THE RIGHT ANGLE

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UNIVERSITY OF Cincinnati
McMICKEN COLLEGE OF ARTS AND SCIENCES
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from the HEAD

Greetings! Well, after years of minor character roles, mathematicians finally took center stage at the movies this year with two extremely popular films portraying math-ematicians at work. The Oscar winning “Beautiful Mind” portrayed the troubled life of Nobel Prize winner John Nash. The charming thriller “Enigma” presented a fictionalized account of the dramatic but secret accomplishments of mathematicians as code-breakers during World War II. Conveying to the general public the beauty and importance of mathematical research has always been a challenge. It’s nice to have Hollywood helping us out for once.

It’s also been a successful year for the Department of Mathematical Sciences with many notable achievements. Srdjan Stojanovic’s book on computational financial mathematics will be published soon by Springer. Don French was awarded a $100,000 grant from the National Science Foundation to study mathematical neuroscience. Victor Kaftal and Gary Weiss had a paper published in the prestigious *Proceedings of the National Academy of Science*. Robin Endelman completed her PhD and has accepted a post-doctoral position at the University of California, Davis. David Minda was awarded the Teacher of the Year award by the Ohio section of the Mathematical Association of America. Larry Gache won the University-wide Graduate Assistant Excellence in Teaching Award. Joy Moore and Steve Pelikan were appointed Ohio Board of Regents Teaching Fellows. Undergraduate Mike Chance graduated magna cum laude and moves on to the PhD program at SUNY Stony Brook. Our new Statistical Consulting service had a highly successful first year, helping both outside clients and UC colleagues with their statistical analyses.

We are delighted to welcome two new faculty members. Nages Shanmugalingam joins us after three years post-doctoral work in Finland, Ireland and the University of Texas. Markus Banagl spent the last three years as a Van Vleck Assistant Professor at the University of Wisconsin.

I hope you enjoy this issue. Don’t forget to keep in touch – we love to hear from our alumni! Drop by next time you’re in town or send us an email with all your latest news.

Sincerely,

T.J. Hodges

Tim Hodges

The popular movie "A Beautiful Mind" dramatized the story of Nobel Prize winning mathematician John F. Nash, Jr. The movie cleverly conveyed both his genius and illness, and incorporated some real mathematics. (Algebraic geometer Dave Bayer was responsible for the mathematical details in the movie. He wrote the formulas and computations that appear on windows and blackboards, and chose the problem the fictional Nash challenged his advanced calculus class to solve. You can read about his contribution under NEWS FOCUS: "Mathematics in Film" in the February 2002 issue of *Science*, available in the online archive at <www.sciencemag.org>.)

Nash won the Nobel Prize (in economics) for his proof that every n-person finite non-cooperative game has at least one equilibrium point. This result generalized the fundamental theorem of two-person zero-sum games (von Neumann, 1928), and expanded the scope of game theory to more complex (and realistic) games with new applications beyond military strategy – to problems in economics, political science, and evolutionary biology.

Mathematical games are used to model competitive situations. The individuals (or opposing sides) involved are called players, and each possible outcome is quantified by a numerical value, or payoff. In games such as chess, each player makes "moves," but game theory is not necessarily concerned with individual moves. Rather, the theory analyzes games at the level of strategy (rule(s) which determine the moves to be made). Each player has a set of strategies to choose among. If a player chooses a single strategy to follow, he or she is following a pure strategy. But sometimes the "best" strategy involves choosing from among available strategies at random (with specific probabilities). These are called mixed strategies. Then the outcome is random, too, so such strategies are evaluated in terms of their expected (average) payoff. In two-player, zero-sum games the payoff for one player is always the negative of the payoff for the other (their interests are exactly opposed). We can use a matrix to represent the game by letting player A's strategies correspond to the rows and player B's to the columns, with each entry of the matrix equaling the value (to player A) of the corresponding outcome. (We don't have to keep track of B's value separately because it is the negative of A's.)

A guiding tenet of game theory is called the minimax principle. Since the players are choosing only a row (or column) and not directly an outcome, once A chooses her row/strategy, B can choose the column corresponding to the smallest payoff in that row to maximize her own payoff. Therefore, a rational row player will choose the row for which the minimum payoff m (worst case) in that row is largest among all row minima (the maximin strategy). Likewise, the column player will choose the column for which A's maximum payoff M is least among all column maxima (minimax strategy). When m = M, neither player can improve her payoff by changing strategy, and we have an optimal, equilibrium solution. For example, in this game

$$\begin{bmatrix} 2 & 0 & -1 \\ 1 & 2 & -2 \\ -2 & 1 & -3 \end{bmatrix}$$

A's maximin strategy is row 1 (the row whose minimum is greatest), and B's minimax strategy is column 3 (the column whose maximum is least). Neither player can improve the value of the game (–1 to A, 1 to B) by changing strategy unilaterally. However, for many games, $m \neq M$. Here is an example:

$$\begin{bmatrix} 2 & -2 & -3 \\ -1 & 0 & 3 \\ 0 & 1 & 2 \end{bmatrix}$$

A's maximin strategy is row 3 (the row whose minimum is greatest), and B's minimax strategy is column 2 (the column whose maximum is least). These choices lead to a payoff of 1 (to A). But if B realizes A is choosing row 3, she can do better by switching her strategy to column 1 (to force A to get 0 instead of 1). Then A can answer by switching to row 1 to achieve a payoff 2. B responds by switching to column 3, and so on. The minimax approach fails to find an equilibrium solution. However, von Neumann proved that such games do have optimal equilibrium solutions if we allow mixed strategies. Prior to Nash's work, the n-person game was analyzed by partitioning the set of players into two disjoint subsets, or coalitions, to reduce to the two-player case.

The approach Nash used avoided the use of coalitions and he called his n-person games "non-cooperative" to emphasize this. He also allowed each player to have independent (not necessarily zero-sum) payoffs. His theory is laid out in his 1950 PhD thesis, and published with different versions of proof in the *Proceedings of the National Academy of Sciences USA 36* (1950) and in the *Annals of Mathematics 54* (1951). His analysis is elegant, and in hindsight, a logical extension of the existing theory. His main tool is a topological fixed point theorem (which guarantees that under certain conditions on a function f, there will be at least one point x such that f(x) = x). Nash applies this theorem to a suitably defined function on the space of mixed strategies to prove the existence of at least one equilibrium point (n-tuple of strategies).

Nash went on to make other contributions, both in game theory and in pure mathematics. He attacked several difficult problems in analysis, producing exciting, ingenious and thoroughly original solutions. Interested readers can consult *The Essential John Nash* (Princeton University Press, 2002), which contains a facsimile of Nash's thesis, along with essays, photos, commentaries and reprints of seven of Nash's publications. John Milnor's 7-page essay "A Nobel Prize for John Nash" (*The Mathematical Intelligencer*, vol. 17, no. 3 (1995)) is an excellent overview of Nash's contributions. Milnor includes the following amusing example of a Nash equilibrium:

A group of 20 is going to dinner. Each has the choice of an adequate meal ($10) or an excellent meal ($20). If paying individually, each one would choose the cheaper meal. However, they have agreed to split the bill. The solution where all 20 choose the more expensive meal is an equilibrium point because the marginal cost of the more expensive meal is only 50 cents.

That is, if any one of the diners would switch to the less expensive meal, his cost would decrease only 50 cents while the value of his meal goes down $10. Thus no player can improve his payoff by unilaterally switching strategy: the definition of equilibrium.

faculty NEWS

Wlodek Bryc gave an invited talk at the International Workshop on Noncommutative Harmonic Analysis in Wroclaw, Poland.

Jim Deddens' paper on pre-emergent herbicide exposure in the *Annals of Occupational Hygiene* was selected as the best publication in the human subjects category at the National Institute for Occupational Health and Safety.

Jintai Ding's research on quantum affine algebras is supported by a grant from the National Security Agency.

Don French was awarded a Career Development Grant from the National Science Foundation to do interdisciplinary work in mathematical physiology. His PhD student Jiyeon Oh is working on numerical methods for mathematical models of networks of neurons.

Chuck Groetsch gave an invited address at the Third Southern Hemisphere Symposium on Teaching Undergraduate Mathematics at Bergen-Dal, South Africa. He is a co-principal investigator on grant to the College of Education from the National Science Foundation's Division of Undergraduate Education.

Tim Hodges was awarded a grant from the National Security Agency to do research on quantum groups. He attended the meeting on Interactions between Algebraic Geometry and Noncommutative Algebra in Oberwolfach, Germany last April.

Sung Eun Kim and **Siva Sivaganesan** taught short courses for researchers at the National Institute for Occupational Health and Safety on applied statistics with S-Plus and applied Bayesian analysis.

Chris McCord is currently acting head of the Economics Department. He gave an invited address at the Conley Index Workshop at Sherbrooke University in Great Britain. Chris also continues to collaborate with colleagues in Mechanical Engineering on topics such as three-dimensional bin-packing algorithms. This research is supported by a grant from the Program on Manufacturing Machines and Equipment of the National Science Foundation.

Ken Meyer spent the spring quarter on leave in England. He gave a number of talks, including at University of Warwick, University of Southhampton, and Imperial College.

Joy Moore was selected to be a 2001-2002 Project NExT Fellow. This prestigious designation is applied each year to a small group of new or recent PhD's in the mathematical sciences, selected competitively, who are interested in improving the teaching and learning of undergraduate mathematics. Joy is the first UC faculty member to be selected as a Project NExT Fellow. The title "NExT" refers to "New Experiences in Teaching." The project is supported by the Dolciani-Halloran Foundation with major funding from the ExxonMobil Foundation, and is administered by the Mathematical Association of America. Moore, along with **Dave Minda**, and **Steve Pelikan**, received state funding to develop math courses for prospective middle school math teachers. Joy Moore and **Steve Pelikan** were also appointed Ohio Board of Regents Teaching Fellows (see article in this issue).

David Minda gave presentations at meetings in Busan, Korea and Kyoto, Japan this summer.

Diego Murio was a speaker and member of the scientific committee for the Fourth International Conference on Inverse Problems in Engineering in Rio de Janeiro last May. He also chaired a session on Genetic Algorithms and Neural Networks.

Magda Peligrad spent the autumn quarter of 2001 doing research with colleagues in Paris. She gave a number of talks at the University of Paris 10 and the Institut Henri Poincaré.

Steve Pelikan is scientific, statistical, and technical advisor to the North American Bluebird Society. Last summer, he designed and directed undergraduate Courtney Busemeyer's summer research project on bluebird data for the Women in Science and Engineering (WISE) program.

Tara Smith attended the meeting on Quadratic Forms and Algebraic Groups in Oberwolfach, Germany last May.

Srdjan Stojanovic's book *Computational Finacial Mathematics using Mathematica: Optimal Trading in Stocks and Options* is scheduled to be published by Birkhäuser-Boston early this fall.

Shuang Zhang co-organized the Satellite Conference on "Operator Algebras and Applications" of the International Congress of Mathematicians held in Beijing, China during August 14 - 19, 2002. He was one of the plenary speakers. Gary Weiss also spoke at the conference. Zhang was appointed to a special professorship at Capital Normal University in Beijing, to help train their younger professors and possibly supervise some MS and PhD students in later years. He plans to spend time there each summer.

student NEWS

Undergraduate Student News:
The department graduated 21 seniors this year, including 10 women. Several plan to pursue high school math teaching. Others plan to work in insurance or banking, and a few plan to go to graduate school.

Michael Chance, winner of our top award the Gulden Scholarship, graduated with high honors in mathematics, phi beta kappa, and magna cum laude. This fall he will be enrolled in SUNY Stony Brook's PhD program in mathematics. He completed graduate courses in Topology and Real Analysis (with Professor Weiss) here.

Ngozi Ndulue graduated summa cum laude with high honors in mathematics. She was a member of phi beta kappa and golden key. She will be a teaching assistant for English classes at a high school in Poitiers, France next year and hopes to pursue mathematics at the Universite de Poitiers in her spare time.

Jennifer Andringa graduated magna cum laude and graduate **Shannon Senger** was a member of phi beta kappa.

Undergraduate award winners for 2001-2002 include: **Michael Chance** (Jeanne Gulden Scholarship), **Carl McTague** and **Danielle Ross** (Harris Hancock Undergraduate Scholarship), **Michael Phelan** (Feld Scholarship), **Gregory Hull** (A&S Mathematics Scholarship), **Louis Blessing, Jr.**, **Elizabeth Bradford**, **Courtney Busemeyer**, **Michael Chance**, **Emma Ensminger**, **Jay Heidinger**, **Kevin Kampschmidt**, **Benjamin Norris**, **Kendall O'Brien**, **Shannon Senger**, **Hannah Seoh** (Harry S. Kieval Scholarship).

Graduate Student News
Graduate student **Larry Gache** won the University Graduate Assistant Excellence in Teaching Award for 2002, for his outstanding teaching in our elementary statistics sequence. Larry finished his MS in mathematics this spring and is working to complete a PhD in political science. **Robin Endelman** defended her PhD dissertation "Degenerations of Elliptic Solutions to the Quantum Yang-Baxter Equation" and moved on to a postdoctoral fellowship at the University of California, Davis. A record number of 18 teachers completed the Master of Arts for Teachers program this summer.

JOHN P. LAMBERT (BS '64)
Dr. Lambert (PhD Claremont Graduate University) is living in Ester, Alaska. He is Professor Emeritus at the University of Alaska, Fairbanks.

DANIEL GREATHOUSE (BA '66)
is living in West Chester, Ohio. He retired from the Environmental Protection Agency, and is currently an Associate at Home Depot.

BARRY RENDER (MS '71)
After completing his MS in math, with a concentration in operations research (15 credits with Professor Frank Wagner), Dr. Render went on to earn a PhD in Quantitative Analysis from the College of Business Administration at UC. He has taught at Boston University, George Washington University, George Mason University, University of Nebraska (Omaha), and is currently Harwood Professor of Operations Research at Rollins College in Winter Park, Florida. He is the author of over 100 articles in journals and 30 textbooks, including the market leaders *Operations Management* (6e) and *Quantitave Analysis* (8e).

JAE K. PARK (PhD '78)

Jae Park, professor of mathematics at Pusan National University (Korea), was recently inducted into the Korean National Academy of Science and Technology. He is only one of three mathematicians to be so honored. Professor Park spent the spring semester (2002) at the University of Louisiana, Lafayette. On May 23, 2002 he visited our department to give a colloquium talk entitled 'Ring Hulls and Their Applications'. Jae received his PhD in ring theory from our department in 1978 under the direction of Professor Joe Fisher. Since that time he has devoted himself to research and working to improve the quality of mathematics in his country, Korea. He has over 70 publications, and has held numerous visiting positions, including at the University of Cincinnati, University of Dusseldorf, University of Stuttgart, Ohio State University, Centre de Recerca Matematica, Institut D'estudies Catalans, University Autonomous de Barcelona, University of Texas, Okayama University, Hirosaki University, Naruto University of Education, Yamaguchi University of Japan, and Adjunct Professor of Yanbian University, P. R. China.

SAMIA MASSOUD (MS '81)
is currently Professor of Information Technology at Prairie View A&M University of Texas.

AARON CLARK (BS, '99)
is living in Montreal, Canada, the bilingual city he chose with his Parisian fiancée. He is running his own business as a private tutor for the GMAT, LSAT, and GRE graduate school admission exams. He is starting the MBA program at Concordia University this year.

SARAH EATON (BA, 2001)
was hired as the girl's varsity head soccer coach at Colerain High School in suburban Cincinnati. While earning her degree in secondary education (emphasis in math), Sarah was a four-year soccer letter winner. She was a UC Top Cat scholar athlete and won the Conference Commissioners Scholar Athlete Award.

Editor's Note: A reader wrote, in response to our announcement of last year's Richard E. Greenholz Scholarship winner, to remind us that Richard Greenholz's wife Sarah (Blank) Greenholz was a math major ('40), who went on to become an expert math teacher and supervisor.

new faculty JOIN DEPARTMENT

This fall, two talented young mathematicians join the ranks of the department. ***Markus Banagl*** *is a topologist who received his PhD at the Courant Institute in 1999 and comes to us after a Van Vleck Assistant Professorship at the University of Wisconsin.* ***Nageswari Shanmugalingam*** *("Nages") works in geometric function theory. She earned her PhD in 1999 from the University of Michigan. Before coming to Cincinnati, she held several postdoctoral positions in Finland, Ireland, and at the University of Texas, Austin. In this article, we introduce their work.*

Topology is the study of geometrical objects using the notion of "neighborhood" to specify proximity, rather than measuring distances. In the last century, considerable effort has been directed towards studying "manifolds" -- spaces that locally look uniform, at each point and in each direction. For example, the surfaces of a ball or of a doughnut are examples of two-dimensional manifolds. From any point on one of these surfaces the immediate neighborhood looks much like a two-dimensional plane. Topologists have been immensely successful in describing properties of manifolds. For instance, it was discovered that each manifold has a number, called its "signature," which measures intersections of geometric sub-objects within the manifold and which carries crucial information about the manifold.

Banagl's interest is focused on investigating the topology of singular spaces. In contrast to a manifold, a singular space may locally look different from point to point. A simple example would be the zero set of polynomials, but singular spaces show up in many contexts, and appear both in pure mathematics (e.g., algebraic geometry, number theory) and outside pure mathematics (mathematical physics). In recent decades, topologists have studied singular spaces with increasing interest. Much of Prof. Banagl's research centers on defining, understanding and computing invariants such as the signature and other characteristic classes for singular spaces.

The field of geometric function theory is essentially a marriage of geometry (the study of topological objects such as curves and surfaces and triangles) and analysis (the study of functions on topological objects). Thus, geometric function theory examines the analytic implications arising from the geometry of an object as well as the geometric information obtained from analytic considerations (mappings, inequalities, etc.).

Nages is one of a small group of researchers who are using geometric function theory to develop the geometric and analytic properties of general metric measure spaces and mappings between them. This program is motivated by applications to partial differential equations, stochastic processes, geometric groups, and analysis on graphs and fractals. Sometimes results proved in this context turn out to be new, even for Euclidean spaces (R^n). One problem Nages is working on concerns inequalities. Mathematicians use Sobolov spaces of functions to study differential equations on manifolds. In that context, certain inequalities follow from properties of the curvature of the manifold. Analogous inequalities don't always hold in metric spaces. Nages is seeking geometric properties of a metric space that would imply analogous inequalities in that setting. She is also investigating type of boundary (distinct from the topological boundary) that arises in connection with a boundary value problem on metric spaces.

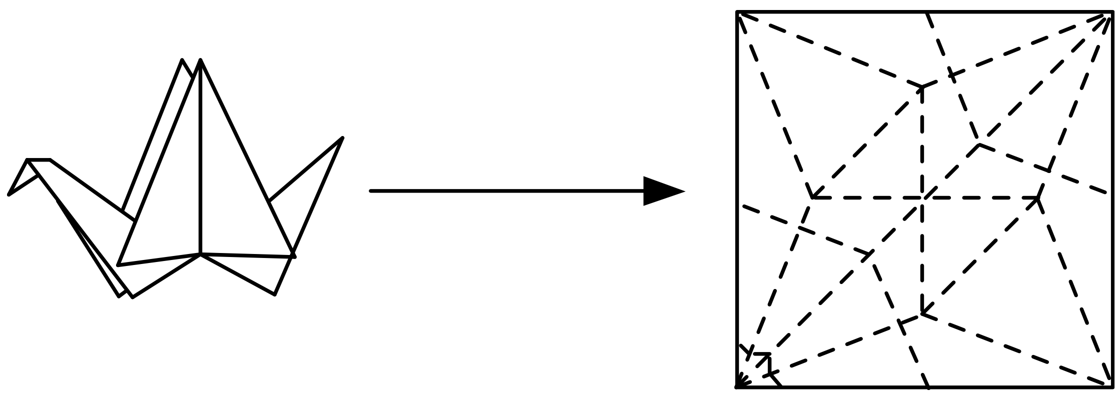
study of origami unfolds a NEW AREA OF MATHEMATICS

Tom Hull, an assistant professor of mathematics at Merrimack College (near Boston, MA), is visiting the department this year. His 1997 PhD was in graph theory, but ever since his college days, he's been fascinated by the mathematics of origami, and for the last five years he's been doing research on the mathematics of paperfolding. In fact, he's now considered one of the world experts in the field. We asked Tom to describe the connections between mathematics and origami. Here is what he said.

I first started learning origami at age 8 when I visited my hermit Uncle Paul. He did origami for recreation, and I pestered him constantly to fold me things. Finally he just gave me one of his origami books to shut me up, and I was hooked. Now, 24 years later, I've written two "how to" origami books (*Origami, Plain and Simple* and *Russian Origami*, both published by St. Martin's Press), edited a proceedings book on origami math, science, and education (*Origami^3* by A.K. Peters Ltd.), and am on the board of directors of OrigamiUSA, a national, non-profit, educational arts organization.

It's not hard for people to see the connection between math and origami. If you fold anything, like a fortune-teller, a boat, a paper hat, a box, or even a paper airplane (and remember that no cuts are allowed!), you can unfold the paper and see the pattern of crease lines that produce the model. Looking at these crease patterns can reveal a certain geometry at play, and many theorems can be deduced from this geometry.

Interest in the mathematics of origami has picked up over the past 5 years. There are researchers at MIT who study computational problems in paper folding, like how long would it take a computer to determine if a given crease pattern can fold flat? Scientists at NASA and other space technology agencies have been consulting with origamists to develop ways to efficiently unfold large objects, like telescope lenses and solar panel arrays, in outer space. And mathematics educators across the country have been using origami more and more as a hands-on way to teach things like Euclidean geometry, the Pythagorean Theorem, mathematical reasoning. I've been teaching a course at Merrimack College on combinatorial geometry, where we use paper folding as the motivation to explore topics that lie in the intersection of geometry and combinatorics. (Notes for this course are on my web page.)



Crease patterns of unfolded origami models reveal interesting geometry

For example, most origami models presented in books are *flat*. That means, when you're done you can press the model in a book without crumpling it or adding new creases. If you open up the model and look at the crease pattern (that is, only the creases that are used in the final model - not the ones merely made along the way), it's not hard to prove that the regions of paper between the crease lines can always be properly two-colored. That is, you can always color them, say yellow and pink, so that no two regions that share a crease line get the same color. To prove this, merely fold the model flat and hold it in front of you perpendicular to your face. Color all regions that are facing to the right yellow, and all regions facing to the left pink. Unfold, and you'll have a proper two-coloring, since all crease lines force the regions on either side of them to face in different directions. (In graph theory terms, this means that flat origami crease patterns are Eulerian graphs.)

This coloring theorem has applications for people trying to model origami on computers. Why do that? Well, anyone studying how surfaces fold up would benefit from being able to do it "virtually", and this includes people who want to model how sheet metal buckles under strain, say in a car accident. This kind of crumpling doesn't always result in a flat folding, but the processes are not dissimilar. In any case, the two-coloring tells you which parts of the paper face in which direction after it's folded, which is a valuable piece of info that a computer would need to know when trying to render the folded image graphically.

Tom's web page <web.merrimack.edu/~thull/origamimath.html> has more information on origami math, including a bibliography, detailed descriptions of several stunning models, and links to other origami math pages on the web. For more information on the theory and applications of paperfolding, read a feature on the Third International Meeting of Origami, Science, Math, and Education at <http://www.siam.org/siamnews/10-01/origami.pdf>.

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math faculty garner State-Wide Recognition

We reported in last year's issue that **David Minda** won the university's 2001 Dolly Cohen Teaching Award. This past year, Minda won the 2002 Mathematical Association of America Ohio Section Award for Distinguished College or University Teaching of Mathematics, the state's top mathematics teaching award. While Minda's contributions to the areas of classical complex analysis and geometric function theory have established his international scholarly reputation, his skill at teaching both undergraduate and graduate students, and his interest in the training of future and in-service teachers have distinguished him locally. Among his teaching accomplishments is his pioneering effort in running a cooperative learning course for minority engineering students in calculus in 1992-93. Minda was also instrumental in developing the curriculum and policies for our Master of Arts for Teachers of Mathematics (MAT) program for certified secondary school teachers, which has become a model for such programs. Graduates of the program cite him as influential role model and strive to emulate him in their own classrooms. Congratulations to Dave!

This year the Ohio Board of Regents (OBR) initiated a Teaching Fellows program to strengthen Ohio's teacher education programs. Three faculty teams from institutions that combine strong general education and math or science training with exemplary teacher preparation were sought. We are pleased to report that UC's team of **Joy Moore** and **Steve Pelikan** was selected as 2002-2003 Teaching Fellows. The two will focus on education programs for future middle school teachers, an area where they share expertise and experience. Both have participated in OBR-funded collaborations which resulted in the development of new math courses for these students at UC. Moore has an interdisciplinary doctorate in math and education and holds a joint appointment in the Department of Mathematical Sciences (A&S) and in the Division of Teacher Education in the College of Education. Her doctoral research looked at the mathematics achievement of students in under-represented groups, and one of her long-standing interests is pedagogical approaches relevant to the mathematics achievement of African-American students, female students, and students from varied cultural backgrounds and learning styles. Moore has supervised mathematics student teachers doing middle school internships, and middle school mathematics pedagogy is one of her professional interests. She recently taught her course "Number Sense for Middle School Teachers" to a group of Cincinnati Public School teachers, as part of a partnership program between the university and the school district. Pelikan is a multi-talented interdisciplinary mathematician who usually collaborates with biologists and medical researchers. His expertise with computers was instrumental in the development of an on-line exercise system for our elementary statistics course, and in the design of an adaptive mathematics placement exam. He has an instinctive grasp for what teachers need to know about mathematics, and has played a key role in revising the Master of Arts for Teachers (MAT) program to better meet the needs of secondary school teachers. His willingness to help with a wide range of topics results in his supervising a large number of MAT projects annually. He is known for for his witty teaching style (sometimes incorporating magic demonstrations) and for his availability and willingness to help outside of class. He designed and taught the inquiry-based course "Algebra for Middle School Teachers." During the coming year, Moore and Pelikan will conduct at least one seminar and will collaborate with other teacher education institutions in Ohio.

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F O L D H E R E

from the EDITOR

I'm glad to be back editing The Right Angle, which I helped launch in 1990. My thanks to my colleagues who did the task so well over the past seven years. I hope to hear from many of you, with comments or news for next year's issue, as I work to keep the newsletter interesting and informative.

Joanna Mitro

Joanna Mitro

Name ______________________________

Address ______________________________

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Year of graduation ______________________________

Degree ______________________________

Current occupation ______________________________

Professional or personal news (comments/suggestions):

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