

DEPARTMENT OF MATHEMATICS
Report to the Board -Spring 1996
(also includes Center for Industrial Statistics Report)

PERSONNEL

Dr. John Rickert was promoted to Associate Professor with tenure.

Professor Brian Winkel formally resigned his position at RHIT. He is a Full Professor of Mathematics at United States Military Academy, West Point, NY.

Mrs. Mary Lou McCullough retired from her position of department secretary after 31 years of service. We thank her for her long years of service.

Ms. Cheryl Dodd was hired as the new department secretary. She comes from an secretarial post at Indiana State University.

GRANTS AND CONTINUING GRANT ACTIVITIES

Professor **Nacer Abrouk** was part of the proposal writing team for the successful Lilly Foundation grant. Professors Abrouk, Broughton, Carlson, Klebanoff, Kiaer, Kinney and Sherman participated in the Lilly conclave. Professors Abrouk and Broughton also participated in the policy development exercise. Professor Abrouk has been named to the Policy Board of TED.

Professor **George Berzsenyi** received a grant for \$18,000 from the National Security Agency in support of the USAMTS. This adds to the NSF funding of two year grant of \$95,000/ year for the related Young Scholars Summer Program. Professors, **Berzsenyi**, **Kiaer** and **Rickert** will participate in the summer program. The students are selected from the nearly 2,000 students who participate in the USA Mathematical Talent Search. Professor **Klebanoff** also participated in the USA Mathematical Talent Search

Professors **Kiaer**, **Lopez** and **Lautzenheiser** all received funding from the Foundation Coalition to develop upper division courses. They will be working on courses in simulation, applied linear algebra for science and engineering students, and a two-hour course modules in applied engineering mathematics.

Professor **Jack Kinney** has received a \$21,000 grant from the Indiana State Department of Education for the Indiana Quantitative Literacy Project - 1996. This grant allows him to conduct at RHIT a week-long workshop in training teachers to teach topics in

probability and statistics in the pre-college years. One of the instructors is the President-Elect of the National Council of Teachers of Mathematics.

Professor **Aaron Klebanoff**, working electronically with Brian Winkel, will be completing work on the technology based problems in Calculus project this summer. The funding for this activity, obtained by Brian Winkel, is a \$100,000 NSF grant combined with \$26,400 from the Arvin Foundation (for high school teachers participation in previous summers). The website of course materials has been accessible for about one year now and has generated some publication activity. On the basis of these publicly available materials, Professors **Rickert** and **Kiaer** received a contract to produce materials for Howard Anton's Calculus book.

Professor **Gary Sherman** is preparing for his eighth NSF-REU (Research Experiences for Undergraduates) summer program. The program continues to produce refereed faculty-student publications: 16 published/accepted, 2 submitted. He will be joined this year by Professor **Allen Broughton**. The amount of the current 3-year grant is approximately \$60,000.

STUDENT ACTIVITIES AND PRESENTATIONS

Mathematics Competitions: Forty-five students participated in the seventh annual Alfred R. Schmidt Freshman Mathematics Competition, coordinated by Professor Rickert. The first prize winner was Ben Ford. The RHIT team placed 34th this year in the Putnam Competition under the direction of Steve Carlson. Twenty students competed altogether. Aaron Klebanoff directed the Math Modeling team consisting of Nick Tallyn, Carl Tracy and James Moore. They received a meritorious ranking, significantly improving on last year's effort. Fifteen students attended the MAA Section meeting at Butler University and competed in the Indiana Collegiate Mathematics Competition. The three highest scoring teams were RHIT teams.

Pi Mu Epsilon: Thirty-nine students and faculty members attended the Annual Pi Mu Epsilon Banquet on April 30. Twenty-two members of the Rose-Hulman student body were inducted into Pi Mu Epsilon, an honorary mathematics fraternity. Dr. Maynard Thompson from Indiana University in Bloomington spoke on "*Why it is difficult for groups to decide how to make decisions.*"

Conferences and workshops: A number of students attended the following conferences and workshops: the Rose-Hulman Undergraduate Mathematics Conference, the MAA section at Butler University in Indianapolis and the Hewitt Associates Actuarial Seminar in Chicago.

Awards: During the Spring Honors and Awards Banquet, Ben Ford was awarded the Palmer Award for outstanding performance as a freshman and Richard Mohr was awarded the Soursley Award as the outstanding graduating mathematics senior. Thirteen other students were recognized for their excellent performance in various mathematics competitions.

Student Presentations:

Craig Cutforth, Randall Johnson, & John Finitzer, *Fuzzy Logic*, RHIT Undergraduate Mathematics Conference.

Nick Fiala, *Some Rectangular Groups Are Nearly Square*, RHIT Undergraduate Mathematics Conference, March 1996.

Jamie Kawabata, *A Recursion Relation for Scrambling Numbers*, RHIT Undergraduate Mathematics Conference, March 1996.

Rick Mohr, *Wondering What Words Weigh in CWATSets*, RHIT Undergraduate Mathematics Conference.

Ryan Scherle, *Temporal Difference learning: Is it the Answer?*, RHIT Undergraduate Mathematics Conference.

FACULTY ACTIVITIES

Professor **Nacer E. Abrouk** attended the Annual Biostatistics Conference in Seattle, Washington and the ASA local Chapter Colloquium in Indianapolis. In curriculum development, he completed Statistical Linear Models which was developed during the Fall Quarter of 1996 and taught during the Winter Quarter of 1996, and along with Jack Kinney developed MA 212, the statistics portion of the Applied Math sequence in the Foundation Coalition Sophomore Curriculum. Dr. Abrouk organized the Undergraduate Mathematics Conference this year, it was very successful with about 100 participants and two well-received main speakers. He served on the Graduate Studies Committee, the Project Policy Development Team, and Lilly Endowment Proposal Committee, and later he was appointed to the Technology and Entrepreneurial Development Executive and Policy Program Board. In addition to participating in this successful (\$4 million) proposal writing committee, he has submitted "The Great Lakes Repository for Industrial Statistics", in collaboration with Michigan State University, as a follow-up to a successful preproposal. The requested funding is \$1.8 million. For consulting, he served as an industrial consultant to Market Strategies of Southfield, Michigan and Applied Extrusion Technologies, Inc. in Terre Haute, Indiana. He also served has also on the Master's Thesis Committee for Han San Yun, Mechanical Engineering and Wei Wang, Mechanical Engineering. Finally, he has published "Approximation of Distribution Laws in Population Genetics Governed by Fokker-Planck Equations" with two co-authors.

Professor **George Berzsenyi** continued his extensive work with the USA Mathematical Talent Search (USAMTS) program, which attracted nearly 2000 students nationwide this year. He also continued with his USAMTS column in CONSORTIUM, where his "Problems, Puzzles & Paradoxes" column also appears regularly. He also kept up with

his column on the International Mathematics Talent Search (IMTS) in MATHEMATICS AND INFORMATICS QUARTERLY and with his "Math Investigations" column in QUANTUM. Moreover, he wrote "Foreword" to the book ARML-NYSML CONTESTS 1989-1994 and a section entitled "The World of Mathematical Competitions" for MATHEMATICS EDUCATION: AN ENCYCLOPEDIA, which should appear later this year. He also completed his half of THE CONTEST PROBLEM BOOK V, a volume covering the American High School Mathematics Examination (AHSME) and American Invitational Mathematics Examination (AIME) for the years 1983-1988. Berzsenyi was chairing the committee in charge of the AIME during those years, and he is the co-author of the book (with Steve Maurer, who directed the AHSME). The volume is to be published by the Mathematical Association of America (MAA) in the near-future. During the year, Berzsenyi also attended the annual winter meeting of the MAA in Orlando, Florida, and the fall meeting of the Indiana Section of the MAA in Indianapolis. At the latter he took part in a panel discussion. During the year he served as the principal Investigator for the second year of an NSF grant awarded to Rose-Hulman for the USAMTS related Young Scholars Summer Program. He was also the recipient of a grant for \$18,000 from the National Security Agency in support of the USAMTS. He continues to serve on the Advisory Boards of MATH HORIZONS and QUANTUM, as well as of several other series of publications.

Professor **Dave Bond** got off to a good start this year learning the ropes of teaching Calculus and Differential Equations. In October he attended a workshop on data compression techniques in Greenbelt, Maryland. Along with Kurt Bryan he gave a series of lectures in the Applied Mathematics Seminar on wavelets, an area of his expertise. He and Steve Carlson submitted to the department a special report requesting improvements to Crapo Hall. He is also a member of the Diversity Council and visual and Performing Committees at RHIT.

Professor **Allen Broughton**, as head of the department, accepted the report of the special curriculum committee (FFQM) which met throughout the fall. He established a standing Curriculum Committee which has designed an implementation of the FFQM report for calculus and is nearing completion on the redesign of the sophomore mathematics courses. This completes the first phase of our curriculum redesign. All of this involved extensive discussions with other departments. The next stage is to redesign the major and the upper division courses, in which we expect to maintain the discussion with the other departments. Professor Broughton attended several conferences, the Miami of Ohio Undergraduate Mathematics Conference, Studio Calculus & Physics at Rensselaer Poly, the AMS Regional Mathematics meeting in Kent, Ohio, the AMS/MAA meetings in Orlando Florida, and Spring meeting of the MAA. In many of these meetings he attended sessions on calculus reform and mathematics teaching reform, to bring back ideas on continuously improving our teaching. He also took four students to the Hewitt Associates Actuarial Seminar in Chicago to expose the students and himself to additional career opportunities for mathematics majors. He and David Mutchler are co-chairs of the Laptop Orientation Committee and in this capacity has been involved in laptop software demonstrations at the fall Open House and the conference A Women's Place. In an effort to improve communications he and Kurt Bryan have constructed a departmental web page and will train students to take over the task in the fall. In course development he is

preparing, along with professors Shibberu and Lautzenheiser, workshop materials for the KIT/RHIT workshop this coming fall, based on the linear algebra course that he and Roger Lautzenheiser are teaching. Concerning professional development he, with his co-authors, has submitted, *Symmetries of Accola-Machlachan and Kulkarni Surfaces*, and distributed it as a technical report. He has an additional manuscript near completion and will be working with Gary Sherman in the REU program, using material from his research. He coordinated a large purchase of Matlab software and toolboxes achieving substantial savings. He continues as faculty advisor to the RHIT Roller Blades Club.

Professor **Kurt Bryan**, with Lester Caudill at the University of Richmond, has continued working on mathematical inverse problems related to thermal nondestructive testing. He delivered a lecture on the subject at Iowa State University in December, and at the ASME annual meeting in Boston in September. He and Professor Caudill have submitted a grant proposal to the mathematical science research division of the NSF, to fund continued work on thermal imaging. Professor Bryan is also working with Michael Vogelius of Rutgers University on the mathematical issues involved in detecting flaws in electrical conductors. They have also begun working on applications of the Radon transform in electromagnetics. Professor Bryan refereed several papers for the SIAM Journal of Applied Mathematics and SIAM Journal of Mathematical Analysis. With David Bond, Professor Bryan also helped organize and give a number of talks in the mathematics department's weekly faculty seminar on applied mathematics. He also served as technical liaison for an undergraduate project on neural net modeling with Tri-Manufacturing, through the Center for Industrial Statistics. The project was brought to successful completion in November. With Allen Broughton, Professor Bryan has maintained and expanded the mathematics department's World Wide Web page. He has also acted as a faculty advisor for 15 IFYCSEM students, and is directing spring design projects for several groups of IFYCSEM students.

Professor **Steve Carlson** has continued his service to the Indiana Section of the Mathematical Association of America as its Vice-Chair, and he will serve as the Section's Chair during the 1996-97 year. In that capacity, he has worked on all aspects of the Section business and, in particular, on the planning committees for the fall 1995 and spring 1996 Section Meetings which were held at Taylor University and Butler University, respectively, and for future meetings. The fall 1996 meeting will be held at Rose-Hulman on October 26.

In addition to attending the MAA Section Meetings, he attended the annual joint meetings of the AMS and MAA held in Orlando, Florida, in January of 1996. He served as the advisor and coach for the Rose-Hulman team entered in the 1995 Putnam Competition, and he has continued his reviewing work for the international mathematical abstracts resource "Zentralblatt fur Mathematics." He has coordinated the ISU-RHIT-SMWC Mathematics Colloquium series and is completing his third year as a member of the RHIT Faculty Affairs Committee and his first year as a member of the RHIT Facilities Commission. Professor Carlson is planning a sabbatical leave during the winter and spring terms of the 1996-97 year to do research and writing, and he has accepted a visiting position at Indiana University, Bloomington, for spring 1997.

The Mathematics Department will host the Fall 1997 Meeting of the Indiana Section of the Mathematical Association of America on October 26, Steve Carlson is currently organizing the meeting. The featured speaker will be Professor Laszlo Babai, an internationally renowned mathematician and computer scientist who holds appointments at the University of Chicago and Eotvos University in Budapest. The meeting activities should attract a group of more than 100 mathematicians and mathematics students from throughout the state and region to the Rose-Hulman campus.

Professor **Elton Graves** received an MAA Distinguished Service award for more than a decade of outstanding work as the Indiana Section of the MAA newsletter editor. During the year Dr. Graves has coordinated the registration of the AJHSME and the AHSME exams helping to achieve record enrollments for Indiana. He is the Department's representative on the institute's Laptop Committee and continues to serve as the Director of the Fast Track program, described below. He was a regular participant in the Applied Mathematics Seminar.

Professor **Ralph Grimaldi** returned to the Rose-Hulman campus this fall after a sabbatical year spent at Clemson University. During the fall quarter, he was once again involved with running the high school mathematics contest with Professor John Rickert. In January Professor Grimaldi attended the National Meetings of the MAA-AMS at Orlando, Florida where he delivered a mini-course on the Fibonacci and Catalan Numbers. February found him at the 27th Southeastern Conference on Combinatorics, Graph Theory and Computing at Louisiana State University where he delivered the paper *Monochromatic Triangles in Complete Graphs*. In March Professor Grimaldi gave a workshop on discrete mathematics at the Texas section meeting of the MAA - in addition to the final invited address. He also gave another such workshop at the Northeastern Section Meeting of the MAA in April. With regard to publications, the article *Redundancy and Reliability of Networks* (co-authored with Douglas Shier) was published in January in the College Mathematics Journal; in February, the following articles were published in the journal *Congressus Numerantium*: *Generating Sets and the Fibonacci Numbers*, and *Unit Parallelogram Graphs* (co-authored with Jean Dunbar and Joydeep Goshal).

Professor **Lynn Kiaer** is completing her second year of teaching in the Integrated First Year Curriculum in Science, Engineering and Mathematics (IFYCSEM). In addition to teaching in the IFYCSEM, she taught MA 444, Deterministic Models in Operations Research, in the winter term, and is teaching a special topics, project-based course in the spring term. Besides teaching activities, she attended the Winter Simulation Conference in December, partially funded through the INFORMS College of Simulation, and has had two papers accepted for the ASEE Conference in June. The two papers, "Integrating Integration," which describes some unusual applications of integration in the IFYCSEM, and "Why Do I Always Get In The Slow Line?" which describes the introduction of a simulation module within a traditional stochastic models course, will be published in the Proceedings of the conference. Dr. Kiaer is also the program chair-elect for the mathematics section of the ASEE, and was recently elected to membership in Sigma Xi. Together with Professor Rickert, Professor Kiaer is working on applications modules for

the new edition of Howard Anton's Calculus, to be completed this calendar year. This project came about as a result of Dr. Anton's seeing, on the web, materials prepared by Professor Kiaer during her participation in the NSF Project for Complex, Technology-Based Calculus Problems, originated by Professor Winkel and continued by Professor Klebanoff. Professor Kiaer has also been able to broaden her perspective this year thanks to an on-going consulting arrangement with Pfizer, in which she is working as a consultant to several teams of Pfizer employees who are addressing various aspects of minimizing release time for sterile pharmaceutical products. Not only has this industry experience been valuable in terms of professional development, but the contact with Pfizer management at the Vigo Plant continues to produce industrial projects for students. This year, a team of two upper-class and four first-year students is working on a project related to her consulting work, and a team of four first-year students is working on an unrelated project. Summer projects this year include the NSF-Rose-Hulman Young Scholars Program, with Professors Berzsenyi and Rickert, and the development of a new course in Simulation, funded by the Foundation Coalition.

Professor **John Kinney** has completed the manuscript for a text in probability, *Probability: An Introduction With Statistical Applications* which is now in production by John Wiley & Sons. A late 1996 publication date is anticipated. He continues work with the Mathematics Advisory Council for the Indiana State Department of Education (three year appointment) and on campus chairs the Committee on Honors and Awards. He continues to work with the Departments of Chemical Engineering and Mechanical Engineering in creating and teaching courses in statistical analysis, and has worked with Nacer Abrouk to develop Math 212, the statistics portion of the Applied Math sequence in the Foundation Coalition Sophomore Curriculum. He is completing a year as President of the Indiana State University Chapter of Sigma Xi and has coordinated a number of activities for that organization of scientists in the Wabash Valley. As noted above Dr. Kinney has recently learned that he has been awarded a grant by the Department of Education to conduct teacher workshops this summer.

During Fall Quarter, Professor **Aaron Klebanoff** invited and hosted a 2-day meeting with Robert Devaney (author of several popular text books and a recognized leader of his field) who gave two presentations to the institute. The first talk was a well received general interest presentation on chaos and fractal geometry, and his second talk was directed at curriculum reform in the area of differential equations. This was particularly useful to the First Five Quarters of Mathematics committee (of which Dr. Klebanoff was an active member) which was charged with recommending a modification to the current core mathematics curricula. Dr. Klebanoff has also been busy working with the First Year Team studying and considering plans for improvement of a student's first year experience at Rose-Hulman.

During the winter quarter he spent considerable time revising and writing new problems for the technology-based calculus problems WWW site that he has been working on for the past couple of years. Due to Brian Winkel's departure from Rose-Hulman, Dr. Klebanoff also assumed the responsibilities of the Principal Investigator of the grants for the calculus problems project. He has been the sophomore mathematics major advisor as well as continuing to advise a masters student towards his degree in applied optics with interests in chaos. Dr. Klebanoff has continued his role as the MAA

local representative. In addition to attending the Fall meeting at Taylor University in Upland, Indiana and the Spring meeting at Baxter University in Indianapolis, he keeps the MAA section informed of RHIT Math Department activities as well as informing the Math Department of important MAA activities. Dr. Klebanoff has continued to review papers submitted to the Mathematical Biosciences journal, and also reviewed "Interactive Differential Equations" software for Addison-Wesley Publishing Company. Based on that work, Addison-Wesley requested Dr. Klebanoff to further review related materials which he has accepted to do.

Dr. Klebanoff has given three presentations this year. The first was given at the Indiana Section of the Mathematical Association of America on the technology based calculus problems which he has co-developed along with colleagues Lynn Kiaer, Jerry Fine, Brian Winkel, and others outside of Rose-Hulman. He gave a similar talk at the International Conference on Technology in Collegiate Mathematics in Houston, Texas. Finally, he presented a paper that he co-authored with colleague John Rickert on the extensions of Feigenbaum diagrams at the joint meetings of the American Mathematical Society and the Mathematical Association of America in Orlando, Florida. Dr. Klebanoff submitted this paper for publication in the College Mathematics Journal. He also published a paper co-authored with Brian Winkel entitled "Integrating Calculus with Science and Engineering: A New WWW Site" in the Indiana section newsletter. Winkel and Klebanoff also had a paper pertaining to their work accepted in the proceedings of the 1996 Annual American Society for Engineering Education (ASEE) Conference. Based on his work done and presentations, Dr. Klebanoff was invited to give a new presentation at next year's ICTCM conference. Dr. Klebanoff continues to grade papers for the USA Math Talent Search. Last, but not least, Dr. Klebanoff coached this year's team in the Mathematical Competition in Modeling which was awarded the prestigious meritorious status.

Professor **Roger Lautzenheiser**, during the fall quarter, attended both the MAA Indiana section meeting and the Miami of Ohio Mathematics Conference. He was appointed chair of the Mathematics Curriculum Committee for the current academic year. Furthermore, he, with Yosi Shibberu, continue to create notes for the Foundation Coalition sophomore mathematics classes, MA 211 and MA 213. He was awarded a grant to develop an Applied Linear Algebra course as part of the Foundation Coalition upper division course development. He is preparing, along with professors Shibberu and Broughton, workshop materials for The KIT/RHIT workshop this coming fall.

Professor **Robert Lopez** started off the academic year of 1995-6 with an involvement in the Laptop Orientation program. He then did an on-campus Maple workshop for several math faculty from Baker College in Flint, Michigan. With Dr. Danner of the Physics department, Dr. Lopez team taught Theoretical Mechanics as part of a Lilly grant project. During the course of the year, Dr. Lopez reviewed a paper for the Journal of Symbolic Computation, reviewed manuscripts for textbooks in Ordinary Differential Equations and in Partial Differential Equations, reviewed a manuscript for a textbook in Advanced Engineering Mathematics, reviewed the Sabbatical Leave proposal for a faculty member at Essex Community College in Baltimore, Maryland, and evaluated the scholarship of a faculty member at Hollins College in Virginia. Dr. Lopez was appointed to the National Advisory Committee for the MathLinks project centered at Rensselaer Poly, and attended

a meeting of that committee there this spring. Dr. Lopez served on the MS committees of Ming Zhong and Xuejing Gao, served on the ICTCM96 Conference Steering Committee, served as Math Division Secretary/Treasurer for ASEE, was an Associate Editor for the Maple Technical Newsletter, and was awarded a summer grant for the development of two applied math courses in a two-credit format.

Professor **John Rickert** continued to serve as a member of the USAMTS staff and will serve as co-PI in this summer's Young Scholars Program. Along with Lynn Kiaer, he was awarded a contract to produce educational modules for the next edition of Howard Anton's Calculus. His paper "Simultaneous Pell Equations", written with David Masser, was accepted for publication by The Journal of Number Theory. He also submitted papers co-authored with Ralph Grimaldi and Aaron Klebanoff (see below). He gave a talk entitled "Extreme Randomness" at the Spring meeting of the Indiana Section of the MAA, held at Butler University. Dr. Rickert has exerted considerable energy in various mathematics competitions, organizing both the seventh annual Alfred R. Schmidt Freshman Mathematics Competition, and the thirtieth annual Rose-Hulman High School Mathematics Competition. He was also coach for Rose-Hulman's five teams competing in the Indiana College Mathematics Competition held at the spring meeting of the Indiana Section of the MAA, three of which were top scoring teams. Additionally, he is the coach and organizer of the teams representing the state of Indiana at the American Regions Math League meet, to be held in June. He is currently preparing to teach the "Fast Track" calculus this summer and the Jump Start program of which he is the director. He served as a freshman advisor and he continues his analysis of the Mathematics Diagnostic Test.

Professor **Gary Sherman** continues to write and publish papers (mostly with students). He spent the winter quarter on sabbatical (working on a text -- Indiscrete Discrete Mathematics), studying Fourier analysis on finite non-commutative groups, and working on papers. He has visited several campuses this year to give talks (see below) and will be giving a week-long NSF short course at DePauw this spring that revolves around the philosophy and content of his NSF-REU program and Indiscrete Discrete Mathematics. During spring quarter he gave a series of talks in the Applied Math Seminar on the Discrete Fourier Transform. The MAA has appointed him to a three year term on a prize committee to select the best articles in one of the MAA's journals.

Professor **Yosi Shibberu** attended a Symposium on Current and Future Directions in Applied Mathematics held at the University of Notre Dame, April 18-21. He also participated in a workshop on mathematical methods in nonlinear optics. He served this year as vice-president of the Indianapolis Alumni Extension of the National Society of Black Engineers (NSBE) and attended the NSBE Spring Regional Conference held at Purdue University, February 9-11, and the NSBE National Convention held in Nashville, Tennessee, March 27-31. Professor Shibberu is faculty advisor of the Rose-Hulman Student Chapter of NSBE and continues to serve as an advisor and tutor in the Academic First Program, a minority outreach program sponsored by Eli Lilly Corporation. This year Professor Shibberu chaired the Student Affairs Committee and served as a member of the Diversity Council and Global Studies Committee. He continues his work with Professor Lautzenheiser developing curriculum materials, for the new Applied

Mathematics courses being taught this year as part of the Foundation Coalition Sophomore Curriculum. He is preparing, along with professors Broughton and Lautzenheiser, workshop materials for the KIT/RHIT workshop this coming fall.

PRESENTATIONS, SEMINARS, COLLOQUIA

Off campus presentations:

Herb Bailey, *Light Scattering by a line of Particles*, Spring meeting of Indiana Section of the MAA , Butler University, Indianapolis, March 1996.

George Berzsenyi, panel discussion: *Young Scholars and REU Programs*, Spring meeting of Indiana Section of the MAA , Butler University, Indianapolis, March 1996.

Kurt Bryan, *Thermal Non-destructive Testing*, ASME Conference on Noise and Vibration, Boston, September 1995.

_____, *Inverse Problems*, Iowa State University, Des Moines, December 1995.

Ralph Grimaldi, mini-course on ``*Fibonacci and Catalan Numbers*'', AMS/MAA National Meetings, Orlando, January 1996.

_____, *Monochromatic Triangles in Complete Graphs*, Southeastern Conference on Combinatorics, Graph Theory and Computing, Louisiana State University, Baton Rouge, February 1996.

_____, workshop on *Discrete Mathematics*, Texas MAA Section Meeting at Texas Tech, Lubbock, March 1996.

_____, mini-course *Discrete Mathematics*, Northeastern Section of the MAA, Babson College, Wellesley, Massachusetts, March 1996.

Lynn Kiaer, MAA Panel discussion: ``*Coordinating Math: Science Education*'', AMS/MAA national meetings, Orlando, January 1996.

_____, part of *IFYCSEM* presentation team, Embry-Riddle Aeronautical University, Daytona Beach, April 1996.

Aaron Klebanoff, *Technology-Based Calculus Problems*, Fall meeting of the Indiana Section of the MAA, Taylor University, Uplands, Indiana.

_____, *Technology-Based Calculus Problems*, ICTCM95, Houston, November 1995.

_____, *Extensions of Feigenbaum Diagrams*, AMS/MAA national meetings, Orlando, January 1996.

Robert Lopez, on campus Maple workshop, for several math faculty from Baker College in Flint, Michigan.

_____, presentation to Steering Committee and Maple workshop at ICTCM95, Houston, Texas, November, 1995.

_____, Maple workshop, ICTCM95, in Houston, November 1995,

_____, Maple workshop, Central Virginia Community College, Lynchburg, Virginia.

_____, Maple workshop, Trinity University, San Antonio, April 1996.

John Rickert, *Extreme Randomness*, Spring meeting of Indiana Section of the MAA, Butler University, Indianapolis, March 1996.

Gary Sherman, panel discussion: *Young Scholars and REU Programs*, Spring meeting of Indiana Section of the MAA, Butler University, Indianapolis, March 1996.

_____, Invited MAA speaker, *Finite Groups*, Texas Tech, Lubbock, April 1996.

PAPERS, PUBLICATIONS AND TECHNICAL REPORTS

Paper and Publications:

Nacer E. Abrouk, H. Salehi, and D. Yen, *Approximation of Distribution Laws in Population Genetics Governed by Fokker-Planck Equations*, 1997 Applied Mathematics and Statistics Conference, King Fahd Petroleum University.

George Berzsenyi, "Problems, Puzzles & Paradoxes", USAMTS column in Consortium.

_____, The Contest Problem Book V, a volume covering the American High School Mathematics Examination (AHSME) and American Invitational Mathematics Examination (AIME) for the years 1983-1988.

_____, column on the *International Mathematics Talent Search (IMTS)*, Mathematics and Informatics Quarterly

_____, *Math Investigations* column in Quantum.

_____, Foreword to the book ARML-NYSML Contests 1989-1994, and a section of *The World of Mathematical Competitions* for Mathematics Education: an Encyclopedia, to appear.

Ralph Grimaldi, Douglas Shier, *Redundancy and Reliability of Networks*, College Mathematics Journal, January, 1996.

_____, *Generating Sets and the Fibonacci Numbers*, Congressus Numerantium, February 1996.

_____, **Jean Dunbar and Joydeep Goshal**, *Unit Parallelogram Graphs*, Congressus Numerantium.

Lynn Kiaer, *Why Do I Always Get In The Slow Line?*, Proceedings of Winter Simulation Conference.

John Kinney, *Probability: An Introduction With Statistical Applications*, John Wiley & Sons. 1996.

Aaron Klebanoff and Brian Winkel, *Integrating calculus with Science and Engineering: A new WWW site*, Indiana section newsletter.

Robert Lopez, *Numerical Analysis*, text republished in Spanish.
_____, *Maple Labs for Linear Algebra*, John Wiley & Sons, 1996.

John Rickert, David Masser, *Simultaneous Pell Equations*, to appear in the Journal of Number Theory.

Gary Sherman, *Counting Products of Triples in Finite Groups*, to appear in *Congressum Numerantium*.
_____, *Trying to do Group Theory with Undergraduates and Computers*, Journal of Scientific Computation.

Technical Report Series:

S.A. Broughton, E. Bujalance, A.F. Costa, J.M. Gamboa, and G. Gromadzki, *Symmetries of Accola-Maclachlan and Kulkarni Surfaces*. RHIT Math. Sciences Tech. Report 95-05.

N. Fiala, C. Hanscom, P. Keenan, and T. Tran, *Rectangular Groups*. RHIT Math. Sciences Tech. Report 95-06.

K. Bryan and M. Vogelius *Effective Behavior of Clusters of Microscopic Cracks inside a Homogeneous Conductor*. RHIT Math. Sciences Tech. Report 96-01.

A. Klebanoff and J. Rickert, *Divergence Diagrams: More than Cantor Dust Lies at the Edge of Feigenbaum Diagram*. RHIT Math. Sciences Tech. Report 96-2.

FACULTY SEMINARS AND COLLOQUIA

Applied Mathematics Seminar There were two themes this year, wavelets and the Discrete Fourier Transform on non-abelian groups. Professors **Dave Bond** and **Kurt Bryan** gave presentations on wavelets and **Gary Sherman** gave a series of talks on the Discrete Fourier Transform.

Colloquium Talks:

Dr. Robert Devaney, Boston University, *The Fractal Geometry of the Mandelbrot Set*, and a presentation on new developments in teaching Differential Equations, September 1995.

Dr. Ralph Grimaldi, *A Tale of Two Results (or... Some Things I Did During My Sabbatical)*.

Dr. Sin-Min Lee, *Edge-Graceful Graphs and Other Conjectures*.

Professor Jozef Siran, *Large (di-)Graphs with Given Degree and Diameter: A new Point of View*.

Dr. George Berzsenyi, *The USA Mathematical Talent Search: Rose-Hulman's Role in Its Development*.

PROGRAMS

The **Thirtieth Annual RHIT High School Math Contest** was held on November 11 1995. Over 460 students from 24 schools attended. The contest was organized by John Rickert and Lynn Kiaer.

The **USA Mathematical Talent Search** attracted nearly 2000 participants this year. From these students will be selected 50 students to participate in the four week Young scholars program. Professors Berzsenyi, Kiaer, Rickert and Klebanoff participated.

The **Thirteenth Annual RHIT Undergraduate Mathematics Conference** was held on March 15-16, 1996. The main speakers were Richard Brualdi from the University of Wisconsin at Madison, who gave two excellent talks on combinatorics and Steve Lalley from Purdue University. The conference was organized by Nacer Abrouk and the next conference will be organized by Aaron Klebanoff and Elton Graves.

The **Fast Track Calculus** program this year continues to attract record numbers of applicants, enrollment are expected to be about the same as last years 43 students. Professors Elton Graves, Robert Lopez, Kurt Bryan and John Rickert will be teaching in this summer program.

CENTER FOR INDUSTRIAL STATISTICS

Professor Nacer Abrouk is the director of the CIS. As with the other niche centers at RHIT it is under the umbrella of TASC and it is expected that CIS will contribute substantially to the Lilly TED Program. The projects are as follows:

Project # CIS_1_96: Reliability Analysis of Failure Time Data for Manufactured Automotive Parts.

Project Source: General Motors, Anderson, Indiana

Participating Faculty: Dr. Abrouk

Participating Students: Eric Fentress, San Yun Han, Wei Wang.

Project # CIS_2_96: Ultrafiltration of Proteins.

Project Source: Chemical Engineering Department, RHIT.

Participating Faculty: Dr. N. Abrouk, Dr. R. Artigue

Participating Students: Kathleen Knabe.

Project # CIS_3_96: Pattern Recognition Modeling using Neural Networks

Project Source: Tri Manufacturing Industries, Terre Haute, Indiana

Participating Faculty: Dr. K. Bryan

Participating Students: Tony Lowe

Project # CIS_4_96: Global Positioning System (GPS) Data Analysis

Project Source: Electrical Engineering Department, RHIT

Participating Faculty: Dr. N. Abrouk, Dr. D. Voltmer

Participating Students: Mark Wolfe, Clayton Epps, Chris Rettig

Project # CIS_5_96: Experimental Design of a Helmet

Project Source: Trek Bicycle Corporation, Waterloo, Wisconsin, and Mechanical Engineering Department, RHIT

Participating Faculty: Dr. N. Abrouk, Dr. D. Gibson, D. Stienstra

Participating Students: Jeff Neibauer, Kevin Nelson, Kyle Curry

Project # CIS_6_96: Experimental Design for a Clinical Trial

Project Source: Biomedical Engineering, RHIT

Participating Faculty: Dr. N. Abrouk, Dr. F. Acker

Participating Students: Allan Schnarr

Project # CIS_7_96: Marine Distributor Modification

Project Source: Mechanical Engineering Department, RHIT

Participating Faculty: Dr. N. Abrouk, Dr. D. Gibson

Participating Students: Chris Blanton, Joel Brazle, Jason Tolle, Jason Watts

Project # CIS_8_96: Performance Parameters of a Redesigned Connector

Project Source: Automation Engineering, Fort Wayne, Indiana, through TASC, RHIT

Participating Faculty: Dr. N. Abrouk, Dr. F. Acker

Participating Students: NA