

DEPARTMENT OF MATHEMATICS

Report to the Board - Fall 1996

(also includes Center for Industrial Statistics Report)

PERSONNEL

Professor **Dave Bond** will be taking a year long Leave of Absence starting the fall quarter to gain industrial experience in applications of his area of expertise to scientific and technical data. He will be working with Alliance for Marine Remote Sensing in Nova Scotia.

Professor **Paul Welsh**, a visiting professor from Tucson, Arizona, on a non-teaching sabbatical, will be observing how Rose-Hulman faculty use computers in teaching of mathematics and gather information on computer infrastructure matters.

GRANTS AND CONTINUING GRANT ACTIVITIES

Professors **Lynn Kiaer**, **Roger Lautzenheiser**, and **Robert Lopez** received grants from the Foundation Coalition upper division course development funds to develop courses in Simulation, Applied Linear Algebra, and Advanced Engineering Mathematics.

Professor **Gary Sherman** conducted his eighth NSF-REU. This summer **Allen Broughton** also participated as a faculty consultant. Four technical reports are under preparation.

Professor **Kurt Bryan** spent six weeks doing research on his joint NSF grant with research colleague Lester Caudill.

Professors **George Berzsenyi** (director), **Lynn Kiaer** and **John Rickert** conducted the sixth annual Young Scholars Summer Program as the summer component of the USA Mathematical Talent Search, funded by NSF.

Professor **Aaron Klebanoff**, along with Brian Winkel, continued writing and revising problems for the Rose-Hulman Technology-Based Calculus Problems website.

Professor **Jack Kinney** once again conducted the Indiana Quantitative Literacy Program Teacher's Workshop on Probability & Statistics in the Mathematics Curriculum for Secondary and Middle School Teachers. Gail and Jack Burrill of the National Center for Research in Mathematics and Science Education assisted in the instruction of this workshop.

FACULTY and STAFF ACTIVITIES

Professor **Nacer E. Abrouk**, acted as ASEE Division Chair, Annual ASEE Conference, Washington, D.C., June 1996 and was appointed to another three years as an ASEE Board Member (1997-2000). His publications and reviews includes co-authoring a paper with Professors D. Yen and H. Salehi,

Michigan State University, entitled "Approximation of Distribution Laws in Population Genetics Governed by Fokker-Planck Equations". This paper will be presented at an international conference on applications of probability and statistics in Saudi Arabia, 1997. He reviewed a paper entitled "Rule of Ten, Rule of Thumb" for the Journal of Statistical Education (JSE), 1996.

With the Foundation Coalition, he reviewed MA212 course content and participated in a two-day workshop at RHIT on curriculum development. He developed, in cooperation with J. Kinney, a student manual for a statistical package (Minitab). Dr. Abrouk developed a new course for the Naval Research Warfare Center at Crane, Indiana. The course focuses on experimental design and quality improvement techniques. This course will be offered at Crane during Fall 1996. He prepared and submitted a mini-course in advanced statistics for the ICTCM International Conference, November 1996, Reno, Nevada.

During the summer session he taught MA214 and MA205 and conducted an independent study in Biopharmaceutical Applications of Statistics. The study involved one employee from Pfizer, Kelly Campton. He was a co-advisor to Allen Schnarre and Katheline Knabb, two Biomedical Engineering graduate students (summer graduation).

He also worked as a statistical consultant for Columbia House and Applied Extrusion Technologies in Terre Haute. He established a relationship between CIS and TRW. Projects from TRW are currently being carried out by students from RHIT under the supervision of CIS. These projects are a contribution to the RHIT TED program.

Professor **George Berzsenyi** completed his work on the seventh year of the USA Mathematical Talent Search, which attracted over 1800 students nationwide, and started his preparations for the eighth year of this NSF supported program for talented high school students. He also served as the Director of the associated four--week long Rose-Hulman Young Scholars Summer Program, which attracted 51 students, representing 25 states. Following the program, he took an active part in the 8th International Congress on Mathematics Education, held in Sevilla, Spain, where he gave three talks. During the Congress he was recognized by the Erdos Award of the World Federation of National Mathematics Competitions for his contributions in the United States during the past years.

Professor Berzsenyi also continued his regular columns in Consortium, Quantum, and Mathematics and Informatics Quarterly during the summer, and spent several weeks creating problems for the USA and International Mathematical Talent Searches. During the spring, he also attended the Indiana Section Meeting of the Mathematical Association of America, where he took part in a panel discussion.

Professor **Dave Bond** taught one course in summer school and made technical preparations for his leave of absence in Nova Scotia.

Professor **Allen Broughton** participated as a faculty consultant in the NSF-REU, along with Gary Sherman. He attended the ASEE Conference in Washington and met with representatives of the Mathworks to discuss site-licensing issues related to MATLAB. He also attended the SIAM summer meeting in Kansas City, meeting with some mathematicians from Foundation Coalition schools.

He served as co-chair with David Mutchler on the Laptop Orientation Team, coordinated with WCC on developing a network software installation scheme, and advised Bruce Danner on the remodeling of rooms G313, G222 and G220 to accommodate laptop use. He and Frank Young drafted a pre-proposal letter to the W.M. Keck Foundation for creating a high-end computing environment at RHIT. He has also submitted a renewal proposal for the RHIT NSF-REU program. Finally, (along with Cheryll Dodd) he coordinated the refurbishment of Crapo Hall offices and classrooms.

Professor **Kurt Bryan**, with Lester Caudill at the University of Richmond, spent the first half of the summer working on mathematical inverse problems related to nondestructive testing. They submitted a paper, "A Uniqueness Result for a Boundary Identification Problem in Thermal Imaging" to the SIAM Journal of Mathematical Analysis. Professor Bryan and Lester Caudill were also awarded a research grant of \$85,500, through the RUI program in the Mathematical Sciences Division of the National Science Foundation. The grant provides three years of funding for research in inverse problems related to nondestructive testing. Professor Bryan, with Hossein Hariri, in the Chemical Engineering Department, submitted the article "Teaching a Transport Phenomena Problem Using a Symbolic Algebra Package" to the journal Chemical Engineering Education. Professor Bryan also refereed several papers for the SIAM Journal of Applied Mathematics and SIAM Journal of Mathematical Analysis.

Professor Bryan spent five weeks in the latter half of the summer teaching in the Fast Track Calculus program (with Professors Graves, Lopez, and Rickert) and one week teaching the Jump Start program (with professors John Rickert and David Mutchler. He also served as a Laptop Orientation Instructor.

Professor **Steve Carlson** attended Math Fest '96 in Seattle, Washington, during the summer. This event constituted the summer joint meetings of the American Mathematical Society and the Mathematical Association of America. In particular, Carlson represented, not only Rose-Hulman, but also the state of Indiana as the official representative of the Indiana MAA Section at the MAA officers meeting. Following the summer meetings, he was invited to serve the national MAA organization as a member of its Committee on Sections. He has accepted that invitation, and his term will extend through January, 2000.

Professor Carlson's activities this year with the Indiana MAA Section include serving as Section Chair during the 1996-97 year and also serving as local arrangements chair for the fall 1996 meeting which will be held on the Rose-Hulman campus on Friday and Saturday, October 25 and 26.

Professor Carlson will be on sabbatical leave during the winter and spring terms of the 1996-97 year to do research and writing, and he has accepted a Visiting Professor position at Indiana University, Bloomington, for the spring 1997 semester.

Professor **Elton Graves** was invited by the MAA and the Science Advisor to President Clinton to attend the ceremonies honoring the 1996 US Olympiad Members. The weekend of events held in Washington, D.C., included a reception at the national headquarters of the MAA, lectures at the National Science Foundation, a reception and lecture at the National Academy of Science, and a formal state dinner held at the State Department. Professor Graves attended the National ASEE Conference held in Washington, D.C. He finished his term as immediate past-chair of the Mathematics Division of ASEE and was elected to the Board of Directors of the Mathematics Division of ASEE. He was also the director of our Fast-Track Calculus Program this year. Forty-one students from 19 states and the Republic of Central Africa participated in this year's program which ran from July 21 until August 23. All 41 participants successfully completed the program and received credit for Calculus I, Calculus II, and Calculus III. The instructors for Fast-Track Calculus were Professor Graves, Professor Lopez, Professor Rickert, and Professor Bryan. They all agreed that this year's group was the best Fast-Track group in the last five years. Professor Graves also helped with the Freshman Laptop Orientation program and acts as a Freshman Advisor for fourteen of the Fast-Track Calculus students. On September 12 through September 15, Professor Graves will be attending a conference in Lincoln, Nebraska, as part of his work with the MAA as the Indiana Coordinator for the AJHSME and the

AHSME. He was also elected by the faculty to be a member of the 1996-97 Faculty Affairs Committee, was appointed by President Hulbert to be Chair of the Admissions and Standings Committee, and continues to represent the Mathematics Department as a member of the Laptop Committee.

Professor **Ralph Grimaldi**, in his role as coordinator of the traditional differential equations courses for this academic year, attended the NSF sponsored Differential Equations Workshop held at Boston University in early June. Later that month he attended the SIAM Conference on Discrete Mathematics at Johns Hopkins University where he presented the paper "Properties and Parameters for a Recursively Defined Family of Graphs." In addition to other professional pursuits, he taught Calculus III during the second summer session held at Rose-Hulman.

Professor **Lynn Kiaer's** summer began with the NSF/Rose-Hulman Young Scholar Program, together with Professors Berzsenyi and Rickert. In late June she attended the ASEE conference, presenting two talks about mathematics innovations at Rose-Hulman. Both papers were published in the Proceedings. Professor Kiaer will be the Program Chair for the Mathematics Division at the 1997 ASEE Conference in Milwaukee. The latter part of the summer was spent developing an upper division course in simulation, supported by funds from the Foundation Coalition. Throughout the summer, Professor Kiaer has been working on application modules which will be included in the new (6th) edition of Howard Anton's Calculus. This work began in the spring and continues through the fall and winter. She was invited to contribute to the text because of her work in previous summers on complex calculus problems with Professor Klebanoff and former Professor Winkel. Professor Kiaer will represent the Mathematics Department for the Women in Mathematics, Science and Engineering program being developed by the admissions department, and is looking forward to her third year as a member of the Integrated First Year Curriculum in Science, Engineering and Mathematics team. She was also an instructor in the Laptop Orientation Program.

Professor **Jack Kinney** once again conducted the Indiana Quantitative Literacy Program Teacher's Workshop on Probability & Statistics in the Mathematics Curriculum for Secondary and Middle School Teachers. Gail and Jack Burrill of the National Center for Research in Mathematics and Science Education assisted in the instruction of this workshop.

Kinney also organized a session at the Annual Meeting of the American Society for Engineering Education on Integrated Programs in Engineering Education. Speakers included himself, Jeff Froyd, Don Richards, and Gloria Rogers. He is pursuing the creation of a section of ASEE devoted to integrated programs. He also presented a paper on the use of Mathematica in courses in probability and statistics for engineers at the Fifth Annual Conference on the Teaching of Mathematics in Baltimore. He conducted a week long Summer workshop on Probability and Statistics for high school and middle school teachers. It was funded by the Indiana Department of Education.

His text, "Probability - An Introduction With Statistical Applications" will be published by John Wiley & Sons in early November. He is also the author of an Instructor's Manual to accompany the text. He is presently in the early stages of a text on mathematical statistics.

Professor **Aaron Klebanoff** began his summer by attending a Calculus Reform workshop sponsored by the Foundation Coalition in Phoenix, Arizona. Upon his return, he spent much of his time writing and revising problems for the World Wide Web site that he developed along with Brian Winkel. Dr. Klebanoff spent five weeks in California during the middle of the summer, and ended up as a part-time consultant to the College Preparatory Mathematics project. The project aims to revise the high school

and junior college mathematics curriculum, and is creating several new textbooks in the process. Dr. Klebanoff worked with some of the authors on problems for the Pre-Calculus text. He also continued his involvement with the Fast Forward program by teaching two sessions on fractal geometry and chaos, and at the end of the summer participated in a problem-based learning workshop at Rose-Hulman. He also was an instructor in the Laptop Orientation Program.

Professor **Roger Lautzenheiser** attending a Calculus Reform workshop sponsored by the Foundation Coalition in Phoenix, Arizona in early June. Next, he worked with Yosi Shibberu as part of the Foundation Coalition Sophomore Engineering Curriculum program revising notes for two of the curriculum's mathematics courses, MA 211 and MA 213. The notes were developed last summer and used throughout the year. He also spent time developing a linear algebra course for upper level engineering and science students.

Professor **Robert Lopez** was honored as the Board of Managers Outstanding Scholar at Spring Commencement. In addition, He was selected as a Waterloo Maple Inc. Distinguished Scholar in July, and spent a week at Waterloo Maple as the company's guest. Dr. Lopez presented a paper at ASEE and serves as Secretary/Treasurer for the Mathematics Division. Under a Foundation Coalition grant, he prepared two 2-credit courses, one in Vector Calculus and the other in Complex Variables. In addition, Dr. Lopez assisted with the Fast Track Calculus program. He continues to serve as a Freshman Advisor, and assisted with Laptop Orientation at the start of the school year.

Professor **John Rickert** spent the summer as part of the teaching staff for the Rose-Hulman Young Scholars Program. He was also an instructor in the Fast Track Calculus, director of the Jump Start program for 23 incoming freshman, and served as a Laptop Orientation Instructor. The paper Monochromatic Triangles in Complete Graphs written with Ralph Grimaldi, was accepted by Congressus Numerantium. Lynn Kiaer and he continued to produce educational modules for the next edition of Howard Anton's Calculus. He administered the freshman Mathematics Diagnostic Exam, administered to all freshmen during registration week. He is working with Robert Lopez to remedy the deficiencies of students who performed poorly on the diagnostic exam and is analyzing the results of this and past diagnostic exams. He served a coach to the teams representing the state of Indiana that placed 6th and 36th in the B division at the American Regions Math League meet, the best finish ever by Indiana teams. The top team won the "site award" for having the highest score among division B competitors at the University of Iowa, the other team was the most improved in Division B. He continued to serve as a member of the USA Mathematics Talent Search staff and organized the 31st annual Rose-Hulman High-School Mathematics Competition. He will be serving as a freshman advisor to Rose-Hulman freshmen. He performed consulting work for NDVJ, the company building the new domed baseball park in Seattle. The work consisted of gathering data and creating mathematical models to determine the probability that a ball in play would hit one of the supporting trusses in the proposed design of the park.

Professor **Gary Sherman** taught a week long NSF short course (Research and Exploration in Discrete Mathematics and Group Theory) at DePauw University in June. He spent the rest of the summer working in his 8th (and final) NSF-REU program and on his idiosyncratic text, "Indiscrete Discrete Mathematics."

Professor **Yosi Shibberu** gave a talk titled "A New Framework for Sophomore Mathematics" at the ASEE Conference in Washington D.C., June 23-27. He also attended the annual meeting of SIAM in

Kansas City, July 20-26, where he completed a short course on the mathematics of finance and attended session on education reform in differential equations. Professor Shibberu worked for two weeks for the Foundation Coalition on improving the Foundation Coalition Sophomore Curriculum. This summer, he completed a draft of a sophomore mathematics textbook entitled "Algebraic and Differential Equations in Science and Engineering" which he co-authored with Roger Lautzenheiser. He also served as a Laptop Orientation Instructor.

In addition to providing clerical support for the seven summer programs listed below, **Cheryll Dodd** continued to upgrade her computer skills, continuously improve office management and coordinated the refurbishment of the Crapo Hall offices.

PRESENTATIONS, SEMINARS, COLLOQUIA

Off campus presentations:

George Berzsenyi presented three papers "USAMTS", "IMTS", and "Hungary's Heritage" while he was in Spain.

Ralph Grimaldi, "Properties and Parameters for a Recursively Defined Family of Graphs," SIAM Conference on Discrete Mathematics at Johns Hopkins University where he presented the paper Properties and Parameters for a Recursively Defined Family of Graphs.

Lynn Kiaer presented two talks about mathematics innovations at Rose-Hulman. Both papers, "Integrating Integration" and "Why Do I Always Get in the Slow Lane?", were published in the June, 1996, Proceedings.

Gary Sherman, *Research and Exploration in Discrete Mathematics and Group Theory*, a week long NSF short course, DePauw University, June 96.

Yosi Shibberu *A New Framework for Sophomore Mathematics*, ASEE Conference in Washington D.C., June 23-27.

PAPERS, PUBLICATIONS AND TECHNICAL REPORTS

Paper and Publications:

Nacer Abrouk, with D. Yen and H. Salehi submitted *Approximation of Distribution Laws in Population Genetics Governed by Fokker-Planck Equations*, to be presented at the International Conference on Applications of Probability and Statistics in Saudi Arabia, 1997.

Kurt Bryan, with Lester Caudill at the University of Richmond, submitted *A Uniqueness Result for a Boundary Identification Problem in Thermal Imaging* to the SIAM Journal of Mathematical Analysis.

Professor Bryan, with Hossein Hariri in the Chemical Engineering Department, submitted the *Article Teaching a Transport Phenomena Problem Using a Symbolic Algebra Package* to the journal Chemical Engineering Education.

Lynn Kiaer, John Rickert continued to write educational modules for the sixth edition of Howard Anton's Calculus.

Jack Kinney, Probability - An Introduction With Statistical Applications, John Wiley & Sons, to be published early November.

John Rickert, Ralph Grimaldi, *Monochromatic Triangles in Complete Graphs*, accepted *Congressus Numerantium*.

Gary Sherman, Indiscrete Discrete Mathematics, preliminary text.

Yosi Shibberu, Roger Lautzenheiser, Algebraic and Differential Equations in Science and Engineering, preliminary text.

Technical Report Series:

Kurt Bryan and Lester Caudill, Jr., *Uniqueness for a Boundary Identification Problem in Thermal Imaging*.

Richard Mohr (student), *CWATSETS: Weights, Cardinalities And Generalizations*.

PROGRAMS (more details of programs in various locations above)

Fast Track Calculus: five weeks, Elton Graves (director), Robert Lopez, Kurt Bryan and John Rickert had 41 students with excellent qualifications successfully complete the program.

NSF-REU seven weeks, for the eighth year, Gary Sherman (director) and Allen Broughton, directed four students, with four technical reports in progress.

USA Mathematical Talent Search, sixth year, George Berzsenyi, Lynn Kaier, and John Rickert, had over 1800 students nationwide.

Rose--Hulman Young Scholars Summer Program, 4 weeks, George Berzsenyi (director), Lynn Kiaer, John Rickert, had 51 talented students from 25 states.

Jump Start, 1 week, John Rickert (director), Kurt Bryan, and David Mutchler (CS), had 23 students, successful complete the program.

Indiana Quantitative Literacy Program Teacher's Workshop, one week Jack Kinney, Probability Statistics in the Mathematics Curriculum for Secondary and Middle School Teachers. Gail and Jack Burrill of the National Center for Research in Mathematics and Science Education assisted in the instruction of this workshop.

Laptop Orientation for New Students, Allen Broughton and David Mutchler, co-chairs, 21 instructors from 7 departments, functioned very smoothly.

CENTER FOR INDUSTRIAL STATISTICS

1. Participated in general discussions on policy formulation for the TED program.
2. Applied for and received funding for laptop computer equipment and software to be used in on projects. Funding from TED program.
3. Made a site visit to TRW in Marshall Illinois along with other RHIT faculty, and hosted a return visit by TRW. A student project course is under way with two students enrolled.