R·I·T
Department of
Mathematics and Statistics
Newsletter
V. 17 , No. 2, May 2003

BUKHARINA IS COS STUDENT DELEGATE

Each of the RIT colleges selects a Student Delegate to give a brief address during the College Commencement Ceremony. **Svetlana Bukharina** has been selected as this year's COS Student Delegate. In addition to Svetlana's participation in the Saturday Commencement Ceremony, she will also represent the COS 2003 graduating class at the Friday evening Academic Convocation.

Svetlana was born in Rostov on Don in southwest Russia. When she was 15 her family moved to New York City where she enrolled in the tenth grade at LaGuardia High School of Arts and Performing Arts (made famous by the movie Fame). In 1999 she entered RIT as a Computational Mathematics major.

During her years at RIT Svetlana has been active in several extracurricular activities. She plays the violin in the RIT Philharmonia Orchestra and also in a string quartet. She was a member of the swim team for her first three years at RIT. She has been active in the mathematics/statistics club and is currently serving as president of PiRIT.

Svetlana has held several jobs while at RIT. She is currently a tutor at the Pittsford Mendon High School assisting special education students in mathematics and science. She is also employed as a teaching assistant in the Department of Mathematics and Statistics at RIT. For the past three summers she has worked at the Mt. Sinai School of Medicine's Neurology Research Department. She also manages to find time to attend summer music festivals in Europe where she takes lessons, plays in groups and works in the office.

Recently Svetlana has been doing undergraduate research under the direction of Professor David Ross. She recently gave a talk at the Joint Mathematics Meetings in Baltimore at a AMS Session on Applications of Mathematics. The title of her presentation, prepared jointly with Prof. Ross, was *"Constant Mean-Curvature Surfaces with Variable Contact Angle."*

After graduation Svetlana plans to attend graduate school at the Georgia Institute of Technology.

RETIREMENT OF PROF. JAMES RUNYON

Although he was fascinated by mathematical gems as a teenager, at that point in his life **Prof. James Runyon** never dreamed of being a teacher of mathematics. While at Cornell University earning a bachelor's degree in Electrical Engineering, he became intrigued with applications of engineering in the field of medicine.

This interest led him to enter the Biomedical Engineering Department at the University of Rochester. The master's degree program brought him to experience the powerful role of mathematics in the search for answers to very practical questions.

His keen interest in mathematics caused him to seek a job at RIT. After two years of teaching, Prof. Runyon pursued a master's degree in mathematics at the University of Rochester. His engineering background made it natural for him to major in applied mathematics. This equipped him to teach a total of 38 years in the RIT Mathematics and Statistics Department.

Prof. Runyon has shown a keen interest in several of the new techniques and technologies of academia, such as the use of writing as a tool for learning, the use of programmable calculators and computers to implement techniques of approximation, the use of the internet for teaching distance learning courses, and the use of various web sites to provide resources for students, both for remedial help as well as for further investigation of course topics.

For many years Prof. Runyon had a prominent role in the editing of our department newsletter. One year he won the title of being the department's "sharp shooter cameraman!" He probably was best known as being quick to volunteer for the little jobs that help things run more

smoothly, such as being a United Way coordinator, student grader coordinator, and a liaison with the engineering technology departments.

His background in engineering led Prof. Runyon to compose a supplement to our Solutions to Engineering Problems course, entitled Non-Standard Functions, Their Laplace Transforms and Applications. It has been used for many years.

At the mid-point of Prof. Runyon's tenure at RIT, he came to a point which for a while looked like the end of his career. He suffered a stroke that led to two brain operations and to six months of slow but sure recovery. The Lord in Whom he trusts proved Himself gracious and used that trial to teach precious lessons hard to learn in any other way.

Prof. Runyon and his wife Norma Mae look forward to retirement. They plan to see more of their two grandchildren, help more in the ministry of their church, develop skills at wood working, volunteer at hospitals, and lend a hand at teaching home school students – just as long as their gracious Lord is pleased to preserve their health and strength.

OUTSTANDING UNDERGRADUATE SCHOLARS, 2002-2003

Abbie Stokes-Riner and Wanda Strychalski

Our department was pleased to have two recipients of this prestigious award. To be eligible for the award, each student must have a grade point average of 3.85 or higher, completed at least 125 quarter credit hours, and have numerous complementing academic achievements.

Abbie Stokes-Riner: An applied mathematics major, Abbie graduated from Oakfield-Alabama (NY) Central School. She is a recipient of an RIT Presidential Scholarship, and a member of Golden Key International Honor Society and Gamma Sigma Alpha. Abbie is an Alpha Xi Delta sister, with whom she has held several executive positions and participated in many philanthropic activities, and is secretary/treasurer of RIT College Panhellenic Chapter. In addition, Abbie has worked as a tutor, note taker, and teaching assistant. She plans to pursue graduate studies.

Wanda Strychalski: Wanda graduated from Fredonia (NY) Central High School and is a computational mathematics major. She is a recipient of the ECI Scholarship, Undergraduate Praxis Scholarship, ZTA Scholarship Award, and the Association for Women in Mathematics Student Award. Wanda is a member of Zeta Tau Alpha, where she has held several executive positions, including the presidency, Gamma Sigma Alpha, Order of Omega, and Phi Kappa Phi and Golden Key International honor societies. She was also the 2001 recipient of the Panhellenic Adelphia Award. She was a software engineer intern at Hewlett-Packard and more recently a teaching assistant in her department. Wanda plans to pursue a Ph.D. in applied mathematics.

PROF. MARCHETTI GETS TENURE AND PROMOTION

Congratulations to **Prof. Carol Marchetti** for being awarded tenure and promoted to associate professor!

Prof. Marchetti attended Case Western Reserve University and received a B.S. in Mathematics in 1988 and an M.S. in Operations Research in 1989. Later, she attended the University of Rochester where she received an M.A. in Statistics in 1994 and a Ph.D. in Statistics in 1997 and has been working here at RIT since then. Among her many distinguished accomplishments, she received the Eisenhart Provost's Award for Excellence in Teaching in 1999.

Asked for an endearing quote, she replied, "I've enjoyed my time here."

JOINT MATHEMATICS MEETINGS

In January several faculty members and students traveled to Baltimore to attend the Joint Mathematics Meetings of the American Mathematical Society (AMS), the Mathematical Association of America (MAA) and the Society of Industrial and Applied Mathematics (SIAM). Several smaller organizations are also represented at these meetings.

Prof. Marcia Birken presented *"Workshop Calculus at Rochester Institute of Technology"* written jointly with **Prof. Sophia Maggelakis**. She also gave a presentation *"Fractal Patterns in Mathematics and Poetry"*, written with Prof. Anne Coon. Prof. Birken was also a co-organizer and moderator for the MAA session of Innovative Use of the World Wide Web in Teaching Mathematics.

Prof. Carol Marchetti gave a talk entitled *"A Delicious Data Approach to Teaching Probability."* **Prof. Carl Lutzer** spoke on *"A 'Real World' Project for Linear Algebra"* and **Prof. Darren Narayan** presented *"An Application of Graph Theory to Surface Reconstruction."* **Prof. David Ross** presented a talk on *"Math Modeling Projects"* that was prepared jointly with **Profs. Sophia Maggelakis and Bernard Brooks**.

Professors Tamara Burton, Darren Narayan and Carl Lutzer were co-organizers and moderators of The AMS-MAA-SIAM Special Session on Research in Mathematics by Undergraduates. **Students Jennifer Goodenow and Jennifer Baldwin** presented talks at this session. Jennifer Goodenow spoke on *"Mathematical Modeling of Cascading Water Clocks,"* written jointly with Prof. David Ross, and Jennifer Baldwin talked about *"Tournaments with a Transitive Tournament Feedback Arc Set,"* prepared jointly with Prof. Narayan.

Student Svetlana Bukharina gave a presentation at a session on Applications of Mathematics. The title of her presentation, jointly with Prof. Ross, was *"Constant Mean-Curvature Surfaces with Variable Contact Angle."*

Also attending the meetings were **Profs. Douglas Meadows** and **Rebecca Hill** and student **Victoria Shults**.

PROF. EDWARD NEWBURG

The good natured disposition of **Prof. Edward Newburg** will be definitely missed in our department. He suffered a stroke in the fall of 2001, putting him on disability for over a year. During that time he remained optimistic that he would return to his beloved field of interest … teaching mathematics. Sad to say, he suffered a second stroke earlier this year and departed on March 6. He left behind his beloved wife, Helen; sister, Ella Griffin; niece, Patricia Griffin; nephew, Michael Griffin; beloved God-daughter, Zyerra, her brother Zandel and mother, Nera Crumpler.

Prof. Newburg graduated from Purdue University in Mathematics and Physics in 1952 with "highest distinction." After earning his M.S. at Purdue, he completed his Ph.D. in Mathematics, with a minor in Electrical Engineering at the University of Illinois in 1958. His Ph.D. thesis was "Potential Representations in Integral Equations."

For about 14 years, Prof. Newburg worked as a research scientist and consultant in projects that included the design of nuclear reactors for submarines and the study of severe storms such as hurricanes, tornadoes and El Ninos. During those years he pursued his career as a teacher of mathematics, first at Rensselaer Polytechnic Institute, then at Worcester Polytechnic Institute, and then at Virginia Commonwealth University. That paved the way for him to come to RIT to serve as Head of the Department of Mathematics from 1974 to 1980.

Prof. Newburg was involved in a grant that supported the development of a computer oriented calculus course sequence. He helped implement a new degree program in computational mathematics. Many of our students today benefit from the establishment of this program. He also played an important part in the development of our Masters of Science Program in Industrial and Applied Mathematics.

Fourier analysis was a particularly favorite subject of Prof. Newburg. This motivated him to investigate the digital processing of signals and images. He presented several talks at a Fourier Optics Seminar, including *"Digital Recording and the Fourier Sampling Theorem,"* and *"Propagation of Elastic Waves."* He was involved in teaching various mini-courses in mathematics modeling and symmetry. He did research in the numerical inversion of Laplace transforms.

Prof. Newburg was also involved in other departments at RIT. He taught a course in Linear Systems for the Electrical Engineering Department and he developed a Fourier Analysis course for students of Photographic Science.

For his sweet smile and friendly chuckle he will be long remembered.

PROF. JACK TISHKOFF

Jack Tishkoff was Professor Emeritus of Mathematics at RIT, where he taught for 33 years. He passed away on January 9, 2003 after an extended illness. He is survived by his wife Betty.

HIGH SCHOOL MATH COMPETITORS AT RIT

On March 6, 2003, the Monroe County Math League (MCML) held its countywide All-Star Competition at RIT for the second year in a row. The event, hosted by the Department of Mathematics and Statistics, attracted more than 460 of the top high school students from Monroe County and the surrounding area to campus for a day of mathematical competitions. While mathematics may bring these outstanding students together for a fun-filled day-off from their regular classes, many of them may become future RIT students in engineering, science, art or, as one participant from last year's event, mathematics.

In his welcoming address to the students at the opening festivities in Ingle Auditorium, **Prof. David Ross** spoke about the variety of occupations available to a person with a mathematics or statistics degree. "Nowadays, virtually every business and industry and hospital and research firm and governmental agency is gathering and analyzing numerical data, and many are using this information to establish new concepts and new theories as well." The students were excited to learn that mathematicians and statisticians are employed by manufacturing firms, financial and insurance companies, as well as research

companies and governmental agencies, helping to design, develop, produce, test, market and distribute products and services.

After the brief opening ceremony, students went to their morning session sites in one of five buildings across campus. For many of the teenagers, this was their first time at a university campus. They not only enjoyed their individual and team competitive sessions, but they also enjoyed the opportunity to meet with their friends from other parts of the county as they gathered in the many lounge areas on campus. On their return trip to Ingle Auditorium for a closing competition and award ceremony, many of the students stopped at the Ben and Jerry's ice cream stand in the Student Alumni Union.

Many of the students and their faculty proctors expressed their happiness at being at RIT again this year. Their sentiments were echoed by the MCML organizer at the end of the day when she thanked the department for hosting their event and mentioned that the group "would be happy to be invited back again next year!"

MATHEMATICS CURIOSITY SEMINARS AND COLLOQUIUM SERIES

December 17: **Prof. James Marengo** presented *"Patterns in Coin Tossing."* (See article in this issue.)

December 20: Dr. Richard Basener of IBM, father of the department's own Prof. Bill Baesner, presented *"Boundaries for Spaces of Functions."*

January 21: **Prof. Laxmi Gupta** presented *"An Approximation to Square Root of 2 in Sulvasutras, A Geometry Manual of 600 BC, India."*

January 28: **Prof. David Ross** presented "*Dynamical System Models of MEMS Devices."*

February 7: Dr. Paul Drake, Professor of Atmospheric Oceanic and Space Sciences at the University of Michigan, presented *"Connecting Laboratory Experiments with Astrophysical Phenomena."*

February 11: 5th year RIT math **student, Melissa Matthews, and Prof. Tamara Burton** presented *"I-Spy and Domination iDot Critical Graphs."*

February 19: Prof. George Thurston, from RIT's Physics Department, presented *"Mathematical Problems Arising in the Study of Concentrated Protein Solutions."*

March 13: Noel Heitmann, from the Department of Mathematics at the University of Pittsburgh, presented *"Numerical Solutions to Partial Differential Equations."*

March 18: Dr. Aurelia F. Minut, from the Institute of Mathematics and its Applications at the University of Minnesota, presented *"Maxwell's Equations: Theory and Applications to Nonlinear Optics."*

March 25: Dr. Edith Adan-Bante, from the University of Illinois at Urbana-Champaign, presented *"Products of Characters of Finite p-Groups."*

March 26: Prof. Staszek Radziszowski, from RIT's Computer Science Department, presented *"Primes are in P-time"* which is a summary of the paper by Agrawal, Kayal and Saxena.

March 28: Dr. Matthew Leingang, from the Department of Mathematics at Rutgers University, presented *"Momentum through the Centuries."*

April 1: Peter Byer, from the Department of Mathematics at the University of Notre Dame, presented *"The Initial Value Problem for KdV-type Partial Differential Equations."*

April 2: Dr. Lawren Smithline, from the Department of Mathematics at Cornell University, presented *"Compact Operators with Rational Generating Functions."* In addition to studying the combinatorial properties of certain operators to understand its spectrum and to do numerical experiments, some compact operators, when viewed from a perspective of recurrence relations, can produce the Fibonacci sequence and Pascal's triangle.

April 8: Dr. Michael Arciero, from the Department of Mathematics at the United States Military Academy, presented *"Noise Cancellation: An Application of the Least Mean Square Algorithm and Connection with Szego Polynomials."*

April 15: **Prof. James Marengo** presented *"Results of the 2002 Putnam Math Competition."*

NEW ACADEMIC PROGRAMS FACILITATOR

We welcome **Karina Shumanski** to the department. She manages the Student Support Office. She works in coordination with the Undergraduate Programs Director to track our majors' progress. Karina will also be participating in the Open Houses, Transfer Days and Orientations. Do you need answers to questions about our students? She has responsibilities that span the entire spectrum of our mathematics and statistics students; from who is on the Dean's List, through department minors, right down to suspensions and probation. She works with the cooperative education office to encourage math/stats majors to complete a work experience. The success of the Calculus Project requires the administration of the placement test and the common portion of the final exams. Yes, she does that, too!

Karina is from the Rochester area; she graduated from high school here. Inspired by a book on Helen Keller she read as a youth, Karina learned sign language and attended deaf camp. She began her post secondary education at Ohio University with aspirations of becoming a social worker. She completed her BS degree in Human

Resources and MS degree in Career Development at RIT. Her previous experience with RIT does not end there. Karina has worked at RIT for 12 years in many areas, including NTID and the Provost's office. She was the Academic Coordinator for the Photography Department. She still maintains her position on the Provost's Retention Committee.

Outside interests include boating and traveling with her husband, Doug Smith. Maybe you'll see her on Honeoye Lake, tubing with her youngest son, Kyle. He is 6 and she has a 26 year old step son, Michael, and a 23 year old step daughter, Stephanie. When it's too cool for boating, she enjoys reading and Russian cooking. She often travels to Toronto with her family to take pleasure in plays and restaurants.

When asked what was the best part of the department so far she replied that she was impressed how helpful and friendly the people are. Of course that's true, and that is why we are sure Karina will fit right in.

NEW LECTURER POSITIONS

The department, in addition to its full time faculty positions, has a fair number of adjunct faculty to help support its teaching mission. In order to alleviate this large hiring each quarter, we have been granted six "Lecturer" positions that are each responsible for teaching four math and/or statistics courses. Five of our six new lectures are pictured and are (from left to right) **Iryna Labachova, Rebecca Daggar, Robert Luce, Helen Timberlake, and Rick Tascione**. Not pictured is **Tim Goodwill**.

Iryna Labachova is from Belarus (in Eastern Europe) and has an MS in Math, Physics, and Computer Science Education from Mogilev State University in Belarus. This is her first academic year at RIT.

Rebecca Daggar has been teaching at RIT for 12 years and has a BS and MA from SUNY Brockport.

Robert Luce has been teaching at RIT since 1969. He attended Perdue University, SUNY Fredonia, and SUNY Brockport and has an MA in Mathematics Education.

Helen Timberlake has been teaching at RIT since 1997. She has an MA in Mathematics from SUNY Brockport.

Rick Tascione has been teaching at RIT since 1984. He attended SUNY Brockport receiving a MS in Mathematics Education. He also attended Syracuse University receiving a MS in Mathematics.

PROF. BASENER'S BOOK, TOPOLOGY AND ITS APPLICATIONS

We look forward to the publication of **Prof. Bill Basener's** textbook, Topology and Its Applications. He is working with Prentice-Hall to produce this topology textbook geared towards third or fourth year undergraduate mathematics majors. Prof. Basener has recently developed and taught 1016-571 Topology, a course that was very well received.

Unlike most mathematical texts, the presentation will move from the concrete to the abstract. Although the treatment will be rigorous and proof based, the elucidation will often begin with examples and then move to general theorems.

The main goal of Topology and Its Applications will be to give the reader a thorough understanding of topology and to motivate its study with applications. Although the majority of these applications to sciences will be presented so that an instructor can include as many or few as desired, a few will be investigated repeatedly in increasing detail as the student progresses through the book.

Prof. Basener has explained how topology began out of the needs of many different areas of mathematics such as analysis (to understand continuity and function spaces), differential geometry (to understand Riemannian surfaces and Einstein's relativity), and dynamical systems (to understand global behavior and the motion of our solar system). Applications of topology are shaping its growth and yet topology texts presently available lack this important aspect that will not only provide motivation for the student but connect this seemingly abstract topic with real and important results. For example, the tragedy involving the drug thalidomide in the 1960's was the result of the lack of understanding of topological knot properties of molecules in the drug. The broad gap between scientists who need topology and mathematicians who know topology must be bridged. The text will provide a much needed link by not only teaching undergraduate students the subject of topology but by emphasizing the applications in concert with the theories. The text promises to maintain the friendly and welcoming style of his lectures that our students currently enjoy.

GRADUATE PROGRAM

The Department is offering an exciting and revitalized master of science degree program in Industrial and Applied Mathematics. This program focuses on the applications of mathematics in the physical sciences, engineering, business and other areas. After completing a core of 4 fundamental courses, this program offers

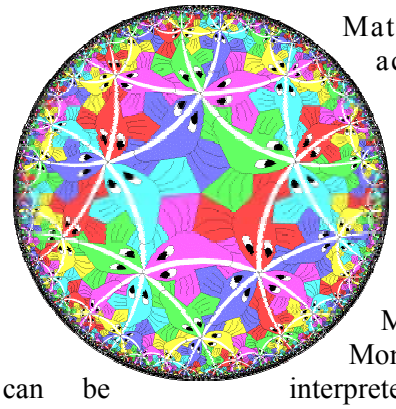
students a concentration in areas of Dynamical Systems, Operation Research, Imaging Science, Biomathematics, Bioinformatics, and Discrete Mathematics. The student then works on either a project or a thesis to successfully finish the program. Graduate students can take courses in many newly developed areas such as Wavelets, Dynamical Systems, Combinatorics and Number Theory. These courses are being offered in the afternoon and early evenings to accommodate the working students.

The Department is also offering combined BS/MS programs. Students are offered seven options for combining undergraduate and graduate degrees, enabling them to complete BS/MS degrees in one year of full time study beyond the normal undergraduate requirements. A minimum of 225 quarter credit hours is required.

A great number of teaching assistantships are available for qualified graduate students. While working with the department and assisting faculty in teaching and grading for courses, TA's can receive up to $10,000 a year. There are also some scholarships available which are given out based on merit and qualification. These scholarships are used to reduce tuition at RIT. Co-op opportunities also exist for the students.

For further information on enrollment, scholarships, assistantships and co-op, or to request an application packet, please contact the Graduate Programs Director, **Dr. Hossein Shahmohamad**, by phone at (585) 475-7564 or e-mail at hxssma@rit.edu.

MATHEMATICS AWARENESS MONTH



Mathematics departments across the country celebrated April as Mathematics Awareness Month. This year's theme was Mathematics and Art.

The logo for Mathematics Awareness Month is a fish design that can be interpreted as a repeating pattern in the Poincaré circle model of hyperbolic geometry. It is based on a regular tessellation and fish like those in M. C. Escher's print Circle Limit III and was adapted by Douglas Dunham.

The Department of Mathematics and Statistics celebrated the month with a lecture series featuring experts in a number of areas that combine mathematics and art. The series featured the following talks:

April 4: Prof. Andrew Davidhazy, Department of Imaging and Photographic Technology, spoke on *"Scanning Photography."*

April 11: Prof. Anne Coon, Department of Language and Literature, and **Prof. Marcia Birken**, Department of Mathematics and Statistics, talked about *"The Mandelbrot Set: Representations in Art, Music and Poetry."*

April 25: Cathy Sweet from the Memorial Art Gallery discussed *"Mathematics and Painting."*

ACTUARIAL NEWS

The Department offers actuarial mathematics courses to pursue a career in the field of actuarial sciences. Passing one or more professional exams greatly enhances one's ability to secure a suitable position in the actuarial profession. Each year several of our graduates take jobs as actuaries.

Congratulations to **Michael Voelkel**, who has passed the first professional actuarial exam of the Society of Actuaries this year.

THE 2002 PUTNAM COMPETITION

The William Lowell Putnam Mathematical Competition was held on December 7, 2002. The exam is a very prestigious and challenging annual competition, taken by over 3000 students from across the United States and Canada.

Seven students from RIT participated in the exam this year: Donald Butler (57th percentile), Victor Kostyuk (80th percentile), Bill Orr (74th percentile), Joseph Rhoads (77th percentile), James Urick (80th percentile), Chi Wong (54th percentile), and Gerardo Zelaya (80th percentile). Joshua Joseph, Zhi Li Pan, Jeffrey Prescott, and Yan Hui Yi also participated in the competition.

Our team (Butler, Pan, and Zelaya) ranked 103rd out of 376 teams. That placed us in the 73rd percentile. Congratulations to all for a fine effort.

COIN TOSSING

Professor James Marengo recently presented two interesting questions in recent talks with answers that do not seem to be at all intuitive. The first question he posed was: "How many times would I have to flip a fair coin to get the pattern head-tails (**ht**)?" To get the **ht** pattern we must first toss the coin until the first head appears. Call **N(h)** the number of flips to get the first head. Then we will continue to get heads until a tail appears. We will let **N(t|h)** be the number of times we have to flip the coin after the first head until the first tail. For example, if we observed the pattern **t t t t t t h h h h h t**, then **N(h)** = 8 and **N(t|h)** = 5. Thus, the number of coin flips to observe the ht pattern is **N(h)** + **N(t|h)** = 13.

It seems unlikely that we would have to flip the coin 13 times before we observed the **ht** pattern. How long should we expect to wait? Prof. Marengo points out that both

random variables **N(h)** and **N(t|h)** share the same geometric distribution with expected values of 2 each. Thus, we would expect to need 4 coin tosses in order to observe an **ht** pattern.

The second question Prof. Marengo posed was: "How many times would I have to flip a fair coin until I got the pattern heads-heads (**hh**)?" At first this seems like the same question. Heads-tails, heads-heads, aren't you just asking how many tosses until a desired two step pattern appears? However, the method we used to approach the first question fails us because after we get the first **h** we have to continue counting half the time (when we follow that **h** with a **t**).

Call C_n the number of binary sequences of length n that do not contain the pattern **hh**. Of course, $C_1 = 2$ (**h** or **t**) and $C_2 = 3$ (**ht, th** or **tt**). Call C_n(**h**) the number of binary sequences of length *n* that do not contain the pattern **hh** but end in **h** and C_n**t** the number of binary sequences of length *n* that do not contain the pattern **hh** but end in **t**. Note that C_n(**t**) = C_{n-1} and C_n(h) = C_{n-1}(**t**) = C_{n-2}. Thus, C_n = C_n(**h**) + C_n(**t**) = C_{n-2} + C_{n-1}. That is, we get the next number in the sequence C_n by adding the last two numbers, C_{n-1} + C_{n-2}. This generates the Fibonacci sequence {2, 3, 5, 8, 13 … }.

We hope to investigate probabilities so let's recall that there are 2^n different sequences of length *n* of **h**'s and **t**'s and C_n of them do not contain the desired **hh** pattern. So the probability of *n* tosses not containing **hh** is $C_n/2^n$. Thus, $\Pr(N(\mathbf{hh})>n) = C_n/2^n$. To calculate the expected value of the number of coin tosses to generate the pattern hh, E(N(**hh**)), we have

$$
\begin{aligned}
E(N_1(\mathbf{hh})) &= \sum_{n=0}^{\infty}\Pr(N_1(\mathbf{hh})>n)\\
&= \sum_{n=0}^{\infty}\frac{C_n}{2^n} = \sum_{n=0}^{\infty}\frac{C_{n-1}+C_{n-2}}{2^n}, [C_{-2}=0, C_{-1}=1]\\
&= \frac{1}{2}\sum_{n=0}^{\infty}\frac{C_{n-1}}{2^{n-1}} + \frac{1}{4}\sum_{n=0}^{\infty}\frac{C_{n-2}}{2^{n-2}}\\
&= \frac{1}{2}\left[\frac{C_{-1}}{2^{-1}} + \sum_{n=1}^{\infty}\frac{C_{n-1}}{2^{n-1}}\right] + \frac{1}{4}\left[\frac{C_{-2}}{2^{-2}} + \frac{C_{-1}}{2^{-1}} + \sum_{n=2}^{\infty}\frac{C_{n-2}}{2^{n-2}}\right]\\
&= \frac{1}{2}\left[2+E(N_1(\mathbf{hh}))\right] + \frac{1}{4}\left[2+E(N_1(\mathbf{hh}))\right]\\
&= 6.
\end{aligned}
$$

In conclusion, on the average it takes 6 tosses to obtain the pattern **hh**, but only 4 tosses obtain the pattern **ht**.

RESEARCH TAPS FOUNTAIN OF YOUTH

Our department's Undergraduate Research Program continued to gain recognition on the national scene as four of our majors **Gregory Dufore, Victor Kostyuk, Melissa Matthews, and Victoria Shults** attended the 34th Southeastern International Conference on Combinatorics, Graph Theory, and Computing. Thanks to generous gifts from *JetBlue Airways*, RIT Alumni and the College of Science Development Office, the students received travel support to attend the conference held in Boca Raton, FL during the first week of March.

Since the Fall Quarter Victor Kostyuk and Victoria Shults, both junior applied mathematics majors, have been working with Prof. Darren Narayan on a research project in graph theory involving minimal vertex rankings. Their joint work included the solution to a previously unsolved mathematical research problem that had been open for over two years. Victor and Vicky's presentation, *Color Distribution in Minimal k-Rankings*, was well received. Prof. Narayan presented other results from the same project in his talk, *Minimal k-Rankings and the A-rank Number of a Path*.

Melissa Matthews, a senior applied mathematics major, has been working with Prof. Tamara Burton since the Fall Quarter on a project involving vertex domination in dot-critical graphs. In her talk, *I-Spy and Domination Critical Graphs: A Preliminary Report*, Melissa presented optimal strategies for spy placement in a communication network. Prof. Burton provided additional results in her presentation *Dot Critical - The Hazards of i: A Preliminary Report*. Melissa's and Prof. Burton's presentations were very well attended and included requests for their upcoming research paper.

SEVEN RIT STUDENTS ADMITTED TO SUMMER RESEARCH PROGRAMS

We are thrilled to announce that seven of our majors have been accepted into summer research programs throughout the nation. **Svetlana Bukharina and Wanda Strychalski** were accepted into the Institute for Advanced Study / Park City Mathematics Institute held in Park City, Utah in July. Five of our students were accepted into National Science Foundation Research Experience for Undergraduates (NSF-REU) programs. These programs are a terrific experience for students to spend a summer working on research problems in mathematics and statistics at another university. In addition these programs also provide a summer stipend, as well as support for housing, meals and transportation. **Victor Kostyuk** was accepted into the DIMACS / DIMATIA NSF-REU Program where he will spend seven weeks at the Center for Discrete Mathematics and Theoretical Computer Science at Rutgers University. As part of this program he will also spend three weeks working on research projects at Charles University in Prague, Czech Republic. This summer **Joseph Rhoads** will be attending the NSF-REU program at California State University at San Bernadino working on problems in knot theory and combinatorics. **James Urick** will be attending the NSF-REU program at the University of Illinois where he will be investigating research problems in evolutionary game theory. **Stephanie Jones and Tiffany Swasta** will be working on research projects this summer in Ohio State University's

NSF-REU program in Applied Statistics and Biostatistics.

WINTER DEAN'S LIST

Jennifer Baldwin	Victor Kostyuk *
Julia Bethel *	Christopher Longano
Brett Billings *	Garrett Manhart
Julie Blackwood	Melissa Matthews *
Neil Brenner	Margaret Pokorny
Svetlana Bukharina	Thomas Prevendoski *
Tonya Campbell	Terese Puma
Andrew Cheshire	Joseph Rhoads *
Dennis Colburn	Robert St. Pierre
Shana Dagel	Mark John Schindlbeck
Jason Dyer	Michael Short *
Calvin Farmer	Victoria Shults *
Gillian Galle *	Abbie Stokes-Riner *
Nicolas Germain	Wanda Strychalski *
Caitlin Glegg *	Tiffany Swasta *
Kevin Gonzales *	James Urick
Jennifer Goodenow	John Vining III
Nicholas Greene *	Michael Voelkel
Thomas Henthorn *	Kathryn Webb
Stephanie Jones *	Pamela Winn

Congratulations to all!
* denotes 4.0 GPA

ALUMNI NEWS

Kathyrn (Haynes) Cleary (SMAM '86) participated in the Faces of Change Conference, held at RIT on April 26. Kathryn is currently Director of Marketing and Business Development for City Blue Imaging Services in Rochester. She holds an MBA from the University of Rochester and is on the Board of Directors at the American Red Cross. In fall 2001 she was a recipient of the Rochester Business Journal 40 Under 40 Award. The Faces of Change conference brings several hundred high school young ladies to RIT to listen to panels of successful women alumni from our science and technology programs. We appreciate Kathryn's willingness to volunteer her time for such an important event.

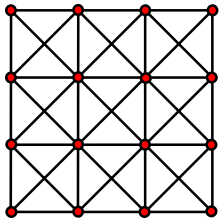
Janny Phuongan Ly (SMAM '01) has left Blue Cross Blue Shield in Rochester for warmer climates. She is now Manager of Medical Finance for AMERIGROUP Corporation in Virginia Beach. She loves her new job and tells people that majoring in mathematics is extremely worthwhile because it can be used in every field. She also sends her thanks to all of her RIT teachers for preparing her so well for her career.

Elizabeth Kelly (SMAM '98) is currently employed at General Dynamics in Boston. She is working on a digital security project involving a web-based management system for a PKI system. PKI (Public Key Infrastructure) has become her specialty since leaving college. She writes that a lot of her success in working as a highly contributing member of a team has come from her training at RIT and sends her thanks to her many instructors.

PROBLEM CORNER: A TRIBUTE TO 2003

In a salute to the wonderful year that was and still is 2003, let a_n be the number whose digits consist of 2003 followed by 0123456789 repeated n times followed by 2003 again. That is, a_n = 20030123456789…01234567892003 for a total of 10n+8 digits. Prove or disprove: 7 divides a_n if and only if 13 divides a_n. (A fully justified solution should be submitted to Prof. Matt Coppenbarger by November 21, 2003.)

Answer to Previous Problem Corner: *Counting Rectangles and Triangles.* Given a 4 x 4 array of points, connect points whose distance between them is either 1 unit or $2^{1/2}$ units as in the figure.



Problem: How many rectangles (including squares) and triangles are there?

Answer: There are 36 rectangles with sides of integer length, 51 tilted rectangles, 68 triangles with a diagonal of integer length, and 56 triangles with a diagonal an integer multiple of $2^{1/2}$, for a total of 211.

Problem: To generalize, given an n x n array of points such that the points are connected as in the example above, determine the number of rectangles and triangles that can be found on the grid as a function of n. (This problem will be submitted to a mathematics journal and so the answer will be suppressed for now.)

DEPARTMENT OF MATHEMATICS & STATISTICS NEWSLETTER

Contributors: Prof. Bernard Brooks, Ms. Shelly Cicero, Prof. Matthew Coppenbarger, Prof. Rebecca Hill, Prof. James Runyon

Print Version: Ms. Shelly Cicero, Prof. David Crystal, Prof. Rebecca Hill

Web Version: Prof. Rebecca Hill

Send news items to: E-mail: mathdept@rit.edu
Mail: Rochester Institute of Technology
College of Science
Department of Mathematics and Statistics
85 Lomb Memorial Drive
Rochester, NY 14623