PROGRAM IN APPLIED MATHEMATICS

UNIVERSITY OF COLORADO
AT BOULDER

BOULDER, COLORADO 80309-0526

ANNUAL REPORT

1994-95

Mark J. Ablowitz, Director
Robert Easton, Interim Director

June 30, 1995
PREFACE

The Program in Applied Mathematics (PAM) has completed six years of service to the University and the State of Colorado as a reconstituted academic unit. The development of the Program has been remarkable. PAM offers a BS, MS and PhD in Applied Mathematics and teaches over 10,000 credit hours per year which corresponds to our teaching approximately 2,700 students per year. It ranks seventeenth among the 34 academic units in the College of Arts and Sciences in credit hours taught. The Program has 12 tenure track faculty members, 3 full time instructors, 40 graduate students and 5 externally supported postdoctoral research associates. In addition to the core faculty, the Program has 30 affiliated faculty members from departments throughout the university who can direct MS and PhD’s in Applied Mathematics.

The BS degree in Applied Mathematics is offered to students in the College of Engineering. A minor in Applied Mathematics is offered to students in the College of Arts and Sciences. At the lower division level the Program teaches a sequence of three four-credit courses entitled Calculus for Engineers and a four-credit introduction to differential equations. These courses directly serve the needs of the College of Engineering and thus are taught in a different format than calculus courses in the College of Arts and Sciences. Lower division math courses for engineers have been taught separately from A&S courses since 1906 when a Department of Applied Mathematics was created on the Boulder campus. During the period 1966-1988 Applied Math was merged with the Mathematics Department.

The Program in Applied Mathematics currently has fifty-one undergraduate majors. Nineteen of our majors were on the Dean’s list last semester with grade point averages of 3.5 or better. Eleven students graduated this year with BS degrees in Applied Mathematics. In 1992 the Boulder undergraduate applied mathematics team won a first prize for its solution in the 1992 National Modelling Contest.

The PhD degree in Applied Mathematics is one of two coordinated PhD programs in the University of Colorado system. The Boulder Applied Math PhD, which is coordinated with the Denver campus, has been successful. In six years the number of graduate students has increased from 0 to 40 and the Program has granted 8 PhD degrees. The National Science Foundation has selected the Program in Applied Mathematics as one of the very few mathematical sciences units in the U.S. to be awarded a major graduate traineeship grant ($550,000). Currently there are 20 graduate students who are supported by external grants; this includes 5 supported by NSF, 8 by the DOD AASERT Program, 4 by faculty and affiliated research grants and 3 graduate students are supported by other fellowship programs.

Research and creativity are extremely important to the Program in Applied Mathematics. In the past six years the faculty have written over 240 research papers, and are sought after to present lectures at meetings throughout the world and to be members of editorial and advisory
boards of major journals in applied mathematics. This year 17 journals/periodicals have editors and/or advisors from The Program’s faculty. In the most recent annual report of the University of Colorado’s Office of Contracts and Grants, external support in the Program in Applied Mathematics totalled nearly $1.4 million, a figure which is extraordinary for a mathematical sciences unit.

Because of the nature of our research and educational mission, during the past five years, the Program in Applied Mathematics has developed one of the most powerful computing laboratories at the university. This was made possible with two large grants from the NSF division of Scientific Computing Research Equipment in the Mathematical Sciences with matching funds from the University of Colorado. The laboratory has a number of computationally proficient workstations with sophisticated graphic capabilities, including two SGI Indigo2 Extremes, eight Sun Sparc 20s, one Sun Sparc 10, five SGI Indigos, one SGI Personal Iris, and one Sun 4. This is in addition to a variety of computing devises in faculty and staff offices.

The following annual report documents the educational and research activities of the faculty and students in the Program in Applied Mathematics. Extra copies can be obtained by writing to Ms. Margy Lanham, Program in Applied Mathematics, Campus Box 526, University of Colorado, Boulder, CO 80309-0526 (margy@boulder.colorado.edu).
1. ROLE AND MISSION

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

a) Provide undergraduate and graduate students with 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 a BS, MS and PhD degrees in Applied Mathematics;

c) Nourish and maintain a professional environment in which teaching, 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. OVERVIEW

A. Undergraduate Education

In 1994-95, the Program in Applied Mathematics had a core of eleven faculty members plus three full-time instructors responsible for the teaching and advising of all undergraduate and graduate students taking applied mathematics courses. The program has a large teaching commitment since most undergraduate engineering majors are required to take four courses in applied mathematics. The Program taught a total of 2670 undergraduate and graduate students in 20 undergraduate courses (divided into 41 sections) and 16 graduate courses. We have 51 undergraduate majors and we are very proud that 19 are on the Dean’s list for academic achievement with grade point averages of 3.5 or better. There are also 11 students pursuing a minor in Applied Mathematics in the College of Arts and Sciences.

B. Graduate Education

The graduate student population continues to grow and the graduate program is prospering. The Program currently has 39 graduate students. In 1994-95 we had 19 teaching assistantships, 8 graduate students on fellowships and traineeships, and currently 12 graduate students are supported by research grants. The number of graduate students supported by research grants has increased substantially; this is due in part to the success of our faculty in
obtaining research support and to the affiliated faculty program. The Program has 30 affiliated faculty members, each of whom can direct a graduate student towards a PhD in Applied Mathematics. It should be noted that, counter to national trends, we continue to be very successful in recruiting U.S. citizens to study in our graduate program. In 1994-95 over 80% of incoming students with support were U.S. citizens from U.S. undergraduate universities. Currently we have 6 foreign graduate students and 2 more will be starting in the fall. Although we certainly encourage international applications, our success in being able to attract high quality American graduate students is remarkable.

This year the National Science Foundation graduate traineeships supported Erik Bollt, Brian Bloechle, Eric Harker and Joseph Iwanski. Michelle VanSteenberg received partial support from the traineeship grant (complementing her award from the National Physical Science Consortium). The $555,000 NSF traineeship grant provides full support for six predoctoral students over a five year period. The Program is truly grateful for the efforts of Jim Meiss in having the foresight and investing so much effort in procuring this prestigious award, which was one of only three such awards by NSF in the mathematical sciences. In addition, there are eight students who are supported by DOD AASERT Awards: Robert Cramer, Ron Flickinger and James Keiser (ONR; Prof. Beylkin), Daryl McCallister, Lora Merck and Tony Werckman (ONR, Profs. Segur and Curry), Scott Mock (AFOSR, Prof. Ablowitz) and David Trubatch (ONR, Prof. Ablowitz). Nicholas Coult was awarded a University of Colorado Chancellor's fellowship; Richard Charles and Christina Perez received NSF fellowships.

C. Enrollment Statistics

The enrollment in the courses offered by the Program continues at extremely high levels. It is particularly noteworthy given the faculty’s small size that the Program teaches so many students. The statistics over the past few years are as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>total enrollment in courses</th>
<th>Applied Mathematics graduate students</th>
<th>Applied Mathematics undergraduate majors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990-91</td>
<td>2562</td>
<td>17</td>
<td>45</td>
</tr>
<tr>
<td>1991-92</td>
<td>2781</td>
<td>27</td>
<td>50</td>
</tr>
<tr>
<td>1992-93</td>
<td>2797</td>
<td>28</td>
<td>47</td>
</tr>
<tr>
<td>1993-94</td>
<td>2809</td>
<td>33</td>
<td>47</td>
</tr>
<tr>
<td>1994-95</td>
<td>2670</td>
<td>39</td>
<td>51</td>
</tr>
</tbody>
</table>

In 1994-95 we observed a small decrease in enrollment in our lower division courses due to smaller enrollments in Engineering. However, enrollment in our upper division courses has continued to increase. With projected increases in undergraduate enrollment we foresee significant enrollment increases in applied mathematics courses.
D. Teaching Awards

Faculty in the Program have been honored with distinguished teaching awards. We are extremely pleased to note that Professor Harvey Segur was named Outstanding Faculty Member by the Minority Engineering Program, 1995. Harvey was previously awarded the Boulder Faculty Assembly (BFA) Teaching Award for 1993-94. All of us in the Program know of Professor Segur's high quality lecturing and deep concern for teaching. It is wonderful to have this recognized by the Minority Engineering Program and earlier by the BFA. Congratulations Professor Segur! This is the second faculty member in the Program who has been a recipient of a University teaching honor. In 1991-92 Professor Curry was the recipient of this honor; Professor Curry has also been recognized as a President's Teaching Scholar for 1993-95.

E. Graduates

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

PhD degree

Master's degree

Bachelor's degree

F. Research

The research activities of the core faculty in the Program are varied. They include nonlinear dynamics, chaos theory, solitons and integrable nonlinear evolution equations, nonlinear optics, inverse problems, analysis of nonlinear equations arising in physical phenomena, computational mathematics including wavelet analysis, multigrid, iterative methods and computational fluid dynamics, matrix algebra, applied probability and statistics. Our affiliated faculty are rostered in a wide range of departments including Aerospace Engineering; Astrophysical, Planetary, and Atmospheric Sciences; Chemistry and
Biochemistry; Civil Engineering; Computer Science; Electrical and Computer Engineering; Geological Sciences; Mathematics; Mechanical Engineering; and the Graduate School of Business.

This report provides data which show that the faculty in the Program are extremely active in their research and scholarly work (a list of publications, invited lectures and Program Preprints are included at the end of this report). However, another very 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. In fact, during 1994-95 the faculty in the Program currently serve in seventeen such capacities on fourteen journals/periodicals which include:

- *Applied and Computational Harmonic Analysis* (Beylkin)
- *Chaos* (Ablowitz)
- *Communications on Applied Nonlinear Analysis* (Bebernes, Easton)
- *Electronic Transactions in Numerical Analysis* (Manteuffel)
- *Inverse Problems* (Ablowitz)
- *Journal of Numerical Linear Algebra and Applications* (Manteuffel)
- *Physica D* (Meiss)
- *Rocky Mountain Journal of Mathematics* (Bebernes)
- *Springer-Verlag Series in Integrable Systems and Solitons*, World Scientific (Ablowitz)
- *SIAM Journal on Applied Mathematics* (Ablowitz) (through 12/94)
- *SIAM Journal on Numerical Analysis* (Beylkin, Manteuffel)
- *SIAM Journal on Scientific Computing* (Manteuffel, McCormick)
- *Studies in Applied Mathematics* (Ablowitz)

In addition, J. Curry is a member of the board of governors of The Geometry Center at the University of Minnesota and T. Manteuffel is a member of the governing council of the Society of Industrial and Applied Mathematics (SIAM) and a member of the program committee of SIAM.

External research grant/contract support continues to increase. The Office of Contracts and Grants of the university documents external support for 1993-1994 for the Program in Applied Mathematics to be nearly $1.4 million dollars! This includes significant grant support for graduate students: a) the NSF traineeship grant which will support six students; b) the DOD AASERT program which now supports eight students; and c) three students who have been awarded their own fellowship support. We are also pleased to note that Professor Meiss was awarded a CRCW faculty fellowship for 1993-94 and Professor Ablowitz was awarded a CRCW fellowship for 1994-95.
G. Conferences

This summer the Program in Applied Mathematics is organizing and hosting an international conference entitled “Symposium in Applied Mathematics: Nonlinear Waves and Dynamics, Asymptotic Analysis, and Physical Applications” which will be held August 3-6, 1995. This conference will honor the many significant and varied contributions of Professor Martin D. Kruskal who will turn 70 years old this year. The meeting will be broad in scope and will include the following topics: nonlinear waves and dynamics, asymptotic analysis, and physical applications.

The Program in Applied Mathematics has a tradition of holding a small annual conference jointly with the Center for Nonlinear Studies (CNLS) at Los Alamos, with the venue alternating between Boulder and Los Alamos. In 1995 the conference was held in Boulder on March 17 and 18. The purpose of this meeting is to give our graduate students, instructors and visitors an opportunity to meet other young scientists in related fields and, when feasible, allow them to give lectures in order to gain valuable experience in speaking before scientific audiences. The consensus opinion is that this meeting is a very worthwhile experience. Thanks go to our local organizer, Yoshi Kimura.

During the summer of 1994 the Program hosted visitors from the former Soviet Union (FSU). This was the second such summer program and involved theoretical and mathematical problems in physics, astrophysical sciences and related fields. It was sponsored by the Sloan Foundation; the Program in Applied Mathematics; Dept. of Astrophysical, Planetary, and Atmospheric Sciences; Dept. of Physics; Dean of Arts and Sciences; Dean of CU Graduate School; Vice President for Academic Affairs and Research; Vice Chancellor for Academic Affairs; and the National Center for Atmospheric Research. In 1994 there were four long-term visitors and four short-term visitors. Two seminars were given each week throughout the summer.

Rocky Mountain Experience IV, our annual short summer mini-conference, was held August 3 and 4, 1994 and featured 17 speakers. It coincided with the end of the 1994 visiting FSU summer program. This year Rocky Mountain Experience V will be held in conjunction with the Symposium in Applied Mathematics.

The Third Colorado Conference on Iterative Methods was held April 4-10, 1994, at Breckenridge, Colorado. The conference was organized by Tom Manteuffel and Steve
McCormick from the Program in Applied Mathematics and Front Range Scientific
Computations, Inc., in cooperation with the Special Interest Group in Numerical Linear
Algebra of the Society of Industrial and Applied Mathematics, with DOE and NSF providing
grant money. Topics included nonsymmetric linear systems, nonlinear systems, optimal order
algorithms and applications on advanced architectures. Attendance for this meeting was
approximately 200.

H. New Faculty

Bengt Fornberg is joining the Program as a full professor. Bengt was formerly a
tenured faculty member at Cal Tech (1974-1984) and more recently worked at Exxon Research
(1984-1995). He is a world renowned expert in spectral methods in numerical analysis and
computational fluid dynamics.

During this academic year we received over 200 applications in response to our
advertisement for instructor positions. We have hired Dr. Hector Lomeli from the University
of Minnesota to be the Program's new long term instructor. Hector's field of expertise is
dynamical systems. We have also hired Dr. Vy Le, an expert in the analysis of partial
differential equations, as a one year instructor. We welcome both Hector and Vy. Anne
Dougherty continues her appointment as instructor. Anne's research area is applied probability
and stochastic processes.

I. Remarks

Yoshi Kimura leaves for a position as full professor in the Graduate School of
Polymathematics at Nagoya University in Japan. This is a remarkable advancement from
instructor to full professor. Congratulations Yoshi!

Sarbarish Chakravarty has accepted a position as Assistant Professor (lecturer) in the
School of Mathematics at the University of New South Wales, Sydney, Australia.

A warm and sincere and appreciation to our fine staff: Stu Naegele (Administrative
Assistant), Janet Glasser (Student Coordinator), Margy Lanham (word processing operator),
Linh Huynh (work study student) for the outstanding job they have done this year. Our staff
members work very hard and certainly go the "extra mile" for the Program; without them the
program could not function. The faculty of the Program: THANK YOU VERY MUCH!
2. FACULTY AND STAFF

A. Core Faculty and Long Term Visitors

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

Loyce Adams, Visiting Professor from Dept. of Applied Math, University of Washington; PhD, University of Virginia. Numerical Linear Algebra, Multigrid Methods, PDE Immersed Interface Problems

Jerrold Bebermes, 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.

Sarbarish Chakravarty, Lecturer, Research Associate; PhD, University of Pittsburgh. General Relativity, Nonlinear Integrable Systems.

Mark Coffey, Instructor; PhD, Mathematics, Courant Institute of Mathematical Sciences, New York University; PhD, Physics, Iowa State University. Nonlinear partial differential equations, theoretical superconductivity.

James H. Curry, Professor; PhD, University of California at Berkeley. Dynamical Systems, Numerical Methods, Nonlinear Equations. (Also Interim Director MASP, Minority A&S Program.)

Anne Dougherty, Instructor; PhD, University of Wisconsin, Madison. Applied Probability, Stochastic Processes.

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

Jean-Michel Fiard, Research Associate; PhD, Université de Savoie, France. Computational Math, Numerical Partial Differential Equations, Multigrid Methods, Computational Fluids, Solid Oxide Fuel Cells, Finite Volumes Methods.

Ben Herbst, Visiting Professor; PhD, University of Orange Free State, South Africa. Numerical Analysis, Solitons.

Scott Herod, Instructor, PhD, University of Colorado. Symmetries and Differential Equations.

Yoshi Kimura, Instructor; PhD, University of Tokyo. Theoretical and Computational Fluid

Kadir Kirikkoprul, Research Associate; PhD, University of Colorado. Perturbation Methods, Computational Fluid Dynamics. (through December 1994)

Randy Leveque, Visiting Professor from Applied Math and Mathematics Departments, University Washington; PhD, Stanford. Numerical Analysis, Computational Fluid Dynamics, Nonlinear Hyperbolic Conservation Laws.

Congming Li, Assistant Professor; PhD, New York University. Nonlinear Differential Equations.

John Maybee, Professor Emeritus; PhD, University of Minnesota. Applied Combinatorics and Matrix Analysis.
Tom Manteuffel, Professor; PhD, University of Illinois, Urbana. Numerical Linear Algebra, Iterative Mathematics, Numerical Solution of PDE's.

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

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

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

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

Constance Schober, Instructor, Research Associate; PhD, University of Arizona. Integrable Systems, Computational Methods.

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

Gerhard Starke, Research Associate; PhD, University of Karlsruhe, Germany. Iterative Methods, Numerical Solutions of PDEs.

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

B. Affiliated Faculty--Graduate Program

Norm Bleistein (Mathematics, Colorado School of Mines) Direct & Inverse Scattering, Asymptotic Methods, Wave Phenomena

William Blumen (Astrophysical, Planetary, and Atmospheric Sciences and Physics), Geophysical Fluid Dynamics in Atmospheric Science

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

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

John Cary (Astrophysical, Planetary, and Atmospheric Sciences and Physics), Nonlinear Dynamics, Plasma Physics, Accelerator and Space Physics

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 (Astrophysical, Planetary, and Atmospheric Sciences and Physics), Plasma Physics, Nonlinear Waves, Turbulence

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

Tissa Illangasekare (Civil Engineering), 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

James Kelly (College of Business), Heuristic Search, Optimization, Artificial Intelligence


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

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

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

Duane Sather (Mathematics), Partial Differential Equations, Fluid Mechanics

Robert Schnabel (Computer Science), Numerical Methods for Optimization, Nonlinear Equations, Parallel Scientific Computation

Richard Seebass (Aerospace Engineering), Aerodynamics, Gas Dynamics, Supersonic and Hypersonic Flows

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

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

Gary Stormo (Biology), Molecular Structures and Patterns, Computer Sequence Analysis, Splicing Algorithms

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

Juri Toomre (Astrophysical, Planetary, and Atmospheric Sciences, Joint Institute for Laboratory Astrophysics), Astrophysics, Mathematical Modelling, Numerical Simulation

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

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

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

C. Short Term Visitors, 1994-95

Amir Averbuch, Tel-Aviv University (July 1994)
Achi Brandt, Weizmann Institute (March-April 1995)
Robert Burridge, Schlumberger-Doll Research, Ridgefield, CT (June-August 1995)
Zhiqiang Cai, University of Southern California (July 1994)
Wenxiang Chen, Southwest Missouri State University (August 1994).
Peter Clarkson, University of Exeter, UK (August 1994)
Victor Galaktionov, Keldysh Inst. of Applied Mathematics, Moscow, Russia (Summer 1994)
Joe Hammack, Pennsylvania State University (September 1994)
Xiancheng Hu, Tsinghua University (March-May 1995)
Takeshi izuka, Dept. of Physics, Ehime University, Japan (September 1994)
Moshe Israeli, Technion, Haifa, Israel (February 1995)
Isaak M. Khalatnikov, Landau Institute for Theoretical Physics, Moscow and Tel Aviv Univ. Sacler Inst. of Advanced Studies, Israel (July-August 1994)
Martin D. Kruskal, Princeton and Rutgers Universities (July 1994)
Vladimir Makhankov, Joint Institute for Nuclear Research, Dubna, Russia; and Center for Nonlinear Studies, Los Alamos National Laboratory (August 1994)
Elizabeth Mansfield, University of Exeter, UK (August 1994)
Robert MacKay, University of Warwick, UK (May 1995)
Shintaro Mori, Dept. of Physics, University of Tokyo (February 1995)
S. Murakami, Dept. of Physics, University of Tokyo (February 2-March 9, 1995)
Kazuaki Nakayama, Dept. of Physics, University of Tokyo (February 1995)
Takenobu Nakao, Dept. of Physics, University of Tokyo (September 1994)
Christoph Pflaum, Institut fur Informatik, TU Munich, Germany (March-June 1995)
Vladimir Prigodin, A.F. Ioffe Physico-Technical Institute, Russian Academy of Sciences, St. Petersburg, Russia (July-August 1994)
Ulrich Ruede, University of Munich (August 1994)
Michael Spector, Dept. of Fluid Mechanics, Tel Aviv University (July-August 1994)
Linda Stals, Australian National University (February 1995)
Jaroslav Stark, University College of London, UK (May 1995)
Boris Stern, Institute for Nuclear Research, Russian Academy of Sciences, Moscow (Summer 1994)
Hideaki Ujino, Dept. of Physics, University of Tokyo (February 1995)
Javier Villarroel, University of Salamanca, Spain (September 1994)
Miki Wadati, Dept. of Physics, University of Tokyo (Feb 2-March 9, 1995)
Tetsu Yajima, Dept. of Applied Physics, University of Tokyo, Japan, (September 1994)
Gene D’Yakonov, Moscow State University (February-March 1995)

D. Staff

Stu Naegele - Administrative Assistant
Janet Glasser - Student Coordinator
Margy Lanham - Word Processing Operator
3. COLLOQUIA, SEMINARS, SYMPOSIA, 1994-95

A. Applied Mathematics Colloquium Schedule, 1994-95

Our Applied Mathematics Colloquium series continued this year. The colloquia were held Friday afternoons during the academic year at 3:00 p.m., with coffee and tea preceding at 2:45 p.m. in the PAM conference room, ECOT 2-01.

R. Jameson, Accelerator Operations & Technology Division, Los Alamos National Laboratory, September 9, 1994
"Chaos in Linear Particle Accelerators"

B. Fornberg, Exxon Research and Engineering, Annandale, NJ, September 16, 1994
"Computing Steady Incompressible Flows Past Blunt Bodies--An Historical Overview"

J. Smith, Director, Center for Computer Research in Music, Stanford, September 23, 1994
"Music Synthesis via Virtual Acoustics"

A. Bobenko, Technische Universität, Berlin, September 30, 1994
"From Discrete Surfaces to the Discrete Quantum Pendulum (the Discrete Sine-Gordon Equation in Geometry and Physics)"

J. Bebernes, Program in Applied Mathematics, University of Colorado, October 7, 1994
"Beyond Blowup"

R. Wicklin, Geometry Center, University of Minnesota, October 14, 1994
"A New Method for Investigating Resonant Dynamics"

B. Herbst, Program in Applied Mathematics, University of Colorado and Dept. of Applied Mathematics, University of The Orange Free State, South Africa, October 21, 1994
"On the Numerics of Integrable Discretizations"

G. Beylkin, Program in Applied Mathematics, University of Colorado, October 28, 1994
"On Fast Fourier Transform of Functions with Singularities"

D. Levermore, University of Arizona and CNLS, Los Alamos, November 4, 1994
"The Complex Ginzburg-Landau Equation as a Perturbation of the Nonlinear Schrödinger Equation"

S. Mahalingum, Department of Mechanical Engineering, University of Colorado, November 11, 1994
"Direct Numerical Simulation of Turbulent Nonpremixed Flames"

R. Tagg, Department of Physics, University of Colorado at Denver, November 18, 1994
"Controlling Chaos in a Parametrically Forced Pendulum"

T. Burns, Computing and Applied Mathematics Laboratory, National Institute of Standards and Technology, Gaithersburg, MD, December 2, 1994
"Connections Between Localized Behavior in Plasticity and in Combustion"

J-M. Fiard, Program in Applied Mathematics, University of Colorado and Université de Savoie, France, January 20, 1995
"Mathematical Modelling and Numerical Simulation of Solid Oxide Fuel Cells"

E. Kostelich, Department of Mathematics, Arizona State University, January 27, 1995
"Targeting and Control of Chaos"
E. Van Vleck, Department of Mathematical and Computer Sciences, Colorado School of Mines, February 3, 1995
"Numerical Shadowing Near Hyperbolic Trajectories"

M. Ablowitz, Program in Applied Mathematics, University of Colorado, February 10, 1995
"1895-1995: Integrability and Applications"

U. Herzfeld, Institute of Arctic and Alpine Research, University of Colorado, February 17, 1995
"An Application of Geostatistics to Marine and Satellite Geophysical Data from Antarctica"

V. Arnold, Steklov Mathematical Institute, Russian Academy of Sciences, February 24, 1995
(Part of 33rd Annual De Long Lecture Series)
"Asymptotics of topological complexity in smooth and in holomorphic dynamical systems"

T. Shinbrot, Northwestern University, March 3, 1995
"Will Control of Chaos Ever Lead to Control of Turbulence?"

C. Golé, SUNY at Stony Brook, March 10, 1995
"Rotation Vectors and Lagrangian Systems"

C. Doering, Center for Nonlinear Studies, Los Alamos National Laboratory, March 17, 1995
"Energy Stability and Turbulent Energy Dissipation"

J. Strain, Dept. of Mathematics, University of California, Berkeley, March 24, 1995
"2-D Vortex Methods and Numerical Integration"

M. Tabor, Program in Applied Mathematics, University of Arizona, April 7, 1995
"The Dynamics of Twist and Writhe"

G. Fairweather, Dept. of Mathematical and Computer Sciences, Colorado School of Mines, Golden, April 14, 1995
"Spline Collocation Algorithms for Separable Elliptic Boundary Value Problems"

K. Kafadar, Mathematics, University of Colorado, Denver, April 21, 1995
"A Data-Analytic Approach for Estimating Lead Time and Screening Benefit Based on Survival Curves in Randomized Trials"

G. Forest, Department of Mathematics, Ohio State University and University of Utah, April 28, 1995
"Modeling the Manufacture of Fibers"

B. Seminars in Applied Mathematics, 1994-95

The Program 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-030 and had coffee and tea 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:

J. Villarroel, University of Salamanca, Spain, September 8, 1994
"On the Two Dimensional Volterra System"

B. Fornberg, Exxon Research and Engineering, Annandale, NJ, September 15, 1994
"A Pseudospectral Approach for Polar and Spherical Geometries"
T. Yajima, Dept. of Applied Physics, University of Tokyo, Japan, September 22, 1994
“Multiple Variable Integrable Equations and the Derivative Nonlinear Schrödinger Equation”

T. Iizuka, Dept. of Physics, Ehime University, Japan, September 29, 1994
“Soliton Phenomena in Periodic Systems”

S. Herod, Program in Applied Mathematics, University of Colorado, October 6, 1994
“Exact Families of Solutions of the Barotropic Vorticity Equation Derived from Symmetry Reductions”

R. Wicklin, Geometry Center, University of Minnesota, October 13, 1994
“Using Technology as a Teaching Tool”

P. Miller, Department of Mathematics, University of Arizona, October 20, 1994
“Exact Multiphase Wavetrain Solutions to the Complex Ablowitz-Ladik Equations”

M. Alber, Department of Mathematics, University of Notre Dame, October 27, 1994
“On Umbilic Geodesics and Soliton and Billiard Solutions of Nonlinear PDE’s”

C.D. Levermore, University of Arizona and CNLS, Los Alamos National Laboratories, November 3, 1994
“The Incompressible Navier-Stokes Limit for the Boltzmann Equation”

J. Weiss, Program in Atmospheric and Oceanic Science, Dept. of Astrophysical, Planetary, and Atmospheric Science, University of Colorado, November 10, 1994
“Dynamical Systems for Modeling Structured Turbulence”

L. Ostrovsky, CIRES, University of Colorado; Environmental Technology Lab, NOAA; and Institute of Applied Physics, Russian Academy of Science, N. Novgorod, Russia, November 17, 1994
“Nonlinear Waves in Rotating Fluids”

D. Richards, University of the Orange Free State, South Africa, December 1, 1994
“Automatic Signature Verification”

L. Monzón, Program in Applied Mathematics, University of Colorado, January 26, 1995
“Wavelets and Quadrature Mirror Filters”

M. Coffey, Program in Applied Mathematics, University of Colorado, February 2, 1994
“Modelling of Vortices in Stratified and Nonlocal Type-II Superconductors”

K. Naukholynzh, NOAA, Boulder, February 9, 1995
“On the Propagation and Nonlinear Interaction of the Broad Band Capillary Wave Packet”

B. Chen, Department of Mathematics, University of Wyoming, February 16, 1995
“Numerical Solution of Convection in Enclosures with Obstacles”

A. Tothlis, West Virginia University, February 23, 1995
“Discretizations of Hamiltonian Systems and Chaos-Integrability Transition”

N. Akhmediev, Optical Sciences Center, Institute of Advanced Studies, The Australian National University, Canberra, March 2, 1995
“Coupled Nonlinear Schrödinger Equations: Dynamic Solutions”

M. Grant, Department of Biology (EPOB), University of Colorado, March 9, 1995
“Teaching and Learning at the University: Some Personal Experiences”

C. Lewis, Department of Computer Science, Institute of Cognitive Science, University of Colorado, March 16, 1995
“Anatomy of a Course: Teaching the Process of Writing Computer Programs”
M. Rabinovich, Institute for Applied Physics, Russian Academy of Science, and Institute for Nonlinear Science, University of California, San Diego, March 23, 1995
“Origin of spirals and Defect Spiral Wave Interaction in the Faraday Experiment”

M. Tabor, Program in Applied Mathematics, University of Arizona, April 6, 1995
“The Structure and Dynamics of Foams”

P. Grinevich, Landau Institute for Theoretical Physics, Moscow, April 13, 1995
“Period Preserving Nonisospectral Flows and the Moduli Space of Periodic Solutions of soliton Equations”

“Two Limit Theorems for Density Dependent Markov Processes, Part I: A Simple Epidemic Model”

A. Dougherty, Program in Applied Mathematics, University of Colorado, April 27, 1995.
“Two Limit Theorems for Density Dependent Markov Processes, Part II: Averaging for Density Dependent Markov Chains with an Application to Graph Theory”

C. Rocky Mountain Experience IV, 1994

D. Los Alamos/Colorado Days, 1995

E. University of Colorado Denver-University of Colorado Boulder Joint Seminars in Computational Mathematics, 1994-95
The Joint CU Denver-CU Boulder Computational Math Seminar was significantly expanded this year, with the regular lecture on Tuesdays at 12:30 preceded by three hours of open discussion, with the location alternating between Denver and Boulder. There were typically 20 or more faculty, students, and visitors from the two campuses attending the open discussions and regular lectures. A list of speakers and the titles of their talks follows:

G. Starke, University of Karlsruhe, Germany and Program in Applied Mathematics, University of Colorado, Boulder, September 6, 1994 (in Denver)
“On the Combination of Multilevel and Krylov Subspace Methods”

R. Leveque, Applied Mathematics and Mathematics Department, University of Washington, and Program in Applied Math, Univ. of Colorado, Boulder, September 13, 1994 (in Boulder)
“Clawpack--A Software Package for Solving Hyperbolic Systems of Conservation Laws”
D. Dean, University of Colorado, Denver, September 20, 1994 (in Denver)

W. Mitchell, Applied and Computational Mathematics Division, National Institute of Standards and Technology, Gaithersburg, MD, September 27, 1994 (in Boulder)
“The Hierarchical Basis Approach to Multilevel Adaptive Methods and Partitioning Adaptive Grids”

L. Adams, Dept. of Applied Math, Univ. of Washington, and Program in Applied Mathematics, Univ. of Colorado, Boulder, October 4, 1994 (in Denver)
“Cartesian Grid Techniques for Problems with Irregular Boundaries”

M. Berndt, Program in Applied Mathematics, University of Colorado, October 11, 1994 (in Boulder)
“The Schwarz Alternating Procedure in Multilevel Methods”

Z. Liu, Department of Mathematics, University of Colorado, Denver, October 18, 1995 (in Denver)
“Multiple Scale Simulation for Transitional and Turbulent Flow”

J. Ruge, Department of Mathematics, University of Colorado, Denver, October 25, 1994 (in Boulder)
“A Nonlinear Multigrid Solver for a Semi-Lagrangian Potential Vorticity-Based Shallow Water Model on the Sphere”

P. Oswald, Texas A&M, November 8, 1994 (in Boulder)
“Besov Space Techniques for Multilevel Methods”

A. Knayzyez, Math Department, University of Colorado, Denver, November 15, 1994 (in Denver)
“Accuracy Estimates for the Rayleigh-Ritz Method”

M. Hanke, November 29, 1994 (in Boulder)
“Regularization by Conjugate Gradients”

K. Ressel, Math Department, University of Colorado, Denver December 6, 1994 (in Denver)
“Least-Squares Finite-Element Solution of the Neutron Transport Equation in Diffusive Regimes”

T. Stern, Applied Mathematics Department, University of Washington, January 24, 1995 (in Boulder)
“Finite Volume Methods for Non-Uniform Grids”

R. Trujillo, Center for Computational Mathematics, University of Colorado, Denver, January 31, 1995 (in Denver)
“A Flux-Based Eulerian-Lagrangian Localized Adjoint Method for the Two-Dimensional Transient Advection Equation”

X. Yu, Brown University and visitor at University of Colorado, Denver, February 7, 1995 (in Boulder)
“Secondary Instability Problems in Boundary Layers”

L. Stals, School of Mathematical Sciences, Australian National University, Canberra, Australia, February 21, 1995 (in Boulder)
“Adaptive Multigrid in Parallel”

W. Niethammer, University of Karlsruhe, Germany, February 21, 1995 (in Boulder)
“Iterative Methods on the Maspar”
F. Special Seminars, 1994-95

We had several special seminars during the year:

A. Dervieux, INRIA-Sophia, August 25, 1994
“New Attempts for Additive Multilevel Methods”

T. Nakao, Dept. of Physics, University of Tokyo, Japan, September 27, 1994
“A Useful Auxiliary Linear System for Davey-Stewartson Hierarchy”

M. Phillips and R. Wicklin, The Geometry Center, University of Minnesota, Saturday, October 15, 1994
“Catching up with Technology in a Changing World”—Geometry and Computer Graphics Workshop

M. Gekhtman, Weizmann Institute, Israel, October 18, 1994
“Non-Abelian Integrable Lattice Equations”

L. Vozovoi, Tel-Aviv University, February 9, 1995
“High Order Fast Elliptic Solver in Rectangular Regions”

S. Mori, Department of Physics, University of Tokyo, February 23, 1995
“Statistical Physics of Random Surfaces: Self-avoiding Randomly Polymerized Membrane”

H. Ujino, Department of Physics, University of Tokyo, February 23, 1995
“An Algebraic Approach to Quantum Calogero Model”

K. Nakayama, Department of Physics, University of Tokyo, February 23, 1995
“Reaction-Diffusion System in Curved Space and the KPZ Equation”

M. Wadati, Department of Physics, University of Tokyo, March 7, 1995
“Motion of Curves and Surfaces”

S. Marakami, Department of Physics, University of Tokyo, March 7, 1995
“Thermodynamics of Quantum Nonlinear Schrödinger Models”

V. Le, University of Utah, March 23, 1995
“Some Global Bifurcation Results for Variational Inequalities”

A.M. Rubenchik, Lawrence Livermore National Laboratory and UC Davis, May 26, 1995
“Pulse Dynamics in Multidimensional Fiber Arrays”
4. COMMITTEES

A. Undergraduate Committee—John Williamson, Chair

The members of the Program Undergraduate Committee this year were John Williamson (chair), Bob Easton, Tom Manteuffel and Jim Meiss.

The Program in Applied Mathematics has fifty-one undergraduate majors. Nineteen of our majors were on the Dean’s list last semester with grade point averages of 3.5 or better, and Eric Phipps won the 1995 Frank Prouty Memorial Scholarship. Eleven students graduated this year with bachelor of science degrees in applied mathematics.

Undergraduates students in APPM 1350 (Calculus I) now have the option of simultaneously taking GEEN 1350 (the calculus work group), where students work in a collaborative learning environment. This is a one-credit hour course taken on a pass/fail basis. The course is taught by a graduate teaching assistant with the help of several undergraduate assistants. The undergraduate assistants are enthusiastic about getting the teaching experience, and they are good role models for the students in the course.

The new Minor in Applied Mathematics, available to students in the College of Arts and Sciences, continues to grow. There are now eleven students in the program.

The Undergraduate Curriculum guide was updated this year. Our thanks to John Williamson for the effort he put into this.

Two new courses recently added to our offerings, “An Introduction to Nonlinear Systems: Chaos” (APPM 3010) and “An Introduction to Symbolic and Numerical Computation” (APPM 3050) were taught again this year. Thanks to Jim Meiss and Scott Herodfor their efforts with this.

Our undergraduate student chapter of SIAM (the Society for Industrial and Applied Mathematics) continues to be very active. There are twenty members in the chapter. Events this past year included meetings, mentor lunches, field trips and “Professors’ Nights Out.” Officers were: Kate Lainson, President; Jennifer Oursler, Vice President; Chris Dozier, Treasurer; Lisa Schauer, Secretary; Chris Mehl, UCEC representative.
B. Graduate Committee--Harvey Segur, Chair

The Program Graduate Committee consists of Jerry Bebernes, Congming Li, Steve McCormick, and Harvey Segur (chair).

The main business of the committee is to advise the current graduate students, process graduate applications, decide upon admission to the graduate program and administer the preliminary exams. Preliminary exams are given twice each year, in four areas: Applied Analysis, Computational Analysis, Partial Differential Equations and Probability/Statistics.

The Program had about 40 graduate students during 1994-95, of whom 13 began last fall. Three students received their PhDs and four their MS degrees within the last year. For the fall semester of 1995, there were 66 applicants, of whom 4 received new TA positions (an usually small number due to a large number of continuing students). In addition, 2 more incoming students were awarded NSF Graduate Traineeships. An important event occurred this year when the graduate students initiated the Graduate Student Organization (GSO) to represent their common concerns.

The number of (funded) Teaching Assistantships has remained at about 16-19 during the past five years. Now a majority of our graduate students are supported on research contracts. The percentage of American students has fluctuated between 80%-90%, while the percentage of women students fluctuated between 23%-41%. Minority students still are under-represented in the Program, but their numbers increased (to about 7%) in the last year.

One measure of the health of the graduate program can be found by observing that PAM graduate students were authors or co-authors on nine of the Program in Applied Mathematics preprints within the last year.

In summary, the graduate program of PAM is now coming of age. While it is not perfect, we believe it is developing nicely.
5. FACULTY SERVICE TO THE UNIVERSITY, PROGRAM AND
SOCIETIES, CALENDAR YEAR 1994

Mark Ablowitz: Program Director, 1/1/94-6/30/94; member of Council of Chairs in the
College of Arts and Sciences, 1/1/94-6/30/94; CRCW fellowship 1994-95

Jerrold Bebernes: member of Program Graduate Committee and the Advisory Committee
to University Mathematics Program

Gregory Beylkin: member of Program Graduate Committee and Program Faculty Search
Committee

James Curry: member of Chancellor's Search Committee, Vice Chancellor's Advisory
Committee, and Campus Policy Board on Information Technology; sabbatical 1994-95

Robert Easton: Program Interim Director (from 7/94); member of Program Instructor Search
Committee; Chair, Educational Policy and Planning Committee (Engineering); member
of Committee on Complexity (Graduate School)

Congming Li: member of Program Undergraduate Committee, Program Graduate
Committee and College of Engineering and Applied Science Education Committee

Tom Manteuffel: member of Program Undergraduate Committee, Program Computer
Committee, and University Applied Math PhD Coordinating Committee

Steve McCormick: member of Program Graduate Committee, Program Faculty Search
Committee, and Program Computer Committee

James Meiss: member of Program Undergraduate Committee; chair, Program Computer
Committee; chair, Program Colloquium Committee; Chair, Goldwater Scholarship
Committee for the University

Harvey Segur: Chair of Program Graduate Committee; member of Boulder Faculty
Assembly

John Williamson: Chair of Program Undergraduate Committee; member of College of
Engineering Scholarship Committee and College of Engineering Undergraduate
Academic Affairs Committee
6. TEACHING ACTIVITIES

A. Courses Taught by Program Faculty, Academic Year 1994-95

(i) Undergraduate Courses

APPM 1350 Chakravarty, Dougherty, Seebass, Segur, Calculus 1 for Engineers.
APPM 1360 Chakravarty, Meiss, Norris, Segur, Calculus 2 for Engineers.
APPM 2350 Dwyer, Herbst, Herod, Manteuffel, McCormick, Calculus 3 for Engineers.
APPM 2360 Bebernes, Coffey, Kimura, Linear Algebra and Differential Equations.
APPM 3010 Meiss, An Introduction to Nonlinear Systems: Chaos
APPM 3050 Herod, Introduction to Symbolic and Numerical Computation.
APPM 3310 Chakravarty, Li, Matrix Methods and Applications.
APPM 3570 Williamson, Applied Probability.
APPM 4360 Schober, Complex Variables, Methods in Applied Mathematics.
APPM 4520 (MATH 4520) Holley, Introduction to Mathematical Statistics.
APPM 4560 Williamson, Introduction to Probability Models.
APPM 4570 Williamson, Statistical Methods.
APPM 4580 Little/Williamson, Statistical Applications Software Methods.
APPM 4650 Easton, Intermediate Numerical Analysis 1.
APPM 4660 Easton, Intermediate Numerical Analysis 2.

(ii) Graduate Courses

APPM 5360 Schober, Complex Variables, Methods in Applied Mathematics.
APPM 5440 Li, Applied Analysis 1.
APPM 5450 Li, Applied Analysis 2.
APPM 5480 (MCEN 7120) Weidman, Perturbation Methods, Methods in Applied Mathematics.
APPM 5520 (MATH 5520) Holley, Introduction to Mathematical Statistics.
APPM 5570 Williamson, Statistical Methods.
APPM 5580 Little/Williamson, Statistical Applications Software Methods.
APPM 5600 (MATH 5600) Manteuffel, Numerical Analysis 1.
APPM 5610 (MATH 5610) Kimura, Numerical Analysis 2.

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APPM 6550  *Williamson*, Introduction to Stochastic Processes.
APPM 7300  *Segur*, Mathematical Methods in Nonlinear Waves and Integrable Equations.
APPM 7400  *Meiss*, Topics in Applied Mathematics--Dynamical Systems
APPM 7400  *Beylkin*, Topics in Applied Mathematics--Wavelets and Fast Algorithms in
Numerical Analysis and Signal Processing
APPM 8000  Seminar in Applied Mathematics

B.  **Summer Courses, 1995**

APPM 1350  *Herod*, Calculus 1 for Engineers.
APPM 1360  *Sholl*, Calculus 2 for Engineers.
APPM 2350  *Coffey*, Calculus 3 for Engineers.
APPM 2360  *Schober*, Introduction to Linear Algebra and Differential Equations.
APPM 4650  *Norris*, Intermediate Numerical Analysis 1.
7. RESEARCH ACTIVITIES FOR CALENDAR YEAR 1994

A. Research Publications for Calendar Year 1994

Mark Ablowitz:
“Parametric Forcing, Bound States and Solutions of a Nonlinear Schrödinger Type Equation”, M.J. Ablowitz and S. De Lillo, Nonlinearity, 7 (1994) 1143-1153.

Jerrold Bebernes
“Asymptotics of blowup for weakly quasilinear parabolic problems” (with S. Bricher and V. Galaktionov), Nonlinear Analysis, 23 (1994) 489-514.

Gregory Beylkin:

Sarbarish Chakravarty:

Tom Manteuffel:

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Steve McCormick:


James Meiss:


Constance Schober:


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Harvey Segur:

B. Invited Lectures and Meetings Attended for Calendar Year 1994

Mark Ablowitz:
Workshop on Twenty Years of the Nonlinear Schrödinger Equation and Recent Developments, Landau Institute for Theoretical Physics, Moscow, Russia, “Computational Chaos in the Nonlinear Schrödinger Equation”, July 23-31, 1994.
University of Science and Technology, Mathematics Department, Hong Kong, “Computational Chaos in Integrable Systems”, Nov. 16, 1994.
Hong Kong Polytechnic, Hong Kong, Mathematics Department, “Computational Chaos in Integrable Systems”, Nov. 17, 1994.

Jerrold Bebernes:
Gregory Beylkin:
Technion, Israel, "Implementation of Operators via Vilter Banks, Autocorrelation Shell and Hardy Wavelets", May 1994
SPIE, Sand Diego, Ca, "Fast and Accurate Computation of the Fourier Transform of an Image", July 1994
Environmental Research Institute of Michigan (ERIM), Ann Arbor, MI "Unequally Spaced FFT and SAR Processing", September 1994.
IMA workshop, tutorial and 2 lectures, Minneapolis, MN, Fall, 1994

Sarbarish Chakravarty:

Bob Easton:

Ben Herbst:
Colorado School of Mines, Golden, CO, "Can One Trust Numerical Solutions of Integrable Infinite Dimensional Hamiltonian Systems?"

Scott Herod:

Yoshi Kimura:
NEEDS Conference, Oppenheimer Study Center, Los Alamos National Laboratory, "Dynamics of Complex Singularities for Burgers’ Equation" (poster), Sept. 12, 1994
The American Physical Society, Division of Fluid Dynamics meetings, Atlanta, GA, "Diffusion in stably stratified turbulence with and without rotation," Nov. 21, 1994
Congming Li:

Tom Manteuffel:
Colorado Conference on Iterative Methods, Breckenridge, CO, April 5-9, 1994.
Workshop on Least-Squares Finite Element Methods, Ohio Aerospace Institute, Cleveland, OH, October 12-14, 1994

Steve McCormick:
Department of Mathematics colloquium, University of Southern California, Los Angeles, CA “Least Squares”, April 1, 1994
Conference on Iterative Methods, Breckenridge, CO, “FOSLS”, April 3, 1994
Distinguished lecturer, University of California at San Diego, La Jolla, CA, “Multilevel Methodology”, July 24-29, 1994.

James Meiss:


Lucas Monzón:

Constance Schober:


Harvey Segur:

C. Research Grants for Calendar Year 1994

**Mark Ablowitz:**

- NSF, Mathematics Division: 1994-96 $25,000
- AFOSR, Mathematics: 1994-96 $88,000
- ONR, Mathematics: 1994-97 $46,000
- Air Force AASERT: 1993-96 $43,000
- ONR AASERT: 1994-97 $48,000
- CRCW: $1,500

**Jerrold Bebernes:**

- NSF, Mathematics Division: 1994-95 $20,000
- NATO: 1993-96 $2,300

**Gregory Beylkin:**

- ONR, Mathematics Division: 1993-95 $30,000
- AASERT - ONR - Mathematics Division: 1992-95 $78,000
- ARPA: 1993-96 $148,000
- IMA: 1994 $24,000
- ERIM (Environmental Research Institute of Mich.) $20,000

**James Curry:**

- ONR, 1992-94 $52,500
- AASERT, ONR, Physics/Oceanography Div.: 1992-94 $14,500
DOE Grant: 1993-95 $54,000
NSF Statewide Systemic Initiative: 1993-96 $17,000
NSF (SCREMS): 1994-95 $65,000

Congming Li:
NSF $20,000

Tom Manteuffel:
DOE, Applied Mathematics: 1993-96 $101,000
NSF, Mathematics Division: 1994-97: $50,000
NSF, Special Projects: 1994-97: $12,000

Steve McCormick:
AFOSR: 1994-95: $200,000
NSF, Mathematics Division: 1994-97: $50,000
NSF, Special Projects: 1994-97: $12,000

James Meiss:
NSF, Mathematics Division: 1993-95 $20,000
NSF, Graduate Traineeship: 1993-98 $111,000
NATO: 1993-94 $2,800
CRCW: 1993-94 $1,700

Harvey Segur:
NSF, Mathematics Division: 1993-96 $20,000
ONR, Physics/Oceanography Division: 1992-94 $52,500
AASERT, ONR, Physics/Oceanography Div.: 1992-94 $14,500
NSF, CISE Minority Fellowship (R. Charles): $6,000

Total $1,450,300

Granting Agencies:
NSF: National Science Foundation
AFOSR: Air Force Office of Scientific Research
ONR: Office of Naval Research
CRCW: Committee on Research and Creative Work, University of Colorado
AASERT: Augmentation Awards for Science and Engineering Research Training
ARPA: Advanced Research Project Agency
D. Miscellaneous for Calendar Year 1994

Mark Ablowitz:
CRCW Fellow, 1994-1995
Advisory boards: Chaos, Inverse Problems

Jerrold Bebernes:
Editor: Rocky Mountain Journal of Mathematics; Communications on Applied Nonlinear Analysis;
Reviewer: book for Bulletin of the American Mathematical Society

Gregory Beylkin:
Visiting Professor, Institute for Mathematical Applications (IMA), Minneapolis, Minnesota, Fall, 1994.
Editorial boards: SIAM Journal on Numerical Analysis; Applied and Computational Harmonic Analysis; Reviewer: NSF proposals; several journals

Sarbarish Chakravarty:
Reviewer: Journal of Mathematical Physics; Physics Letters A; Communications in Mathematical Physics; Physical Review Letters; Physical Review E, Nonlinearity, Journal of Physics A: Mathematical and General

James Curry:
Sabbatical 1994-1995
Co-PI: Colorado State Systemic Initiative
member: Board of Governors of The Geometry Center at the University of Minnesota
Designated President's Teaching Scholar, 1993-1995
Reviewer: Journal of Atmospheric Science

Robert Easton:
Editorial Board: Communications on Applied Nonlinear Analysis, Reviewer: NSF; research journals; graduate text for Houghton-Mifflin

Yoshi Kimura:
Reviewer: Journal of Atmospheric Science, SIAM Journal of Applied Mathematics, Physica D
Congming Li:
Reviewer: NSF; Rocky Mountain Journal of Mathematics; Communications in Pure and Applied Mathematics; Journal of American Mathematical Society; Communications in Partial Differential Equations

Tom Manteuffel:
Co-Chair, 3rd Colorado Conference on Iterative Methods, Copper Mountain, CO, April 5-9, 1994.
Member: Council of the Society of Industrial and Applied Mathematics (SIAM) and Program Committee of SIAM
Organizer, Workshop on Least-squares Finite Element Methods, Ohio Aerospace Institute, Cleveland, OH, October 12-14, 1994.

Steve McCormick:
Editor: SIAM Journal on Scientific Computing
Reviewer: grant proposals; Math Reviews; Zentralblatt
Co-Chair, 3rd Colorado Conference on Iterative Methods, Copper Mountain, CO, April 5-9, 1994.

James Meiss:
Editor: Physica D
Reviewer: NSF proposals; Physica D; Physical Review; Physics Letters; Physical Review Letters; book for Physics Today
Visited during sabbatical: University College, London; University of Warwick; University of New South Wales; Nagoya University; and La Trobe University.

Harvey Segur:
Boulder Faculty Assembly Teaching Excellence Award, 1994
8. PREPRINTS OF THE PROGRAM: 1994-95

Following is a list of preprints developed by Program faculty and visitors during this academic year. If you would like a copy of any preprint, please request a copy in writing from Margy Lanham, Program in Applied Mathematics, Campus Box 526, University of Colorado, Boulder, CO 80309-0526.

No.


