department NEWS

faculty NEWS

Wlodek Bryc gave a plenary talk at the ninth Conference on Probability in Bedlewo, Poland last May.

Jim Deddens visited the IRAS (Institute for Risk Assessment Services) at the University of Utrecht in the Netherlands this fall. In Cincinnati he continues to collaborate with researchers at NIOSH (National Institute of Occupational Safety and Health). One of his current projects is an exposure assessment of flood-damaged homes in greater New Orleans.

Jintai Ding is on sabbatical this year at the University of Dramstadt in Germany, where his focus is post-quantum public key cryptography. He is one of the editors of the new journal, Advances of Mathematics in Communications. His book "Multivariate Public Key Cryptosystems," coauthored by Dieter Schmidt and Jason Gower, was recently published by Springer.

Scott Dumas was on sabbatical last year at DESY-Hamburg (a particle-accelerator lab in Germany) and the University of New Mexico. He also visited the University of Warwick, The University of Paris and the Bureau des Longitudes. In June 2006 he gave an invited talk at the International Conference on Nonlinear and Stochastic Dynamics in Sichuan, China. **Dumas, Bingyu Zhang,** and **Ning Zhong** are co-conveners of a Taft Research Seminar on Analysis and Control of Non-linear Dispersive Wave Equations during 2006-2007. They will be hosting a number of research visitors and speakers on this topic.

Don French and Steve Kleene (of the College of Medicine) won one of the University Research Council's new Interdisciplinary Grants for their project, "Modeling of Transduction in Olfactory Cilia."

Dave Herron and **David Minda** and several graduate students traveled to India last December-January to participate in the International Workshop on Quasiconformal Mappings and their Applications in Madras and the International Conference on Geometric Function Theory, Special Functions and Applications in Pondicherry.

Paul Horn is an adviser to the Clinical Laboratory Standards Institute Committee on Reference Intervals *(see article)*.

Victor Kaftal has been working with Debashis Pal in the Department of Economics, studying the effect of price discrimination on social welfare.

Xiaodong Lin was Visiting Scientist at the National Institute of Statistical Sciences during February-March 2006. For summer 2006 he received a grant from the University Research Council to work on "Privacy Preserving Approaches for Integrating Health Related Databases" and a Faculty Research in China Grant from UC International. He organized a two-day workshop on Brain Imaging Research last April.

Magda Peligrad was awarded a new two-year grant from the National Security Agency for her research in probability theory. She spent a month and a half this summer at the University of Paris VI. She recently joined the editorial board of the Journal of Mathematical Analysis and Applications as associate editor.

Mihaela Poplicher is principal investigator on a grant awarded by the Ohio Department of Education for the professional development of teachers.

Dan Ralescu attended IPMU 2006 (Information Processing and Management of Uncertainty) in Paris, where he organized a special session and coauthored several papers. He was visiting professor at Beijing University of Technology and Tokyo Institute of Technology during summer 2005 and at the University of Oviedo (Spain) and Tokyo University of Science last fall. Dan is also the recipient of a Faculty Research in China Grant.

Nageswari Shanmugalinam gave a series of lectures at the Indian Institute of Technology in August.

Siva Sivaganesan is co-principal investigator on a National Institutes of Health grant to Children's Hospital for "Bayesian Modeling of Adolescent Maturity."

Seongho Song lectured at Pusan National University (Korea) last December, and presented a paper at the Eighth World Meeting on Bayesian Statistics in Alicante, Spain, last June.

Srdjan Stojanovic gave several presentations in the past year, including addresses last August at the Fourth World Congress of Bachelier Finance Society in Tokyo, Japan, and the International Conference on Mathematical Finance and Related Topics in Kanazawa, Japan. Last fall he presented a short course on "Stochastic Volatility and Risk Premium" for the Global Association of Risk Professionals, New York.

Gary Weiss gave a plenary lecture at the 21st International Conference on Operator Theory in Timisoara, Romania this past July, and three plenary lectures in the workshop on the Kadison-Singer Problem at the American Institute of Mathematics in September.

Shuang Zhang was the main speaker at the International Conference on Operator Algebras and Operator Theory, held in Xian, China, in July.

Bingyu Zhang had a productive year on sabbatical in 2005-2006, during which he was a visiting professor at the University of Illinois at Chicago. In addition, Bingyu has run two marathon races this year: the eighth Cincinnati Flying Pig Marathon on May 7 and the 27th Columbus Marathon on Oct. 15. He is now only 3 minutes and 26 seconds short of his goal: qualifying for the Boston Marathon.

Ning Zhong was on sabbatical last year. During part of this time she was visiting professor at FernUniversität in Germany. She also visited the University of Hagen in Germany and Beijing, China. In February she organized the Workshop on Computable Analysis that was held at UC.

student NEWS

Undergraduate Student News

The department graduated seven math majors this year. Undergraduate award winners for 2005-2006 include **Mads Almassalkhi** (Hancock Scholarship, Kieval Scholarship), **David Arnold** (Feld Scholarship, Linder Book Award), **Steve Bertke** (Kieval Scholarship), **Donald Brown** (A&S Math Scholarship, Kieval Scholarship), **Dan Carney** (Jeanne Gulden Scholarship, Kieval Scholarship), **Ryan Davis** (Kieval Scholarship), **Douglas Hogue** (Kieval Scholarship), **Rob Meyer** (Hancock Scholarship), **Luyao Shen** (Kieval Scholarship), and **Emily Wermer** (Buck Scholarship). **David Arnold** did original research with Visiting Professor Zair Ibragimov last year. He presented his work, "Quasisymmetry of the Natural Power Functions," at a conference in Atlanta. In other work, he invented a secure method of cryptography using a deck of cards and a big permutation group, which he presented at last spring's undergraduate seminar. His talk was titled "Classical Cryptography in the Digital Age." David is captaining UC's Putnam Exam team this fall.

Graduate Student News

Six students graduated with the MS degree in mathematical sciences, and nine students earned our new MS degree in Statistics *(see Hypotenews)*. **Dorjsuren Badamdorj** completed his doctoral degree under the direction of Professor Don French. **Chris Camfield** and **Bogdan Visinescu** won Taft Advanced Graduate Fellowships for 2006-2007. **John Wagner** was awarded the Henry Laws Fellowship for 2006-2007. **John Wagner** and fellow PhD student **Zeynep Teymuroglu** had University Research Council Graduate Fellowships to support their research last summer. Our Outstanding Students for 2005-2006 were: **Mauricio Osorio** (First Year), **John Baena** and **David Freeman** (Second Year), and **Lili Ding** (Finishing Master's Student). **Bogdan Visinescu** was named Outstanding Graduate Assistant. **Jhules Clark** was a Yates Fellow for 2005-2006.

alumni NEWS

Steven Magas (BA 1979, BS 1979) has been practicing law since his 1982 graduation from law school. Steve is currently a trial lawyer with Smith, Rolfes & Skavdahl, a 16-lawyer firm with offices in Cincinnati and Columbus focusing on insurance defense and bad faith litigation. Steve's "Bike Law" practice, his niche in the two-wheeled legal world of representing injured bicycle and motorcycle operators, continues to grow and has been recognized nationally in Lawyer's Weekly USA, and locally in Cincinnati Magazine, the Cincinnati Post and Cincy Business magazine. Steve continues to play music locally, performing regularly with Saffire Express, a popular classic rock band featured at many of Cincinnati's festivals and parties.

Richard Spires (BS 1984) was appointed Chief Information Officer for the Internal Revenue Service this fall. Spires had been the agency's associate chief information officer for Applications Development. In that position, he had oversight of the projects within the IRS's Business Systems Modernization Program that worked to update core tax processing systems as well as develop Internet applications. In his new position, he will be responsible for all aspects of the IRS's IT systems. He has been with the IRS since 2004.

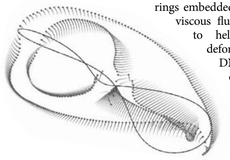
Cheryl (Niermann) Lesaint (BA 2001) is completing graduate study at The Ohio State University, where she will receive her PhD in Statistics in December 2006. This summer she was selected as the first Statistical Summer Fellow at SAS Institute in Cary, N.C.

Please use the included form to include your latest news in the next issue of The Right Angle and other McMicken College publications.

sookkyung lim BRINGS NEW EXPERTISE TO UC

After spending three years as postdoctoral visitor at the Mathematical Biosciences Institute (MBI) at The Ohio State University in Columbus, Sookkyung Lim joined the department this fall as an assistant professor. She obtained her PhD in Applied Mathematics from the Courant Institute in New York University in 2003 under the mathematician/physiologist Charles Peskin, who is well known for his mathematical models of the heart. Lim's research interests are mathematical modeling, scientific computing and numerical analysis for biological and medical problems, especially simulations of biological fluids. Goals of her research projects include understanding the thoracic pump mechanism during cardiopulmonary resuscitation (CPR) and blood circulation in the human embryo, investigating cardiovascular diseases such as aortic aneurysms using computational experiments, and studying the behavior of bacterial flagellar filament and dynamics of DNA conformation with twist and bend in fluid. While at the MBI she collaborated with applied mathematician Avner Friedman and physician Subha Raman.

Lim's study of bacterial flagella was motivated by the question, how do bacteria move? Many species of bacteria swim in an aqueous environment by means of rotating flagella. The flagellum is a helical filament driven by a rotary motor at the cell surface. In E.coli, the rotation of the flagellar motor has the ability to switch direction so that both clockwise (CW) and counterclockwise (CCW) rotation of the flagellum may occur. When the motors turn CCW (as viewed looking towards the cell), the filaments rotate parallel in a concerted bundle that pushes the cell body steadily forward, and the cell is said to "run". During a run, all of the motors have to rotate CCW. When one or more of the flagellar motors abruptly change direction of rotation from CCW to CW, the flagellar filaments work independently, and the cell body moves erratically with little net displacement; the cell is then said to "tumble." The effect of tumbling is to randomize the direction of the next run. These two modes alternate. The cell runs and tumbles, executing a three-dimensional random walk. Although the ultimate goal is to simulate the two modes of motility (running and tumbling) of E.coli, Lim and Peskin began with a simple question which concerns the whirling instability of a rotating elastic filament. They created a 3-D computational model of an elastic and neutrally bouyant filament having micro-architecture motivated by bacterial flagella. They use the Immersed Boundary (IB) method to study the interaction between the elastic filament and the surrounding viscous fluid as governed by the incompressible Navier-Stokes equations at a very low but nonzero Reynolds number, and discovered interesting and unexpected properties of "overwhirling" motions of such filaments. (For movies of their simulations see http://www.math.nyu.edu/aml/sook.html.)



Lim and Peskin have also studied twisted elastic rings embedded in an incompressible viscous fluid as a simple model to help them understand deformations of circular DNA molecules that occur many prokaryotic and viral DNAs and also occur in the mitrochondria of eukaryotic cells.

clarence lubin MEMORIAL FUND ESTABLISHED

Richard Stevens (MA 1954) and his wife, **Jeanne**, recently honored the memory of Dick's former friend and colleague, Clarence Lubin, with an unrestricted charitable gift to establish the Clarence Lubin Memorial Fund. Dick is Professor Emeritus of Architecture, having retired in 1990 from the College of Design, Architecture, Art, and Planning (DAAP), where he taught mathematics for almost 30 years.

Prior to coming to UC, Dick Stevens earned his bachelor's degree in mathematics from Kenyon College, and served as a naval officer aboard the USS St. Louis in the South Pacific during WWII. At the end of the war, he decided to continue his education with the help of the GI Bill, and enrolled at the University of Cincinnati in mechanical engineering, with the intention of helping modernize the foundry industry. He co-oped at the Cincinnati Milling Machine Company (now, Cincinnati Milacron), completing his degree in 1949. In those days, the College of Engineering had its own mathematics department and Dick was offered the opportunity to teach there part-time. His interest in an engineering career had waned, so he accepted this offer, and enrolled as a graduate student in mathematics at the same time, completing his MA in mathematics in 1954. He was poised to continue working toward a doctorate in mathematics under the direction of I. A. Barnett. However, after being awakened at 2 a.m. one morning by a phone call from Barnett, who apparently had been working on a problem and called to discuss it, Dick realized he did not have the temperament to pursue mathematics research. Instead, he joined the DAAP faculty to teach engineering mathematics to architecture students.

Dick Stevens relishes memories of his UC teachers and colleagues, including C. R. Moore, Louis Brand, Chemistry professor Earl Frederick Farnau (who hosted lunch time "open house" at the large table in his office), Meyer Salkover, Fred Rogers, David Lipsich and his good friend Clarence Lubin. The Stevens' gift will benefit the Department of Mathematical Sciences, to be used at the discretion of the department head.

In the accompanying paragraphs, we've collected some of Dick's memories of Clarence Lubin, together with information provided by the UC Archives and others, including Roger Chalkley and engineering professor Ron Huston.

THE RIGHT ANGLE is produced by the Department of Mathematical Sciences McMicken College of Arts and Sciences University of Cincinnati PO Box 210025 Cincinnati, OH 45221-0025

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Comments and suggestions are welcome.

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Lubin's 1923 graduation photo

Lubin in 1963

Clarence Isador Lubin was born in Albany, Ga., in 1900, attended Hughes High School in Cincinnati, and then earned a degree in Chemical Engineering from UC in 1923. As an undergraduate, he played football for UC and was a member of the Sigma Alpha Mu fraternity. Lubin was a contemporary of fellow UC engineering student Charles Vernon Theis, who went on to become a noted hydrologist and who credits Lubin's assistance in working out the equation in hydrology that carries Theis's name. After graduation, Lubin continued his studies at Harvard University and earned a doctorate in mathematics in 1929. Lubin's career on the faculty of the College of Engineering officially dates from 1923 until 1971. During WWII he worked on the Manhattan Project with a group of mathematicians assigned to help design a uranium enrichment plant at Oak Ridge, Tennessee.

Lubin's former colleagues remember him as a strong mathematician with a good sense of humor, but apparently students were frightened of him because of his outwardly gruff and unfriendly demeanor and severe grading policies (he often gave zeros on quizzes). A bachelor until age 54, Lubin had several close friends on the faculty at UC, including Dick Stevens, chemical engineering professor Frederick Farnau and fellow math professor (in the College of Engineering) Harry Miller, with whom he enjoyed hiking and camping in various remote areas of Canada. He was a horse race enthusiast who owned a few racehorses, but he is said to have lost money at it (even though he tried to use mathematics to improve his odds at the racetrack). He was also an amateur potter who produced pots while repeating a favorite Evening College class in pottery for 25 years. Clarence Lubin died in 1989.

Thanks to all of our donors

The department acknowledges its deepest gratitude to alumni, staff, faculty and friends for their continued support. With your gifts we fund scholarships, attract and retain the finest faculty and enrich the learning experience of our graduate and undergraduate students.

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F O L D H E R E

from the EDITOR

I hope you've found this issue informative and as fun to read as it was to collect the news and stories. Please share your news and stories with us using this form or by e-mail to RightAngle@math.uc.edu.

Joanna Mitro

Name _____
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Professional or personal news (comments/suggestions):

building BETTER REFERENCE INTERVALS

When your physician orders a blood test, the report that comes back lists the levels of various chemicals in your blood and displays a "normal" range that hopefully your values fall into. This "normal range" is what is known to statisticians and clinical chemists as a "reference interval." When combined with other clinical data, reference intervals help physicians distinguish healthy from diseased states. Faculty member and statistician Paul Horn is an expert on reference intervals. He is an advisor to the Clinical Laboratory Standards Institute (CLSI) Committee on Reference Intervals, which is currently revising the document that sets standards for how laboratories determine reference intervals all over the world. Horn has developed methods for constructing reference intervals that are robust, meaning they are sensitive to outliers in the data, and that work well even when based on relatively small samples.

The upper and lower endpoints of a reference interval are estimates of the upper and lower 2.5 percentiles of the distribution of reference values (i.e., measurements from healthy individuals), based on data (observations from a sample), and therefore the determination of reference intervals is a statistical problem. Specifically, the traditional reference interval is a 95% *prediction interval*, constructed so that 95% of the time, a future observation from the healthy population will lie in the interval. Thus, if a patient's reading falls outside of the reference range, we might be witnessing an unusual but healthy state. However, the chance of this is low (5%), so this result warns physicians to consider the possibility that the patient's reading is abnormal because of disease. In order to estimate the endpoints with sufficient precision, the CLSI recommends a minimum sample size of 120 observations.

Unfortunately, obtaining 120 observations from a healthy population is not always feasible. Horn has devised an approach for estimating quantiles from smaller samples without making unreasonable assumptions or inappropriate calculations, using robust methods. One obstacle is the fact that the distribution of the values of chemical analytes is usually skewed to the right. The typical solution is to transform the data to achieve symmetry, compute the reference interval, then back-transform to the original scale. Such a transformation works well for the lower endpoint, but Horn discovered that the estimate of the upper endpoint was unduly influenced by the transformation, especially if the underlying skewness was extreme. To avoid this problem, Horn creates a pseudo-sample by combining all data points greater than the sample median with corresponding pseudo-values that are equidistant and less than the median. For example, if $n = 20$, and the data are ordered: $x_1 < ... < x_{20}$, the symmetric pseudo-sample is, $2M - x_{20} < 2M - x_{19} < ... < 2M - x_{11}$ $(= x_{10}) < x_{11} < ... < x_{20}$, where M is the median. (In this case, the median is located half-way between x_{10} and x_{11}, i.e, $M = (x_{10} + x_{11})/2$.) From this symmetrized sample, the appropriate symmetric prediction interval is computed, and its upper endpoint is used as the upper limit (quantile) on the reference interval.

It has been demonstrated that Horn's reference intervals do a reasonable job for sample sizes as small as 10, though at least 20 observations are recommended. He is also able to construct 90% confidence intervals for the endpoints of these intervals. All of these methods are described in the book, "Reference Interval: A User's Guide," by Paul S. Horn and Amadeo J. Pesce. The book contains a CD-ROM with SAS® and Excel macros to do the computations. Presently Horn is working on nonparametric versions of these intervals in addition to the important pooling question: Under what conditions can we pool two samples of size 60, say, so as to achieve the required sample of size 120 for nonparametric estimation?

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McMICKEN COLLEGE OF ARTS AND SCIENCES
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UNIVERSITY OF Cincinnati

from the HEAD

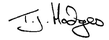
Dear Alumni and Friends,

This year saw the departure of one of the department's most visible and popular faculty members, Professor Chuck Groetsch. Chuck's outstanding contributions as teacher, mentor, department head and interim dean have been appreciated by all who worked or studied with him. Chuck moves on to be Dean of the College of Science at the Citadel. He takes with him our best wishes for the future.

We are delighted to welcome a new faculty member, Assistant Professor Sookkyung Lim, who joins us from the Mathematical Biosciences Institute in Columbus. You can read more about Sook's exciting research in mathematical biology inside.

This year, the Ohio Board of Regents approved our request for a new graduate program, a Master of Science in Statistics. This program will build on the success of the statistics track of the MS in Mathematical Science to provide students with the training they need to move on to careers in applied statistics in both the public and private sector.

Finally, I'd like to personally thank our many friends who continue to support the department with donations big and small.



Tim Hodges

goodbye, DR. GROETSCH

by Donald French, Ken Meyer and David Minda

After 35 years of exceptional service at UC, Professor Charles (Chuck) Groetsch accepted the position of Dean of the School of Science and Mathematics at The Citadel (the Military College of South Carolina) in Charleston, S.C. Chuck and his wife, Sandy, are fond of Charleston and have a vacation home in the area, so the Citadel deanship offered an opportunity Chuck could not resist.

Chuck has been one of the most active, productive, and popular members of the department. He was math department chair (1985-1991) and interim Dean of the College of Arts & Sciences (2000-2001). As chair, he hired nine new faculty. His research, scholarship and expository skills are internationally recognized. He has written 10 books and over 80 papers and serves on the editorial board of six different journals. His work has been honored in a number of ways: He received the Mathematical Association of America's George Pólya Award for expository excellence and the McMicken Dean's Award for Research and is a Fellow of the Graduate School at UC. Chuck is also known for his engaging and outgoing personality. Often a focal point of lunchtime conversation, Chuck would regale faculty, staff and students with endless stories of his childhood in New Orleans and his favorite TV show, "Seinfeld," or provide witty commentary on current events.

The bulk of Chuck's research, nearly 70 papers, focuses on integral equations and inverse problems, and connections between these areas. Mathematicians are usually confronted with a well-posed direct problem, e.g., given initial conditions or parameters for a model, compute the corresponding solution. Direct problems are usually well-posed, meaning there is a unique solution and it is relatively insensitive to small changes in input data. In contrast, in an inverse problem, one tries to deduce initial conditions or parameters from observation of the solution (data). Integral equations and inverse problems are rarely well-posed and are thus much more difficult. To Chuck, this makes them more interesting.

In his popular book, "Inverse Problems in the Mathematical Sciences" (Vieweg, Wiesbaden, 1993), Groetsch points out that inverse problems are extremely common; they arise in such diverse areas as medical imaging, geology, hydraulics and immunology. Chuck contributed to both the solution and analysis of these problems and a thorough identification of their range of application.

The other major component of Chuck's research has been the development of a theoretical framework for integral equations, in particular Fredholm integral equations of the first kind. Like inverse problems, these types of problems tend to be ill-posed. Much of Chuck's research in this area deals with Tikhonov regularization; this technique develops a new integral equation problem that is well-posed and has a solution that approximates the original one.

In recent years Chuck's scholarly interests have moved in the direction of historical mathematics. Twice a year he meets with a group of about a dozen individuals, primarily mathematicians from the surrounding area (Northern Kentucky University, Xavier University, and Miami University) to discuss and read original source materials in mathematics. This group is called the Ohio River Early Sources in Mathematics Exposition (ORESME) Reading Group. The acronym is the name of the French mathematician and philosopher Nicole Oresme (1323-1382). The reading group also ties in with Chuck's interest in recasting early works in terms of modern mathematics. In recent years Chuck has considered 16th century ballistics and other historical investigations concerning the trajectories of projectiles.

In May, Chuck was given an appropriate send-off by the department and the college. The reception for his departure was attended by colleagues from across the campus, a mark of his many contributions to the university. To help him remember his long career at UC, his colleagues presented him with serious gifts (an inscribed pen, an antique abacus and a "Rumpole of the Bailey" DVD) as well as less serious gifts, including a hard-to-come-by copy of a calculus textbook Chuck agreed to coauthor but that never sold a single copy. Chuck was also reminded of the large number of Chuck Bucks still unredeemed. (Every colleague who taught a class for him was given a Chuck Buck as a promise to return the favor.) To clear his debts, Chuck will have to return to UC to teach classes for colleagues who hold these Chuck Bucks. Until then, Chuck will be missed by his colleagues.

the HYPOTENEWS

New Master's Degree in Statistics

For more than 20 years the department's concentration in Statistics (a track available in the Master of Science program) existed as a formal, but unofficial, degree program that produced between five and 20 graduates per year. The practical coursework, expert training in advanced statistical software such as SAS and SPlus, and unique job and internship opportunities available in the Cincinnati area helped make this concentration attractive to students. In 2005, the department requested permission to offer a separate Master of Science Degree in Statistics, and last January the Ohio Board of Regents approved the degree. This summer the first nine students graduated with this degree.

The new degree is based on the former concentration, and gives this program more visibility among prospective students and heightened recognition among prospective employers. Graduates of this program are prepared to work as statisticians in industry or government or to enter a PhD program in either Statistics or Biostatistics. Graduates are trained to design statistical studies, perform sample size calculations, analyze study data, assess statistical significance and convey/discuss their conclusions. All students participate in the Statistical Consulting course, working on real-world projects and making oral presentations of results.