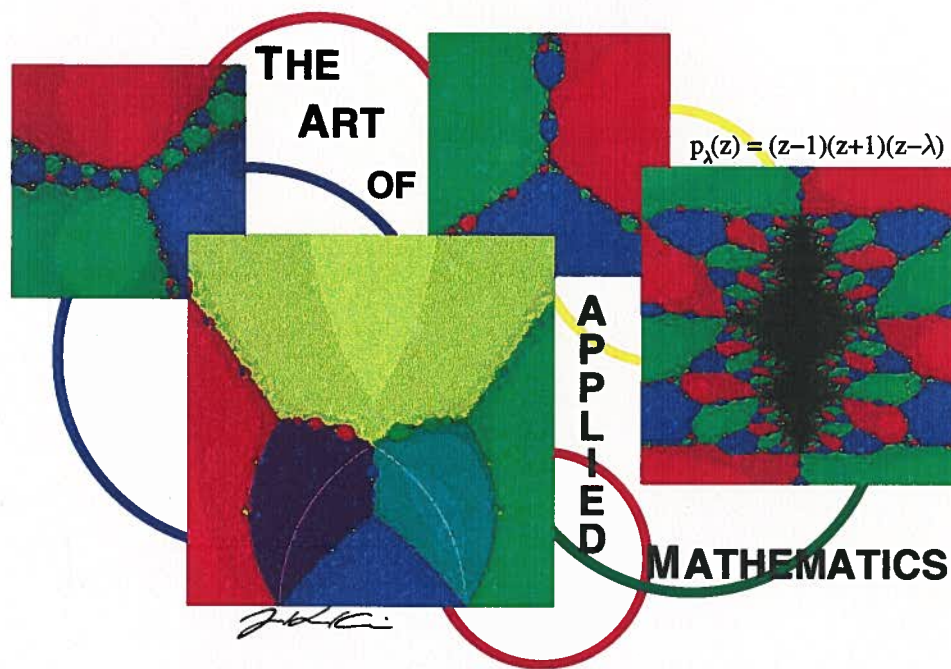


Department of Applied Mathematics



Annual Report 2001–2002

University of Colorado at Boulder
Boulder, CO 80309

Harvey Segur, Chair
July 1, 2002

Cover Art: This year's images were produced by undergraduate Jeremy Horgan-Kobelski, in collaboration with VIGRE postdoctoral fellow Gareth Roberts, as part of a comparison of the root-finding methods of Newton and Halley applied to cubic polynomials in the complex plane. Depending on the starting point (on the complex plane), iterations of these methods converge to one of the three roots or bounce around chaotically forever. Areas are colored according to the root which iteration leads to and/or according to how many iterations are required for convergence (to within $\delta=10^{-6}$). Initial points which do not lead to convergence are colored black, and turn out to be interesting figures including some surprisingly Mandelbrot-like sets.

Jeremy Horgan-Kobelski received a BS in May 2002 and Gareth Roberts is currently an assistant professor at College of the Holy Cross. Both authors were supported by NSF-VIGRE grant DMS-9810751.

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OVERVIEW

The Program in Applied Mathematics was created on the Boulder campus in 1989 for several reasons. Two of these reasons were that CU's Engineering faculty wanted their students taught well, and that scientists in other disciplines on campus wanted access to mathematical expertise for their own research. In the years since then, the Department of Applied Mathematics has retained these two objectives: to teach our classes well, and to provide mathematical expertise to scientists and engineers in other disciplines. Many departments share the first objective; the second is an essential part of Applied Mathematics. A third objective goes along with these: to provide our students with a rich educational experience, in which they see both the beauty of mathematics and its practical value.

The National Science Foundation created its VIGRE program (Vertical Integration in Research and Education) in 1999, to encourage "innovative educational programs in which undergraduates, graduate students, postdoctoral fellows and faculty are mutually supportive". This department received one of the first VIGRE grants, in part because the objectives of the VIGRE program were close to the objectives of this department. Even so, in the three years that VIGRE has been in place, it has fundamentally changed the department. Several sections of this Annual Report document these changes.

Postdocs have been part of the mix in this department since its inception in 1989. Because of VIGRE, there are now more postdocs, and they participate in more aspects of the program than they did before. In 2001-2002, this department had about as many postdocs as long-term faculty, and postdocs taught about as many classes as our long-term faculty. The VIGRE grant is described in detail in §2H. In that section, individual students and postdocs relate the effect the grant had on them. As described in both §2A and §2H, a majority of our senior majors now participate in VIGRE-related research projects. Some of these result in published papers. Our graduate students and postdocs now mentor younger students as they rarely did before. These experiences have changed the way our students and postdocs view their own educational development.

Generally, VIGRE has allowed us to enrich the educational experience that we offer to our own students. Beginning in 2002 we will also offer a richer educational experience to interested graduate students in other disciplines. Two new graduate programs will provide advanced training in mathematics and especially in computation to students in other disciplines. One is a new MS/MA program in mathematical biology, run jointly by our department and the Department of Molecular, Cellular and Developmental Biology (MCDB). The other is a new track in Computational Science and Engineering, in which a student obtains a Master's degree from our department on the way to a PhD in some other scientific discipline. Both of these new programs are described in §2B.

As our society changes, the Department of Applied Mathematics must also change to meet the changing educational needs. This Annual Report describes some of the changes that we have made in the past year to meet these changing demands. It also describes aspects of the program that we have no intention of changing, because they work well. The report is a snapshot of this year's Department of Applied Mathematics.

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 2001-2002. See §6 for a detailed list of the courses taught.

We had 66 undergraduate majors in 2001-2002, with 13 receiving their baccalaureate degrees. (See §2D for a list of our graduates.) We are proud that 23 students in the fall and 20 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 interested in more in-depth training in applied mathematics. Thirty-five students, 5 more than last year, are pursuing minors in Applied Mathematics.

The undergraduate student chapter of SIAM (the Society for Industrial and Applied Mathematics) is responsible for promoting interactions between applied math faculty and majors. It also sponsors activities and presentations that introduce undergraduates to the use of mathematics in engineering and the sciences. Events this past year included student presentations, invited

speakers and the ever-popular mentor lunches. (For a complete list of presentations, please see §4F.) Mary Kindel Van der Heijde served as Chapter President and she was assisted by Jocelyn Renner and Stefan Wild. The officers for the 2002-03 academic year will be **Jocelyn Renner** (President), **Moorea Brega** and **Darin Gillis**. Anne Dougherty was the faculty advisor for 2001-02 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 2002, the Applied Math Department entered a record number of four teams (11 students). The contest ran from 12:01 am February 7, 2002 until midnight February 12, 2002 and drew entries from 522 teams representing 282 institutions and 11 countries. The paper submitted by the team consisting of **Saverio Spagnolie**, **Stefan Wild** and **Kevin Leder** (all Applied Math majors) was designated as one of the Outstanding Papers for Problem B. This is the highest designation possible. The problem they worked on involved building a mathematical model that examines the effects that different overbooking schemes have on airline revenue with the goal of identifying an optimal strategy. Their solution paper will be published in the fall issue of the UMAP Journal. Congratulations are also due to:

Darin Gillis, Geoff Goehle and **Aaron Windfield** (APPM majors)

Moorea Brega and **Alejandro Cantarero** (APPM majors)

James Barron (math and physics double major), **Jill Kamienski** (CS) and **Olivia Koski** (physics)

Each of these three teams worked on a mathematical model to control the waterspray from a fountain based on wind speed and direction. All three teams received a Meritorious designation! It is very unusual that all four of our teams would be rated so highly. We had an outstanding group of students who worked very hard during the 4 days of the contest.

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

This year's class of graduating seniors may be the strongest mathematically and computationally since the start of the Applied Math Department! Three students (**Geoff Goehle**, **Jeremy Horgan-Kobelski** and **Mary Kindel Van der Heijde**) graduated "with high distinction" (cumulative GPA must be at least 3.90) and three students (**Kevin Leder**, **Saverio**

Spagnolie and Adam Thede) graduated “with distinction” (cumulative GPA at least 3.75). The department recognized six of its outstanding students:

Mary Kindel Van der Heijde - Outstanding Senior for Service

Jeremy Horgan-Kobelski - Outstanding Senior for Research

Geoff Goehle, Kevin Leder, Grant Macklem, Saverio Spagnolie - Henri-James Award

The Henri-James scholarship is a cash award given to outstanding Applied Math graduating seniors who are continuing on to graduate school.

In addition, three of our seniors were recognized outside of the department:

Jeremy Horgan-Kobelski was selected by the College of Engineering as Outstanding Graduate in Research.

Saverio Spagnolie received a 2002-2003 National Defense Science and Engineering Graduate (NDSEG) Fellowship which provides tuition, fees, and a stipend for three years.

There were over 2000 applicants for this prestigious fellowship.

Stefan Wild was one of three finalists for the Silver Medal Award, given annually by the Colorado Engineering Council to a single Engineering student in recognition of overall achievement.

The members of the Undergraduate Committee were John Williamson, Anne Dougherty, Natasha Flyer and Keith Julien. The primary duties of this committee are to advise undergraduates and to supervise all aspects of the undergraduate curriculum.

B. Graduate Education

This report on graduate education in the Department of Applied Mathematics answers two questions: *What are we doing now?* and *Where are we heading?*

What are we doing now?

The main areas of research in the department are computational mathematics, physically applied mathematics, dynamical systems, analysis, and statistics/probability. Many of the PhD theses produced within our department are related to one of these areas. However, the department also has a vigorous Affiliated Faculty program, and students in the department can (and do) complete their PhD thesis under the direction of any of the 37 Affiliated Faculty. Long-term objectives of the department are to seek out and to encourage new areas of application of mathematics; our Affiliated Faculty members play a crucial role in that process. (See §3B for a list of the affiliated faculty and their departments.)

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

- In 2001-2002, the department had a record number (63) of graduate students.
- The entering class in fall 2001 had 16 new students.

- We continue to attract a large fraction of U.S. citizens: in 2001-2002, 70% of the incoming students with financial support were U.S. citizens. (One student from Brazil was happy to identify the winner of the 2002 World Cup!)
- Approximately 1/3 of our graduate students are women.
- Our graduate program had five under-represented minority students in 2001-2002. Of these five, one received a PhD in 2001-2002, and another an MS.
- Four students completed their PhDs in 2001-2002. Six students received MS degrees, with four 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 (27) were Teaching Assistants (TAs) in the fall semester. The teaching load was smaller in the spring semester, when 23 served as TAs. Aside from TA support, the largest single source of funding for graduate students was NSF's VIGRE, which supported 10 students in 2001-2002. (See §2H for more information about VIGRE.) Furthermore, 4 students were supported as research assistants within the department, 7 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). One student held a prestigious Chancellor's Fellowship.

The Graduate Committee for 2001-2002 consisted of Gregory Beylkin, James Meiss, Cong-Ming Li, and Steve McCormick (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.

Where are we heading?

The Department of Applied Mathematics helped to create two new graduate programs in 2001-2002. Both programs are intended to provide advanced mathematical training to scientists and engineers working in disciplines other than mathematics.

(1) The Joint MA/MS Program in Mathematical Biology

All of our graduate students are required to take a year-long sequence of graduate courses in some area of application of mathematics. This requirement exposes our students to interesting problems in chemistry, physics, and branches of engineering, but almost none of our students take graduate courses in biology. Very few graduate students in mathematics have the necessary background to take a graduate course in (say) molecular biology, and *vice versa*.

To overcome this problem, the Department of Applied Mathematics (APPM) and the Department of Molecular, Cellular, and Developmental Biology (MCDB) have created a joint graduate program that fills in the gaps in an interested student's background. In this program, a student takes three years to earn two Master's degrees, one in APPM and one in MCDB. Both departments see mathematical biology as an exciting new field, and see this program as one way to

participate in it. See <http://amath.colorado.edu/programs/mcdb.html> for details of the program.

(2) *Computational Science and Engineering*

The important role played by our Affiliated Faculty was mentioned above. Under this program, a graduate student in Applied Mathematics can carry out doctoral research under the guidance of an Affiliated Faculty member, as part of a PhD in Applied Mathematics.

However, the program does not help a student who has an interest in mathematics, but who wants a PhD in (say) Physics. For the benefit of these students, we have created a new option in *Computational Science and Engineering*. This interdisciplinary program is designed to give solid mathematical and computational training to a graduate student of some other scientific discipline. By taking a prescribed set of courses both in Applied Mathematics and in the other discipline, the student earns a Master's degree in Applied Mathematics, while simultaneously working towards a PhD in the other discipline. So far, four other departments have joined this new program: Aerospace Engineering Sciences, Astrophysical and Planetary Sciences, Program in Atmospheric and Oceanic Sciences, and Physics. We expect other departments to join in the near future. Details of the program can be found at <http://amath.colorado.edu/programs/cseng.html>.

C. Enrollment Statistics

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

Year	Total enrollment in courses	Applied Mathematics graduate students	Applied Mathematics undergraduate majors
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
2000-01	3091/ 3517*	61	63
2001-02	3275/ 3701*	63	66

*The totals in bold include all Calculus I & II Work Study Groups, as well as Calculus III Labs & Differential Equations Labs.

D. Graduates

We congratulate our most recent alumni:

PhD Degree (See §7D for thesis titles)

August 2001

Rudy Horne
Bobby Phillip

December 2001

Travis Austin
John Carter

Master's Degree

December 2001

Pakinee Suwannajan*

May 2002

Daniel Cooley*
Eun Kim*

Brian Krause
Alexander Villacorta

Julia Zuev*

*Continuing with PhD at CU

Bachelor's Degree

December 2001

Ashlie Singer

May 2002

Geoff Goehle
Curtis Higgins
Deborah Hinck
Jeremy Horgan-Kobelski

Kevin Leder
Michael Ninomiya
Saverio Spagnolie
Benjamin Sukow

Adam Thede
Robert Thornton
Mary Kindle Van der Heijde
Michael Walters

E. Awards and Honors

Mark Ablowitz and Bengt Fornberg: Each was selected by CU's Council on Research and Creative Work for a Faculty Fellowship during 2001-2002.

Amy Biesterfeld: Elected to serve as President-Elect for the Colorado-Wyoming Chapter of the American Statistical Association. In summer 2003, she will begin serving a one-year term as President.

Amy Biesterfeld and J. Adam Norris: Each received a 2001-2002 Faculty Appreciation Award from CU's Multicultural Engineering Program. MEP students selected the two recipients, citing personal commitment and dedication to teaching.

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

Keith Julien: Nominee for the Sullivan-Carlson Award (in Teaching), Fall 2001.

Jeffrey Luftig: Recipient of Graduate Professor of the Year Award from the Leeds College of Business, Spring 2002.

Tom Manteuffel: President of SIAM, an international organization of scientists and mathematicians with more than 9,000 members.

F. How are we doing?

Year after year, these Annual Reports list the recent accomplishments of the Department of Applied Mathematics. A persistent reader might wonder how this department compares with other departments across the country. In what follows, we discuss some measures of merit that other organizations have used recently to rank departments. We know of no perfect measure. The set of measures that follows might help the reader to decide how well this Department of Applied Mathematics is doing relative to other departments. (In this section we sometimes refer to our department as APPM.)

1) VIGRE

The Department's VIGRE grant is discussed at length in §2H. These grants were created by the National Science Foundation (NSF) in 1999. The grants are restricted to the "mathematical sciences", which NSF defines as mathematics, applied mathematics, or statistics. Each grant is worth a few million dollars, spread over 3-5 years.

The competition for these valuable grants has been intense. By 2001, 31 VIGRE grants had been awarded to select departments across the nation. The list of participating departments includes many at the prestigious schools that one might expect (e.g., Berkeley, Princeton, Harvard). It also includes the Department of Applied Mathematics at the University of Colorado/Boulder.

During 2001-2002, APPM's VIGRE program was reviewed by NSF, and renewed for an additional two years. In the same review process, some VIGRE programs in other departments were terminated, so this renewal was an affirmation of the quality of our program.

2) Externally funded research

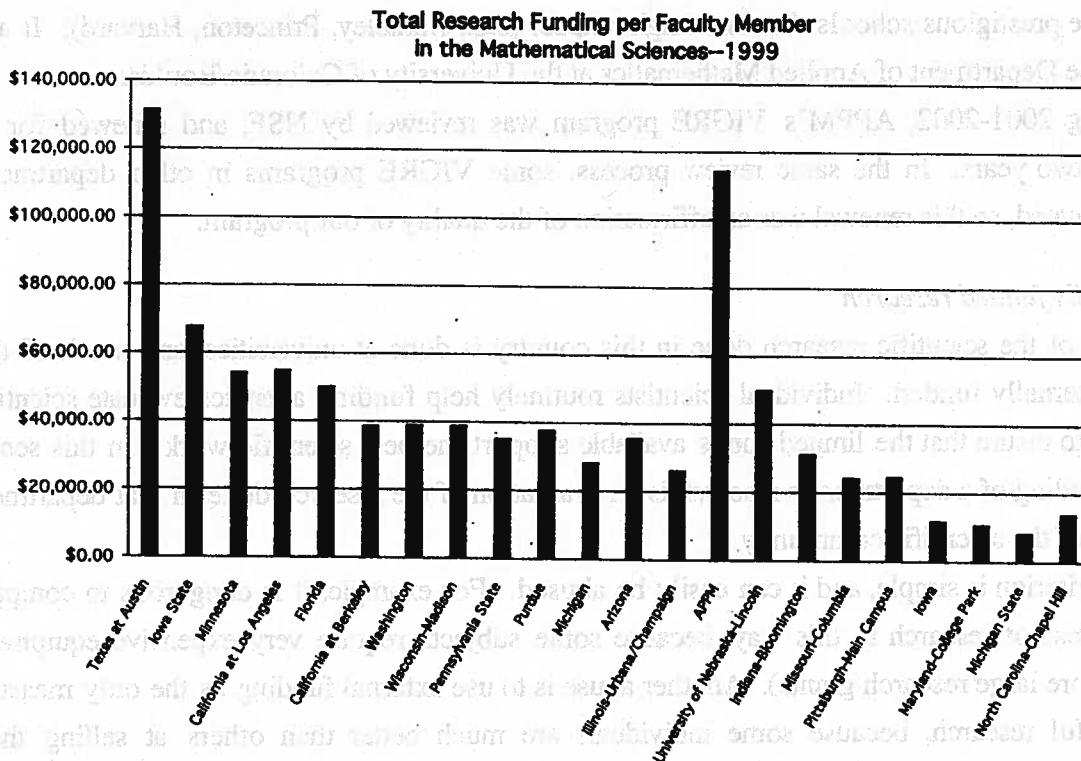
Much of the scientific research done in this country is done at universities, and much of that work is externally funded. Individual scientists routinely help funding agencies evaluate scientific proposals, to insure that the limited funds available support the best scientific work. In this sense, external funding of a department's research is an evaluation of the research done in that department by the rest of the scientific community.

This criterion is simple, and it can easily be abused. For example, it is dangerous to compare different areas of research in this way, because some subjects require very expensive equipment (and therefore large research grants). Another abuse is to use external funding as the only measure of successful research, because some individuals are much better than others at selling their research, and at securing funding.

Subject to these warnings, external funding is a measure of the scientific value of the research of a department in the sciences, and the National Science Foundation regularly publishes these data. In the most recently published survey (covering 1996-1999), the University of Colorado had \$2.0 M in funded R&D expenditures in the mathematical sciences in 1999. (See Table B-56 of

<http://www.nsf.gov/sbe/srs/nsf01329/sectb.htm>.) APPM brought in \$1.7 M of this amount.

We can make this number (\$1.7 M in 1999) relevant by comparing it with the corresponding funded R&D expenditures in the mathematical sciences in 1999 at the other AAU comparison universities. (The University of Colorado regularly uses this list of 25 schools, compiled by the American Association of Universities, to evaluate its own programs, its own salaries, etc.) APPM ranks about in the middle of departments in the mathematical sciences at these schools (14th out of 25) by this measure. However, the size of our department (14 tenured or tenure-track faculty in 1999) is typically much smaller than the faculty in the mathematical sciences at these schools. Plotted below is the total research funding per faculty member, obtained by dividing the total research funding in the mathematical sciences at a school by the number of tenured or tenure-track faculty in the mathematical sciences at that school. (The schools are ordered in this graph by their order in the NSF's Table B-56, cited above. Thus, Texas had the most research funding in the mathematical sciences, Iowa State was second, etc. Some of the 25 AAU comparison schools are not shown in this graph, because the NSF's Table B-56 only lists the research funding of the top 100 schools.)



When measured in this way, the comparison is astounding: Texas beats APPM, Iowa State brings in half as much research funding per faculty member as APPM, and no other school is even half as good as APPM. If this measure were taken by itself, it would indicate that APPM is one the best departments in the mathematical sciences in the country.

Might this information be skewed by a few large grant-getters, who carry the rest of the department? Certainly some faculty members in APPM bring in more external funding than others. However, except for some very senior faculty members nearing retirement, every APPM tenured or tenure-track faculty member has had external funding since 1998, if not earlier. This is an extremely active department.

3) Satisfied students

The 2000 National Doctoral Program Survey polled current and recent students in graduate programs (in any discipline) across the country. Details of the survey, including its methodology, can be found at <http://survey.nagps.org>. The survey shows how well the current and former doctoral students of a particular department think their own department prepared them. Information about a particular department is published in this survey if 10 or more individuals who attended that department responded. As the survey report states, individual respondents were self-selected; this was not a controlled experiment.

Only seven Applied Mathematics Departments across the country had 10 or more former students respond to the survey. Of those seven departments, APPM ranked #1 in terms of "overall satisfaction". The survey polled these current and former students on several topics. APPM did not rank #1 in every category, but it ranked either #1 or #2 on 8 of the 10 topics queried. The results of this survey were very positive for our department.

4) U.S. News & World Report Survey

Each year, the U.S. News & World Report publishes its ranking of graduate programs. (Of the rankings discussed here, this one is probably the most widely read and the least reliable statistically.) In 2002, the magazine ranked departments in Applied Mathematics for the first time. The ranking includes both Departments of Applied Mathematics, like this one, and Departments of Mathematics that include applied mathematics among their specialties.

According to this ranking, APPM tied for 21st in the US, along with Arizona, Harvard, RPI, Rutgers, and SUNY-Stony Brook. Complete details can be found in *U.S. News & World Report's Best Graduate Schools* (ISBN 1-931469-14-8), 2002.

G. Research

The core faculty in the Department are extremely active in their research and scholarly work. See §§ 7 and 8 for lists of publications, invited lectures and departmental preprints. We present here some other signs of the research activity of the department.

1) 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 2001-2002, the faculty in the Department served in 14 such capacities on 13 journals/periodicals, which include:

- Applied and Computational Harmonic Analysis* (Beylkin)
- Cambridge University Press Texts in Applied Mathematics* (Ablowitz)
- Communications on Applied Nonlinear Analysis* (Bebernes, Easton)
- 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* (Curry)
- Proceedings of the American Mathematical Society* (Ablowitz)
- Rocky Mountain Journal of Mathematics* (Bebernes)
- SIAM Journal of Numerical Analysis* (Manteuffel)
- SIAM Journal of Applied Dynamical Systems* (Meiss)
- Studies in Applied Mathematics* (Ablowitz)

2) Copper Mountain Conference - 2002

Tom Manteuffel and Steve McCormick organize the Copper Mountain Conference in the spring of each year. This year the conference was on Iterative Methods and was held during March 24-29. There were 180 participants and 96 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, for over 30 graduate students. The Student Paper Competition and substantial participation by the students in the lecture program and audience has been one of the hallmarks of this series. Student participation has made the Copper Mountain conferences a central contributor to the fields of multigrid and iterative methods.

3) Mini-symposium in honor of Jerry Bebernes' retirement

During April 1-2, the Department of Applied Mathematics held a Mini-symposium in honor of Jerry Bebernes and his many contributions to the University of Colorado since he joined the faculty in 1962. Approximately 100 people attended some or all of the mini-symposium. There were four speakers. Gary Meisters, from U. of Nebraska, has been a colleague of Jerry's ever since Jerry was a graduate student there. Klaus Schmidt, from U. of Utah, has worked for many years with Jerry in the study of parabolic partial differential equations. Dave Eberly, a former student of Jerry's, now owns and runs Magic Software, Inc. Alberto Bressan, another former student, is from SISSA, in Trieste, Italy. Alberto will give one of the prestigious plenary lectures at this year's International Congress of Mathematicians in Beijing, China.

H. Department-wide Grants

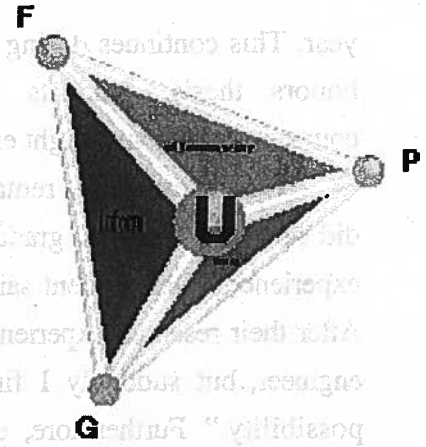
VIGRE (Vertical Integration in Research and Education) is an NSF-funded program that supports education and research. The Department's VIGRE program began in 1999, and was reviewed this year by a panel from the NSF. The great news is that the panel was extremely impressed by our program, and decided to continue the grant for years four and five. This is not insignificant, since several VIGRE programs were discontinued after review.

Our VIGRE program is organized around *tetrahedral* research groups. These are focused groups that involve each of the elements of the VIGRE grant—faculty, postdoctoral fellows, graduate and undergraduates (the vertices), who interact (the edges) and collaborate (the faces) both on research and on educational activities. Under VIGRE at Colorado, we support four tetrahedral groups in concentration areas of our department: nonlinear waves, dynamical systems, multigrid computation, and fast algorithms. Each VIGRE group fosters collaborative research, runs a seminar series that encourages interaction and discussion at multiple levels, and is involved in education both through multiple mentoring interactions (more about this below) and dissemination of research ideas into projects in our courses.

Of course the strength of our program lies in the people, their hard work and enthusiasm. In the past year the VIGRE grant supported four Postdoctoral Fellows (Panos Panayotaros—Dynamical Systems, Natasha Flyer—Fast Algorithms, Brian Bloechle and Jeffrey Heys—Multilevel Computation). Next year two new Fellows will join VIGRE, Charles Che from Northwestern University in Dynamical Systems and Jamison Moeser from Brown University in Nonlinear Waves. We also supported ten graduate students and fifteen undergraduates.

An important aspect of VIGRE is broadening the education of students in the mathematical sciences. There are a number of ways in which we give our students experiences beyond those traditional to a mathematics education. This includes the structure of our degree programs: each undergraduate is essentially required to have a minor in an area with significant mathematical applications. Similarly each graduate student must complete a yearlong sequence of courses at the graduate level in some area of application. In many cases, this has led to graduate students doing research with an advisor in an outside department.

By far the most visible short-term result of our VIGRE program has been the development of the research skills and life-changing experiences for our undergraduates. We have supported nearly thirty undergraduate projects in the first three years of VIGRE. The canonical model is for an undergraduate to begin a project with a tetrahedral group during the summer following the junior



year. This continues during the final year, leading to a capstone report along the lines of a senior honors thesis. Students are typically recruited for these projects from upper-division courses—which are taught either by our regular faculty or our postdoctoral fellows.

What is especially remarkable is that many of the undergraduate students that we supported did not even consider graduate school as an available or desirable option prior to their VIGRE experience. One student said, “My old career plan led to sitting in a cubical as a programmer.” After their research experience many now see things differently: “I always thought I’d be a civil engineer, but suddenly I find myself getting a BS/MS in applied math and see a PhD as a possibility.” Furthermore, engaging in the research process is a revelation to many students: “Working under the VIGRE grant taught me many valuable skills and changed my life plans. I now have an understanding of the methodologies used to undertake research in mathematics and I have learned a great deal about the preparation of articles for peer review.” The abandonment of textbook exercises is also a fundamentally new experience for these students: “Incredibly, there is no book with the answers in the back.”

The undergraduate program is centered around the development of successful projects and effective mentors/student relationships. We have found that a number of our VIGRE graduates and postdoctoral fellows are pleased to be involved in these activities, and find them useful in developing their skills as future advisors: “My experience as a mentor definitely helped get my tenure-track job.”

Some of the undergraduates have also become teaching assistants for our calculus courses. This experience—certainly expanded beyond that of traditional undergraduate education—leads directly to improved chances for acceptance in a graduate program as well as giving the students the experience to be more effective in their first graduate school teaching assignment. Moreover, as one of our students said, “it is an eye-opening experience to have students sling questions at you right and left.” For teachers who have to enlighten while trying to be entertaining, it can be heart-warming to have a student realize that “I now know how hard it is to convey mathematics well.”

Internships form another broadening activity for all of our students. Boulder is fortunate to have a number of national laboratories and high technology companies in the neighborhood. Over thirty of our students (graduate and undergraduate) have had internships—typically for a summer—at one of these institutions in the past three years. For graduate students this may be an interlude where their PhD project is put on hold, or it may inspire the development of a research area, or it can even lead to a thesis project itself. In some cases it has led to a post-degree position.

CCHE Program of Excellence in Applied Mathematics

The CCHE Program of Excellence in Applied Mathematics is designed to enhance the national/international stature of the University of Colorado’s program in Applied Mathematics on

the Boulder and Denver campuses and to improve the visibility of the units and comprehension of our efforts by Colorado students, parents and teachers. A vertically integrated program, with collaborating faculty, postdoctoral/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. Computational equipment has been improved and expanded. A K-12 outreach program has been created. (See §2I for details.)

In this vertical integration model, postdoctoral researchers are actively engaged in both the teaching and research effort. We believe that in the field of applied mathematics, it is entirely natural and beneficial to have postdoctoral mathematicians work much more closely in the teaching and learning part of our program.

One of our vertical research efforts involves the study of wave propagation in high bit rate optical communications. The transmission of information in optical fibers involves sending signals that travel at nearly the speed of light. Important open questions include finding the impairments of the signal in realistic fibers due in part to chromatic dispersion, noise and nonlinearity. We have explained how a recently developed technology, referred to as dispersion management, can be used to help overcome signal distortion, energy transfer to neighboring frequency channels, and timing penalties due to nonlinearity. Nonlinear effects are particularly important to consider at higher bit rates where peak signal amplitudes need to be sufficiently large in order to overcome background noise.

I. 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 2002 marks the third 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. Three two-week workshops are offered, one each in calculus, discrete mathematics and probability/statistics. A total of 40 teachers have registered for the three workshops---this is almost twice the number who participated in each of the previous two years. We believe that this indicates strong support for the program from Colorado's secondary math teachers. The workshops are supported with major funding from the CCHE Excellence grant (see §2H). Additional funding comes from the CU-Boulder Outreach Committee and the J.R. Woodhull/Logicon Applied Mathematics Professorship.

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. Fourteen secondary teachers spent 2.5 hours each week, for nine weeks, exploring 8th-12th grade probability topics. A statistics seminar is planned for fall, 2002.

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:

- Summer Multicultural Access to Research Training (SMART), sponsored by the CU Graduate School. James Curry mentored 1 or 2 students during each of the 10-week summer programs in 2000, 2001 and 2002.
- Success Institute Presentations on July 14, July 27, and July 28, 2001 by Anne Dougherty, James Curry, and Kari Tenfjord.
- Engineering Open House, October 20, 2001. Presenters were Dan Cooley, Ryan Girard and Mark Petersen.
- Women in Engineering Career Day programs for high school girls, October 10, 2001 and March 2, 2002. Presenters were Mark Petersen, Cristina Perez and Julia Zuev.
- High School Honors Institute; July 29 through August 1, 2001. Presenters were Neil Burrell, Bengt Fornberg and Scott MacLachlan.

J. Changes in Personnel

The current Department of Applied Mathematics is in some ways a re-creation of an earlier department. The first Department of Applied Mathematics began (as the Department of Engineering Mathematics) in 1906, in the College of Engineering. In 1966, that department merged with the Department of Mathematics. Professor Jerry Bebernes, who joined the CU faculty in 1962, has the distinction of being the only person to have been a member of all three departments: the original Department of Applied Mathematics, the Department of Mathematics, and the current Department of Applied Mathematics.

Unfortunately for us, Jerry Bebernes retires in 2002. Jerry has been our reliable analyst ever since the current Department of Applied Mathematics was re-created in 1989. He and Cong-Ming Li have provided the functional analysis that keeps our computationalists honest! Jerry will become Professor Emeritus, he will continue with his research, and he has plans to update a history of mathematics on the Boulder campus. Thank you, Jerry.

The department hired two new Assistant Professors this year. Dr. Philippe Naveau received his PhD in Statistics from Colorado State University in 1998, although he grew up in France and

has been working at l'Ecole Polytechnique in Paris. Philippe's area of expertise is extreme value theory (*i.e.*, the statistics of rare events). Philippe will join Jem Corcoran (who also graduated from CSU), Anne Dougherty and John Williamson, as part of our growing team of statisticians and probabilists.

Our second new Assistant Professor will be Meredith Betterton, who received her PhD in Physics from Harvard University in 2000, and has held positions at the Curie Institute in Paris and at the Courant Institute of Mathematical Sciences at New York University since then. Meredith has strong research interests in mathematical biology, which this department views as an area of increasing importance. (See §2B for a description of our new graduate program in mathematical biology.) We look forward to Meredith's joining us in January, 2003.

We bid fond farewell to Dr. Amy Biesterfeld, who has been an able Instructor in this department for the past three years. After much soul-searching, Amy has decided to devote more time to her family.

Turnovers in the office staff, which were a recurring problem a year ago, have been virtually nonexistent under the able leadership of Catherine Larkins, our office manager. The current staff has been a delight to work with, and our office now runs very smoothly. We are all grateful to Laurie Conway, Victoria Fernandez, and Jan Kaufman for their hard work and cheerful dispositions, even when dealing with zany mathematicians. (See §3D for a complete list of the departmental staff, official and unofficial.)

3. FACULTY, RESEARCH ASSOCIATES AND STAFF

A. Core Faculty and Long Term Visitors

Mark J. Ablowitz, Professor; PhD, Massachusetts Institute of Technology. Partial Differential Equations, Solitons, Nonlinear Waves.

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

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

Amy Biesterfeld, Instructor; PhD, University of California at Los Angeles. Applied Probability, Stochastic Processes.

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.

Peter Clarkson, Visiting Professor; University of Kent, UK, February 17 - March 18, 2002.

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, Part-time Instructor; PhD, Paris IX, France. Dynamical Systems.

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

Silvana Delillo, Visiting Professor; Universita de Perugia, Italy, April 17 - May 14, 2002.

Rabia Djellouli, Research Assistant Professor; PhD, Paris XI, France. Computational Science, Wave Propagation.

Andrew Docherty, Visiting Researcher; University of New South Wales, Sydney, Australia, January 15, 2001 - November 10, 2001.

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.

Robert Falgout, Visiting Researcher, Lawrence Livermore National Laboratory; PhD, University of Virginia. Computational Mathematics, Multigrid Methods, Parallel Computing.

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.

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

Toshihiko Hirooka, Postdoctoral Research Associate; PhD, Osaka University, Japan. Optical Soliton Communications.

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

Chang Ock Lee, Visiting Professor; Korean Advanced Institute of Science and Technology, January 13 - February 8, 2002.

Jongwoo Lee, Visiting Professor; PhD, University of Wisconsin, Madison. Higher Order Methods, Scientific Computation, Computational Electrodynamics. March 1, 2001-February, 2002.

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.

Boris Malomed, Visiting Professor; Faculty of Engineering, Tel Aviv University, April 15 - May 15, 2002.

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.

Martin Mohlenkamp, Postdoctoral Research Associate; 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.

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.

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

Jens Georg Schmidt, Postdoctoral Research Associate; 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.

Katherine Socha, Visiting Researcher; PhD, University of Texas at Austin. June 1, 2002 – August 1, 2002.

Michael Spivey, Part-time Instructor, Summer 2002; PhD, Princeton University. Operations Research.

Javier Villarroel, Visiting Professor; Universidad do Salamanca, Spain, September 29 – October 22, 2001.

John Williamson, Professor; 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.

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.

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.
- John Rundle** (Geological Sciences; Cooperative Institute for Research in Environmental Sciences), Statistical Mechanics Applied to Earth Sciences, Complex Systems, Simulations of Nonlinear Systems, Earthquakes, Transport Processes in the Geological Sciences.
- 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. Short Term Visitors, 2001-2002 (Departmental visitors, four to fourteen days):

Demetrios Christotoulides, Lehigh University, October 17 - October 21, 2002.

John Carter, Seattle University, June 22-July 5, 2002.

Rod Halburd, Loughborough University, UK, April 1 – April 14, 2002.

Philip Holmes, Princeton University, November 1-4, 2001.

Edgar Knobloch, University of California, Berkeley, April 10-14, 2002

Jerome Leon, Universite Montpellier, France, April 30 - May 7, 2002.

Matthew Nicol, University of Surrey, April 24-28, 2002

Naiki Saito, University of California at Davis, May 5-9, 2002

Edriss Titi, University of California, Irvine, October 24-27, 2001.

Jianke Yang, University of Vermont, May 7-12, 2002.

D. Staff and Professional Research Assistants

Bridget Bogle, Accounting Technician (moved in December, 2001)

Laurie Conway, Student Coordinator

Bruce Fast, Systems Administrator

Victoria Fernandez, Accounting Technician/Faculty Coordinator

Janis Kaufman, Office Coordinator

Barbara Kraus, Professional Research Assistant

Margy Lanham, Professional Research Assistant (retired September 2001)

Catherine Larkins, Office Manager

Kari Tenfjord, Professional Research Assistant

Michelle Travis, Database Development Project (consultant, July - December, 2001)

Patricia LaGant, Shannon Lahr, Nuttapong Sombutsiri, and Moriah Waterland, part-time student assistants.

4. WEEKLY COLLOQUIA and SEMINARS 2001-2002

A. Applied Mathematics Colloquium Schedule, 2001-2002

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.

Paul Beale, Department of Physics, University of Colorado, September 7, 2001, "New Exact Results for the Two Dimensional Ising Model."

Rob Falgout, Lawrence Livermore National Laboratory, September 14, 2001, "Multigrid Methods and the Challenge of Terascale Simulation."

Curt DeGross, The Children's Hospital, Denver, Colorado, September 21, 2001, "Computational Fluid Dynamic Modeling Applications in Pediatric Heart Disease."

Paul Martin, Department of Mathematical and Computer Sciences, Colorado School of Mines, September 28, 2001, "Waves in Wood: An Inverse Problem for Telegraph Poles."

David Kassoy, Department of Mechanical Engineering, University of Colorado at Boulder, October 12, 2001, "Fireballs: Mathematical Modeling of High Temperature and Pressure Spots in a Reactive Gas."

Demetrios N. Christodoulides, Department of Electrical Engineering and Computer Science, Lehigh University, October 19, 2001, "Incoherent Spatial Solitons."

Edriss Titi, Departments of Mathematics, Mechanical and Aerospace Engineering, University of California, Irvine, October 26, 2001, "Mathematical Study of Certain Geophysical Models."

Philip Holmes, Department of Mechanical and Aerospace Engineering, Program in Applied and Computational Mathematics, November 2, 2001, "Mechanical Models for Insect Locomotion."

Claudia Tebaldi, Research Applications Program, National Center for Atmospheric Research, November 9, 2001, "Looking for Nonlinearities in the Large Scale Dynamics of the Atmosphere."

Don Estep, Department of Mathematics, Colorado State University, November 16, 2001, "Accounting for Stability: Accurately Estimating the Error of Numerical Solutions of Differential Equations."

Samuel Levy, Celera Genomics, November 30, 2001, "Finding Signals that Regulate Genes from Human Genomic Sequence."

Meredith Betterton, Courant Institute, December 7, 2001, "Collapsing Bacterial Cylinders"

Sebastian Schreiber, Western Washington University, December 14, 2001, "Chaotic Transients and Unexpected Extinctions."

Philippe Naveau, Laboratoire de Meteorologie Dynamique Institut Pierre Simon Laplace, Ecole Polytechnique, France, January 18, 2002, "Extremes: A climate case study and the convergence of the maximum."

- Bernard Deconinck, Department of Mathematics, Colorado State University, January 25, 2002, "Riemann Surfaces, Theta Functions and Water Waves (What on Earth was on that T-shirt anyway?)"
- David Kassoy, Department of Mechanical Engineering, University of Colorado, Boulder, February 1, 2002, "Fireballs: Mathematical Modeling of High Temperature and Pressure Spots in a Reactive Gas."
- Doug Nychka, Geophysical Statistics Project, National Center for Atmospheric Research, February 8, 2002, "Wavelet Representations for Nonstationary Spatial Fields."
- Kenneth Krauter, Department of Molecular Cellular and Developmental Biology, University of Colorado at Boulder, February 15, 2002, "Is Genetic Mapping of Complex Human Traits Possible?"
- Frank Wise, Department of Applied Engineering and Physics, Cornell University, February 22, 2002, "Progress Toward the Generation of Light Bullets – Optical Spatiotemporal Solitons."
- Boris Khattatov, Data Analysis and Assimilation Group, Atmospheric Chemistry Division, National Center for Atmospheric Research, March 1, 2002, "Inverse Modeling of Sources of Atmospheric Pollutants."
- Doug Robertson, Cooperative Institute for Research in Environmental Sciences, March 8, 2002, "Computer Revolutions, or Why the Invention of the Computer Should be Considered the Beginning of Mathematics."
- David Randall, Department of Atmospheric Science, Colorado State University, March 15, 2002, "Simulating Climate on Geodisic Grids."
- Omar Ghattas, Department of Biomedical Engineering, Department of Civil and Environmental Engineering, Carnegie Mellon University, March 22, 2002, "Multiscale Newton-Krylov Methods for Inverse Wave Propagation."
- Alberto Bressan, S.I.S.S.A. – Via Beirut 4, Trieste, Italy, April 1, 2002, "Viscosity Solutions of Nonlinear Hyperbolic Systems."
- Patrick Weidman, Department of Mechanical Engineering, University of Colorado at Boulder, April 5, 2002, "The Eiffel Tower: A Tail of Two Exponentials."
- Edgar Knobloch, Department of Physics, University of California, Berkeley, April 12, 2002, "Nearly Inviscid Faraday Waves."
- Chris Wikle, Department of Statistics, University of Missouri, Columbia, and Ralph Milliff, Colorado Research Associates, April 17, 2002, "Bayesian Hierarchical Modeling of Air-Sea Interaction."
- Matthew Nicol, Department of Mathematics and Statistics, University of Surrey, April 26, 2002, "Dynamical Systems With Symmetries: The Euclidean Group."
- Jerome Leon, University Montpellier, France, May 3, 2002, "Can we still learn from the Pendula Chain?"

B. Seminars in Applied Mathematics, 2001-2002

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:

Harvey Segur, Department of Applied Mathematics, University of Colorado at Boulder, September 6, 2001, "Traveling Water Waves of Permanent Form."

Andrew Docherty, School of Electrical Engineering and Telecommunications, University of New South Wales, September 13, 2001, "The Challenge of High-Bitrate Optical Communications Over Long Distances."

Lev Pitaevskii, University of Trento, Trento Italy, September 20, 2001, "Hidden Symmetry of Atoms Trapped in a Harmonic Potential in Two Dimensions."

Bernard Deconinck, Department of Mathematics, Colorado State University, September 27, 2001, "Bose-Einstein Condensates in Periodic Potentials."

Javier Villarroel, Facultad de Ciencias, Universidad de Salamanca, October 11, 2001, "The Burgers Equation Coupled to Stochastic Noise in Ito's Sense."

Demetrios N. Christodoulides, Department of Electrical Engineering and Computer Science, Lehigh University, October 18, 2001, "Blocking and Routing Discrete Solitons in Two-Dimensional Networks of Nonlinear Waveguide Arrays."

Edriss Titi, Departments of Mathematics, Mechanical and Aerospace Engineering, University of California, Irvine, October 25, 2001, "On the Connection Between the Viscous Camassa-Holm Equations (Navier-Stokes-Alpha Model) and Turbulence Theory."

Philip Holmes, Department of Mechanical and Aerospace Engineering and Program in Applied and Computational Mathematics, Princeton University, November 1, 2001, "Trapping of Kinks and Solitons by Defects: Phase Space Transport in Finite Dimensional Models."

Jackson R. Herring, National Center for Atmospheric Research, November 8, 2001, "Structural and Statistical Aspects of Stably Stratified Turbulence."

Toshihiko Hirooka, Department of Applied Mathematics, University of Colorado at Boulder, November 15, 2001, "Nonlinear Pulse Interactions in High-Speed Fiber-Optic Communications."

Keith Julien, Department of Applied Mathematics, University of Colorado at Boulder, November 29, 2001, "Stably-Stratified and Unstably-Stratified Quasigeostrophic Flows."

Meredith Betterton, Courant Institute, December 6, 2001, "Structure Formation in Melting Snow: Penitentes, Suncups, and Dirt Cones."

Boaz Ilan, Tel Aviv University, January 10, 2002, "Deterministic and Random Effects in the Nonlinear Schroedinger Equation."

Jamison Moeser, Division of Applied Mathematics, Brown University, January 17, 2002, "Stable Pulse Propagation in Optical Fibers with Varying Dispersion."

Kelvin Wagner, Department of Electrical and Computer Engineering, University of Colorado at Boulder, January 31, 2002, "Fourier Treatment of Nonlinear Optics."

Panayotis Panayotaros, Applied Math Department, University of Colorado at Boulder, February 7, 2002, "Non-linear Rayleigh Waves."

Eduard-Wilhelm Kirr, Department of Math, University of Michigan at Ann Arbor, February 21, 2002, "Resonances in Schrodinger Equation with Time Dependent Potentials."

Willy Hereman, Department of Mathematical and Computer Sciences, Colorado School of Mines, February 28, 2002, "Symbolic Computation of Conserved Densities, Generalized Symmetries, and Recursion Operators for Nonlinear Evolution and Lattice Equations."

Natasha Flyer, Department of Applied Mathematics, University of Colorado, Boulder, March 7, 2001, "Accurate Numerical Resolution of Transients for Convection-Diffusion Equations."

Peter Clarkson, Institute of Mathematics and Statistics, University of Kent, March 14, 2002, "Symmetry, the Chazy Equation and Chazy Hierarchies."

Dave Eberly, President of Magic Software, Inc., April 4, 2002, "Geometric Algorithms Arising in the Development of Game Engines."

Rod Halburd, Department of Mathematical Sciences, Loughborough University, UK, April 11, 2002, "Exact Special Solution of ODE's and Complex Analysis."

Boris Malomed, Tel Aviv University, April 18, 2002, "Introduction to Non-Linear Optics."

Boris Malomed, Tel Aviv University, April 25, 2002, "Three-Dimensional Doughnut Solitons with an Intrinsic Vorticity."

Jerome Leon, University of Montpellier, France, May 2, 2002, "The Raman Soliton Story."

Jianke Yang, University of Vermont, May 9, 2002, "Higher-order Solitons in the N-wave System."

C. University of Colorado at Boulder/University of Colorado at Denver/Colorado School of Mines Joint Seminar in Computational Mathematics, 2001-2002

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:

Rob Falgout, Lawrence Livermore National Lab, Department of Applied Mathematics, University of Colorado, Boulder, September 11, 2001, "New Advances in Algebraic Multigrid."

Ulrich Ruede, Department of Computer Science, University of Erlangen-Nuernberg, October 2, 2001, "Adaptive Multilevel PDE Solvers for High Performance Computing."

Eli Turkel, Department of Mathematics, Tel Aviv University, November 6, 2001, "Robust Low Speed Preconditioning for Steady and Unsteady Flows."

Wendy Orlando, Colorado Research Associates Division, Northwest Research Associates, Inc., February 5, 2002, "Computational Fluid Dynamics in the Atmosphere and the Pulmonary Arteries."

Peter Hunter, University of Auckland, March 6, 2002, "Modeling the Electromechanics of the Heart and Broader Issues of the Physiome Project."

Xiao-Chuan Cai, Department of Computer Science, University of Colorado at Boulder, March 19, 2002, "Two-level Nonlinear Additive Schwarz Preconditioned Inexact Newton Algorithms and Applications."

Zhiqiang Cai, Purdue University, Department of Mathematics, April 2, 2002, "Numerical Methods for Elasticity: Stress-Displacement Formulation."

D. Dynamical Systems Seminars, 2001-2002

The weekly Dynamical Systems seminar is a research working group led by James Meiss. Following is a list of the speakers and the titles of their talks:

Srinath Vadlamani, Department of Applied Mathematics, University of Colorado at Boulder, September 6, 2001, "Study of Lie Symmetries and Application to PDEs."

James Meiss, Department of Applied Mathematics, University of Colorado at Boulder, September 13, 2001, "Invariant Manifolds for Quasiperiodic Orbits: The Problem of Reducibility."

Robert Easton, Department of Applied Mathematics, University of Colorado at Boulder, September 20, 2001, "Rabinovich's Results on Minimizing Trajectories."

Panayotaros Panayotis, Department of Applied Mathematics, University of Colorado at Boulder, September 27, 2001, "Variational Methods for the Three Body Problem."

Glen Stewart, LASP, University of Colorado, October 11, 2001, "Autoresonance and Its Applications."

James Howard, Laboratory for Atmospheric and Space Physics, University of Colorado at Boulder, October 18, 2001, "Asteroidal Satellites."

Keith Julien, Department of Applied Mathematics, University of Colorado at Boulder, October 25, 2001, "Rotational Convection."

Adriana Gomez, Department of Mathematics, University of Colorado at Boulder, November 1, 2001, "Constructing Integrable Maps: Suris Method."

Lev A. Ostrovsky, ZelTech/NOAA ETL, Department of Applied Mathematics Affiliate, November 15, 2001, "Coherentization in a System of Coupled Nonlinear Oscillators."

Meredith Betterton, Courant Institute, December 6, 2001, "Structure Formation in Melting Snow: Penitentes, Suncups, and Dirt Cones."

Paul Mullenney, Adriana Gomez, Kristian Sandberg, Department of Applied Mathematics and Mathematics Department, CU-Boulder, January 24, 2002, "Chaotic Advection in 3D Fluids, The Group of Polynomial Diffeomorphisms, and Variational Methods in Image Processing."

Mark Petersen, Srinath Vadlamani, Derin Wysham, Department of Applied Mathematics, University of Colorado at Boulder, January 31, 2002, "A Pseudo-spectral Model for the Intermediate Quasi Geostrophic Potential Vorticity Equation, The "VP Method": An Algorithmic Unification of Vlasov and the Particle-in-Cell Methods, $1+\sqrt{2}$ Convergence."

Ziad Musslimani, Department of Applied Mathematics, University of Colorado at Boulder, February 7, 2002, "Discrete Diffraction Managed Spatial Solitons."

Jeanne Clelland, University of Colorado at Boulder, February 14, 2002, "Backlund Transformations of Hyperbolic Monge-Ampere Equations."

Mikhail Rabinovich, Institute of Nonlinear Science, University of California, San Diego, "Neural Synchronization in the Networks with Activity Dependent Excitatory Synapses."

Jeff Weiss, Program in Atmospheric and Oceanic Sciences, February 28, 2002, "Dynamical systems and Geophysical Turbulence."

Neil Burrell, Department of Applied Mathematics, University of Colorado at Boulder, March 7, 2002, "Layered Quasi-Geostrophic Vortex Models."

Charles Che, Northwestern University, March 14, 2002, "Quasi-periodic Lagrangian Systems on the Annulus."

John Rundle, CIRES & Physics, CU-Boulder, March 21, 2002, "Scaling and Nucleation in Driven Meanfield Threshold Systems: The Physics Underlying Earthquake Dynamics."

Matthew Tearle, Applied Math Department, University of Colorado at Boulder, April 4, 2002, "Optimal Perturbations of Stratified Shear Flow."

Edgar Knobloch, University of California at Berkeley, April 11, 2002, "Oscillatory Binary Fluid Convection in Finite Containers."

Sergei Silvestrov, Centre for Mathematical Sciences, Lund University, Sweden, April 17, 2002, "Topological Dynamical Systems, Operator Algebras, and Representations of Commutation Relations."

Paul Mullaney, Applied Math Department, University of Colorado at Boulder, April 18, 2002, "Fluid Mixing via Chaotic Advection in 3D."

Lawrie Virgin, Duke University, April 24, 2002, "A Case Study in Nonlinear Dynamics: A Rocking Block."

Matthew Nicol, University of Surrey, April 25, 2002, "Rigidity Theorems in Dynamics."

Jerome Leon, University of Montpellier, France, May 2, 2002, "The Raman Soliton Story."

E. Fast Algorithms Seminars, 2001-2002

Anita Layton, NCAR, September 25, 2001, "An Efficient Numerical Method for Mathematical Models of the Urine Concentrating Mechanism."

Martin Mohlenkamp, Lucas Monzon, Department of Applied Mathematics, CU-Boulder, October 9, 2001, "Could It Be, A New Trig Identity?"

Hans DeSterck, Department of Applied Mathematics, CU-Boulder, October 16, 2001, "How to Deal With Divergence-Free Vector Fields Numerically."

Natasha Flyer, Department of Applied Mathematics, CU-Boulder, October 30, 2001, "RBFs: What Are They?"

Bracy Elton, Scientific Libraries Group & New Opportunities Group, Cray, Inc., November 12, 2001, "The Fast Fourier Transform, Some Implementation Tricks, and a Few Words on Your Mathematical Future."

Grady Wright, Department of Applied Mathematics, CU-Boulder, November 27, 2001, "An Algorithm for the Stable Computation of Radial Basis Function Interpolants in the Limit of Increasingly Flat Basis Functions."

Aime Fournier, NCAR, December 11, 2001, "What's the Connection Between Spectral Elements and Multiwavelets?"

Martin Mohlenkamp, Department of Applied Mathematics, CU-Boulder, January 15, 2002. "An Attack on the Curse of Dimensionality."

Gregory Beylkin, Department of Applied Mathematics, CU-Boulder, January 22, 2002, "Approximations and Fast Algorithms."

Paul Fischer, Argonne National Laboratory, February 12, 2002, "Spectral Element Methods for Transitional Flows."

Brad Alpert, NIST, February 19, 2002, "Quadratures for Mostly-Uniform Discretization of Regular and Singular Functions."

Andrew Dienstfrey, NIST, February 26, 2002, "Multipole Methods for Photonic Crystal Computations."

Vani Cheruvu, Department of Applied Mathematics, CU-Boulder, March 12, 2002, "Multiwavelet Solutions for a Class of Advection-Diffusion Equations."

Jay Wolkowisky, Department of Mathematics, CU-Boulder, March 19, 2002, "Elliptic PDE's, Multigrid Methods, and MATHEMATICA."

Brian Mapes, NOAA-CIRES Climate Diagnostics Center, April 23, 2002, "Strides, Steps and Stumbles in the Annual March of the Seasons."

Fernando Perez, CU-Boulder Physics and Applied Math Departments, April 30, 2002. "Perturbation Methods in Quantum Mechanics."

Naoki Saito, UC Davis, May 7, 2002, "How Can We Do Local Fourier Transforms More Nicely?"

F. Probability and Statistics Seminars, 2001-2002

John Williamson, Department of Applied Mathematics, University of Colorado at Boulder, September 19, 2001, "Using Selected Samples to Locate Genes."

- Philippe Naveau, Laboratoire de Meteorologie Dynamique Institut Pierre Simon Laplace, Ecole Polytechnique, France, September 26, 2001, "A Statistical Methodology to Detect Pulse-like Events in Climatic Time Series."
- Jennifer Hoeting, Department of Statistics, Colorado State University, October 10, 2001, "Bayesian Model Averaging for Spatial Prediction."
- Hee-Seok Oh, Geophysical Statistics Project, National Center for Atmospheric Research, October 17, 2001, "Period Analysis of Variable Stars."
- Geof Givens, Department of Statistics, Colorado State University, October 24, 2001, "Statistics and Software for Bayesian Simulation Modeling."
- Bill Oliver, Information Technology Services, University of Colorado at Boulder, October 31, 2001, "An Overview of the S."
- Ute Herzfeld, Geomathematik, Universitaet Trier and Department of Applied Mathematics (Affiliated Faculty), November 7, 2001, "Theoretical Geostatistics and Geostatistical Data Analysis."
- Richard McNamara, Department of Applied Mathematics, University of Colorado at Boulder, November 14, 2001, "Spanning Tree Method for Determining Steady-State Distributions With Applications to Loss Systems."
- Jem Corcoran, Department of Applied Mathematics, University of Colorado at Boulder, November 28, 2001, "Stochastic Summation of High-Order Feynman Graph Expansions."
- Eric Chicken, Department of Statistics, Purdue University, December 10, 2001, "Density Estimation Using Block Thresholding."
- Luc Bovens, Department of Philosophy, University of Colorado at Boulder, February 13, 2002, "Welfare, Voting and the Constitution of a Federal Assembly: A Monte Carlo Simulation."
- Uli Schneider, Department of Applied Mathematics, University of Colorado at Boulder, February 20, 2002, "Coupling Methods in Perfect Sampling and their Applications to the Variable Selection Problem."
- Jaehwan Kim, Leeds School of Business, Marketing, University of Colorado at Boulder. February 27, 2002, "Bayesian Model of Product Attributes, Preference and Satiation."
- F. Jay Breidt, Department of Statistics, Colorado State University, March 6, 2002, "Noncausal Autoregressive Modeling Via All-Pass Filters."
- Thomas Bengtsson, Geophysical Statistics Project, National Center for Atmospheric Research, Boulder, March 13, 2002, "Statistical Methods for Numerical Weather Prediction."
- Sergei Kuznetsov, Department of Mathematics, University of Colorado at Boulder, April 10, 2002, "On Unbiased Estimation of a Power of an Unknown Matrix."
- Robert Kaj Gittings, Department of Economics, University of Colorado at Denver, April 24, 2002, "Pardons, Executions and Homicide."
- Uli Schneider, Department of Applied Mathematics, University of Colorado at Boulder, May 1, 2002, "Perfect Simulation in Bayesian Variable Selection (pt. II)."

G. Undergraduate and Graduate Seminars, 2001-2002

SIAM Undergraduate Seminars

The following Seminars were sponsored by the SIAM Undergraduate chapter:

New Majors Lunch, September 6, 2001.

Beth Carman, Lockheed Martin Mission Systems, September 20, 2001.

Annual Applied Mathematics Majors/Minors Meeting, October 9, 2001.

SIAM's Fall Advising Lunch, November 1, 2001.

Open Option Engineering Majors Meeting, "The Distinguished Major of Applied Mathematics", November 8, 2001.

Mark Copeland, University of Colorado at Boulder, Applied Math Department, "Discrete Mathematical Techniques and Search Engines", November 20, 2001.

Naoki Saito, University of California, Davis, "Thinking About Graduate School?", SIAM Mentor Lunch, November 29, 2001.

Erin Attfield, Teach From America, "Teach From America Program", January 29, 2002.

SIAM Advising Lunch, April 3, 2002.

Saverio Spagnolie, Stefan Wild, Kevin Leder, Darin Gillis, Geoff Goehle, Aaron Windefield, Moorea Brega, and Alejandro Cantarero, all Applied Mathematics Majors, "Mathematics and Modeling - The MCM", April 10, 2002.

VIGRE Presentations: Debbie Hinck, "Image Enhancement for Fingerprint Identification", Jocelyn Renner, "Mathematical Model of Dispersion Using Lyapunov Exponents", Alejandro Cantarero, Moorea Brega, and Corry Lee, "Approximation, Standardization and Other Applications of Non-Negative Matrix Factorization", Ashok Basawapatna, Patricia Orendorff and Robert Thornton, "The Trig Identity of the Future", April 18, 2002.

Graduate Seminars 2001-2002

Mark Petersen, Department of Applied Mathematics, "Mathematical Harmonies", September 24, 2001.

Kristian Sandberg, Department of Applied Mathematics, "Mathematical Methods in Image Processing", October 8, 2001.

Cristina Perez, Department of Applied Mathematics, and Scott Kittelman, Program Research Assistant in PAOS, "A Classic Fluid Dynamics Problem", October 29, 2001.

Mark Petersen, Department of Applied Mathematics, "Atmospheric Dynamics and the Quasi-Geostrophic Potential Vorticity Equation", January 17, 2002.

Matt Tearle, Department of Applied Mathematics, "Fluids Dynamics, Matrices: An Eternal Golden Braid", February 27, 2002.

Neil Burrell, Department of Applied Mathematics, "Earth, Wind and Water: Open Ocean Deep Convection Models", March 12, 2002.

Srinath Vadlamani, Department of Applied Mathematics, "Study of Lie Symmetries and Application to PDEs", March 19, 2002.

Paul Mallowney, Department of Applied Mathematics, "Fluid Mixing via Chaotic Advection in 3D", April 16, 2002.

Scott MacLachlan, Department of Applied Mathematics, "Multiscale Methods in Scientific Computing (or How I Learned to Stop Worrying and Love Multigrid)", April 30, 2002.

5. FACULTY SERVICE TO THE UNIVERSITY, DEPARTMENT AND SOCIETIES, CALENDAR YEAR 2001

Mark Ablowitz:

- Reviewer for: NSF Grants, Australian Research Grants and Hong Kong, China Grants.
- Reviewer for journals: *Physics Letters A*, *Physical Review Letters*, *Journal of Engineering Math*, *Physical Review E*, *Optical Society of America*, *Optical Letters*, *Photonics and Technology Letters*.
- Coordinating Editor of *Proceedings of the American Mathematical Society*.
- Editor of *Journal of Engineering Mathematics*, *Cambridge University Press Texts in Applied Mathematics*, and *Studies in Applied Mathematics*.

Jerrold Bebernes:

- Editor, *Rocky Mountain Journal of Mathematics*.
- Reviewer: NSF Proposals (3), Italian Research Proposals (3).
- Referee: *Journal of Mathematical Analysis and Applications*, *Journal of Engineering Mathematics*, *Journal of Differential Equations*, *Journal of Physics A*, *Proceedings Royal Society of Edinburgh*.
- Member: Arts and Sciences Council (Fall, 2001).
- Evaluator: letters of recommendation for promotion to full professor at other universities and for research award.

Gregory Beylkin:

- Consultant for Pacific Northwest National Laboratory.
- Consultant for Fast Mathematical Algorithms and Hardware Corporation.
- Consultant for GeoEnergy, Inc.
- Member of the Graduate Committee.
- Member of the Advisory Editorial Board of Applied and Computational Harmonic Analysis.

Amy Biesterfeld:

- Instructor for the Statistics class in Applied Math's Summer Institute for high school teachers.
- Referee for *Journal of Technometrics*, *Journal of Computational Statistics and Data Analysis* and *Journal of Statistics Education*.

Jem Corcoran:

- Member of graduate student committee (Spring 2001).
- Co-organizer of departmental colloquium series (Fall 2001).
- Member of faculty search committee.
- Book reviewer for the *Journal of the American Statistical Association*.
- Referee for the *European Journal of Applied Signal Processing*.

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).
- Run the Afro-Americans in the Mathematical Science listserv.
- Associate Editor of the *MAA Monthly Journal*.
- Computing Committee member.
- Faculty Search Committee member - Dynamical Systems/Mathematical Biology (Fall 2001.)
- Helped organize the Department's Summer VIGRE research presentations and associated activities.

Anne Dougherty:

- Associate Chair for the Department of Applied Mathematics.
- Search committee member for faculty position in Statistics/Probability.
- Faculty advisor for the CU Boulder SIAM (Society for Industrial and Applied Mathematics) undergraduate chapter.
- Probability and Statistics prelim committee.
- Department of Applied Mathematics Undergraduate Committee member.
- Editor for the Department of Applied Mathematics 2001 newsletter which was sent to several hundred friends and alumni of the department.
- Organized Applied Math's participation in several Engineering College programs: Engineering Orientation August 22-24, 2001; Engineering Open House, October 20, 2001; Women in Engineering Career Days programs, March 3, 2001 and November 10, 2001.
- Applied Math's representative to the Engineering Academic Council.
- Actuarial studies committee member.
- CU campus representative for Goldwater Scholarship.
- Reviewer for *Structural Safety Journal*.
- Outreach activity: Organized three 2-credit, two-week professional development classes for 22 high school teachers, July, 2001.
- Served on BVSD Math Coordinator's Interview Committee, Spring 2001.
- Participated in NACME's (National Action Council for Minorities in Engineering) Engineering Vanguard Program Mathematics Assessment, January 2001.

Bengt Fornberg:

- Member of the Undergraduate Committee and the Budget Committee, Spring 2001.
- Regularly reviewed proposals for FRD (NSF's counterpart in South Africa) and NSF.
- Refereed about a dozen articles for various journals as well as a book review for a publisher. Performed external evaluation of undergraduate numerical analysis program at Wichita State University.
- Planned and then participated in teaching the APPM part of the High School Honors Institute, held 7/30-8/1, with the goal of attracting strong high school students to apply to CU and APPM.
- Advisor for one team participating in the annual COMAP international modeling competition.
- Served as course coordinator Spring 2001 for APPM 2360.

Keith Julien:

- Department of Applied Mathematics Undergraduate Committee member, 2001.
- Member of Dynamical Systems Faculty Search Committee.
- APPM Transfer Credit Advisor.
- Faculty committee member for EEF (Engineering Excellence Fund).
- Reviewer for *Journal of Fluid Dynamics* and *The Physics of Fluids*.
- Grant Peer Review, NSF Oceanography.

Congming Li:

- Member of the Department Graduate Committee, 2001-2002.
- Reviewed papers for many professional journals.
- Diversity Coordinator for Department, Fall 2001.
- 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.
- Colloquium Committee.
- 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, April 1-6, 2001.

Steve McCormick:

- IMACS Conference Committee on CFD.
- Consulting Activities: Lawrence Livermore National Lab.
- Computing Committee.
- Associate Chair of the Graduate Program.
- Comp Math Prelim Committee.
- Reviewed many proposals for NSF and DOE.
- Reviewed many papers AMS Reviews and Zentralblatt.
- Co-Chair: Copper Mountain Conference on Multigrid Methods, Copper Mountain, CO, April 1-6, 2001.

James Meiss:

- VIGRE Conference, National Academy of Sciences, Washington, DC, April 20-21. Panel member on "Broadening Education in Mathematical Sciences."
- Reviewer for three proposals to the National Science Foundation.
- Co-Organizer for the Midwest Dynamical Systems Meeting, Oct. 5-7, 2001, Boulder, CO.
- Letters of reference for colleagues for tenure at 3 universities.
- SIAM Dynamical Systems Activity Group Web Site moderator for the "Dynamics Thesaurus" Web site.
- Reviewer of Book Proposal for Princeton University Press.
- Graduate Committee - Graduate applications and vetting.
- Hiring Committee: Assistant Professor in Dynamics/Mathematical Biology.
- Chair of the VIGRE activities in the Department, including organizing the successful review in November that lead to the renewal of our VIGRE grant (\$1 million additional funds).

- Chair Hiring Committee: VIGRE Postdoctoral Fellowships.
- Preliminary Examination Committee, Aug. 2001 and January 2001 – write and grade the PDE preliminary exam for MS and Ph.D. students.
- Center for Integrated Plasma Studies, Fellow.
- Colorado Center for Chaos and Complexity, Fellow.
- Associate Editor for *SIAM Journal on Applied Dynamical Systems*.
- Reviewer for *Nonlinearity*, *Physical Review E*, *Physica D*, *Rocky Mountain Journal of Mathematics*, *Annals of Mathematics*, *Journal of Physics A*, and *Physical Review Letters*.

Harvey Segur:

- Chairman of the Department of Applied Mathematics.
- Chairman of Hiring Committee for position in Statistics/Probability.
- Member of VIGRE site-review committee, which resulted in renewal of the VIGRE grant (\$1,000,000 additional funds).
- Member of Hiring Committee in Mathematical Biology/Dynamical Systems.
- Reviewer for *Archives for Rational Mechanics*, *Journal of Fluid Mechanics*, *Journal of Mathematical Physics*, *Physical Review Letters* (4 papers), *Proceedings of National Academy of Sciences*, and *SIAM Journal of Applied Mathematics*.

John Williamson:

- Undergraduate Committee, January through December, 2001.
- Coordinator of weekly Probability/Statistics Seminar, September – December, 2001.
- Member of Faculty Search Committee for Probability/Statistics position.
- College of Engineering Academic Council, January – June, 2001.
- College of Engineering Scholarship Committee, January – December, 2001.

6. TEACHING ACTIVITIES

6A. Courses Taught by Department Faculty, Academic Year 2001-2002

(i) Undergraduate Courses

APPM 1350	<i>Biesterfeld, Dougherty, Heys, Norris, Panayotaros, Segur</i> , Calculus I for Engineers
APPM 1360	<i>Biesterfeld, Curry, Djellouli, Meiss</i> , Calculus 2 for Engineers
APPM 2350	<i>Dougherty, Flyer, Hirooka, Musslimani, Norris</i> , Calculus 3 for Engineers
APPM 2360	<i>Bloechle, Cramer, Daly, DeSterck, Julien</i> , Introduction to Linear Algebra & Differential Equations
APPM 2380	<i>DeSterck, Morgenthaler (Professor, Aerospace Engineering)</i> , Introduction to Ordinary Differential Equations
APPM 2450	<i>Carvalho, Girard</i> , Calculus 3: Computer Lab
APPM 2460	<i>Nabity, Wojciechowski</i> , Differential Equations: Computer Lab
APPM 2480	<i>Girard</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, Heys</i> , An Introduction to Symbolic and Numerical Computation
APPM 3310	<i>Cramer, Curry, Panayotaros</i> , Matrix Methods and Applications
APPM 3170	<i>Copeland</i> , Discrete Applied Mathematics
APPM 3570	<i>Dougherty</i> , Applied Probability
APPM 4120	<i>Goodrich (Professor, Mathematics)</i> , Introduction to Operations Research
APPM 4350	<i>Mohlenkamp</i> , Methods in Applied Mathematics: Fourier Series and Boundary Value Problems
APPM 4360	<i>Muslimani</i> , Methods in Applied Mathematics: Complex Variables and Applications
APPM 4380	<i>Julien</i> , Modeling in Applied Mathematics
APPM 4520	<i>Williamson</i> , Introduction to Mathematical Statistics
APPM 4540	<i>Corcoran</i> , Introduction to Time Series
APPM 4560	<i>Williamson</i> , Introduction to Probability Models
APPM 4570	<i>Biesterfeld, Copeland</i> , Statistical Methods
APPM 4580	<i>Luftig (Senior Instructor, Leeds School of Business)</i> , Statistical Methods for Data Analysis
APPM 4650	<i>Bloechle, Clelland</i> , Intermediate Numerical Analysis I
APPM 4660	<i>Mohlenkamp</i> , Intermediate Numerical Analysis II

(ii) Graduate Courses

APPM 5120	<i>Goodrich (Professor, Mathematics)</i> , Operations Research
APPM 5350	<i>Mohlenkamp</i> , Methods in Applied Mathematics: Fourier Series and Boundary Value Problems
APPM 5360	<i>Muslimani</i> , Methods in Applied Mathematics: Complex Variables
APPM 5440	<i>Li</i> , Applied Analysis 1
APPM 5450	<i>Li</i> , Applied Analysis 2
APPM 5460	<i>Meiss</i> , Dynamical Systems
APPM 5470	<i>Bebernes</i> , Methods in Applied Mathematics 3: Partial Differential Equations
APPM 5520	<i>Williamson</i> , Introduction to Mathematical Statistics
APPM 5540	<i>Corcoran</i> , Introduction to Time Series
APPM 5560	<i>Williamson</i> , Introduction to Probability Models
APPM 5570	<i>Biesterfeld, Copeland</i> , Statistical Methods
APPM 5580	<i>Luftig (Senior Instructor, Leeds School of Business)</i> , Statistical Applications Software and Methods

APPM 5600	<i>McCormick</i> , Numerical Analysis 1
APPM 5610	<i>Beylkin</i> , Numerical Analysis 2
APPM 6520	<i>Corcoran</i> , Mathematical Statistics
APPM 6610	<i>Manteuffel</i> , Intro to Numerical PDE's
APPM 7400	<i>Beylkin, Corcoran, Dougherty, Flyer, Li, Luftig, Mohlenkamp</i> , Seminar—special topics
APPM 8000	<i>Corcoran, Manteuffel</i> , Colloquium
APPM 8100	<i>Muslimani</i> , Seminar--Nonlinear Equations
APPM 8100	<i>Meiss</i> , Seminar--Dynamical Systems
APPM 8200	<i>Manteuffel, McCormick</i> , Seminar--Computational Mathematics

B. Summer Courses, 2002

APPM 1350	<i>Burrell</i> , Calculus I for Engineers
APPM 1360	<i>Carvalho</i> , Calculus II for Engineers
APPM 2350	<i>Spivey, Westphal</i> , Calculus III for Engineers
APPM 2360	<i>Petersen</i> , Intro. Linear Algebra and Differential Equations
APPM 2450	<i>Girard</i> , Calculus III: Computer Lab
APPM 2460	<i>Nabity</i> , Differential Equations: Computer Lab
APPM 2710	<i>G. Wright</i> , JAVA I
APPM 2750	<i>Norris</i> , JAVA II
APPM 4650	<i>Norris</i> , Introduction to Numerical Analysis I
APPM 5040	<i>Norris</i> , Calculus Applications for High School Teachers
APPM 5050	<i>Nelson</i> , Discrete Math for High School Teachers
APPM 5070	<i>Biesterfeld</i> , Applied Statistics for High School Teachers

7. RESEARCH ACTIVITIES FOR CALENDAR YEAR 2001

A. Research Publications for Calendar Year 2001

Mark Ablowitz

“Quasi-linear Optical Pulses in Strongly Dispersion Managed Transmissions Systems”, *Optics Letters* 26 (2001) 459-461.

“On the Scattering of Multiple Lumps for the Kadomtsev-Petviashvili Equation”, M.J. Ablowitz and J. Villarroel, *Scattering and Inverse Scattering in Pure and Applied Science*, Eds. P. Sabatier and E.R. Pike, Academic Press (2001), 1792-1806.

"Quasi-linear Optical Pulses in Strongly Dispersion-managed Transmission Systems", *Proceedings Nonlinear Guided Waves and their Applications*, (NLGW 2001), Clearwater, FL. MC76, March 2001.

"Resonant Intra-channel Four-wave Mixing in Strongly Dispersion-managed Transmission Systems", *Proceedings of Conference on Optical Fiber Communications* (OFC 2001), Anaheim, CA, WD33, March 2001.

"Discretizations, Integrable Systems and Computation", M.J. Ablowitz, B.M. Herbst, and C.M. Schober, *J. Phys. A: Math. Gen.* 34 (2001) 10671-10693.

"Discrete Diffraction Managed Spatial Solitons", M.J. Ablowitz and Z. Musslimani, *Physical Review Letters*, 87 (2001) 254102-1-254102-4.

"Nonlinear Schrodinger Equations with Means Terms in Non-resonant Multi-dimensional Quadratic Materials", M.J. Ablowitz, G. Biondini, and S. Blair, *Physical Review E* 63 (2001) 605-620.

"Incomplete Collisions of Wavelength-division Multiplexed Dispersion-managed Solitons", M.J. Ablowitz, G. Biondini, and E.S. Olson, *J. Opt. Soc. Am. B* 18 (2001) 577-583.

"Nonlinear Feedback Shift Registers Via Nonlinear Evolution", M.J. Ablowitz, *Studies in Applied Math* 2000, 107 (2001) 127-136.

"Intrachannel Pulse Interactions and Timing Shifts in Strongly Dispersion-managed Transmission Systems", M.J. Ablowitz and T. Hirooka, *Optics Letters* 26 (2001) 1846-1848.

"Nonlinear Effects in Quasi-linear Dispersion Managed Pulse Transmission", M.J. Ablowitz and T. Hirooka, *IEEE Photonics Technology Letters*, 13 (2001) 1082-1084.

"Long Time Dynamics of the Modulational Instability of Deep Water Waves", M.J. Ablowitz, J. Hammack, D. Henderson, and C.M. Schober, *Physica D* 152-153 (2001) 416-433.

Gregory Beylkin

"Multiresolution Analysis of Elastic Degradation in Heterogeneous Materials", K. Willam, I. Rhee and G. Beylkin, *Meccanica* 36, pp. 131-150, (2001).

"Scattered Data Interpolation Using Multiresolution QR Factorization", G. Beylkin, D. Gine and N. Coult (October 15, 2001).

"Approximation of High Dimensional Control Systems Using Best-Basis Representations", Fazio, Shane and G. Beylkin, (May 2001).

"Approximations and Fast Algorithms", G. Beylkin, (August 2001).

"Numerical Operator Calculus in Higher Dimensions", G. Beylkin and M. Mohlenkamp, M.J., (August 2, 2001).

"Towards Multiresolution Estimation and Efficient Representation of Gravitational Fields", G. Beylkin and R. Cramer, (May 2001).

"Multiresolution Analysis of Elastic Degradation in Heterogeneous Materials", Wiillam, Kaspar, Rhee, Inkyu and Beylkin, (May 2001).

"Approximations and Fast Algorithms", *Proc. SPIE: Wavelets: Applications in Signal and Image Processing IX*, v. 4478, 2001, pp.1-9.

Amy Biesterfeld

"The Price (or Probability) is Right", *Journal of Statistics Education*, Volume 9, Number 3,(2001).

Jem Corcoran

"Perfect Sampling from Independent Metropolis-Hastings Chains", J.N. Corcoran and R.L. Tweedie, *Journal of Statistical Planning and Inference*, (to appear).

"Perfect Simulation for Harris Recurrent Markov Chains", J.N. Corcoran and R.L. Tweedie, *Annals of Applied Probability*, (2001) 11(2), 438-451.

James Curry

"Stochastic Aspects of One-dimensional Discrete Dynamical Systems: Bedfords Law", M.A. Snyder, J.H. Curry and A. Dougherty, *Physical Review E*, Volume 64 (2001).
One APPM technical preprint.

Anne Dougherty

"Stochastic Aspects of One-dimensional Discrete Dynamical Systems: Bedfords Law", M.A. Snyder, J.H. Curry and A. Dougherty, *Physical Review E*, Volume 64 (2001).

Bengt Fornberg

"A Pade-based Algorithm for Overcoming the Gibbs Phenomenon", T.A. Driscoll and B. Fornberg, *Numerical Algorithms*, 26 (2001), 77-92.

"Some Steady Axisymmetric Vortex Flows Past a Sphere", A. Elcrat, B. Fornberg, M. Horne, K. Miller, *J Fluid Mech*, 433 (2001), 315-328

CU APPM Preprint #472: "A Short Proof of the Unconditional Stability of the ADI-FDTD Scheme".

CU APPM Preprint #469: "Stable Computation of Multiquadric Interpolants for all Values of the Shape Parameter" (with E. Wright).

CU APPM Preprint #471: "An Efficient and Stable High-Order Time Stepping Method for the 3-D Maxwell's Equations" (with J. Lee).

CU APPM Preprint #470: "A Numerical Study of Some Radial Basis Function Based Solution Methods for Elliptic PDEs" (with E. Larsson).

Keith Julien

"Vertical Transport by Convection Plumes: Modification by Rotation", K.Julien, S. Legg, J. McWilliams, Werne, *Physics and Chemistry of the Earth Part B-Hydrology Oceans and Atmosphere* 26 (4): 259 (2001).

"Rotating Magnetoconvection; A Note on the Linear Theory" (Preprint with E. Knoblock and S. Tobias).

"Nonlinear Diffusive Behaviour in an Nearly Equidiffusive Three Component Elementary Reaction Diffusion System" (Preprint with E. Wright).

Congming Li

“Modeling Chemical Reactions in Rivers: A Three Component Reaction”, C. Li and E. Wright, Vol. 7 #2, (2001) *Disc. And Cont. Dyn. Sys.*

“Prescribing Scalar Curvature on S-N”, C. Li and W. Chen, *Pac. J. Math.*, 199 (2001) 61-78.

Thomas Manteuffel

“First-order System Least Squares (FOSLS) for Spatial Linear Elasticity: Pure Traction”, S. Kim, T. Manteuffel and S. McCormick, *SIAM J. Numer. Anal.*, Vol. 38, No. 5, pp. 1454-1482 (2001).

“Algebraic Multigrid Based on Element Interpolation (AMGe)”, M. Brezina, A. Cleary, R. Falgout, V. Henson, J. Jones, J. Ruge, T. Manteuffel and S. McCormick, *SIAM J. Sci. Comp.* Vol. 22, No. 5, pp. 1570-1592, (2001).

“The Role of Inner Product in Stopping Criteria for Conjugate Gradient Iterations”, S. F. Ashby, M.J. Holst, T.A. Manteuffel and P.E. Saylor, *B.I.T.* (2001).

“First Order Systems \mathcal{L}^* (FOSLL*): Scalar Elliptic Partial Differential Equations”, *SIAM J. Numer. Anal.*, Vol. 39, No. 4, pp. 1418-1445 (2001).

Stephen McCormick

“First-Order System \mathcal{L}^* (FOSLL*): Scalar Elliptic Partial Differential Equations”, *SIAM J. Numer. Anal.*, to appear (with Z. Cai, T. Manteuffel, and J. Ruge).

“First-order System Least Squares (FOSLS) for Spatial Linear Elasticity: Pure Traction”, S. Kim, T. Manteuffel and S. McCormick, *SIAM J. Numer. Anal.*, Vol. 38, No. 5, pp. 1454-1482 (2001).

“Algebraic Multigrid Based on Element Interpolation (AMGe)”, M. Brezina, A. Cleary, R. Falgout, V. Henson, J. Jones, J. Ruge, T. Manteuffel and S. McCormick, *SIAM J. Sci. Comp.* Vol. 22, No. 5, pp. 1570-1592, (2001).

James D. Meiss

“Drift by Coupling to an Anti-Integrable Limit”, R.W. Easton, J.D. Meiss and G. Roberts, *Physica D*, 156 pp. 201-218 (2001).

“Volume Preserving Maps with an Invariant”, A. Gomez and J.D. Meiss, submitted to *Chaos*.

B. Invited Lectures and Meetings Attended for Calendar Year 2001

Mark Ablowitz

Workshop: Preservation of Stability under Discretization, Math Dept., Colorado State University, Fort Collins, May 30-June 2, 2001.

Euro Summer School “What is Integrability?” Newton Institute, Cambridge U.K., August 13-24, 2001, “On Discrete Nonlinear Schroedinger Systems” August 13, 2001.

International Conference: “Arizona Applied Math Fest”, November 1-3, 2001, “Quasi-linear Pulses in High Bit Rate Optical Communications”, November 1, 2001.

Department of Engineering Communications, Osaka University, "Interaction Effects in Quasi-linear Pulse Propagation", December 4, 2001.

Summer School "Complex Difference Equations" Mekrijrvi Research Station, Finland, July 31-August 3, 2001 "Integrability in Math and Physics" – 4 lectures.

Jerrold Bebernes

"Nonlocal Models of Shear Banding", Durham Mathematics Conference, Mathematics of Combustion, Durham, England, July 6-16, 2001.

Gregory Beylkin

"On Complexity Reduction for Density-Matrix Computations", American Chemical Society National Meeting, April 3, 2001.

"Representations of the Gravity fields and Their Impact on Usage, Estimation and Maintenance of Gravity Models", DARPA Geopotential Workshop, March 2001.

"Complexity Reduction in Operator Calculus", DARPA/DSRC Workshop, March 2001.

"Towards Computing Spectral Projectors in Dimension Three", March 2001, DARPA VIP.

"Towards Solving the Multi-particle Schrodinger Equation", DARPA VIP Program Review, Nov. 2001.

Jem Corcoran

Seminar, Invited Talk, Geophysical Statistics Project, National Center for Atmospheric Research, Boulder, CO, 2001. Title: "Tutorial of Perfect Simulation Methods".

Seminar, Invited Talk, Department of Statistics, Colorado State University, Fort Collin, CO 2001. Title: "Stochastic Summation of High-Order Feynman Graph Expansions".

Conference, Invited talk: Monte Carlo in the New Millenium, Gainesville, FL, 2001. Title: "Scaled and Layered Multishift Coupling for Perfect Simulation".

Anne Dougherty

"Vertical Integration of Web-Based Blocks of Instruction". Presented at the Teaching with Technology Conference, University of Colorado at Boulder, August 5-7, 2001.

Bengt Fornberg

Total of 18 presentations; given at UCB, CSU, Wichita State Univeristy, Uppsala and Chalmers Universities (Sweden), UBC and Simon Fraser University (Canada), Imperial College London (England), Universities of Dundee and Strathclyde (Scotland), Suanbo and KAIST (South Korea), NUS (Singapore).

Keith Julien

"Highly Supercritical Magnetoconvection": sixth SIAM Conference on Applications of Dynamical Systems (May 2001, Snowbird, Utah).

"Transport by Coherent Structures in Geophysical and Environmental Flows", Rotating Convection EuroMech Workshop 428, (2001, ISI Foundation, Turino, Italy).

"Reduced PDE Description for Nonlinear Magnetoconvection in the Presence of Strong Oblique Fields", Stellar Astrophysical Fluid Dynamics, (June 2001, Condom, France).

Invited speaker at APPM Colloquia, Feb. 16, 2001: Constrained Thermal Convection.

APPM seminar, Nov. 8, 2001: Reduced Hydrostatic and Non-Hydrostatic Descriptions.

APPM Dynamical Systems Seminar: Oct. 25, 2001: Rotational Convection: Reduced Hydrostatic and Non-Hydrostatic Descriptions.

Invited speaker at EuroMech 428: Rotating Convection, Turino, Italy.

APPM Dynamical Systems Seminar, March, 2001: Codimension-2 Steady-State Interactions with $O(2)$ Symmetry.

Invited speaker Conf. Magnetoconvection and Reduced PDE Descriptions at Stellar and Astrophysical Fluids, Condom, France.

Congming Li

“Study of Parabolic Systems Modelling Chemical Reaction and Diffusions in Rivers”, American Math Society Meeting, #970.

“Curvature Problems” Colloquium, University of Tennessee, Knoxville.

“Method of Moving Planes”, University of Vanderbilt, Nashville, Tennessee.

Tom Manteuffel

Colloquium speaker, Simon Fraser University, Vancouver, British Colombia, Canada, January 12, 2001.

Workshop speaker, ASCI Linear Systems Solvers Workshop, Las Vegas, NM, October 1, 2001.

Colloquium speaker, University of Hannover, Hannover, Germany, August 31, 2001.

Invited speaker, International Symposium on Computational and Applied PDE's, Zhangjiajie, China, July 2, 2001.

Colloquium speaker, Academica Senica, Beijing, China, June 27, 2001.

Colloquium speaker, University of Washington, Seattle, Washington, January 16, 2001.

Distinguished lecturer, Simon Fraser University, Vancouver, British Colombia, Canada, January 15, 2001.

Steve McCormick

Tri-Lab ASCI Solvers Workshop, “Current Research in Algebraic Multigrid”, with T. Manteuffel (the only external collaborators invited to participate and lecture) October 2001.

Jim Meiss

“Twistless Singularities in Symplectic Maps”, Hamiltonian Systems in Guanajuato, Mexico, March, 2001.

“Symposium on Polynomial Mappings”, SIAM Dynamical Systems Meeting, Snowbird, Utah, May, 2001.

“Twistless Bifurcations in Hamiltonian Systems”, Seminar at Australian National University, Canberra, August 16, 2001.

Harvey Segur

“Stability of a Density-Stratified Shear Flow”, IMACS International Conference, University of Georgia, Athens, GA, April 9-12, 2001.

“Traveling Waves of Permanent Form”, Programme on Surface Water Waves, Isaac Newton Institute, Cambridge, England, August 14, 2001.

“Water Waves of Permanent Form”, Solitons Equations Conference, University of Colorado, Colorado Springs, CO, August 10, 2001.

“Water Waves – An Overview”, Fields Institute, Applied Mathematics Colloquium, Toronto, Ontario, Canada, June 8, 2001.

C. Research Grants Active in 2001

Mark Ablowitz

NSF (New)

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

AFOSR, Mathematics, 1999-2001

NSF, Engineering Communications, 1998-2002

CCHE, 1999-2002; Co-PI's, B. Fornberg, J. Curry

Gregory Beylkin

DARPA/AFOSR, 1998-2001

DARPA/Univ. of Va., 1996-1999, 2000-2001

DARPA/USC, 1998-2001

DARPA/Raytheon, 1998-2001

NSF/ITR, 2000-2002

Jem Corcoran

Co-PI, Univ. of Georgia 2000-2002, Co-PI H. -B. Schüttler

James Curry

Colorado Department of Education 1997-2002

Co-PI. NSF/AGEP, 2000-2005, PI P. DeStefano,

Co-PI C. Lynch

Anne Dougherty

CU Continuing Education Outreach Grant, 2001

Bengt Fornberg

NSF, Mathematics Division, 1997-2001, 2000-2003

Keith Julien

NSF/CORA, 1998-2001

NASA/CORA, 1999-2002

Congming Li

NSF, Mathematics Division, 1999-2002

Tom Manteuffel

Sandia National Laboratories, 2001

DOE, Applied Mathematics, 1996-2001

DOE/Lawrence Livermore, 1998-2001; Co-PI's, S. McCormick,
C. Farhat, K.C. Park

Co-PI, NIH, 1998-2001; PI, V. Barocas

Steve McCormick

DOE, 2001

NSF, Math Div., 1997-2000, 2000-2003; Co-PI's T. Manteuffel,

T. Russell

Lawrence Livermore, 2001

James Meiss

NSF, Mathematics Division, 1999-2002

NSF/VIGRE, 1999-2004; Co-PI's, M. Ablowitz, J. Curry,

B. Fornberg

Harvey Segur

NSF, Mathematics Division, 1998-2002

D. Dissertations for Academic Year 2001 – 2002

Rudy Horne, "Collision induced timing jitter and four-wave mixing in wavelength division multiplexing soliton systems," Advisor: Mark Ablowitz – Ph.D. August 2001.

Bobby Philip, "Asynchronous Fast Adaptive Composite Grid Methods for Elliptic Problems on Adaptively-Refined Curvilinear Grids," Advisor: S. McCormick – Ph.D. August 2001.

Travis Austin, "Advances on a Scaled Least-Squares Method for the 3-D linear Boltzman Equation," Advisor: T. Manteuffel – Ph.D. December 2001.

John Carter, "Stability and Existence of Traveling Wave Solutions of the Two-Dimensional Nonlinear Schrödinger Equation and its Higher-Order Generalizations," Advisor: Harvey Segur – Ph.D. December 2001.

E. Miscellaneous for Calendar Year 2001

James Meiss

Computer Programs: "1Dmaps 1.0" a Macintosh Application, software and manual.

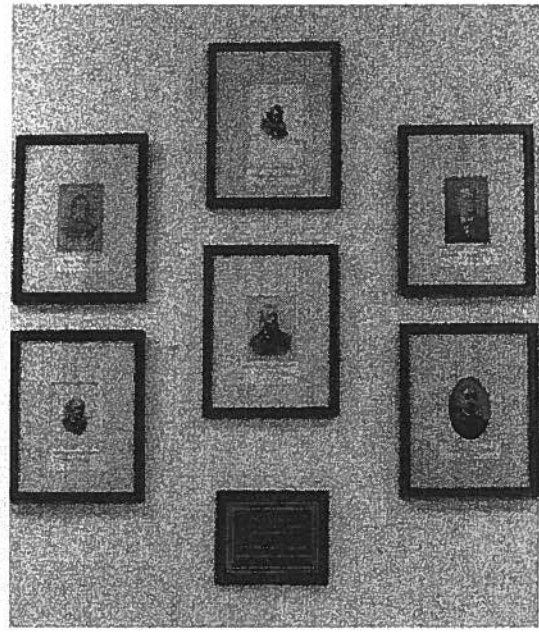
8. PREPRINTS OF THE DEPARTMENT: 2001-2002

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, Boulder, CO 80309-0526 (janis.kaufman@colorado.edu).

459. *Methods for Discrete Soliton in Nonlinear Lattices*, Mark Ablowitz, Ziad Musslimani, Gino Biondini, June, 2001.
460. *Discrete Diffraction Managed Spatial Solitons*, Mark Ablowitz, Ziad Musslimani, June, 2001.
461. *Nonlinear Effects in Quasi-Linear Dispersion-Managed Pulse Transmission*, Mark Ablowitz, Toshihiko Hirooka, July, 2001.

462. *Managing Nonlinearity in Strongly Dispersion-Managed Optical Pulse Transmission*, Mark Ablowitz, Toshihiko Hirooka, July, 2001.
463. *Intra-Channel Pulse Interactions and Timing Sifts in Strongly Dispersion-Managed Transmission Systems*, Mark Ablowitz, Toshihiko Hirooka, June 28, 2001.
464. *Intra-Channel Pulse Interactions in Dispersion-Managed Transmission Systems: Energy Transfer*, Mark Ablowitz, Toshihiko Hirooka, July, 2001.
465. *Chaotic Dynamics of Modulational Instability in Optical Fibers*, M.J. Ablowitz, C.M. Schober, July, 2001.
466. *Good Problems: Teaching Mathematical Writing*, M. Mohlenkamp, D. Bundy, E. Gibney, J. Mccoll, K. Sandberg, B. Silverstein, P. Staab, M. Tearle, August 15, 2001.
467. *Approximations and Fast Algorithms*, G. Beylkin, August, 2001.
468. *Image Analysis Using Singular Value and Wavelet Decomposition and Non-Negative Matrix Factorization*, James Singleton, Ricardo Torres, August 8, 2001.
469. *Stable Computation of Multiquadric Interpolants for All Values of the Shape Parameter*, Bengt Fornberg, Grady Wright, April 18, 2001.
470. *A Numerical Study of Some Radial Basis Function Based Solution Methods for Elliptic PDEs*, Elisabeth Larsson, Bengt Fornberg, September 10, 2001.
471. *An Efficient and Stable High-Order Time Stepping Method for the 3-D Maxwell's Equations*, Jongwoo Lee, Bengt Fornberg, July 26, 2001.
472. *A Short Proof of the Unconditional Stability of the ADI-FDTD Scheme*, Bengt Fornberg, June 4, 2001.
473. *Discrete and Continuous Nonlinear Schrödinger Systems*, M.J. Ablowitz, B. Prinari, A.D. Trubatch, July 27, 2001.
474. *Libftsh: software for a fast transform for spherical harmonics*, M.J. Mohlenkamp, October 8, 2001.
475. *Scattered data interpolation using multiresolution QR factorization*, G. Beylkin, D. Gines, N. Coult, October 15, 2001.
476. *Numerical Operator Calculus in Higher Dimensions*, G. Beylkin, M.J. Mohlenkamp, August 2, 2001.
477. *Generic twistless bifurcations*, H.R. Dullin, J.D. Meiss, D. Sterling, September 29, 1999.
478. *Volume-Preserving Maps with and Invariant*, A. Gómez, J.D. Meiss, October 8, 2001.
479. *Drift by Coupling to an Anti-Integrable Limit*, R. Easton, J. Meiss, G. Roberts, April 17, 2001.
480. *An Identity for Sine of the Sum of Sseveral Variables*, M. Mohlenkamp and L. Monzon, October 24, 2001.

481. *Discrete vector spatial solitons in a nonlinear waveguide array*, M. Ablowitz and Z. Musslimani, November 1, 2001.
482. *The Cauchy Problem for the Kadomtsev-Petviashvili II Equation with Nondecaying Data Along a Line*, J. Villarroel, M. J. Ablowitz, October 30, 2001.
483. *Collision-induced timing shifts in dispersion-managed soliton systems*, M. Ablowitz, G. Biondini, A. Biswas, A. Docherty, T. Hirooka, October 9, 2001.
484. *Dark and Gray Strong Dispersion-Managed Solitons*, M. Ablowitz and Z. Musslimani, November 27, 2001.
485. *Nonlinear Diffusive Behavior in a Nearly Equidiffusive Three Component Elementary Reaction Diffusion System*, E. Wright and K. Julien, December 11, 2001.
486. *Chaotic Dynamics in Nonlinear Waves: Computational and Physical*, M. Ablowitz and C.M. Schober, November 2001.
487. *Collisions between Discrete Vector Solitons*, M. Ablowitz and Z. Musslimani, February 4, 2002.
488. *Suppression of Intrachannel Dispersion-Managed Pulse Interactions by Distributed Amplification*, T. Hirooka, and M. Ablowitz, February 22, 2002.
489. *Higher order asymptotic analysis of dispersion-managed transmission systems: solutions and their characteristics*, M. Ablowitz, T. Hirooka, and T. Inoue, February 22, 2002.
490. *Resonant Intra-Channel Pulse Interactions in Dispersion-Managed Transmission Systems*, M. Ablowitz. and T. Hirooka, February 22, 2002.
491. *Analysis of Timing and Amplitude Jitter due to Intra-Channel Dispersion-Managed Pulse Interactions*, T. Hirooka, and M. J. Ablowitz, February 22, 2002.
492. *Nonlinear Waves and (Interesting) Applications*, M. Ablowitz, T. Hirooka, and Z. Musslimani, March 7, 2002.
493. *Quasi-Linear Optical Pulses in Dispersion Managed Fibers: Propagation and Interaction*, M. Abowitz and T. Hirooka, March 15, 2002.
494. *Nonlinear Diffusive Behavior in a Nearly Equidiffusive Three Component Elementary Diffusion System*, E. S. Wright and K. Julien. Sept. 2001.
495. *Rotating Magneto-convection: A Note on the Linear Theory*, K. Julien, E. Knobloch, and S. M. Tobias, May 2001.
496. *Some Observations Regarding Interpolants in the Limit of Flat Radial Basis Functions*, B. Fornberg, G. Wright, and E. Larsson, March 12, 2002.
497. *Discrete Spatial Solitons in a Diffraction-Managed Nonlinear Waveguide Array: A Unified Approach*, M. Ablowitz and Z. Musslimani, April 14, 2002.



This year the department was able to preserve a turn of the (20th) century collection of 29 prints of famous mathematicians thanks to a generous donation from the J. R. Woodhull/Logicon Teaching Professorship in Applied Mathematics. The prints were rescued from a dusty storage room a few years ago. They have now been cleaned and framed with a conservation mounting and are on display in the department's workroom, ECOT 221. The display was arranged by Dr. Lucas Monzon.

