MATHEMATICS RESEARCH AND EDUCATION AT THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

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ANNUAL REPORT 2003-2004

NSF funded the Department of Mathematics at the University of Illinois at Urbana-Champaign (UIUC) with a five-year VIGRE grant beginning in June 2000. This is the annual report for 2003-2004, the fourth full year of funding under this program. For detailed information about the NSF-supported UIUC VIGRE program, see <http://www.math.uiuc.edu/VIGRE>.

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I. OBJECTIVES OF UIUC VIGRE PROGRAM

The UIUC VIGRE program was designed with many different program components so that graduate students and faculty members could find activities in the program corresponding to their particular interests. Indeed, the majority of graduate students and faculty members have been active in one fashion or another in our VIGRE program (see III. A,B).

To demonstrate our VIGRE strategies and how the objectives have been met, we present our report in the following order:

II. MAIN COMPONENTS OF THE UIUC VIGRE PROGRAM
III. PARTICIPANTS IN THE UIUC VIGRE PROGRAM
IV. PERFORMANCE ASSESSMENT OF THE UIUC VIGRE PROGRAM.

The first six pages of this report are in summary form. This is followed by an extended description of this year's activities. As part of this program, the participants were asked to submit reports and summaries of their activities to the VIGRE coordinator. These are attached in an appendix to this report.

II. MAIN COMPONENTS OF THE UIUC VIGRE PROGRAM

A. Graduate Recruitment

Graduate students at UIUC are broadly recruited. The NSF VIGRE grant provides fellowships to support outstanding graduate students who are citizens or permanent residents of the US. The UIUC VIGRE program supported 13 graduate students in 2000-2001, 15 graduate students in 2001-2002, 16 graduate students in 2002-2003, and 17 graduate students in 2003-2004. The current plan is to use the NSF VIGRE program funds to support 17 more graduate students beginning in fall 2004.

B. Postdoctoral Recruitment

Postdoctoral faculty members at UIUC are also widely recruited. The NSF VIGRE grant provides 50% of the annual stipend needed to support postdoctoral faculty members, all of whom must be citizens or permanent residents of the US. The remaining 50% of the stipend comes from matching funds taken out of the UIUC Department of Mathematics operating budget. The department's postdoctoral program includes Doob Postdoctoral faculty members, as well as VIGRE postdoctoral faculty members. Taken together, during the period 2000-2004, these programs will have supported 25 postdoctoral faculty members. Because these postdoctoral faculty members have a wide range of research interests, they have had a broad and significant impact on the research and teaching missions of the UIUC Department of Mathematics.

C. RAPs (Research Among Peers)

The RAP groups are working seminars consisting of regular faculty, postdoctoral faculty, and graduate students. RAP organizers are regular or postdoctoral faculty members. There were 10 RAPs during the academic year 2003-2004.

D. ALPs (Across Level Peers)

The ALP groups consist of faculty members, graduate students, and undergraduate students. They differ from RAPs in that undergraduate students are involved. ALP organizers are regular or postdoctoral faculty members. There was one ALP conducted in 2003-2004.

E. GSSs (Graduate Student Seminars)

Graduate students organize and conduct these seminars, with faculty oversight. Eleven of these seminars have been conducted since summer 2003, each with a specific theme. In addition, the more broad-based Math 500 graduate student seminar was active again this year.

F. TTUs (Teacher Training for Undergraduates)

These supervised activities are designed for undergraduate students who are interested in the teaching of mathematics. A faculty member mentors and supervises this activity. TTUs are focused around a course that the faculty member is teaching. The student learns about the preparation of lecture materials and examinations, and participates in the classroom instruction as the term progresses. Many students have expressed an interest in the TTU program. Five TTUs were conducted in 2003-2004.

G. REGs (Research Experiences for Graduate Students)

The purpose of REGs is to encourage research activities at an early stage of the graduate program. The Graduate Affairs Committee from 2002-2003 conceived of the REGS program as a part of discussions centered on the department's involvement as a partner in the CID (Carnegie Initiative on the Doctorate). The first summer, REGs consisted of 20 first and second year graduate students who worked on research projects with faculty in various formats. The program has grown; 31 graduate students are participating in REGs in summer 2004. The norm is for one or more graduate students to work with one or two faculty, but the working groups are kept small. Graduate students receive a stipend of $3,200 for the REGs activity. Students who qualify for NSF VIGRE support are given stipends from the VIGRE budget. International students are supported at the same level by other funding sources. Not all projects are expected to culminate in a publishable research article. The primary goal of REGS is to engage beginning graduate students in the mathematical research agenda of the Mathematics Department and to thereby increase their maturity level; such students are then better prepared to participate in deeper research projects.

H. REUs (Research Experiences for Undergraduates)

Two types of REUs are sponsored by the VIGRE grant: individual REUs and group REUs.

1. Group REUs

These research experiences are for undergraduate students. The summer REUs are planned as group activities with one or more faculty supervisors, and may have graduate students as assistants. These programs run for 8 weeks during the summer sessions at UIUC. NSF funds the undergraduate student with a stipend of $2,700 during a summer REU. The Department of Mathematics increased this stipend to $3,200 using its own funds. There were two group REUs in summer 2003 and there will be three group REUs in summer 2004.

2. Individual REUs

Each REU has a faculty supervisor. The supervisor and student agree together on a research activity, which involves independent research, possibly in conjunction with study of the existing literature. The undergraduate student is paid a stipend of $2,000 for an individual REU. Most of the individual REUs occur during the academic year, but some of them also occur during the summer. There were 17 individual REUs in 2003-2004.

III. PARTICIPANTS IN THE UIUC VIGRE PROGRAM

A. Faculty Participants in the UIUC VIGRE program

The PI and CoPIs for the UIUC VIGRE grant are the following members of the Department of Mathematics:

1. Prof. Joseph Rosenblatt, PI and VIGRE Coordinator, Chair of the Department of Mathematics
2. Prof. John D'Angelo, CoPI and CID Coordinator
3. Prof. Graham Evans, CoPI and Undergraduate Programs Director
4. Prof. Philip Griffith, CoPI and Director of Graduate Studies
5. Prof. Robert Muncaster, CoPI and Associate Chair of the Department of Mathematics

The UIUC VIGRE program has its main components widely dispersed through the educational and research activities of the department. For this reason, many of the faculty members are involved in VIGRE-related activities such as RAPs, ALPs, TTUs, and REUs. Faculty members who have been participants, organizers, or supervisors of particular VIGRE activities during 2000-04 are listed, with codes for their type of involvement, later in this report. Over the last four years, 2000-2004, at least 109 UIUC

faculty members have had some form of involvement with the VIGRE program. The number of faculty involved in the UIUC VIGRE program over the last four years is:

1. RAPs: 79
2. ALPs: 12
3. Graduate Student Seminars: 8
4. TTUs: 13
5. REGs: 25
6. Individual REUs: 19
7. Group REUs: 8
8. Postdoctoral Mentors: 27
9. Faculty Advisor: 27

B. Student Participants in the UIUC VIGRE program

Undergraduate students and graduate students actively participated in various components of the program in the academic year 2003-04. See below for more details. The number of undergraduate and graduate students involved in the UIUC VIGRE program in some form or another over the last four years is:

1. RAPs: 70 graduate students and 4 undergraduate students
2. ALPs: 17 undergraduate students and 6 graduate students
3. GSSs: 46 graduate students
4. TTUs: 16 undergraduate students
5. REGs: 46 graduate students
6. Individual and Group REUs: 79 undergraduate students

IV. PERFORMANCE ASSESSMENT OF UIUC VIGRE PROGRAM

A. External site visits

1. The UIUC VIGRE proposal included funding a site visit by three mathematicians from outside UIUC. They were Carl Pomerance, Al Taylor, and Carol Wood. This site visit occurred on September 27, 28 of 2001. Their report appeared in the 2001-2002 annual report on our VIGRE program

2. The official NSF site visit occurred on Tuesday, December 3, 2002. The NSF team consisted of Richard Millman (NSF, VIGRE program director), David Griffeath (University of Wisconsin, Madison), and Marianthi Markatou (NSF and Columbia University). Based on this third-year review, NSF gave continued funding for the fourth and fifth years of the UIUC VIGRE program.

3. The department created an Alumni Visiting Committee, which visited the department October 16-18, 2003. It consisted of Dick Hain (Duke), Stuart Kurtz (Chicago), Jim Colliander (Toronto), and Judy Walker (Nebraska), all UIUC

graduate alumni. Their report was shared with the entire department and key administrators on campus. See IV C 1c) for additional information.

B. Meeting the Objectives of the UIUC VIGRE program

The UIUC VIGRE program has a broad range of objectives related to mentoring of graduate students and postdoctoral faculty members, improving the educational program for graduate students and undergraduate students, and shortening of the time needed to obtain a PhD degree. The Department of Mathematics is constantly assessing its programs overall. In particular, it is an active partner in the CID. The Graduate Affairs Committee (GAC) in 2001-2002 studied extensively issues connected with time to degree, mentoring and advising of graduate students, and other aspects of the graduate student experience. The GAC has continued this work in 2002-2003 by seeking ways to implement the recommendations from this study. The GAC focus this year is on mentoring and the critical transition for graduate students from coursework to research; reports on these issues will be coming out later this calendar year. Also, it was a consensus of our CIRI report (see the VIGRE Annual Report 2000-2001), the VIGRE site visits, and the internal assessments, such as the ones performed by GAC, that the VIGRE program has been a positive force for improvement in the department.

The main components of the UIUC VIGRE program serve to advance our objectives.

1. Integration of research and education in the undergraduate and graduate programs

   RAPs, REGs, ALPs, Graduate Student Seminars, TTUs, REUs

2. Broadening of educational experiences in the mathematics programs

   RAPs, REGs, Graduate Student Seminars, REUs, TTUs

3. Mentoring at all levels of the mathematics programs

   RAPs, ALPs, Graduate Student Seminars, REGs, TTUs

4. Recruitment of graduate students, and postdoctoral faculty

   Fellowship support for new and continuing graduate students
   New postdoctoral faculty positions
   Mentoring of new graduate students and postdoctoral faculty members

5. Shortening of the time needed to obtain a PhD

   VIGRE program activities have the effect of increasing scientific activity in the department through the main components (e.g. RAPs, REGs, REUs). They give students new opportunities for immersion in research. This involvement is helped by

a. Fellowships for graduate students
b. Released time for involvement in the VIGRE program

The 2001-2002 report from the GAC on the time to degree for graduate students generated a number of ideas for shortening the time to degree. In particular, the new REGs program (Research Experiences for Graduate Students) that emerged from this report was singled out as a proactive step to shortening the time to degree for many of the graduate students.

6. Connecting mathematics with other programs

RAPs, Graduate Student Seminars, Mathematics in Science and Society Series

Connections among the Department of Mathematics and the Departments of Electrical and Computer Engineering, Theoretical and Applied Mechanics, Physics, Materials Science and Engineering, Computer Science, Aeronautical and Astronautical Engineering, Chemical Engineering

Development in progress of a campus wide Applied Mathematics Program that will have a variety of departmental affiliates and independent curriculum plans

Connections among the Department of Mathematics, NCSA (National Center for Supercomputing Applications), CSL (Coordinated Science Laboratory), and the Beckman Institute

C. The (CID) Carnegie Initiative on the Doctorate

The CID is a national level discussion about the current state and future directions of the doctorate in the US. The Carnegie Foundation is involving a number of different disciplines in this study. The Department of Mathematics is one of the eight partner departments in mathematics. John D'Angelo is the coordinator for our CID activities. At some near time in the future, there will be a public dissemination of the final conclusions and recommendations of the CID.

II. MAIN COMPONENTS OF THE UIUC VIGRE PROGRAM

Extended Description

A. Graduate Recruitment

The graduate fellowship component of the NSF VIGRE grant has been extremely beneficial to student fellowship recipients. Students have used VIGRE support to focus more intensely on their research and to make good progress on their Ph.D. degrees. All new graduate students talk with the Director of Graduate Studies, Phil Griffith) about their educational goals and are assigned a faculty advisor in their area of greatest research interest. Sometimes these advisors become the students' dissertation advisors too.

The 13 graduate students supported in 2000-01 (with their advisors) were:

Edith Adan-Bante (Everett Dade)
Mark Bauer (Nigel Boston)
Jerry Gagelman (Anand Pillay)
Joseph Mileti (Carl Jockusch)
Andrew Richardson (Phil Griffith)
Noah Salvaterra (Stephanie Alexander)
Christopher Willett (Susan Tolman)
John Barela (C. Ward Henson)
Madhav Chandrasekher (Nigel Boston)
John Maki (Eugene Lerman)
Lia Petracovici (Aimo Hinkkanen)
Andrew Rizzo (Zhong-Jin Ruan)
Jason Tedor (Doug West)

The 15 graduate students supported in 2001-2002 (with their advisors) were:

John Barela (C. Ward Henson)
Elizabeth Gallery (Richard Sowers)
Joseph Mileti (Carl Jockusch)
Natella O'Bryant (Richard Sowers)
Lia Petracovici (Aimo Hinkkanen)
Andrew Rizzo (Zhong-Jin Ruan)
Akira Sano (William Haboush)
James Tyne (Lou van den Dries)
Alison Champion (Nigel Boston)
David Gepner (Matt Ando)
David Murphy (Fossum/Haboush)
Boris Petracovici (Robert Jerrard)
Andrew Richardson (Phil Griffith)
David Rose (Joe Miles)
Jacent Tokaz (Douglas West)

The 16 graduate students supported in 2002-2003 (with their advisors) are:

Michael Baym (Alexandru Zaharescu)
Zhou Dong (Anand Pillay)
Jerry Gagelman (Anand Pillay)
Nadya Markin (Iwan Duursma)
David Murphy (Fossum/Haboush)
Jennifer Paulhus (Iwan Duursma)
Melissa Simmons (Zhong-jin Ruan)
Stephanie Traneer (Andreas Stein)
Sylvia Carlisle (C. Ward Henson)
Caleb Eckhardt (C. Ward Henson)
Donald Gibson (A. J. Hildebrand)
Joseph Mileti (Carl Jockusch)
Eric Owiesny (Bruce Berndt)
Boris Petracovici (Robert Jerrard)
Sandra Spiroff (Phil Griffith)
Diana White (Sather-Wagstaff/Griffith)

The 17 graduate students supported in 2003-2004 (with their advisors) are

Laura Chasman (Dirk Hundertmark)
Zhou Dong (Anand Pillay)
Samuel Kadziela (Iwan Duursma)
Christopher Lee (Matt Ando)
Nadya Markin (Nigel Boston)
Joseph Mileti (Carl Jockusch)
Michael Roman (Michael Loui)
Tony Se (Lou van den Dries)
Jeremy Wong (Stephanie Alexander)
Timothy Cobler (Iwan Duursma)
David Gepner (Matt Ando)
Hamid Kulosman (Phillip Griffith)
David Lipsky (Matt Ando)
Jason McCullough (Iwan Duursma)
Joshua Mullet (Daniel Grayson)
Lucas Sabalka (Daniel Grayson)
Diana White (Sean Sather Wagstaff)

The 17 graduate students planned for support in 2004-2005 (with their advisors) are

Laura Chasman (Dirk Hundertmark)
Zhou Dong (Anand Pillay)
Isaac Goldbring (*Phillip Griffith)
Kevin Jones (Matt Ando)
Nadya Markin (Nigel Boston)
Daniel Morton (*Phillip Griffith)
Patrick Reynolds (*Phillip Griffith)
Nathaniel Stapleton (*Phillip Griffith)
Daniel Zaharopal (*Phillip Griffith)
Timorthy Cobler (Iwan Duursma)
David Gepner (Matt Ando)
Simon Heller (Ilya Kapovich)
David Lipsky (Matt Ando)
Jason McCullough (Iwan Duursma)
Ryan Rettberg (*Phillip Griffith)
Tony Se (Lou van den Dries)
Paul Wenger (*Phillip Griffith)

*new graduate students assigned to Phillip Griffith, Director of Graduate Studies, for their initial faculty mentor

B. Postdoctoral Recruitment

In the academic year 2003-2004, there were 7 VIGRE Postdoctoral Research Associates in the Department of Mathematics. One new VIGRE postdoctoral faculty member joined the 6 others who have now had two to three years of experience in the program.

Three VIGRE Research Assistant Professors began their appointments in fall 2000:

Sean Sather-Wagstaff (commutative algebra)
Karen Shuman (harmonic analysis, signal processing)
Jozef Skokan (graph theory, combinatorics).

Sean Sather-Wagstaff also was selected as an NSF postdoctoral fellowship recipient.

Three more VIGRE Research Assistant Professors began their appointments in fall 2001:

Christopher French (topology, homotopy theory)
Alica Miller (dynamical systems)
David Sherman (operator theory).

In fall 2002, the three new VIGRE Research Assistant Professors were:

Patrick Bahls (geometric group theory)
Matthew Boylan (number theory)
Donald Yau (topology).

In fall 2003, the one new VIGRE Research Assistant Professors was:

Eun So Lee (differential geometry)

In fall 2004, the three new VIGRE Research Assistant Professors will be:

Clifton Ealy (logic)
Stephen Hartke (combinatorics)
Prabhu Janakiraman (analysis and probability theory)

See the Math Times (the Department of Mathematics newsletter) for information about these and other new faculty members at UIUC. The Math Times can be found at the link <http://www.math.uiuc.edu/mathtimes>.

C. RAPs (Research Among Peers)

There were 10 RAPs in progress during the academic year 2003-04. Here are brief descriptions of these RAPs.

1. Scott Ahlgren and Matt Boylan conducted a RAP in spring 2004. The group discussed connections between modular forms, modular curves, Galois representations, and problems in number theory. Participants talked on background material and current research papers. In addition to the organizers, other regular participants included Leon McCulloh and 10-12 graduate students. For more information about this RAP, go to their weppage http://www.math.uiuc.edu/~boylan/rap.html.

2. Florin Boca conducted an RAP on Expander Graphs (Constructions and Applications) in fall 2003 and spring 2004. The aim was to read in detail the book ``Elementary Number Theory, Group Theory, and Ramanujan Graphs" by Davidoff, Sarnak and Valette, together with a few more additional topics. Regular participants included Iwan Duursma, Ilya Kapovich, Robert Kaufman, Marius Junge, Alexandru Zaharescu (mathematics faculty members), Pascal Vontobel (CSL postdoctoral faculty member), Ioana Boca, Michael Bush, Negar Kiyavash (graduate students). Other participants included Yevgeny Gordon (Eastern Illinois University faculty member), Patrick Bahls (mathematics postdoctoral faculty member), Dan Farley (mathematics department visitor), Weiting Cao, Lucas Sabalka, Florin Stan (graduate students).

3. Robert Fossum (Department of Mathematics) and Yi Ma (Department of Electrical and Computer Engineering) conducted a RAP on Geometry and Algebra of Computer Vision. This RAP centered on a series of lectures concerning the mathematical foundations for implementing computer vision. Participants included faculty members and graduate students in the Departments of Mathematics and Electrical and Computer Engineering.

4. Marius Junge and Nicholas Yannelis (Department of Economics at UIUC) conducted a RAP on vector-valued integration and its connections to economics. The mathematical background of equilibrium theory with asymmetric information in economics was the central focus of this RAP. Participants included the organizers, Denka Kutzarova, Jerry Uhl, Tom Carty, Melika Bulu, and M. Polarmatchuk.

5. Ilya Kapovich conducted a RAP in fall 2003, the last semester of the RAP "Metric Spaces of Non-Positive Curvature". They review in detail Richard Schwartz' proof of the Quasi-Isometric Rigidity Theorem for non-uniform lattices in H^n (where $n>2$). This theorem provided a far-reaching generalization of Mostow Rigidity and also resulted in the birth of a new an active subject of Quasi-Isometric Rigidity. The following people participated in this RAP: (faculty members) Ilya Kapovich (organizer), Stephanie Alexander, Richard Bishop, Paul Schupp, David Berg; (postdoctoral faculty and visitors) Peter Brinkmann, Patrick Bahls, Dan Farley, Kim Whittlesey, (graduate students) Elizabeth Denne, Bogdan Petrenko, Jeremy Wong, Lucas Sabalka, and John Barela. There were also two guest speakers: Gregory Bell from Pennsylvania State University and Alex Furman from the University of Illinois at Chicago.

6. Sheldon Katz conducted a RAP in spring 2004 on supersymmetry from a mathematical perspective. There were talks on supersymmetry and mirror symmetry. The speakers were Sheldon Katz, Steve Bradlow, Rinat Kedem, Richard Corrado, Tom Junk, Josh Guffin, Florin Boca, and Duncan Christie. The regular participants were Elizabeth Denne, Dirk Hundertmark, Chad Fendt, Joshua Guffin, Inga Karliner, Jonathan Cox, Tom Junk, Kevin Kai-feng Chiou, Rob Leigh, Michael Mulligan, Michael Sommers, Sean Nowling, Rinat Kedem, Mehmet Sahin, Michael Stone, Ognyan Stoyanov, Vivek Srikrishnan, and Fu Yong.

7. Rinat Kedem conducted a RAP in fall 2003 on Nakajima's quiver varieties and representation theory. The group met weekly and worked through a number of aspects of the original work of Nakajima and related work of other mathematicians. The primary participants were Maarten Bergvelt, Steve Bradlow, Richard Corrado, William Haboush, Wei He, Sheldon Katz, Rinat Kedem, David Murphy, Akira Sano, Susan Tolman, Bin Wang, and Xinyun Zhu

8. Eugene Lerman conducted a RAP in fall 2003 on SubRiemannian Geometry. The group met twice a week for the whole term. They used Richard Montgomery's recent book as a guide for the discussions. The participants included Eugene

Lerman, Vadim Zharnitsky, Rob Ghrist, Jeremy Tyson, Dror Varolin, Sue Tolman, Steve Bradlow, Ilia Binder, Dick Bishop, Stephanie Alexander, and Howard Osborn.

9. Sean Sather-Wagstaff conducted a RAP in spring 2004 on Sharp's Conjecture on dualizing complexes. The goal was to cover background material and the proof of Sharp's conjecture using the existence of Macaulayfications. The regular participants were faculty members and graduate students.

10. Dror Varolin conducted a RAP in fall 2003 on several complex variables and Riemannian geometry. Participants included graduate students and faculty members. The speakers included John D'Angelo, Dror Varolin, Alex Tumanov, Adam Coffman (IUPUI Fort Wayne), John McCarthy (Washington University), and Eric Shippers (University of Michigan).

D. ALPs (Across Level Peers)

During spring 2004, Robert Ghrist conducted an ALP on Robotics with students from the Department of Mathematics and several departments in the College of Engineering, and other interested faculty members.

E. Graduate Student Seminars

There were 11 graduate student seminars with different themes in 2003-2004. In addition, the graduate student seminar Math 500 was active for the second year. The graduate student organizer of these seminars is given a teaching reduction of ½ of their teaching load during the period of the seminar or as soon after that as is possible. This reduction in teaching, and the educational experience of the seminar itself, contribute to their progressing more quickly in their degree program.

1. Here are brief summaries of the 11 graduate student seminars:

a. Jonathan Cox organized a GSS with Sheldon Katz as the faculty supervisor. The topic for this activity in fall 2003 was Gromov-Witten invariants and related topics. See <http://www.math.uiuc.edu/~jacox/pastf03.html> for further information about talks and participants. This group then went on to work together in spring 2004 on a GSS in mirror symmetry. See <http://www.math.uiuc.edu/~jacox/past.html> for information about this subsequent semester's activity.

b. Katarina Jegdic led a GSS in analysis in fall 2003. A variety of talks and topics were investigated in detail with wide participation. See their webage for more information: <http://www.math.uiuc.edu/~kjegdic/analysis_fall03.html>.

c. John Jossey organized a GSS on Algebraic Number Theory, with the faculty supervision of Steve Ullom and Leon McCulloh. The group followed the text by Cassels and Frohlich, "Algebraic Number Theory." The graduate student

participants were Barry Walker, Nadya Markin, Jennifer Paulhus, Micah James, Michael Bush, Timothy Kilbourn, Bin Wang, Florin Stan, and the organizer.

d. Joseph Mileti's GSS ran in summer 2003. The topic of study was large cardinals. There was a small group of regular participants. Joseph Mileti and Javier Moreno gave most of the talks.

e. Jennifer Paulhus ran a summer 2003 GSS on Algebraic Number Theory. The group covered diverse topics that they had encountered in their studies. The regular participants were Timothy Kilbourn, Jennifer Paulhus, Micah James, John Jossey, James Atkinson, Eric Landquist, Stephanie Treneer, Ayhan Gunaydin, Barry Walker, Michael Bush, and Maosheng Xiong.

f. Bogdan Petrenko (Scott Ahlgren, faculty supervisor) led a GSS in Quantum Calculus during fall 2003. The group met weekly and worked together to cover the text "Quantum Calculus" by V. Kac and P. Cheung. The main participants were Bogdan Petrenko, O. Chan, Jong Yun Hahn, Chadwick Gugg, D. Robinson, and Stephanie Treneer

g. Diana White, with Sean Sather-Wagstaff as the faculty supervisor, conducted a GSS in summer 2003. The focus was to study varieties and schemes, using the book by Hartshorne, "Varieties and Schemes." The principle participants were Shivi Bansal, Samuel Kadziela, Kevin Jones, and the organizer. Diana White then continued this activity in fall 2003 and spring 2004 in organizing a GSS on Commutative Algebra and Algebraic Geometry.

h. The Women in Mathematics at UIUC GSS seminar has run over the last couple of years. This year, taking over from Stephanie Treneer and Jennifer Paulhus, a group of three students organized this ongoing forum for mathematical talks. This year's organizing committee consisted of Jeong Ok Choi, Katarina Jegdic, and Valerie Peterson. Rinat Kedem was the faculty advisor. This seminar activity occurred usually every two weeks.

2. Math 500 is a different type of graduate student seminar. It is a series of expository talks by graduate students for graduate students. The graduate students present a broad view of their own research area. They also can give details about their individual research. This forum for graduate students to speak about their work, and the basics of their research area of interest, has been a well-attended event on an ongoing basis. Michael Bush was the student organizer of this year's Math 500 lecture series. Phil Griffith (faculty member) acted as the faculty supervisor. In addition, two of our postdoctoral faculty members, Matthew Boylan and Patrick Bahls, were regular participants and mentors for Michael Bush and the other graduate student participants in Math 500. Math 500 continued to be a success this year. See <http://www.math.uiuc.edu/~mrbush/math500.html> for more details.

F. TTUs (Teacher Training for Undergraduates)

TTUs have given a number of undergraduate students an opportunity for cooperative teaching with a faculty member. Five TTUs were conducted during the 2003-04 academic year.

1. Aaron Wittrig had a TTU working with Randy McCarthy in a fall Math 120 large lecture class, the first course in the calculus sequence.

2. Amber Hardy had a TTU working with Jerry Uhl in a Calculus & Mathematica 315 course in spring 2003.

3. Jack Kahoutek had a TTU working with Jerry Uhl in a Discovery Course section of Calculus & Mathematica 120 during the fall 2003 term.

4. Greg Stanton had a TTU working with Carl Jockusch in a Discovery Course active learning section of Math 120 in fall 2003.

5. Steven Spradu had a TTU working with Serge Ivanov in spring term 2004. He was involved in every aspect of the course planning and presentation.

G. REGs (Research Experiences for Graduate Students)

Here is a summary of the REGs from summer 2003 and summer 2004 (as currently planned). As described above, the primary goal of REGS is to engage beginning graduate students in the mathematical research agenda of the department, and to thereby increase their maturity level; such students are then better prepared to participate in deeper research projects.

Summer 2003 REG Participants

Student	**Faculty Mentor**
James Atkinson (USA) NSF	Scott Ahlgren
Salih Azgin (Turkey)	Anand Pillay
Shivi Bansal (India)	Marius Junge
Caleb Eckhardt (USA) NSF	C. Ward Henson
Tamas Forgacs (USA) NSF	John D'Angelo
Chadwick Gugg (USA) NSF	Kevin Ford and Alexandru Zaharescu
Ayhan Gunaydin (Turkey)	Lou van den Dries
Kevin Jones (USA)	Daniel Grayson
Samuel Kadziela (USA) NSF	Iwan Duursma
Timothy Kilbourn (USA) NSF	Scott Ahlgren
Youngsoo Kim (Korea)	Daniel Grayson

Andrew Ledoan (USA) NSF	Kevin Ford and Alexandru Zaharescu
Jung Jin Lee (Korea)	Marius Junge
Christopher Lee (USA) NSF	Eugene Lerman
Maciej Malicki (Poland)	Slawomir Solecki
Andrea Mhoon (USA) NSF	Daniel Grayson
Ricardo Rojas (USA) NSF	Iwan Duursma
Rekha Santhanam (India)	Daniel Grayson
Bart Snapp (USA) NSF	Sankar Dutta
Jonathan Webster (USA) NSF	Andrea Stein

Summer 2004 REG Participants

Student	**Faculty Mentor**
Shivi Bansal (India)	Sean Sather-Wagstaff
Sylvia Carlisle (USA) NSF	C. Ward Henson
Thomas Carty (USA) NSF	Robert Muncaster
Xiangyu Cheng (China)	Yanyun Zhu
Jeong-Ok Choi (Korea)	Doug West
Tamas Forgacs (USA) NSF	Dror Varolin
Hailong Hu (China)	Doug West
Kevin Jones (USA) NSF	Matthew Ando
Samuel Kadziela (USA) NSF	Sean Sather-Wagstaff
Timothy Kilbourn (USA)	Sean Sather-Wagstaff
Ji Young Kim (Korea)	Yanyun Zhu
Ming Kou (China)	Robert Bauer
Qi Liu (China)	Doug West
Jana Marikova (Czech Republic)	Lou van den Dries
Nadia Masri (USA) NSF	Sean Sather-Wagstaff
Lale Ozkahya (Turkey)	Doug West
Jennifer Paulhus (USA)	Iwan Duursma
Valerie Peterson (USA) NSF	Robert Ghrist
Melissa Simmons (USA) NSF	Bruce Reznick
Bart Snapp (USA) NSF	Sean Sather-Wagstaff
Michael Sommers (USA) NSF	Sheldon Katz
Hua Tao (China)	Renming Song
Jennifer Vandenbusche (USA) NSF	Doug West
Chunlin Wang (China)	Renming Song
Yun Wang (China)	Renming Song
Diana White (USA) NSF	Sean Sather-Wagstaff
Joseph Wright (USA) NSF	Doug West
Maosheng Xiong (China)	Iwan Duursma
Gexin Yu (China)	Doug West
Feng Zhang (China)	Renming Song
Wei Zou (China)	Yanyun Zhu

REMARKS: We describe here three of the REGS from 2003 in more detail to give some idea of the variety and range of styles in the various REGS.

a. Professor Daniel Grayson led a group of five graduate students from his course on algebraic K-theory into a Summer REGS project. Grayson is writing a graduate text on the subject and wished to give a more manageable presentation of a particularly thorny topic. He divided up the workload among the students and served as their mentor. The end result was an article accepted for publication in Journal of Algebra jointly written by the five students and Grayson.

b. Professor Scott Ahlgren worked with two students on separate projects in number theory. Each student wrote up his own results at the end of summer. One has been accepted for publication in Journal of Number Theory. Both projects were successful in that they helped their respective student researchers achieve a higher level of confidence and understanding of the commitment one needs in undertaking scientific research.

c. Professor John D'Angelo worked with Tamas Forgacs on complex variables analogues of Hilbert's 17^{th} problem. During the summer D'Angelo advised Forgacs to take a graduate course from Varolin on Riemann surfaces in the following fall. As a result Forgacs has chosen Varolin to be his thesis advisor. In this case, the REGS program did not result in a published paper, but did succeed in focusing the student's interests and in the early choice of an advisor.

H. REUs (Research Experiences for Undergraduates)

Two types of REUs were offered again this year. One type is the individual REUs that typically occurs during the academic year, but can also be organized in the summer. The other type is the group REUs that are best organized for a block of time during the summer. The UIUC summer 2003 REU program was based on the previous successful summers 2001 and 2002 REU program. Some of the individual and group REUs have led to publishable mathematical articles. These students have an * after their names.

1. Group REUs in summer 2001, 2002, 2003, and 2004:

The VIGRE grant included support of $2,700 per student for summer group REUs. The first three years of the grant have sufficient funds for 36 students to have such experiences. The Department of Mathematics supplemented these awards so that the total stipend was $3,200 in the summer programs. The students paid for their own travel, housing, and board out of this stipend.

The initial plan was to have summer group REUs, in groups of about 18 students each, during the summers of 2001-2003. This timing was necessitated by the funding for the UIUC VIGRE program coming too late to advertise and run a program in the summer of 2000. The demand for the summer program for 2001 was so great, with 26 participants from all around the country, that an expansion of the program to accommodate between 20

and 30 students is being planned for subsequent years. In summer 2002, there were 22 students involved in four different group REUs. In summer 2003, there were 13 students involved in two different group REUs. The plan at this date is to have 16 students involved in group REUs in summer 2004; there will be three groups, one in geometric visualization, one in game theory, and one in group theory.

Both graduate students and faculty members are encouraged to propose such group REUs or to participate in one of the group REUs that is already planned.

a. Recall first that the summer 2001 group REUs included:

i. George Francis organized a group summer REU around computational mathematics and computer visualization that had 9 students. Dr. Karen Shuman, one of our NSF VIGRE postdoctoral faculty members, assisted him. See the appendix for further information about this program. This group's participants were

Benjamin Bernard (UIUC)
Benjamin Farmer (UIUC)
Mark Flider (UIUC)
Douglas Nachand (UIUC)
Alison Ortony (UIUC)
Lorna Salaman (U. of Puerto Rico)
Benjamin Shanbaum (UIUC)
Robert Shuttleworth (Youngstown)
Matthew Woodruff (UIUC).

ii. Bob Muncaster conducted a group REU focused on game theory, Markov chains, and basic evolutionary theory with 10 participants. Prof. Muncaster has had a long-standing collaboration with faculty members in the Department of Political Science. He used this connection to make his group REU interdisciplinary between mathematics and political science. See the appendix for further information. This group's participants were

Tina Carpenter (U. of Idaho)
Ethan Coon (U. of Rochester)
William Cuckler (UIUC)
Pritam Dalal (UCBerkeley)
Natasha Fast (UIUC)
Tom Ferrone (UIUC)
Asher Kach (UIUC)
Matthew Lee (Harvard)
Stephanie Olson (UIUC)
David Smyth (UIUC).

iii. A. J. Hildebrand and Alexandru Zaharescu supervised a group REU in number theory with 7 students. The program consisted of short courses and lectures, weekly seminars, group meetings, and individually supervised research, and concluded with two sessions of student presentations. The two short courses were on Farey Fractions and Applications and on Finite Automata in Number Theory. See the appendix. This group's participants were:

Rich Astudillo*(UIUC)
Evan Borenstein (U. of Virginia)
Michael Comerford*(Princeton)
David Dueber (UIUC)
Alan Haynes*(UT Austin)
David Weaver (UNC-Chapel Hill)

Jiashen You (U. of Hawaii).

For additional information about group REUs from summer 2001, see our webpage http://www.math.uiuc.edu/VIGRE/reu/reu_01.html.

b. Four group programs were organized for summer 2002, with a total of 22 student participants. We added a new program in topology and fractal geometry to the programs that we ran in summer 2001.

i. Slawomir Solecki led an group in topology: point-set topology and fractal geometry. This group REU had 5 students. The topic area offers a variety of interesting topics worthy of study. Also, there are a number of open problems that are accessible to undergraduate students in these areas, especially in issues connected with the dimension of fractals. This group's participants were:

Prudence Heck (Rutgers)
Bryce Johnson (Washington U.)
Christopher Jones (Youngstown)
Michael Mulligan (UIUC)
Patrick Watts (Augustana)

ii. George Francis again organized a group summer REU around computational mathematics and computer visualization that had 6 students. This group's participants were:

Amit Chatwani (Princeton)
Ben Farmer (UIUC)
Michael Henry (Augustana)
Abdul Hamide (Xavier)
Wendy Hubbard (UIUC)
Yana Malysheva (UIUC)

iii. Bob Muncaster conducted a group REU focused on game theory, Markov chains, and basic evolutionary theory that has 5 participants. This group's participants were:

Whitney Bush (Bradley)
Kristie Engemann (UIUC)
Ana Pavasovic (College Intl)
Ken Scheiwe (UIUC)
Tim Teravainen (New College Florida)

iv. A. J. Hildebrand supervised a group REU in number theory with 6 students. The program was like the previous summer's program with modification to fit the new group of students. This group's participants were:

Sharon Chuba* (Penn State)
David Dueber*(UIUC)
Aleck Johnsen* (UIUC)
Paul Pollack*(Univ. of Georgia)
Jeremy Rouse*(Harvey Mudd College
Erin Wolf*(UIUC)

c. Two group programs were organized for summer 2003, with a total of 13 student participants. The two group themes in the program were geometric group theory and evolutionary game theory.

i. Bob Muncaster conducted a group REU focused again on game theory, Markov chains, and basic evolutionary theory that has 6 participants. This group's participants were:

Andrew Badr (UIUC)
Robert Fitzgerald (Arizona State)
Anatoly Kats (Carnegie Mellon)
Aubrey da Cunha (Iowa State)
Kapil Kamdar (UIUC)
James Urick (Rochester Institute)

ii. Kim Whittlesey conducted a group REU focused on geometric group theory. This REU group consisted of 7 people This group's participants were:

Jesse Beder (U of Chicago)
Kalina Gospodinova (Whittier College)
Eric Radke (Case Western Reserve)
Ian Wyckoff (U of Arizona)
Vishal Doshi (UIUC)
Jacobus Machalow (UIUC)
Andrew Webster (UIUC)

d. Three group programs are planned for this summer 2004, with a total of 16 student participants. The three group themes in the program are geometrical computing, geometric group theory, and mathematical modeling.

i. George Francis and Peter Brinkmann are conducting the group REU on geometrical computing illiMath2004. This will be an improved and updated version of the previous REUs run by George Francis in the summers 2001, 2003 This REU group will consist of 6 people This group's participants will be:

William Baker (UIUC)
Gregory Stanton (UIUC)
Brett Witt (UIUC)
Benjamin Kauk (UIUC)
Emily Gunawan (Wells)

ii. Kim Whittlesey will conduct a group REU focused on geometric group theory. This REU group will consist of 6 people. This group's participants will be:

Seth Case (UIUC)
Aja Johnson (Elon)
Tyler Smith (UIUC)
Adam Levine (Harvard)
Xin Jia Johnson (UCLA)
Christopher Spicer (Mt. Mercy)

iii. Bob Muncaster will conduct a group REU focused on mathematical modeling of social and political issues. This REU group will consist of 5 people. This group's participants will be:

James Freitag (UIUC)
Alina Marinova (Bard)
Jennifer Mo (Northwestern)
Mathew Louis-Rosenberg (Swarthmore)
Janeta Marinova (Bard)

For additional information about this summer's activity, see our webpage http://www.math.uiuc.edu/VIGRE/reu/.

2. Individual REUs

i. Konstantin Drapkin has an individual REU with John D'Angelo in summer 2003. He worked on problems in complex analysis.
ii. Ben Emrick conducted individual REUs with Matt Ando in summer 2003 and fall 2004. They worked on a range of problems in topology generally, and homotopy theory in particular.
iii. Blair Flicker is participating as in the group REU being conducted by Peter Brinkmann and George Francis in summer 2004. But his task will also be individualized according to earlier plans to study geometric visualization.
iv. Edward Kung pursued an individual REU with Donald Yau during summer 2003. This led to an interesting short publication on finding a matrix of a given sign pattern and line sum.
v. Joseph Laracy had an individual REU with Julian Palmore in spring 2004. He designed a cryptographic coprocessor (a VHDL implementation of RSA), and in the process learned a great deal of mathematics in a wide scope of topics.
vi. Ben Lundell had an individual REU with Chris French in summer 2003. They worked on knot invariants.
vii. Ben Lundell had an individual REU with Randy McCarthy in fall 2003. He studied the fundamental group and veering spaces, using various texts.
viii. Ben Lundell had an individual REU with Steve Ullom in spring 2004. His project was rational points on elliptic curves and Mordell's theorem. Now he is looking at group laws on singular quadrics.
ix. Ben Lundell will be working on an individual REU in summer 2004 with Iwan Duursma, and a first year graduate student Jason McCullough. The plan is to study problems in coding theory and algebraic geometry.
x. Serge Posudevsky had an individual REU in spring 2004 with Serge Ivanov. He focused his research on topics in the texts by Algli Papantonopoulou, "Algebra: Pure and Applied" and M. I. Kargopolov, "Fundamentals of the Theory of Groups."
xi. Noah Prince had an individual REU was in fall 2003 with Alexandr Kostochka on graph minors.
xii. Noah Prince and Lucas Wiman had REUs with Douglas West in spring 2004. They studied the Union-Closed Conjecture, often attributed to Peter Frankl from around 1979.
xiii. Tyler Smith held an individual REU with Randy McCarthy in spring 2004. He worked on a variety of topics in topology and category theory.
xiv. Tyler Smith and Patrick Szuta (together with Jonas Grigaliunas) had individual REUs through coordinated interaction with Robert Ghrist in summer 2003. They worked on a variety of problems in configuration complex geometry, computational Cech homology and self-assembly experiments.
xv. Patrick Szuta is pursuing an individual REU with Andres Stein in summer 2004. He is working on the factoring of integers with elliptic curves and applications.

xvi. Andrew Webster has an individual REU with John D'Angelo in summer 2204.

III. PARTICIPANTS IN THE UIUC VIGRE PROGRAM

Extended Discussion

A. Faculty Participants in the UIUC VIGRE program over the four years 2000-2004

We single out here particular faculty members who have been, or plan to be, organizers or participants in specific programs.

1. Graduate Fellowships

Each year an admissions committee of faculty helps Phil Griffith review applications to graduate school in mathematics. Phil Griffith and this committee decide on which prospective students should be offered support through the VIGRE program. We also invite top new graduate student prospects to visit our department; we use departmental funds to pay the entire cost of each of these recruitment visits. For example, such visits were an important factor in our recruiting Zhou Dong (Carnegie-Mellon) and Lucas Sabalka (University of Nebraska). In addition, Phil Griffith uses information previously gathered on the progress and potential for success of the existing graduate students in order to decide which of the continuing students should be offered fellowship support through the UIUC VIGRE program. All of these decisions are reviewed with Joe Rosenblatt (the VIGRE coordinator).

Also, during the year, the Fellowship Committee meets to decide which students should be given fellowship support from various funds, based on their applications, progress in graduate school, and letters of recommendation. This review is a source of evaluations of students used by Prof. Griffith in awarding VIGRE fellowships to continuing graduate students.

2. Postdoctoral Positions

Each year as part of the process of hiring new faculty members, the area groups in the department meet to discuss candidates. They include in this discussion possible postdoctoral faculty appointments. The Postdoctoral Search Committee takes these recommendations into consideration in their own review of the postdoctoral faculty applications. The Postdoctoral Search Committee then gives prioritized lists to the Chair of the department, one for the Doob Research Assistant Professors and one for the VIGRE Research Assistant Professors. The Chair makes offers to new postdoctoral faculty from this list.

3. VIGRE Program Component

A. Faculty Participation 2000-2004

R [Research Among Peers (RAP)]
A [Across Level Peers (ALP)]
G [Graduate Student Seminars (GSS)]
T [Teaching Training for Undergraduates (TTU)]
RG [Research Experience for Graduate Students (REG)]
U [Research Experiences for Undergraduates (REU)]
SU [Summer Research Experiences for Undergraduates]
M [Mentor of Postdoctoral Faculty Member]
GA [Faculty Advisor of VIGRE-funded Graduate Student]

Ahlgren, Scott (R, RG, M)
Alexander, Stephanie (R, GA)
Alvarez-Consul, Luis (R)
Ando, Matthew (RG, U, M, GA)
Bahls, Patrick (VIGRE Postdoc, R)
Basterra, Maria (R)
Bauer, Robert (R, RG)
Bennett, Michael (U)
Berg, David (R)
Bergvelt, Maarten (R)
Berndt, Bruce C. (R, G, M, GA)
Binder, Ilia (R)
Bishop, Dick (R)
Boca, Florin (R)
Boston, Nigel (R, A, U, GA)
Boylan, Matthew (VIGRE Postdoc, R)
Bradlow, Steven (R, M)
Braunfeld, Peter (T)
Brinkmann, Peter (R, U, SU)
Bucher, April (T)
Burkholder, Donald (R)
Corrado, Richard (R)
Dade, Everett C. (GA)
D'Angelo, John (R, RG, U, M, CID, Co-PI)
Diamond, Harold (A, T)
van den Dries, Lou (U, M, GA)
Duursma, Iwan (R, A, G, RG, U, M, GA)
Dutta, Sankar (R, RG, M)
Evans, E. Graham, Jr. (R, T, U, Co-PI)
Farley, Dan (R)
Ford, Kevin (RG)
Fossum, Robert M. (R, GA, CID)
Francis, George K. (R, A, T, U, SU)
French, Christopher (T, U, VIGRE Postdoc)
Furedi, Zoltan (R, M)
Ghrist, Robert (R, A, RG, U)
Kutzarova, Denka (R)
Lamel, Bernhard (R)
Leigh, Rob (R)
Lerman, Eugene (R, RG, M, GA)
Loeb, Peter (M, GA)
Mazur, Marcin (R)
McCarthy, Randy (T, U, M, GA)
McCulloh, Leon (R, M)
Miles, Joseph B. (GA)
Miller, Alica (R, VIGRE Postdoc)
Mortensen, Karen (T, TA Mentor)
Muncaster, Robert G. (A, SG, SU)
Osborn, Howard (R)
Palmore, Julian (U, T)
Pillay, Anand (R, RG, M, GA)
Pong, Wai Yan (R)
Rezk, Charles (R)
Reznick, Bruce (RG)
Rosenblatt, Joseph M. (R, M, PI and VIGRE Coordinator)
Rotman, Joseph J. (G)
Ruan, Zhong-Jin (R, GA)
Sather-Wagstaff, Sean (R, G, RG, GA, Math 500, VIGRE Postdoc)
Schlichting, Marco (R)
Schupp, Paul E. (R, A, M, GA)
Sherman, David (R, VIGRE Postdoc)
Shirokova, Nadya (R)
Shuman, Karen (SU, R, Math 500, VIGRE Postdoc)
Skokan, Jozef (R, VIGRE Postdoc)
Solecki, Slawomir (R, RG, SU)
Song, Renming (R, RG)
Sowers, Richard B. (G, U, GA)
Stein, Andreas (A, RG, U, GA)
Stone, Michael (R)

Grayson, Daniel (R, RG, M)
Griffith, Phillip (R, G, M, GA, Math 500, Co-PI)
Haboush, William J. (R, GA)
Heittokangas, Janne (R)
Henson, C. Ward (RG, M, GA)
Hildebrand, A. J. (A, U, SU)
Hinkkanen, Aimo (M, GA)
Hundertmark, Dirk (R)
Ivanov, Sergei (U, T)
Jerrard, Robert L. (M, GA)
Jockusch, Carl G. (T, GA)
Junge, Marius (R, RG, M)
Junk, Thomas (R)
Kapovich, Ilya (R, M)
Karliner, Inga (R)
Katz, Sheldon (R, RG)
Kaufman, Robert (R)
Kedem, Rinat (R)
Kostochka, Alexandr (R, U, M)
Kowalski, Piotr (R)
Stolarsky, Kenneth (G)
Stoyanov, Ognyan (R)
Sullivan, John M. (R, A)
Symington, Margaret (R)
Tolman, Susan (R, M, GA)
Tumanov, Alexander (R)
Tyson, Jeremy (R)
Uhl, Jerry (R, T)
Ullom, Stephen. (U, M)
van den Dries, Lou (RG)
Varolin, Dror (R, RG)
Vasilyev, Yevgeniy (R)
Weichsel, Paul M. (TA Mentor, Co-PI)
West, Douglas B. (R, A, G, RG, U, M, GA)
Whittlesey, Kim (R, T, SU)
Wu, Jang-Mei (M)
Yau, Donald (U, VIGRE Postdoc)
Zaharescu, Alexandru (R, A, RG, SU, GA)
Zharnitsky, Vadim (R)
Zhu, Yanyun (RG)

B. Student Participants in the UIUC VIGRE program over 2000-2004

We single out here students who have been participants or organizers in particular VIGRE program components. Many of them have been organizers of activities and spent a considerable amount of time on that activity in the process. Also, many of the students have been involved in more than one way with the UIUC VIGRE program.

R [Research Among Peers (RAPs)]
A [Across Level Peers (ALP)]
G [Graduate Student Seminar (GSS)]
GO [Organizer of GSS]
RG [Research Experience for Graduate Students (REG)]
V [VIGRE Fellowship]

1. Graduate Students

Adan-Bante, Edith (V, Math 500)
Asari, H. (R)
Atkinson, James (G, RG)
Aydin, Yelda (R)
Azgin, Salih (RG)
Bansal, Shivi (G, RG)
Barela, John (R, V)
Bauer, Mark (V)
Mauer-Oats, Andrew (R)
McCullough, Jason (V)
McLaughlin, Jimmy (R, Math 500)
Mhoon, Andrea (RG)
Mileti, Joseph (GO, V, Math 500)
Minasian, Vahagn (Math 500)
Moosa, Rahim (R)
Moreno, Javier (G, GO)

Baym, Michael (V)
Baxter, Kristine (R)
Bulu, Melika (R)
Bush, Michael (R)
Cao, Weiting (R)
Carlisle, Sylvia (RG, V)
Carty, Thomas (R, RG, SU)
Champion, Alison (R, V)
Chan, Song Heng (R)
Chan, O-yet (G)
Chandrasekher, M. (V)
Chasman, Laura (V)
Cheng, Xiangyu (RG)
Chiang, River (R)
Cho, Jae-Seong (R)
Choi, Jeong-Ok (R, GO, RG)
Choi, Guemlan (R)
Cobler, Timothy (V)
Cox, Jonathan (R, GO)
Davis, Craig (R)
Denne, Elizabeth (R, SU, Math 500)
Domazet, Haris (A)
Dong, Zhou (V)
Duong, Han (A)
Eckhardt, Caleb (RG, V)
Edge, Brad (R)
Fendt, Chad (R)
Ferguson, Colin (A)
Forgacs, Tamas (RG)
Fu, Yong (R)
Gagelman, Jerry (R, V)
Gallery, Elizabeth (V)
Gepner, David (V)
Goldbring, Isaac (V)
Guffin, Joshua (R)
Gugg, Chadwick (G, RG)
Gunyadin, Ayhan (G, RG)
Hahn, Heekyoung (R, GO)
Han, Jong Yun (G)
Hayati, Katia (A)
He, Wei (R)
Heller, Simon (G, V)
Hu, Hailong (R, RG)
Huber, Timothy (G)
Hwang, Kyung-Won (R)
Hyeon, D. (R)
Morton, Daniel (V)
Mullet, Joshua (GO, V)
Murphy, David (R, GO, V, Math 500, CID)
Musat, Magdalena (R)
Nakprasit, Kittikorn (R)
O'Bryant, Kevin (R, G, GO, Math 500)
O'Bryant, Natella (GO, V)
Owiesny, Eric (V)
Ozkahya, Lale (RG)
Pahlajani, Chetan (G)
Paulhus, Jennifer (R. G, RG, V)
Pelsmajer, Michael (R, G, Math 500)
Peterson, Valerie (G, GO, RG)
Petracovici, Boris (V)
Petracovici, Lia (V, Math 500)
Petrenko, Bogdan (R, A, GO)
Poitevin, Pedro (R)
Polkowska, Dominika (R, G)
Preedy, Katharine (R)
Ramamurthi, Radhika (R)
Rettberg, Ryan (V)
Reynolds, Patrick (V)
Richardson, Andrew (R, V, Math 500)
Rizzo, Andrew (R, V)
Rohwer, Thomas (R, G)
Rojas, Ricardo (R, G, RG)
Roman, Joseph (V)
Rose, David (V)
Sabalka, Lucas (R, V, CID)
Salvaterra, Noah (V)
Sano, Akira (R, V)
Santhanam, Rehka (G, RG)
Saran, Maya (R)
Se, Tony (V)
Simmons, Melissa (RG, V)
Sheikh, Naeem (R, GO)
Snapp, Bart (G, RG)
Sneed, Jason (V)
Sommers, Michael (RG)
Spiroff, Sandra (R, V)
Stan, Florin (R, G)
Stapleton, Nathaniel (V)
Szatrowski, Miriam (R)
Tao, Hua (RG)
Tedor, Jason (V)

James, Micah (G)
Jegdic, Katarina (GO)
Jensen, Per (R)
Jones, Kevin (G, RG)
Jossey, John (A, G, GO)
Kadziela, Samuel (G, RG)
Kang, Jeong-Hyun (R)
Kaul, Hemanshu (R, G)
Kilbourn, Timothy (R, G, RG)
Kim, Ji Young (RG)
Kim, Seog-Jin (R)
Kim, Youngsoo (RG)
Kiyavash, Negar (R)
Kongsiriwong, Sarachai (R)
Konwerska, Gosia (R, G)
Kou, Ming (RG)
Kuhnt, Thomas (Math 500)
Kulosman, Hamid (V)
Landquist, Eric (G)
Ledoan, Andrew (RG)
Lee, Christopher (RG, V)
Lee, Jung Jin (RG)
Li, Jinjia (R, G, GO)
Lipsky, David (V)
Liu, Qi (RG)
Maki, John (G, V)
Malicki, Marciej (RG)
Marikova, Jana (RG)
Markin, Nadya (V)
Martin Pizarro, Amador (R)
Masri, Nadia (R, RG)
Tiar, Tarik (G)
Tokaz, Jacent (R, V)
Treneer, Stephanie (G)
Tyne, James (R, V)
Vandenbusche, Jennifer (RG)
Walker, Barry (R, G)
Wallace, Jake (A)
Wang, Bin (R, G)
Wang, Chunlin (RG)
Wang, Jin (R)
Wang, Yun (RG)
Webster, Jonathan (RG)
Wenger, Paul (V)
White, Diana (R, A, G, GO, RG, V)
Willett, Chris (V, Math 500)
Wong, Jeremy (R, V)
Wright, Joseph (RG)
Yazdani, Soroosh (R)
Yeap, Boon (R)
Yee, Ae Ja (R)
Yesilyurt, Hamza (R)
Yew, Anthony (R)
Yi, Jinhee (R)
Yu, Gexin (RG)
Yong, Few (R)
Xiong, Maosheng (G, RG)
Zaharopal, Daniel (V)
Zhang, Feng (RG)
Zhao, Yijia (R)
Zhu, Wei (RG)
Zhu, Xinyun (R)
Zou, Wei (RG)

3. Undergraduate Students

REUs
Rich Astudillo (UIUC)
William Baker (UIUC)
Michael Baym (UIUC)
Benjamin Bernard (UIUC)
Evan Borenstein (U. of Virginia)
Whitney Bush (Bradley)
Tina Carpenter (U. of Idaho)
Seth Case (UIUC)
Amit Chatwani (Princeton)

REUs, continued
Ken Scheiwe (UIUC)
Benjamin Shanbaum (UIUC)
Robert Shuttleworth (Youngstown)
Tyler Smith (UIUC)
David Smyth (UIUC)
Philip Spencer (UIUC)
Christopher Spicer (Mt. Mercy)
Vivek Srikrishnan (UIUC)
Gregory Stanton (UIUC)

REUs continued
Sharon Chuba (Penn State)
Michael Comerford (Princeton)
Ethan Coon (U. of Rochester)
William Cuckler (UIUC)
Pritam Dalal (UC Berkeley)
David Dueber (UIUC)
Ben Emrick (UIUC)
Kristie Engemann (UIUC)
Benjamin Farmer (UIUC)
Natasha Fast (UIUC)
Tom Ferrone (UIUC)
Blair Flicker (UIUC)
Mark Flider (UIUC)
James Freitag (UIUC)
Emily Gunawan (Wells)
Abdul Hamide (Xavier)
Alan Haynes (UT Austin)
Prudence Heck (Rutgers)
Michael Henry (Augustana)
Wendy Hubbard (UIUC)
Aja Johnson (Elon)
Aleck Johnsen (UIUC)
Xin Jia Johnson (UCLA)
Bryce Johnson (Washington U.)
Christopher Jones (Youngstown)
Benjamin Kauk (UIUC)
Edward Kung (UIUC)
Melanie Lang (UIUC)
Joseph Laracy (UIUC)
Ben Lundell (UIUC)
Asher Kach (UIUC)
Matthew Lee (Harvard)
Adam Levine (Harvard)
Matt Louis-Rosenberg (Swarthmore)
Ben Lundell (UIUC)
Alina Marinova (Bard)
Janeta Marinova (Bard)
Yana Malysheva (UIUC)
Jennifer Mo (Northwestern)
Michael Mulligan (UIUC)
Douglas Nachand (UIUC)
Stephanie Olson (UIUC)
Alison Ortony (UIUC)
Ana Pavasovic (College Intl)
Paul Pollack (Univ. of Georgia)

REUs continued
Patrick Szuta (UIUC)
Tim Teravainen (New College FL)
Patrick Watts (Augustana)
David Weaver (UNC-Chapel Hill)
Lucas Wiman (UIUC)
Brett Witt (UIUC)
Matthew Wolak (UIUC)
Erin Wolf (UIUC)
Matthew Woodruff (UIUC)
Jiashen You (U. of Hawaii)

TTUs (all UIUC)
Rich Astudillo
Benjamin Bernard
Mohamed Faisal
Amber Hardy
Lynn Herberger
Wendy Hubbard
Jack Kahoutek
Dustin Lindley
Ross Mohr
Matt Moran
Blaire Rose
Jim Schuster
Steven Spradu
Greg Stanton
Martha Teklu
Aaron Wittrig

RAPs (all UIUC)
Kevin Chiou
Luigi Marini
Michael Mulligan
Vivek Srikrishnan

ALPs (all UIUC)
Matt Ahrens
Ricardo Astudillo
Michael Baym
Angela Bennett
Brodie Bertrand
David Dueber
Mark Flider
Aaron Guitierrez
Jessica Jackson
Douglas Nachand
Byron Persion
Carey Radebaugh

REUs continued	**ALPs continued**
Noah Prince (UIUC)	Ben Shabaum
Serge Posudevsky (UIUC)	David Smyth
Carey Radebaugh (UIUC)	Chong-Kian Soh
Emily Riehl (Normal, Illinois)	Dennis Turpin
Jeremy Rouse (Harvey Mudd)	Matt Wolak
Lorna Salaman (U. of Puerto Rico)	

IV. PERFORMANCE ASSESSMENT OF UIUC VIGRE PROGRAM

Extended Discussion

A. External Site Visits

Each fall for the last three years, the department has had an external review. The visiting committee in 2001 was planned as part of the original VIGRE proposal. The visiting committee in 2002 was the official NSF third-year review committee. The visiting committee in 2003 was the Alumni Visiting Committee, created in conjunction with CID activities. See IV A above or the extended discussion in IV C 1c) below for further information.

B. Meeting the objectives of the UIUC VIGRE program

We list the six objectives of the UIUC VIGRE program and discuss how they have been met.

1. Integration of research and education in the undergraduate and graduate programs.

   See the annual reports from 2000-2003, and the materials prepared for the fall 2002 NSF site visit.

2. Broadening of educational experiences in the mathematics programs

   One of the newest programs to be initiated during the NSF VIGRE funding period is the new mathematics honors program. An ad hoc committee of five faculty members (John D'Angelo, Graham Evans, Ward Henson, Richard Laugesen, and Joe Miles) created a new honors program in 2002 after assessment showed our previous honors program to be weak and poorly designed. The new program has been successful for a handful of the top-performing undergraduate students and has had several ancillary benefits. One benefit has been that several students in the program have applied to be undergraduate TAs and have presented themselves remarkably well in their lecturing. Another benefit is that honors students have become more engaged in the department and therefore better mentored. Several

honors students have participated in REUs and other VIGRE activities. In short, the honors program has been a useful tool for recruitment to our VIGRE program.

Another indicator of changes in mathematics during the VIGRE grant period is the changes in enrollments in mathematics. From fall 2000 to fall 2003, the number of undergraduate mathematics majors have increased by 10% and the number of actuarial science majors has increased by 75%. During this time, the total number of majors supervised by the Department of Mathematics has increased by only 5% because the Department of Computer Science raised the entrance requirements for admission to the mathematics/computer science combined major, a major that the Department of Mathematics administrates.

During this same period, the number of graduate students has remained relatively stable, although the level of preparation and ability of these students has risen due to successful recruiting of new graduate students. The Department of Mathematics has been able to combined other resources with the NSF VIGRE program and put together approximately $500,000-$600,000 per year in fellowship funding for graduate students, supporting 40-45 graduate students per year. This support is having a positive impact on the educational experiences and the time-to-degree of the graduate students in mathematics at UIUC. Data on this time-to-degree is being analyzed at this time and will be available for the final report on this NSF VIGRE grant that is due at NSF in spring 2005.

For additional information, see the annual reports from 2000-2003 and the materials prepared for the fall 2002 NSF site visit.

3. Mentoring at all levels of the mathematics programs

In fall 2002, the department responded to ideas for VIGRE that it learned about at one of the VIGRE workshops. Modeling the grant writing workshop at Duke University, the department conducted two meetings in fall 2002 and 2003 to help the postdoctoral and the new faculty members understand the opportunities and methods for seeking external funding of their research. Faculty members with experience in obtaining external funding talked about how they proceed in grant writing. Joyce Roberts, the department's business manager and funding supervisor, talked about budgets for grants and electronic submission procedures. Then the participants separated into small working groups to discuss their particular plans. At the end of the process, a number of completed grant proposals resulted from this workshop; these were submitted to NSF for review.

Mentoring of postdoctoral faculty members has been considered especially important in the department because they are in transition from being graduate students to being completely independent teachers and research mathematicians. For this reason, the postdoctoral hiring is carried out with faculty connections in mind. For a list of the postdoctoral faculty members with their mentors, see http://www.math.uiuc.edu/VIGRE/postdoc_mentoring.html.

As another indictor of the real mentoring of postdoctoral faculty that has gone on in the Department of Mathematics, recently with NSF VIGRE support, there have been many articles written jointly by faculty members, postdoctoral faculty members, graduate students, and undergraduate students. Here is a partial list of these activities over the last five years.

We list articles that are jointly written by postdoctoral faculty members or articles that are written by graduate and undergraduate students (articles are ordered alphabetically by the postdoctoral faculty member or student name).

Code: **bold names** are postdoctoral faculty members
<u>underlined</u> names are undergraduate students

ARTICLES WRITTEN WITH POSTDOCTORAL FACULTY

1. **L. Alvarez-Consul,** S. Bradlow, O. Garcia-Prada, J. Glazebrook, F. Kamber: The invariant Hermitian-Einstein equation over a Kahler G-manifold and dimensional reduction, (30 pages, in preparation)

2. **Maria Basterra** and Matthew Ando, The Witten Genus and equivariant elliptic cohomology, Math. Z. 240:4 (2002) 787--822.

3. **Maria Basterra** and Randy McCarthy, Gamma-homology, topological André-Quillen homology and stabilization, Topology Appl. 121 (2002), no. 3, 551--566.

4. Scott Ahlgren and **Matthew Boylan**, Arithmetic properties of the partition function, Inventiones Mathematicae 153:3 (2003) 487--502.

5. Scott Ahlgren and **Matthew Boylan**, Coefficients of half-integral weight modular forms modulo ℓ^j, preprint, 20 pages.

6. **Christopher French** and Matthew Ando, Discrete torsion for the supersingular orbifold sigma genus. In the proceedings of a conference at the Isaac Newton Institute, 2003, to appear.

7. **P. Kowalski** and A. Pillay, Quantifier elimination for algebraic D-groups, preprint.

8. **P. Kowalski** and A. Pillay, Subvarieties of commutative meromorphic groups, preprint.

9. **P. Kowalski** and A. Pillay, A note on groups definable in difference fields, Proceedings AMS, 130 (2001) 205--212.

10. **P. Kowalski** and A. Pillay, Pro-algebraic and differential algebraic groups on affine spaces, American Journal of Math., 122 (2000) 213--222.

11. **Marcin Mazur** and Steve Ullom, Galois module structure of units in real biquadratic number fields, Acta Arithmetica 111.2 (2004) 105--124.

12. **Alica Miller** and Joseph Rosenblatt, Characterization of regular almost periodicity in compact minimal abelian flows, Transactions of the AMS, to appear, 29 pp.

13. Anand Pillay and **Wai Yan Pong**, On Lascar Rank and Morley Ranks of definable groups in differentially closed fields. Journal of Symbolic Logic 67 (2002) 1189--1196.

14. A. Caldararu, S. Katz, and **E. Sharpe**, D-branes, B fields, and Ext groups, hep-th/0302099, Adv. Theory. Math. Phys., to appear.

15. **Eric Sharpe** and Sheldon Katz, D-branes, open string vertex operators, and Ext groups, Adv. Theor. Math. Phys., to appear.

16. S. Katz, T. Pantev, and **E. Sharpe**, D-branes, orbifolds, and Ext groups, hep-th/0212218, Nuc. Phys. B, to appear.

17. Marius Junge and **David Sherman**, Noncommutative L^p Modules, Journal of Operator Theory, to appear.

18. Marius Junge, Zhong-Jin Ruan, and **David Sherman**, A classification for 2-isometries of noncommutative L_p-spaces, preprint.

19. Eugene Lerman and **Nadya Shirokova,** Completely integrable torus actions on symplectic cones, Math Research Letters 9:1 (2002) 105--115.

20. Joseph Rosenblatt and **Karen Shuman**, Cyclic functions in $L_p(R)$, $1 < p < \infty$, Fourier Analysis and Applications 9 (2003), 289-300.

21. N. Eaton, Z. Füredi, A. Kostochka, **J. Skokan**, Tree representations of graphs, submitted to European J. Combinatorics, 15 pp.

22. N. Eaton, Z. Füredi, **J. Skokan**, On p-intersection representations of bipartite graphs, in preparation, 2002.

23. Peter Loeb and **Erik Talvila**, Covering lemmas and Lebesgue integration, Scientiae Mathematicae Japonicae, 53 (2001), No. 2, 209--221.

24. Peter Loeb and **Erik Talvila**, Lusin's Theorem and Bochner Integration, submitted.

25. Eugene Lerman and **Tadashi Tokieda**, On relative normal modes. C. R. Acad. Sci. Paris Sér. I Math. 328:5 (1999) 5, 413--418.

26. A. Pillay and **E. Vassiliev**, Imaginaries in beautiful pairs, to appear in Illinois Journal of Math.

27. Itay Ben-Yaacov, Anand Pillay, **Evgueni Vassiliev**, Lovely pairs of models, Annals of Pure and Applied Logic 119 (2003).

28. B. C. Berndt, P. B. Bialek, and **A. J. Yee**, Formulas of Ramanujan for the power series coefficients of certain quotients of Eisenstein series, International Mathematics Research Notices (2002), no. 21, 1077--1109.

29. B. C. Berndt and **A. J. Yee**, Congruences for the coefficients of quotients of Eisenstein series, Acta Arith. 104 (2002), 297--308.

30. S. Ahlgren, B. C. Berndt, **A. J. Yee**, and A. Zaharescu, Integrals of Eisenstein series and derivatives of *L*-functions, International Mathematics Research Notices (2002), No. 32, 1723--1738.

31. B. C. Berndt and **A. J. Yee**, Ramanujan's contributions to Eisenstein series, especially in his lost notebook. In *Number Theoretic Methods - Future Trends*, C. Jia and S. Kanemitsu, eds., Kluwer, Dordrecht, 2002, pp. 31--53; abridged version, A survey on Eisenstein series in Ramanujan's lost notebook. In *New Aspects of Analytic Number Theory*, Y. Tanigawa, ed., Research Institute for Mathematical Sciences, Kyoto University, Kyoto, 2002, pp. 130--141.

32. G. E. Andrews, B. C. Berndt, J. Sohn, **A. J. Yee**, and A. Zaharescu, On Ramanujan's continued fraction for $(q^2;q^3)_\infty / (q;q^3)_\infty$, Trans. Amer. Math. Soc. 355 (2003), 2397--2411.

33. B. C. Berndt and **A. J. Yee**, A page on Eisenstein series in Ramanujan's lost notebook, Glasgow Math. J. 45 (2003), 123--129.

34. B. C. Berndt, **A. J. Yee**, and A. Zaharescu, On the parity of partition functions, Internat. J. Math. 14 (2003), 437--459.

35. B. C. Berndt, **A. J. Yee**, and J. Yi, Theorems on partitions from a page in Ramanujan's lost notebook, J. Comp. Appl. Math. 160 (2003), 53--68.

36. B. C. Berndt and **A. J. Yee**, On the generalized Rogers--Ramanujan continued fraction, Ramanujan J. 7 (2003), 321--331.

37. G. E. Andrews, B. C. Berndt, J. Sohn, **A. J. Yee**, and A. Zaharescu, Continued fractions with three limit points, Adv. in Math., to appear.

38. B. C. Berndt, **A. J. Yee**, and A. Zaharescu, New theorems on the parity of partition functions, J. Reine Angew. Math., to appear.

39. B. C. Berndt, S. H. Chan, B. P. Yeap, and **A. J. Yee**, A reciprocity theorem for certain *q*-series found in Ramanujan's lost notebook, Ramanujan J., to appear.

40. B. C. Berndt and **A.J. Yee**, Combinatorial proofs of identities in Ramanujan's lost notebook associated with the Rogers--Fine identity and false theta functions, Annals of Combinatorics, 7 (2003), to appear.

ARTICLES WRITTEN WITH GRADUATE STUDENTS

1. Kevin C. Jones, Youngsoo Kim, Andrea H. Mhoon, Rekha Santhanam, Barry J. Walker, and Daniel R. Grayson, The additivity theorem in K-theory, Journal of K-theory, to appear.

ARTICLE WRITTEN BY OR WITH UNDERGRADUATE STUDENTS

1. Rich Astudillo, On a class of Thue-Morse Type sequences, J. Integer Sequences 6 (2003) Article 03.4.2.

2. Alan Haynes, A note on Farey fractions with odd denominators, J. Number Theory 98:1 (2003) 89--104.

3. M. Henry, **K. Shuman**, G. Francis, B. Farmer, B., and D. Nachand, illiAnalyst, a software product.

4. Edward Kung and **Donald Yau**, submitted for publication.

5. Paul Pollack, Consecutive values of the Thue-Morse sequences, preprint, 20 pages, to be submitted.

6. A. Kostochka and N. Prince, On average degree of graphs without $K_{\{s,t\}}$-minor for a fixed s and large t, in preparation.

7. John D'Angelo, Simon Kos, and Emily Riehl, A sharp bound for the degree of proper monomial mappings between balls, Journal of Geometric Analysis 13:4 (2003) 581--593.

8. Graham Evans and Emily Riehl, On intersections of polynomials and the Cayley Bacharach Theorem, Journal of Pure and Applied Algebra 183 (2003) 293--298.

9. Jeremy Rouse and Sharon Chuba, On palindromes and prepalindromes, preprint, 25 pages, to be submitted.

See the annual reports from 2000-2003 and the materials prepared for the fall 2002 NSF site visit.

4. Recruitment of graduate students and postdoctoral faculty

   See the annual reports from 2000-2003 and the materials prepared for the fall 2002 NSF site visit.

5. Shortening of the time needed to obtain a PhD

   After four years of the NSF VIGRE program at UIUC, it is too early to measure accurately the quantitative impact of the VIGRE program on the time to degree of our graduate students. On an individual basis it is clear that the fellowships have enabled a number of students to move more quickly into working on research needed for their dissertations or in actually completing their thesis work. There is also an increase in the quality of what some of the graduate students have been able to achieve during their graduate work.

   In 2001-02, the GAC of the department completed an extensive study of the issue of time to degree. The study has a number of recommendations that were the focus for implementation in 2000-04. In particular, the GAC found that early exposure to seminars and research (e.g. REGs) was crucial for shortening the time to degree. The GAC found that the VIGRE RAPs help to accomplish this goal. Indeed, both the VIGRE program components, RAPs and Graduate Student Seminars, have given the participants a better idea of what mathematical research is all about. Organizers of these activities also obtained release from some of their teaching, giving them more time to pursue their individual studies.

6. Connecting mathematics with other programs

   The Department of Mathematics at UIUC is committed to both breadth and depth in its graduate program. Graduate students from UIUC go on to positions that use their mathematical education in different ways. Many of the students go on to teaching and doing research at colleges and universities. Others go on to positions in the private sector, working in technology development, actuarial science, financial mathematics, engineering, and many other fields in which mathematics has important applications.

   In recent years the Department of Mathematics has developed quite a large number of research and teaching connections with a variety of different departments and groups at UIUC. These connections include joint work with the Departments of Electrical and Computer Engineering, Theoretical and Applied

Mechanics, Physics, Materials Science and Engineering, Computer Science, Aeronautical and Astronautical Engineering, Chemical Engineering, and Curriculum and Instruction (in the College of Education). It also includes connections between the Department of Mathematics and the Beckman Institute and the NCSA (National Center for Supercomputing Applications).

Here is a list of some of the graduate students whose graduate work is interdisciplinary in nature:

Student	**Advisor(s)**	**Area/Appointment**
Anderson, Mark	R. Muncaster	Applications to Econ
Al-Fadel, Tarici	J. Palmore	Discrete Dynamics
Aydin, Yelda	B. Berndt	RA,CSE,Fall 01/Spring 02
Champion, Alison (VIGRE)	N. Boston	Coding Theory
Chebalov, Sergei	Bronski/Klabian	Industrial Engineering
Dimer, Ali	Lerman/Namachchivaya	Aero and Astro Eng
Domazeet, Harris	N. Boston	Cryptography
Gambill, Thomas	Bronski/Kerkhoven	C.S.
Jegdic, Katarina	R. Jerrard	RA in CPSD
Jossy, John	N. Boston	Cryptography
Jung, Nara	R. Jerrard/S. Portnoy	Statistics
Kaul, Hemanshu	D. West/S. Jacobson	RA, Mech and Indst. Eng
Landquist, Eric	A. Stein	RA, John Deere Co.
Musa, Mona	N. Boston	Coding Theory
Petracovici, Boris (VIGRE)	R. Jerrard	PDE (Elasticity)
Venkat, Vandana	S. Jacobson	Optimization
Wolf, Erin	A. Stein	CS grad student, math PhD advisor

Such interdisciplinary connections will continue to be a part of the department's agenda in the future. A group of faculty members from the Department of Mathematics and other departments around the UIUC campus have begun building an Applied Mathematics Program. This program will coordinate the applied mathematics research that is occurring on campus. An active web-based interactive seminar page for the Applied Mathematics Program is under development. Also, the plan is for this program to coordinate and promote various types of applied mathematics sequences that are suited to different science and engineering specialization. We have now a complete list that can be routinely updated of applied mathematics courses being offered around campus. We still need to resolve issues of coordination, funding, and faculty involvement. Ongoing discussions with the College of Engineering and several institutes and centers on campus are helping to accelerate the development of the UIUC Applied Mathematics Program.

Here are two examples:

1) The interaction between the Departments of Mathematics and Physics continues to grow. The two departments have collaborated on team teaching of geometry and physics courses and have had an ongoing joint seminar, the BCDE seminar. In fall 2001, Prof. Sheldon Katz, an expert in algebraic geometry and string theory, joined the faculty at UIUC with a joint appointment in the Departments of Mathematics and Physics (2:1). Prof. Katz is coordinating interdisciplinary activities in mathematics and physics; he is also leading the development of algebraic geometry at UIUC. Part of the agenda of the new Applied Mathematics Program will be an applied mathematics program for physics and mathematics graduate students, one that focuses on algebraic geometry, string theory, and related aspects of mathematical physics.

2) In fall 2002, Prof. Robert Ghrist, an expert in dynamical systems and topology, joined the Department of Mathematics at UIUC. His background and interest in applied mathematics has been critical in his involvement with faculty members in TAM. He started and continues to run an interdepartmental Applied Mathematics Seminar that has hosted an outstanding series of talks by UIUC and visiting mathematicians, scientists, and engineers. For further information on this very interesting seminar series, see http://www.math.uiuc.edu/~ghrist/amseminar.html.

C. The CID

The Department of Mathematics has been one of the eight partners in the ongoing CID. Many VIGRE activities are intimately connected with the graduate program; indeed the Department of Mathematics has seriously evaluated its graduate program as part of its VIGRE activities. So the CID and VIGRE should be considered together. John D'Angelo (VIGRE Co-PI) has been the department's coordinator for CID activities. Last year, the graduate student representative was David Murphy, and this year the graduate student representative is Lucas Sabalka. Also this year, Robert Fossum has joined as an additional faculty member actively involved in the discussions and developments of the CID.

The CID involvement represents our desire to go beyond our current activities and to revise and revitalize our graduate program. John D'Angelo has prepared a detailed report of our CID involvement. We summarize here the CID activities during 2003-2004.

1. Specific CID Events from academic year 2003-04 related to VIGRE

a) **10-02-03** Judith Ramaley, NSF Program Director of Education and Human Resources, visited the department to learn about its VIGRE and CID activities. Graduate students and faculty participated in a discussion where each person describing defining moments for them in choosing research mathematics as a career path.

b) **10-04-02** John D'Angelo spoke about the CID as a panelist on "Trends in Mathematics" at Washington University's sesquicentennial conference. (panel moderated by Guido Weiss; other panelists were A. Coifman, R. Bryant, A. Bonami)

c) **10-16-03 to 10-18-03** AVC (Alumni Visiting Committee) The AVC consisted of Dick Hain (Duke), Stuart Kurtz (Chicago), Jim Colliander (Toronto), and Judy Walker (Nebraska), all UIUC graduate alumni. They visited the department, interviewed faculty members and graduate students, met with university administrators, and even gave seminar talks. Several months later the AVC provided the department a lengthy report. The AVC made many good suggestions and recommendations, concerning both the graduate program and the department's operations as a whole. The department is working toward taking full advantage of their insights. The Department Chair (Joseph Rosenblatt) and the Director of Graduate Studies (Phillip Griffith) met with Richard Wheeler (Dean of the Graduate College) and discussed the report and its implications for the graduate program in mathematics. Also, the department's Long Range Planning Committee has asked the department to consider the report deeply and to find ways to implement more of its suggestions.

d) **10-25-03** John D'Angelo served as a panelist at the AMS Committee on Education meeting in Washington DC. The panel's topic was the CID. It was moderated by Roger Howe; the other panelists were Hyman Bass (Michigan) and John Ewing (AMS).

e) **11-6-03 to 11-07-03** George Walker visited UIUC. Walker, a physicist and former provost at IU, is leading the CID. There was a joint luncheon with other UIUC departments involved in CID: History, Educational psychology, and Neurosciences. Walker also met with Rosenblatt, David Murphy, D'Angelo and also separately with D'Angelo and Bradlow.

f) **12-16-03** Barbara Lovitts (sociologist and author) has been commissioned by the Sloan Foundation to prepare a report on graduation education and the doctorate in the US. Bruce Berndt, Douglas West, Don Burkholder, Paul Schupp, and John D'Angelo participated in a discussion, together with John Ory and Karen Carney from UIUC, to help provide insights from the UIUC perspective for this study.

g) **12-17-03** The Math Department held its first departmental town meeting in at least 25 years. The discussion focused on hiring; we agreed to discuss the graduate program in a future meeting (see j) below).

h) **December 03** The GAC began discussions of a transition course for beginning graduate students. This topic could lead in interesting directions. Such a

course would fill gaps, but could also serve as a recruiting tool if we allowed advanced undergraduates to enroll.

i) **01-07-04** Robert Fossum, Joseph Rosenblatt, and David Murphy convened with the CID at AMS meeting in Phoenix.

j) **2-25-04** The second departmental town meeting spent 90 minutes on the graduate program. Although the discussion was lively, there was no tangible outcome. One piece of wonderful news was that alumnus Barry Greenstein donated $100,000 to the department. A large chunk of this will be used for the current summer's REG program, to augment VIGRE funds.

k) **2-26-04** A one-hour conference call was held with George Walker, David Murphy, and Jonn D'Angelo on CID. The call focused on planning ways to improve the CID process.

l) **2-27-04** GAC meeting devoted to CID progress.

m) **3-17-04** John D'Angelo and David Eisenbud met and discussed on how to get MSRI and CID together. As a result, MSRI will participate in the convening meeting this summer.

n) **4-21-04** The annual meeting for the Graduate College at UIUC included a panel discussion on the CID. John D'Angelo represented mathematics, Clare Crowston represented history, Michelle Perry represented educational psychology, and Sam Beshers represented neurosciences. Each person described the departmental CID activities during the academic year 03-04. John D'Angelo also discussed the influential Flexner report on Medical Education from 1910 (commissioned by the Carnegie Foundation) and he asked whether the CID could have a similar impact.

o) **07-10-04 to 07-13-04** CID convening at Carnegie Foundation in Menlo Park, CA. John D'Angelo, Robert Fossum, and Lucas Sabalka will represent UIUC.

2. The Research Experience for Graduate Students program (REGS) will continue for graduate students in summer 2004, again partially supported by funds from VIGRE. See above for further information about summer 2003 REGs and the plans for summer 2004 REGs.