

Summer 2003

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Mathematics Alumni Newsletter

University of Denver

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This newsletter is published semiannually and your submissions are welcome

If you have an article or information that might be of interest to other alumni and you would like to have it published in the newsletter, please send it to:

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Please include your name, mailing address, and email address so we can contact you.

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Greetings From The Chair

We are inordinately proud of the DU students who choose to major in mathematics. Therefore, it is a particular pleasure to announce the outstanding majors in each class. Everyone was recognized at the University Awards Ceremony on May 21, 2003. Our outstanding seniors are Tom Gieck and Derek Moulton.

Tom always loved sports and math when he was growing up, and for a while thought he would be a statistician for a sports team. At DU he completed a double major in mathematics and statistics with numerous honors. He has since passed one actuarial exam and has taken a position with Watson Wyatt in Denver.

Derek's mathematical studies had to accommodate his varsity soccer commitments, but he nevertheless found time to complete a most interesting honors thesis under the direction of Joel Cohen. In the thesis he wrote a computer algebra simplification program and ran it against

the Maple counterpart. Derek will begin graduate work in applied mathematics at the University of Delaware in the fall.

Under Jim Hagler's direction, one of our outstanding junior mathematics majors, Alex Thomson, was the author of what must be one of the loveliest student projects of all time. Alex was randomly altering the parameters of one of the classic nowhere-differentiable functions and observing the resulting graphs when, to his surprise, there emerged from the jumble of wild and jagged approximations a remarkably smooth-looking limit function. In fact, the limit looked familiar: it turned out to be a garden-variety parabola. The proof is a beautiful application of a fixed point theorem.

Brandon Haenlein was our other outstanding junior, Denis Lapitski and Tom Greene were our outstanding sophomores, and Anuradha Bhatia was our outstanding freshman.

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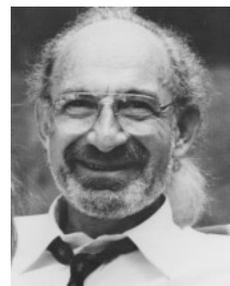
Alvaro Arias Awarded Tenure

We are pleased to announce that Alvaro Arias has been granted tenure. This well-deserved award received strong support from Alvaro's colleagues, students, and research peers. The Department is fortunate to attract and retain faculty of such high caliber, thereby assuring that it will continue to thrive.



Stan Gudder Receives Evans Professorship

The Evans Professorship is the highest honor bestowed by the University on a single faculty member each year. In recognition of his deep and prolific contributions to the foundations of quantum mechanics over a career spanning thirty-five years, Stan Gudder will become an Evans Professor at Convocation next fall. We are terrifically proud of Stan and his accomplishments, and happy for the recognition he so richly deserves. This recognition is reinforced by Stan's election last July to the presidency of the International Quantum Structures Association (IQSA), which will hold its



(Continued on page 2)

Greetings From The Chair *(Continued from page 1)*

In addition, we were delighted to honor the following students for their academic achievement as first-time recipients of the Hammond Scholarship in spring quarter: Alex Thompson, Derek Moulton, Brandon Haenlein, Cy Holladay and Julie Raffety. Tom

Gieck and Tom Greene were named Honorary Hammond Scholars and Denis Lipitski received the Gladys Johnson Scholarship from the Division of Natural Science, Mathematics and Engineering. Congratulations, everyone!

Richard N. Ball

Stan Gudder Receives Evans Professorship *(Continued from page 1)*

biennial international conference at DU in the summer of 2004. (You may recall that several articles in the previous Math Department newsletter mentioned DU's involvement in the foundations of quantum mechanics.)

Of course, rolling back the boundaries of ignorance in any mature mathematical discipline requires some heavy intellectual lifting. But Stan's contributions go beyond his masterful command of the classical literature and techniques. Stan has often successfully brought new ideas and methods to bear on the central issues in the foundations of quantum mechanics, thereby starting whole new research streams which then receive scholarly attention from others in the field. It is no exaggeration to characterize him as some sort of mathematical pied piper.

Always finding delight in elementary problems from any source, especially those that are easy to state but hard to solve, Stan sometimes infects one of his hapless colleagues with his enthusiasm and the upshot is often a beautiful piece of mathematics. A

good example is the paper *Probabilities of consecutive integers in Lotto* jointly authored with Jim Hagler and appearing in *Mathematics Magazine*. Stan's article entitled *Quantum Computation* recently appeared in the *American Mathematical Monthly*, perhaps the most widely read and prestigious journal of expository mathematics in the world.

Stan's passion for his mathematics also informs his teaching. His two-quarter class on quantum computation was a notable success, creating a heightened interest in the subject on the part of a number of graduate students and several faculty members. It is not unreasonable to expect this interest to lead to further research, with all the concomitant activities: courses, papers, dissertations, faculty visits, etc.

Stan plans to travel while on sabbatical leave during the fall and winter quarters, lecturing, collaborating, and promoting the upcoming IQSA conference at DU. We wish Stan and his wife Paula a most refreshing and productive sojourn.

Sue Seitz Retires

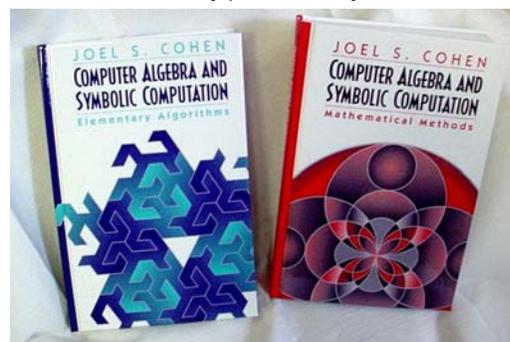
After a lengthy and productive career as an instructor, Sue Seitz retired in June. Sue earned a Masters in Computer Science from DU through the Women in Computer Science Program run by, among others, Otis Rechar and Mike Martin. She segued from GTA to instructor duties in 1986, and has been a mainstay in the instruction of programming languages ever since. The languages, of course, have changed over the years, from Fortran to Pascal to C to C++, but Sue's deep concern for her students and expert academic guidance remained constant throughout her career. Widely known and liked throughout the University, Sue will be missed. Sue and her husband Dave have already begun a remarkably active summer of trailer camping, sight-seeing, and musical performances. Our best wishes attend them.



Joel Cohen Publishes Textbooks

Many of the alumni may remember taking the computer algebra course sequence taught by Professor Joel Cohen. Two textbooks based on those course notes have been in various stages of development for 16 years and were recently published by AK Peters LTD. These books, *Computer Algebra and Symbolic Computation: Elementary Algorithms* and *Computer Algebra and Symbolic Computation: Mathematical Methods*, respectively address the practical and the theoretical aspects of the subject of computer algebra.

The texts are designed to provide all of the material needed to understand the concepts so that an extensive background in mathematics or computer science is not needed. All material is computer language independent and a CD is available that contains all of the programs presented in the books in the Maple, Mathematica, and MuPAD computer algebra languages. In addition, the CD contains an electronic, hyperlinked version of the text that can access the software in these languages.



Marsico Grant

The Marsico initiative, made possible by a generous grant from donors Tom and Cydney Marsico, is intended to support the development of more rigorous curricula, intensify student/faculty interaction, and enhance DU's academic environment. In response to Requests for Proposals, the Math Department proposed a number of new courses. We were pleased to be awarded a portion of this grant to develop these courses. Two of the courses and the rationale for their development are outlined in the following paragraphs.

Science students typically begin their studies with calculus, and are thereby assured of seeing the beauty and power of mathematics. In fact, most of our majors begin in some other science and change to mathematics as a result of a good experience in calculus. But many non-science students also have excellent backgrounds and aptitudes in mathematics, and these students are not exposed to 'real' mathematics in the lower-level foundations courses where they are often misplaced. Professors Arias, Hagler, Gudder, and Ormes have responded to this need by designing enriched versions of the lower foundations course. Although these classes require no sophisticated background, they will be offered at a high level to small (15 student) classes taught by these excellent and enthusiastic faculty members.

Imagine the lucky DU students who will get a chance to take either of the two classes described at the right this fall. The first will be taught by Alvaro Arias and the second by Nic Ormes. Courses on the mathematics of voting and on mathematical art will be offered in the fall of 2004.

Introduction to Cryptography In this seminar the students will learn the theory and implementation of common public key cryptosystems, which are the basis of security features of Internet products such as signed and encrypted email. The encryption and decryption process is based on elementary number theory and large prime numbers. We will use web page resources of the Mathematical Association of America and the mathematics software Scientific Notebook to work with large numbers. For example, we can use Scientific Notebook to show that the number 307456030231027154561632082084849237305176015114697384040597 is prime.

Patterns and Symmetry Objects exhibiting symmetry are ubiquitous in art, architecture, science and mathematics. In this seminar, students will study the algebra and geometry of symmetry as it appears in patterns. We will examine finite and infinite patterns in the plane (Figure 1, by M.C. Escher), as well as some appearing in the Poincaré disk (Figure 2, by M.C. Escher). Students will use geometric software to assist with mathematical understanding and to create artistic designs based on the mathematics we study.

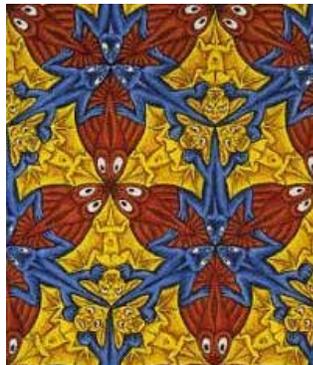


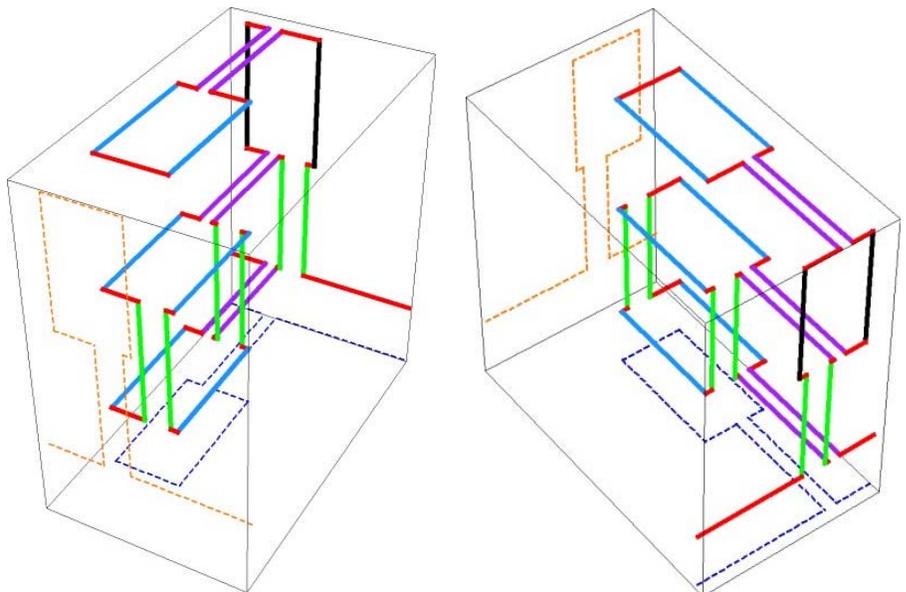
Figure 1



Figure 2

Research Snapshot

This figure shows two views of all the points in 3-space whose projections (shadows) lie in the given dashed curves in the horizontal (x - y) and vertical (y - z) planes. If you look closely, you can see that one of the components (connected pieces) projects fully onto both curves. That such a component exists for any pair of given curves of a certain type is a surprising conclusion of an investigation currently being conducted by Rick Ball, Jim Hagler, and Nic Ormes. This is just one of the ongoing research activities in the Math Department.



Tea At The Greene

Our Friday afternoon teas are on hold during the summer months. We expect to resume this tradition once the Fall Quarter starts and we would be pleased to have you join us. We typically meet every Friday afternoon at 3:00 in the John Greene Hall lounge. Although no advance notice is required, you might want to contact Liane Beights at (303) 871-3344 to confirm that tea hasn't been postponed due to a conflicting event. We look forward to seeing you there.



Photo courtesy of the Brown Palace Hotel

Hockey Night 2003



On February 15, over 90 math alumni and DU Math Department faculty, staff, and guests gathered for our annual hockey night. Before the game, refreshments were served in John Greene Hall and there was an opportunity for everyone to get reacquainted with old friends and meet new ones. We then

saw an exciting hockey game with the DU Pioneers playing the Fighting Sioux of the University of North Dakota. At the

time, North Dakota was ranked No. 5 in the WCHA. The game was tied at 1-1 from 3:20 of the second period until the final seconds. With two seconds remaining, a Pioneer defenseman scored with a slap shot from the blue line to give DU a 2 to 1 victory.

We attempt to contact all alumni who live within a reasonable distance to inform them of our hockey nights. If you are interested in attending the next hockey night and we somehow missed you this year, please let us know. Email dopplige@du.edu.

Where Are They Now?

Cynthia Clark Cynthia contacted us and gave us the following update.

"I attended DU for one year Sept 1963 - Aug 1964 and received a master's degree in mathematics. While a student, and for three years after I received my degree, I taught in the department as an instructor -- several courses in the Business School as well as classes in the mathematics department. I taught the 3 course calculus sequence, finite mathematics, and introductory statistics. I had courses under Dr. Ruth Hoffman and Dr. George Bardwell in the mathematics department; Dr. Wolfgang Yourgau in philosophy of science; Dr. Margaret Brittan in econometrics. I kept in contact with Dr. Hoffman and Dr. Brittan over the years but have recently lost touch with both of them.

"After my three years of teaching at DU I went on to graduate school for several years part time as I had small children. I began in mathematics but changed to statistics when my husband took a position at Drake University in Des Moines, Iowa. I received a master's and doctoral degree in statistics from Iowa State University in 1973 and 1977, respectively. Shortly after that my husband and I moved to Washington DC where we have been ever since. I have worked for the federal

government as a statistician in several agencies -- the Census Bureau, the Office of Management and Budget and the National Agricultural Statistics Service.

"I currently have a senior position as Associate Director for Methodology and Standards at the Census Bureau. I oversee the mathematical statisticians, social science researchers, computer scientists, and mathematicians who work at the Census Bureau and have responsibility for the methodology and quality of our statistical programs.

"My husband and I have six children and seven (almost eight) grandchildren. Four of our children are married. All have bachelor's degrees; three have master's degrees; one has a doctoral degree and two are in doctoral programs. So they are all busy and active in many activities.

"One of my most vivid memories of DU is walking across campus to class one November day in 1963 and being informed that President Kennedy had been assassinated. A more pleasant memory is skating at the DU ice rink with our young children. I still skate -- and have advanced to freestyle and ice dance, enjoying this frequently."

We thank Cynthia for reconnecting with the department and for sharing her achievements and memories with us.

A Math Puzzler

Shelby Worley ('82) provided us with this puzzler in the previous edition. Rachel (Shute) Hughes ('96) provided a correct answer.

Let $X_1, X_2, X_3, \dots, X_n$ be a sequence of real numbers. Let $X_1 = 1$. Define the rest of the sequence by the recursion formula $X_n = 1 + \frac{1}{n}(X_1 + X_2 + X_3 + \dots + X_{n-1})$. Find a closed form expression for X_n . A solution, provided by Jim Hagler is below.

Solution: We first solve for X_{n+1} in terms of X_n . Observe that if $n > 1$,

$$X_1 + \dots + X_{n-1} = n(X_n - 1) \quad \text{Now,}$$

$$X_{n+1} = 1 + \frac{1}{n+1}((X_1 + \dots + X_{n-1}) + X_n) = 1 + \frac{1}{n+1}(n(X_n - 1) + X_n) = X_n + \frac{1}{n+1}.$$

Since $X_1 = 1$, $X_2 = X_1 + \frac{1}{1+1} = 1 + \frac{1}{2}$, $X_3 = X_2 + \frac{1}{2+1} = 1 + \frac{1}{2} + \frac{1}{3}$, and in general, for

$$n > 1, \quad X_n = 1 + \frac{1}{2} + \dots + \frac{1}{n}. \quad (\text{A careful proof using mathematical induction was also given}$$

by Shelby.)

We Want To Hear From You

This newsletter is one of our efforts to maintain communications with our alumni. We're always happy to hear from you.

Send a paragraph or two and let us know what you have been up to these days. Pictures are welcome, too! Send information to: Don Oppliger, DU Math Dept, 2360 S. Gaylord, Denver, CO 80208. Email: dopplige@du.edu