

# DEPARTMENT OF MATHEMATICS

## Report to the Board - Spring 2000

### PERSONNEL

**Kurt Bryan, Aaron Klebanoff, Robert Lopez** and **LeRoy Franklin** will all be returning after leaves at Rutgers, Annapolis, Terre Haute, and Iceland. **Ralph Wojtowicz** has been hired for an additional year after the departmental search failed to find a suitable statistician to replace Nacer Abrouk

### GRANTS AND CONTINUING GRANT ACTIVITIES

**Allen Broughton, John Rickert** and **Gary Sherman** continue to conduct an NSF-REU in Hyperbolic Geometry, Computational Group Theory and Number theory. This is the third year of the three year (\$120,000) grant, continuing an eleven-year history of consecutive NSF-REU's at the RHIT site.

### DEPARTMENTAL AWARDS

A Leadership Award from the Indiana Association for the Gifted was accepted by the Mathematics Department. The award recognized Rose-Hulman's efforts, particularly those of the Mathematics Department, at providing many excellent academic experiences for middle school and high school students.

### STUDENT ACTIVITIES, PRESENTATIONS, PUBLICATIONS and AWARDS

**Pi Mu Epsilon** (advisor Elton Graves): Thirty-five students and faculty members attended the Annual Pi Mu Epsilon Banquet on May 2, 2000. Twenty-five of the Rose-Hulman student body were inducted into this honorary mathematics fraternity. Dr. Underwood Dudley spoke on his work with angle trisectors. During the year the fraternity assisted in many math department projects such as the ARS freshman competition, the RHIT High School Mathematics Contest and the Undergraduate Mathematics Conference.

### Mathematics Competitions

1. **Alfred R. Schmidt Freshman Mathematics Competition** (advisor John Rickert): The 11<sup>th</sup> annual Alfred R. Schmidt Competition Freshman Mathematics Competition was held September 23, 1999. Ten students participated in the freshmen math competition. Prizes were awarded as follows: Michael Ewing – 1<sup>st</sup>, Peter Nei – 2<sup>nd</sup>, Brian Davis and Mike Simon – 3<sup>rd</sup>, Josh Crumley, Jon Mastin, David Shafer and Phil Smith – Meritorious Mention, Luther Wang – Honorable Mention. Justin Smith also attended.
2. **21<sup>st</sup> Annual Virginia Tech Regional Mathematics Competition** (advisor John Rickert): There were 255 contestants from 41 institutes. Nathanael Berglund tied for 5<sup>th</sup> place while Matthew Katinas and Dennis Lin came in at 7<sup>th</sup> place. Team members: Nathanael Berglund, Brooke Chenoweth, Andrew Chi, Heidi Ellens, Michael Ewing, Matthew Katinas, Matt Lepinski, Dennis Lin, Randy Motchan, Peter Nei, David Powder, David Sing, Peter Webb, Jonathan Webster, Stephen Young.

3. **59<sup>th</sup> Annual Putnam Competition** (advisor Steve Carlson): Twenty students took part in the exam on December 4<sup>th</sup>. The team of Matt Lepinski, Dennis Lin and David Powder ranked of 35<sup>th</sup> among the 346 institutions which entered teams. Six students Nathanael Berglund, Matt Katinas, Matt Lepinski, Dennis Lin, Elaine Mahler, and Randy Motchan placed in the top 500 of the 2581 participants.
4. **Mathematical Contest in Modeling** (Advisor David Rader): The four teams and their results were Matt Lepinski, Dennis Lin, Randy Motchan, (Meritorious); Kenneth Crabb, Stephen Young, Curtis Huttenhower (Meritorious) and Eduardo Escardo-Raffo, David Powder, and Peter Webb, (Successful Participant); Michael Ewing, Peter Nei, and Thomas Schneider (Successful Participant). Also of note, two teams of Rose civil engineering students participated in the interdisciplinary portion of the MCM contest.
5. **Indiana College Mathematics Competition** (Advisor: John Rickert): The team of Matt Lepinski, Dennis Lin and David Powder won third place in the competition. The team of Timothy Kilbourn, Peter Webb, and Lucas Beverlin had the fifth highest score.

#### **Student Presentations:**

**Michael Ewing, Peter Nei & Tom Schneider**, “Rookies in the Math Modeling Contest” Rose-Hulman Undergraduate Mathematics Conference

**Matt Lepinski**, “Algebraic Numbers and Triangle Iterations” Rose Mathematics Seminar and poster session at the Joint Mathematical Meetings in Washington. The poster won a cash prize.

**Dennis Lin**, “NP Complete Radio Tower Placement”, Rose-Hulman Undergraduate Mathematics Conference

**Stephen Young**, “Chaotic Behavior over the Naturals”, Rose-Hulman Undergraduate Mathematics Conference

#### **Student Publications:**

**Carolyn M. Girod, Matthew Lepinski, Joseph R. Milet, Jennifer R. Paulhus**, *Cwatset Isomorphism and its Consequences* MS TR 00-01

#### **Conferences and Workshops**

Six students attended the Spring Meeting of the Indiana Section of the MAA held at Earlham on April 7<sup>th</sup> and 8<sup>th</sup>, participating in the ICMC competition mentioned above. A number of these students attended a workshop on Cryptology.

#### **Awards:**

During the Spring Honors and Awards Banquet, **Michael Ewing** was awarded the Palmer Award for outstanding performance as a freshman. **Matthew Lepinski** received the Sausley award for outstanding performance as a senior. For exceptional performance in Mathematics competitions, the following Students were awarded prizes: **Matt Lepinski, Dennis Lin, Randy Motchan, Nathanael Berglund, David Powder, Matthew Katinas, Christina Mahler** (Putnam); **Matt Lepinski, Dennis Lin, Randy Motchan, Curtis Huttenhower, Kenneth Crabb, Steve Young** (Modeling Competition); and **Matt Lepinski, David Powder, and Dennis Lin, Timothy Kilbourn, Peter Webb, and Lucas Beverlin** (ICMC Competition).

#### **Scholarships**

**Matt Lepinski** was awarded an NSF Fellowship.

**Brooke Chenoweth** received a Women in Science Scholarship, Indiana University.

### **Summer REU experiences**

**Dennis Lin:** Rose-Hulman

**Timothy Kilbourn:** University of Tennessee

**Janet Trimm:** University of Alabama

**Stephan Young:** University of Tennessee

### **FACULTY and STAFF ACTIVITIES**

**Allen Broughton** had two papers accepted: “Constructing Kaleidoscopic Tiling Polygons in the Hyperbolic Plane” by the MAA Mathematical Monthly and “Divisible Tilings in the Hyperbolic Plane” by the New York Journal of Mathematics. The research for the latter paper was a joint effort of Broughton and his REU students Dawn M. Haney, Lori T. McKeough and Brandy M. Smith. In addition the article “The Rose-Hulman NSF-REU Program” was accepted in the conference proceedings of the Working Conference on Summer Mathematics Programs for Undergraduates, which he attended in September. He also attended the Joint Mathematics meeting in Washington and the Fall and Spring meetings of the MAA, participating in a panel discussion at the last meeting. In addition to his duties as head of the department, he was chairman of the Curriculum Committee and coach of the KSD2 team Strategic Planning effort. In this latter capacity he attended a workshop on Assessment of Technology Programs at Wake Forest University. He continues to be webmaster for the Mathematics department and director of the NSF-REU

**Kurt Bryan** has been on sabbatical during the 1999-2000 academic year, at Rutgers University. He has written a paper, “Singular Solutions to a Nonlinear Elliptic Boundary Value Problem Originating in Corrosion Modeling,” with Michael Vogelius, to appear in the Quarterly of Applied Mathematics. They are continuing work on related problems. He and Michael Vogelius have also written a survey article “A Survey of Results Concerning the Identification of Cracks in Electrical Conductors” for the Journal of Inverse Problems, on mathematical problems associated with non-destructive testing using electromagnetic methods. Dr. Bryan has also completed a paper “Existence and Uniqueness of Solutions to the Heat Equation with Nonlinear Jump Conditions” with Lester Caudill at the University of Richmond to be submitted to the Electronic Journal of Differential Equations.

**Stephan Carlson’s** paper entitled “Proof Without Words: Self-Complementary Graphs” was published in the February 2000, issue of *Mathematics Magazine*. Carlson has continued his service to the Mathematical Association of America as a member of the national Committee on Sections and the MAA Task Force on Special Interest Groups. He has also completed the first year of a three-year term as the Governor of the Indiana Section of the MAA. In addition to regional and national meetings of professional societies, he attended the 2000 RHIT Undergraduate Mathematics Conference. Carlson’s work on campus included academic advising of senior mathematics majors, advising the Rose-Hulman students who participated in the 1999 Putnam Competition, and serving on the Faculty Affairs Committee.

**David Finn** attended the Fall and Spring MAA Indiana Section meetings at Valparaiso University and Earlham College and the Midwest PDE Conferences at University of Illinois Urbana-Champaign and at Purdue University, and he co-organized the Undergraduate Math conference with Gary Sherman. His paper “On the negative case of the singular Yamabe problem” appeared in the Journal of Geometric

Analysis, and he continued writing reviews for Math Reviews. In addition, he continued on going research projects with Robert McOwen at Northeastern University and Rafe Mazzeo at Stanford University on the singular Yamabe problem, and with Jim Tanton at Merrimack College on the geometry of bicycle tracks.

**LeRoy A. Franklin** journeyed to Reykjavik, Iceland in January, 2000 through May, 2000 as a Fulbright Teaching Scholar in Industrial Statistics in the University of Iceland. He is teaching an Advanced Statistics course for the Faculty of Engineering. He attended the National Decision Sciences Institute Meetings in November, 1999 in New Orleans to present, along with Dr. Belva J. Cooley, "Minitab Versus Excel: a Comparison of Simple Linear Regression Capabilities and Results". He also attended the National American Statistical Association meetings in Baltimore in August, 1999 as Treasurer of the Quality and Productivity Section. A number of joint papers have appeared recently: "A Messy, But Instructive, Case Study in Design of Experiments", (with Dr. Belva J. Cooley, Dr. LeRoy A. Franklin, and Mr. Gary Elrod), *Quality Engineering*, Spring, 2000; "A Comparison of Flat and Shallow Conical tips for Cervical Cryotherapy", (with Kathleen, A. Stienstra, MD, Benjamin E. Brewer, MD), *Journal of the American Board of Family Practice*, vol. 12, no.5, 360-366, Sept-Oct, 1999; "An Industrial Case Study in Comparing the Importance of Variation and Center", (with Dr. Belva Cooley, and Mr. Gary Elrod), *Quality Progress*, vol.32, no.10,90-94, October, 1999; "An SPC Case Study on Stabilizing Syringe Lengths", (with Dr. LeRoy A. Franklin and Mr. Samar Mukherjee), *Quality Engineering* (1999-2000), vol.12,no.1,65-71. In addition, the article "Sample Size Determination for Lower confidence Limits for Cp, Cpk and Cpm" has appeared in *Computers and Industrial Engineering*, Vol. 36, no.3, 603-614, fall, 1999.

**Elton Graves** has continued as the State Director of the AMC->8, AMC->10, and AMC->12 mathematics exams sponsored by the Committee on American Mathematical Competitions (CAMC) and as a member of the Executive Advisory Committee to the CAMC. Last fall he was appointed to the Professional Development Subcommittee of the Committee on Applications of the MAA. At the National MAA meeting held last January, he was appointed as a co-organizer for a technical session on teaching statistics that will be part of the January 2001 meeting of the MAA. He continues to be an active member of the Indiana Section of the MAA and serves as a member of the Board of Directors for the Mathematics Division of ASEE.

In October the CRC Publishing Company published the *Handbook of Discrete and Combinatorial Mathematics*, for which Professor **Ralph Grimaldi** wrote the two sections on generating functions and recurrence relations. In November he once again coordinated the Rose-Hulman High School Mathematics Contest with fellow coordinator Professor John Rickert. January of 2000 found him at the National Mathematics Meetings in Washington D.C., where he delivered a two-day mini-course on the Fibonacci and Catalan Numbers. His paper *Tilings and Patterns of Enumeration* (co-authored with Professor Phyllis Chinn of Humboldt State University and Professor Robert Brigham of Central Florida University) was published in March in the journal *Congressus Numerantium*. Also in March he attended the 31st International Conference on Combinatorics, Graph Theory and Computing at Florida Atlantic University where he chaired a session on graph theory and delivered the paper *Compositions with Odd Summands*. He also served as coordinator for the Discrete Mathematics sequence and spring statistics courses.

Professor **Roger Lautzenheiser** launched the Rose-Hulman Institute of Technology Undergraduate Journal in Mathematics in March of 2000. The first issue contains 5 papers written by undergraduates

at schools across the nation, and the second issue will come on-line in October 2000. The journal has received many favorable comments and may be viewed at <http://www.rose-hulman.edu/mathjournal/>. He also served as the coordinator for the sophomore matrix and differential equations course, the first time the revamped course has been taught.

**Jeffery J. Leader's** paper, "The Zero-Crossing Phase-Lock Loop: Results from Discrete Dynamical Theory" (co-authored with Bill May of Applied Signals Technology), has been accepted by Applied Mathematics Letters. He attended the Joint Mathematics Meetings, Washington, D.C. Dr. Leader participated in the Colloquium Series with three lectures on Interval Methods for Global Optimization in Math. Dr. Leader was also Chair of the Departmental Library Committee and served on an EE M.S. Thesis Committee.

**Tanya Leise** attended the Pacific Crest Teaching Institute Workshop, February 28-March 1, 2000, Rose-Hulman. In addition she helped with the High School Mathematics Contest, in November and judged the Recyclable Engineering Contest in January. Her presentations include: "An Introduction to Dynamically Accelerating Cracks", an invited talk as part of the differential equations seminar, Mathematics Department, in November, at Purdue University; "A Two-Part Seminar on Dynamically Accelerating Cracks", November 3 and 10, 1999, in the Rose Math Seminar; and "Dynamically Accelerating Cracks in the Context of Plane Strain", at the 36<sup>th</sup> Annual Technical Meeting of the Society of Engineering Science, in October at the University of Texas at Austin. Along with Jay R. Walton, she has submitted the paper *A general method for solving dynamically accelerating multiple co-linear cracks*, to the *International Journal of Fracture*.

**Robert Lopez** has been on leave this year finishing the Advanced Engineering Math text he's writing. Aside from giving a November talk at ICTCM (San Francisco), and a February talk at North Carolina State University, the rest of the year has been a blur of copy-editing and revising, as 2000 pages, 700 graphs, and 273 Maple worksheets are morphed into a finished product.

**Jerry Muir** had his paper "Holomorphic Idempotents and Retracts in the Unit Ball of a Commutative  $C^*$ -algebra with Identity" accepted for publication by the Journal of Mathematical Analysis and Applications. He continues to collaborate with Ted Suffridge at the University of Kentucky and John Pfaltzgraff at the University of North Carolina, Chapel Hill on problems in several complex variables. During the academic year he and Suffridge submitted the paper "Unbounded Convex Mappings of the Ball in  $C^n$ " and had it accepted for publication by the Proceedings of the American Mathematical Society. In January, Professor Muir presented the paper "Linear Fractional Transformations in Complex Euclidean Space" at the joint meetings of the American Mathematical Society and Mathematical Association of America in Washington D.C. (joint work with Suffridge). He also reviewed several chapters of a textbook on real analysis and applications for Prentice Hall. During the winter and spring quarters, he offered an independent study course to a senior (Matt Lepinski) on measure theory and functional analysis.

**David Rader** continued his development of MA590 "Operations Management" for the Engineering Management Program. In addition, he wrote a complete set of notes for use in the MA444 course, and he redesigned the course in Stochastic Models in Operations Research (MA445). He organized the Jump Start program prior to the start of classes last fall, helped with the RHIT High School Mathematics contest, and he also was the advisor for this year's Mathematical Contest in Modeling, which yielded two Meritorious commendations. In addition, he served on the Institute's Commission

on the Assessment of Student Outcomes (CASO). Professionally, he attended the Fall meeting of the Indiana Section of the Mathematical Association of America, where he participated in a forum for graduate students on "Life after Graduate School". He presented two papers this year: "Pseudopolynomial and fully polynomial approximation algorithms for a class of quadratic 0-1 knapsack problems" at the INFORMS Fall 1999 meeting in Philadelphia, PA, and "Optimal cell flipping to minimize channel density in VLSI design and pseudo-Boolean optimization" in an invited colloquium talk at Valparaiso University. In addition, during the academic year, the paper "Maximally Disjoint Solutions to the Set Covering Problem" was accepted for publication in the *Journal of Heuristics*.

**John Rickert** developed and taught the new class "Fermat's Last Theorem" during the winter term. He continued to work with his REU students to help them complete their technical report discussing their work during the 1999 Rose-Hulman REU. He was coach for Rose-Hulman's teams competing in the Indiana College Mathematics Competition administered at the spring meeting of the Indiana Section of the MAA at Earlham College. He served as a freshman advisor. He was chair of the Student Affairs Committee and the Mathematics Department Curriculum Committee. He served as member of the KSD3 committee. He served as faculty member for the Jump Start program. He was one of the organizers of the thirty-fourth annual Rose-Hulman High School Mathematics Competition. He served as a coach and organizer of the teams representing the state of Indiana at the American Regions Math League meet, to be held in June and is the Web-master for the American Regions Mathematics League web site. During the summer he will be a teacher at the 2000 Research Science Institute, held on the campus of M.I.T. He has been working with the Rose-Hulman mathematics club, coordinating weekly mathematical problem solving sessions for area high school students. He also presented a session on mathematics as part of Rose-Hulman's "Explore Engineering" program.

**Gary Sherman** is writing a monograph entitled *The Theory of Cwatsets* based on work he and his students have done in the process of inventing and developing the theory at Rose-Hulman. He gave several invited talks this year, including "What's a Cwatset?" to the mathematics faculty at Cork, Ireland where he served as the external examiner on a Ph.D. thesis based on questions he raised in his research work with undergraduates. His joint paper (with Jason Fulman, Michael Galloy, and Jeffrey Vanderkam), entitled "Counting Nilpotent Pairs in Finite Groups" appeared in *Ars Combinatoria*. He served on the Institute PTR Committee, organized our undergraduate conference with David Finn, and advised the junior mathematics majors.

**Yosi Shibberu** submitted a grant proposal to the National Science Foundations titled "Contact Geometry of Protein Folds." He also took part in the planning for a proposal submitted to the Hughes Foundation for establishing an applied biology program at Rose-Hulman. Professor Shibberu gave three talks on hidden Markov models in the Rose Math Seminar. Professor Shibberu is also a member of the quality of education committee, the diversity council and a member of the special taskforce on minority applicants appointed by the President. This year, Professor Shibberu served on the thesis committees of two graduate students in the mechanical engineering department. After putting in a long year as calculus coordinator he is planning for his coordination activities for the sophomore differential equations and matrix algebra sequence offered next year. Currently, he is the advisor for freshmen math majors.

During the past year **Ralph L. Wojtowicz** had the opportunity to expand his teaching repertoire to include differential equations and probability and statistics. He made progress on his dissertation

through the use of sketches, which may be viewed as a context for both the logicians' model theory and the applied mathematicians' theory of modeling. He began work on implementing computational category theory tools (computing Kan extensions) using Java.

**Patti Staggs** attended the Web Design Conference in Indianapolis in October.

## **PRESENTATIONS, SEMINARS and COLLOQUIA**

### **Off campus presentations:**

**Allen Broughton** "Whither Mathematics Departments", panel discussion, Spring IMAA meeting, Earlham College.

**Leroy Franklin** with Dr. Belva J. Cooley, "Minitab Versus Excel: a comparison of Simple Linear Regression Capabilities and Results", National Decision Sciences Inst. Meetings, New Orleans, November, 1999.

**Jerry Muir** "Linear Fractional Transformations in Complex Euclidean Space" presented at the joint meetings of the American Mathematical Society and Mathematical Association of America in Washington D.C. (joint work with Ted Suffridge).

**Ralph Grimaldi** "Fibonacci and Catalan Numbers", two-day minicourse at the National Mathematics Meetings in Washington D.C.

\_\_\_\_\_ "Compositions with Odd Summands" 31st International Conference on Combinatorics, Graph Theory and Computing at Florida Atlantic University.

**Tanya L. Leise** "An Introduction to Dynamically Accelerating Cracks", invited talk as part of the differential equations seminar, Mathematics Department, November 16, 1999, Purdue University, West Lafayette, IN.

\_\_\_\_\_ "Dynamically Accelerating Cracks in the Context of Plane Strain", 36<sup>th</sup> Annual Technical Meeting of the Society of Engineering Science, October 25, 1999, University of Texas at Austin.

**David Rader** "Pseudopolynomial and fully polynomial approximation algorithms for a class of quadratic 0-1 knapsack problems" at the INFORMS Fall 1999 meeting in Philadelphia, PA,

\_\_\_\_\_ "Optimal cell flipping to minimize channel density in VLSI design and pseudo-Boolean optimization" invited colloquium talk at Valparaiso University.

**Gary Sherman** "What's a Cwatset?" and "The Great Shoot Out", annual meeting, Associated Colleges of the Chicago Area.

\_\_\_\_\_ "How long does it take to shuffle a deck of cards?", invited speaker, Midwest Section of Kappa Mu Epsilon at Muskingum College

\_\_\_\_\_ "What's a Cwatset?" mathematics faculty at Cork, Ireland, and at Wabash College

**Rose Mathematics Seminar** (organizer Roger Lautzenheiser)

**Herb Bailey:** Motion of a Hanging Chain after the Free End Is Given an Initial Velocity

**S. Allen Broughton:** Higher Genus Soccer Balls and Kaleidoscopic Tilings in the Hyperbolic Plane (2 talks)

**David Finn:** Which way did that bicycle go? and other geometric questions about bicycle Tracks

\_\_\_\_\_ : Which way did he say that bicycle went?

**Evan Graves:** Dynamical Analysis of a Chaotic Electrical Circuit

**Jeff Leader:** Interval Methods for Optimization (3 talks)  
**Tanya Leise:** A two-part seminar on Dynamically Accelerating Cracks (2 talks)  
**Matt Lepinski:** Algebraic Numbers and Triangle Iterations  
**Jerry Muir:** Complex Variables (2 talks)  
**Yosi Shibberu:** Hidden Markov Models (3 talks)

## PAPERS, PUBLICATIONS AND TECHNICAL REPORTS

### Papers and Publications:

**Herb Bailey**, “Motion of a Hanging Chain after the Free End Is Given an Initial Velocity”, accepted by the *American Journal of Physics*.

\_\_\_\_\_, “Monte Hall plays a Two Person Game”, accepted by *Mathematics Magazine*.

\_\_\_\_\_, A Variety of Triangle Inequalities, accepted by the *College Mathematics Journal*.

**Allen Broughton**, “Constructing Kaleidoscopic Tiling Polygons in the Hyperbolic Plane”, accepted by the *Mathematical Monthly*, MAA.

\_\_\_\_\_ (with Dawn M. Haney, Lori T. McKeough and Brandy M. Smith), “Divisible Tilings in the Hyperbolic Plane” accepted by the *New York Journal of Mathematics*.

\_\_\_\_\_ “The Rose-Hulman NSF-REU Program” conference proceeding of the *Working Conference on Summer Mathematics Programs for Undergraduates*.

**Kurt Bryan** (with Michael Vogelius), “Singular Solutions to a Nonlinear Elliptic Boundary Value Problem Originating in Corrosion Modeling,”, to appear in the *Quarterly of Applied Mathematics*.

\_\_\_\_\_ (with Michael Vogelius), A Survey of Results Concerning the Identification of Cracks in Electrical Conductors, to be submitted to the *Journal of Inverse Problems*.

\_\_\_\_\_ (with Lester Caudill), “Existence and Uniqueness of Solutions to the Heat Equation with Nonlinear Jump Conditions” to be submitted to the *Electronic Journal of Differential Equations*.

**Stephan Carlson**, “Proof Without Words: Self-Complementary Graphs”, *Mathematics Magazine*, February 2000.

**David L. Finn**, “On the negative case of the singular Yamabe problem”, appeared in the *Journal of Geometric Analysis*.

**Leroy Franklin**, (with Dr. Belva J. Cooley, and Mr. Gary Elrod), “A Messy, but Instructive, Case Study in Design of Experiments”, *Quality Engineering*, Spring, 2000.

\_\_\_\_\_ (with Kathleen, A. Stienstra, MD, Benjamin E. Brewer, MD), “A Comparison of Flat and shallow Conical tips for Cervical Cryotherapy”, *Journal of the American Board of Family Practice*, vol. 12, no.5,360-366, Sept-Oct,1999.

\_\_\_\_\_ “Sample Size Determination for Lower confidence Limits for Cp, Cpk and Cpm”, *Computers and Industrial Engineering*, Vol. 36, no.3, 603-614, fall, 1999.

\_\_\_\_\_ (with Dr. Belva Cooley, and Mr. Gary Elrod), “An Industrial Case Study in Comparing the Importance of Variation and Center”, *Quality Progress*, vol.32, no.10,90-94, October, 1999.

\_\_\_\_\_ Dr. LeRoy A. Franklin and Mr. Samar Mukherjee, “An SPC Case Study on *Quality Engineering* (1999-2000), vol.12,no.1,65-71.

**Aaron Klebanoff**, with Eric Bollt, Convergence Analysis of Davidchack and Lai’s Algorithm for Finding Periodic Orbits” accepted by *Chaos, Solitons and Fractals*.

**Ralph Grimaldi**, Handbook of Discrete and Combinatorial Mathematics, *CRC Publishing Company*, two sections on generating functions and recurrence relations.

\_\_\_\_\_ (with Professor Phyllis Chinn and Professor Robert Brigham), “Tilings and Patterns *Congressus Numerantium*, March 2000.

**Jeffery J. Leader**, (with Bill May) "The Zero-Crossing Phase-Lock Loop: Results from Discrete Dynamical Theory", accepted by *Applied Mathematics Letters*.

**Tanya L. Leise**, (with Jay R. Walton), “A general method for solving dynamically accelerating multiple co-linear cracks”, submitted to *Int. J. Fracture* April 2000.

**Jerry R. Muir**, “Holomorphic Idempotents and Retracts in the Unit Ball of a Commutative  $C^*$ -algebra with Identity”, accepted, *Journal of Mathematical Analysis and Applications*.

\_\_\_\_\_ (with T. Suffridge), “Unbounded Convex Mappings of the Ball in  $C^n$ ”, accepted, *Proceedings of the American Mathematical Society*.

**David Rader**, “Maximally Disjoint Solutions to the Set Covering Problem”, accepted, *Journal of Heuristics*.

**Gary Sherman**, (with Jason Fulman, Michael Galloy, and Jeffrey Vanderkam), “Counting Nilpotent Pairs in Finite Groups”, appeared in *Ars Combinatoria*.

#### **Mathematical Sciences Technical Report Series:**

**MS TR 99-02** Jim Belk, *Tilings Which Split at a Mirror*.

**MS TR 00-01** Carolyn M. Girod, Matthew Lepinski, Joseph R. Mileti, Jennifer R. Paulhus, *Cwatset Isomorphism and its Consequences*.

**MS TR 00-02** Kurt Bryan and Michael Vogelius, *Singular solutions to a Non-linear Elliptic Boundary Value Problem Originating from Corrosion Modeling*.

**MS TR 00-03** Ryan Derby-Talbot, *Lengths of Geodesics on Klein's Quartic Curve*.

#### **The Rose-Hulman Undergraduate Mathematics (Electronic) Journal**

<http://www.rose-hulman.edu/mathjournal/>

The first volume consisting of 5 papers by undergraduates went live at end of March. The Editor in Chief is Roger Lautzenheiser and David Rader is the Assistant Editor. To give an idea of the types of papers here are the titles and authors for the first volume.

**Lori Giles**, University of Evansville, *Optimization Methods Applied to and Compared Through an Academic Database*.

**J. Jacob Tawney**, Denison University, *Turning the Lights Out in Three Dimensions*.

**Suzanne Reichel**, University of Wisconsin and **Kyen Waldron**, University of Oregon, *Spirals, Partial Sums and Continuous Images*.

**Melissa DeLeon**, Seton Hall University, *A Study of Sufficient Conditions for Hamiltonian Cycles*.

**C. Ryan Vinroot**, North Carolina State University, *Symmetry and Tiling Groups for Genus 4 and 5*.

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

The **34<sup>th</sup> Annual Rose-Hulman Mathematics Competition** was held in November. Approximately 500 high school students were in attendance. It was co-organized, by **Ralph Grimaldi** and **John Rickert** with assistance from David Finn, Jerry Muir, Tanya Leise, David Rader, and Ralph Wojtowicz.

The **Seventeenth Annual RHIT Undergraduate Mathematics Conference**, organized by **Gary Sherman** and **David Finn**, was an overwhelming success. Seventy participants came to listen to and/or present papers. The Undergraduate Conference is one of a handful of Conferences in the

country that is completely devoted to student speakers, except for the invited speakers. The guest speakers this year were Dr. Nigel Boston and Dr. Frank Morgan who made the worldwide announcement of his proof of the Double Bubble Conjecture during the conference.

The **Fast Track Calculus** program this year attracted sixty applicants. Forty students have been invited to participate and enrollments are expected to be about the 40-50 range. Professors' **Elton Graves** and **Roger Lautzenheiser** and **Aaron Klebanoff** will be teaching in this summer's program which begins July 16.