DEPARTMENT OF MATHEMATICS
Report to the Board - Fall 1998

PERSONNEL

Roger Lautzenheiser returned from sabbatical at Kanazawa Institute of Technology (KIT) in Ishikawa, Japan and **John Rickert** returned from sabbatical at Pennsylvania State University. **LeRoy Franklin**, a statistician, joins us from Indiana State University. Dr. **David Voss** will join us for fall and winter quarters, as a Visiting Professor, completing the first half of a sabbatical from Western Illinois University. Dr. **Jarek Lech** joins us from Michigan State University, for the year as a Visiting Assistant Professor. Both **Nacer Abrouk** and **Yosi Shibberu** will be on sabbatical leave during the 1998-99 academic year. **George Berzsenyi** will be taking an special leave during the 1998-99 year. **Lynn Kiaer** has resigned her position at Rose to work with General Electric's Operations Research Department in Schenectady, New York.

GRANTS AND CONTINUING GRANT ACTIVITIES

Allen Broughton and **Gary Sherman** conducted this summer's portion of the NSF-REU program. This is the tenth year of the REU, two more summers remain on the current installment of the grant.

John Kinney received a grant from the Indiana State Department of Education to conduct a two-week summer program for 35 Indiana middle and secondary school teachers. The purpose of the grant was to provide instruction in probability, statistics, and discrete mathematics so that teachers could incorporate these topics into existing courses as well as develop individual courses devoted to these areas. Separate courses in probability and statistics, as well as a course in discrete mathematics, are now approved for inclusion in our secondary Core 40 curriculum. The grant provides for released time for the entire academic year so that Dr. Kinney can work with the teachers in a follow up to the summer program.

STUDENT ACTIVITIES, PRESENTATIONS, PUBLICATIONS and AWARDS

Matt Lepinski took part in the RHIT NSF-REU summer program.

FACULTY and STAFF ACTIVITIES

George Berzsenyi commenced his special leave to prepare a book on the first eight years of the USAMTS and to pursue other writing projects. He hopes to publish at least two books of problems (and solutions, etc.) during his leave.

Allen Broughton worked with four students during this summer's NSF-REU program. Three technical reports from this summer are in progress. In addition, two technical reports, noted below, from the previous summer have been completed. The work of the 10 students Dr. Broughton supervised in the 1997 and 1998 Summers will be combined into four submitted papers, jointly authored by him and his students. The papers are currently under preparation. He also attended a Foundation Coalition workshop at RHIT in June and then participated in the Foundation Coalition conclave in Colorado Springs. During the summer, he extensively developed the departmental website. He was an instructor for the Laptop Orientation program.

Kurt Bryan, with co-author Lester Caudill at the University of Richmond, wrote a paper, "Stability and Reconstruction for an Inverse Problem for the Heat Equation" which has been accepted to appear in the Journal of Inverse Problems. The research was funded by a grant through the Mathematical Sciences Division of the NSF. Bryan and Caudill also organized a very well-attended mini-symposium on "Inverse Problems and Nondestructive Testing" for the SIAM national meeting in July in Toronto. Professor Bryan also attended an AMS/SIAM conference on Inverse Problems at Mt. Holyoke College in July. He and Lester Caudill presented their work at both conferences and continued their work on inverse problems throughout the summer. Professor Bryan attended the MAA "Mathfest" conference in Toronto where he was an invited panelist in a mini-symposium on "Mathematics Across The Curriculum." He spoke about integrating vector calculus and electromagnetics in Rose-Hulman Integrated First Year Curriculum in Science, Mathematics, and Engineering. Professor Bryan organized and taught (with Aaron Klebanoff and David Mutchler) the Jump Start program for incoming first-year students. The program has now been run for a fifth time and was quite successful. He also taught a 1 ½ hour class on Cryptography in each session of Fast Forward. Professor Bryan refereed papers for the SIAM Journal on Control and Optimization and for the Journal of Inverse Problems. He also served on the Master's thesis committee for Tom Combs, who successfully defended in August.

Stephan Carlson's textbook "Topology of Surfaces, Knots, and Manifolds: A First Undergraduate Course" was used in courses of the departments of mathematics at Indiana University and the University of North Dakota in the spring of 1998. He has been invited to present a paper on curricular options for undergraduate topology at the meeting of the American Mathematical Society to be held in Chicago, Illinois, in September. During the summer, Professor Carlson traveled to Toronto, Ontario, to attend MathFest '98—the summer meeting of the Mathematical Association of America. His participation included work on the MAA's National Committee on Sections, of which he is a member through January, 2000. In June he completed his term as Past-Chair of the Indiana MAA Section, and his service to the Section included chairing the selection committee for the MAA Certificate of Meritorious Service.

Carlson has continued his reviewing work for the international mathematical abstracts and reviews resource "Zentralblatt für Mathematik." On the RHIT campus, he served as an instructor in the 1998 Laptop Orientation sessions, and he has accepted the position as chair of the Mathematics Department's Curriculum Committee.

Leroy Franklin attended the Joint Statistical Meetings in Dallas in August. Earlier in the summer he was elected as treasurer of the Statistical Quality and Productivity section of the American Statistical Association.

Elton Graves was invited, through the efforts of George Berzsenyi, by the MAA to attend the awards ceremonies for the 1998 United States Mathematical Olympiad Team. Melanie Wood from Park Tudor School in Indianapolis became the first female to be a member of the United States Olympiad Team. Dr. Graves was invited to attend the ceremonies as part of his work with the American High School Mathematics Exam. The ceremonies were held in Washing D.C. on June 7 and 8. They included mathematical talks at the National Science Foundation, and the National Academy of Science. It should be noted that the United State Team place third in the International Mathematical Olympiad. The ceremonies were capped by a state dinner at the State Department.

During the weekend of June 19-21 Dr. Graves attended a meeting of the Executive Committee of the Committee of American Mathematical Competitions (CAMC). As a member of the Executive Advisory Committee of the CAMC, Dr. Graves was asked to present his views on how we can encourage more schools to participate in the American Junior High and American High School Mathematics Exams. At the present time, Indiana ranks in the top 10 in the country in participation in these national exams.

From June 28 to July 1, Dr. Graves attended the national American Society of Engineering Education (ASEE) meeting in Seattle, WA. He was re-elected as a director of the Mathematics Division of ASEE. He was also elected to the post of Newsletter Editor for the Mathematics Division.

From July 19 through July 21, Dr. Graves, along with Dr. Roger Lautzenheiser, taught Fast Track Calculus. This year 46 students participated in the program and all 46 received credit for Calculus I, II, and III.

Dr. Graves was an instructor in the Laptop Orientation program and will serve as Calculus course coordinator.

Ralph Grimaldi taught Discrete Mathematics for two weeks during the summer to the high school and middle school teachers involved in the program Mathematics for the 21st Century (directed by Professor John J. Kinney). In addition, he taught Calculus III during the second summer session and gave one lecture each week on Graph Theory for the Fast Forward program. Time was also spent preparing for the Rose-Hulman High School Mathematics Contest and for the Clemson University Discrete Mini-Conference where he is an invited speaker for this September. Finally, in August he was informed that his paper "The Catalan Numbers as Compositions of Squares" was accepted for publication by Congressus Numerantium.

Matthew Hopkins worked as an invited visiting faculty researcher this past summer, at Sandia National Labs in Albuquerque, New Mexico. He worked with Rose-Hulman mathematics alumnus David Womble on research in computational fluid dynamics.

John Kinney directed a two week program in June for 32 Indiana secondary and middle school teachers of mathematics. The program, "Mathematics for the 21st Century", seeks to instruct teachers in probability, statistics, and discrete mathematics so that topics from these newer areas of mathematics can be incorporated in the mathematics curriculum in Indiana. He will work with these teachers throughout this academic year through a grant from the Indiana State Department of Education. His paper, "Using Mathematica in Probability and Statistics", appeared in the Proceedings of the Section on Statistical Education (1997) of the American Statistical Association. He was invited to organize and chair a session on Computer Algebra Systems in Courses in Probability and Statistics at the Joint Statistical Meetings in Dallas in August. He also presented a paper at those meetings.

Aaron Klebanoff began his summer activities by authoring a grant proposal entitled "An Indiana MAA Student Chapter Hosted Workshop" in his role as the Student Chapter Coordinator for the Mathematical Association of America. He also attended a two-day workshop on the sophomore Foundation Coalition curriculum at Rose-Hulman in early June. He devoted much of his time during the summer to understand a "chaos toy" that he has been analyzing. In July, he also participated in SIGGRAPH '98, an international computer graphics conference in Orlando, Florida. There Cary Laxer and he delivered a presentation pertaining to the course that they developed. Upon his return from Florida, Dr. Klebanoff taught fractal geometry and chaos games to 7th and 8th grade girls in the Fast Forward program. He also taught along with Professors Kurt Bryan and David Mutchler in the Jump Start program during the last week of August.

Roger Lautzenheiser, upon returning from sabbatical at Kanazawa Institute of Technology, began teaching in the Mathematics Department's Summer Fast Track Calculus Program. Before leaving Kanazawa, he presented a talk to the KIT faculty comparing the educational systems at KIT and RHIT. Furthermore, he was involved in a mathematics seminar studying the long term behavior of various random sequences.

Robert Lopez attended, and spoke at, the MAA Mathfest meeting in Toronto. During the summer, he completed a set of notes (350 pages) for a course in tensor calculus, to be taught in the winter quarter. He also updated some 70 Maple worksheets from version 4 to version 5 for use in MA113 and MA201 this fall. The calculus notes run some 600 pages, and the differential equations notes run some 300 pages. He and Steve Carlson updated the Maple syntax guide made available to students. Robert wrote Chapters 2, 3, 4, and 5 (about 1000 pages) for the Advanced Engineering Math text he's working on for Addison-Wesley.

David Rader submitted two papers for publication (see below), while a third paper, "Optimal cell flipping to minimize channel density in VLSI design and pseudo-Boolean optimization", co-authored with E. Boros, P.L. Hammer, and M. Minoux, was accepted for publication in Discrete Applied Mathematics. He also did consulting work for the Southern Collegiate Athletic Conference, devising improved schedules for the 1999-2000 basketball season. Finally, he developed a graduate course in Operations Management, which is co-listed as a Mathematics and a Engineering Management course in the Fall of 1998.

Gary Sherman worked with four students in our NSF-REU program and completed a revision of Indiscrete Discrete Mathematics this summer. The paper "Finite Groups can be Arbitrarily Hamiltonian", co-authored with former REU students, Stephan Ahern and Mark Huber, was accepted by *Communications in Algebra.*

PAPERS, PUBLICATIONS AND TECHNICAL REPORTS

Paper and Publications:

Kurt Bryan, Lester Caudill "Stability and Reconstruction for an Inverse Problem for the Heat *accepted by the Journal of Inverse Problems*.

Ralph Grimaldi, "The Catalan Numbers as Compositions of Squares", *accepted by Congressus Numerantium*.

John Kinney, "Mathematica in Probability and Statistics", *Proceedings of the Section on Statistical Education (1997) of the American Statistical Association.*

David Rader, (co-authored with E. Boros, P.L. Hammer, and M. Minoux) **"**Optimal Cell Flipping to Minimize Channel Density in VLSI design and Pseudo-Boolean Optimization", *accepted by Discrete Applied Mathematics.*

_____, "Lifting Results for the Quadratic 0-1 Knapsack Problem", *submitted to SIAM Journal of Optimization.*

_____, "Maximally Disjoint Solutions of the Set Covering Problem", *submitted to Journal of Heuristics.*

Gary Sherman (with Stephen Ahern and Mark Huber former REU students), "Finite Groups can be Arbitrarily Hamiltonian", *accepted by Communications in Algebra.*

Mathematical Sciences Technical Report Series:

Vinroot, C. Ryan, *Symmetry and Tiling Groups for Genus 4 and 5*, June 29, 1998, MSTR 98-02 (faculty sponsor Allen Broughton).

Rader, David J. and Peter Hammer, *Maximally Disjoint Solutions of the Set Covering Problem*, July 13, 1998, MSTR 98-03

Haney, Dawn M. and Lori T. McKeough, *Quadrilaterals Subdivided by Triangles in the Hyperbolic Plane*, August 23, 1998, MSTR 98-04 (faculty sponsor Allen Broughton).

PRESENTATIONS, SEMINARS and COLLOQUIA

Kurt Bryan (with Lester Caudill) organized a mini-symposium on "Inverse Problems and Nondestructive Testing" for the SIAM national meeting in Toronto in July.

_____, MAA "Mathfest" conference in Toronto, panelist in a mini-symposium on "Mathematics Across The Curriculum." He spoke about integrating vector calculus and electromagnetics in Rose-Hulman Integrated First Year Curriculum in Science, Mathematics, and Engineering.

John Kinney, organized and chaired a session on Computer Algebra Systems in Courses in Probability and Statistics at the Joint Statistical Meetings in Dallas in August. He also presented a paper at those meetings.

Aaron Klebanoff (with Cary Laxer), SIGGRAPH '98, Orlando Florida, presentation on the "Chaotic Dynamics and Fractals" a course they co-developed

Roger Lautzenheiser, presentation to KIT faculty, comparing the educational systems at KIT and RHIT.

Robert Lopez, MAA Mathfest meeting in Toronto, "Maple, Laptop Computers and the 21'st

PROGRAMS and CONFERENCES (more details of programs in various locations above)

Professors **Elton Graves** and **Roger Lautzenheiser** taught this summer's Fast Track Calculus program to 46 students. The intensive five-week course covers Calculus I, II, and II. This year's FTC program attracted a record number of applicants (72 this year). All 46 students successfully completed and were awarded credit for Calculus I, II, and II.

The RHIT NSF-REU, coordinated by **Allen Broughton** and **Gary Sherman**, ran from June 7 through July 25, 1998. Two research groups, Tilings (SAB) and Cwatsets (GJS), each had four students, producing a total of four draft technical reports.