Russell Betts  
Dean, IIT College of Science

Last year, our newsletter focused on the theme and the science: The Raw Fuel of Innovation® and the thesis that basic science advances are essential to the innovations that drive our economy and improve our lives.

IIT has always had a clear commitment to relevance, but it might be thought that this sentiment would be somewhat muted in the College of Science—home as it is to research in basic science and scholarship driven in large part by simple curiosity. It is true that the College’s mission is to train the next generation of our faculty and Ph.D. students pursue the fundamental, perhaps even the esoteric: neutrino physics, graph theory, genetics, and algorithms, for example. Nevertheless, we also have a keen eye on the application of basic knowledge and skills. Examples of such innovations form the theme of this year’s newsletter. Among other examples, we highlight:

- Chemistry Assistant Professor Adam Hock has developed a new catalyst which will enhance the industrial production yield of propene.
- Biology Professor Jaling Xiang has learned that a powerful tumor suppressor can be generated in some colon cancer cells.
- Applied Mathematics Professor Tomasz Bielecki has co-authored a new book on counterparty risk, a key issue in both past and current debt crises.
- Computer Science Distinguished Professor Xian-He Sun has identified 30 percent of the College of Science faculty while keeping the total number more or less constant. The college is getting younger and better! Not that the senior members of our faculty have been asleep. They have received major external funding awards in an increasingly competitive climate, and the overall significance of their work is recognized by a growing number of elected fellows in professional societies and invitations to speak and give advice at national and international venues.

Thus we see that the investments of the past several years are paying off, and we can look forward to increasing visibility and reputation for the college and its programs. To realize this potential, we must provide the facilities and space needed by our faculty. Like many institutions which experienced major growth and construction during the 1960s, IIT is a deteriorated infrastructure which now must be replaced and renovated. Fortunately, [cont’d on p. 19]
An IIT biology professor has learned that a powerful tumor suppressor found only in mutated cells can be generated in some colon cancer cells. Certain colon tumors with genetic microsatellite instability often lose tumor suppressor BAX due to microsatellite mutation. But BAX∆2, a BAX alternative isoform, can be “salvaged” from the mutated gene, recently learned. BAX∆2-positive cells are selectively sensitive to chemotherapeutics through an unconventional signaling pathway. This means that colorectal tumors thought to have been “BAX-negative” may instead be able to generate the BAX∆2 that will be beneficial for chemotherapeutic treatment.

Xiang and her team reported their findings in the journal Molecular Cancer Research. Their work is supported by the National Institutes of Health (NIH).

How can science fuel the innovation that drives industry and our economy? A good example is a new catalyst invented by an IIT chemist to transform propane to propene.

Current catalysts produce methane and ethylene through unwanted side effects. Separating the desired products adds to energy demand and cost. Adam Hock, assistant professor of chemistry at IIT and assistant scientist at Argonne National Laboratory (ANL), with teammates at ANL and Northwestern University, has developed a new silica supported single-site Zn(II) catalyst that is more selective for the desired propane to propene transformation, reducing waste, increasing efficiency, and potentially lowering production costs. Hock and his team used isolated zinc atoms rather than the particles of metal typically used as the catalyst. Because the zinc atoms are isolated, they have a small number of available reaction pathways to follow, and thus they are very selective for the removal of hydrogen from the short-chain alkane propane to yield propene and hydrogen.

Propene, with worldwide sales of $90 billion in 2008, is a crucial product for the petrochemical industry, used in the manufacture of plastics, packaging and other applications. Propane dehydrogenation for propene production is used in the United States and globally, particularly in the Middle East, and many plants are currently being built.

“Chemists have long sought to transform one substance into another; however, chemical transformations often result in mixtures of products,” said Hock. “This is especially true for difficult reactions that require the input of large amounts of energy because excess energy can cause side or subsequent reactions. Therefore, very selective catalysts for difficult reactions are highly sought-after.”

Added Russell Betts, dean of the College of Science, “This is an example of how profound understanding of basic science can lead directly to innovation in industry and in the marketplace.”

The new catalyst was described in an article published in ACS Catalysis and is the subject of a patent application by IIT and ANL. The ACS Catalysis article is the first in a series that will explore these types of catalysts.
An Introduction to Stochastic Dynamics is an accessible summary for understanding dynamical systems under random influences, important for everything from forecasting the weather to anticipating earthquakes to avoiding financial meltdowns.

MITIGATING COUNTERPARTY RISK

A new book by Tomasz R. Bielecki, professor of applied mathematics and director of the Master’s in Mathematical Finance program, offers a fresh take on mitigation of counterparty risk, a key problem of the 2008 global credit crisis and current European sovereign-debt crisis and consequently an increasing concern worldwide.

Counterparty Risk and Funding: A Tale of Two Puzzles (Chapman and Hall/CRC Financial Mathematics Series), co-authored by Stéphane Crépey and Damiano Brigo, offers a ground-up approach for understanding the risks associated with non-promise of cash flows due to the default by a party in an over the counter derivative transaction. It was written for researchers, graduate students, financial quant, managers in banks, credit valuation adjustment (CVA) desks, and members of supervisory bodies.

"Understanding the subtle interconnections between credit and funding is key to a modern valuation of derivatives," said Fabio Mercurio, head of derivatives research, Bloomberg LP. "This timely contribution, written by world-class academics who are also well-recognized experts in the field, offers a rigorous and comprehensive analysis of the main theories underpinning the new valuation principles."

Bielecki offers a fresh take on mitigation of counterparty risk, a key problem of the 2008 global credit crisis and consequently an increasing concern worldwide.

NEW CONCURRENT AVERAGE MEMORY ACCESS TIME (C-AMAT) MODEL MAY REDUCE DATA ACCESS DELAY

The most profound research is not the design of the fastest algorithm for a given problem; it is revealing a fundamental computing property so hundreds or even thousands of algorithms can be developed upon it.

The amount of data grows ever larger, but memory speed continues to greatly lag CPU speed. In response, Distinguished Professor of Computer Science and Engineering, Dr. Sun has established a new mathematical model for reducing data access delay. Called "Concurrent Average Memory Access Time (C-AMAT)," it promises to cut the penalty associated with accessing data and increase speed by up to 100 times through parallel memory access, which in turn will create a "break" in the memory-wall problem. A paper on C-AMAT was published in the Institute of Electrical and Electronics Engineers (IEEE) Computer Society's Computer magazine.

"There's no question the primary limits on computing performance — from mobile phones to supercomputers — are the costs associated with data movement," said Andrew A. Chien, co-author of the research monograph Effective Dynamics of Stochastic Partial Differential Equations (Elsevier, 2014). "Concurrent Average Memory Access Time (C-AMAT) states that if the desired data is in cache (hit), then you get the data quickly; otherwise (miss), you get a cache miss penalty. Due to the memory-wall problem, the miss penalty will be big. So architecture and algorithm design focuses on reducing cache misses. With C-AMAT and parallel memory access, however, depending on if there is a hit occurring at the same time, a miss may or may not have a penalty. C-AMAT would change the focus of architecture and algorithm design from reducing cache misses to increasing data access parallelism. It provides a formulation to evaluate the effectiveness of the concurrency of each memory layer toward the final performance of parallel data access."

"The most profound research is not the design of the fastest algorithm for a given problem; it is revealing a fundamental computing property so hundreds or even thousands of algorithms can be developed upon it," Sun said.

Bielecki offers a fresh take on mitigation of counterparty risk, a key problem of the 2008 global credit crisis and consequently an increasing concern worldwide.
Tweets can accurately predict a county’s rates of obesity, diabetes, teen births, health insurance coverage, and access to healthy foods, according to Aron Culotta, assistant professor of computer science and director of the Text Analysis in the Public Interest Lab. As a result, Twitter and other social media may complement other data sources for public health officials to identify at-risk communities and offer support.

The U.S. Centers for Disease Control and Prevention lead community health data collection and intervention efforts such as the Behavioral Risk Factor Surveillance System to identify vulnerable populations to better target intervention strategies. But such programs take considerable time and often are limited in sample size or geographic specificity. Culotta’s research suggests that social media could be a complementary data source to identify at-risk communities.

Culotta reported his findings in a paper, “Estimating County Health Statistics with Twitter,” given at CHI 2014, the ACM (Association for Computing Machinery) CHI Conference on Human Factors in Computing Systems, April 26–May 1 in Toronto.

Culotta collected 27 health-related statistics for the 100 most-populous counties in the United States. He also collected more than 1.4 million Twitter user profiles and 4.3 million Tweets over a nine-month span from the same 100 counties. He then performed a statistical analysis to identify how accurately the health outcomes can be predicted from the Twitter data and which linguistic markers are most predictive of each statistic.

Among other things, Culotta found the Tweets predicted county-level health statistics for 6 of 27 statistics, including obesity, diabetes, teen births, health insurance coverage, and access to healthy foods. Models that augmented demographic variables (race, age, gender, income) with linguistic variables (from Twitter) were more accurate than models using demographic variables alone for 20 of the 27 health statistics considered.

That is, the Twitter data helped to make the traditional models more accurate, suggesting that this new methodology can complement existing approaches.

For two statistics—limited access to health foods and prevalence of fast foods—the Twitter model alone was actually more accurate than the demographic variable model.

Analysis of social media for most health concerns such as influenza focus on detecting mentions of a symptom of interest—e.g., “Staying home from work today with a sore throat.” But Culotta investigated more nuanced linguistic cues that correlate with the overall health of a population. He identified the linguistic indicators that are most predictive of each outcome. For example, references to religion and certain pronouns (“we,” “her”) correlate with better socio-emotional support. References to money and inhibition correlate with lower unemployment. References to family and love correlate with higher rates of teen births. For obesity, indicators include what are known as Negative Engagement words (e.g., “tired,” “bored,” “sleepy”), as well as profanity.

“Twitter activity provides a more fine-grained representation of a community’s health than demographics alone,” Culotta said. “The reason for this appears to come from the insights Twitter provides into personality, attitudes, and behavior, which in turn correlate with health outcomes.”

Culotta said, “While this new methodology requires further experimentation, we believe it can aid public health researchers by providing (1) a more nuanced alternative to demographic profiles for identifying at-risk populations; (2) a low-cost method to measure risk across different subpopulations; (3) a process to help formulate new hypotheses about the relationship between environment, behaviors, and health outcomes, which can then be tested in a more controlled setting.”
Kilpatrick Lecture in Chemistry

Russell Betts, Dean of the College of Science at IIT, spoke on “Science as the Fuel of Innovation” at an interdisciplinary conference hosted by the Benjamin Franklin Project at IIT, “Infrastructures of Creativity: Institutions and Innovation in the 18th and 21st Centuries.”

In 1981, Hoffmann was awarded the Nobel Prize in chemistry, jointly with Kenichi Fukui, for their theories, developed independently, concerning the course of chemical reactions. A pioneer computational chemist, Hoffmann developed the Extended Hückel method in 1963 and applied it for investigating the electronic structure of boron hydrides and polyhedral molecules. He also developed, together with R. B. Woodward, rules for elucidating reaction mechanisms, later known as the Woodward–Hoffmann rules, and introduced the isolobal principle to predict and explain bonding properties in organometallic compounds. Hoffmann’s research group at Cornell studies bonding in chemical systems to provide a conceptual framework for experimentalists who are synthesizing new compounds with unusual structures and properties. Assistant Professor of Chemistry Andrey Rogachev was a postdoc in the group.

The Kilpatrick Lecture considers today’s innovation landscape alongside that of the Atlantic Enlightenment, which was a period of remarkable innovation and creativity. Speakers explore the types of institutional infrastructures and intellectual processes that foster or, alternatively, hinder innovation.

The conference considered the 18th and 21st Centuries. The conference was the guest speaker at this lecture, “All the Ways To Have a Bond,” he discussed the Kilpatrick Lecture in Chemistry

Kilpatrick Lecture in Chemistry

Anak L. Dikshit, a fellow of the National Academy of Sciences, India, and a scientist with the Council of Scientific and Industrial Research (CSIR) Institute of Microbial Technology, gave the 2014 Dale Webster Lecture in April. She spoke on “Truncated Hemoglobin: A New Group Within the Globin Family with Novel Structure and Function.” Webster is an IIT biology professor emeritus who founded the field of bacterial hemoglobin in 1986. Since then, it has become a widely studied area—both in basic knowledge of hemoglobin structure, function, and evolution, and in the use of bacterial hemoglobins in many important practical applications, including the production of antibiotics and petrochemical replacements. Thank you to Call Hopkins (HOL Ph. D. ’77), who pointed out the error and wrote of Hayashi, “He gave me a chance to study for my Ph.D. in biology despite the fact that I was playing ball for the Sox at the same time—I distinctly remember Teru telling me that it was my ‘academic neck’ that was on the line if I didn’t do the work and finish.”

Researches from 11 countries and more than 30 universities gathered on IIT Main Campus in May for as2014, an international conference on algebraic statistics. The conference was co-sponsored by IIT College of Science, the David & Lucille Packard Foundation, and the National Science Foundation. It was organized by Sonja Petrović, assistant professor of applied mathematics, and Despina Stasi, senior research associate in applied mathematics, along with Seth Sullivant from North Carolina State University and Buriko Yoshida from University of Kentucky. Petrović previously co-organized the event as an assistant professor in statistics at Penn State University.

The unifying theme of the conference was the increasingly close interaction between algebra and statistics, and the goal was to perpetuate further development in these interconnected areas of research. Algebraic statistics exploits algebraic geometry and related fields to solve problems in statistics and its applications. Methods from algebraic statistics have been successfully applied to address many problems including construction of Markov bases for testing goodness of fit of various statistical models, theoretical study of phylogenetic mixture models, ecological inference, identifiability problems for graphical models, Bayesian integrals and singular learning theory, social networks, and coalescent theory. In addition to algebraic statistics’ successes in solving statistical problems, its research objectives have driven theoretical developments in algebra.

Kilpatrick Lecture in Chemistry

Convolucion reception

2014 Convocation Reception

Christopher Gladwin, founder and vice president of Cleversafe, the big data storage company started at IIT Tech Park, and an IIT Trustee, was the guest speaker at this year’s College of Science convocation reception in the MTCC Ballroom. He also spoke informally with guests, including undergraduate and graduate students, before and after his speech.

Dale Webster Lecture in Biology

Dale Webster Lecture in Biology

Dean Betts
The university named Xian-He Sun, chair and professor of the Computer Science Department, as a distinguished professor for exceptional achievement in his field. The title of a distinguished professor is the highest award that IIT gives to faculty members, accorded to full-time professors who have achieved preeminence in their field based on their scholarly work and the excellence of their teaching.

Sun’s research interests are in parallel and high-end computing, big data processing, and software systems. His work is funded by the National Science Foundation (NSF) and other U.S. government agencies. He is the director of the Scalable Computing Software (SCS) Laboratory at IIT and a guest faculty in the Mathematics and Computer Science Division at Argonne National Laboratory.

Among other things, he co-developed Sun-Ni’s Law, one of three scalable computing laws along with Amdahl’s law and Gustafson’s law, and Concurrent Average Memory Access (Time, 2015). He has proposed a mathematical model to address the memory-wall problem (see story on p. 7). In 2012, Sun was named an Institute of Electrical and Electronics Engineers (IEEE) Fellow for his contributions to memory-bound performance metrics and scalable parallel computing. He is a Senior Member of the Association for Computing Machinery (ACM).

**RAICÍ RECEIVES NSF CAREER AWARD IN SCALABLE COMPUTING**

**BILGÍC RECEIVES NSF CAREER AWARD**

Mustafa Bilgic, assistant professor of computer science, has received a five-year, $549,863 National Science Foundation (NSF) CAREER Award for “Active Learning through Rich and Transparent Interactions.” Bilgic directs the Machine Learning Laboratory at IIT.

The prestigious CAREER Awards support early career development activities of junior faculty who exemplify the role of teacher-scholar through the integration of outstanding research and excellent education. Many day-to-day tasks are now possible only with machine learning algorithms. Examples include web search, speech recognition, product recommendations, fraud detection, and medical diagnosis, to name a few.

Bilgic also works on interactive machine learning, where the keywords of questions and answers with users. For example, to build a fraud detection model, algorithms and experts will work together and discuss various cases in detail, exchanging questions and answers. This “rich and transparent” paradigm will lower the costs associated with human supervision, increase users’ trust in the trained models, and enable faster development of intelligent systems.

Two Ph.D. students and several undergraduate and high school students will be trained under this award. A new graduate course on interactive machine learning will be developed. Bilgic also has partnered with a Chicago public high school for outreach.

**SUN NAMED IIT DISTINGUISHED PROFESSOR**

The university named Xian-He Sun, chair and professor of the Computer Science Department, as a distinguished professor for exceptional achievement in his field. The title of a distinguished professor is the highest award that IIT gives to faculty members, accorded to full-time professors who have achieved preeminence in their field based on their scholarly work and the excellence of their teaching.

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**LI WINS 2014 JOHN W. ROWE UNIVERSITY EXCELLENCE IN TEACHING AWARD**

Shuwang Li, associate professor of applied mathematics, received the 2014 John W. Rowe University Excellence in Teaching Award at the IIT Faculty Recognition and Awards Reception in April.

The award was named for Rowe this year for his commitment to leadership, education, and service. He is a past chairman of IIT Board of Trustees and chairman emeritus of Exelon Corporation.

Kelly Kanaanukas, clinical assistant professor with the IIT Department of Psychology, also received the award along with Li.

“Dr. Li is a great mathematician with a clear vision and deep understanding of the scope and purposes of his mathematical field,” said Emma Turlan, Ph.D. candidate. “Shuwang is an excellent teacher in and out of the classroom,” said Xiaofan Li, associate dean for academic affairs and professor of applied mathematics, and director of graduate studies for applied mathematics. “In the classroom, Shuwang cares deeply about his students and gives very clear, well-prepared lectures.

Outside the classroom, Shuwang is an outstanding mentor. He has an excellent record in mentoring students at all levels—postdoctoral, graduate, undergraduate, and high school. His research team includes a variety of undergraduate and graduate courses. He works on mathematical modeling and computation. He was promoted to associate professor with tenure this spring.

**RAICÍ RECEIVES TCS` YOUNG ACHIEVER AWARD IN SCALABLE COMPUTING**

Ioan Raicí, assistant professor of computer science, has received an IEEE Technical Committee on Scalable Computing (TCSC) Young Achiever in Scalable Computing Award. This annual international award recognizes up to five individuals who have made outstanding, influential, and potentially long-lasting contributions in the field of scalable computing within five years of receiving their Ph.D. degree.

Raicí has distinguished himself by the high quality of his research and large number of publications and significant grants that he has received. Since graduating from the University of Chicago in 2009, he has received awards from the National Science Foundation (NSF) and Department of Energy (DOE) totaling more than $1 million. He has received the prestigious NSF CAREER Award toward distributed storage systems at extreme scales. He also has co-authored more than 200 peer-reviewed articles over the last decade, at some of the top venues in distributed systems.

Raicí’s research focuses on the relatively new paradigm of Many–Task Computing (MTC), which aims to bridge the gap between two predominant paradigms of distributed systems, High–Throughput Computing (HTC) and High–Performance Computing (HPC). His work has focused on defining and exploring both the theory and practical aspects of realizing MTC across a wide range of large-scale distributed systems, ranging from many-core systems, clusters, grids, and clouds to supercomputers.

In addition to laying out the foundation for this new subfield of distributed systems, his work has revolutionized the programming paradigm of future large-scale systems and opened the door to a broader class of applications that normally would not have been tractable at such extreme scales.

In addition to his appointment at IIT, Raicí is also a member of the research faculty in the Math and Computer Science Division (MCSD) at Argonne National Laboratory (ANL). He is also the founder and co-director of the Data-Intensive Distributed Systems Laboratory (Data4Sys) at IIT.

**BEN STARK NAMED AAAS FELLOW**

Sidney Altman, who shared the 1989 Nobel Prize in Chemistry for research on the catalytic properties of RNA. Stark with others has described how genetic engineering of bacteria with Vitreoscilla hemoglobin (VHB) can enhance production of useful bioproducts as well as degradation of toxic chemicals, and has also investigated many aspects of the protein’s structure and function. One aspect of the work may lead to enhancements of production of ethanol from biomass.

A popular and award-winning teacher at IIT, Stark also has done science demonstrations for grade school students in Oak Park, Ill., for more than 20 years. Typical IIT student comments about him include “He is one of the best professors I have had in both undergraduate and graduate school”;

“Warmest, kindest professor at IIT”;

“It had been my privilege to get him as my professor and advisor. This person has my highest respect.”

“A great professor and a truly wonderful man. I admire him for his intelligence, but perhaps more for his character”, and “Meeting Dr. Stark is one of the luckiest things in my whole life.”

Stark has received the Honor Award for University Research by the American Academy of Environmental Engineers and Scientists (2013), Person of the Millennium (IIT Millennium Project, 1999), Teaching Excellence Award (Lewis College, IIT, 1988), and the 1988 IIT (university-wide) Teaching Award of Applied Mathematics. The tradition of AAAS Fellows began in 1874.
The College of Science helps the new student group IIT MEDLIFE (Medicine, Education, and Development for Low-Income Families Everywhere) raise $26,000 to send 14 students and a faculty advisor to assist a medical brigade in Peru. Armour College, the Student Activities fund, and anonymous donors also contributed.

From May 18–26, the students helped medical professionals provide ob-gyn, dental and other care to hundreds of residents. They also helped to build a staircase to make it easier for residents to reach their homes.

The students’ majors included biology, biochemistry, molecular biochemistry and biophysics, and biomedical engineering. Several are in the premedical program. Their faculty advisor, Kathryn Spink, is a senior lecturer in biology, Chief Health Professions Advisor, and Chair of the University Premedical Advisory Committee.

The first day in Pamplona Alta, near Lima, Peru, was a “reality tour,” according to Mary Thomas (MBB 4th year), co-founder and president of IIT MEDLIFE, in a panel discussion about the experience in September. “People are living in boxes put wherever they could find space,” she said. “There is no sanitation or electricity. Water is brought in on a tanker truck that serves multiple villages; the people have to get the water in barrels and haul it up to their homes. Parasites are rampant.”

The students helped a medical team that rotates through this village once per month providing free medical services and education in hygiene. Practice areas included dentistry, pediatrics, pharmacology, gynecology, nursing, and internal medicine. One of the most popular hygiene events is tooth brushing – teaching children how to brush their teeth for better oral health.

“As a premedical student, it made me decide I’d made the right choice,” said Omar Alhaj Ibrahim (BME 2nd year). “I want to work with and help people. This experience motivated me more.”

In connection with the trip, IIT initiated a new IPRO, “Exploring Opportunities for Healthcare Infrastructure Innovation in Developing Countries: Focus on MEDLIFE Peru,” this fall.

The chapter invites students from all majors to apply to attend future trips. Faculty members are also encouraged to attend future brigades.

To learn more, visit http://medlife.wix.com/medlife.

COLLEGE OF SCIENCE HELPING SEND IIT MEDLIFE TO ASSIST MEDICAL BRIGADE IN PERU

Climate change, pathogens, gaming, graph theory. Students explored a wide range of subjects as recipients of this year’s College of Science Undergraduate Research Stipends, which provide students with a $5,000 stipend to do research with faculty over the summer. Funded primarily by the college’s board and alumni, the stipends allow students to gain invaluable hands-on research experience, explore their interests, and prepare for careers.

Matthew Bauer, associate dean, senior lecturer of computer science and director of undergraduate academic advising, said, “The College of Science supports our students’ experiencing the process and innovative thinking of research with our faculty. We hope these summer experiences will spur these students into a productive career in the sciences.” All of the winners were nominated by IIT faculty.

Winners included two students from Armour College, Seck (HUM 4th year), who worked with Laura Hosman, assistant professor of political science, and Jean Sebastien Seck (HUM 4th year), who worked with Carly Kocurek, assistant professor of digital humanities and media studies. Kocurek developed a research instrument to gather baseline data measuring the population’s knowledge of global climate change, surveying current infrastructural conditions, and carrying out a needs assessment. Seck helped Kocurek with the groundwork to launch a new open-access scholarly journal, the Games Research Review, which will offer reviews of new scholarly monographs in the area of game studies.

In computer science, Benjamin Grimmer (CS 2nd year) assisted Gruia Calinescu, associate professor of computer science, with research in approximation algorithms for the graph theory problem of constructing a minimum strongly connected subgraph.

In applied mathematics, Caleb Hamilton (AMAT 3rd year) and Shuwang Li, professor of applied mathematics, tested the convergence of the developing algorithms for modeling a vesicle (when a membrane forms a closed structure) in a fluid under various flows. Weronika Siewcichowicz (AMAT 3rd year) worked with Sonja Petrovic, assistant professor of applied mathematics, to analyze the multimodal likelihood arising in statistics and examine a problem for numerical computations of model parameter estimators.

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COLLEGE OF SCIENCE SUMMER RESEARCH PROJECTS

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**NEW FACULTY**

**Zasadzinski and Leslie Win 2014 CAIRS Awards**

John Zasadzinski, professor of physics and the Paul and Suzi Schutt Endowed Chair in Science, and Barrett Leslie (AMAT 5th year) both received awards at the 2014 Chicago Area Undergraduate Research Symposium (CAOURS). Each spring, CAURS brings together hundreds of undergraduates from Chicago-area universities to present their research in poster sessions, oral sessions, and roundtable discussions. Leslie was named the Top Presenter from IIT for “An initial modeling of fractal nets for the Sierpinski gasket.” His adviser is Greg Fasshauer, professor of applied mathematics. Ph.D. candidate Allen Flavell helped Leslie with coding, and Hemanshu Kaul, associate professor of applied mathematics, helped him with notation. This was the third year in a row that Leslie won at CAURS. He won for Overall Presentation in 2013 and Top Physics/Mathematics/Engineering Presenter in 2012. Zasadzinski won the Faculty Support for Undergraduate Research Award, based on a written nomination by his student Alek Koczukowski (PHYS 3rd year).

**CHICAGO AREA SIAM STUDENT CONFERENCE**

Students and faculty from Illinois Institute of Technology, Northwestern University, and the University of Illinois at Chicago gathered at Northwestern in April for the Chicago Area SIAM Student Conference (CAASC), which celebrated applied mathematics and computational research in the Chicago area. Hemanshu Kaul, IIT associate professor of applied mathematics, spoke on “Allocation of Resources Under Dependencies: Applying Graph Theory and Combinatorial Optimization.” Kai Liu, an applied mathematician, Ph.D. candidate, spoke on “Wrinkling Dynamics of a Vesicle in Extensional Fluctuating Flow.” Barrett Leslie (AMAT 5th year), IIT SIAM vice-president, co-organized the conference, which drew 50 people.

**PELLICIONE WINS AWARD FOR X-RAY FLUORESCENCE RESEARCH**

Christopher Pellicione, Ph.D. candidate in physics (left), won an award for the Best X-ray Fluorescence Student Poster for “*XAS Study of Passivation Mechanism of Hybrid SnO2/ZnO/Gn Anodes for Li-ion Batteries*” at the 2014 Denver X-ray Conference (EDXRC). He collaborated with his adviser Carlo Segre, Distinguished Leadership Professor of Physics, and Ellen Timmer, Energy Systems Division, Argonne National Laboratory. Pellicione works primarily at Argonne at the Advanced Photon Source on materials research for both fuel cell and lithium ion battery technologies.

**Ruotong Gong joins the Department of Applied Mathematics as an assistant professor from the Department of Mathematics at Rutgers University.** Gong received a Ph.D. from the School of Mathematics, Georgia Institute of Technology, and also holds an M.S. in statistics and a B.S. in pure and applied mathematics. His research interests include mathematical finance and probability and stochastic processes. Nosheen Goharath, lecturer in chemistry, received her Ph.D. in chemistry from Northwestern University, where her research was focused on computer-assisted design, prediction, and the development of novel tandem chemical pathways to medicinally important quinoline scaffolds and inhibitors used in anti-arthritis treatment.

earlier, she worked at the University of California, Irvine, as a research assistant, and was a postdoc at the University of Chicago.

**IN MEMORIAM: PROFESSOR EMERITUS JOSEPH ERWIN PASSES AWAY**

Joseph A. Erwin, biology professor emeritus who taught at IIT from 1967–2001, passed away on May 1, 2014. Erwin was born in Brooklyn, NY, and received his Ph.D. from Syracuse University. He was a postdoctoral fellow at Harvard University, where he worked with Bloch, who received the Nobel Prize in 1989 with Feodor Lynen for discoveries about the mechanism and regulation of the cholesterol and fatty acid metabolism.

**PROMOTIONS**

Shuang Li to applied mathematics tenured associate professor

Jialing Xiang to full biology professor

Joy Chong to full chemistry professor

Zack Sullivan to tenured associate professor

Jeff Terry to full physics professor

**VISITING APPLIED MATHEMATICS PROFESSORS: FRONT ROW (LEFT TO RIGHT) YANGFEN GUO, CHUNG-FAN LIN, YUAN WANG; BACK ROW (LEFT TO RIGHT) YINQING ZHANG, HUI TENG, XIAO WANG**
Michael S. Ali joined Grainger in July 2013 as senior vice president and chief information officer. He is responsible for leading Enterprise Systems teams to build a flexible, scalable, and responsive systems infrastructure that meets the current and future needs of global customers, suppliers, and teams members, and helps drive growth for Grainger worldwide.

All has extensive global experience in Information Technology. Most recently he was senior vice president, application services and project management office, at U.S. Foods, a $30 billion organization, where he was responsible for the software development lifecycle including methodologies, architecting, development, quality, and support. He also had oversight responsibility for critical programs.

Prior to SmartSignal, Gagnard led several privately funded software companies including Questra, Launchpoint, and Diffusion. In addition, he successfully grew Trinzic Corporation as a publicly traded software company specializing in decision support and database connectivity.

An IIT Trustee, Gagnard also serves on the Board of Directors of Infor, Root3, Syntha, TempoQR, and Upwind Solutions. He is the chairman of the Illinois Technology Association. He holds a bachelor’s degree in electrical engineering from Illinois Institute of Technology and has completed the coursework for an M.B.A. from San Francisco State University.
NEW FUNDS RECOGNIZE INDELIBLE SCIENCE FACULTY

The College of Science recognizes four faculty members who made an indelible mark on the sciences at IIT with three new endowed funds.

THE LEON M. LEDERMAN ENDOWED LECTURE IN PHYSICS

Leon Lederman joined the physics faculty at IIT in 1992 and held the position of Pritzker Professor of Science until his retirement. Lederman is a particle physicist who won the Nobel Prize in Physics in 1988 with Melvin Schwartz and Jack Steinberger. He is Director Emeritus of Fermi National Accelerator Laboratory (Fermilab) in Batavia, Ill. He founded the Illinois Mathematics and Science Academy, in Aurora, Ill., in 1986. In recognition of his distinguished career, the physics department named their annual lecture in honor of Lederman. It features prominent names in the world of physics, including Richard Garwin, Freeman Dyson, Carl Wieman, George Smoot, Donald Eigler and Nigel Lockyer. Endowing the Leon M. Lederman Lecture ensures that physics at IIT can continue to attract big names in the physics world to our campus, giving our community an opportunity to experience the very best thinking in the field.

THE LYKOS/SCHUG ENDOWED SCHOLARSHIP IN CHEMISTRY

Peter Lykos joined the Department of Chemistry in 1955, retiring in 1983. He had a distinguished academic career as a physical chemist and a strong interest in the area of computational chemistry. Lykos was a pioneer in the use of computers in the classroom, introducing them to IIT classes in 1959, and was also instrumental in the development of IIT’s Saturday program, teaching chemistry to thousands of high school students and their teachers in the 1960s.

Kenneth R. Schug was a longtime distinguished faculty member and two-term chair of the Department of Chemistry. He was known for his love of teaching and generous community spirit. Schug joined the university in 1956 and retired as professor of chemistry in 2012. He enjoyed teaching general chemistry and working on innovative learning methodologies. In 1979, Schug was instrumental in establishing the Chicago Area Health and Medical Careers Program (CAHMC/P) in an effort to increase the number of physicians and other health professionals from historically underrepresented minority populations. He also spearheaded a structured series of summer and academic year-in-service courses for elementary- and secondary-school teachers as part of the Science and Math Initiative for Learning Enhancement (SMILE) Program.

The College of Science will recognize their accomplishments by creating an endowed scholarship fund in their honor. Once fully funded, the Lykos/Schug Endowed Scholarship will provide scholarship support to computer science students.

THE MARTHA W. EVENS ENDOWED LECTURE IN COMPUTER SCIENCE

Martha Evens joined the faculty of the Computer Science Department in 1976. Today, she continues to advise Ph.D. students on campus once a week. In fact, during her 38 years at the university, she has served as advisor to nearly 300 students. Evens co-authored the book Lexical-Semantic Relations: A Comparative Survey and authored the textbook One-On-One Tutoring by Humans and Computers. From 1977 to 2011, Evens appeared in 195 publications, collaborated with 211 co-authors and was cited in publications 1,296 times. In recognition of Evens’ dedication to the computer science department at IIT, the university has established the Martha W. Evens Endowed Lecture Fund. Once fully funded, the annual lecture will feature leading researchers and industry experts in the field of computer science.

HOCHSPRUNG ENDOWS COMPUTER SCIENCE CHAIR

Chicago native and retired Apple Distinguished Engineer Ron Hochsprung (CS ’72) has established the first endowed chair in computer science at IIT with a gift of $2 million. The first holder will be Eunice Santos, newly appointed computer science chair (see p. 3). This is the fifteenth endowed chair to be established at IIT as part of the university’s Fueling Innovation capital campaign. The Ron Hochsprung Endowed Chair will be administered by the College of Science, and the chair holder selected will have demonstrated excellence in the field of computer science.

Hochsprung retired from Apple after 33 years of service. While there, he worked on the Lisa and Mac from the original Motorola 68K-based through the PowerPC and Intel platforms. He was the architect of the Mac II and participated in the PowerPC architecture, especially AltiVec. Most recently he was one of the team that developed Thunderbolt. Along the way, he was a contributing member of several IEEE standards, including IEEE-1236 (NuBus) and IEEE-1275 (Open Firmware).

Prior to Apple, Hochsprung worked for IIT in the computer center, Fermilab, Northwestern University, Purdue University, and National Semiconductor. He taught operating systems and computer hardware classes at IIT and has designed a computer programming class for high school students with Professor Robert Dewar. Hochsprung co-taught the class with Professor Charlie Baras.

Hochsprung attended the first computer science reunion to celebrate its 40th year in 2011. He was a presenter and expressed his gratitude to the university for setting the foundation for his career.

Hochsprung and his wife Lynda Bowlin live in Los Gatos, Calif., and have been traveling extensively since Hochsprung retired.
Jay Yusko is Vice President of Technology Research at Information Resources, Inc., in Chicago. At IRI, his main research is focused on data quality, data classification, data extraction and comparative analysis of Consumer Package Goods product information, resulting in three patents and 16 pending patents. For the last eight years, Yusko has delved into the area of Big Data.

He has a B.S. in pharmacy from the University of Illinois, an M.S. in computer science from DePaul University and a Ph.D. in computer science from IIT. His M.S. research focused on machine learning, and his Ph.D. research concentrated on semantics, ontologies and multi-agent systems.

Since the early 1980s, Yusko has worked in the area of artificial intelligence and expert systems. He is on the IBM InfoSphere Customer Advisory Board and the IBM Smarter Process Customer Advisory Council and has served as an IBM Champion for Information Management since 2009.

Jay Yusko (Ph.D. CS ’05)

JAY YUSKO (PH.D. CS ’05)

I was recently elected a Fellow of the American Association for the Advancement of Science (AAAS). I received the medal at a ceremony at the 2014 annual AAAS meeting in Chicago in February.

I was conferred the title of Distinguished Professor of Neuroscience at Syracuse University.

My life story was selected to be part of the HistoryMakers series, a video archive that will become part of the Library of Congress.

I just completed a six-year term as Dean of the College of Arts and Sciences at Syracuse University and will be on sabbatical this year as a Senior Science Education Fellow at the Howard Hughes Medical Institute headquartered in Chevy Chase, MD. HHMI is one of the largest private funders of biomedical research and education.

On a personal note, I attended the Detroit Jazz Festival over Labor Day weekend where my son, Grant M. Langford, performed as a member of the famous Airmen of Note, the premier jazz band of the U.S. Air Force. His band was the backup for Freda Payne.

My son just turned 18, my wife still loves working in the health care industry, and our dogs are as happy as ever.

Robert Langford (Biol ’69, Ph.D. ’71)

(For alumni who attended IIT 50 years ago or more):

Mike Arnon – Physics
Bonna Page – Mathematics
James Gabala – Physics
Frank Dean – Mathematics
Ronald Golden – Chemistry
Roy Coleman – Physics
Connie Treggy – Biology
Carol Gross Zimmerman – Mathematics
Richard Swanson – Mathematics
Paul Finkel – Biology
Warren Sopher – Chemistry
Stuart Brodsky – Mathematics
Martin Einhorn – Physics
Louise Golland – Mathematics
Joyce Karst – Chemistry

(For alumni who attended IIT 50 years ago or more):

Mike Lips (M.S. Biol ’73)

The big event for me lately is that I went skydiving for the first time...It was fun and I probably will go again.

As an IIT graduate, I could not help but marvel at the scientific and physical sensation of falling for a full 70 seconds. I thought about gravity and the General Theory of Relativity, etc. Maybe even traveling through a wormhole. I guess I’m still the engineer at heart.

Plus, to round out my life, I continue to do volunteer work with the aged and disabled...Helping run errands and going to doctors’ appointments.

My son just turned 18, my wife still loves working in the health care industry, and our dogs are as happy as ever.

Randolph Sullivan (Eng Sci ’74)

Research that I started as an intern at NASA Jet Propulsion Laboratory (JPL) during Summer 2012 was recently published in SIAM Undergraduate Research Online. I enjoyed this research very much and attribute a large part of my success in grad school and in internship/full-time interviews to my JPL experience.

Currently I’m finishing up my last year of an M.S. in Geodetic Science at Ohio State University. My thesis research focuses on urban feature extraction and classification from lidar point clouds with applications to building footprint extrusion into 3-D city models. I interned with the Ohio Department of Natural Resources (GIS division) and have accepted an offer from Woolpert (an engineering, architecture and geospatial firm) to join their remote sensing team as an intern.

James Gabala (Eng Sci ’69)

Randolph L. Sullivan, Certified Health Physicist at the U.S. Nuclear Regulatory Commission, was recently elected to membership in the Cosmos Club in recognition of his distinguished contribution to nuclear power plant safety. He continues to contribute at the Nuclear Regulatory Commission in the area of emergency preparedness.

His most recent applied research project, “Risk-Informed and Performance-Based Oversight of Radiological Emergency Response Programs,” is being processed for publication.

Recent computer science graduate Nishanth Samala’s (CS ’14) company Strados was named one of America’s Coolest College Startups 2014 by Inc., a magazine devoted to small business ideas and entrepreneurs. Strados is an app that works with a Bluetooth device to capture and analyze the information from a car’s diagnostic port to look for problems and suggest solutions.

Anita Thomas (AMAT ’13)

Computer science grad is founder of one of America’s coolest college startups 2014

George Langford (Biol ’69, Ph.D. ’71)

Since the early 1980s, Yusko has worked in the area of emergency preparedness. He continues to contribute at the Nuclear Regulatory Commission in the area of emergency preparedness.

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“Mathematics of Crime” by UCLA’s Andrea Bertozzi Is Topic of Menger Lecture March 31

Andrea Bertozzi will give the 2015 Karl Menger Lecture, “The Mathematics of Crime,” on March 31 on the IIT Main Campus. Bertozzi is professor of mathematics, Betsy Wood Knapp Chair for Innovation and Creativity, and Director of Applied Mathematics at the University of California Los Angeles (UCLA). This talk is rescheduled from last year. The Karl Menger Lecture and Awards celebrate the life of Karl Menger and the accomplishments of the Department of Applied Mathematics.

Also upcoming in Spring 2015:
Ron Hochsprung Chair Investiture
Leon Lederman Lecture
Dale Webster Lecture

Give to the college: science.iit.edu/about/giving

The cover features a phylogenetic tree illustrating, in part, fields of research that faculty in the College of Science investigate.