APPLIED MATHEMATICS NEWSLETTER

UNIVERSITY OF COLORADO AT BOULDER

FALL 1998 VOLUME 1 #1

A Newsletter?

Welcome to the new Applied Mathematics Newsletter. We hope that you find it of interest—both to let you know what has been happening in the Department and to help our alumni keep in touch with each other as well as us. In the following pages, you will find some news about a major grant that the department has received from the National Science Foundation. We intend that this grant spearhead some changes both in the way we do and teach applied mathematics.

To this end, we ask that you take a little time to fill out the survey at the end of the newsletter. This will help us assess how useful you found your training, so that we can make the applied math degree more relevant and train today's students for tomorrow's world.

We encourage you also to write to let us know what you are up to and how life is impacting upon your mathematics—if you wish your contribution to be included in the next issue, let us know. Note that we will not publish the information that you give in the survey unless you explicitly give your okay, with the exception of your name and graduation year. Most of all, enjoy.

Jim Meiss (the editor-by-default)
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From The Chair

The Department has completed an extraordinarily successful year. We recently learned that we will receive a major new grant from the National Science Foundation called VIGRE. It should be stressed that all members of the Department (faculty, graduate students undergraduates and staff) made invaluable contributions in one form or another to the grant: the VIGRE grant is a major departmental achievement.

The grant means that we are poised to move to the next level of excellence. We have demonstrated that we can compete with excellent departments in the mathematical sciences, many of which are much larger and have considerably more resources than we do. The Department is looking forward to the challenges that the VIGRE effort presents.

Teaching and research activities of our faculty continue to be carried out at a daunting level, especially when considering the size of the core faculty (13 tenure track faculty and 2 instructors). In 1997-1998, the Department taught 3,323 students—the largest enrollment ever! We are pleased to report that the Department has successfully introduced computational projects into its second year lower division course. Based upon student interest, we are expanding our lower division efforts in computing and related projects.

Graduate enrollment has increased to 51 this year, and the number of affiliated faculty has increased to 37. These are remarkable figures considering the fact that there were no graduate students or affiliated faculty in 1989, when the Program in Applied Mathematics began operations. In addition, last year, we awarded 15 B.S., 11 M.S. and 3 Ph.D. degrees: congratulations to our excellent students!

The 98-99 academic year is well underway, and we believe that it will be as successful as the last one.

Mark Ablowitz
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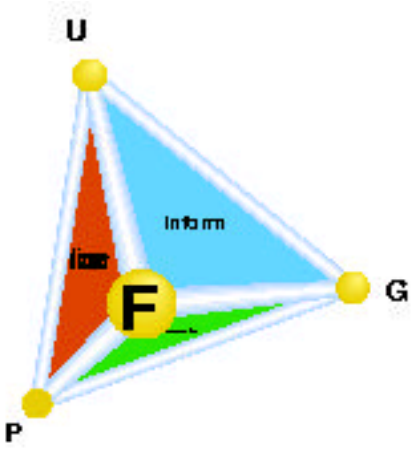
Major NSF Grant Funded

The Department has been awarded a major grant by the National Science Foundation for vertical integration of research and education (VIGRE, *pronounced vigor*) for $2.3 million over the next five years. The extremely competitive NSF VIGRE program is designed to bring together



faculty and students at all levels of research and education. NSF awarded six VIGRE grants. The other successful mathematical sciences units are Columbia, Harvard, Pennsylvania State, Princeton, and the University of Washington.

The grant is headed by Professor James Meiss, with three Co-Investigators (Mark Ablowitz, James Curry, and Bengt Fornberg). The effort introduces a novel concept of interactive research groups called *tetrahedra*, where each of the vertices represents one of the elements of the group: faculty, postdoctoral fellows, graduate students and undergraduate students.

Many of today's research projects require an interdisciplinary effort among a number of individuals, such as those involving complex mathematical and computational models of physical systems. A successful research project then requires collaboration with scientists in the modeling process, computational mathematicians in the algorithm development, and mathematical analysts in the interpretation and generalization of the results. The tetrahedra will facilitate the computational, communication and analytical skills needed to prepare students for the pivotal fact that "continuous change is a central feature of contemporary life."

Each of the tetrahedra will also participate in the development of "case study modules" for the Department's undergraduate courses. These modules will train students in collaborative problem solving skills, and give them an introduction and direction in the research.

Comings and Goings

We are pleased to welcome Keith Julien as an Assistant Professor in the Department. Keith received his Ph.D. in Applied Mathematics from Cambridge University in 1991. He worked as a postdoctoral researcher in JILA from 1991 to 1994, was a member of the Advanced Study Program at NCAR from 1994 to 1996 and served as an instructor in Applied Mathematics in 1997. Keith's areas of expertise include mathematical and computational fluid dynamics.

Hector Lomeli, who was an instructor for the Department for three years, left this summer to take a faculty position at the Instituto Tecnógico Autónomo de México in Mexico City. Congratulations Hector! Hector's wife, Monica Lluis, received a Master's degree in Telecommunications this year. She currently has a position with Cisco Systems in California.

Sabarish Chakravarty returns to the Department this fall after three years at the University of New South Wales in Sydney. Sabarish will be an instructor this year, and can already be seen most days patiently explaining the intricacies of integration methods to his students in his office.

APPM Blue

We are pleased to report that IBM announced that the Applied Mathematics Department was the recipient of a 12-node IBM SP 2 advanced

parallel processing computer, valued at nearly $900,000. Professors Tom Manteuffel and Steve McCormick, in collaboration with Professor (and APPM affiliated faculty member) Oliver McBryan, from Computer Science, worked hard to make this grant a reality. This gift from IBM will allow our students and faculty to gain invaluable experience in working with state of the art parallel computers, which is becoming a central research area in the field of scientific computation.

David Sholl joins Carnegie Mellon

After graduating in December '95, I did a postdoc for a year at Penn State, then moved on to another postdoc at Yale a year later. More recently, I have started a new job as a tenure-track assistant professor in the Chemical Engineering department at Carnegie Mellon University. I'm now in my second semester at Carnegie Mellon, and am currently teaching a graduate mathematical methods course. Trying to cover the highlights of linear algebra, ODE's, and PDE's while throwing in some numerical methods and statistics for good measure is a challenge, but I am enjoying it (I'm not sure if all of the students share my enthusiasm).

On the family side, Connie and I experienced a great change in our lives last year when our son Kevin was born. Kevin is now almost 15 months old and his antics keep us greatly amused. He is a seasoned traveler, with trips to New Mexico, California, and Australia already under his belt. We have recently bought a house with lots of room for Kevin to run around in and with big windows for him to watch the deer, rabbits, and wild turkeys that regularly visit our yard.

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Joseph Pearse: Consultant!

I have just begun working as a consultant for "The Summit Group," a small company of about 500 people that consults on open systems and IBM AS/400 mainframes. For the first two months of employment, I, along with the other new hires, are training, learning the ins and outs of the systems. After that, sometime in late November/early December, we will begin to go on site at various clients and begin working. Although, as of yet, I am not using many of my strictly mathematical skills, the time I spent learning Matlab in Numerical Analysis has provided a good basis for the programming that I am learning now.

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The Applied Math T-shirt for 1998-1999. This is one of five pictures that appear on the stunning T-shirt. To order the T-shirt, specify your size (S,M,L,XL) and send $15 (including postage) to Lynn Randolph, Box 526, University of Colorado, Boulder, CO 80309.
For an explanation of the pictures see
http://amath.colorado.edu/appm/faculty/hdullin/

McCormick goes Down Under

Sabbatical leaves are supposed to benefit professors by renewing research and teaching interests. By this meas-

ure, my sabbatical last year was successful: new research directions were stimulated by the various engineering groups that I visited, and I returned to teaching with the passion to share these developments with the students.

My travels took me to Lawrence Livermore National Lab (LLNL) in northern California and to the University of Auckland in the exotic and amazingly beautiful land of the kiwis. At LLNL, I worked with numerical analysts and physicists to develop more efficient methods for solving the large-scale problems that arise in simulation of nuclear stockpiles. This is a highly critical problem in energy research because, to protect our environment, we must thoroughly understand how these materials behave in storage over long periods. The problems that arise in the simulation of these processes are truly gigantic and require major advances in numerical algorithms and computing machinery.

In New Zealand, I worked with engineers at the cutting edge of human heart modeling. These are extremely difficult problems as well because they involve a complex combination of detailed physical processes: fluid flow (the blood), structural mechanics (the heart tissue), and electromagnetics (the heart activation process). I was happy to contribute in however small a way to the improvement in the algorithms that were being used for both types of simulations. Nevertheless, what affected me most was the opportunity to work closely with engineers and physicists who have an incredible understanding not only of the physical processes involved, but also of the applied mathematical issues that they face. It is truly impressive to see strong scientific teams working at the cutting edge of research.

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Bernard Deconinck at MSRI

I am currently a postdoc (for one year) at the Mathematical Sciences Research Institute (MSRI or Misery) in Berkeley, CA. This institute is independent of the University of California, although we are actually on its campus. MSRI organizes several workshops each year. I am here for the workshop that starts in the spring, Random Matrices and Integrable Systems.

Because of the workshops, many people flow through MSRI each year. The official number for last year was roughly 1300. This is good since I'm looking for a job for next year, and I get to talk to many big shots. It is bad because only a few of them stay for extended periods. Hence, it's not easy to talk to these people, given that they want to do a lot in their time here.

My research interests haven't changed much yet. That's partly because I've been spending a lot of my time writing up a paper on some of my thesis results. Apart from that, I've been doing a lot of reading. I've also been attending many talks, including most of the introductory workshop on symbolic computation and foundations of computational math.

Berkeley is a really nice (but expensive) place to live. I'm about a half-hour walk away from where I take the shuttle bus to MSRI. The shuttle goes between the math building and MSRI. Clearly, having as great a math department as UC Berkeley close by is a superb resource. I should use it more! From MSRI, there's a wonderful view of the San Francisco Bay and the whole of Berkeley. One of the advantages of being in Berkeley is that people are more than willing to come and visit us.

The inconvenience of having a job that's only for one year is that I'm already applying for jobs next year. Nevertheless, I'm happy with this one!

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Alumni Survey

We are in the process of looking at our curriculum and thinking about ways it can be improved. We are also trying to assess how useful your applied math degree has been to you. To determine how to make the applied math degree more relevant to today's industrial and business needs, we need your help.

We would truly appreciate it if you would fill out the following survey and return it to us. If you would prefer to fill it out on-line, the address is http://amath.colorado.edu/alumni/survey. Alternatively, call us at 303-492-4668 if you would like to discuss these questions with us directly. Thanks for your reply!

Anne Dougherty (Anne.Doughtery@Colorado.EDU)

Name: _____
Address:

Year of graduation and degree received: _____
email:_____Phone: _____
Education in addition to that obtained at CU.
(Please give institution, field of study, degree received and year)

The following questions ask about your current work:

Company: _____
Work address:

Current position: _____
Primary duties of your current position:

_____
To what degree were your applied math skills needed to obtain your current position?
○ (not at all) ○ (somewhat) ○ (frequently) ○ (critical to current job)

_____
To what degree does your current position utilize your applied math skills?
○ (not at all) ○ (somewhat) ○ (frequently) ○ (critical to current job)

_____
Which applied math courses or topics have been most useful to you in your current position?

_____
Which applied math courses or topics have been most useful to you in previous positions?

_____
Which applied math courses/topics have been least relevant?

Which courses/topics were not taught (or you did not take) that you wish you would have taken?

Please give any other comments on your Applied Math education at CU Boulder.

What, if any, information about yourself (job, spouse, children, etc.) would you like included in the next issue of the Applied Math newsletter? (NOTE: Only information that appears in this section, together with your name and graduation year, will be printed. Information given in the survey questions above will not be printed unless you so specify in this section.)

If you are ever in the Denver/Boulder area, would you be interested in talking with some of our undergraduate/graduate students about career opportunities in your area?

We are also trying to establish a list of companies that offer employment opportunities and internships for students in applied math. If your company is one of these, please give the name and contact information of the appropriate person.

Segur is Presidential Teaching Scholar

Harvey Segur has been selected as a Presidential Teaching Scholar, one of the highest honors the University can bestow. This award is offered to a truly select group of individuals at the University for their remarkable teaching and scholarly efforts. Segur is widely known to be an extraordinary teacher and scholar and was the only recipient of the award this year University-wide. Harvey is the second APPM faculty member to receive this honor joining ranks with Professor James Curry.

Congratulations Harvey!

Laurie Heyer in LA

I remember our first month of graduate school as a time of great excitement and uncertainty. We were in a new environment and making new friends, but with an overwhelming workload at first. My first month as a postdoc at USC has been much the same—only now the responsibility is greater, the expectations are higher, and the opportunities for encouragement are fewer. However, I'm holding on for dear life, learning survival techniques, and enjoying the ride.

This semester, I am teaching Probability for Business. Over 800 students take this course each semester, larger than that of any of Boulder's calculus courses. My section is the small one, with 85 students. I have one TA, while most sections have two for 150 students. There is a common final for all sections, so we all cover the same material; however, unlike CU's calculus courses, the uniformity stops there. Some professors assign homework, others don't, some give quizzes, and some don't, some give two midterms, others give three. Everyone spends different amounts of time on each topic. The integration of computer labs into the class is left entirely up to each instructor; it is only required to ask them to do *something* on the computer. It remains to be seen to what extent performance on the common final varies from section to section. (What a great data set for studying the effects of different teaching and evaluation techniques!) I'm extremely pleased to be teaching in my own field, even if it is a basic class.

In addition to my teaching duties, I am sitting in on an advanced statistics class, going to two or three talks per week, and filling the holes in my biology background by reading the textbook for a junior level class. For my research, I have been asked to look at a problem in an area new to me. I'm also working on a project with the other two postdocs in a new research area for the group. It's like beginning two new theses.

In short, I am incredibly busy. The research environment here is rich, and opportunities for involvement in projects with various people seem unbounded. The combination of teaching and learning that I am getting to do this semester is exactly why I got into this business; I find it challenging and invigorating. Moreover, although I have written only about my work, living in LA is just as challenging and invigorating. I'll save that story for another time.

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