2003.

Betsy Siewert, "Crash Course: Proteins", June 17, 2003.

Ziad Musslimani, "Crash Course: DNA", June 24, 2003.

H. Undergraduate and Graduate Seminars, 2002-2003

SIAM Undergraduate Seminars:

Scott MacLachlan, "A Brief Tour of Computational Mathematics", October 17, 2002.

Chris Arnie, Dean of the School of Mathematics and Sciences, College of St. Rose, Albany, N.Y., "Math Modeling: Applying Mathematics and Creativity to Problem Solving and More", November 15th, 2002.

Darin Gillis and Patrick Simek, "An Overview of MVT and the DU/CU Collaboration", January 30, 2003.

Tim Flora and Diana Mann of Ball Aerospace, "Deep Impact and Other Space Exploration Projects at Ball", February 27th, 2003.

Modeling Presentations, SIAM Award Winning team (Outstanding Designation) **Darin Gillis, Aaron Windfield, & Dave Lindstone**; (Meritorious Designation) **Alejandro Cantarero, Corry Lee, and Moorea Brega**; (Honorable Mention) **Kimiko Kano, Ian Derrington, and Joseph Carrafa**, April 10th, 2003.

VIGRE Presentations (Round One), **Jocelyn Renner**, "Mathematical Model of Dispersion Using Lyapunov Exponents", **Josh Nolting**, "Exploring and Implementing Finite Element Methods", **Michael Franklin**, "Image DeNoising using Nonlinear Total Variation & Anisotropic Heat Diffusion", April 17, 2003.

VIGRE Presentations (Round Two), **Moorea Brega** and **Alejandro Cantarero**, "Image Segmentation using Active Contours", **Kristie Henderson** and **Hilary Snyder**, "Scott the Baker", **Ian Derrington** and **Patrick Hoffman**, "Computational Aspects of PDE's", April 24, 2003.

Graduate Seminars:

Mark Petersen, "Navier and Stokes: Who are These Guys, Anyway?", October 2, 2002.

5. FACULTY SERVICE TO THE UNIVERSITY, DEPARTMENT AND SOCIETIES, CALENDAR YEAR 2002

Mark Ablowitz:

- Reviewer for: NSF Grants, Hong Kong, China Grants, Kuwait University Graduate School.
- Reviewer for journals: *Physical Review Letters*, *Journal of Engineering Math*, *Physical Review E*, *Optical Society of America: Optics Letters*, *Journals of the Optical Society of America*.
- Coordinating Editor of *Proceedings of the American Mathematical Society-Applied Mathematics*.
- Editor of *Journal of Engineering Mathematics*, *Cambridge University Press Texts in Applied Mathematics*, and *Studies in Applied Mathematics*.
- Member of APPM Undergraduate Committee.

Gregory Beylkin:

- Consultant for Pacific Northwest National Laboratory.
- Consultant for Fast Mathematical Algorithms and Hardware, Corp.
- Consultant for GeoEnergy, Inc.
- Member of the Graduate Committee.
- Colloquium organizer.
- Member of APPM Hiring Committee.
- Member of the Advisory Editorial Board of Applied and Computational Harmonic Analysis.
- Mentor to 5 postdoctoral fellows.

Jem Corcoran:

- Co-organizer of departmental colloquium series.
- Member of faculty search committee.
- Book reviewer for the *Journal of the American Statistical Association*.
- Referee for the *European Journal of Applied Signal Processing*.
- Thesis advisor for 2 PhD students.

James Curry:

- Member of the Ford Foundation Fellows conference planning committee.
- Chair of the AMS regional selection committee.
- Serve on the AMS Committee on Academic Freedom, Tenure, and Employment Security (CAFTEs).
- Manage the Afro-Americans in the Mathematical Science listserv.
- Reviewed numerous NSF proposals related to the Math Science Partnership, STEM activities and education proposals for CREST.

- Associate Editor of the *MAA Monthly Journal*.
- Member of the Department PRP team.

Anne Dougherty:

- Associate Chair for the Department of Applied Mathematics.
- Member of Applied Math's PRP Committee.
- Faculty advisor for the CU Boulder SIAM (Society for Industrial and Applied Mathematics) undergraduate chapter.
- Probability and Statistics prelim committee member.
- Undergraduate committee member and undergraduate faculty advisor for Applied Math.
- Wrote an article on the Dept. of Applied Mathematics for CU Engineering 2002 magazine.
- Organized Applied Math's participation in several Engineering College programs: Engineering Orientation August 21-23, 2002; Engineering Open House, November 9, 2002; Women in Engineering Career Days programs, March 2, 2002.
- Applied Math's representative to the Engineering Academic Council.
- Actuarial certificate committee member.
- CU campus representative for Goldwater Scholarship.
- Coordinator, along with James Curry, of the calculus portion of the CU-Dillard Educational Technology partnership.
- Online tutoring coordinator for the Department of Applied Mathematics.
- Outreach activity: Organized three 2-credit, two-week professional development classes for 39 high school teachers, July, 2002.
- Outreach activity: APPM/BVSD Partnership - Organized 2 seminars for Boulder Valley School District middle and high school teachers of mathematics.
- Organized three teams to participate in the international 2002 Mathematical Contest in Modeling.
- Faculty Coordinator for GEEN 1350 and 1360.

Bengt Fornberg:

- Member of the Undergraduate Committee and advisor for freshmen and 5th year seniors.
- Regularly reviewed proposals for NSF and its counterpart in some other countries (e.g. South Africa, Singapore, Hong Kong).
- Refereed about a dozen articles for various journals as well as a book review for a publisher.
- Serving 3 year appointment on an NSF panel for awarding Postdoctoral Fellowships in the Mathematical Sciences.
- Supervised one postdoctoral fellow.

Keith Julien:

- Department of Applied Mathematics Undergraduate Committee member.
- Dynamical Systems Faculty Search Committee.
- APPM Transfer Credit Advisor.
- Member and Chair of Department's Computer Committee.
- Member of Graduate Committee.
- Faculty committee member for EEF (Engineering Excellence Fund).
- Member of Arts and Sciences Council.
- Member of Arts and Sciences Budget Subcommittee.
- Organizing member of High School Honors Institute (July 2002).
- Reviewer for *Journal of Fluid Dynamics*.
- Grant Peer Review. *NSF Oceanography*.
- Reviewer for Journal Article in *Solar Physics*.
- 2002 APPM advisor for Undergraduate Seniors.
- Joint Advisor for four PhD candidates.

Congming Li:

- Member of the Graduate Committee, 2002.
- Member of Hiring Committee.
- Reviewed papers for many professional journals.
- Reviewed grants for NSF.
- Editor: *Communication on Pure and Applied Analysis*.

Tom Manteuffel:

- President Society of Industrial and Applied Mathematics.
- Member of the Joint Policy Board for Mathematics.
- Consulting Activities: Dolphine Medical and Lawrence Livermore National Laboratory.
- Department Computational Math Prelim Committee member, spring 2002.
- Colloquium Committee, spring 2002.
- Graduate Committee member, fall 2002.
- Hiring Committee member, fall 2002.
- Associate Editor: *Electronic Transactions in Numerical Analysis*.
- Editorial board: *Numerical Linear Algebra and Applications*.
- Associate Editor: *SIAM Journal on Numerical Analysis*.
- Reviewed proposals for DOE and NSF.
- Reviewed papers for *Numerical Methods for Partial Differential Equations*, *SIAM Journal on Scientific Computing*, and *SIAM Journal on Numerical Analysis*.
- Co-Chair: Copper Mountain Conference on Multigrid Methods, Copper Mountain, CO, March 24-29, 2002.
- Organizer: Workshop on Least-squares Finite-element Methods, Oberwolfach, Germany, June 14, 2002.
- Principal advisor for three graduate students.

Steve McCormick:

- IMACS Conference Committee on CFD.
- Consulting Activities: Lawrence Livermore National Lab.
- Computing Committee.
- Comp Math Prelim Committee.
- Applied Math Program Review Committee.
- 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.
- Co-Chair: 8th Copper Mountain Conference on Multigrid Methods, Copper Mountain, CO, March 24-29, 2002.
- Chair, AMG and FOSLS Summits, Lake City, CO, September 25-29.
- Principal advisor for three graduate students.

James Meiss:

- Letters of Reference for Colleagues for Tenure at 2 Universities.
- SIAM Dynamical Systems Activity Group Web site moderator for the "Dynamics Thesaurus" Web site.
- VIGRE review panel for proposal to the National Science Foundation, Sept. 19-20, 2002.
- Reviewer for 4 proposals for the National Science Foundation.
- VIGRE conference presenter, May 3-5, 2002, Reston, VA.
- Chair of the VIGRE activities in the Department, including organizing the successful review that led to the renewal of our VIGRE Grant for 2 additional years. Also keeping track of the VIGRE budget for five postdoctoral fellows, twelve graduate fellows, and 10-12 undergraduate research associates.
- Chair Hiring Committee: VIGRE postdoctoral Fellowships.

- Preliminary Examination Committee - write and grade the PDE preliminary exam for MS and PhD students, January and August, 2002.
- Graduate Committee – Graduate applications and vetting.
- Associate Chair for Graduate Studies, Advisor for 1st and 2nd year students.
- Member of Dean’s Committee on Promotion and Tenure.
- Center for Integrated Plasma Studies, Fellow.
- Colorado Center for Chaos and Complexity, Fellow.
- Associate Editor for *SIAM Journal on Applied Dynamical Systems*.
- Reviewer for *Physical Review E*, *Physica D*, *AIP Journal Chaos, Discrete and Continuous Dynamical Systems – B*, *Journal of Physics A*, and *Physical Review Letters*.
- Principal Advisor for four graduate students.
- Reviewer of Book Proposal for Princeton University Press.
- Reviewer of a proposal for the Chilean Science Foundation, FONDECYT.

Phillipe Naveau:

- Elected member of the “Bureau Environnement de la Societe Francaise de Statistique” – a society to promote the use and the development of innovative statistical methods.
- Advisor for two graduate students.

Harvey Segur:

- Chairman of the Department of Applied Mathematics.
- Chairman of hiring committee in statistics/probability (2001-02).
- Member of hiring committee in mathematical biology (2001-02).
- Chairman of hiring committee in analysis (2002-03).
- Chairman of PRP committee.
- Chairman of Tenure/promotion committee for Keith Julien.
- Chairman of Comprehensive review committee for Jem Corcoran.
- Chairman of Evaluation committee for Anne Dougherty.
- Member of VIGRE committee.
- Member of NSF panel on PDE’s – February 2002.
- Member of NSF panel on IGERT grants – May 2002.
- Reviewer for *Physical Review Letters*, *Journal of Phys. Oceanography*, *Physics Letters A*, *Applied Mathematics Letters*.

6. TEACHING ACTIVITIES

6A. Courses Taught by Department Faculty, Academic Year 2002-2003

(i) Undergraduate Courses

APPM 1350	<i>Copeland, Heys, Li, Norris, Spivey, Westphal</i> , Calculus I for Engineers
APPM 1360	<i>Carvalho, Curry, Moeser, Copeland, Sterling</i> , Calculus 2 for Engineers
APPM 2350	<i>Dougherty, Flyer, Moeser, Musslimani, Norris</i> , Calculus 3 for Engineers
APPM 2360	<i>Bloechle, Julien, Ilan, Meiss, Musslimani</i> , Introduction to Linear Algebra & Differential Equations

APPM 2380	<i>Julien, Morgenthaler (Professor, Aerospace Engineering),</i> Introduction to Ordinary Differential Equations
APPM 2450	<i>Beltran del Rio, Girard, Kunicki, Sheehan,</i> Calculus 3: Computer Lab
APPM 2460	<i>Brannon, Nabity, Tearle,</i> Differential Equations: Computer Lab
APPM 2480	<i>Brannick,</i> Intro to O.D.E. Lab
APPM 2710	<i>Copeland,</i> JAVA 1 Training and Mathematical Algorithms
APPM 2750	<i>Norris,</i> JAVA 2 Training and Mathematical Algorithms
APPM 3010	<i>Meiss,</i> An Introduction to Nonlinear Systems: Chaos
APPM 3050	<i>Flyer,</i> An Introduction to Symbolic and Numerical Computation
APPM 3310	<i>Betterton, Cramer, Panayotaros,</i> Matrix Methods and Applications
APPM 3570	<i>Dougherty,</i> Applied Probability
APPM 4120	<i>Bloechle,</i> Introduction to Operations Research
APPM 4350	<i>Curry,</i> Methods in Applied Mathematics: Fourier Series and Boundary Value Problems
APPM 4360	<i>Panoyataros,</i> Methods in Applied Mathematics: Complex Variables and Applications
APPM 4380	<i>Fornberg,</i> Modeling in Applied Mathematics
APPM 4520	<i>Holley (Professor, Mathematics),</i> Introduction to Mathematical Statistics
APPM 4540	<i>Kuznetsov (Professor, Mathematics),</i> Introduction to Time Series
APPM 4560	<i>Dougherty,</i> Introduction to Probability Models
APPM 4570	<i>Corcoran, Daly, Furrer, Naveau,</i> Statistical Methods
APPM 4580	<i>Luftig (Senior Instructor, Leeds School of Business),</i> Statistical Methods for Data Analysis
APPM 4650	<i>Julien, Taylor (Professor, Mathematics),</i> Intermediate Numerical Analysis I
APPM 4660	<i>Beylkin,</i> Intermediate Numerical Analysis II
APPM 4840	<i>Curry,</i> Independent Study

(ii) Graduate Courses

APPM 5120	<i>Bloechle,</i> Operations Research
APPM 5350	<i>Curry,</i> Methods in Applied Mathematics: Fourier Series and Boundary Value Problems
APPM 5360	<i>Panayotaros,</i> Methods in Applied Mathematics: Complex Variables
APPM 5380	<i>Fornberg,</i> Modeling in Applied Mathematics
APPM 5430	<i>Ablowitz,</i> Methods in Applied Mathematics: Applications of Complex Variables
APPM 5440	<i>Li,</i> Applied Analysis 1

APPM 5450	<i>Li</i> , Applied Analysis 2
APPM 5470	<i>Segur</i> , Methods in Applied Mathematics 3: Partial Differential Equations
APPM 5480	<i>Fornberg</i> , Approximation Methods
APPM 5520	<i>Holley (Professor, Mathematics)</i> , Introduction to Mathematical Statistics
APPM 5540	<i>Kuznetsov (Professor, Mathematics)</i> , Introduction to Time Series
APPM 5560	<i>Dougherty</i> , Introduction to Probability Models
APPM 5570	<i>Corcoran, Daly, Furrer, Naveau</i> , Statistical Methods
APPM 5580	<i>Luftig (Senior Instructor, Leeds School of Business)</i> , Statistical Applications Software and Methods
APPM 5600	<i>Manteuffel</i> , Numerical Analysis 1
APPM 5610	<i>Fornberg</i> , Numerical Analysis 2
APPM 7400	<i>Beylkin, Corcoran, Dougherty, Flyer, Luftig, McCormick, Manteuffel, Naveau</i> , Seminar—special topics
APPM 8000	<i>Beylkin, Heys</i> , Colloquium
APPM 8100	<i>Ablowitz, Musslimani</i> , Seminar - Nonlinear Equations
APPM 8100	<i>Julien, Meiss</i> , Seminar - Dynamical Systems
APPM 8100	<i>Corcoran</i> , Seminar – Probability/Statistics
APPM 8200	<i>Manteuffel, McCormick</i> , Seminar--Computational Mathematics

B. Summer Courses, 2003

APPM 1350	<i>Girard</i> , Calculus I for Engineers
APPM 1360	<i>Vadlamani</i> , Calculus II for Engineers
APPM 2350	<i>Staab</i> , Calculus III for Engineers
APPM 2360	<i>Mullowney, Spagnolie</i> , Intro. Linear Algebra and Differential Equations
APPM 2450	<i>Hill</i> , Calculus III: Computer Lab
APPM 2460	<i>Wysack</i> , Differential Equations: Computer Lab
APPM 2710	<i>Bishop</i> , JAVA I
APPM 2750	<i>Norris</i> , JAVA II
APPM 4650	<i>Norris</i> , Introduction to Numerical Analysis I
APPM 4720/5720	<i>de Gosson</i> , Topics in Applied Math: Geometry and Mechanics
APPM 5040	<i>Norris</i> , Calculus Applications for High School Teachers
APPM 5050	<i>Monzon</i> , Discrete Math for K-12 Teachers
APPM 5070	<i>Biesterfeld</i> , Applied Statistics for High School Teachers

7. RESEARCH ACTIVITIES FOR CALENDAR YEAR 2002

A. Research Publications for Calendar Year 2002

Mark Ablowitz

"Methods for Discrete Solitons in Nonlinear Lattices", M. J. Ablowitz, Z. Musslimani, and G. Biondini, *Physical Review E* 65 (2002) 026602-1-4.

"Intrachannel Pulse Interactions in Dispersion-Managed Transmission Systems: Energy Transfer", M. J. Ablowitz & T. Hirooka, *Optics Letters* 27 (2002) 201-203.

"Managing Nonlinearity in Strongly Dispersion-Managed Optical Pulse Transmission", M. J. Ablowitz & T. Hirooka, *JOSAB* 19 (2002) 425-439.

"On Timing Shifts in Dispersion-Managed Soliton Systems", M. J. Ablowitz, A. Biswas, A. Docherty, T. Hirooka, G. Biondini, & S. Chakravarty, *Optics Letters* 27 (2002) 318-320.

"Suppression of Intrachannel Dispersion-Managed Pulse Interaction by Distributed Amplification", T. Hirooka & M. J. Ablowitz, *IEEE Photonics Technology Letters* 14 (2002) 316-318.

"Analysis of Timing and Amplitude Jitter Due to Intrachannel Dispersion-Managed Pulse Interaction", T. Hirooka and M. J. Ablowitz, *IEEE Photonics Technology Letters* 12 (2002) 633-635.

"Discrete Vector Spatial Solitons in a Nonlinear Waveguide Array", M. J. Ablowitz & Z. Musslimani, *Physical Review E* 65 (2002) 056618-1-13.

"Resonant Intrachannel Pulse Interactions in Dispersion-Managed Transmission Systems", M. J. Ablowitz & T. Hirooka, *IEEE Journal on Selected Topics in Quantum Electronics* 8 (2002) 603-615.

"Higher Order Asymptotic Analysis of Dispersion-Managed Transmission Systems: Solitons and Their Characteristics", M. J. Ablowitz, T. Hirooka & T. Inoue, *J. Opt. Am. B* 19 (2002) 2876-2885.

"Chaotic Dynamics in Nonlinear Waves: Computational and Physical", M. J. Ablowitz & C. M. Schober, *Collected Lectures on the Preservation of Stability Under Discretization*, Eds: D. Estep & S. Tavener (2002) SIAM, Phila.

"Managing Nonlinearity in Strongly Dispersion Managed Optical Pulse Transmission", M. J. Ablowitz & T. Hirooka, *Technical Digest, OSA Conference Nonlinear Optics: Materials, Fundamentals and Applications*, 2002.

"The Cauchy Problem for the Kadomtsev-Petviashvili II Equation with Non-Decaying Data Along a Line", J. Villarroel & M. J. Ablowitz, *Stud. Appl. Math* 109 (2002) 151-162.

Gregory Beylkin

"Numerical Operator Calculus in Higher Dimension", G. Beylkin & M.J. Mohlenkamp, *Proceedings of the National Academy of Sciences*, v. 99, 16, pp. 10246-10251, 2002.

"On Generalized Gaussian Quadratures for Exponentials and Their Applications", G. Beylkin & L. Monzon, Applied and Computational Harmonic Analysis, v. 12, pp. 332-373, 2002.

"Toward Multiresolution Estimation and Efficient Representation of Gravitational Fields", G. Beylkin and R. Cramer, Celestial Mechanics and Dynamical Astronomy, v. 84, 1, pp. 87-104, 2002.

"A Multiresolution Approach to Regularization of Singular Operators and Fast Summation", G. Beylkin & R. Cramer, SIAM Journal on Scientific Computing, v.24, 1, pp. 81-117, 2002.

"Adaptive Solution of Partial Differential Equations in Multiwavelet Bases", B. Alpert, G. Beylkin, D. Gines, and L. Vozovoi, Journal of Computational Physics, v. 182, pp. 149-190, 2002.

Jem Corcoran

"Perfect Sampling From Independent Metropolis-Hastings Chains", J. N. Corcoran and R. L. Tweedie, Journal of Statistical Planning and Inference, (2002) 104/2, 297-314.

Bengt Fornberg

"Interpolation in the Limit of Increasingly Flat Radial Basis Function", T. A. Discoll and B. Fornberg, Computers and Mathematics with Applications, 43 (2002) 413-422.

"Observations on the Behavior of Radial Basis Functions Near Boundaries", B. Fornberg, T. A. Driscoll, G. Wright, and R. Charles, Computers and Mathematics with Applications, 43 (2002), 473-490.

Keith Julien

"Highly Supercritical Convection in Strong Magnetic Fields", 2002, K. Julien, E. Knobloch, and S. M. Tobias, Chapter 8 in Advances in Nonlinear Dynamos, Eds. Ferriz-Mas and M. Nunez (The Fluid Mechanics of Astrophysics and Geophysics Series).

"Nonlinear Magnetoconvection in the Presence of a Strong Oblique Field", 2002, K. Julien, E. Knobloch, and S.M. Tobias, Chapter 2 in Stellar Astrophysical Fluid Dynamics. Eds. M. J. Thompson, and J. Christensen-Dalsgaard, (Cambridge University Press).

Congming Li

"Global Existence of Solutions to Reaction Diffusion System Based Upon Carbonate Reaction Kinetics", C. Li and E. Wright, Comm. Pure & Appl. Anal., 1 (2002) 77-84.

Thomas Manteuffel

"First-Order System Least Squares for Elasto-hydrodynamics with Application to Flow in Compliant Blood Vessels, T. Manteuffel, J. J. Heys, C. G. DeGroff, W. W. Orlando, and S. McCormick, Biomed Sci. Instr. 38 (2002), pp. 227-282.

"Algebraic Elimination of Slide Surface Constraints in Implicit Structural Analysis", T. Manteuffel, E. Chow, C. Tang, and B. Wallin, Int. Jour. For Numer. Meth. In Eng., 2001; 01;1-21.

Stephen McCormick

"First-Order System Least Squares for Elasto-hydrodynamics with Application to Flow in Compliant Blood Vessels", S. McCormick, T. Manteuffel, J. J. Heys, C. G. DeGroff, and W. W. Orlando, Biomed Sci. Instr. 38 (2002), pp. 227-282.

James D. Meiss

“Volume Preserving Maps with an Invariant”, A. Gomez and J. D. Meiss, *Chaos* 12 (2002) 289-299.

Philippe Naveau

“Extremes in Hydrology”, R. Katz, M. Parlange, and P. Naveau, *Advances in Water Resources*, (2002), Vol. 25, 1287-1304

“Briefing Note on Statistical Downscaling Methodologies for WP3”, The EC BIOCLIM Project (2002-2003) 5th Euratom Framework Programme.

“Two Statistical Methods for Improving the Analysis of Large Climatic Data Sets: General Skewed Kalman Filters and Distributions of Distributions”, P. Naveau, M. Vrac, M. Genton, A. Chedin, and E. Diday, (2002) *Proceedings of the Fourth European Conference on Geostatistics for Environmental Applications, geoENV2002 (Barcelona)*.

B. Invited Lectures and Meetings Attended for Calendar Year 2002

Mark Ablowitz

Summer School on Theoretical Physics, Canberra, Australia, Jan. 20-Feb. 1, 2002, Australian National University, three lectures on “Nonlinear Waves and (Interesting) Applications”, January 16-18, 2002.

Department of Mathematics, Hong Kong University of Science and Technology, Hong Kong, China, “Nonlinear Waves in High Bit-Rate Communications”, February 8-16, 2002.

Department of Mathematics, Howard University, “Soliton Waves Everywhere”, March 1, 2002.

Department of Mathematics, Ohio State University, “Integrability and Nonlinear Waves, 150+ Years and Counting”, April 18, 2002.

Sigma Xi Chapter, University of Colorado at Boulder, “ Waves, Waves, Waves....Waves Everywhere”, April 23, 2002.

Universidad Complutense, Madrid, Spain, International Conference on “Nonlinear Models in Physics: Perspectives for the XXI Century”, June 7-8, 2002, “Integrability and Nonlinear Waves – 150+ Years and Counting”, June 7, 2002.

Advanced NATO Research Workshop, Cadiz, Spain, June 9-19, 2002, “Chaotic Dynamics: Computational and Physical”, June 14, 2002.

European Science Foundation Conference on “Symmetries and Integrability of Difference Equations”, June 21-26, 2002, “On Certain Nonlinear Difference Equations”, June 21, 2002.

International Conference on Nonlinear Physics Theory and Experiment, Gallipoli, Italy, June 27-July 6, 2002, “Nonlinear Waves in High-Bit Rate Communications”, June 27, 2002.

Department of Mathematics, MIT, “Nonlinear Waves in High Bit-Rate Communications”, October 21, 2002.

College of Engineering, University of Colorado, Colorado Springs, “WWW: Waves, Water and the Web!”, October 24, 2002.

Department of Physics, University of Cuernavaca, "WWW: Waves, Water and the Web!", December 3, 2002, "Discrete and Continuous Nonlinear Schrodinger Equations", December 4, 2002.

Gregory Beylkin

"New Multiresolution Representations of the Earth's Gravity Field", G. Beylkin and R. Cramer, W.A. Heiskanen Symposium on Geodesy, Columbus, OH, October 1-4, 2002.

"Adaptive Solution of Advection-Diffusion Equations in Multiwavelet Bases", NCAR, February 6, 2002.

"Applications of Multiwavelet Regularization of Singular and Hypersingular Operators", G. Fann, R. Harrison (PNNL), G. Beylkin and R. Cramer (University of Colorado at Boulder), and K. Jordan (IBM Research).

"A Multiresolution Approach to Quantum Chemistry in Multiwavelet Bases", R. Harrison, G. Fann and G. Beylkin.

Jem Corcoran

Conference, Invited Talk, Interface 2002, Montreal, Canada 2002. Title: Shift and Scale Coupling Methods for Perfect Simulation.

Bengt Fornberg

Total of 19 colloquia given at the following locations: In the US: CU Boulder, Brown University. In China: Hong Kong Baptist University, City University (HK), University of Hong Kong, Zhongshan University (Guangzhou), Tsinghua and Peking Universities (Beijing). In Singapore: National University of Singapore. In England: Durham University. In Algeria: Badji Mokhtar – Annaba University.

Keith Julien

Invited speaker (May 2002) Department of Mathematics, University of California at Irvine. "Reduced Hydrostatic and Non-Hydrostatic Descriptions for Rotationally Constrained Flows".

Congming Li

"Some Methods in Nonlinear Analysis", Colloquium, Tonji University, Shanghai.

"Aprior Estimates to Elliptic PDE's", Institute of System Sciences, Academic Sinica, Beijing.

"Prescribing Scalar Curvature on S-n", Graduate School, Academic Sinica, Beijing.

Tom Manteuffel

Invited Speaker, Workshop on Least-Squares Finite-Element Methods, Oberwolfach, Germany, June 14, 2002.

Steve McCormick

Second ASCI tri-lab Apps-Driven Solver Workshop, Monterey, CA, August, 2002 "Algebraic Multigrid Solvers".

SCIDAC TOPS Meeting, Lawrence Livermore National Lab, "Current Research in Algebraic Multigrid", January 2002.

SCIDAC Atmospheric Sciences Meeting, Denver, "Multigrid and FOSLS Research at the University of Colorado at Boulder", with T. Manteuffel, February 2002.

CU-Boulder Engineering CAS Seminar, "First-order Systems for Fluids and Structures", November, 2002.

Phillipe Naveau

"How to Estimate the Breakpoint Vortex Timing in Arctic Ozone Time Series", Annual Conference of The International Environmetrics Society, P. Naveau, P. Keckhut, A. Hauchecorne, and L. Goldfarb, Genova, Italy, 2002.

External Collaborator for the NCAR Weather and Climate Impact Assessment Science Initiative (project: "Extreme Events in Climate Models and Spatial Scaling"). Travel expenses paid for Invited Plenary Talk at the Fourth European Conference on Geostatistics for Environmental Applications, geoENV2002 (Barcelona, Spain 2002).

Harvey Segur

"Stabilizing the Benjamin-Feir Instability", MTNS Conference, Notre Dame, August 14-16, 2002.

C. Outside Funding Active in 2002

Mark Ablowitz

NSF, Mathematics Division, 1997-2000, 2000-2003

NSF, Mathematics Division-Collaborative, 2001-2004

NSF, Engineering Communications, 1998-2003

AFOSR, 1999-2002

CCHE, 1999-2002; Co-PIs, B. Fornberg, J. Curry

Gregory Beylkin

NSF/ACI, ITR, 2000-2003,

NSF/Mathematics Division, ITR, 2002-2004, Co-PI M. Mohlenkamp

DARPA/University of Virginia, 2000-2002

NSF, Mathematics Division, Fellowship, 1999-2003

NIMA, 2002-2004, Co-PI, B. Cramer

Jem Corcoran

Co-PI, University of Georgia 2000-2004, Co-PI H.-B. Schüttler

UCAR, 2002-2003

James Curry

NSF, Colorado Dept Of Education, Connect, 1997-2002

J.R. Woodhull Teaching Fellowship, Gift Fund, 2000-2004

NSF, SCREMS, 2002-2004, Co-PIs M. Mohlenkamp, R. Clelland, H. Segur

Co-PI. NSF/AGEP, 2000-2002, PI P. DeStefano, Co-PI C. Lynch,

Anne Dougherty

CU Outreach Committee, Auxiliary Fund, 2002, Co-PI M. Nelson

CU/Dillard Collaboration, Carnegie Foundation, Gift Fund, 2002-2003

Bengt Fornberg

NSF, Mathematics Division, 1997-2000, 2000-2003

Keith Julien

NSF/Oceanography, Collaborative, 2002-2005; Co-PIs, K. Julien, J. Werne, R. Miliff
NASA, 1999-2002; Co-PIs, K. Julien, J. Werne

Congming Li

NSF, Mathematics Division, 1999-2002

Tom Manteuffel

DOE, Applied Mathematics, 1996-2002

UCAR, 2002

SIAM, Auxiliary Fund, 2000-2002

DOE/Lawrence Livermore, 1998-2002; Co-PIs, S. McCormick, C. Farhat, K.C. Park
Sandia National Labs, 2001-2003

Steve McCormick

NSF, Math Division, 1997-2000, 2000-2003; Co-PIs, T. Manteuffel, T. Russell

DOE, 2001-2003

James Meiss

NSF, Mathematics Division, 1999-2002, 2002-2003

NSF/VIGRE, 1999-2004; Co-PIs, M. Ablowitz, J. Curry, B. Fornberg

Harvey Segur

NSF, Mathematics Division, 1998-2003

NSF, Mathematics Division, FRG, 2002-2005

D. Dissertations for Academic Year 2002 – 2003

Cristina Perez

“Simulating the Interaction Between Intraseasonal and Interannual Variability in the Tropical Pacific with a Coupled System of Nonlinear Ordinary Differential Equations,” Advisor: Keith Julien/Andrew Moore – Ph.D. May 2003.

Eric Wright

“Modeling and Analysis of Aqueous Chemical Reactions in a Diffusive Environment,” Advisor: Congming Li – Ph.D. August 2002.

Grady Wright

“Radical Basis function Interpolation: Numerical and Analytical Developments,” Advisor: Bengt Fornberg – Ph.D. May 2003.

Master’s Theses for Academic Year 2002-2003

Rian Bogle

“Learning Objects: new models and tools for creating and sharing educational materials,” Advisor: James Curry – MS December 2002.

Paul Wiedmann-Goiran

“Extension of Discontinuous Galerkin Method to Exterior Helmholtz Problems,” Advisor – Charbel Farhat/Steve McCormick – MS December 2002.

Stefan Wild

“Seeding Non-Negative Matrix Factorizations with the Spherical K-Means Clustering,” Advisor: James Curry/Anne Dougherty – BS/MS May 2003.

E. Miscellaneous for Calendar Year 2002

James Meiss

Computer Programs: "iStandard Map 4.1i" a Macintosh Application, software and manual released to internet archives.

Frequently Asked Questions in Nonlinear Science. This document serves as a source for the internet newsgroup sci.nonlinear.

8. PREPRINTS OF THE DEPARTMENT: 2002-2003

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, Department of Applied Mathematics, 526 UCB, University of Colorado at Boulder, Boulder, CO 80309-0526 (janis.kaufman@colorado.edu).

498. *Four Wave Mixing in Dispersion-Managed Transmission Systems*, M. Ablowitz, G. Biondini, S. Chakravarty and Rudy Horne, April 16, 2002.
499. *A Lightweight Java Taskspaces Framework for Scientific Computing on Computational Grids*, H. DeSterck, R. Markel, T. Pohl, U. Ruede, September 12, 2002.
500. *Accurate Numerical Resolution of Transients in Initial-Boundary Value Problems for the Heat Equation*, N. Flyer and B. Fornberg, April 11, 2002.
501. *Some Unconditionally Stable Time Stepping Methods for the 3-D Maxwell's Equations*, J. Lee and B. Fornberg, August 1, 2002.
502. *Some Numerical Techniques for Maxwell's Equations in Different Types of Geometries*, B. Fornberg, December 10, 2002.
503. *On the Nature of Initial-Boundary Value Solutions for Dispersive Equations*, N. Flyer and B. Fornberg, December 20, 2002.
504. *Motivating Non-Negative Matrix Factorizations*, S. Wild, J. Curry, A. Dougherty, April 18, 2003.
505. *Reversible Polynomial Automorphisms of the Plane: the Involutory Case*, A. Gomez and J.D.Meiss, September 18, 2002.
506. *Twist Singularities for Symplectic Maps*, H. R. Dullin and J. D. Meiss, October 24, 2002.
507. *Heteroclinic Intersections between Invariant Circles of Volume-Preserving Maps*, H. E. Lomeli and J. D. Meiss, November 14, 2002.