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Indiana University Department of

Mathematics Alumni Newsletter

Vol. 7 College of Arts & Sciences Alumni Association Fall 1997

From the chair

Sines of success: Sum of multiple undertakings adds up to a plus for math department

We were most fortunate to hire an outstanding mathematical couple this year: Michael Larsen and Ayelet Lindenstrauss. They will join us in fall 1998. Associate Professor Larsen, a recipient of a Sloan Fellowship and a former winner of the Putnam competition, works in number theory. His appointment fills a void we have suffered from for a long time in this area. Assistant Professor Lindenstrauss is a talented topologist. We were fortunate to enjoy tremendous support from the dean of the College, Morton Lowengrub, in this regard. Indeed, although there was a hiring freeze in place throughout the College, we were originally allowed to recruit for one position only through the receipt of "one percent funds" — specially earmarked funds from tuition income for the purpose of increasing the number of faculty and decreasing class sizes. With the dean's help we were able to "trade in" a temporary position and hire both of these exceptionally talented young people.

Another substantial change will occur in December when Professor J. Stampfli retires after 30 years of distinguished service to this department. Professor Stampfli served as our chair from 1980–83 and is well-known in the mathematical community for his broad contributions to functional analysis and operator theory.

Professor William Ziemer received the IU Distinguished Faculty Award in 1996. Only one of these is awarded on this campus each year. This is a career award honoring his tremendous contributions in research, teaching, and service over his more than 30 years here. Professor Ziemer has written several celebrated books and has been a leader in the field of geometric measure theory (which he learned from his advisors at Brown University, H. Federer and W. Fleming) and its applications to regularity questions for solutions to nonlinear partial differential equations. He has also served as Chair of the department twice and is constantly sought after for advice on a wide spectrum of mathematical issues of both local and national significance.

Professor Jon Barwise is a logician who holds appointments in several College departments. His research group enjoys high international visibility and has an amazing number of projects going on simultaneously. Many of these are software related and are developed by Professor Barwise with student learning in mind (for example Hyperproof and Tarski's World). Moreover, Professor Barwise was instrumental in the development of the new IU degree program in cognitive science. In June of 1997, Professor Barwise was awarded (along with his collaborator J. Etchemendy of Stanford) the "Educom Medal" for the development of software teaching tools for logic studies. Tarski's World was cited as a particularly elegant contribution.

In November, the faculty gathered for a lecture presented by Manfred Denker and Edward Bruner, of Goettingen, in honor of Professor Madan Puri. A Festschrift on the occasion of Professor Puri's 65th birthday was presented to him. Professor Puri is now ranked fourth on the list of most prolific authors in Statistics.

The winner of the Rothrock Mathematics Teaching Award this year was Professor William Wheeler. Professor Wheeler joined our faculty in 1972 after completing his PhD in logic at Yale University. He has dedicated himself to instruction and is currently teaching two large sections of finite mathematics (M118) each semester. Along with Prof. D. Haile, he has developed a completely new version of M118, designed for liberal arts students and featuring widespread use of graphing calculators. He is devising a related special section of M118 for pre-business students which will use software such as Microsoft Excel, an extremely powerful spreadsheet (with which many of you are no doubt intimately familiar). Moreover he has constructed a massive set of notes which serves as a textbook, the royalties on which he donates to the department. He is a master of the use of technology and fully exploits the substantial high-tech devices in our new lecture halls (such as Rawles Hall 100).

We continue to offer a few sections of elementary calculus in a "reform" style each semester. The verdict is still out on the desirability of such an approach; there is considerable national debate on this issue. Experimental (="reform") versions of Business Calculus (M119) have also been given. Professor D. Maki's new interdisciplinary courses are in full swing, marking a new direction for us.

(continued on page 2)

From the chair

(continued from page 1)

Although we continue to have a healthy number of honors students, the number of our majors continues to decline, as is the case nationwide. Nevertheless, job opportunities for our graduates remain strong. Because of strong financial markets in recent years, the generous gifts of a number of benefactors have grown to the point where the department received $8,000 in investment income for 1996. This money was awarded as scholarships to a number of outstanding mathematics majors at the annual Mathematics Department Awards Ceremony in April. Presiding over all of this is Professor J. Brothers who will continue as director of undergraduate studies.

Another relevant local development is the establishment of the Center for Mathematics Education. Housed in Swain East and directed by Professor W. Frascella of IU South Bend, this center was created under the Indiana Mathematics Initiative with support from the National Science Foundation in the amount of $2 million over a four year period. K-12 teachers will benefit from seminars, workshops, and technical support and will receive coordination related to state educational reform efforts. The executive committee overseeing the implementation of these funds is composed of professors D. Maki, of our department, and F. Lester, mathematics education.

New and exciting areas of interest include financial mathematics (such as "derivatives" of Wall Street fame) and the study of wavelets. Professors J. Stampfli and V. Goodman will offer in spring 1998 an advanced undergraduate course in financial mathematics. This field of stochastic analysis has become very popular, especially in view of astonishing national economic growth and the paucity of academic jobs. Wavelets have replaced the discrete Fourier transform as the fastest and most efficient manner for manipulating immense amounts of data (as in data compression algorithms). There is an explosion of new literature on this topic, which emanates mostly from engineering schools. Professor A. Torchinsky now works in closely related areas.

Building on our strength in applied mathematics, we continue to prepare for our introduction of a master's degree program in industrial mathematics. Following the well-established prototypes at the Institute for Mathematics and Its Applications, in Minneapolis, and the University of Kaiserslautern, in Germany, we will structure these studies in the following manner. A student will have much more hands-on experience and exposure to actual scientific computation, statistics, numerical analysis, etc. (instead of a traditional theoretical background). The hope is to place students in non-academic positions; such jobs are still available, despite national decreases in defense spending. Furthermore, we are working to resurrect the traditional master's degree by completely changing the requirements.

Last spring, we convened a special committee to review our department from top to bottom. Every area is to be considered, including graduate and undergraduate education, issues of departmental governance, and procedures for election to committees and their structure. This was long overdue and will result in many improvements. Substantive changes have also been made to the election and term of the chair. Changes in the graduate curriculum have been suggested as well. (In 1996, we completely revamped our qualifying examination procedure.)

The renovation of Swain Hall East was complete in time for the beginning of the fall semester in August 1996. Our former home now houses numerous graduate students and retired faculty members, the offices of the *IU Mathematics Journal*, the Institute for Applied Mathematics and Scientific Computation, as well as several of Professor D. Maki's colleagues with whom he works on the implementation of the interdisciplinary courses related to his large NSF grant. We also have a number of extremely nice, technology-equipped classrooms there. The appearance of the interior is spectacular; you will hardly recognize our former abode!

We will use substantial space on the third floor of Swain Hall East to introduce a Mathematics Learning Resource Center. This center will incorporate leading-edge technology and will offer a comprehensive program to satisfy the out-of-class needs of all undergraduate students who take mathematics courses. We envision having class-specific areas for tutoring and a microcomputer laboratory equipped with the latest mathematical software. The center will be staffed primarily by mathematically talented undergraduates and will be open daily for substantial time periods. Despite two unsuccessful attempts at securing internal IU funds for this center, we began its operation on a small scale in May. Moreover, we have recently hired a very talented young person, Ms. Christine Oxley, whose duties include teaching and coordinating our college algebra course M025, as well as serving as our high school liaison.

In June 1996, the department hosted a most successful international meeting on applied mathematics, marking the 10th anniversary of the creation of our institute in this area. This three-day affair was very well attended and featured first-rate speakers from around the country (see page 4).

Professor Glenn Schober was a dearly loved member of this department. Many of you knew him through classes or, perhaps, from encounters around the department. After his untimely death in 1991, the department solicited contributions to a fund in his name, to which many of you generously contributed. I am pleased to announce that the first of these funds have been disbursed to a number of advanced graduate students, enabling them to attend relevant meetings and conferences in their areas. Glenn's family is thriving: Kristi has a great job in Indianapolis, Vicki is about to finish medical school at IU, and Madrean is now a partner in her medical firm.

The national job outlook for PhDs in mathematics continues to be dismal. However, I am pleased to report that each of our finishing students has successfully found academic employment this year. Applications to our graduate program continue to slowly decrease — evidently the word is out of the dire national situation. Professor Bruce Solomon has finished a three-year term as director of graduate studies. On behalf of the department, I would like to take this opportunity to thank him for a superb job. The next director of the graduate program will be Professor P. Sternberg.

As I enter my third and last year as chair, I am fully confident in declaring that our department is quite healthy in every aspect. Our research output is broader, deeper, and stronger than ever, and we are dynamically changing our approaches to instruction at all levels. Please stop by if you are in town, or let us hear from you through any medium of your choice.

— Bob Glassey

We want to hear from you!

Please use the form on page 6 to send us your class note. While you're at it, become a member of your alumni association today!

Barwise wins 1997 Educom Medal in philosophy

In the age of visualization, what chance does formal logic have to compete for the attention of students? Is logic even relevant to modern life, which seems to be swept along by forces such as the mindless computer and the "information revolution"?

"Logic is not playing games with symbols. Logic is the science of valid reasoning," says Jon Barwise, professor of philosophy, mathematics, and computer science on the Bloomington campus. Valid reasoning is important to everything from business and medicine to law and ethics.

However, introductory logic courses have traditionally treated the subject in an abstract way, with rules to be memorized and then applied to proving that a particular statement follows from some other statements. The important relationship between statements and the world they describe is seldom included. How can a teacher get across the principles of logic without losing all relationship to the world around us?

Barwise and his collaborator, John Etchemendy, professor of philosophy at Stanford University, came up with a solution to this and related problems by constructing three computer programs to help students learn logic. For their efforts, they won the 1997 Educom Medal in the category of philosophy.

Educom is a nonprofit consortium of colleges, universities, and other organizations, dedicated to the transformation of higher education through the application of information technologies. It has 600 institutional members and nearly 100 corporate associates. Winners of the Educom award receive a silver medal, a bronze statue, and a check for $2,500. The winners were honored in a special presentation at the association's annual meeting on Oct. 28-31 in Minneapolis.

"The creation of educational courseware is very important if higher education is to take advantage of the information revolution," Barwise says. "But this kind of creative work is not much encouraged, since it does not fit into any of the traditional research/teaching/service categories. I would hope that this award will make faculty think about the importance of this kind of activity and encourage some of them to get involved."

According to a statement by the consortium: "Educom considers this award to be the highest recognition of excellence and accomplishment on the part of individuals who are dedicated to improving the undergraduate learning experience through information technology."

Each year, Educom works with professional societies to identify individuals who have demonstrated that the integration and dissemination of information technology can help improve undergraduate teaching. This year, Educom worked with the American Philosophical Association, the American Political Science Association, the Geological Society of America, and the American Society of Mechanical Engineers.

The American Philosophical Association selected Barwise and Etchemendy as winners in the area of philosophy for their collaborative development of the educational computer programs Turing's World, Tarski's World, and Hyperproof, which introduce students to the principles of logic. Each package comes with a textbook and is designed for students to use outside of class. Barwise sees the courseware as "an intellectual erector set, where students can explore the topics and work problems. The computer helps them do it efficiently and allows them to do things that you just can't do with a pencil and paper."

The first of these software packages was Turing's World, developed in 1986 to teach basic concepts of logic and computation. Turing's World permits students to build and run complex Turing machines easily, which would be almost impossible using paper and pencil. The Turing machine, developed by the English logician Alan Turing in 1936, became the fundamental model for the computer. It remains one of the basic principles of computer science and beginning computer science courses. But it is difficult to demonstrate a powerful Turing machine on a blackboard, because most Turing machines require hundreds of steps to do a complex task. It is impractical to construct such a Turing machine during class or as a homework problem, so Barwise and Etchemendy decided to use the computer to teach about the computer. With Turing's World, a student can design a Turing machine, check to see whether it works, and find and correct any mistakes. The many tasks that would take hours with pencil and paper are done in moments by the computer.

Using the computer to teach the principles of computer science was so successful that Barwise and Etchemendy developed Tarski's World, which teaches the language of elementary logic. Logic is about the relationships between sentences and the world, so Barwise and Etchemendy depicted "worlds" in the form of diagrams. Tarski's World presents a variety of worlds in the form of pictures of blocks on a grid. Logical sentences refer to a diagram of a world, and students can see for themselves whether statements such as "The small cube is behind the large tetrahedron" are true or not. Because the material is presented on a computer, the students can manipulate the worlds, change the worlds, and construct their own worlds. They get far more practice than would be possible with conventional methods, because the computer does the tedious but simple parts quickly, checks the student's work, and shows the student any errors.

Hyperproof, the third software package developed by Barwise and Etchemendy, goes beyond the language of logic to teach the principles of valid reasoning. A student is presented with a block world similar to the ones in Tarski's World, but certain information is left out. For example, a student may be told that a large block is in the back row of a grid, but not be told the block's shape. The computer checks the student's proofs and points out any errors.

In Tarski's World and Hyperproof, the abstract concepts of logic become visible and concrete through the use of diagrams. Diagrams are hardly new, but traditionally they have been considered inferior to words as a form of representation. Barwise disagrees, maintaining that diagrams should be treated with the same logical rigor as sentences or mathematical symbols. "Reasoning does not depend on how you represent the information," he says. This has opened up a new area for research: developing theories of logic that account for information based on diagrams, as well as on words and symbols. As graphic information becomes increasingly important and widespread, such theories will have much to contribute.

Departmental news

Math teams up with other disciplines in curriculum

Professor Dan Maki's undergraduate interdisciplinary courses are well under way. Supported by a large NSF grant, Maki has initiated joint courses with several departments in the College of Arts and Sciences: Criminal Justice (Techniques of Data Analysis for Criminal Justice), Economics (Game Theory), and Speech and Hearing (Studies of Voice Recognition).

For the spring semester, he envisions a number of new and exciting opportunities, including joint courses in linguistics, sociology, political science, and biology. An immense amount of preparation is required for this undertaking, and we are fortunate to have the complete support of the administration in this regard.

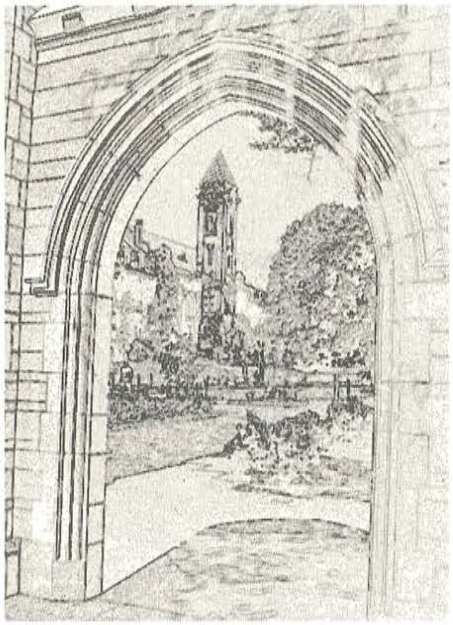
Cognitive science major takes off

This year marks the start of a new cognitive and information sciences major at IU. This interdisciplinary major draws on faculty from a number of disciplines, especially mathematics, computer science, psychology, and philosophy. Each student in the major takes four core courses, corresponding to the four fields mentioned, and then specializes in a particular branch of the subject.

One of the four core courses is Q250, Mathematical Models in the Cognitive and Information Sciences, designed by Jon Barwise and a visitor to the department this year, Roussanka Loukanova from Sofia University. The class will be taught for the first time this coming spring semester. It will treat elementary set theory, automata theory, formal grammars, logic, and topics from linear algebra used in parallel distributed processing models of cognition.

Math journal goes online

Like the department itself, the *Indiana University Mathematics Journal* is being reproduced for the World Wide Web. The online Journal offers a variety of items in addition to the hypertext version of the printed papers. The most popular offering may turn out to be the IUMJ CyberLounge, with its emphasis on visual mathematics and on math games that actually exist in our departmental lounge (such as



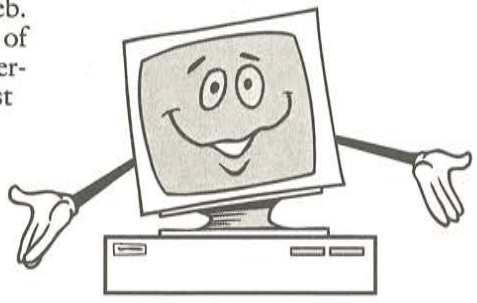
Rubik's cube, tangram, crossword puzzles). There is a page, called Faces at the IU Math Lounge, where you might find some of your favorite professors.

The online IUMJ has four "corners": Readers, Authors, CyberLounge, and Sales and Service. The papers themselves are readable at the Readers' Corner, which also reviews the latest technology that has an impact on Web browsing (for example Adobe's Acrobat). The Authors' Corner, while created to serve authors of the IUMJ, contains a section on TeX resources with emphasis on the use of TeX on the Web. The other two corners are self-explanatory.

This site owes its entire existence to TeX guru Elena Fraboschi, who is now a Java master as well. She has invested vast effort in this enterprise. Her faculty colleagues are most grateful (and most impressed, as we know you will be). Please visit this site at **www.iumj.indiana.edu**.

Swain East Tutoring Center helps students from afar

With the help of a Lilly Foundation grant for retention, the Department of Mathematics is inaugurating a tutoring center on the third floor of Swain Hall East this year. It is be staffed by talented undergraduates who tutor all elementary mathematics courses. We envision having tables for specific courses, where students can find help on homework and other assignments.



The center, when completed, will be open for substantial time periods each day and part of every weekend. A bank of 10 computers will be available, along with appropriate instructional software. Dean Morton Lowengrub has supported the introduction of such a center, calling to our attention the prototype at Oklahoma State University.

Last summer, the center began operation on a small scale, and quickly became exceptionally popular among the students. Eventually a video library will also be introduced, where students could view VCR tapes containing lectures on particular topics.

National Applied Mathematics meets in Bloomington

During the period June 1-3, the Department of Mathematics at Indiana University hosted a national meeting on applied mathematics. The event marked the 10th anniversary of the creation of IU's Institute for Scientific Computing and Applied Mathematics, directed by Professor Roger Temam. This well-attended meeting was fortunate to have in attendance these internationally famous mathematicians/scientists:

Tai-Ping Liu, Stanford University; M. Ghil, UCLA; G. Papanicolaou, Stanford University; W. Strauss, Brown University; C. Jones, Brown University; M. Gunzburger, Iowa State University; R. Samelson, Woods Hole Oceanographic Institute; J. Bona, University of Texas; H. Kaper, Argonne National Lab; and J. Serrin, University of Minnesota. Professor Serrin, a distinguished alumnus of our department, is a member of the National Academy of Sciences.

Among the topics discussed were hyperbolic conservation laws and related numerical methods of approximation, climate problems, stability of plasmas, solitary waves, superconductivity, and the Ginzburg Landau equations.

The department and the institute are pleased to acknowledge financial support from the College of Arts and Sciences and the Office of Research and the University Graduate School at IU, the National Science Foundation and the Institute for Mathematics and Its applications at the University of Minnesota.

The Institute for Scientific Computing and Applied Mathematics at IU holds a weekly seminar, sponsors a preprint series, and offers advanced computational facilities to all of its various members.

Alumni news

Before 1960

Paul M. Pepper, BA'31, MA'32, retired in 1974 as professor emeritus of industrial and systems engineering at Ohio State, but is still doing research using the OSU mainframe computer.

Monroe County honored **Morris E. Binkley**, BA'39, for 20 years of service to the community by naming a newly completed youth shelter in his homor. Binkley and his wife, Alice Lloyd Binkley, BA'37, have been married for 60 years and all three of their children are IU graduates.

Paul D. Oyer, MA'49, BA'48, is a real estate broker for Re/Max of Santa Fe, N.M.

1960–69

Donald A. Buckeye, MA'61, PhD'68, professor of mathematics at Eastern Michigan University, Ypsilanti, received the Michigan Association of Governing Boards 1997 Distinguished Faculty Award.

John A. Beachy, MA'65, PhD'67, professor of mathematical sciences at Northern Illinois University, De Kalb, was named as one of NIU's 1997 Presidential Teaching Professors — NIU's highest teaching honor.

Stephen D. Bailey, BA'67, is a business analyst for the Kaiser Foundation Health Plan in Oakland, Calif.

1970–79

Bette Warren, PhD'76, professor of mathematics at Eastern Michigan University, Ypsilanti, received the Michigan Association of Governing Boards 1997 Distinguished Faculty Award.

Marcus T. Simon, BA'77, recently published his book *Your Intuition is Wrong!*, which was inspired by mathematics classes at IU.

George Daniel Callon, MA'79, is the seven-year chair of the mathematical sciences department, which has received numerous awards and grants, at Franklin College. He and his wife, Debbie, have two children, Emily, 3, and Nathan, 1.

1980–89

Marshall Jay Grossack, BA'83, is the Southern regional actuary for the St. Paul Insurance Co. and was awarded the designation "chartered property casualty underwriter" by the American Institute for CPCU.

Gina Marie (Borgioli) Hieb, BA'87, is teaching mathematics and Spanish to sixth through eighth graders, coaching the Santa Lucia MathCounts team, and writing math curricula for *California Agriculture in the Classroom*, in Cambria, Calif.

1990–Present

Denise Ann Smith, BA'91, is a planning assistant for American Express Financial Advisors Inc.

Susan Switzer Black, BS'91, is a mathematical statistician with the U.S. Bureau of Labor Statistics in Washington, D.C.

Kirsten B. Stewart, BA'92, graduated from the University of Minnesota Law School in 1995. She is an associate attorney with Doherty Rumble & Butler in St. Paul, Minn.

Mary-Lynn Niland, BA'93, graduated from Ohio State Medical School in June 1997. She plans to practice pediatrics.

Wherever you are, you can find IU friends, classmates

Whatever happened to Bill West, that guy who made us all laugh in physics lab?"

If you've ever wondered about a former IU classmate in the years since "real life" took you on your separate paths, your chances of finding him or her just increased enormously. Alumni can now locate and communicate with each other over the Internet, thanks to Indiana University's Alumni Network.

In February, Indiana University launched the Alumni Network, an online directory that alumni can view on the World Wide Web. Alumni can access the entire network of Indiana University's nearly 400,000 alumni by subscription only, but there is no charge for the service. To subscribe, alumni agree to make their public information available to others using the network. Public information includes name, home address, work address, degree date, spouse name, e-mail address, and home page URL. Phone numbers are not made available. Network data comes from the IUAA alumni records system.

All IU alumni and friends may access the online system to look up their own records and amend or change personal information. However, only subscribers may search the network for other alumni — either individually or in groups — by name, school, degree, graduation date, and current location. If a search finds another subscriber, the entire public record for that individual will be displayed. The only information provided for a nonsubscriber will be name, degree, and graduation date. Subscribers may contact each other directly from the Alumni Network via their e-mail or home page links.

The idea for the network was developed by alumni relations offices within several IU schools in response to requests from their alumni. The completed project is the result of a cooperative effort by Indiana University, the IU Alumni Association, and the Alumni/Foundation Information Systems.

The address for the Alumni Network is **www.alumnet.indiana.edu**. Alumni can also access it via the IUAA web site at **www.indiana.edu/-alumni**.

The Indiana Alumni Network — a service whose time has come:

- It's free!
- Public information only!
- It's secure!
- No telephone numbers are listed!
- It's fast!
- Subscribe and unsubscribe any time you wish!

Mathematics Alumni Newsletter

This newsletter is published annually by the Indiana University Alumni Association in cooperation with the Department of Mathematics and the College of Arts and Sciences Alumni Association, to encourage alumni interest in and support for Indiana University. For membership or activities information, call (800) 824-3044 or e-mail iualumni@indiana.edu.

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