ORIE

Newsletter
Spring 2016

Page 3
ORIE, Cornell Tech launch master’s degree

Page 4
Geoffrion gift to enrich student experience

Page 7
ORIE 50th anniversary coverage

LOOKING BACK AND LOOKING FORWARD

CELEBRATING 50 YEARS OF ORIE AT CORNELL
This has been an incredible year for the School of Operations Research and Information Engineering at Cornell! We just celebrated our 50th anniversary last month, and the theme of “looking back and looking forward” could not have been more appropriate for this juncture in the School’s history.

In looking forward, the vision of a footprint of ORIE at Cornell Tech in NYC has moved from the planning stage to a reality. This past year, Huseyin Topoloğlu, an ORIE faculty member in Ithaca since 2002, has moved to the Tech campus. This coming fall, Huseyin will be joined by Itai Gurvich, who has been on the faculty in the Kellogg School of Management at Northwestern University, and Nathan Kallus, who completed his Ph.D. in Operations Research at MIT last year and has been a postdoctoral fellow based at USC this year. The triumvirate of Topoloğlu, Gurvich, and Kallus both aligns well with the entrepreneurial thrust of the Tech campus, and brings strength across the full cross-section of methodological pillars of OR—optimization, stochastic models, and statistical/machine-learning methods. The Cornell Tech group will launch a new ORIE M.Eng. program next year with a “beta” class of eight students. Although elements of the program are similar to the traditional M.Eng. based in Ithaca, this new program focuses on the impact of data at scale, particularly within the tech industry, and promotes a more interdisciplinary and entrepreneurial scope for project work.

Another important step forward has been the introduction of a certificate program in Financial Data Science (FDS) as a fourth semester option for our masters in financial engineering program at CFEM in NYC; a pilot group of four students is just completing this innovative program. And the arrival this past fall of three new junior faculty in Ithaca is the next big step in the demographic transition of the ORIE faculty. Finally, in perhaps the biggest step of all, the School is thrilled to announce that an ORIE Professor of Practice position has been endowed by Arthur Geoffrion ’59 MIE ’61 and his wife Helen. The new position will increase opportunities to integrate industry experience into the Ph.D. education to an entirely different level.

The 50th anniversary celebration provided many opportunities to look back as well, with reminiscences on their faculty and student careers at Cornell by Bill Maxwell ’57 Ph.D. ’61 and Lee Schruben ’68, and culminating in an emotional reflection on 50 years in Ithaca by Uma Prabhu at a banquet dinner. The anniversary celebration was “kicked off” by the 15th Bangs Lecture, given by Ph.D. alumna Theresa Wise M.S. ’92 Ph.D. ’95, outgoing CIO of Delta Airlines, whose lecture discussing the evolution of the role of OR tools in the airline industry demonstrated the dramatic impact of analytics in that domain over the past few decades. Then during the day, research talks by Cornell ORIE alumni Brenda Dietrich M.S. ’83 Ph.D. ’86, Retsef Levi M.S. ’04 Ph.D. ’05, and Peter Cramton ’80 were complemented by a distinguished industry panel (of ORIE alumni, of course) on the role of analytics throughout a cross-section of industries, and a panel of multi-generational ORIE alumni families (although three participated, there are roughly a dozen such families!) And earlier in the year, there were events honoring the career of Bruce Turnbull upon the occasion of his retirement and celebrating the 70th birthday of Sid Resnick, again reflecting the generational changes in the School’s evolution.

All in all, it was a year of exciting changes, with the chance to celebrate the School’s distinguished history balanced by the new opportunities presented by an increasingly analytics-driven society.

David B. Shmoys
Director, ORIE
Laibe/Acheson Professor of Business Management and Leadership
Cornell Tech and the Cornell Engineering have announced a new Master of Engineering degree in Operations Research and Information Engineering (ORIE).

Based at Cornell Tech’s campus in New York City, the program will educate experts who thrive in environments that use computational tools, algorithms and large amounts of data to make business decisions for the technology industry.

Operations research is the science of decision-making in complex or uncertain environments. Online retailers, like Amazon, rely on cutting-edge algorithms and large-scale computation to make inventory and pricing decisions for millions of products and make recommendations to shoppers in real time. The computations must take into account a seemingly infinite amount of data that include customer preferences, location and timing of demand, and purchase histories of customers.

“Many other companies, including Apple, Google, Lyft and Netflix, face similar situations that require them to make decisions at massive scale and at rapid speeds. Making such decisions clearly defies human capabilities,” said Huseyin Topaloglu, professor of ORIE based at Cornell Tech. “Systems need to take in the huge amount of available data, figure out what is relevant and what is not, use the data to understand how the environment is likely to evolve in the future, create algorithms to make decisions, and monitor the system’s response to decisions.”

Cornell Engineering offers an ORIE master’s degree on its Ithaca campus, but Lance Collins, the Joseph Silbert Dean of Engineering, says the Cornell Tech degree is unique because of its entrepreneurial focus and project-based co-curriculum that involves students from across the university.

“ORIE students will be teamed up with business students, computer science students or possibly somebody from the Jacobs Institute,” said Collins.

“The teams are fundamentally multidisciplinary and they’re attacking real problems that come from industry. I think that interdisciplinary element just creates a unique environment for training the students.”

The curriculum will also cover the fundamentals of operations research through courses designed specifically for the tech industry, including optimization methods, modeling under uncertainty and machine learning. Electives include service systems and online markets, e-logistics, data science, business for tech and startup systems. The curriculum places emphasis on large-scale computation.

ORIE, CORNELL TECH LAUNCH NEW MASTER’S DEGREE

David Shmoys, director of the School of ORIE, understands big data in the Big Apple well. He’s been working with Citi Bike to develop a more efficient system to distribute and rebalance the bike-sharing service’s fleet around its many New York City hubs.

“The analytics viewpoint of OR is a key ingredient in leveraging a host of new technologies. This degree is specifically designed for entrepreneurial graduates looking to bring their talents to start-ups or established tech companies, so it makes sense to offer the program in a city where those companies exist in abundance, and on a campus that understands the industry well,” said Shmoys, who has played a number of roles in helping to build the campus.

The ORIE degree is Cornell Engineering’s first non-computer science offering at Cornell Tech and will welcome its inaugural class in the fall of 2016.

“This is a major step for the college and I’m really excited we’ve now planted the flag of engineering firmly on the Cornell Tech campus,” said Collins.
At a gala dinner celebrating ORIE’s 50th anniversary, Director David Shmoys announced that an ORIE Professor of Practice position has been endowed by Arthur Geoffrion ’59 MIE ’61 and his wife Helen. The position is a key step in an initiative to expand ORIE’s role in providing students with opportunities to integrate real-world applications with their textbook and lecture-based learning. Shmoys expects that the endowment “will have a transformative effect on the school.”

With their gift, the Geoffrions have created the first endowed Professor of Practice (an academic title approved in 2015) in Cornell’s College of Engineering. Professors of Practice are “expected to enrich the experience of our students by bringing to Cornell a deep understanding and appreciation of the best practices as applied in real-world settings.” However this new endowment is not the first major step the Geoffrions have taken to support more interaction of faculty and graduate students with industry and government. The Geoffrion Family Fund for Industrial Interaction for ORIE was endowed in 2009, with a similar objective but more limited goals.

In endowing the ORIE Professor of Practice this year, Arthur Geoffrion commented that “the conditions at ORIE seem at present to be particularly fertile for this type of new faculty position. No change agent and facilitator for industrial-academic interaction could succeed without a local culture that is accepting and desirous of this sort of thing. I became convinced, after faculty hiring priorities emphasized applied Operations Research earlier in this decade and especially after recent discussions with ORIE Director David Shmoys and Engineering Dean Lance Collins, that there was a great opportunity to make a beneficial difference” with this endowment, “helping the school become even better, while remaining true to its
current identity.” Shmoys concurs with the timing, saying that “this gift comes at exactly the right time, and provides the School with exactly the right resources, to move our initial steps in integrating industrial experiences within the Ph.D. program to the next level.”

Geoffrion believes that academic-industry interaction is valuable to students and faculty “because of the cornucopia of research problems they will discover, the knowledgeable real-world colleagues and laboratories they will have for learning and testing their ideas, and the real-world experiences that will enliven the classroom.” He also believes that the interaction is valuable to companies and agencies that will “benefit from improved decision technology.” He emphasizes that, rather than competition between theory and applications, “the objective should be to achieve a healthy synergistic balance between applications and theoretical work.” During his years with the Institute for Operations Research and Management Science (INFORMS), which Geoffrion served as President in 1997, he “preached that the destiny of OR in academia is the destiny of OR in practice, and vice versa; either one without the other will be stunted, but together they will thrive,” he said.

Shmoys observes that “the availability of data to help drive decision-making in a broad cross-section of industries (many of which didn’t exist 10 years ago) has dramatically increased the impact of OR in society today. One direct consequence of this change is to greatly expand the range of opportunities for students, particularly doctoral students, to integrate an immersion experience within their education.” Such an experience “has been a key element for several members of today’s Cornell OR Ph.D. cohort, but in an ad hoc way that has been complicated to arrange” he points out.

The Professor of Practice endowment enables ORIE to “set in motion the notion of an advising and consulting laboratory in ORIE,” Shmoys told attendees at the anniversary gala. The laboratory provides an umbrella structure that will make it possible for students to pursue data-driven modeling and analytical projects that solve real-world problems, extending the project experiences characterizing ORIE’s Master of Engineering program in a systematic way to the undergraduate and Ph.D. program. Geoffrion sees the establishment of the advising and consulting laboratory as evidence that “ORIE was ripe for a greater effort to cultivate relations with industry.”

In particular, Shmoys said that the Geoffrion-sponsored Professor of Practice will bring real-world engagement opportunities for Ph.D. students to the mainstream within ORIE, increasing the guidance available for project execution. “The endowment will enable the hiring of a faculty member whose primary responsibility will be the cultivation of ongoing relationships with members of a portfolio of industry partners who can provide the right sort of hands-on experience for these Ph.D. students,” said Shmoys. As Geoffrion points out, “Ph.D. students provide the next generation of professors. The more that professors recognize the crucial synergy between academia and practice, the better will be their shared destiny.” ORIE also plans to have Professors of Practice in the M. Eng. and undergraduate programs, all under the umbrella of the advising and consulting laboratory.

Arthur Geoffrion, who received a Bachelor of Mechanical Engineering from Cornell in the class of 1959, went on to receive a Master of Industrial Engineering degree from Cornell in 1961 and the first Ph.D. in Operations Research from Stanford. “Cornell was the place where Andy Schultz piqued my interest and answered the question that has determined my career: ‘What is Operations Research?’” he said.

Geoffrion joined the UCLA faculty in 1965 and retired in 2005 as James A. Collins Chair in Management Emeritus. A highly regarded practitioner and theoretician (he is a member of the National Academy of Engineering and a Fellow of INFORMS), he has worked throughout his career to close the gap between academia and management, for example by establishing in 1982 what became the INFORMS Roundtable.

Professors of Practice are “expected to enrich the experience of our students by bringing to Cornell a deep understanding and appreciation of the best practices as applied in real-world settings.”
At a time when the ability to use “big data” analytics and machine learning algorithms has become in great demand, ORIE has introduced a new certificate in Financial Data Science (FDS) that augments and complements the established Master of Engineering concentration in Financial Engineering (MFE for short). The certificate is optionally available to MFE students as a semester following their fall semester at Cornell Financial Engineering Manhattan (CFEM), which in turn follows the first year of the program, held in Ithaca.

Analytics and machine learning respond to the explosion of data and computer processing power available in many areas of endeavor, including financial services. The Institute for Operations Research and the Management Sciences (INFORMS) defines analytics as “the scientific process of transforming data into insight for making better decisions.” In 1959 IBM’s Arthur Samuel defined machine learning as “giving computers the ability to learn without being explicitly programmed,” and applied an early version to the game of checkers. Historically, the field of statistics had to develop ways to derive better decisions from a paucity of data and processing power, but these limitations no longer constrain the analyst who is skilled in contemporary data science.

The curriculum for ORIE’s FDS@CFEM certificate combines computing techniques and machine learning with hands-on projects brought by leading financial practitioners. The curriculum was designed by a committee of experts to equip students with mastery of machine learning and computational “big data” technologies so they can solve real, large-scale finance problems. A select group of students has been recruited for the inaugural semester.

Integrated curriculum

By design, all FDS@CFEM students take the same tightly integrated set of courses, which are bound together through a “practicum” course. They are participating in three courses, one on machine learning, another on “big data” computing techniques, and a practicum that integrates the knowledge gained in these courses with their earlier FE studies through a series of practitioner-led projects incorporating real financial data.

“The idea is that as students learn different concepts in the classroom, they assimilate the material and put it into practice tackling real problems with the help of practitioners,” according to M.Eng. Director Kathryn Caggiano.

“In a typical program, students study self-contained topics in ‘silos’ of courses taught by instructors who independently develop their syllabi, outcomes and deliverables with little or no collaboration, leaving students to figure out how, when, and why to combine these concepts on their own,” Caggiano said. Instead, FDS@CFEM provides students with “content that is integrated with practical experience and a realistic context in which to apply it.” Moreover for FDS@CFEM, “not only are the instructors planning and designing their courses collaboratively, but they are communicating with each other throughout the delivery process to make sure that students understand the how, when, and why of applying the concepts to real problems.”

To read more about the FDS@CFEM program, please go to http://goo.gl/xswNb6.

The first FDS@CFEM class: (L-R)Luna Cheng, Dora Dai, Irene Shi and John He.
A lumni, faculty, students and guests assembled in April for a day-long commemoration of a time when Operations Research came into its own at Cornell. The day featured talks, panel discussions, reminiscences, a trivia quiz, and a gala dinner. Video recordings of the sessions are available on an ORIE YouTube channel.

The celebration was kicked off by the 15th Bangs Lecture, delivered by Theresa Wise Ph.D. ’95 retired Chief Information Officer of Delta Airlines, who traced the evolution of Operations Research in the airline industry. The Bangs Lecture was established in 1990, at the midpoint of the past 50 years, to honor John R. Bangs, Jr., M.E. ’21, who pioneered the administrative engineering program that led to today’s ORIE. Wise provided a personal perspective on the ways in which crew scheduling, revenue management, technology integration in merged airlines, and data analytics are understood, solved, and put into action at Delta and elsewhere in the industry.

Greeting the assemblage, Cornell Engineering Dean Lance Collins noted that the mid-1960s were a time of change, marked by the establishment of Computer Science, Materials Science and ORIE. The celebration comes at an interesting time marked by “a real expansion of opportunities in data analytics, with ORIE in the center of it all.” Collins reported that in Ithaca, ORIE has had “tremendous hiring in a fiercely competitive world for OR faculty, bringing about a new generation” replacing faculty from the 60s and 70s who retire. At the new Cornell Tech in New York, “ORIE is a key element, with the first Master of Engineering program on the New York campus, which one year from now moves to Roosevelt Island.”

Talks by Brenda Dietrich Ph.D. ’86, Retsev Levi Ph.D. ’05 and Peter Cramton ’80, respectively took stock of the role of Operations Research in successive waves of computer technology, the risk associated with food imports, and the successes, failures, and future of markets he is involved in designing. Talks by three retired ORIE professors, Bill “Max” Maxwell, Lee Schruben, and Narihari “Uma” Prabh, captured key elements of the past half-century from a personal perspective. Two panel discussions, one comparing the experiences of different generations of students in the same families and the other looking back and forward at the impact of OR and analytics on industry, positioned the 50th anniversary as a point in time. A trivia quiz (below), moderated by Professor Emeritus Jack Muckstadt (with Director Shmoys as his Vanna White) provided levity as he tested attendees’ ability to recognize faculty and students in old photographs and to answer questions such as “who wrote the thesis with the shortest title” (Ans: Chris Jones ’80). At the gala dinner, ORIE Director David Shmoys announced a major gift to endow a Professor of Practice as part of a new structure to increase student interaction with industry.

Reacting to the event, Sam Mallette ’80 said “in some ways I sort of felt like an ant walking in a redwood forest when seeing and listening to all of the “giants” from our field and hearing about their various accomplishments! The network of people associated with Cornell ORIE is pretty awesome” said Eric Laub ’81 M.Eng. ’83. “It was a pleasure to revisit Cornell for ORIE’s 50th anniversary, especially to hear so many stories of OR careers and OR work.”

A trivia quiz, moderated by Professor Emeritus Jack Muckstadt (with Director Shmoys as his Vanna White) provided levity during Saturday’s symposium.
Theresa Wise, CAM Ph.D. ’95, who just stepped down this year as Chief Information Officer and Senior Vice President of Delta Airlines, gave the 15th Bangs Lecture, which served as a “kick-off” event for the 50th anniversary celebration. Wise described industry trends for the airlines, while interspersing these more general comments with stories from her own personal trajectory. She stressed that the most elegant OR models might not always win, but “they can win, particularly if we structure them, implement them, and most importantly communicate about them effectively.” She credited the use of OR models as being crucial for the success of the airline, which today has 80,000 employees, 330 destinations, 11 hub airports, and over 15,000 flights per day. Furthermore, she viewed the OR model-based approach as being instrumental in the smooth merging of Delta and Northwest Airlines (in which she played the critical role of integrating the information systems of the two airlines).

Wise reflected back on her first summer internship at Northwest Airlines. She was in the middle of her doctoral work at Cornell in Applied Mathematics under the supervision of Professor Leslie Trotter, in the School of Operations Research and (then) Industrial Engineering. She arrived at Northwest thinking that she would be spending her summer working on models for revenue management—the idea of creating different prices for seats within the same class of service, based on expected demand and remaining capacity. Although this idea was just taking off in the airline industry, the project at Northwestern was scrapped, and so Wise needed to find a new project on which to work. She settled on thinking about the problem of scheduling the assignment of crews to flights. Most airlines then (and indeed still today) first construct a schedule for all of their planes, which leaves each leg that a plane flies in need of a crew to staff that leg. This “crew scheduling” problem is solved on a monthly basis, with each crew member specifying a detailed set of preferences, subject to an intricate set of regulations governing allowed patterns of flights (with constraints such as the maximum number of consecutive hours a crew member can work, as well as a minimum length of time off between tours of duty).

Wise showed how to solve these problems effectively via a so-called set partitioning model and developed integer programming methods for its effective solution. Wise moved from heading operations research at Northwestern, to taking a lead role in their IT department, eventually becoming the Chief Information Officer (CIO) of Northwestern, before becoming CIO for the merged Delta Airlines.

Wise talked extensively about being the CIO while leading the IT merger of the two airlines. She highlighted a “wall walk” that helped unify the process where hundreds of different sub-projects were required to integrate the two IT systems. This wall walk, was based on a long wall (at right) completely filled with “post-it” notes delineating the state of different aspects of the overall project. Wise also reflected on the changing technologies that drove many of those changes, particularly noting the way that cell phones enable direct communication with their customer base both for routine operations, as well as for providing information to the passenger in a time of service “irregularities.” Wise talked about the increasing role of “big data” in the operations at Delta, citing that, for example, the annual growth in data stored for analytics is over 40%, and concluded by stating that OR has been an invaluable force for business change and results at Delta.

For a video of the talk, please go to https://goo.gl/OW1N0N
Brenda Dietrich, Ph.D. ’86, who is Vice President of Data Science in IBM’s Business Analytics organization, “has led IBM’s thrust in analytics for years,” said ORIE Director David Shmoys in his introduction. Dietrich described “How OR fits into the larger information technology (IT) picture, and things that we as practitioners can either take advantage of the trends or get run over by them.”

Dietrich traced the evolution of IT from transaction processing, through personal computing, to mobile, social, cloud, and ‘big data’ computing, noting that at each stage, computing activities leave behind an ‘exhaust’ of data including transaction records, search trajectories, and transmissions from apps that broadcast cellphone locations. In the 80s and 90s, data like this was used by OR analysts primarily for forecasting. The PC brought ease of access, but the data was left on the desk and disks of the individual analyst. The internet provided a trail of data associated with searches and orders. Now, new devices and apps are generating vast quantities of data, which use of the cloud makes economically feasible to collect and analyze.

She reported that, as ways are sought to “monetize data sets,” there are now markets for them as well as established supply chains. However “we can have all the data in the world but if we don’t implement the decisions that are made from it, it is worthless,” she asserted. OR analysts can contribute to improving the world through influencing the choices people make by the way we present them with information. The potential lies in bringing together data from multiple sources to create “systems of insight.” Using examples from her work at IBM, Dietrich discussed various ways in which data, for example from the “internet of things” or the trajectory of user interactions during a search, can be used to move “from data to insight to action,” and showed how this process offers a wealth of opportunities for operations research.

Looking back to the last century, computerized inventory systems led to the ability for companies to hold “less stuff,” a significant transformation, Dietrich recalled. By analogy, the exploitation of sensor data in the internet of things leads to ways to transform business through analyzing data rather than just presenting it. Moreover, exogenous data, such as weather data, can be exploited to great benefit when tied together with internal operational and customer data.

Compared with the limited capability of a search engine, cognitive computing, as illustrated by IBM’s Watson system of “Jeopardy” fame, can interact with the decision maker to understand the question, produce possible answers and evidence, analyze the evidence, compute the level of confidence, and deliver the response, evidence and confidence.

Dietrich described opportunities for operations research in cognitive computing, for example in creating models, locating and navigating evidence, and capturing and incorporating user actions and outcomes in decision support tools in order to learn from the choices that are made. She placed particular emphasis on the ways in which people interact, using words. Most current operations research communication involves numbers and equations. “With ubiquitous computing capacity and data storage available, will this change?” she asked. She used an example that combines classical operations research techniques with a natural language interface and the potential to learn from the interaction of user and system to illustrate the kind of change that is becoming possible.

For a video of the talk, please go to https://goo.gl/YfckVJ
ECONOMICALLY MOTIVATED ADULTERATION RISKS IN GLOBAL FOOD SUPPLY CHAINS EMANATING FROM CHINA

Retsef Levi Ph.D. ’05 is the J. Spencer Standish (1945) Professor of Operations Management at the MIT Sloan School of Management. He spoke to the 50th anniversary gathering about the risk of economically motivated adulteration occurring in global food supply chains. Determining the risk and allocating resources to combat it is a problem that “OR has all of the ingredients needed to analyze: supply chain management, modeling, data, analytics, and making important decisions.” As part of interdisciplinary work of experts in OR, Biology, and Chemistry focused on China, Levi and his collaborators conjectured that there are two key drivers of adulteration risk: high dispersion of the supply chain, and weak regulatory quality in specific regions in China.

Levi noted that the Chinese farming supply chains are characterized by so-called “dragon-head” companies that consolidate output from a large number of small, high-risk, low-margin farms before passing it along for processing and export. This dispersed structure is based on small farmers who “have little to lose, and under sufficient pressure are willing to do everything to maintain their income,” Levi pointed out. “Each produces a tiny amount, but for the farmer it is their entire income.”

By contrast, the Chinese government is encouraging a shift to vertical integration, with large, corporate owned firms that send output directly to processing facilities. Although such an integrated supply chain structure has a higher risk of disruption, the team used publically available data from U.S. and Chinese sources, a dispersion formula related to entropy, and regression techniques to confirm their hypothesis that the “dragon-head” structure and higher dispersion indeed result in higher risk. Similarly, they used publically available data on export certification quality inspections, incident reports, and Value Added Tax (VAT) collections to confirm their hypothesis that weaker regulatory quality leads to a higher risk of economically motivated adulteration.

The project results can be used to prioritize risk at the product, firm and shipment level, and to develop systematic approaches to monitoring and regulations.

For a video of the talk, please go to https://goo.gl/ciDBPG

Retsef Levi Ph.D. ’05
Peter Cramton ’80 is Professor of Economics at the University of Maryland and the European University Institute, and on the International Faculty of the University of Cologne. A Cornell ORIE major as an undergraduate, he received a Ph.D. in business from Stanford in 1984.

“Technology has enabled much better markets,” Cramton asserted. Market designers “try to establish effective rules of market interaction—and these rules really matter. What I like to call ‘Economics Engineering’ entails ideas from economics (incentives), operations research (optimization), computer science (algorithms), psychology (behavioral aspects), and general engineering (vectors in communication, transportation, etc.),” he said. “Good market design—based on the objectives of efficiency, simplicity, transparency and fairness—improves allocations and pricing information, and reduces the chance of market failure due to excessive risk or inadequate competition.”

Cramton discussed the success of designed markets for electricity and telecommunications, and showed how the same principles can improve transportation scheduling, climate policy, and trading of financial securities.

- Wholesale electricity markets have been transformed by the ideas of open access to transmission capacity and by well-designed products that send the right pricing signals. Cramton described a successful market in which “every few minutes, computational optimization is used to determine who should be generating how much electricity, who should get it, and how it should be priced. Underlying market rules translate the preferences of the generators and the preferences of the demand side into an optimization problem with the objective of maximizing social welfare, subject to constraints governed by engineering laws.” The market optimizes use of existing resources in the short term, and for the longer term, produces pricing that leads to investment in the right quantity and mix of resources, he said.

- The auctioning of communications spectrum, in which Cramton has also been closely involved, is now well-established, with “current broadcast incentive auctions underway to repurpose TV spectrum to mobile communications—the most complicated auction ever by orders of magnitude, involving combinatorial optimization at every stage.” As with electricity, telecommunications has evolved from monopoly, through oligopoly (because of the large entry cost), to competition.

- In financial markets, Cramton said, “making time discrete can greatly improve market efficiency.” Currently, financial trades (for example at NASDAQ) are continuously “threaded through” a single computer, with no real computation possible. This provides “a prize for whomever is fastest, leading to an arms race with enormous investment and advances in speed, one that does not actually improve capital investment but costs investors.” With co-authors, he has argued instead for frequent batch auctions, in which orders are collected over a short interval (say, one-tenth of a second), and the auction can achieve a consensus clearing price. This “greatly simplifies the market for everybody,” introduces opportunities for operations researchers to use the short interval to compute a clearing price, and transforms competition based on speed to competition based on price.

Cramton also discussed the potential for market design to improve transportation scheduling and to combat climate change. Reforms employing improved market designs meet resistance, said Cramton, since there is established money being made from inefficiencies. Nonetheless, he is “quite confident” that designed markets will eventually come to pass, noting that already several Cornell faculty members are currently involved in market design research.

For a video of the talk, please go to https://goo.gl/a424H7
Drawing on a sample of the wealth of experience of ORIE alumni in a range of industries, Director Shmoys convened a panel consisting of Jeff Goldman (Procter & Gamble), Jamie Hintlian (Ernst & Young), Chris Jones (Marchex), Radhika Kulkarni (SAS), Reha Tütüncü (AQR Capital) and Theresa Wise (Delta Airlines) to provide insights into the evolution of the tools and science underlying what OR has brought to their industry and where things are going in the next decades or so.

Hintlian ’82, M.Eng. ’85, M.B.A. ’86 leads the Life Science Supply Chain practice at Ernst & Young (EY). He discussed what EY calls “the digital operations agenda,” which Hintlian said covers three developments: intelligent machines (plant equipment with sensors and products with electronic serial numbers that can be traced in real time), advanced analytics that is “literally at our fingertips,” and “connecting people with work,” with such capabilities as visualization. He noted that the life science supply chain is much like that in other manufacturing industries, but must operate within a regime of regulation, which now requires tracking and tracing of materials from manufacturer to point of dispensing, as well as a new FDA requirement for reporting of all deviations from the approved “recipe” for the manufacturing supply chain. Without analytics, these requirements are only useful to management “if you like driving with only the rear view mirror.” But now being able to bring together datasets from intelligent machines and other systems allows leadership to use predictive analytics to anticipate where issues might arise, and connects line workers with their work, empowering them to understand and make effective use of available information.

Kulkarni Ph.D. ’81, Vice President of Advanced Analytics R&D at analytics solutions company SAS, traced the growth at SAS of operations research, which accelerated dramatically some years ago when the company moved from providing statistical software to become a provider of business solutions. “The CEO recognized that optimization would be an enabler of success in providing solutions,” she said, and now more than 200 people, including more than 20 Ph.D., work in OR at SAS. Looking forward, “Recent developments are making OR even more critical in Data Analytics,” she said. “Problems that couldn’t be solved before now can be solved” due to the increase in economical computing power.

Jones ’80, M.Eng. ’81 Ph.D. ’85, who has worked as a software developer for Amazon, a supply chain architect for Aspen Technologies, and an associate professor at Simon Fraser, is now a principal software developer for Marchex, a company that does “call analytics.” He noted that while Moore’s Law may be ending, networked and parallel computing and even quantum computing may take its place as a driver of scale. Computational tools are better, but it still remains “hard to build a model that is correct, current, and complete,” asking “can we get to a Moore’s Law with respect to modeling?” As an indication of where analytical computing power is leading he said that Marchex currently joins together records of 1 million telephone calls and 1 billion web clicks to “trace the customer journey leading up to a purchase.”

Goldman ’97 M.Eng. ’98 is Associate Director of Enterprise Data Science at Procter & Gamble (P&G) after serving as...
analytics advisor to top P&G executives. While he agreed with the remarks of others on the role of technology, he said that his view of operations research has changed. When he left Cornell, he saw “the core of operations research was helping organizations make good decisions based on science.” Now he sees the “ability to analyze business data, make unbiased recommendations on the state of the business, what likely competitive activity might be, and how best to respond to different competitive activity, while not directly operations research in themselves” is most likely to come from people with an operations research background, so the challenge for operations research is “to have a seat at the decision table with the senior executive.” Goldman sees “analytics as the future of industry and of our own field. The more we can focus the people coming out of school on understanding business aspects and how the combination of analytic mastery, analytic depth and business understanding provide a unique combination that will allow our profession to be differentiated on the world stage.”

Wise M.S. ’92 Ph.D. ’95, who delivered the Bangs Lecture at the outset of the celebration, noted that in the airline industry “there has been tremendous change but the types of things we look at and the underlying approaches are persistent.” However “there is more work to be done,” she said, for example in predictive analytics, in coping with messy data, and in seeking customer input when as the airline continuously refines systems that cope with “irregular operations,” i.e. “putting things back together after disruptions from weather and operational problems. Wise credits success at Northwest and Delta to getting OR and IT people to work together: “Fully leveraging OR involved good IT,” she said.

In 2005 Tütüncü, Ph.D. ’96, became a “quant” on Wall Street after 10 years as a mathematics professor at Carnegie Mellon University. He recently moved from Goldman Sachs to AQR Capital Management. Reviewing his personal history as well as that of OR in finance, he said that when he joined the industry, quants were considered as problem solvers providing a service, and there was a failure to recognize the full value of an OR background, with some people blaming models and software for failures that were actually due to their limited OR knowledge or to inadequate forecasting. The introduction of new academic Financial Engineering programs, in which ORIE was a pioneer, led to a proliferation of people with OR-based Financial Engineering degrees in the industry, which helped improve the situation. Later, the introduction of “new financial products in the securitization space” some of which incorporated bad models that led to bad decisions, gave a bad name to the quant culture, he said, leading to an effort by OR quants to educate people about problems in their use of the products. (Even before the financial crisis, academics such as the late David Heath, then at Cornell, had worked to improve the measurement of risk, he said). Looking forward, he noted that while innovation may have slowed down, there is potential “in the advanced analytics space, for example turning large quantities of data—including more unusual sources such as non-numeric and unstructured data—into models, for example by applying machine learning.” He hopes that a fresh Ph.D. he hires from an OR program in the future will demonstrate new methods and techniques rather than “ceding leadership to our sister fields.”

For a video of this talk, please go to https://goo.gl/0yRfNG
In introducing a panel representing multigenerational families, ORIE Director David Shmoys said, “One of the nice things about being around for fifty years is that ORIE has been host for quite a large number of families—upwards of a dozen—with parent-and-child pairs who both have OR degrees.” He asked panel members to comment on differences and similarities among ORIE programs for the different generations, having provided lists of the courses they had taken. Many of the panelists discussed different individual ways in which they had been able to broaden and diversify their undergraduate ORIE experience, demonstrating how the capabilities to do so have evolved over the years.

Bill Wiberg ’81 and his daughter Holly, who is in this year’s graduating class, comprise an ORIE pair family. Bill noted that prior to coming to Cornell he had never heard the term “operations research.” In his work as a venture capital investor the term “data analytics” comes up every day. “My guess is that when people come to Cornell now, they are much better equipped to understand what OR is,” he said.

Comparing her course list with her father’s, Holly Wiberg noted that, for ORIE students in her father’s cohort “there was much more emphasis on traditional engineering fields.” Not having to fulfill so many underclass engineering requirements “has worked to my advantage,” she said. It enabled her to take a semester abroad, at the Hong Kong University of Science and Technology. However her father Elliot Paull ’77 noted that even with more required engineering courses than Amy he had been able to diversify by taking courses in five of Cornell’s colleges. That experience helped put engineering in perspective by showing how important data is to solving real problems, while his OR courses equipped him well in taking data and relating it to business problems, during his career at Microsoft and subsequently as an independent consultant.

In comparing her ORIE education with her father’s, Amy noted that the foundational courses, such as Math 293 and the core OR courses, have remained in the curriculum, even having the same course numbers. “I have been able to take courses that were complementary to the engineering and operations research courses,” she said. “I’m glad that the trend of using your operations research understanding in a very multidimensional kind of way continues.”

Henry Shum ’83 Ph.D. ’89 was a member of the panel together with his two godsons, Adrian Wu and Nathan Ngan, both seniors who will be pursuing the M.Eng. in Financial Engineering next year. Shum provided some insight into the compartmentalization of theory and practice that occurred in the past, by recalling that in his first job, with International Paper, “I never imagined that in real life there is such a thing as the ‘cutting stock problem,’ despite having been introduced to this famous operations research problem in Professor Leslie Trotter’s class,” he said. “But that is what I worked on for the next five or six years!”

Wu noted that, based on comparing course lists, he had been able to take a different approach from Shum, by taking courses in the Johnson Graduate School of Management as a way of combining theory and practice. “It was interesting that I could apply things that I learned in OR and draw a connection” to topics encountered in his business courses. “My classes in OR helped me understand the nitty-gritty of how to make these things actually work,” he said. Ngan decided to take the Financial Engineering program because “it gives me the best of both worlds in terms of academic and also career exposure.”

Asked by Brooke Shum ’77 what ORIE can do to add value for a student coming here versus going elsewhere, Shmoys said that a significant differentiator would be getting additional resources to be able to systematically provide hands-on experience beyond what has been available to only about 20% of the students, including some of the panelists.
Bill Maxwell’s talk provided perspective on the long history of OR at Cornell, which began more than 10 years before the founding of the School. As an undergraduate, Maxwell was led to the study of simulation after taking the first computing class offered at Cornell in 1956. By the time he had started his master’s the following year, he realized that computers could be used to enhance production planning. It was around this time that Maxwell began work with his degree supervisor and long-time collaborator, Dick Conway. The two were building simulation models on the IBM 650.

Maxwell went on to earn his Ph.D. at Cornell in 1961 and started teaching shortly after that. The first course he taught was a masters-level simulation class that he designed.

“I was an undergraduate in a five-year program and in ’63 as an assistant professor I was on a major committee that came up with the notion of the current four years for a bachelor of science.”

With Conway, he became interested in the use of simulation to understand scheduling. In 1962, they developed a method of modeling queuing systems using discrete probability distributions, making it easier to develop computer simulations of such systems.

Maxwell spent a year as a consultant with the RAND Corporation in 1965. His work from this period contributed to the book he, Conway, and Louis W. Miller of RAND published two years later, on the Theory of Scheduling. This comprehensive text explores the mathematical models underlying the theory of scheduling. Organized according to scheduling problem type, it examines three solution techniques: algebraic, probabilistic, and Monte Carlo simulation by computer.

For a video of this talk, please go to https://goo.gl/hDWN8s
Lee Schruben spent more than a quarter century in Ithaca, before retiring from Cornell as the Andrew S. Schultz Jr. Professor of Industrial Engineering in May 2000. He came to Cornell from Manhattan, Kansas in 1964 on what he believed was a football scholarship.

“I came here to play football,” says Schruben. “It was a very short career. We played Princeton and I got injured. And back then, when you get injured you lose your scholarship. So I went to coach (Tom Harp) and said … I can do [practically any] thing. Just let me finish out the year. And he said, ‘Schruben, you have an engineering scholarship. You don’t have a football scholarship.’ I was tricked. I thought I was here to play football.”

After graduating from Cornell in 1968 with his B.S. in Operations Research, Schruben spent a few months working for Emerson Electric Company, St. Louis, Mo. before being drafted into the U.S. Navy.

“Operations research saved my life,” Schruben says. “During that time, there was a conflict in Vietnam and all the people my age were being drafted. I was drafted out of college. Byron Saunders said, ‘Operations research is now a major and the navy knows what operations research is; put that down….So I got myself two more years and then I went in the navy as an operations researcher.”

After earning advanced degrees from North Carolina (M.S., Statistics) and Yale (M.Phil., Health Care Systems and Ph.D., Operations Research/Statistics), Schruben found himself back in Ithaca in 1976 as an assistant professor in ORIE.

“I miss Cornell every day,” says Schruben, who is Professor and Past Chair, Department of Industrial Engineering and Operations Research at University of California at Berkeley. “I’m thrilled to be back. I think those who have left feel the same way.”

For a video of this talk, please go to https://goo.gl/o35E5E

The celebration weekend came to a close at the gala dinner at Klarman Hall. ORIE Director David Shmoys gave a heartfelt introduction to guest speaker Uma Prabhu, pointing out the weekend “also marks 50 years of Uma Prabhu in Ithaca.”

“It’s hard to underestimate Uma’s role as a mentor to so many of us,” Shmoys says. “When I transitioned to Cornell, I really saw the full human being—not just the scholar, the intellect, the teacher—but an Uma Prabhu who deeply and genuinely cared about everyone.”

Shmoys said that Prabhu “set a tone and character for what kind of place Cornell ORIE was and is today; in no small part due to his own actions. Uma’s special warmth and caring was something that permeated the place. And I think as we look at these 50 years, we would really be a very, very different place without his presence.”

Upon taking the stage, Prabhu humbly said Cornell’s rising to the state of prominence was “not just due to my efforts, but by the joint effort of all the faculty. I mean this most honestly.”

Prabhu talked about coming to the United State from India in 1964. After a year at Michigan State, he came to Cornell as a faculty member in the Department of Industrial Engineering. In addition to speaking about the formation of the current School of Operations Research and Information Engineering, Prabhu talked about how some of the original faculty members moved on to other schools to help develop OR departments at their new universities.

One of ORIE’s newest faculty members, Siddhartha Banerjee, said “The highlight of the event for me was meeting Uma Prabhu and listening to his dinner talk. For me, hearing him for the first time was an amazing experience. As a talk, it was very different from any I have heard—a collection of stories and observations, which, put together, were strangely moving. It really made me appreciate the history and the spirit of this department.”

At the end of Prabhu’s talk, the guests rose to a spontaneous standing ovation for the man and his work.

For a video of this talk, please go to https://goo.gl/5or3ZY
ORIE @ 50: WEEKEND IN PICTURES
As a fifth-year student in mechanical engineering, Meyer Gross ’58 began his first year at Cornell Law School while in the last year of what was then a five-year undergraduate degree program. He completed 210 credits in the five years. As an undergraduate, he was in mechanical engineering’s administrative option, which became ORIE. Perhaps because he was already moving towards law, he was not elected to Tau Beta Pi, the national engineering honorary society, at that time.

With his wife Karen, also a lawyer, Gross travelled to Ithaca in March to be initiated into Tau Beta Pi. “I’ve waited nearly sixty years for this,” he said.

Following the initiation ceremony, which was open only to Tau Beta Pi members, he and Karen joined the other members for lunch in the atrium of the Physical Sciences Building. “The ceremony was quite stirring, even for these eyes, which have seen so much over the years,” he said. “I could not get over the Physical Sciences Building. I just knew the space as a walk between Baker and Rockefeller.” At lunch, he told the undergraduates with whom he was sitting what mechanical engineering education was like 60 years ago, and what constituted diversity in the student body.

In his career as a lawyer, Gross, who transferred to Columbia Law School to complete his J.D., did not forsake engineering. He served as patent counsel for technical firms involved in instrument systems, aerodynamics, and pharmaceuticals, and obtained important patents relating to bi-axial orientation of plastic sheets, use of Interferon for cancer therapy, automatic focusing cameras, and water-drip irrigation. He also provided intellectual property counsel for such artists as Billy Joel, The Police, The Village People and Sir Paul McCartney, as well as for numerous foreign companies and international law firms.

Gross has remained loyal to Cornell, serving as co-chair of his 55th reunion and Vice Chairman of the New York-New England region of the Alumni Association, conducting numerous interviews and endowing an undergraduate engineering scholarship and an internship in the Johnson Museum of Art. He is a voting member of the American Institute for Economic Research (an organization that gave him a scholarship as an undergraduate), and a member of the board of the non-profit Classical Saxophone project.
The fall of 2015 marked the arrival to campus of three junior faculty members, each of whom had spent the past two years as a postdoctoral researcher: Sid Banerjee from Stanford, Yudong Chen from Berkeley, and Jamol Pender from Columbia. The broad research wingspan of the School is reflected in the breadth of their scholarship.

Siddhartha Banerjee

Siddhartha Banerjee arrives at Cornell having completed a postdoctoral fellowship at Stanford in the Department of Management Science and Engineering after getting his Ph.D. at UT Austin in the Department of Electrical and Computer Engineering. Sid designs algorithms for systems where a large number of agents interact through a communication or social network. His work spans the areas of control of information flows, large-scale computing for social networks, and learning and recommendation systems for the Internet. He has done work on setting up incentive mechanisms in collaborative platforms, where agents can build on each other’s work. He studied on-demand transportation systems, such as Uber and Lyft, where there is a strategic interaction between drivers, passengers and quoted prices, and has worked on designing scalable algorithms to personalize web searches.

Yudong Chen

Yudong Chen arrives at Cornell ORIE having completed a postdoctoral fellowship with Martin Wainwright in the Department of Electrical Engineering and Computer Sciences at UC Berkeley (where Wainwright has a joint appointment with Statistics as well). Yudong received his Ph.D. in Electrical and Computer Engineering from UT Austin in August 2013. Yudong’s research interests lie in the area of machine learning, statistical inference, networks and optimization. His work develops algorithms for discovering and analyzing patterns in large-scale data, with a particular emphasis on the interplay between accuracy, robustness and computational efficiency of these algorithms. The theoretical framework that he provides for his algorithms allows us to understand what problems are provably difficult to solve and how much data is needed to solve certain problems provably well.

Jamol Pender

Jamol Pender joins the ORIE faculty after completing a postdoctoral fellowship at Columbia University in their Department of Industrial Engineering and Operations Research. Pender’s research area is in queuing theory, which has its origins in the study of telecommunication systems, but is currently applied in the optimal management of large scale service systems such as call centers, data centers, and healthcare systems. Pender’s work focuses on studying the behavior of these time-varying systems, providing tools to answer questions such as how to estimate how many customers are in line, how long will customers wait, and how many employees are needed to provide quality service. His research attempts to answer some of these important questions through the stochastic analysis of time-varying queueing networks and the development of new simple and fast algorithms for the service systems community to use.
Jim Dai joins Sid Resnick, David Ruppert and David Shmoys as chaired professors in ORIE. Resnick is the Lee Teng-Hui Professor in Engineering, Ruppert the Andrew Schultz Jr. Professor of Engineering and Shmoys is the Laibe/Acheson Professor of Business Management and Leadership Studies. Being named a chaired professor is the highest academic honor Cornell bestows.

Dai, who came to Ithaca from the H. Milton Stewart School of Industrial and Systems Engineering at the Georgia Institute of Technology, has worked for more than 20 years on stochastic models arising from communications, manufacturing and service systems. He received B.A. and M.S. degrees from Nanjing University and a Ph.D. from Stanford University, all in mathematics. He has been named a full professor at Cornell.

Dai is an elected Fellow of both the Institute of Mathematical Statistics and the Institute for Operations Research and the Management Sciences. His work ranges across a variety of applications that entail randomness experienced over time.

For example, he has looked at rules for staffing customer call centers to provide both quality (short waiting times) and efficiency (high utilization of staff), taking into account the possibility that some fraction of callers will abandon the system if they have to wait too long. He recently developed and validated a mathematical model that can be used to test strategies for reducing the time that emergency room patients have to wait for a bed once it is known that they must stay in the hospital. He is principal investigator on a National Science Foundation grant to model systems that incorporate a network of processing capabilities, such as large web server farms and semiconductor wafer fabrication facilities.

All of these problems have required Dai to develop deep new mathematical techniques in order to create and characterize models that represent them.

Dai’s chair is named for Leon C. Welch, who received his bachelor’s degree in mechanical engineering from Cornell in 1906. As an undergraduate he played semi-professional baseball during the summers to help pay his college expenses. Following a long and distinguished career as an engineer and businessman, he retired in 1947 as Vice President of the Standard Oil Company of Indiana. In 1956, as a result of his involvement with the University Council and his friendship with then Dean of Engineering S.C. Hollister, he made provisions in his will to endow a professorship in the Engineering College. He died in 1962, and the endowment passed to Cornell following the death of his wife, Edith Packard Welch, in 1966. The previous Leon C. Welch Professor was Mike Todd, who retired from the School of Operations Research and Information Engineering at Cornell last year.
ORIE FACULTY, STAFF RECEIVE COE AWARDS

HENDERSON, JAY EARN CEAA AWARDS

ORIE Professor Shane Henderson received the Tau Beta Pi Professor of the Year award at this spring’s Cornell Engineering Alumni Association awards luncheon.

The Tau Beta Pi engineering honor society recognizes a tenure-track professor as one of the college’s most outstanding teachers. Professors are nominated by their students and are selected by Tau Beta Pi each year.

Tau Beta Pi is the only engineering honor society representing the entire engineering profession. It is the nation’s second-oldest honor society, founded at Lehigh University in 1885 to recognize students of distinguished scholarship and exemplary character.

THREE FACULTY RECEIVE COE TEACHING AWARDS

Three members of the ORIE faculty received teaching excellence awards for 2015 and were honored at a luncheon in December.

Professor Adrian Lewis was presented with the Kenneth A. Goldman ’71 award, while Professor James Renegar received the Mr. & Mrs. Richard F. Tucker ’50 award. Professor Huseyin Topaloglu received the James and Mary Tien teaching award.

Lewis won the Sonny Yau ’72 award in 2007. That same year, ORIE undergraduates voted him Teacher of the Year. From 2010 to 2013 he was Director of the School of Operations Research and Information Engineering, following which he took a well-deserved sabbatical. Therefore, this nomination covers his years as teacher from the previous award to the present day.

Although Renegar received teaching awards in 1998, 2001 and 2011 (from 2004 to 2009 he was ORIE’s Director), he continues to introduce fundamental changes to the courses that he teaches, and demonstrating a devotion to his craft, where merely excellent is not enough.

Having won COE teaching awards in 2005 and 2012, Topaloglu also received the James M. and Marsha D. McCormick Advising Award in 2014.
MIKE TODD ELECTED TO NAE

Mike Todd, the Leon C. Welch Professor Emeritus in the School of Operations Research and Information Engineering, has been elected to The National Academy of Engineering (NAE). Todd was elected for contributions to the theory and application of algorithms for continuous optimization.

Election to the National Academy of Engineering is among the highest professional distinctions accorded to an engineer. Academy membership honors those who have made outstanding contributions to “engineering research, practice, or education, including, where appropriate, significant contributions to the engineering literature,” and to the “pioneering of new and developing fields of technology, making major advancements in traditional fields of engineering, or developing/implementing innovative approaches to engineering education.”

Todd joins 33 other current or former Cornell faculty members to be selected to the NAE, including Bill Maxwell, the Andrew Schultz Jr. Professor Emeritus of Industrial Engineering in the School of Operations Research and Information Engineering.

PATIE, SAMORODNITSKY ORGANIZE “ADVENTURES IN SELF-SIMILARITY”

Nearly two dozen scholars from the Canada, China, England, France, India, Israel, Mexico, Poland, Switzerland, Ukraine and the United States shared research results at a conference about the mathematics of a phenomenon that occurs in communication networks, finance, geology, hydrology, and many other disciplines.

According to ORIE Professor Gennady Samorodnitsky, self-similarity “is found everywhere.” In the popular view, it is associated with spatial phenomena in the form of fractal geometry, a standard example of which is the shape of coastlines that look similar at smaller and smaller scales as one zooms in. The conference was devoted to the mathematics of self-similarity occurring in random processes that unfold over time. For example, the absolute returns of equity data in finance show similar patterns at different time scales, as does Ethernet traffic. Mathematical models based on the idea of self-similarity can yield valuable insights into the behavior of these and other processes. Although the applications are broad, the recent conference was devoted to expanding the understanding of the mathematics of self-similarity, with talks on such topics as “an isomorphism theorem for infinitely divisible processes” and “sample paths of the solution to the heat equation with fractional noise.” Videos of some of the talks are at https://goo.gl/gnfpxJ.

Samorodnitsky organized the conference together with ORIE Associate Professor Pierre Patie, Loïc Chaumont of the Université d’Angers and Yimin Xiao of Michigan State University. The conference was sponsored by ORIE, the Cornell Department of Mathematics, and a program at the Université Libre de Bruxelles with which Patie was previously affiliated.
Distinguished academic and industry statisticians spoke at a symposium celebrating the retirement of Professor Bruce Turnbull, Ph.D. '71. They joined colleagues, students, family and friends at a barbeque at Cornell’s A.D. White House afterwards last September.

The gathering included the presentation of a slide show featuring Turnbull, family, and colleagues over the years.

Turnbull, who first came to Cornell as a graduate student following a B.A. in Mathematics from Cambridge University, has worked on a wide variety of statistical applications in energy, epidemiology, medicine, engineering, manufacturing and toxicology. His Cornell dissertation, under the direction of former ORIE Professors Howard M. Taylor III and the late Robert E. Bechhofer, is titled Bounds and Optimal Strategies for Stochastic Systems. Taylor, who has retired from the University of Delaware, attended the event.

Turnbull joined the Cornell faculty in 1976 following positions at Stanford and Oxford. At the beginning of this century he served as the first chair of the newly formed Department of Statistical Science and is retiring as a professor in both ORIE and that department.

Taylor recalled that there had been efforts to form a university-wide statistics unit in the late 1960s, when he was on the ORIE faculty, but there was much resistance to such a move at that time. “At Bruce’s retirement,” he said, “I was amazed at what he had achieved in terms of statistics at Cornell, where a university-wide Department now exists. What an achievement! Bruce can get things done—I think part of it is that he is a good listener.”

To read more on Bruce Turnbull’s retirement celebration, please go to http://goo.gl/wu1qf5.
Friends of Lee Teng-Hui Professor in Engineering Sidney Resnick were not surprised at the announcement that his birthday would be celebrated by a roast, which was held in the Herbert F. Johnson Museum of Art and attended by family, friends, and colleagues last November. Though for some attendees the event might have been considered “payback time” the evening was marked by warm affection tempered with (mostly) gentle gibes.

In early December, the celebration continued with a New York City Gala held at Cornell Financial Engineering Manhattan (CFEM). The Gala consisted of a series of technical talks by long-term Resnick colleagues, culminating in dinner (with more roasting) in a nearby restaurant dining room located in the antique vault of the former JP Morgan Bank.

The Ithaca Roast

Roasters included Professor Richard Davis from Columbia University; ORIE Professors Mark Lewis, Mike Todd, Shane Henderson, Franz Schalekamp and David Shmoys; a trio of members of ORIE’s entering Ph.D. class of 1993; and Resnick’s son Nathan ’05, now a technology recruiter based in New York City.

The New York City Sidposium

Most of the speakers at the New York City Gala have had a long professional and personal association with Professor Resnick. Thomas Mikosch (University of Copenhagen), Paul Embrechts (ETH) and Claudia Klüppelberg (Munich University of Technology) were at ETH, the Swiss Federal Institute of Technology in Zurich, Switzerland, in 1992 when Resnick met them as a Visiting Fellow there. These three speakers have written papers with him, as have the other speakers: Holger Rootzén (Chalmers University of Technology, Gothenberg Sweden), Resnick’s Cornell colleague Gennady Samordnitsky, Resnick’s former Ph.D. student Bikramjit Das (Singapore University), and Resnick’s frequent collaborator Richard Davis (Columbia).

Roasting Continues

Following a day of deep technical discussion, roasting continued in the bank vault at the Sidposium dinner, where slides evoked themes such as bicycles, basketball, art, notable Resnick rejoinders, and enduring friendships.
According to Laibe/Acheson Professor of Business Practice and Leadership Studies Emeritus Jack Muckstadt, “learning by doing works well only when feedback is fast and unambiguous.” Muckstadt, Professor Peter Jackson and other ORIE faculty, IBM retiree John Jenner ’57, B.M.E. ’68, M.B.A. ’59 and other industry colleagues, and University of Michigan Professor of Business Information Technology Emeritus Dennis G. Severance have developed and evolved a way to deliver both experience and prompt feedback in the classroom.

Jenner, who as a faculty member of IBM’s Manufacturing Technology Institute (MTI) in the early 1980s devised the first experiential learning Manufacturing System Operations Game, describes experiential learning as “a bridge between the academic world and the working world.” According to Jenner, MTI was established to increase the professionalism of IBM’s manufacturing cadre. Jenner recognized that engineering graduates needed to confront industrial problems that had grown increasingly complex, requiring the coordination of a broader set of skills and larger teams, so that IBM could better compete with Japanese manufacturers at the time. He realized that creating a context in which students can work to solve these problems “is simplified by using computers to simulate the working environment and to manage the flow of information needed to characterize the problems.”

At a Cornell event this fall, Muckstadt, Severance, Jackson, Jenner and others celebrated 30 years of experiential learning at Cornell, Michigan and in industry. The event was designed to honor those who have contributed to the evolution of experiential learning and to introduce faculty from other disciplines to an approach that is in stark contrast to traditional ‘didactic’ teaching.

Keynote Address

In the event’s keynote address, Severance described this contrast, defining experiential learning as “students working in small groups on realistic practice-oriented projects in ambiguous and challenging situations with real consequences, for which there is no one correct answer.” In this approach, “the responsibility for learning lies with the student as learner, rather than the teacher as trainer,” he said. Students are able to solicit support from faculty, advisors and colleagues, but faculty are facilitators rather than disseminators of known information. Severance’s address, subtitled “WIIFM: What’s In It for Me???” emphasized that “everyone who needs to cooperate for a project to succeed, must perceive positive WIIFM or the project will fail.”

Origins of Experiential Learning at Cornell

Muckstadt was first introduced to operations research-related experiential learning in 1983, when he met with Jenner at MTI in Manhattan. Jenner recalls that during the visit, “Jack and I sat together at lunch and I committed to set up my game for use at Cornell.” Jackson, who had already developed a distribution game at Cornell, reprogrammed the game for ORIE’s network of personal computers, and in 1985, Jenner, Jackson and Muckstadt began teaching the game at Cornell, a collaboration that has continued ever since.
Walker, who is Emeritus Professor of Policy Analysis at Delft University of Technology, has spent his career working on real-world public policy applications of operations research. His approach to what he calls ‘deep uncertainty’ draws upon 40 years of experience at the RAND Corporation in New York City, Santa Monica, and the Netherlands.

In his talk, he characterized the traditional approach to policy analysis — making assumptions, predicting outcomes, and then choosing a policy — as fraught with the consequences of uncertainty (Donald Rumsfeld’s things “we don’t know what we don’t know”) and liable to lead to costly outcomes. As examples of the unreliability of predictions, he contrasted predicted Eurostar ridership with the actual number of passengers ten years later, and actual U.S. energy use versus gross national product in 2000 as much lower than predicted in 1975.

Rather than simply ignoring uncertainty, assuming the future is knowable, using probability distributions to project a trend, or basing a policy on a few scenarios, Walker recommends “Dynamic Adaptive Policies,” i.e., policies that can be adapted as conditions change over time. Formulating such policies entails using a massive quantity of computer simulations to explore and identify circumstances under which a policy might succeed or fail, developing a ‘policy protection plan’ for a promising policy, and setting up a monitoring system with triggers that set off defensive and corrective actions if needed.

Walker’s approach is being used on several projects in Europe and Asia, including the design of a “Flexible Port” for the Port of Rotterdam, capacity management at Schiphol Airport, water management in the Netherlands in the face of climate change, and water management in several other areas of the world that are vulnerable to climate change.
Cornell Engineering’s Cooperative Education Program announced the Co-op of the Year award recipients at the 2015 Co-op Welcome Back Reception on September 2, 2015 and three ORIE students received distinguished honors.

Kelsey Cadagin ’15 earned distinguished honors after working at GE Transportation in Erie, Pa. over the summer. Amelia Elverson ’16 did her co-op at Entrust Datacard Corporation in Shakopee, Minn., while Htoo Wai ’17 worked at PayPal in Timonium, Md.

The nominations for the award are submitted by supervisors who have worked closely with a Co-op student that they feel has demonstrated leadership, initiative, and innovation in the Co-op position.

Three ORIE Students Receive Co-op Awards
Six Cornell Financial Engineering students teamed up to claim their share of first place in the fourth annual Academic Affiliate Membership Student Competition sponsored by the International Association for Quantitative Finance.

The team was composed of Shaojie He ‘15, Jin Li ‘15, Sandeep Saju ‘15, Mengying Zhang ‘15, Yanan Zhang ‘15 and Jiahe Zhou ‘15. Leveraging their knowledge in finance, actuarial science, statistics and optimization, the students were able to produce a robust data-driven solution. Ultimately, the report was deemed a winner among 25 highly competitive teams.

In January 2015, IAQF released the problem, which consisted of designing a product that would reduce the risk of defined-benefit pension plans. The problem is a very timely one and has been documented extensively in the financial press. Guided by Cornell Financial Engineering Manhattan’s Victoria Averbukh and Sasha Stoikov, the “Greeks and Geeks” spent most of its winter break skyping with each other from various corners of the globe. After reviewing the financial literature and exploring the data, the team was able to write a stellar report—Liability Driven Investment: A Dynamic Hedging Strategy Against Multiple Risk Exposures of Pension Funds—detailing its solution.

“Solving practical problems sponsored by industry is at the core of the School of Operations Research and Information Engineering Master’s of Engineering program,” says Stoikov. “We are very proud to see how well our students competed against the top-ranked quantitative finance programs.”

FINANCIAL ENGINEERING STUDENTS WIN IAQF COMPETITION

RUPPERT, MATTESON PUBLISH TEXTBOOK

Professor David Ruppert recently completed the second edition of his textbook Statistics and Data Analysis for Financial Engineering. The book is aimed at master’s students in financial engineering and is used as a textbook in ORIE 5640. Professor David Matteson, Department of Statistical Science, who teaches ORIE 5640 regularly, has been added as a co-author. Professors Ruppert and Matteson gave a short course based on the second edition at the Joint Statistical Meetings in Seattle in August 2015.
The International Computer Programming Competition (ICPC) draws tens of thousands of undergraduate contestants from more than 2,000 universities in more than 100 countries, who participate as teams on a regional basis. This year, four Cornell teams competed with teams from 19 other schools, including Columbia, NYU, Princeton and Yale, in the Greater New York regional contest at Queens College in New York City.

The team coached by ORIE Ph.D. student Daniel Fleischman and made up of senior Saketh Are, sophomore Victor Reis and junior Jake Silverman won the competition decisively, beating two Princeton teams that tied for second. The other Cornell teams all finished in the first half in the rankings. According to Silverman, “The very last moments of the competition were fairly intense. We were all spitballing possible ideas about how to solve the last question, hoping that one of them would stick — and eventually one did.”

The winning Cornell team traveled to Phuket, Thailand in May to compete against more than 100 regional winners from around the world. While no U.S. team has won in nearly 20 years in a competition dominated by St. Petersburg State University of Information Technologies, Mechanics and Optics and other non-U.S. schools, Fleischman hopes the team brings home to Cornell one of the 12 medals — four each of gold, silver and bronze — that will be awarded in Phuket.

Dimitriy Drusvyatskiy, ORIE Ph.D. ’13, was designated as one of three finalists for the 2015 Tucker Prize, awarded for an outstanding doctoral thesis. His dissertation, “Slope and Geometry in Variational Mathematics”, was supervised by ORIE Professor Adrian Lewis.

The dissertation develops fundamental concepts in mathematical optimization that do not rely on the traditional characterization of optimization problems in terms of whether they are linear, polynomial, smooth, sparse or other such properties that relate to how the problem is represented algebraically. Instead, Drusvyatskiy explores properties that are intrinsically geometric in character, in particular the fastest instantaneous rate at which a mathematical function decreases, its slope. His insights are particularly relevant when the relationships involved in a problem are not ‘smooth’, i.e., small changes in input can result in abrupt changes in output.

In citing the basis for selecting Drusvyatskiy as a finalist, the Tucker Prize Committee noted that the dissertation “gives the mildest of conditions for many striking results in [so-called] tame optimization.” The citation concluded, “In summary, built on rich imagination and creativity, this dissertation makes an inspiring set of fundamental and far reaching conclusions in the area of nonsmooth optimization.”
Many consumers choose products based at least in part on reviews on a retailer’s website. But as more and more customers rely on reviews, the reviews may tend to become concentrated on products with many favorable reviews, leaving other products relatively unexplored. So the retailer may decide to offer an incentive, such as a discount, to encourage consumers to explore less frequently reviewed products by buying and reviewing them. If incentives are properly set within the available budget, both the retailer and the customer may benefit by their use, improving overall social welfare.

Designers of systems in other domains, such as crowdsourced information discovery (e.g., ratings of stories for social news sites), crowdsourced work (e.g., Amazon Mechanical Turk), citizen science (e.g., Galaxy Zoo or eBird) and even government funding of research efforts have similar opportunities to improve exploration by offering incentives to ‘agents’ to explore more widely.

**Prize-winning paper**

ORIE’s Peter Frazier, OR Field members Robert (Computer Science) and Jon (Computer Science) Kleinberg, and Jon’s former student David Kempe, now a professor at the University of Southern California, won the best paper award at the 2014 Association for Computing Machinery (ACM) Conference on Economics and Computation for their work on incentivizing exploration. The paper was one of more than eighty accepted for the conference and subsequent publication.

In the paper, the authors examine the trade-off between the expected size of incentive payments made to agents versus the expected reward to the principal who organizes the exploration. The more that is spent on incentives, the less accrues to the principal, but the total reward may or may not decrease with the payout. The authors’ approach considers both payments and rewards to be uncertain quantities, evolving over time, given that the actual value of each product, web story, distributed work effort, area of the astronomical sky, bird habitat or research activity may only be known up to a probability distribution on the outcome of the exploration.

According to Frazier, the original motivation for the work came from considering research funding by agencies, such as the National Science Foundation and the National Institutes of Health, that may want to offer incentives for research that has high risk, but also has a high potential long-range payoff, without overly reducing funding for small advances in popular areas that have less risky short-term returns. “You have a budget that you can afford, you want to use this budget to maximize the result,” Frazier told the Cornell Chronicle. “We give a formula for what is achievable.”

For more on this story, please see http://goo.gl/AK2eBl.
At a graduation ceremony on commencement weekend, doctoral students and faculty advisors participated in the ancient ritual in which the hood is placed on the student’s academic regalia to mark the awarding of the Ph.D. degree.

Professor David Williamson, ORIE’s Associate Director for Graduate Studies, noted that since research is the act of “doing something that was not known to be doable, casting light into formerly dark places,” the students “have doubtless known both the thrill and the joy of discovery, as well as the gloom and self-doubt caused by hard work that led only to a seeming dead end.” He said that the faculty is “enormously proud of our graduates,” who “arrived as our students, but are leaving as our colleagues.” Seven new colleagues were honored at the ceremony.

Applications of their research range from information filtering to energy transmission and health care to web marketing and finance.

Andrey Krishenik, a graduate of the Moscow Institute of Physics and Technology, completed his Cornell Ph.D. under the supervision of Professor Andreea Minca. In his thesis, he explored two highly relevant aspects of financial mathematics. He used game theory to determine that there is a lower bound on how much liquid net worth a company must have before its inability to sell assets due to a lack of buyers (as happened for some during the recent financial crisis) results in defaulting on its obligations. He also developed a model that addresses the question of why it is in the interest of shareholders for a company to hold a significant amount of both cash and debt on their balance sheet at the same time, rather than using the former to pay off the latter and reduce taxes and interest. He will be joining the Guggenheim Partners Investment Company as a Quantitative Researcher.

James Davis, who grew up in the small New Jersey farming community of Vineland, completed a bachelor’s degree in mathematics and philosophy at Rutgers University-Camden after transferring there from Cumberland Community College. He had enrolled in the community college from an early career as a cook with an inquisitive mind and a high school degree. His Ph.D. research, advised by Professor Huseyin Topaloglu and Professor David Williamson, uses customer choice models—specialized mathematical descriptions of how customers behave—as the basis for algorithms that automatically make choices about which items a retailer should optimally display to its customers. His algorithms can be efficiently employed in settings where millions of items are available. Davis, who particularly enjoys building things, will be an Assistant Professor at the University of Illinois at Urbana-Champaign.

Jacob Feldman, from Bethesda
Md., holds a bachelor’s degree in mathematics from Harvey Mudd College. His thesis focuses on questions similar to those James Davis addressed, determining which assortment of items a retailer should present to customers, though with a different customer choice model and with additional constraints, for example to forestall cannibalizing sales of other, more profitable products. Such problems are known to become forbiddingly difficult to compute to optimality as the number of products grows, and so are typically approached with heuristic methods whose results cannot be guaranteed. Under the supervision of Professor Huseyin Topaloglu, Feldman developed a way to find upper bounds on the optimal expected revenue, thereby quickly determining how close candidate solutions are to the best possible, which he shows through computational experimentation to be quite close indeed for certain heuristic approaches. Jake joined the faculty of the Olin Business School at Washington University in St. Louis as an Assistant Professor.

Nicholas James, from Tallahassee Fla., received a bachelor’s degree in mathematics from the University of Florida. Under the supervision of OR field member David Matteson (Statistical Sciences), he developed data analysis algorithms to deal with situations in which the properties of the observations in a statistical time series may change at points in time. For example, economic events, such as the recent subprime mortgage crisis, can drastically change market behavior and therefore data series that depend on market behavior. However standard methods are based on the assumption that the underlying properties of the series are similar throughout, ignoring such change points.

Using as few mathematical assumptions as possible, the algorithms James developed correctly partition data into consistent segments. James demonstrated the statistical and computational advantages of his new methods by using novel mathematical proofs and creating a new software package. His methods have been implemented at Twitter, where he spent an internship. James is joining Google as a Software Engineer.

Ravi Kumar, from a suburb of Delhi, India, has Bachelor’s and Master’s degrees in mechanical engineering, the former from the Indian Institute of Technology in Delhi and the latter from the State University of New York at Buffalo. At Buffalo, he did research on estimating the motion of tumors, a concern in radiation therapy. In the four years between his earlier degrees, he worked on various aspects of electrical substation design and operation. His Cornell thesis research, under the supervision of Professor Mark Lewis, deals with efficient use of energy in the operation of telecommunications networks. In particular, he used queuing theory and stochastic dynamic programming to develop and analyze models and methods that determine near-optimal policies for scheduling transmission of different traffic streams over time and for adjusting transmission rates in response to traffic congestion. He showed that these policies can be computed efficiently and can lead

Continued on next page
to substantial savings in energy cost without sacrificing quality of service. Ravi is a research scientist at PROS in Houston.

Eric Cao Ni grew up in Hangzhou, China, an ancient city said to be the eastern terminus of the Silk Road. He holds a double degree in engineering and economics from the National University of Singapore. Under the supervision of Professor Shane Henderson, he developed a framework for the efficient performance of supercomputers and cloud computers in carrying out the computationally intensive algorithms necessary to make optimal decisions in an uncertain environment. His research is in the area of simulation optimization, in which choices are made among competing strategies, evaluating each of which may entail a complex simulation—for example planning the location and deployment of a fleet of ambulances in a city where the frequency and arrival times of emergency calls are hard to predict. Using techniques from probability theory, he has shown how such high performance computing resources can be used to remarkably increase the speed at which the simulation-based algorithms operate, thereby expanding the range of problems that can be solved within a given computing budget. He will join an investment bank in London as a Quantitative Strategist.

Xiaoting Zhao, from Fujian, China, graduated from Smith College in 2009 with a degree in physics and economics, later receiving a baccalaureate graduate certificate in mathematics and statistics from Smith. Her thesis develops models for filtering the information in systems such as arXiv.org, the online repository of scientific articles established by Cornell physicist Paul Ginsparg and now primarily housed at Cornell. With more than 1 million full-text articles, growing at the rate of 8000 new articles per month, discovering the most relevant recent information at arXiv.com is a challenge for scientists. They can be aided by an information filtering system that automatically pre-processes incoming articles and selects some to forward to the scientist. Under the supervision of Professor Peter Frazier, Zhao developed novel policies for filtering and ranking articles in a way that balances exploration, i.e. expanding the range of articles provided in order to gain better insight into those evolving preferences with exploitation, i.e. providing articles that respond to past user preferences. Zhao joined the Dynamic Sciences Lab at the enterprise software company Infor as a (data) scientist.
MORE THAN 100 STUDENTS EARN ORIE BACHELOR’S DEGREES

Among the 6,000 students from Cornell’s 147th graduating class were more than 100 ORIE graduates on a sun-filled day at Schoellkopf Field on May 24, 2015. The ORIE graduates then moved to Sage Chapel for the formal awarding of their Bachelor of Science degrees in front of family, friends and faculty.

Laibe-Acheson Professor and ORIE Director David Shmoys reminded the graduates to stay in touch and added, “We have the highest expectations of you.” Shmoys also told the graduates that these are opportune times in the OR field because “the IT revolution has brought us this era of big data, which has made it possible to introduce the analytical tools central to operations research in an incredible range of applications where data-driven decision-making is the key element.”

Joined by Acheson/Laibe Professor Emeritus John Muckstadt, Professor Peter Jackson, ORIE’s Associate Director for Undergraduate Studies, presented student awardees and degree recipients to the audience. Jackson then announced specific awards, most named after historic notables in ORIE. The Byron W. Saunders Award to the top students in ORIE went to Li Wang and Ariel Jiting Wang.

Li Wang, a native of Haining Zhejiang, China, earned his B.S. degrees in ORIE and Computer Science, and will be pursuing his Ph.D. in Operations Research at M.I.T. beginning in the fall. Ariel Jiting Wang, from Changchun, Jilin, China, has joined Ernst & Young in its New York City financial services office. Byron W. Saunders was the director of the School of Industrial Engineering and Operations Research, which became ORIE, and later served as the Dean of the University Faculty.

The Lynn E. Bussey and Allan H. Mogenson awards are in the form of fellowships in the ORIE Master of Engineering program. Bussey, an ORIE graduate, taught engineering economics at Cornell—his text, first published in 1978, is still in use.

The Bussey prize was awarded to Ellen Patridge and Vincent Marino. Patridge, a native of Victor, N.Y., is already pursuing the Applied OR concentration. She is a summer intern doing tech consulting in the financial services division of PricewaterhouseCoopers in Boston, Mass. Ellen will complete the M.Eng. program in the fall. Marino, who hails from Limerick, Pa., will study Strategic Operations at Cornell beginning in the fall.

Oliver Lu, who received his B.S. degrees in both ORIE and Chemical Engineering, received the Allan H. Mogenson Prize, named after a 1924 Cornell graduate who pioneered the concept of work simplification. Lu, a native of Bridgewater, N.J., is matriculating into the Financial Engineering concentration in the M.Eng. program in the fall.
Recent ORIE graduate Li Wang ’15 said, “The Merrill award is the most meaningful and important award I have won and I feel very grateful and fortunate to be selected as a Merrill Scholar.” The late Philip Merrill ’55 created the Merrill Scholar program, which is being continued with the support of his family. Thirty-five new Merrill Scholars from across the campus were recognized at a ceremony just prior to last year’s Commencement.

A hallmark of the Merrill program is the opportunity for the Scholars—who are at the top rank of Cornell graduates in “scholastic accomplishment, intellectual drive, energetic leadership abilities and a propensity to contribute to the betterment of society”—to designate influential teachers in their lives, at both the college and high school level.

Wang designated ORIE’s Professor Peter Frazier and his high school teacher Huiping Xie, who travelled to the event from Hangzhou, China, near Shanghai, where she taught Wang English at the Hangzhou Foreign Language School. All of Wang’s studies there were in English. According to Wang, Xie “had a wonderful time at Cornell, and felt very honored and special as the only international teacher” to attend the event.

Wang, who graduated summa cum laude, “had an extremely positive experience in two research projects with ORIE faculty members, Associate Professor Frazier and Assistant Professor Andreea Minca,” he said.

With Professor Frazier and ORIE Ph.D. student Jialei Wang, Li Wang participated in a research project on a strikingly different topic, predicting the stability of small interfering RNA (siRNA) molecules in genetics. These molecules interfere with the expression of certain genes, and their efficacy in doing this as part of therapy for brain cancers is being tested at the Mirkin Lab in the Department of Chemistry at Northwestern University. The stability of a siRNA molecule is crucial to the improvement that it brings. Because experimentation with the enormous number of available siRNA molecules is costly and time-consuming, it is impossible to conduct experiments for each one, so Frazier and Wang built a mathematical model that iteratively uses data from a series of experiments to predict stability, make recommendations about which siRNA molecule to test next, and use the resulting feedback to improve the model. They have drafted a working paper targeted for publication in the bioinformatics literature.

“Professor Frazier has influenced me in all aspects of learning, teaching and researching,” said Wang. “So I wish to continue my academic journey in Operations Research and use OR to change the life of many others, just like Peter is doing.” For his part, Frazier says “I have been continually impressed by Li’s dedication and intelligence, and his willingness to try new and difficult things. It’s been fantastic to work with him.”

Wang has just begun Ph.D. studies in the Operations Research Center at MIT, where two of his Cornell classmates, brothers Divya and Somy Singhvi are also new Ph.D. students. Wang already has teaching experience, as a teaching assistant in ORIE’s Industrial Data and Systems Analysis course and as a course consultant in computer science courses that use the MATLAB system. At MIT, his new research focus will be on network revenue management problems. He recalls the “caring environment” in ORIE, and the experience of students helping each other in office hours rather than vying with each other in homework and exams.
In a competition open to the entire College of Engineering, a Systems Engineering project advised by ORIE Professor Peter Jackson has won the 2015 Silent Hoist and Crane prize.

Nearly a century ago in Brooklyn, N.Y., Silent Hoist & Crane manufactured a variety of heavy duty material handling equipment including forklifts, platform trucks, mobile cranes, container handlers and winches. In 1950 the company endowed an annual materials handling prize at Cornell. Although its assets were acquired in the 1990’s, the prize endures—with the scope expanded to include handling of a wide variety of materials, including information. Several of this year’s prizes were awarded at an ORIE graduation ceremony.

Systems Engineering Master of Engineering (M.Eng.) students, Anyi Xin, Lingcong Ma and Wenhan Xue, teamed up to carry out the winning project, for Canadian National Railway (CN), a long-time client for ORIE M.Eng. projects. The project dealt with a planned upgrade of CN’s pay system. Several thousand CN employees are paid based on complex formulas derived from numerous union contracts. These rules change over time, making it hard to keep payment systems up to date. So dozens of experts in these rules must double-check payroll calculations in order to catch payment errors created from the “legacy” computer system.

In anticipation of the system upgrade, CN commissioned the Cornell students to recommend a new approach for representing the rule set and to computing wages. The team designed an algorithm and built a prototype system to test it. Professor Jackson reports that CN is extremely pleased with the work, and hopes to use the prototype in a production setting until a formal replacement system can be created.

Two of the three ORIE projects that tied for second in the prize competition dealt with healthcare operations.

ORIE students Adam Hardiman and Amelia Radtke and Michael Tillman, analyzed the policies and processes governing the scheduling of operating rooms at Cayuga Medical Center at Ithaca, a hospital that services four counties in central New York State. The project was advised by Professor Muckstadt and ORIE Professor Jim Dai.

Professor Muckstadt also advised another of the second-place winning projects, the second of a series to improve the processes for cleaning, sterilizing and preparing surgical instruments for the operation rooms at a top orthopedic and rheumatology hospital in New York City, the Hospital for Special Surgery. Team members Daniel Dworakowski, Rajeev Alluri, and Scott Wiebel worked with the Central Sterile Processing unit that employs 85-100 full-time employees at the hospital.

Pitney Bowes, known to many as the provider of postage meters that weigh and add postage to envelopes and packages at the point of origin, now has a much broader set of offerings to “power the transactions that drive commerce.” One major Pitney Bowes business line, Presort Services, partners with the U.S. Postal Service to presort mail by zip code, thereby qualifying delivery for reduced postal rates. Variation in the volume of mail picked up and delivered for processing in the company’s 35 facilities where mail is presorted is a challenge in workforce scheduling. A team comprised of Shiying Wang, Elisa Gunawan, and Ellen Patridge, under the guidance of Professor Mark Lewis and ORIE Master of Engineering Director Kathryn Caggiano, worked with the Pitney Bowes facility in Reading, Pa. The main objective of the project was to create a software tool that forecasts incoming mail volume as a function of factors such as shift, day and month, weather conditions, and the pattern of customer orders.

Please go to http://goo.gl/1LGMti for the full story.

ORIE professor Peter Jackson (far right) with Systems Engineering students Anyi Xin, Wenhan Xue and Lingcong Ma.
At a graduation ceremony on Commencement weekend, Master of Engineering Director Kathryn Caggiano announced this year’s recipients of the Andrew S. Schultz, Jr. award. The award honors the late head of ORIE’s predecessor Department of Industrial Engineering and Administration, who served as Dean of the College of Engineering during years when Operations Research became established in the College. It goes to the most outstanding Master of Engineering students, as evidenced by high academic achievement, exceptional teamwork, and demonstrated potential to become exemplary professional citizens.

This year’s honorees were Michael Tillman and Mary Tapscott. Tillman was a member of the prize-winning team that analyzed operating room scheduling at Cayuga Medical Center in Ithaca. Now he is a Senior Analyst in the health care group in the Minneapolis office of Kurt Salmon, a consulting firm that has employed many ORIE alumni.

Tapscott, a Houston native who was an undergraduate in ORIE, said of her and her family that “this award is extremely meaningful to us in particular... and we are very familiar with the good for which it stands.” The prize is a legacy of Lynn E. Bussey ’43 ME ’47 in honor of Tapscott’s grandfather, for whom it is named, and was first awarded 25 years ago.

Like Tapscott, Andrew S. Schultz, Jr. earned his B.S. at Cornell, in his case in Administrative and Mechanical Engineering. In 1941 he received a Cornell Ph.D. in Administrative Engineering and after service in WWII, he returned to Cornell as a faculty member. He advanced to be named department head and in 1963 became the fifth Dean of the College of Engineering. During his deanship he established industrial engineering as a separate department and oversaw the creation both of Cornell’s first courses in operations research and, in 1965, the establishment of both the Department of Industrial Engineering and Operations Research and the college-wide Master of Engineering (M.Eng.) program.

Tapscott has joined a Virginia office of consulting firm Booz Allen Hamilton, where she is an operations research analyst and consults in the area of mission operations for the Department of Defense.

Please go to http://goo.gl/KmI8SI for the full story.
Please join us at the ORIE Reunion Breakfast

Saturday, June 11, 2016
8:30 - 10:00 a.m.
Weiss Lounge
411 Rhodes Hall

Come reconnect with classmates, fellow alumni and faculty.

Send us your memories!

As part of our 50th anniversary celebration, over the coming year, we are building a Youtube channel full of 50 years (and more) of ORIE reflections, so send us your thoughts on the question:

"How did your ORIE education at Cornell impact your later professional life? In particular, in looking back, of all of the facets of your education, on what aspects do you think you most regularly and fundamentally rely?"

It doesn't need to be anything long; it could be just a short anecdote or story that encapsulates your Cornell ORIE experience.

Please send your memories to our 50th Anniversary E-mail address:

ORIE50th@cornell.edu

If your files are too large for your E-mail system, we invite you to upload them to a collaboration web site. Please notify us if you have difficulty uploading via E-mail or have any other questions.