Working on the Dark side of the moon

INFORMS member’s new book offers first-hand look at secretive National Security Agency

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On the Cover

Not quite undercover
INFORMS member Thomas Willemain recalls his sabbatical year at the NSA.

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ORMS Today  December 2017  Volume 44, No. 6  ormsstoday.informs.org
What do you think are the most significant barriers for women/minorities in OR/MS careers? How could they be remedied?

Mental barrier that they don’t “belong” to this field. By saying this, I am not trying to undermine the existing systematic discriminations against these groups, but I think overcoming this mental barrier is a very effective step. Seeing more women/minorities in this field especially in leading roles can be very encouraging. Therefore, having female mentors or mentors from minority groups can be a great help. Also, being part of a minority supporting group like Women in OR/MS and Women in STEM is a way of getting involved in an active movement toward a less discriminated work environment.

Which INFORMS event do you look forward to the most?
The INFORMS Annual Meeting. Participating in the wide variety of sessions including keynote speeches by people from academia and industry, tutorial sessions, and general sessions, always motivates me, and makes me feel more energized to work on my own research. INFORMS events provide new opportunities that you may not have thought about. As a personal experience, during the 2015 Annual Meeting in Philadelphia, I learned about the Pro Bono Analytics program. I am now involved in a project through this program, where we are trying to help a non-profit company in the Boston area restructure their data collection, retrieving, and analysis processes.

What advice do you have for new students entering this field?
The best advice that I can think of is what I was given when I entered this field. In the first year of my undergraduate degree, my professor, Dr. Hamed Tarkesh, said that we are problem solvers, do not let the label of Industrial Engineering stop you from learning any other skills that can be helpful in solving problems that you find important.

What is your dream job?
I would like my job to have a meaningful impact on people’s lives. For me, this would turn a job into a career. I also like to work in a challenging environment. I am a lifetime learner and I get a great joy out of learning new subjects and mastering new skills.
INFORMS & Lionheart at 30

This year marks the 30th anniversary of OR/MS Today under the auspices of Lionheart Publishing and Lionheart Founder and President John Llewellyn. To celebrate the occasion, INFORMS held a special reception at its annual meeting in Houston for friends, clients and staffers who have known and worked with John and Lionheart over the years. Along with INFORMS staff, OR/MS Today Committee Chair Jim Cochran helped organize the event and served as master of ceremonies. INFORMS President Brian Denton read a citation that chronicled John's 30-year tenure and presented John with a plaque in honor of his “contributions to the community of operations research and the management sciences, and for his distinguished service to INFORMS.”

As the editor of OR/MS Today for 27 of the past 30 years, I’ve had a front-row seat to the ups and downs and ins and outs of a three decades-long relationship that ultimately served both parties well. When I was hired, John basically tossed me the keys to the editorial car of OR/MS Today and told me to drive it, which I did with my foot to the floor. John, meanwhile, focused on the business end of publishing.

From the beginning, John and I had a great appreciation for the concept of separation of church and state, which, in the publishing business, translates to the separation of editorial and advertising. If the latter influences the former, it brings into question the integrity of the publication. John has never asked me to cross that line. We always kept our eyes on the same prize: the INFORMS membership.

For those of you keeping score at home, Lionheart has produced 186 issues of OR/MS Today since 1988, along with 54 issues of Analytics, an online-only magazine aimed at non-INFORMS members as well as members that John was instrumental in founding in 2008 in concert with INFORMS. What is probably less known is that for the vast majority of the past 30 years, Lionheart produced, printed and mailed a copy of OR/MS Today to each and every member of INFORMS every other month at zero net cost to the Institute. The credit for that financial miracle belongs to John Llewellyn.
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I like to think that our INFORMS community is highly inclusive, diverse and welcoming, attracting people from all backgrounds. Unfortunately, statistics about our membership tell a somewhat different story. Based on recent estimates from our membership database, about 20 percent of our members identify as women and 7 percent report they are underrepresented minorities. These statistics do not capture the full diversity of our membership regarding a variety of institutional affiliations, culture, sexual identity, disability status, educational background, and the many aspects that define us as individuals or professionals. However, these statistics do raise questions about the diversity of our membership and whether we are doing all that we can to be an inclusive and welcoming organization.

Many people, myself included, are motivated to act because they believe it is the “right thing to do.” There are also important practical reasons to act. For example, research suggests that diverse organizations are better at making decisions because individuals from a broad range of backgrounds often generate more ideas. Diverse organizations are better at making decisions because individuals from a broad range of backgrounds often generate more ideas. (1). Another practical consideration is that attracting more people from diverse backgrounds to our field will create a greater supply to meet the growing demand for people in our field.

Identifying the reasons for lack of diversity in our society and our field is challenging. However, there are many activities underway to shed light on why this is so, and ways to mitigate this problem. Approximately one year ago INFORMS funded a strategic initiative to begin examining diversity, equity and inclusion (DEI) in our society and our field. At the summer board meeting, the INFORMS Board approved a new DEI Committee that reports to the president-elect of INFORMS. This committee, chaired by Michael Johnson, includes members from Women in OR/MS, the Minority Issues Forum and the Junior Faculty Interest Group, as well as members of the INFORMS Board and members-at-large.

The committee has a broad charge that includes monitoring the diversity of our membership and seeking out, creating and maintaining best practices for INFORMS to improve diversity and inclusion-related performance. One of the first actions of the committee was to create the following INFORMS diversity statement that was approved by the INFORMS board earlier this year that defines INFORMS’s position on diversity, equity and inclusion:

“INFORMS values and seeks diverse and inclusive participation within the membership and profession it represents. To achieve this goal, INFORMS is committed to providing an environment that encourages and supports equal opportunity, free expression, freedom from discrimination, harassment and retaliation, full participation in all activities and leadership, and collaboration among people of different backgrounds.”

INFORMS also has a new Diversity Community on INFORMS CONNECT that you can join by going to the INFORMS connect page, clicking on “Communities,” and then clicking on “Groups I can Join.” I encourage you to join the discussion.

I am proud to say that INFORMS recently became among the first of hundreds of professional societies to participate in a first-of-its-kind National Science Foundation research
I encourage you to seek out “unconscious bias training” to help understand biases that may unintentionally affect your decision-making.

project to study the experiences of professionals in the STEM (science, technology, engineering and mathematics) workforce. The study’s goal is to expand basic knowledge about the experiences of people across STEM disciplines, industries and work environments. The study team compiled a detailed report about the results of the survey that we are now making available to all INFORMS members [2]. The INFORMS Board and the INFORMS DEI Committee have reviewed the report and will be using the evidence and recommendations it provides to help advance our goal of being an inclusive organization that is welcoming to all members of our field.

There are many reasons for INFORMS to work toward becoming a more diverse and inclusive society, and there are many reasons to be optimistic that we are on a path to achieve these goals. In addition to some of the recently launched programmatic activities within INFORMS, there are numerous ways you can help. One specific thing I encourage you to do is to seek out “unconscious bias training” to help understand biases that may unintentionally affect your decision-making. Many of you might have access to professional training at your institutions, and you can also find excellent resources online, including a study by psychologists at Harvard University, University of Virginia and the University of Washington [3]. One of the most important things you can start with is understanding your own unconscious bias.

REFERENCES


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About the Conference: Among the hottest topics in the world today is O.R., Analytics, and AI. With the rapid adoption of new technologies including mobile computing, cloud computing, social networks, and the Internet of Things, vast amounts of various types of data are being generated rapidly, and are being tightly integrated with the industry decision-making processes.

Why You Should Attend: The 2018 INFORMS International Conference in Taipei offers participants a full range of presentations, panels, and interactive sessions that explore emerging technology and applications in AI including agriculture, industry, healthcare, and retail.

Abstract Submission Deadline: February 28, 2018

http://meetings.informs.org/2018international
The National Science Foundation (NSF) is the largest investor in non-medical academic research in the nation. Created in 1950, NSF is a U.S. federal government agency, funded by taxpayers, whose mission is “to promote the progress of science; to advance the national health, prosperity and welfare; to secure the national defense.” By investing in basic and applied research in the sciences and engineering, mostly in academia, it has served as a catalyst for economic growth and facilitated societal well-being. It has enabled the discovery of new knowledge and spearheaded innovations that have helped shape the economic and social fabric of the United States. Together with the National Institutes of Health, the NSF has enabled the United States to become a world leader in scientific innovation and advancement.

NSF makes funding decisions based on a peer-review process. The peer-review process typically calls upon academic and industrial experts to evaluate the creativity of proposed research and the value of the knowledge that would ensue from its support. Over the years, NSF has used a variety of criteria to evaluate proposals for funding. Prior to 1997, there were four peer-review criteria: 1) research performer competence, 2) intrinsic merit of the research, 3) utility or relevance of the research, and 4) effect on the infrastructure of science and engineering. The theme of these criteria centered on “advancing the frontiers of knowledge.”

Under concerns raised by the efficacy of the review process based on these four criteria, the National Science Board (NSB), the entity that sets policies for NSF, recommended changes resulting in a reduction from four down to two peer-review criteria: intellectual merit, to capture the knowledge created by the research, and broader impacts, to capture the societal benefits that would accrue from NSF supported research investments. This change was enacted into law by the 114th Congress, with the American Innovation and Competitiveness Act. As with many actions, the laws of unintended consequences may yield the dominate effect.

As an academic who has been supported by NSF funding, has sat on NSF review panels, led an NSF-sponsored workshop on enhancing broader impact, and served as a program director at NSF as a rotator (while on leave from my university faculty position), I appreciate what NSF does, and value the contributions that it has made to our nation’s well-being. Indeed, I have personally benefited from the existing NSF funding model and peer-review process. I also believe that having two criteria for evaluating research proposals for support is fundamentally flawed, and limits the potential value of what NSF can achieve.

When presented with two objectives, human nature inherently prioritizes them, based on internal biases or external values. Given two criteria to assess the value of a research proposal, researchers and reviewers implicitly place a priority on one criterion over the other. This is manifested in one criterion being optimized (the primary) and the other criterion meeting a threshold or being used as a tiebreaker (the secondary). With few exceptions, intellectual merit serves as the primary and broader impacts serves as the secondary.

The result of this hidden hierarchy is that the full value of NSF investments is not being fully realized. Does this mean that NSF is funding low-quality research? Most definitely not. NSF receives more quality proposals than it can support. What it does mean is that the collective value of research being supported by NSF can be elevated to better serve its stakeholders.

The fundamental metrics with the two review criteria are sound. What is required is a single cohesive criterion that embodies both intellectual merit and broader impacts, so that they are not considered as disparate concepts within proposals, but rather, a single unifying ideal to strive for. One possible way to express this ideal is with the criterion, advancing knowledge for society. This criterion embodies the intellectual merit criterion for advancing the frontier of knowledge, both fundamental and applied, and the broader impacts criterion for societal benefits. The name of the criterion is less critical than the need
I am dismayed that the Lanchester Prize [for the best contribution to operations research and the management sciences published in English in the past three years] was not awarded this year. This makes six years out of the last nine with no award. Are we to believe, and in effect announce to the world, that there is no good O.R. work being published in English anymore?

Why not award the Lanchester Prize?

To the editor:

I am dismayed that the Lanchester Prize [for the best contribution to operations research and the management sciences published in English in the past three years] was not awarded this year. This makes six years out of the last nine with no award.

Are we to believe, and in effect announce to the world, that there is no good O.R. work being published in English anymore?

The Lanchester, not the Edelman, used to be considered the profession’s most prestigious award. Now, to the extent that anyone even takes note of it, the Lanchester Prize (or lack of it) has become an embarrassment to the profession.

What’s going on here? The situation cries out for action.

Douglas Samuelson
Annandale, Va.

ACKNOWLEDGEMENT

This article was written with support to the author from the National Science Foundation (CMMI-1629955). Any opinions, findings, conclusions or recommendations expressed in this material are those of the author and do not reflect the views of the United States government or the National Science Foundation.
Restaurant menus, crowd wisdom, matching inmates with prisons and more

Nutrition: Restaurant menu labeling has a surprising result

The results of a forthcoming study in the INFORMS journal Marketing Science looking at the broader impact of calorie labeling on menus suggests that posting calorie info can not only induce more healthful choices by consumers in a restaurant, but may also affect how consumers review restaurants and redirect consumers towards more healthful options within restaurants.

- Los Angeles Daily News, Nov. 4

Great Valley professor recognized for service by INFORMS

Robin Qiu, professor of information science at Penn State Great Valley, is a 2017 recipient of the Volunteer Service Award from the Institute for Operations Research and the Management Sciences (INFORMS). Established in 2016, the award recognizes exceptional volunteer service to the organization.

- Penn State News, Oct. 30

Harnessing the wisdom of crowds: New online resource shares impact of analytics on crowdsourcing

From reporting traffic jams using the Waze app to a colony of ants working together to achieve extraordinary feats, examples of crowdsourcing and collective intelligence are all around us. As the problems that we face grow in complexity, the speed and reach of communications and data flow are vastly improving now that just about anyone can act as a consultant on a problem by providing their own individual expertise and information. Analytics can be used to refine this insight from groups to provide their own individual expertise and information. Analytics can be used to improve solutions to problems in a variety of areas including economics, computer science, biology, communications, political science, and organizational behavior.

- INFORMS, Oct. 30

Cell game: Novel software helping inmates find a home

A new computer program, developed by a team from Lehigh University that matches inmates with suitable prisons has saved the Pennsylvania Department of Corrections about $3 million in its first year. Officials said it has resulted in fewer prison assaults, shortened wait times for treatment programs by nearly two months, reduced the number of prison transfers and lightened the workload of corrections staff. In recognition of their development, the Lehigh University team has received the INFORMS Wagner Prize, the top international prize in the field of operations research practice.


INFORMS members raise thousands to help make a difference for Houston’s homeless

For the homeless men, women and children of Houston still struggling in the aftermath of Hurricane Harvey, a helping hand came from an unexpected source – a thousand comfort kits with essential toiletries and hygiene items assembled by the attendees of the INFORMS 2017 Annual Meeting, held in Houston, Oct. 22-25.

- INFORMS, Oct. 24

This is what testosterone has to do with stock prices (Hint: a lot)

High levels of testosterone have long been associated with dominant and aggressive behavior in men, but now it appears that high levels can cause male stock traders to mistakenly inflate stock prices, leading to terrible economic consequences. That’s what the authors of a new study published in the INFORMS journal Management Science concluded based on an experiment that was the first ever to test how testosterone levels (T-levels) can affect stock trading decisions.

- Reader’s Digest, Oct. 18

INFORMS 2018 Board of Directors unites industry and academic leaders

Leaders in industry and academia from around the world are among those who will be joining the INFORMS Board of Directors in 2018. INFORMS, the leading international association for operations research and analytics professionals, announced the newest members elected to its Board of Directors later this week for the 2017 INFORMS Annual Meeting, doing their part to not only learn and network within their profession, but to help with Houston’s ongoing recovery from Hurricane Harvey.

- INFORMS, Oct. 18

CMU Dean Ramayya Krishnan elected to top leadership spot at INFORMS

INFORMS, the leading international association for operations research and analytics professionals, announced that Ramayya Krishnan, Ph.D., dean of Carnegie Mellon University’s Heinz College of Information Systems and Public Policy, has been elected as the 25th president of the INFORMS Board of Directors.

- INFORMS, Oct. 13

INFORMS congratulates Nobel Prize winner Richard Thaler

INFORMS congratulates Richard H. Thaler, renowned behavioral economist and researcher, who was awarded the 2017 Nobel Memorial Prize in Economic Sciences for his outstanding contributions to the field of economics. Among the citations prominently featured by the Nobel Prize committee in Professor Thaler’s award was his seminal 1985 paper on his now famous theory of mental accounting, which was published in the INFORMS journal Management Science.

- INFORMS, Oct. 12

5,600 operations research and analytics professionals set to arrive in Houston for the 2017 INFORMS Annual Meeting

More than 5,600 operations research and analytics professionals and students from around the world will arrive in Houston for the 2017 INFORMS Annual Meeting, doing their part to not only learn and network within their profession, but to help with Houston’s ongoing recovery from Hurricane Harvey.

- INFORMS, Oct. 18
and industry sectors of operations research (O.R.) and analytics.

- INFORMS, Oct. 4

Syngenta and the Analytics Society of INFORMS launch third annual Syngenta Crop Challenge in Analytics

Syngenta and the Analytics Society of INFORMS invite analytics and operations research students and professionals to contribute to the future of agriculture by entering the Syngenta Crop Challenge in Analytics. The submission period for the competition is now open, and entries will be accepted until Jan. 11, 2018.

- BusinessWire, Oct. 3

Certified Analytics Professional program earns prestigious ANSI accreditation

The Certified Analytics Professional (CAP®) program, the only global professional certification for analytics practitioners, has been accredited by the American National Standards Institute (ANSI), the American member of the International Organization for Standardization (ISO), furthering its distinction to what CIO Magazine earlier this year called one of the top “big data certifications that will pay off.”

- INFORMS, Oct. 2

Quality tops quantity when it comes to contacts

According to a study conducted by Rahul Telang of Carnegie Mellon University and Rajiv Garg of the University of Texas, it’s the quality, not the quantity, of your online professional connections that will help with a successful job search. Their study, based on a survey of 424 jobseekers, was published in Management Science, a journal of the Institute for Operations Research and the Management Sciences (INFORMS).

- Pittsburgh Post-Gazette, Oct. 2

Improving “softer skills” in analytics

The INFORMS “Essential Practice Skills for High-Impact Analytics Projects” workshop is an intensive, hands-on workshop that explores the concept of “structured problem solving” and provides participants with practical frameworks to go from ISSUE to ACTION. It combines approaches for analytical and creative problem solving, strategies for communicating and persuading, and processes for managing projects and working in teams.

- International Solver, Sept. 29

New study: respond to reviews

A study in the INFORMS journal Marketing Science finds management responses can not only lead to higher ratings for businesses, but also more substantive reviews even if they aren’t all positive.

- Western Hotelier, Sept. 26

Ashely Kilgore (akilgore@informs.org) is the public relations manager at INFORMS.

REFERENCES

For links to all of the articles mentioned above, visit: http://bit.ly/2jdflOf
Vision for the new INFORMS Journal on Optimization

Optimization has a long and distinguished history and has been at the core of INFORMS from the founding of the Operations Research Society of America (ORSA) in the early 1950s. I would argue that without the simplex method, the key algorithm for linear optimization, ORSA might not have existed.

Historically, optimization and operations research have focused on the process of building models to derive optimal decisions. While models have been the protagonist, data has been a secondary actor. In recent years, we have witnessed an unprecedented growth of data in electronic form and methods, typically associated with the area of machine learning, for prediction.

I feel that one of the largest opportunities of the field of optimization is to embrace data in a protagonist role and combine it with machine learning. The vision of the future for the field of optimization and operations research is summarized in Figure 1. Specifically, I feel that the future of optimization/operations research is in its union with machine learning to form the field of analytics: the science that starts with data and builds models to derive optimal decisions that add value.

Areas of Interest for New Journal

With these ideas in mind, my vision of the new INFORMS Journal on Optimization includes the following areas:

- data-driven optimization
- optimization methods in machine learning
- exciting real-world applications of optimization

In addition, the journal will publish papers in more traditional areas of optimization. A non-exclusive list of methodologies that the journal covers includes: convex optimization (including linear optimization); general purpose nonlinear optimization; discrete optimization (combinatorial, integer, mixed integer optimization); optimization under uncertainty (dynamic programming, stochastic programming, robust optimization, simulation-based optimization); infinite dimensional optimization; and online optimization.

Especially welcome are contributions studying new and significant applications. A non-exclusive list of application areas the journal covers includes: healthcare, inventory and supply chain management; logistics; revenue management and pricing; energy; the Internet; interfaces with computer science; and finance.

There are other leading journals in optimization that are more focused on the methodology of optimization. The aspiration of the INFORMS Journal on Optimization is to add a quality outlet that, in addition to methodological papers, will also publish papers that place particular emphasis on data-driven optimization, the interface with machine learning and real-world applications of optimization.

The INFORMS Journal on Optimization welcomes the following types of submissions:

**Regular articles:** These are original papers that build on an area and expand it in different ways. A paper in this category will be published electronically within one year of submission. Accepted regular articles are expected to score highly in at least one of the following questions:

- How new and significant is the application studied?
- How original/creative is the optimization modeling?
- How original/creative is the optimization methodology?
- How significant is the impact in practice?

**Perspective articles:** These are unusually original papers that initiate an area, typically the first of their kind. A paper in this category will be published electronically within two months of submission.

**Review articles:** These are papers that present a unifying and comprehensive review of an area of optimization. A paper in this category will be published electronically within six months of submission.

**Special issues:** We will invite papers in a theme of optimization. The first such special issue is in the area of machine learning and optimization. Please submit papers for the special issue by Dec. 31, 2017. We expect that the first review will be sent back to authors by April 1, 2018. The special issue is earmarked to be published by January 2019.

Addressing Problems and Encouraging Contributions

There are three trends in our field that the journal aspires to reverse: (a) long delays, (b) negativity in the review process, and (c) the difficulty that particularly original papers experience in order to be published.

Figure 1: Union of optimization, O.R. and machine learning.

By Dimitris Bertsimas
To address long delays, for regular papers the journal will try to solicit reviews from three reviewers for each paper and will aspire to get a response to the authors within three months of submission. We expect at most one round of revision, and the overall expectation is that a paper will appear electronically within one year of submission. If a regular paper is not sent to reviewers, we will communicate this decision to authors within two weeks of submission.

To address negativity in the review process, the journal will not reject a paper with one (out of three) negative report, unless there are serious questions on correctness. I very much believe in finding what is good in an idea and trying to improve it. I especially believe it is important to encourage our young people.

To encourage research with high aspirations and unusual originality, we have introduced the notion of perspective papers. Such papers will be reviewed directly by members of the editorial board, and a first response will be returned to the authors within one month of submission, with the objective that accepted papers will appear within two months of submission.

**The Life of a Paper**

The final innovation is that accepted papers will appear electronically with a rationale of their contribution, written by the associate editor and the editor-in-chief. Furthermore, the community can post public eponymous comments on the paper, and the authors will have an opportunity to comment. In this way, a paper is a live object generating discussion and ideas over time.

**The Editorial Board**


**Special issue on machine learning and optimization**

In recent years, there have been exciting developments in the interface of optimization and machine learning. To further facilitate developments in this exciting area, the INFORMS Journal on Optimization is accepting papers for a special issue in the area of machine learning and optimization. Please submit papers to the journal via https://mc.manuscriptcentral.com/ijoo by Dec. 31, 2017. We expect that the first review will be sent back to authors by April 1, 2018. The special issue is scheduled to be published by January 2019.

**New INFORMS Journal for 2019!**

**INFORMS JOURNAL ON OPTIMIZATION**

Special Issue on Optimization and Machine Learning

**Call for Papers—Submission Deadline**

**December 31, 2017**

In recent years, there have been exciting developments in the interface of optimization and machine learning. To further facilitate developments in this exciting area, the INFORMS Journal on Optimization is soliciting submissions for a special issue. Please submit papers via the journal’s submission system at https://mc.manuscriptcentral.com/ijoo by December 31, 2017. We expect that the first review will be sent back to authors by April 1, 2018. The special issue is earmarked to be published in January 2019.

https://mc.manuscriptcentral.com/ijoo
University of Tennessee’s MSBA program designed to fill analytics talent gap in the corporate world

To remain competitive, companies today must invest in analytics talent to generate insights for smarter decision-making. But without individuals equipped to both analyze data and translate their findings into big-picture insights, companies fall short of this goal. According to McKinsey Global Institute’s December 2016 report, “The Age of Analytics: Competing in a Data-Driven World,” there’s still a talent shortage in the marketplace — not of strict code writers, but of analytics professionals who can ask the right questions, identify underlying business problems, formulate and solve the right analytics models, and transform complex analytic results into actionable insights to benefit the organization.

“The biggest barriers companies face in extracting value from data and analytics are organizational,” says the McKinsey report. “Many struggle to incorporate data-driven insights into day-to-day business processes. Another challenge is attracting and retaining the right talent...[individuals] who [can] combine data savvy with industry and functional expertise.” The University of Tennessee Haslam College of Business Master of Science in Business Analytics (MSBA) program, a finalist for the 2017 UPS George D. Smith Prize from INFORMS, is specifically designed to fill this talent gap.

To the best of our knowledge, in fall 2010 our college became the first business school in the nation to launch a master's program in business analytics. The MSBA degree was inspired by our work with companies that were integrating analytics into their competitive strategies and had cited analytics as a key to their future success. We learned from our industry partners that analytics – as they defined it – involved the tools of operations research, statistics, data mining/machine learning, database technologies and computing and was not narrowly defined as “big data.”

Our industry partners were looking for analytics professionals who: (1) were well-versed in statistics, operations research, data mining/machine learning, database technologies and computer science with experience using a broad range of technical tools; (2) understood the basics of business; (3) were able to communicate clearly, both in writing and orally; and (4) possessed leadership skills. They were looking for multitalented experts who could give them the insights they needed to make smart business decisions.

Through our conversations, we realized we could not simply modify existing courses or programs to meet these criteria. We needed to start with a clean slate. We drew upon the expertise of our faculty with years of experience applying operations research and statistics to solve real-world industry problems, as well as the strengths of our two former master's programs: one in management science, started in 1966, and the other in statistics, started in 1947.

As a result, we created a groundbreaking program that develops analytics professionals our industry partners call “high-level contributors” with “real-world business acumen” and impressive “face-the-client skills.” They’re individuals who have the skills to closely analyze data and interpret it in the larger context of an organization. All of our graduates are prepared for successful analytics careers in industry – and to date, all have secured highly competitive jobs upon graduation.

We highlight four distinctive ways we teach analytics from an industry context to best prepare our students for successful careers in business.

I: We partner with industry.

Our students know about industry needs from our UT Business Analytics Forum. The Forum brings industry practitioners to campus twice a year for a two-day conference for students, faculty and Forum attendees. The purpose of the Business Analytics Forum is to expand the analytics knowledge of our industry partners, the faculty and students; share best practices in analytics; and help solve business analytics problems. Industry practitioners give presentations on topics such as media selection, supply chain analytics, data governance, data visualization, the INFORMS Analytics Maturity Model, the Internet of Things and digital marketing. We host panel discussions on the challenges that analytics professionals face and highlight curriculum issues to ensure that our coursework remains relevant and up-to-date. The Forum also invites speakers from outside its membership – from companies that compete on analytics, such as Amazon, Tableau, Google, Teradata and even Kroger.

The Business Analytics Forum also provides an opportunity for students to sit across the table from senior level managers and executives at major corporations. Students hear firsthand the issues companies face and how industry is working to solve tough analytics problems. The experience reinforces the concepts they are learning in class and allows students to learn about the analytic skills most valued by industry.

The Forum also enables faculty members to collaborate with our corporate partners to formulate relevant and well-scoped student classroom and capstone projects.

2: Our curriculum continuously evolves in order to stay relevant.

As detailed previously, our MSBA curriculum spans six main areas of study. In addition, we develop our students’ soft skills, including written and oral communication, teamwork, ethics and leadership.
We regularly benchmark our curriculum against the academic analytics marketplace and stay in constant communication with industry through our Business Analytics Forum, our Advisory board, our capstone projects and regular communication with our industry partners. Thus, we continuously evaluate and update our curriculum to ensure that the education we are providing meets the needs of industry. For example, based on feedback we received from our industry partners, we incorporated the programming languages R and Python, as well as a course in big data technologies, into the core curriculum and are currently working to introduce a course on deep learning into the elective curriculum.

3: Our students get real-world experience.

Practical experience abounds for our MSBA students. In our classrooms, students learn from industry professionals. Professors employ real-world data sets and require the students to tackle actual problems from an industry partner in course projects. Our students interact within teams, write business reports and deliver presentations for both technical and non-technical audiences – again, mirroring real-world experiences.

Industry participation in the classroom. Industry experts serve as guest lecturers in our classrooms on specific applications of analytics. For example, in the decision optimization course, a subject matter expert from industry speaks on applications of mixed integer programming in sports scheduling. Similarly, a representative from the airline industry shares his experiences with optimization in commercial airline scheduling, as well as revenue management. In the statistical methods for business course, a subject matter expert often provides instruction on the application of visualization techniques using Tableau. Industry practitioners regularly deliver guest lectures on topics such as web experimentation and multifacto marketing in the design of experiments course. A portion of the database and big data technologies course is taught by two subject matter experts: one, an author of a textbook on Hadoop, and the other a researcher at Oak Ridge National Laboratory working in big data and high-performance computing. In the systems optimization, decision optimization and simulation courses, corporate partners sponsor class projects and often provide valuable real-time feedback during the students’ final oral project presentations.

Industry-sponsored case competitions. In 2016, one of our corporate partners sponsored our first annual UT MSBA Case Competition. The company provided gigabytes of data, including point-of-sale and inventory data for one of the leading brands in its own retail stores and in a set of retailers. The company sought to understand the similarities and differences in purchasing behavior between shoppers of its products at big retail chains and customers at its own stores.

Student teams were given 48 hours to complete the analysis, prepare a visual presentation of their results, and deliver an oral presentation to the corporate analytics team. The students were forced to think critically and transform the data into the format best suited to answer the relevant business questions in a very short timeframe, and then communicate the results of their analyses to real-world analytics professionals. The corporate panel challenged each team with difficult questions.

The UT MSBA Case Competition has become an annual event. The spring 2017 case competition focused on determining the best strategies to drive online sales for a corporate partner. Students were provided DoubleClick Activity data from Google for analysis. In less than 48 hours, the students transformed gigabytes of data into valuable insights for the corporate sponsor.

This real-world analytics exercise using actual data coupled with interaction with analytics professionals from industry serves as invaluable training for the students as they complete their first year of study and prepare for their analytics internship.
Real-world experience: capstone course. In no course do our students benefit more from our industry partners’ involvement than our three-credit-hour required capstone course taken in the students’ final semester of study.

The capstone is no ordinary graduate class; in fact, it is not like a class at all. Our industry partners come to our program with real-world challenges. Our students step up to meet those challenges and create value for our corporate partners. The capstone experience allows students to work for an industry client as part of a team. It forces them outside their comfort zone to apply their soft skills and technical skills to solve a practical problem. In the capstone work environment, students are accountable for interaction with corporate executives, for developing and maintaining a well-functioning team, and for selecting and successfully deploying the technical tools needed to solve the problem. The environment is challenging, but the students are positioned to succeed. We have invested significant time and expertise in the evolution of a structure that enhances growth opportunities for students and simultaneously improves the outcome for the client.

Throughout the course, the students work in small teams of four or five on a tightly defined project with their client company. The faculty appoints one student per team to serve as the project manager who receives project management training from a program alumnus just before the start of the capstone semester. Every team is assigned a faculty mentor who serves as a sideline resource for the team. At the beginning of the semester, the teams travel to the client’s headquarters to meet with the project team. Together, they further define the problem, assess the data availability and scope deliverables. The students are afforded the opportunity to hear about the symptoms of the client’s business issue directly from the client. They see the processes and learn to ask the right questions to formulate a structured business problem statement.

Specific training to further develop communication, leadership, teamwork, creative thinking, technical writing and business soft skills is delivered by a faculty team in a “just-in-time/learn-do” manner that parallels the natural progression of the project. Throughout the capstone semester, teams have weekly video conferences with their client. Each team also provides updates on project status, issues, challenges, etc., in periodic updates to the other student teams and faculty mentors during capstone class meetings. Through this process each student experiences vicariously a set of eight to 10 capstone projects. At the end of the semester, students deliver their recommendations in a presentation to high-level executives from the corporate sponsor and provide a final written report, typically accompanied by a software application prototype. Most client companies immediately act on the insights or scale up and deploy the analytical models developed by the capstone teams – and then line up for the next capstone opportunity.

The capstone experience inspires a high level of confidence and maturity, giving our students a head start as they begin their careers as analytics professionals after graduation.

4. We are educating students in business, the environment where analytics is applied.

One defining element of our three-semester MSBA program is that our students leave with a fundamental understanding of business. Students have the unique opportunity to enroll in a subset of MBA courses, such as operations management, supply chain management, marketing and accounting. Students sit in the same classroom alongside MBA students, learning from their instructors and from MBA classmates. They serve on teams with MBA students concentrating in finance, supply chain, marketing and management, mimicking real-world, cross-functional teams where they play the role of analytics professionals. On these teams, they fine-tune their ability to explain analytic results in business terms that any manager can understand.

The Haslam MSBA constantly challenges students to apply what they’re learning by solving analytics-based business problems and working on real-world analytics projects so that our graduates can turn data-driven insights into actionable results in industry.
What are current issues/trends/challenges in sustainable O.R.?
Developing models and solutions for a circular economy, engaging productively with business strategies that relate to climate change, expanding sustainability from a primary focus on environmental issues to social issues and business-community engagement.

What prompted you to enter this field? Why?
My high school used to organize career days in our junior and senior years. One of the contributors was an industrial engineer who worked in the local meat processing and packing factory. He spoke of his job as a process engineer and optimizer with such enthusiasm (despite what I thought was a particularly uninspiring setting) that I was really intrigued. I wanted to study math, but I decided to double major in Industrial Engineering and Mathematics instead. How I got interested in Sustainable Operations? My first PhD project was developing procurement policies for the single-use Kodak camera, one of the first remanufactured consumer products. I got very excited that I could use my modeling skills to help firms do well by doing good, and over the course of my career, increasingly focused my energy on sustainable operations and supply chain management research, teaching, and outreach.

What is something you learned in the last week/month?
We were in Chios, Greece last week, which is across from my hometown of Izmir, Turkey. We call the island Sakiz, meaning “mastic,” an aromatic resin that has been used as medicine since antiquity and is still used in traditional folk medicine of the region. I learned that although there are mastic trees elsewhere in the Mediterranean, since about AD50, mastic production has been confined almost exclusively to Chios. My family collected a few drops of mastic from trees by the road and felt very privileged!

Tell us a funny math joke.
A mathematician was traveling on a train.
She told her companions: “There were 264 cows on that field.”
“Wow, how did you do that?!” they asked
“Easy! I just counted the legs and divided by four.”

More questions for L. Beril?
Ask her in the Open Forum on INFORMS Connect!
http://connect.informs.org
Changing the game at a 134-year-old retail company where innovation enjoys a long tradition.

By Matt Sias, Greg Noble and Pooja Singh

Back in 1883 when Barney Kroger invested his life savings of $372 to start his first store, the second purchase he made was a horse and carriage so he could deliver goods to his customers. One could make the argument that Barney knew the importance of delivery before Domino’s, Amazon or Blue Apron ever existed. Innovation has long been a tradition at Kroger. In the early part of the 20th century, Kroger was the first grocery store to include a bakery so customers didn’t have to travel to two stores, the first to introduce self-shopping and the first to surround its stores with parking lots. As technology evolved, it became the first company to test electronic scanners in the 1970s and one of the first to formalize consumer research. In the 1990s, it was one of the first stores to test self-checkouts, and by the start of the 21st century, it had spawned an industry-leading loyalty program.
The Kroger Co. is a 134-year-old retailer servicing more than 9 million customers every day. It is also in the business of manufacturing, distribution, finance, pharmacy, health services, fuel, real estate, jewelry, grocery, general merchandise, digital and delivery to name a few. The company’s operational footprint spans more than 2,800 locations in 35 states and Washington, D.C., and with every new business line entered, every additional facility opened and each new customer served, these operations continue to increase in complexity and scale. In this fast-paced environment the operations research (O.R.) team at Kroger must harness both technological innovation and an exponentially increasing amount of data in order to help our leaders make better, more informed decisions.

While the company made its foray into advanced analytics in marketing and merchandising in the early 2000s with the establishment of dunnhumbyUSA, with a 50 percent stake, a team dedicated to O.R. didn’t begin at Kroger until January 2007. The O.R. team came on the heels of the establishment of the R&D department within Technology under the leadership of Brett Bonner, vice president of R&D. When he asked Kroger’s CIO for help identifying and contacting the O.R. team, he received a pat on the shoulder, a small wink and the words, “You’re it.” Soon after, Doug Meiser was brought into R&D to establish an O.R. team, which has flourished under his leadership.

O.R. Team Structure and Goals
Doug Meiser started as the first O.R. analyst in R&D and slowly began to build out a team of associates, consultants and academics. Meiser, now the director of Operations Research, leads a team of 20+ associates collaborating extensively with professors and Ph.D. recipients from local universities on a variety of projects touching nearly every business line in the company. Due to the diverse nature of the projects with which O.R. is now engaged, the backgrounds of the team’s analysts cover a variety of skill sets that allows them to build, test, manage and scale solutions to an enterprise level. While several of the team members came internally from Kroger with various technology backgrounds, Meiser also expanded with several new hires in the areas of statistics, applied mathematics, industrial engineering, data and systems architecture and machine learning.

Just as there are many different solutions to the same problem, there are many different flavors when it comes to how O.R. practitioners are structured throughout a company. In Kroger’s case, the O.R. team grew organically from within R&D with the initial goal of helping to simulate and validate new technology opportunities that would create a sustainable competitive advantage. As some of the first R&D projects were spun up, these goals evolved to include helping manage and measure these new solutions through the systems development lifecycle into production. Soon O.R. was fielding requests to take on additional projects outside of R&D with the goal of helping business partners solve some of their most complex problems. O.R. analysts are now being embedded into projects throughout the enterprise, collaborating with Kroger business partners to improve operational performance.

Early Successes
This first big success for R&D and the O.R. team involved developing and deploying the retail industry’s first real-time, front-end prescriptive analytics solution for queueing that Kroger calls QueVision. What began as a button-labelled “Dynamic Lane Planning” in a discrete event simulation of a store’s front-end helped Kroger answer the question, “What if we could open another lane the moment queueing conditions required it?” The results of that simulation led to a system of sensors above each entrance and register that measures the number of customers walking into Kroger stores, as well as the number of customers standing in line at each lane. Combined with a real-time transactional feed from the POS system it was now possible to make predictions on the number of customers arriving at the front end by day of week and time of day.

The system informs front-end managers on a big screen hanging above the registers how many lanes are open, how many lanes should be open now, and how many should be open in 30 minutes, in order to proactively meet the rush of customers about to arrive. This journey both defined the
Roundtable Profile

Kroger was able to measurably decrease average check-out wait times across the organization from four minutes to about 30 seconds

Source: Kroger

Kroger was able to measurably decrease average wait times across the organization from an average of four minutes to about 30 seconds. The company also significantly improved queueing standards with no additional impact to front-end labor. Along with being featured in *The Wall Street Journal* and *Popular Science*, this solution garnered The Kroger Co. the No. 3 spot in *Information Week*’s Elite 100 in 2014.

The O.R. team soon moved beyond the realm of R&D with successful projects revolving around warehouses, inventory and new POS (point of sale) solutions. Commodity Aligned Delivery was a project that reorganized every warehouse in the enterprise to facilitate building more aisle-friendly pallets for stores based on the proximity of product in adjacent aisles. This allowed a pallet of product to be taken directly to the floor and stocked, instead of being broken down in the back room and loaded onto U-boats, reducing the time it takes a store to unload and stock each truck by an average of three hours.

In 2013, Kroger was honored to be recognized as a Franz Edelman finalist for the O.R. team’s solution for Pharmacy Inventory Optimization. This was an innovative analytical approach to inventory control that combines simulation and optimization to set Min/Max re-order points for the ordering system. This solution reduced annual out-of-stocks by 1.7 million prescriptions, reduced annual inventory costs by $120 million, increased annual sales by $80 million, while reducing annual labor spent on ordering by roughly $10 million.

As part of the project aimed at improving store ordering, the simulation/optimization being leveraged in the pharmacy solution was modified to identify minimum re-order values for each shelf-stable SKU at the store level, as well as products in our fresh departments. This approach seeks to minimize the total cost by taking into account factors such as out-of-stocks, inventory costs, restocking costs, potential shrink and presentation value by simulating order movement at various minimum points in order to find the optimal solution.

In Kroger’s “Scan, Bag, Go” program, where customers can scan and bag items as they shop in order to decrease the time it takes to checkout, O.R.
developed an intelligent order verification algorithm that can assess every shopping session. Certain risk factors associated with the shopping trip are then evaluated (similar to credit score models). Working closely with Loss Prevention and the MAX Team, this real-time mathematical model determines if order verification is warranted for a specific transaction.

Today, O.R. best practices and methodologies are expanding throughout the enterprise and redefining the way Technology scales and architects new solutions, how Finance prioritizes capital allocations, how Merchandising plans vendor promotions, and how our stores manage their inventory and ordering systems. Machine learning is now driving key business processes, while O.R. continuously measures and reports how the algorithms are performing against manual changes introduced by associates.

**Technology and Data**

The amount of data being produced by Kroger systems has been growing exponentially in the past few years. With the push into digital, the company now has online ordering and pickup, as well as delivery in some markets. In addition, Kroger has the largest deployment of the ZigBee protocol mesh network throughout its stores with more than 50,000 access points, and Kroger continues to develop new sensors and integration points that allow its associates to be more customer-centric, focusing their time on more value-added tasks.

Take for example temperature monitoring. This used to be a tedious process where an associate would go to every cooler, bin and freezer in the store every 15 minutes with a higher degree of accuracy. The system could also alert management and facility maintenance to failing infrastructure so it could be proactively addressed before the equipment broke down and product was lost. Food safety is pinnacle at Kroger, and this solution helps enable that metric.

Kroger’s loyalty program has been an industry leader for more than a decade and highlights the largest source of highly advanced analytical talent in the company, which is wholly-owned subsidiary 84.51°. The amount of customer insight that 84.51° is creating represents a treasure trove that would make any of the company, which is wholly-owned subsidiary 84.51°. The amount of customer insight that 84.51° is creating represents a treasure trove that would make any of the company’s customers, as well as how they consume our services. O.R. and innovation are nothing less than table stakes in the years ahead for any company that wants to remain successful.

With 84.51°’s success in designing and executing the loyalty program and using that data to drive complex business decisions, they had already validated the value of advanced analytics to the organization. When the science and approaches developed by O.R. were called into question, 84.51° became a great partner in validating the work being put forward. As such, the O.R. team has developed a close partnership with 84.51° to promote and spread the cultural embrace of data-driven decision-making.

This partnership includes peer reviews of projects to foster healthy debate, new ideas and an exchange of knowledge. An annual analyst conference focuses on analytics and data sciences. Combined training classes are held throughout the year on a variety of topics, coding languages and advanced methodologies. Hackathons with local non-profits provide pro-bono work opportunities for associates, and the chance to work on problems outside of the realm of grocery retail. At a recent conference, Kroger teamed up with Cincinnati Children’s Hospital and Cradle Cincinnati to look at the impact of shopping habits on infant mortality rates within Hamilton County.

**The New Kroger Way**

The Kroger Co. has a long tradition of innovation and managing change in a fast-paced industry with razor thin margins. Often when attending conferences or having other retailers/vendors come in for a demonstration, we hear, “We had no idea you guys were working on stuff this advanced. You wouldn’t expect this from a grocery chain.” However, Kroger is much more than your average “grocery store.” It is a customer-focused, Fortune 25 company with more than $115 billion in annual sales (2016) and 134 years of retailing experience. The convergence of disruptive technology and data has created a paradigm shift in both the way we connect with our customers, as well as how they consume our services.

O.R. and innovation are nothing less than table stakes in the years ahead for any company that wants to remain successful.

**Machine learning** is driving **key business processes**, while O.R. **continuously measures and reports how the algorithms are performing.**

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**Greg Noble** is the O.R. team lead for Inventory Solutions at Kroger. Noble earned a B.S. and M.S. in industrial and systems engineering and a Ph.D. in engineering from Wright State University. He joined the Kroger O.R. team in 2013.

**Pooja Singh** serves as O.R. team lead for Strategic Systems. She joined Kroger’s O.R. team in 2013. She has 14 years of analytics and leadership experience. She earned an MBA and a master’s degree in quantitative analysis from the University of Cincinnati.

**Matt Sias** serves as O.R. team lead for Productionalization and Support at Kroger. Sias joined the R&D group in 2009 and moved into an operations research role in 2012. He graduated from the University of Cincinnati with a degree in information systems.
‘Working on the Dark Side of the Moon’

Longtime INFORMS member’s new book offers a first-hand look at life inside the National Security Agency.

By Thomas R. Willemain

Editor’s note: Following are excerpts from Thomas Reed Willemain’s recently published book, “Working on the Dark Side of the Moon: Life Inside the National Security Agency.” The co-founder and senior vice president-research of Smart Software, Inc., Willemain is a longtime member of INFORMS and several other professional and honorary societies, including the Military Operations Research Society and the American Statistical Association.

Professor Willemain previously held faculty appointments in the schools of Management and Engineering at Rensselaer, the Kennedy School of Government at Harvard and the School of Architecture and Planning at Massachusetts Institute of Technology. He also served as a senior research associate at the Heller School of Social Welfare at Brandeis University.

“Working on the Dark Side of the Moon” is based on Willemain’s 2007-2008 academic year as a sabbatical visitor with the Mathematics Research group at the National Security Agency (NSA) in Fort Meade, Md. He subsequently spent several summers as an expert statistical consultant to NSA and as a member of the adjunct research staff at an affiliated think tank, the Institute for Defense Analyses Center for Computing Sciences (IDA/CGS).
The DARKROOM
My very first day on the job was generally exciting but ended with moments of angst and dread. I was assigned to an overcrowded office in a cold, dingy basement of the [redacted] building. The sign on the door proclaimed it to be the DARKROOM. The original DARKROOM was a proto-NSA set up in the World War I era….

There were three desks in our room. The first desk sat in the doorway and was visible from the entrance to the DARKROOM suite. This space was called the “Ejection Seat” because the occupant was usually quickly shuttled somewhere else. To me, the Ejection Seat was a bonus resource. Because the most recent occupant had already been ejected, the workstation sat idle. Therefore, I got to run “embarrassingly parallel” computing jobs on the Ejection Seat workstation while simultaneously running other instances on my own workstation.

Each desk had a computer that had been named after someone famous. I embarrassed myself early by asking why everybody else’s computer was named after a famous mathematician but mine was named after a notoriously sexy actress. Maybe my basic instinct was to act to type as an engineer plunked down in a nest of mathematicians.

The other great physical resource in our room was a very long and very ancient slate blackboard, perhaps the only one remaining in Math Research (and later lovingly transported to Laurel, Md., when all of the Research Directorate was bumped off campus to a suburban office park) and some colored chalk. One of my first acts of secret public service to the United States, on Day 2, was to wash the blackboard, clean the erasers, replenish the chalk supply, and use an antique vacuum cleaner to tidy up afterwards. (For a long time, I had a fear that my janitorial contribution would be vacuum cleaner to tidy up afterwards. (For a long time, I had a fear that my janitorial contribution would be

Outside the DARKROOM: Walls and Halls
The physical environment outside the DARKROOM was no more luxurious than within it. Located in the basement of the building where computers (which love cold) were more important than people (who usually do not), the corridors were quite chilly (cold air settles downward).

The corridors were also quite dingy, painted “government gray” and poorly lit. One happy day I wandered down, anxious as usual about whether I could really crack the problem I was working, when something struck me as odd, even alien. It took a while, but I finally realized that somebody had actually painted the walls with lighter colors. Later, there was another strange day when something again seemed very different. Somebody had installed actual lights in the ceiling, and it was easy to see where I was going. Not quite sunshine, but a definite mood enhancer. Less dungeon, more drab government office building.

To me, the corridors around the DARKROOM were quite frustrating, because along each one were many mysterious and tantalizing doors marked by mysterious and tantalizing signs. As an inveterate academic, I itched to go through each one and ask everybody, “What are you working on?”… Of course, curiosity is not the same as need-to-know, so the doors never opened for me….

NSA enforces work/life balance by not permitting staff to work more than a normal work week (except during emergencies, like 9/11). I presume this keeps psychological meltdowns to a tolerable few…

Not surprisingly, the stuff in the NSA gift shop is overpriced, but at least some of the money goes to the employee welfare fund, so that’s OK. What is most strange, to me, is that every single thing in there is made in China. That sounds like a scandal waiting to happen: Can’t we find any American vendors? You can be sure that I checked my Chinese-made NSA laser pointer very carefully before using it in secret spaces. If there are any bugs in that device, they eluded me.

But then, I never took the course on bugs. Instead, I took the short version of the very interesting course on “Denial and Deception.” That was a wicked pleasure for a professor who is supposed to be in the Truth Business. I love to brag that I’m a graduate of that course. And I kinda like to say, “I can neither confirm nor deny” whenever it’s even slightly appropriate. It never hurts to practice. Do I actually practice? Hey, I can neither confirm nor deny.

More Academic than Academics
As a professor, I am steeped in the tradition of frequent seminars and the imperative to create new knowledge. I viewed it as a bargain with society: We would be free to play, and society would ultimately benefit. In principle, this means that university departments must be open to new ideas, must constantly upgrade their knowledge, and must work hard to ensure that the knowledge gets passed on to new minds.

In practice, I have seen the crush of business in the university impede the development and exchange of new ideas. I have seen departmental seminars devolve to become recruiting and propaganda vehicles. I have seen supposedly eager doctoral students sit mute and never question a guest speaker. I have rarely seen seminars in which unproven, experimental ideas are discussed energetically.

Surprisingly, what I found in my corner of the NSA was a much closer approximation to the academic ideal. I was amazed at the level of intellectual activity in the Math Research organization. Not only the interns but also senior staff would enroll in special-...
There is another advantage to plying one’s trade inside the NSA that appeals to many otherwise other-worldly academic types: mission relevance. Working at NSA, there is an immediacy to the sense of mission that is difficult to reproduce in academia.

Air Gap
There is another advantage to plying one’s trade inside the NSA that appeals to many otherwise other-worldly academic types: mission relevance. Working at NSA, there is an immediacy to the sense of mission that is difficult to reproduce in academia. If nothing else, NSA works on problems of high national importance. There is a secret daily news summary published electronically within NSA called “NSA Daily.” All one has to do is to skim these stories to understand the full urgency of the NSA mission.

I found that I could not make it through the day without reading “NSA Daily.” It was my secret addiction. If I were feeling mentally sluggish in the morning, I could start the day with “NSA Daily” and get motivated. If I needed a break at lunch, I could read a few stories and get re-motivated. At the same time, I would often come away depressed and discouraged by the unrelenting flow of stories about attacks, threats, weaknesses and dire possibilities.

Inside the NSA
Friends and family would be surprised when I said that the work in the secret world could be depressing; that’s what I meant. It is so easy to go merrily through the day on the outside and, even watching the nightly news, never understand the full dimensions of the threat matrix. Since I grew up during the height (depth?) of the Cold War and lived near a Strategic Air Command base that was a prime Soviet nuclear target, I have the notion of “threat” baked in. But nothing says “threat” like the “NSA Daily.” No hype; just a catalog of grim facts.

The Real People of NSA
Rosie was the secretary in the office that handled the sabbatical program. She also worked on NSA’s program of unclassified summer research grants to mathematics faculty. She always took excellent care of her two lost boys, myself and “ANDREW” …

Rosie herself is an interesting story. She spent a full career at NSA, and during that time she burrowed in very deeply. Some people know that the comedian Wanda Sykes had at one point worked in a clerical capacity at NSA, and she may be the most visible black alumna of the Agency. But Rosie stayed in a long time, and I noticed that she was a key member of a large circle of black women who probably ran the Agency behind the scenes. Rosie was the one who, on Day 1, retrieved me from the Visitors’ Center and guided me through the intake process (escort through the maze, photograph, security briefing, swearing in, assignment to office, payroll paperwork, etc.). Literally every place she went, with me in tow, she would see “sisters” from her circle. If the sergeants really run the Army, and the chiefs really run the Navy, then the Sisters may really run the NSA …

In general, my impression is that the troops fell on both extremes of the spectrum of passion for the work. Some were there just because they were assigned; they knew they’d be moving on and did their jobs, period. …

At the opposite end on the passion scale, other troops felt a deep personal connection to what was happening in Iraq and Afghanistan, either because they had been there, they were going to deploy there, their buddies were already there, or all of the above. Earlier, I mentioned the multitude of seminars in Math Research. There were also agency-wide seminars, which I tried to attend whenever there was a hope of expanding my sense of the big picture. One I will never forget was given by a Marine major on the subject of defeating the IEDs that were the major source of our casualties in the two wars. Never have I seen such controlled but intense passion in any seminar on any subject in any venue.

Kill Chain
Few sabbatical opportunities involve death. This one did, in a way.
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Inside the NSA

It is obvious to the casual observer ... that the work we did was part of a kill chain.

NSA is part of the Department of Defense. The DoD deals in death on a large scale. But NSA is also part of the Intelligence Community (“IC”), which does not normally deal in death (except for parts of the CIA). So spending time in a Mathematics Research group inside NSA can seem fairly far removed from dealing in death. Day to day, what one sees are equations, graphs of equations, computer code, data, data and more data. One also sees technical courses, technical seminars and technical papers.

Only twice did I hear anything in any way related to death. The first is classified. The other instance was a general announcement about the Memorial Wall that holds the growing list of NSA personnel killed in the line of duty. The CIA has a much better-known wall of this type; I travelled ... to the “Big 4” operations buildings to see a name added in a very sad ceremony.

While there is almost no whiff of death in the daily business of the NSA, it is obvious to the casual observer, or at least to anyone with a minimum of moral awareness, that the work we did was part of a kill chain. Knowing this required that I force myself, before starting the sabbatical tour of duty, to acknowledge this fact and affirm my acceptance.

I thought of my father in combat in Germany and his discomfort with that memory, which involved, among other fraught moments, a recon mission that turned into an ambush that turned into a counterattack on a machine gun nest that turned into a Silver Star. I thought of the people I saw on TV who were forced to jump out of the burning World Trade Center towers. I thought of my wife, daughter and son and the people who considered them targets. I said yes.

The work done in Math Research is at the very distant end of the kill chain, but it is still in the chain. Some parts of the work are farther removed from a trigger pull than others, some closer. The first project I undertook was an attempt to develop an improved method of [redacted]. At the time, the Iraq war was raging. ... I do not know whether my work was ever implemented and resulted in enemy killed in action, and I will surely never know. Not knowing is not the same as not wondering.

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Thomas R. Willemain, Ph.D., is co-founder and senior vice president of Smart Software, Inc.; a former faculty member with the School of Management at Rensselaer, the Kennedy School of Government at Harvard and the School of Architecture and Planning at Massachusetts Institute of Technology; as well as a longtime member of INFORMS. For more information about his book, “Working on the Dark Side of the Moon: Life Inside the National Security Agency,” visit: http://www.tomwillemain.com.

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Data science is more than just building machine learning models; it’s also about explaining the models and using them to drive data-driven decisions. In the journey from analysis to data-driven outcomes, data visualization plays a very important role of presenting data in a powerful and credible way.

Why Unstructured Data?
Structured data only accounts for about 20 percent of stored information. The rest is unstructured data – texts, blogs, documents, photos, videos, etc. Unstructured data, also known as dark data, includes information assets that organizations collect, process and store during regular business activities, but generally fail to use for other purposes (for example, analytics, business relationships and direct monetizing). Unstructured data is the hidden part of the massive iceberg that has yet to be analyzed for useful decision-making.

In many circles, unstructured data is considered a burden that should be sorted and stored away. In reality, it contains valuable business insights that can significantly augment the business understanding that we have today from structured data.

Although machine learning can analyze any type of data (structured or unstructured), unstructured data is virtually useless without machine learning algorithms (including natural language processing (NLP) algorithms, text-mining algorithms, pattern/classification algorithms, etc.) While machine learning algorithms have seen significant advancements, the tools and processes to visualize the results from these algorithms for the common man have not kept pace.

As we create and consume more unstructured data, we have to extend the visualization efforts to include unstructured data.

By Navneet Kesher

Image © Rancz Andrei | 123rf.com
Visualization tools for unstructured data are extremely valuable, but they have traditionally operated mostly on highly structured data, such as stock prices and sales records. As we create and consume more unstructured data, we have to extend the visualization efforts to include unstructured data.

**Importance of Data Visualization**

As a data scientist, I always question the amount of time I put into data visualization. Throughout my early analytics career, I observed that the prettier my graph, the more skeptical my audience was in the quality of my analysis. While I loved data visualization, I also feared coming out as the person who puts more emphasis and effort into making the graphs pretty rather than ensuring a thorough analysis (Figure 2).

As I progressed in my career, I realized that data analysis and data visualization are not entirely exclusive work sets – they co-exist and feed off of each other (aka, you can produce pretty graphs and still come off as someone with analytical prowess). The rest of this article on data visualization will focus on representing highly complex analysis on a sheet of paper (or slide) for someone who may not have the need to understand the underlying details.

**Representing Unstructured Data**

Below are the three broad guidelines that I follow while building visualization for unstructured data:

1. **Start with a goal.** Goals are the fundamental bonding agent that connect the purpose of the analysis to the visualization of results. Whether the goal is to arrive to a decision or start an action into exploring next steps, the data scientist should aim to identify and convey the results and corresponding visualization that best supports a well-defined goal.

   For example, if the goal is to analyze a call center’s audio recordings to determine the type and corresponding volume of complaints, a cubism horizongraph [1] may be very useful. Cubism.js is a very effective time series visualization tool that uses stacked area graphs to help analyze output content from audio-video streaming data. In the case of call center audio recordings, the horizongraph visualization can help determine the intensity of the customer conversations (along with time series data) without having to transcribe audio into text.

   While we are on the topic of call center’s customer service recordings, if the goal is to understand the differences between a subscription customer versus a free-tier customer, then a text analysis along with scatter text visualization [2] may make more sense. Of course, this will need transcription and annotation of the media files.

   Call centers use analytics for analyzing thousands (or millions) of hours of recorded calls. Among others, the main goal is to gain insight into customer behavior and identify product/service issues. The analysis method that I have found particularly useful for these goals is self-organizing maps (SOM) [3], which, along with classification, have added the benefit of dimensionality reduction. SOMs are also good for visualizing multidimensional data into 2-D planar diffusion map.

   Having and understanding the goal is the most crucial aspect for any data visualization process. Always ask yourself and your stakeholders: What will this data be used for? List the data points that will be vital for...
Data Visualization

2. Simplicity for the win. The very reason we analyze unstructured data is to provide structure to it. Data visualization plays a very important role in conveying the results of the analysis, and visualization is most effective when it is simple to understand and can stand by itself without a lot of subtext or metadata. One of my favorite examples is this visualization on “How Families Interact on Facebook” [4] by the Facebook Data Science Team. This is a very simple yet powerful way to reveal the results of a very complex text analysis.

Another classic example is the use of bar/line charts vs. radar/spider charts. I am a big proponent of easy-to-read charts, aka, charts that can convey a maximum amount of information in the least amount of time.

Here are a couple of other ways I like for simple visualization of unstructured data:

**Word clouds.** Word clouds help visualize the occurrence of words within a corpus, with the size of the text representing the number of times the word or the phrase occurs in the larger text collection. Word clouds are very effective in visualizing the results when performing tf-idf (term frequency-inverse document frequency, a numerical statistic that is intended to reflect how important a word is to a document in a collection or corpus of words). Word clouds can be very effective in uncovering the topic areas of discussion for any social media content or feedback surveys/comments. If you use Python, you may want to bookmark an awesome word cloud library [5] by Andreas Muller. For an interesting application, see “Inauguration Word Clouds with tf-idf” [6].

**Chord diagrams.** A chord diagram is a powerful tool that can be used to represent the contextual meaning of words (especially when analyzing using latent semantic analysis [7]). If the number of topics are <10, Seaborn heat-maps [8] (or even a stacked bar chart) may be a better alternative; however, with a larger set of topics, chord diagrams have better visual representation.

Lines connecting nodes on a circle in Python examples of a chord diagram [9] and a filled chord diagram [10] indicate the relationship between these nodes/words (color of the line can denote a positive or negative relation) and the thickness of the connecting lines quantifies the extent of the relationship.

Don’t overload your visualization with data and present clear contrasts wherever applicable.

3. Know your audience. Knowing your audience and tailoring visualization for optimal consumption will go a long way into making a successful presentation. It’s always good to understand how the data translates into strategic direction for the product. Don’t work in a silo – involve and get feedback from your stakeholders as you do your analysis and create visualization thereof. Iterate! If you cannot get feedback from everyone, make sure that you think about who will actually be looking at these visualizations, what’s important to them and most importantly, how much time will they have to look at your graphs.

These are the most important things you should do to understand your audience. Technical jargon
won’t work if your audience doesn’t know what they mean. No matter how beautiful your graphs are, if you don’t deliver meaningful and actionable insights, your work does not classify as impact.

For example, if you present your data in the form of a network graph [10] (network graphs are designed to measure and quantify the relationships between different vertices or nodes on a graph), take some time to explain how the graph works. In a social data context, network graphs can be a powerful tool in telling a story on the health of your product’s ecosystem.

Data visualization is an art that data scientists need to be good at in order to tell a compelling story from their analysis. Figure 5 best depicts the four quadrants of good analytics insights.

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President-Elect Nick Hall outlines a bold strategy to enhance INFORMS’ visibility.

By Peter Horner

Nicholas G. Hall’s journey from University of Cambridge economics major to U.C. Berkeley management science Ph.D. student to Ohio State University professor to president-elect of INFORMS isn’t so much a long, strange trip as it is a natural evolution. For example, his doctorate degree made him a perfect candidate to teach project management at Ohio State University, where he has turned the course into one of the most popular electives among MBAs at OSU’s Fisher College of Business (no small feat, given MBA students’ historical reluctance to go anywhere near serious math). Likewise, Professor Hall’s professional background in accounting made him a logical pick to serve as treasurer of INFORMS from 2011-2014.

A prolific author, editor and speaker, Professor Hall has published more than 80 articles in the journals *Operations Research*, *Management Science*, *Mathematics of Operations Research*, *Mathematical Programming*, *Games and Economic Behavior*, *Interfaces* and several other journals. He has served a combined total of more than 42 years on the editorial boards of *Operations Research* and *Management Science*. He has given more than 360 academic presentations, including 112 invited presentations in 24 countries, 12 conference keynote presentations and nine INFORMS national conference tutorials. A 2008 citation study ranked him 13th among 1,376 scholars in the operations management field.

In addition to project management, Professor Hall’s research interests include incentives, scheduling and pricing, along with applications of operations research.

In a recent series of online and face-to-face interviews, Professor Hall outlined his bold strategy to enhance INFORMS’ visibility and to address other key issues the Institute will face in the future. Following are excerpts from the interviews as Professor Hall prepares to take the reins as the 24th president of INFORMS on Jan. 1, 2018, including the surprising admission that what he really wanted to be was a professional golfer. Fore!
What is the “state of INFORMS” from your viewpoint in terms of its major activities and its financial status?

The overall state of INFORMS is outstanding, in fact probably the best it has ever been. Recently freed from short-term financial constraints and a culture of day-to-day thinking, INFORMS is moving on to larger and more strategic objectives. These objectives define the theme of my year as president, which is “visibility and awareness.”

Please expand on your plans for visibility and awareness.

Regarding visibility, we are planning a policy conference in Washington, D.C., in 2018, to inform key decision-makers about the contributions that the work of INFORMS makes to society; likely topics include energy and healthcare. This is a new venture for INFORMS, so even with expert consulting help we may not deliver perfectly the first time around, but we will learn and improve. Possible dates are in April or December, taking into consideration the November election cycle. Similar events are planned for 2019 and 2020.

An event of this type, even if successful, is not sufficient after the applause dies down without awareness. That is, we need to develop a broad and consistent reputation among key decision-makers for delivering quality solutions. This objective is quite strategic. Some components we are planning to build awareness include: writing policy white papers, placement of story ideas and op-eds, and conducting in-person briefings with key editors.

As a former treasurer of INFORMS, you have considerable insight into the Institute’s financial situation. How would you describe INFORMS’ current finances?

When I first became treasurer in 2011, INFORMS had experienced five years of operating losses, and had net assets of about $11 million. The working capital barely met financial guidelines for similar organizations. Today, INFORMS is in dramatically better financial condition with about $19 million in net assets. Annual revenue and expenses are about $11.2 million, with an operating surplus averaging about $200,000. We are also much better diversified than previously. When I first joined the board in 2001, more than 70 percent of INFORMS’ revenue came from publications; this figure is now below 50 percent, with the difference being picked up mainly by meetings and some growing analytics revenues.

Are there any specific new or in-the-works INFORMS initiatives you would like to tell the membership about?

There are many current initiatives. Some cost money and therefore require formal board approval, whereas others do not.

Example initiatives within the first category are:
- The three policy conferences in Washington, D.C., that I described earlier.
- A substantial upgrade of INFORMS’ membership management software system to a new customer management system that is compliant with newly published standards.
- Development of the recently initiated and successful student leadership conference into an annual event.
- INFORMS assuming operational control of OR/MS Today and Analytics magazine.

Example initiatives within the second category are:
- Development of a Charter for Authors, which specifies reasonable conduct of journal review processes and respectful treatment of authors, and is pending approval by editors and the Publications Committee.
- Consideration of term limits for editorial board members.

The last two initiatives are pending approval by editors-in-chief and the Publications Committee.

What are the most important things that the membership probably doesn’t know about INFORMS that it should?

Here is a concise summary. INFORMS is a 501c3 nonprofit organization with 54 full-time employees at its office in Catonsville, Md., close to BWI airport. The office has been ably led since 2011 by Executive Director Melissa Moore. Ten functional area staff directors each work with a vice president who is elected to a two-year term. Recently, INFORMS had about 10,500 regular, retired and student members. This number is highly seasonal due to the annual meeting and is projected at 12,500 by year end, closely in line with the 2016 number. Member turnover is about 20 percent annually, which seems too high but is not easy to fix. Regular membership is about 65 percent academic and 35 percent industry/government/military. INFORMS is a leading publisher of scientific research, with about 2 million article downloads annually.
Tell us a little about yourself. You earned bachelor and master degrees in economics at Cambridge, followed by a Ph.D. in management science at U.C. Berkeley. It's a long way from Cambridge to Berkeley, and it's a long way from economics to OR/MS. Who or what drew you to Berkeley and management science?

After graduating with my degree in economics, I joined about half my classmates in starting a professional training contract in accounting. This involved a course in “decision-making,” including something completely new to me called a linear program. It had two decision variables. That graphical solution procedure seemed so inefficient! Why wouldn’t you just rank the constraints by gradient, and pick the two that bracketed the gradient of the objective? This was the first of many mistakes, but nonetheless interesting to think about.

Meanwhile, I was sent to perform a stock count at a large gravel pit. After several hours of walking around on top of the gravel pile in a business suit and rubber boots, and a lot of high school geometry, I confidently produced an estimate of 145,308 tons of gravel. The manager responded that he was happier with his book figure of 110,000 tons. It seemed time to do something else. My office-leaving party at a London casino generated funds for the journey to California, much like the Leonardo DiCaprio character in “Titanic” but fortunately without ice.

Berkeley has long had an excellent program in OR/MS, and was a great choice for me. I learned dynamic programming and stochastic processes from the authors of the classic textbooks, Professors Dreyfus and Ross, respectively. Two others among my instructors, Professors Harary and Akerlof, subsequently won Nobel Prizes.

What mentors or others played significant roles in your early education?

Between the ages of 9 and 11, I was blessed with a wonderful mathematics teacher, Mrs. Truscott. I will always be grateful to her for encouraging my interest in mathematics. It was a sad day for me when she left my school.

What’s the best advice you received in your career?

I join all the other students in my Ph.D. program in appreciating the early career advice and encouragement we received from the late Ernest Koenigsberg. My Ph.D. advisor, Dorit Hochbaum, wisely steered me away from some flavor-of-the-month topics and toward better ones where I could learn much more. My numerous co-authors have greatly improved my choice of research problems and my thinking about them. Recently, [INFORMS Executive Director] Melissa Moore has helped me become more strategic in my thinking about the issues facing INFORMS.

What’s the best advice you would give one of your students today?

First, attend the 90-minute seminar “What They Don’t Tell You in Graduate School about Academic Careers,” which I have given to numerous universities in North America, Europe and Asia over the last 15 years. Second, use this detailed information to decide if an academic career is really what they want. If so, understand that an academic career is a journey, meaning there will be both good and bad steps along the way. Third, try to find a topic that you expect you will really enjoy studying in the long term, where your research, teaching and other activities will be synergistic. Fourth, keep in mind the proverb, which originates in Arabic and is now widely used in Turkey, “The dogs are barking, but the caravan continues.”

How and why did you become a member of INFORMS? What was your impression of the first conference you attended?

I joined INFORMS at the 1982 fall conference in San Diego, as part of the conference registration package. My university supported student travel to the conference being held at the elegant Town and Country Hotel, but not accommodation, so I booked into the E-Z 8 Motel nearby. The shuttle bus driver summarized his information: “Nine for the Town and Country, and one for the E-Z 8.” I attended my first INFORMS conference session at the tiki hut right next to the pool, where the speaker needed to pause whenever someone dived from the high board. Later, things improved. Two leaders of our academic field, Egon Balas and Jim Orlin, were generous with their advice.

You teach project management to MBA students, and I understand it’s one of the most popular MBA electives. How does one make math and modeling popular with business students, who generally try to avoid such courses?

As I explain in my 2016 INFORMS tutorial, project management is a perfect topic for academic career development, including both research and teaching. It is almost unique to find a topic where innovative practice (e.g., critical chains 1997, agile 2001) is ahead of research. But there is a particular teaching challenge: In my class I typically find several students with five or 10 years of project management experience and the Project Management Professional certification, whereas one-third of the students have never seen a
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project. Their mathematical backgrounds are similarly diverse.

Obviously, a standard textbook approach will not keep all these students satisfied. So, I teach my course predominantly from hands-on activities: games, exercises, competitions, structured case discussions and online simulations. I have four outstanding guest speakers from local companies who discuss the day-to-day specifics of career choice and development, project execution processes, IT projects and agile methodology, respectively.

Most valuable of all, the students learn about themselves and each other, using a self-assessment exercise that is similar to Myers–Briggs but at a problem-solving level. Students from 10 graduate programs across campus attend my course, for example many students earning a Doctor of Pharmacy degree will need to manage pharmaceutical development projects. Project management is a great opportunity for business schools.

You own your own consulting business. How does your teaching and academic research benefit your practice . . . and how does your practice work benefit your teaching and students?

I own a consulting business, CDOR, registered in Columbus, Ohio. This name stands for “Columbus Discovers Operations Research.” I use it mainly as a hobby, and only accept projects that interest me. My most recent project involved an intellectual property dispute over a heuristic for a really famous O.R. problem that I am not allowed to name. Mainly, I have learned about the importance of good communication over exactly what is needed and about specific delivery. The more immediate connection between work and reward in consulting, compared to research, is certainly appreciated.

Your extensive research and list of publications and citations speak for themselves. At the same time, you’ve delivered hundreds of presentations, more than 100 invited talks and a dozen or so keynote addresses all over the world. What’s behind your obvious joy of public speaking and connecting with a live audience?

It is wonderful to share our ideas, and even more wonderful to influence the early careers of young people. But it is also a valuable learning experience to speak. I will give two examples. First, I once gave a seminar to a group without a strong O.R. background in Asia. But one question from that audience was a gem; it generated a whole section that completed a partly developed paper. Second, I once traveled four hours each way to give a seminar in the United Kingdom, and owing to a double booking, the audience was only two people. Sure, I would have preferred a larger audience, but I had a chance to practice my talk, and I have no regrets about going.

I am usually anxious about speaking. For example, I always visit my classroom for 10 minutes on the weekend before the first class, even though I have been teaching since 1983 and I am familiar with that room. The worst talks I have ever given occurred when, for whatever reason, I was not anxious. Anxious is good.

Based on your equally extensive volunteer work, including more than 42 combined years serving on the editorial boards of Operations Research and Management Science, it’s clear you enjoy volunteer work as well. What drives you to devote so much of your time and energy to INFORMS and other organizations?

Editorial work is extremely interesting and it is possible to learn so much. For those who have not had this experience, it is astonishing how much splendid quality research is submitted to INFORMS’ main journals. I served on the editorial board of Management Science for 16 years. This is currently my 27th consecutive year on the editorial board of Operations Research. I must be a poster child for editorial term limits. I have handled about 350 papers in these two roles, and I wish more of them could have been accepted.

Can you put into perspective how important volunteers are to INFORMS?

There is great benefit in both directions. For INFORMS, almost all the activities outside the office in Maryland are volunteer activities, so those are collectively of great importance. For example, they are essential for successful strategy, sound financial decision-making, professional recognition, delivery...
Growing up, my first choice of career was to be a professional golfer. Vitae summa brevis spem nos vetat incohare longam. [They are not long, the days of wine and roses.] Still, my lifelong interest in following professional golf has taken me to 14 major championships and numerous other events. I’m currently planning my 2018 schedule around Carnoustie [site of the British Open Championship] in Scotland in July. I am still hopeful that the PGA TOUR will adopt the playoff series redesign that I developed with Chris Potts (Interfaces 2012); it would be an improvement.

Since I spend several months a year working on research projects in Asia, I am learning modern standardized Chinese, i.e., Putonghua, from the phonetic Romanization pinyin. My learning process is slow. Some people might call it asymptotic. A lot of wrong information is written about learning Chinese for English speakers. Pronunciation is supposedly hard, but in fact it is easy, and anyway it is all available in a single page online with audio links. Chinese grammar is somewhat different from English, but not much more so than German. The main difficulty is that, with few common roots, Chinese vocabulary is a nightmare. So, the job of the CCTV newsreader remains secure for now.

I love to attend food and wine festivals, whether local or international. In 2016, I attended the best one in the world, Salone del Gusto, which is held every second year in Turin, with 7,000 exhibitors from over 100 countries and more than 400 tasting events. I hope never to miss it.

Last question: At the end of 2018, on what basis will you measure or grade the success of your term as president?

First, I hope that the policy conference is successful, and it becomes the start of an annual tradition that establishes INFORMS as a recognized major player in national decision-making. Second, I hope that INFORMS members will enjoy the food at the two receptions in Phoenix; otherwise, I expect I will hear about it.

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The 2018 INFORMS Conference on Business Analytics and Operations Research will take place in Baltimore, Md., on April 15-17 at the Baltimore Marriott Waterfront. Since 1729, Baltimore has served as a vital hub of discovery and growth in Maryland. Located within an easy distance of both Philadelphia and Washington, D.C., Baltimore — birthplace of the U.S. National Anthem — is among those cities that played a defining role in the founding of the United States. Since then “Charm City,” as Baltimore is appropriately nicknamed, has grown from a bustling port city, to an industrial center to a community focused on service, and it is the current home of INFORMS.

Analytics 2018 will bring together nearly a thousand leading analytics professionals and industry experts to share ideas, network and learn through real-life examples of data-based analytical decisions. Long-formatted talks offer an outlet to hear the complete story of successful analytical projects from inception through implementation. This conference also offers substantial networking opportunities, making it the analytics event of the year for anyone who works in the analytics, operations research or management science fields.

Handpicked topics and speakers: The Analytics conference has seen huge growth and success year after year due in part to the conference program committees. They develop the topic tracks, select speakers and organize the presentations that comprise the heart of the conference. The Analytics 2018 committee is chaired by Jack Kleeber, principal at Kromite, LLC. The 38 members of the program committee include analysts and managers from companies such as Amazon, American Airlines, Boeing, Deloitte Consulting, Gartner, General Motors, Intel Corporation, InterContinental Hotels Group and FICO, as well as leading universities and government agencies.

The conference committee has designated nine “Emerging Topics” (formerly known as Invited Tracks) for 2018: Analytics in the Public Sector, Analytics Leadership, Analytics on Unstructured Data, Analytics Process, Decision & Risk Analysis, Emerging Analytics, Marketing Analytics, Revenue Management & Pricing and Supply Chain Analytics. The program will be rounded out with invited talks.
INFORMS Board update: 2017 Annual Meeting

The INFORMS Board of Directors met in Houston on Oct. 21–22 in conjunction with the 2017 INFORMS Annual Meeting. Following is a summary of the meeting.

Financial: INFORMS is very strong financially. Projected revenue for 2017 is $246,000. The reserves balance is $13.96 million, or 135 percent of three-year average annual expenses (versus a 75 percent target). Short-term capital is $5.79 million. Total net assets of $19.75 million represent a record for INFORMS. The Board approved the 2018 budget with a projected surplus of $85,000 and authorized $1 million from the reserves for initiatives.

Membership: INFORMS has 11,256 members. This number increases seasonally around the time of the annual meeting, and it is projected to be around 11,700 by year-end. INFORMS is paying increased attention to retention and new member recruitment.

Meetings: Nearly 5,900 people attended the INFORMS Annual Meeting in Houston—the largest meeting to date! Prior survey results highlighted concerns about too many parallel sessions and low participation on Wednesday, and hence, the meeting experimented with a 2 p.m. Wednesday end. For future conferences, potential changes include limiting sessions allocated to subdivisions (sponsored sessions have the lowest average number of talks per session), shifting to a Saturday-Tuesday format (70 percent of survey respondents were in favor), limiting each registered attendee to one presentation (as speaker), a special track for Ph.D. students in the academic job market, rapid fire talks for contributed talks (see pechakucha.org) and inviting high-profile speakers (with local connections) for a plenary session.

Strategic issues: Board members Susan Martonosi and Laura Albert led a strategic discussion about the future members of INFORMS. The Board discussed the topics of diversity, analytics, practitioner membership and international applications. Specifically, whether and how to do things differently, activities to initiate or sunset, and how to gather resources and volunteers to support efforts.

Publications: Journal submissions continue to increase at approximately 15 percent annually. Publications downloads nearing 2 million per year, with an annual increase of about 3 percent. Editors are considering the possibility of term limits for editorial board members, for example 50 percent turnover every three years. This topic will be discussed by the Publications Committee and potentially considered at the January Board meeting. A charter for authors was discussed at the Editors’ Meeting. Further discussion is needed prior to Board consideration. Two new INFORMS journals, *Journal on Optimization* and *Stochastic Systems*, opened for submissions in 2017.

Practice activities: Board approved revisions to the Practice Policies and Procedures (Section 12) to:
- Align with Board’s goal of being strategic
- Develop structure for increasing outreach efforts
- Facilitate stronger partnerships between industry and academia
- Increase member engagement by being more inclusive


Strategic initiatives: Several exciting completed or ongoing initiatives were highlighted:
- Academic Leadership Workshop at the annual meeting
- Diversity, Equity, Inclusion Committee formed and active
- Student Leadership Conference held for first time, will be repeated in 2018
- Expanding volunteer opportunities
- Opportunities to donate and contribute to INFORMS initiatives
- Mentor match program

Approved initiative funding, as follows:
- $225,000 for policy conferences in Washington, D.C., in 2018, 2019 and 2020
- $440,000 to increase awareness of the profession and INFORMS in 2018
- $409,823 to offer and endow a student scholarship 2018-2022
- $45,000 one-time funding for evaluation and consideration of conversion to a new customer management system (with another substantial additional funding request to be made in 2018)

Nicholas G. Hall, INFORMS president-elect, and Pinar Keskinocak, INFORMS secretary
INFORMS Fellows Class of 2017

INFORMS honored 12 new Fellows for their "outstanding lifetime achievement in operations research and the management sciences" at a special luncheon during the 2017 INFORMS Annual Meeting in Houston. INFORMS Fellows have "demonstrated exceptional accomplishments and made significant contributions to the advancement of operations research and management science over a period of time." The award, which brings together the very best operations researchers and analytics experts throughout the world, recognizes outstanding achievement in five areas: education, management, practice, research and service.

The 2017 Fellow honorees include:

Jeffrey M. Alden (General Motors) for advancing the application of operations research at General Motors through broad and high-impact contributions to manufacturing, engineering and the development of advanced analytics problem-solving tools.

Jeffrey D. Camm (Wake Forest University) for outstanding contributions to the teaching of OR/MS, for outstanding advocacy and contributions to the practice of OR/MS, for excellent leadership in academia as an advocate for OR/MS and analytics and for long-standing distinguished service to INFORMS and the profession.

James J. Cochran (University of Alabama) for outstanding contributions to operations research education around the world and for service to the profession.

Shane G. Henderson (Cornell University) for contributions in simulation, simulation-optimization methodology and applied probability in O.R. practice in emergency services logistics with broad impact, for distinguished professional service and outstanding education contributions.

David Morton (Northwestern University) for outstanding research in stochastic optimization, contributions to O.R. practice, and for serving as a mentor and leader in the field.

Andy Philpott (University of Auckland) for contributions to formulation and implementation of optimization models for efficient operations of electric power systems and markets, and for exemplary service as an educator and leader in the INFORMS community.

R. Ravi (Carnegie Mellon University) for contributions to the understanding of algorithms in combinatorial optimization, their application in business and technology, and for educational innovation in operations research.

Edwin Romeijn (Georgia Institute of Technology) for outstanding contributions in research to optimization and supply chain management, and healthcare, education academic leadership, and service to INFORMS and the profession.

Andrzej Ruszczynski (Rutgers University) for outstanding contributions to stochastic optimization theory and practice including innovative representations of risk and novel computational methods.

Susan M. Sanchez (Naval Post-graduate School) for advancing the defense community’s use of data farming, sustained research contributions to the design and analysis of large-scale simulation experiments, and distinguished service to INFORMS and the simulation profession.

Jing-Sheng Jeannette Song (Duke University) for deep, sustained research contributions to the fields of inventory theory and supply chain management.

Mark S. Squillante (IBM Research) for fundamental contributions to the theory and practice of applied probability and stochastic optimization and control.

Tardos awarded Morse Lectureship

Éva Tardos, the Jacob Gould Schurman Professor of Computer Science at Cornell University, was awarded the 2017 Philip McCord Morse Lectureship at the INFORMS Annual Meeting in Houston.

The citation noted that Professor Tardos "exemplifies the true spirit of Professor Morse," and, who, like Morse, "has been an outstanding spokesperson for the operations research profession."

The lectureship is awarded in honor of Morse in recognition of his pioneer contribution to the field of operations research and the management sciences. The award is given in odd-numbered years at the INFORMS Annual Meeting if there is a suitable recipient. The term of the lectureship is two years. The award is $2,000, a certificate, a travel fund of $5,000, a copy of Morse’s autobiography, “In at the Beginnings: A Physicist’s Life” and a copy of Morse and George Kimball’s “Methods of Operations Research.”

Brenda Dietrich served as chairperson of the 2017 Morse Lectureship committee.
Hunt receives 2017 INFORMS President’s Award

David Hunt, a manager at the global management consulting firm Oliver Wyman, was named the 2017 recipient of the INFORMS President’s Award in recognition of his “career achievements that have had a positive societal impact on public policy in the transportation sector and for his extraordinary work with INFORMS including the creation of a new Pro Bono Analytics Service.”

The award was presented by INFORMS President Brian Denton at an awards session held at the INFORMS Annual Meeting in Houston. The INFORMS President’s Award recognizes and encourages important contributions to the welfare of society by operations researchers at the local, national and global level. The award committee includes the current INFORMS president and the two most recent past presidents.

The citation read in part:

David Hunt … has had a 30+ year career implementing operations research solutions in the transportation industry for clients on six continents. David has led public policy efforts in the transportation industry, and he has written several white papers filed with the U.S. Department of Transportation that have helped shape federal transportation regulations, including the first-ever nationwide rail capacity study. His current interest is in applying predictive models to improve transportation safety and reliability.

David began his INFORMS involvement in the early 1990s and has served in many capacities since then, including as president of the New Jersey Chapter of INFORMS, president of the Rail Applications Section, chair of the INFORMS Subdivision Council and as a vice president on the INFORMS Board of Directors.

David led the development of the INFORMS Ethics Guidelines in 2016.

Most recently he led the effort to create Pro Bono Analytics, a new INFORMS volunteer service that provides support to nonprofit organizations in need of analytics help. At last count, more than 450 volunteers have offered their analytical skills to a wide variety of projects for nonprofit organizations working in underserved areas or for underserved populations.

Reddy, Soret win Undergraduate Operations Research Prize

Siddharth Reddy of Cornell University and Agathe Soret of École Polytechnique were winners of the 2017 Undergraduate Operations Research Prize from INFORMS for the respective papers, “Unbounded Human Learning: Optimal Scheduling for Space Repetition” (Reddy) and “A Generalized Markov Chain Model to Capture Dynamic Preferences and Choice Overload” (Soret).

The awards were announced at the INFORMS Annual Meeting in Houston by committee chair Murat Kurt following a series of presentations.

The competition is held each year to honor a student or group of students who conducted a significant applied project in operations research or management science, and/or original and important theoretical or applied research in operations research or management science, while enrolled as an undergraduate student. The prize includes a monetary award of $500 plus travel support to attend the INFORMS Annual Meeting.

Honorable mention honors went to Yue Hu of Northwestern University for the paper, “Fluid Optimal Control of Pilling System with Large Switchover Times.”

Other finalists and their papers included: Chungjae Lee, Jason Bermudez, Kevin Desprez, Alexander Kehres, Leah Patterson, Suphaphat Petlerkwong and Yuntong Zhu of Georgia Tech for “Contact Tracing Protocol”; Maria Patino of Universidad de los Andes for “Optimization Strategies to Support Analyses and Decisions to Increase the Coverage of Cervical Cancer Screening Tests in Rural Areas of Cundinamarca, Colombia”; and Stephanie Allen of SUNY Geneseo for “A Two-Stage Vehicle Routing Algorithm Applied to Disaster Relief Logistics after the 2015 Nepal Earthquake.”
Hillier, Labe receive Kimball Medals for distinguished service

Frederick S. Hillier, INFORMS Fellow and professor emeritus of operations research at Stanford University, and Russell Labe, CAR of RPL Analytics Consulting, an active member and volunteer with INFORMS and its predecessor TIMS for more than 35 years and also an INFORMS Fellow, received the 2017 George E. Kimball Medal for distinguished service to INFORMS and the O.R. profession. The medals were presented at the 2017 INFORMS Annual Meeting in Houston. Committee chair Rina Schneur made the presentations.

The citations read in part:

**Frederick S. Hillier**: Professor Hillier … spent his career on the Stanford faculty after obtaining his undergraduate and graduate degrees there. His research has extended into various areas, including integer programming, statistical quality control, operations management, queuing theory and risk analysis for capital budgeting. Two of his six books are in the latter two areas.

Fred is especially known for his classic, award-winning textbook, “Introduction to Operations Research,” co-authored with the late Gerald J. Lieberman. It was first published in 1967, exactly 50 years ago, and is now in its 10th edition (with plans for an 11th edition). This book has been used by hundreds of thousands of students worldwide, including through translations into multiple languages. The book has received much credit for both raising the visibility of our field and attracting numerous individuals to enter the field. Its 6th edition was awarded honorable mention for the 1995 INFORMS Lanchester Prize, and Fred received the 2004 INFORMS Expository Writing Award for its 8th edition.

Fred is also the co-author of another popular textbook, “Introduction to Management Science: A Modeling and Case Studies Approach with Spreadsheets” (co-authored with his son, Mark S. Hillier). First published in 1999, its 6th edition will appear in January 2018. The book has received a substantial international audience and has been translated into four other languages.

Fred has further enriched the literature of our field by being the founding series editor of a book series, the International Series in Operations Research and Management Science, that he started in 1993 and developed into an exceptionally prominent Springer book series. When Fred retired from the series in 2013 on the 20th anniversary of its founding, 200 books that he brought into the series had been published with several dozen more under contract for future publication.

Since becoming a member of ORSA and TIMS in 1960, Fred has taken on many leadership roles in INFORMS and these predecessor societies. He has served as the ORSA treasurer; the TIMS vice president for meetings and the co-general chairman of a TIMS international meeting. He also has been the chairman of the following committees: TIMS Publication Committee, the ORSA Search Committee for Editor of Operations Research, the ORSA Resources Planning Committee, the ORSA/TIMS Combined Meetings Committee and the INFORMS Selection Committee for the John von Neumann Theory Prize.

Fred was elected an INFORMS Fellow in 2004.

**Russell Labe**: Russell Labe has been a practitioner of operations research for 38 years. He started his career working for eight years at RCA Operations Research Group and spent the following 28 years at Merrill Lynch, where he helped establish the first management science group on Wall Street in 1986. Russ was director of the group for 10 years and retired in 2015 from the Bank of America as the director of Merrill Lynch Analytics & Modeling, leading a group of five departments and 50 analysts.

In retirement, he established his own consulting firm, RPL Analytics Consulting. Russ received his BA in mathematics from Lebanon Valley College and his MEng in operations research from Cornell University. During his career, Russ focused on applying operations research and analytic methodologies to industry problems in the areas of product pricing, liquidity risk, revenue forecasting, client attrition, product propensity, investment asset allocation, marketing effectiveness and sales force compensation. Projects completed by the Merrill Lynch team provided documented benefits of $100M+ in annual revenue enhancement and cost reduction. During his tenure, Russ helped Merrill Lynch win three major INFORMS practice prizes: the INFORMS Prize in 1997, the Edelman Prize in 2001 and the Wagner Prize in 2004. He was a co-author of several articles published in Interfaces and the journal of Product Innovation Management.

Russ has been a member of INFORMS and its predecessor TIMS since 1981. He served on the INFORMS Board for two years as VP of Practice. He was elected an INFORMS Fellow in 2014. He was heavily active in the Practice Section (formerly CPMS) where he served as chair for four years and council member for 25+ years. He was the Merrill Lynch company representative on the Roundtable for 12 years and served as secretary of the Roundtable Executive Committee for four years.

Russ chaired the Edelman Prize Committee for two years and served as a coach and judge numerous times. He also served as a judge for the INFORMS Prize, the Wagner Prize and the UPS Prize. He served as chair of the Edelman Gala Committee for two years and was a member of the Investment Committee for eight years.

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The 2017 John von Neumann Theory Prize of INFORMS was awarded to Donald Goldfarb and Jorge Nocedal for their "fundamental contributions, theoretical and practical, that have, and continue to have, a significant impact on the field of optimization."

The award citation also noted that Goldfarb, a professor of industrial engineering and operations research at Columbia University, and Nocedal, a professor of industrial engineering and management sciences at Northwestern University, have made "semital contributions to the theory and applications of nonlinear theory and applications of nonlinear optimization over the past several decades. These contributions cover a full range of topics, going from modeling, to mathematical analysis, to breakthroughs in scientific computing. Their work on the variable metric methods (BFGS and L-BFGS, respectively) has been extremely influential."

Prize committee chair Avishai Mandelbaum made the presentation at the 2017 INFORMS Annual Meeting in Houston. The prize recognizes scholars who have made fundamental, sustained contributions to theory in operations research and the management sciences.

The citation read in part: "Goldfarb's deep research contributions tie together the theoretical and the very practical in traditional linear and nonlinear programming, interior point methods, and the newly in vogue methods developed for signal processing and machine learning — and doing all that through a unique understanding of the fundamental issues in each and all of these areas. His contributions to the field are exceptionally broad, very influential and long-lasting, beginning with the famous Broyden-Fletcher-Goldfarb-Shanno (BFGS) algorithm for nonlinear optimization in the 1960s, then the revolutionary steepest edge simplex method for linear programming in the 1980s and in the last decade first-order methods for large-scale convex optimization. The primal and dual steepest edge simplex algorithms, devised by Goldfarb with Reid and Forrest, respectively, are the most widely used variants of the simplex method. Goldfarb's work provides the theoretical foundation for many variants of this method implemented in most state-of-the-art commercial linear programming solvers. The Goldfarb-Idnani dual active set method for quadratic programming (QP) is one of the most widely used QP methods."

Nocedal made seminal contributions to the area of unconstrained and constrained nonlinear optimization that have fundamentally reshaped this field. This includes the development of L-BFGS methods, extending interior point methods to non-convex constrained optimization, co-authoring a highly influential book in nonlinear optimization, and recently illuminating the interface between optimization and machine learning via efficient and effective second-order methods.

In the 1980s, Nocedal invented the L-BFGS optimization algorithm, the limited memory version of the BFGS method. This opened the door to solving vastly larger unconstrained and box-constrained nonlinear optimization problems than previously possible; Nocedal's L-BFGS algorithm requires storage that is only a small multiple of the number of variables, whereas the original BFGS method required a quadratic amount of storage. The L-BFGS algorithm has had an immense practical impact, which is difficult to overstate.

Nocedal was also instrumental in extending the interior-point revolution beyond convex optimization. In the late 1990s, he and his collaborators proposed the first theoretically sound algorithm for nonlinear and nonconvex optimization problems. This algorithm was practical and, importantly, did not rely on strong assumptions.

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Negin Golrezaei of the University of Southern California won the 2017 George B. Dantzig Dissertation Award from INFORMS for the dissertation, "Real-Time Optimization of Personalized Assortments." Committee chair Wedad Elmaghraby presented the award at the INFORMS Annual Meeting in Houston.

The award honors the best dissertation in any area of operations research and the management sciences that is innovative and relevant to practice. The award is designed to encourage academic research that combines theory and practice and stimulates greater interaction between doctoral students (and their advisors) and the world of practice.

Lehigh University, Pennsylvania Department of Corrections win Wagner Prize

Nearly 100 unique factors have to be considered during the complicated task of assigning inmates to any of the Pennsylvania Department of Corrections’ 25 facilities. What once took seven employees nearly a week to accomplish can now be completed in less than 10 minutes at an expected savings of nearly $3 million, thanks to an algorithm created by a team of Lehigh University students and professors and the Pennsylvania Department of Corrections.

In recognition of their unique new application of operations research (O.R.), Tamás Terlaky, Mohammad Shahabsafa, Chaitanya Gudapati, Anshul Sharma, Louis J. Plebani and George R. Wilson of Lehigh University and Kristofer B. Bucklen of the Pennsylvania Department of Corrections were presented the Daniel H. Wagner Prize for Excellence in Operations Research Practice by INFORMS.

The prize-winning paper, “The Inmate Assignment and Scheduling Problem and its Application in the PA Department of Corrections,” not only realized profound success in a real-world setting, but it had a strong mathematical foundation that was easily and concisely communicated. The award was presented during the 2017 INFORMS Annual Meeting in Houston.

Over a period of five years, the team from Lehigh University worked closely with the Pennsylvania Department of Corrections to successfully implement the novel Inmate Assignment Decision Support System (IADSS). IADSS was designed to address the problems associated with inmate assignment by providing an optimal, simultaneous system-wide assignment tool. The project, which has been recognized for its contribution on the floors of the House and Senate in the Pennsylvania Capitol and included in the permanent record of Pennsylvania, is the first time that O.R. methodologies have been used to optimize operations in the correctional system.

Other finalists for the 2017 award included:

- “Crew Decision Assist: Optimizing Crew Deployment for Freight Trains” by Dasaradh Mallampati, Brian Roth, Pooja Dewan, April Kuo and Juan Morales, BNSF Railway, and Anant Balakrishnan, University of Texas at Austin

George E. Nicholson Student Paper Competition

Andrew Li of Massachusetts Institute of Technology (MIT) won the 2017 George E. Nicholson Student Paper Competition for the paper, “Learning Preferences with Side-information.”

The competition is held each year to honor outstanding papers in the field of operations research and the management sciences written by a student.


Finalists included: Zhi Chen (National University of Singapore), Daniel Freund (Cornell University), Will Ma (MIT) Erhun Ozkan (University of Southern California) and Zhengyuan Zhou (Stanford University).

The awards were presented by Committee Chairs Hayriye Ayhan and J. Cole Smith at the INFORMS Annual Meeting in Houston.

Nicholson Student Paper presenter Hayriye Ayhan (front center) is flanked by winner Andrew Li (right) and second-place finisher Bradley Sturt (left), along with other finalists.
John Tsitsiklis receives Saul Gass Expository Writing Award

John Tsitsiklis, the Clarence J. Lebel Professor with the Department of Electrical Engineering and Computer Science at MIT and director of MIT’s Laboratory for Information and Decision Systems, was named the 2017 recipient of the Saul Gass Expository Writing Award. Committee Chair Noah Gans made the presentation at the 2017 INFORMS Annual Meeting in Houston.

Named in honor of Saul Gass, an O.R. pioneer and an extraordinary and prolific writer, the prize recognizes an operations researcher/management scientist whose publications demonstrate a consistently high standard of expository writing.

The citation read in part:
Professor Tsitsiklis has made fundamental contributions to optimization, dynamic programming, decentralized control of systems and statistical learning. The influence of research — such as his 1993 work on decentralized detection and his 1994 paper, “Efficient Algorithms for Globally Optimal Trajectories” — reflect the clarity of his thinking as expressed in writing.

The excellence of Professor Tsitsiklis’ writing extends to the pedagogical.

The lucidity and elegance of textbooks, such as “Introduction to Probability” (with Dimitri Bertsekas) and “Introduction to Linear Optimization” (with Dimitris Bertsimas) have helped a generation of students develop their intuition for underlying concepts in probability theory and in optimization.

While it can be difficult — and should be difficult — to distinguish good writing from clear thinking, Professor Tsitsiklis understands that excellence in technical writing, as a craft, is essential to the communication of important ideas. His note, “A Few Tips on Writing Papers with Mathematical Content,” provides succinct yet highly valuable guidance to any researcher who seeks to communicate his or her ideas to a broad audience.

Bonder Scholarship for O.R. in Military Apps

Lee Evans, a Ph.D. candidate at the University of Louisville, received the 2017 Seth Bonder Scholarship for Applied Operations Research in Military Applications.

The purpose of the scholarship is to promote the development and application of process modeling and operations research analyses to military issues. The scholarship consists of a grant of $4,000 that is intended to provide financial support for a promising new researcher. In addition, the award winner will be eligible for up to $1,000 of travel funding. An additional $2,000 grant is provided and funded by the Seth Bonder Foundation.

Dr. Seth Bonder was the founder and CEO of Vector Research, Incorporated (VRI) for 31 years, a company recognized for its quality and innovations in applying OR/MS to public and private sector enterprises.

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Doing Good with Good O.R. Student Paper Competition

Can Zhang of the Georgia Institute of Technology won the 2017 Doing Good with Good O.R. Student Paper Competition from INFORMS for the project and paper, “Truthful Mechanisms for Medical Surplus Product Allocation.”

The competition is held each year to identify and honor outstanding projects in the field of operations research and the management sciences conducted by a student or student group that have a significant societal impact. Finalists presented their papers in sessions held in conjunction with the INFORMS Annual Meeting in Houston.

Committee member Chase Rainwater presented the award. Turgay Ayer and Jonathan Helm co-chaired the committee.


Volunteer Service Award

The Volunteer Service Award recognizes up to 20 INFORMS members annually who have been engaged in volunteer service during the past year and whose contributions have had an impact in the area they serve. Volunteer Service Awardees must have at least one year of involvement in INFORMS and must not be current or incoming Board members. They are awarded at three levels: distinguished service, meritorious service and service.

Lauren Davis chaired the selection committee.

The 2017 Volunteer Service Award recipients included:

Distinguished Service
- Guzin Bayraksan, University of Arizona, for her service to Women in OR/MS, the Optimization Society, and the Academic Programs and Database Committee
- Saif Benjaafar, University of Minnesota, for his leadership as general chair of the 2016 International Meeting in Hawaii
- Pooja Dewan, BNSF Railway, for her service to the Practice Section, Edelman Gala Committee, Railway Applications and Analytics Society
- Chanaka Edirisinghe, Rensselaer Polytechnic Institute, for his leadership as general chair of the 2016 INFORMS Annual Meeting in Nashville, Tenn.

Meritorious Service
- Murat Kurt, Merck & Co., Inc., for his service to the Health Applications Society, and as chair of the Bonder Scholarship in Applied Health Services and Undergraduate O.R. Prize Committees
- Irvin Lustig, Princeton Consultants, for his service to the History & Traditions Committee, the Committee on Engaging Organizations and the Edelman Award
- Suvaajet Sen, University of Southern California, for his leadership of the effort to create the new Journal on Optimization and service to the Optimization Society

Service
- Bjorn Berg, University of Minnesota, for his representation of the Health Applications Society on the Subdivisions Council and Short Intro Talks Subcommittee
- Shreya Gupta, University of Texas-Austin, for her service to the University of Texas-Austin Student Chapter and to ORMS Tomorrow
- Sadan Kulturel-Konak, Pennsylvania State University, for her service to the Transportation Science & Logistics Society and on the Public Awareness Committee
- Paul Messinger, University of Alberta, for his involvement with Service Science and Editor’s Cut
- Sarah Nurre, University of Arkansas, for her leadership as president of the Women in OR/MS forum
- Shengfan Zhang, University of Arkansas, for her service to the Public Sector O.R. Section and to the ad hoc Diversity Committee
Scenes from Houston 2017

Clockwise, from right:

Houston sparkled as host of the 2017 INFORMS Annual Meeting; Alexander Lovett checks in; INFORMS got it right, but the “N” looks wrong; Lyft was among the companies looking for talent in the Career Center; three amigos (l-r): conference chairperson Bill Klimack, Tamas Terlaky and Richard McGrath; and every INFORMS meeting has to have awards, lots of awards, such as the shiny Kimball Medal.

Photos by Max Resnick
(with the exception of the Houston skyline photo)
Clockwise, from above:

The general reception held at Minute Maid Park, home to the 2017 World Series champion Astros, was a big hit with men; ... and women; the meeting drew nearly 5,900 attendees, an all-time record; it’s thumbs-up for the 2018 INFORMS International Meeting, chaired by Grace Lin (right); Houston was inspiring; two attendees find a quiet spot to chat; Houston was strong; Pooja Dewan checks out the buffet table; the convention center where all the magic happened.
A panel of industry and academic experts will judge written submissions based on teams’ use of the full analytics process, from framing the problem to methodology selection, data use, model building and quantitative analysis. Demonstrated “soft skills” in teamwork, communication and presentation will also be considered in judging.

Eight finalists will be announced on March 5, 2018, and they will be invited to present their work at the INFORMS Analytics Conference set for April 15-17 in Baltimore. Travel and conference registration will be partially supported by INFORMS. All finalist teams receive a monetary award (first prize is $7,500), as well as certificates for each team member and the university. For complete information, visit: http://connect.informs.org/oratc/home ORMS

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In Memoriam

**Jeff Arthur (1952-2017)**

Jeff Arthur, professor emeritus with the Statistics Department at Oregon State University and a longtime and active member of INFORMS, passed away Nov. 12, surrounded by loved ones. He was 65.

Professor Arthur was a member of the INFORMS Meetings Committee for many years dating back to 1998, when he served as program chair of the INFORMS Annual Meeting in Seattle. Among his many awards, Professor Arthur was a recipient of the OSSSO Teaching Award from the OSU Department of Statistics in 1982 and 1998, a finalist for the Carter Award for outstanding graduate teaching, College of Science, at OSU in 1992, 1993 and 1994, and a recipient of the Carter Award in 1998.

His research interests included mathematical programming and applications, computational aspects of optimization, and optimization modeling of environmental issues.

“Jeff was a vibrant member of the Meetings Committee for over 10 years,” recalls Rina Schneur, a former president of INFORMS who also served on the Meetings Committee. “Vibrant in many ways, from his Hawaiian outfits to having fun activities to bringing up some great ideas. We were a tight group of six, like a family, that met four times a year. We got a lot of important business done, with a lot of fun intertwined.”

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**Add S Jeff Camm, an INFORMS Fellow and another member of the Meetings Committee: “[Jeff Arthur’s] passion for the profession improved INFORMS meetings, but his love of people and his love of life are what I will remember most about him. He had a wonderful way of making any meeting fun. He treated everyone with respect. He will be greatly missed.”**

Born in South Bend, Ind., on July 28, 1952, Professor Arthur attended Purdue University where he received a bachelor’s degree in mathematics, and his master’s and doctorate degrees in operations research. He then shared his knowledge and passion as a professor in the Statistics Department at OSU from 1977 through 2011.

Professor Arthur spent his retirement traveling the world with his wife Becky and enjoying life to the fullest. He especially enjoyed food and the arts; most of all, he loved experiencing them with family and friends.

He is survived by his wife Becky, son Kyle, daughter-in-law Emily, stepchildren Ellie and Seth, grandchildren Julian and Jason and brothers Mike and Robert. **ORMS**

**Sources:** Oregon State University, _Corvallis Gazette-Times_
Meetings

INFORMS Annual &
International Meetings

2018

April 15-17
INFORMS Conference on Business Analytics & Operations Research
Marriott Waterfront Hotel, Baltimore
Chair: Jack Kleebe, Kromite, LLC
http://meetings.informs.org/analytics2018/

June 17-20
INFORMS International Conference
Tamsui International Convention Center
Taipei, Taiwan
Chair: Grace Liu, Asia University
http://meetings2.informs.org/2018international/

Nov. 4-7
INFORMS Annual Meeting
Phoenix Convention Center & Sheraton Phoenix Hotel Phoenix
Chair: Young-Jun Son, University of Arizona
http://meetings.informs.org/phoenix2018

2019

April 14-16
INFORMS Conference on Business Analytics & Operations Research
JW Marriott Austin
Austin, Texas

June 9-12
INFORMS International Conference
JW Marriott & CasaMagna Marriott Cancun
Cancun, Mexico

Oct. 20-23
INFORMS Annual Meeting
Washington State Convention Center & Sheraton Seattle Hotel Seattle, Wash.

INFORMS Community Meetings

2018

Jan. 8-10
6th INFORMS TSL Society Workshop
Hong Kong, China
Chair: Stein W. Wallace
http://connect.informs.org/tsl/conferences/tsl-workshops

March 1-3
2018 INFORMS Organization Science Conference
Park City Marriott, Park City, Utah
http://connect.informs.org/orgsci/winter-meeting/home

March 23-25
INFORMS Optimization Society Conference
University of Colorado-Denver
Chair: Stefan Voß

June 21-22
2018 INFORMS Revenue Management and Pricing Section Conference
Scotiabank Conference Centre, Toronto, Canada
http://connect.informs.org/rmp/conferences/rmp-conferences

Dec. 9-12
Winter Simulation Conference
The Swedish Exhibition & Congress Center, Gothenburg, Sweden
Chair: Bjorn Johansson, Chalmers University of Technology

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People

Goutam Dutta, a professor at the Indian Institute of Management in Ahmedabad, India, and a longtime member of INFORMS, was elected a Fellow of the Operational Research Society of India (ORSI). He becomes one of just 30 Fellows in the 60-year history of the Society. Professor Dutta, who teaches in the Production and Quantitative Methods area, was also elected president-elect of ORSI.

Richard Larson – MIT professor, INFORMS past president and widely known as “Dr. Queue” in the operations research community – was a primary source in a Nov. 23 New York Times article, “Why Stand in Line on Black Friday? The Psychology Explained.” Larson told the Times, “These queues are quite different than the usual annoying ones we encounter day to day at the ATM or in the subway” … “The habit makes sense, in some weird way” and … “once a year, they’re exhilarating.”

Abdolmajid Yolmeh, a student in the Industrial and Systems Engineering Department at Rutgers University, was named the winner of the 9th Annual Student Contest held by the New Jersey Chapter of INFORMS. Yolmeh was honored for his work on “A Two-Stage Invest-Defend Game: Balancing Strategic and Operational Decisions.” The research was done with Professor Melike Baykal-Gürsoy.

The Student Contest is open to all students who are a resident of New Jersey or who are attending a New Jersey college. Extended abstracts were submitted and three finalists were selected. The finalists presented their work at a New Jersey Chapter meeting in October, where a panel of judges selected the winner.


Go to www.informs.org/Conf for a searchable INFORMS Conference Calendar.
Gurobi software drives award-winning inmate assignment project

A team from Lehigh University using Gurobi was awarded one of the top international prizes in operations research, the Daniel H. Wagner Prize, for its work developing the Inmate Assignment Decision Support System (IADSS). The award was announced at the 2017 INFORMS Annual Conference held in Houston. For more on the Wagner Prize, see page 47.

Assigning inmates to correctional facilities is a complex process taking into account literally dozens of factors relating to the inmate, such as criminal history, demographic characteristics, and mental and physical health needs, as well relating to the prison system, such as facility utilization levels, support program availability and existing inmate characteristics at each facility. Good assignments are important for both the inmate, since they can result in a lower chance of violent interactions with other inmates, as well as faster access to treatment programs, and the prison system since it can reduce staff workload and the number of prison transfers.

The application the Lehigh team developed took five years to create but saved the Pennsylvania Prison System $3 million in just the first year of use. It has reduced the number of incidences of inmate violence, reduced transfer rates and staff workload, and has also reduced the time it takes for inmates to get access to treatment programs. What literally took a staff of seven a full week to do is now done in just a few minutes on a daily basis by the application. The team’s process and results are detailed in the paper submitted for their winning entry, “The Inmate Assignment and Scheduling Problem and its Application in the PA Department of Corrections.”

The problem is modeled as a mixed integer linear optimization problem where the objective is a hierarchically weighted sum of six different objectives including penalizing violations of assignment criteria, not exceeding capacity constraints and minimizing wait times for treatment programs. The model contains about 30,000 binary and about 200 integer variables, and has about 25,000 constraints. Gurobi is used as the engine with the solve terminated when it reaches a small predetermined optimality gap. In just a few minutes, Gurobi is able to provide a high-quality solution, and the application is now in daily use at the Pennsylvania Department of Corrections.

The project participants included Kristofer B. Bucklen from the Pennsylvania Department of Corrections and professors Tamás Terlaky, Louis J. Plebani and George R. Wilson and grad students Mohammad Shahab-safa, Naga Venkata Chaitanya Gudapati and Anshul Sharma from Lehigh’s Industrial and Systems Engineering Department.

AIMMS picks UniSoma as its AIMMS Partner of the Year

AIMMS named UniSoma as its AIMMS Partner of the Year for 2017. Founded in 1984, UniSoma has played a leading role in the introduction of operations research and analytics at some of Brazil’s largest companies, including JBS, Suzano, Aurora Alimentos, Marfrig, Itambé and many others. The company develops advanced planning and complex scheduling solutions, helping businesses save millions with supply chain optimization. AIMMS has accompanied UniSoma throughout this journey. The companies formalized their partnership in 2009 and have been working together for 20 years.

UniSoma received the award for demonstrating business excellence and customer satisfaction while delivering transformative AIMMS solutions. AIMMS also recognized UniSoma for excellence in quality, value, services and innovation. The award highlights the strength of the partnership and UniSoma’s focus on accelerating optimization projects for clients.

Gertjan de Lange, AIMMS senior vice president, Connecting Business & Optimization, said: “This award recognizes the business value and innovation that the partnership is delivering to our joint customers. We have created and nurtured this value with UniSoma’s deep business and industry expertise and AIMMS’ market-leading prescriptive analytics technology. It’s a true pleasure to honor UniSoma’s achievements and their contribution to the expansion of AIMMS’ footprint with this award.”

AIMMS created the Partner of the Year Award in 2015 to recognize the valuable contribution of its extensive network of partners. The selection process is based on the following criteria: generating business opportunities, delivering customer success, leveraging AIMMS technology and boosting AIMMS’ footprint.

Luciano de Moura, commercial director at UniSoma, said: “The award is the recognition of two decades of partnership between UniSoma and AIMMS. During this time, we jointly helped leading companies in Brazil to improve their planning decisions and to achieve new levels of efficiency. UniSoma and AIMMS share values such as focus on customer results, innovative attitude and commitment to the quality of our SCP Solutions. We will continue to work together to increasingly deliver state-of-the-art analytical solutions to the market.”

What’s new in Analytica 5.0?

The Lumina team recently announced the release of Analytica 5.0, a major new release that includes literally hundreds of new and improved features. Users with active support can upgrade free to a subscription to Analytica 5.0. Others can purchase a new subscription.

Highlights include:
- New toolbar icons and matching pop-up node controls on diagrams give faster access for common operations on each node.
- Multithread computing: Parallel computing speeds up the most common calculations using multithreading when your computer has multiple processors or cores.
- Cell table formats: Users can now set formats in tables, including text style, size, color and font, borders, background colors, number format and images. Users can specify formats by cell, headers, rows, columns, slices or ranges, and they pivot along with the table view. Conditional formats let users compute styles or colors to create heatmaps and other powerful visualizations.
- New Find dialog: Click or press control+f for a vastly more powerful Find dialog that lets users search their model by object identifier, title, description and other text attributes. It can also search the online Analytica wiki documents. ORMS
Faculty Position in Lyle EMIS Department
Southern Methodist University
Open Rank Faculty Position | Position Number 00053949

The Department of Engineering Management, Information, and Systems (EMIS) invites nominations and applications for an opportunity to be involved in the shaping of innovative academic programs in Operations Research, Management Science, Engineering Management, Systems Engineering, and Information Engineering. We seek outstanding candidates for an open rank faculty position in all areas relevant to our academic programs and all areas of industrial and systems engineering – methodological and applied – including but not limited to advanced data analytics, optimization, stochastic modeling, simulation, and model-based systems engineering with applications in supply-chain, manufacturing, healthcare, information, energy, and defense systems.

Eligible candidates for the position must have completed requirements for a doctoral degree in operations research, industrial engineering, systems engineering, or related field by August 2018; and must have the expertise to teach courses in areas relevant to our programs at the undergraduate, masters, and doctoral levels. Eligible candidates for a tenure-track position are expected to demonstrate the ability to develop a strong, externally-funded research program and help advance the frontiers of knowledge. Candidates for Associate or Full Professor should have a commensurate record of research publications and external funding and an outstanding potential for research program development and research leadership. Extraordinary candidates at all levels will be considered.

SMU is a leading private university dedicated to academic excellence. Located near the center of Dallas, Texas, SMU enrolls 11,000 students, with nearly half in graduate programs. The EMIS department resides within the Bobby B. Lyle School of Engineering (http://www.smu.edu/lyle) – founded in 1925 and offers a strong program of research and education at all levels, including Ph.D. degrees in operations research and systems engineering (http://www.smu.edu/Lyle/Departments/EMIS). The school provides an exceptional environment supporting multi-disciplinary collaborations and academic outreach and houses several institutes and centers – with generous endowment support – relevant to research and teaching programs of the EMIS Department. These include the Hunter and Stephanie Hunt Institute for Engineering and Humanity, Darrin Deason Institute for Cyber Security, Caruth Institute for Engineering Education, and Hart Center for Engineering Leadership.

SMU is designated as a preferred employer in the Dallas/Fort Worth (DFW) metropolis, one of the most prolific industrial centers in the country and a dynamic region with leading high-technology companies in the aerospace, defense, energy, information technology, life sciences, semiconductors, telecommunications, transportation, and biomedical industries. Some of the top companies and research institutes with a strong presence in the DFW area include Texas Instruments, Raytheon, Lockheed Martin, Bell Helicopter, Fiat Chrysler, BNSF Railway, Turner Construction, Jacobs Engineering, Trinity Industries, Huit-Zollaars, Inc., The Beck Group, University of Texas Southwestern Medical Center, Parkland Health and Hospital System, and Baylor Research Institute. DFW is a multi-faceted community, offering exceptional museums, diverse cultural attractions, and a vibrant economy. Dallas’ quality of life is exceptional with a relatively low cost of living, upscale apartments and homes within walking distance of SMU campus, the opportunity to live in the city or out in the country with a relatively short commute. To learn more about the rich cultural environment of SMU, please see: http://www.smu.edu.

The committee will notify applicants of its employment decision after the position is filled. Hiring is contingent upon the satisfactory completion of a background check. SMU will not discriminate in any program or activity on the basis of race, color, religion, national origin, sex, age, disability, genetic information, veteran status, sexual orientation, or gender identity and expression. The Executive Director for Access and Equity/Title IX Coordinator is designated to handle inquiries regarding nondiscrimination policies and may be reached at the Perkins Administration Building, Room 204, 6425 Boaz Lane, Dallas, TX 75205, 214-768-3601, accessequity@smu.edu.

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Faculty Position in the Grado Department of Industrial and Systems Engineering

The Grado Department of Industrial and Systems Engineering (ISE) at Virginia Tech invites applications for a tenure-track faculty position at the rank of Assistant Professor, effective August 2018. We seek outstanding candidates in all areas of Stochastic Processes and more generally in Stochastic Operations Research. Candidates will have the opportunity to work with a wide range of research groups and faculty within the Department, College, and University, including those working in the areas of data analytics, simulation methodology, stochastic and/or simulation optimization, stochastic queueing and queuing networks, decision sciences, health systems and technology, medicine, telecommunications, financial engineering, and intelligent infrastructure, among others.

The ISE Department is comprised of 30 full-time faculty with approximately 550 undergraduate students, 170 master’s students, and 90 doctoral students. The undergraduate and graduate ISE programs are currently ranked eighth and sixth, respectively, by U.S. News & World Report. Additional information about the department can be found at https://ise.vt.edu.

Candidates are expected to lead innovative and high-quality research, build a strong sponsored-research program, develop and teach graduate and undergraduate courses in ISE, and advise and mentor graduate and undergraduate students. The position requires a Ph.D. in industrial and systems engineering, operations research, or a closely related field. Preferred qualifications include demonstrated experience with interdisciplinary teaching or research in areas that align with existing departmental research strengths and with Virginia Tech’s university-wide, multidisciplinary focus on Data and Decisions. In addition to collaborating with faculty in ISE, the successful candidate will have the opportunity to engage in transdisciplinary research, curriculum, and outreach initiatives with other university faculty members working in the university’s Data and Decisions Destination Area (https://provost.vt.edu/destination-areas.html). The Data and Decisions Destination Area is focused on advancing the human condition and society with better decisions through data. Faculty working together in this area are integrating data analytics and decision sciences across the transdisciplinary research and curriculum efforts at Virginia Tech and beyond.

Interested individuals should apply online at jobs.vt.edu (posting number TR0170184). Candidates should submit a cover letter, current CV, research statement, teaching statement, three relevant research publications, and the names of at least three references. Review of applications will begin immediately, and the deadline for ensuring full consideration is December 31, 2017. The position will remain open, and applications may be considered until the position is filled. For more information or for any questions about the search, please contact the Search Committee at ise-search@vt.edu. Applicants interested in meeting with a faculty member at the Winter Simulation 2017 Conference should contact the Search Committee. Applicants are encouraged to include in their cover letter a list of any presentations they have at this conference.

Virginia Tech is committed to a culturally and ethnically diverse campus environment and to principles that promote inclusive practices. Virginia Tech does not discriminate against employees, students, or applicants on the basis of age, color, disability, gender, gender identity, gender expression, national origin, political affiliation, race, religion, sexual orientation, genetic information, or veteran status. Virginia Tech is the recipient of a National Science Foundation ADVANCE Institutional Transformation Award to increase the participation of women in academic science and engineering careers. The ISE Department strongly supports the Virginia Tech Principles of Community.
The Department of Industrial Engineering and Logistics Management invites applications for substantial-track faculty positions in the area of (i) Predictive and Prescriptive Analytics, (ii) Healthcare and Sports Analytics, (iii) Financial Engineering and Fintech, and (iv) Demand and Supply Analytics.

Applicants must have a PhD degree in Industrial Engineering, Operations Research, or a closely related area. The appointee is expected to demonstrate strong potential for effective teaching and promising research in the respective fields.

Appointments at all ranks (Assistant Professor/Associate Professor/Professor) will be considered. Salary is highly competitive and will be commensurate with qualifications and experience. fringe benefits include annual leave, medical and dental benefits. Housing benefits will be provided where applicable. Appointment at Professor rank will be on substantive basis. Initial appointment for Assistant Professor/Associate Professor will normally be made on a 3-year contract. A gratuity will be payable upon successful completion of contract. Strong candidates applying for Associate Professor position may also be considered for appointment on substantive terms.

Applications with a full CV, statement of research and teaching; transcript of graduate work; copies of 2 research publications; names, emails and addresses of at least three referees, should be directed to the Search and Appointment Committee, Department of Industrial Engineering and Logistics Management, The Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong [email: ielm@ust.hk]. Review of applications will start immediately and continue until the positions are filled.

More information about the Department can be found at http://www.ielm.ust.hk.
Florida A&M University-Florida State University
COLLEGE OF ENGINEERING
Department of Industrial and Manufacturing Engineering

Tenure-Track Faculty Position in Systems Engineering

The Department of Industrial and Manufacturing Engineering at Florida A&M University-Florida State University College of Engineering invites applications for a tenure-track faculty position in the area of systems engineering. The preferred candidate would be hired at the assistant professor level, although applicants with outstanding qualifications and experience may be considered for appointment at a higher rank, and tenure can be considered. Successful candidates are expected to develop a strong externally-funded research program and demonstrate excellence in teaching undergraduate and graduate courses and mentoring M.S. and Ph.D. students.

Applicants should hold a Ph.D. in Industrial Engineering, Systems Engineering, Operations Research, Statistics, Computer Science or a related discipline. The desired research and teaching areas of interest include system modeling, simulation, risk analysis and analytics with applications including but not limited to energy systems, healthcare systems, transportation systems, advanced manufacturing, biomedical engineering and resilient infrastructure.

The FAMU-FSU College of Engineering is unique in combining two outstanding universities with overlapping but distinct missions - the nation’s top Historically Black College/University with one of the nation’s ~100 Highest Research Activity Universities. As such we provide an outstanding research and entrepreneurship based education to one of the most diverse student populations in the U.S.

The IME Department presently has 14 faculty members, ABET accredited B.S. programs in industrial engineering and 175 undergraduate students, and M.S. and Ph.D. programs in industrial and manufacturing engineering and engineering management with over 60 graduate students. Home to the High-Performance Materials Institute, the IME Department annual research expenditures have averaged approximately $2.5 million over the last 5 years from multiple sources including active NSF and DoD grants. Applicants should submit:

- Cover letter
- Full curriculum vitae
- 2-page research statement
- 1-page teaching statement
- No more than four selected publications for review
- Names and contact information of three potential references
- EEOC form (https://www.eng.famu.fsu.edu/resources/pdfs/FAMU-FSU-COE-EEOC-Form-for-Applicants.pdf)

Application documents should be sent in pdf format to systemsresearch@eng.famu.fsu.edu. Any questions about the position should be directed to Prof. Chiwoo Park at chiwoo.park@eng.famu.fsu.edu. Review of applications will begin November 1st 2017, but applications will be accepted until Dec. 15th or later if the position is unfilled.

Florida A&M University and Florida State University are Equal Opportunity/Affirmative Action employers that encourage applications from minorities and women, and comply with the American Disabilities Act. Both are public records agencies pursuant to Chapter 119, Florida Statutes.

Department Head -
Grado Department of Industrial and Systems Engineering

The Grado Department of Industrial and Systems Engineering (ISE) at Virginia Polytechnic Institute and State University (Virginia Tech) is seeking nominations and applications for the position of Department Head. The department has 30 full-time faculty members, with an on-campus enrollment of about 550 undergraduate, 170 M.S. and 90 Ph.D. students. Graduate program areas of specialization include Human Factors Engineering and Ergonomics, Management Systems Engineering, Manufacturing Systems Engineering, and Operations Research. Additionally, the department manages an extended campus graduate program, which offers Master of Engineering Administration, M.S. in Systems Engineering, and Ph.D. in Management System Engineering degrees, as well as graduate certificates. Research facilities include the Center for Innovation-Based Manufacturing, Center for Human Factors and Ergonomics, and Center for High-Performance Manufacturing. The current annual research expenditures exceed $3.4M. Both graduate and undergraduate programs are consistently ranked in the top ten IE programs nationally.

Applicants must have a proven record of scholarly publications, funded research, effective teaching, and professional and university service. Evidence of experience in leading faculty, and a demonstrated commitment to inclusion and diversity in an academic environment, is required. In support of its strategic initiatives, the College of Engineering at Virginia Tech seeks a dynamic leader committed to fostering an environment in which faculty, staff, and students from a variety of backgrounds, cultures, and personal experiences are welcomed and can thrive. The Department Head is expected to provide effective departmental representation across the University, as well as foster strong relationships with industry representatives, government sponsors, alumni, and the ISE Advisory Board.

The appointment requires a Ph.D. degree, with at least one degree in Industrial Engineering or a closely related field. Professional qualifications and experience should be consistent with the requirements for appointment at the rank of Full Professor with tenure. A professional engineering (P.E.) registration, and/or similar certification in a specialty-engineering field, is desirable. Applicants must apply online at jobs.vt.edu (posting number TR0170200): application materials will include a cover letter, curriculum vitae, statement of leadership experience and philosophy with a brief vision for the department, and contact information for at least three references. Review of applications will commence on February 1, 2018 and continue until the position is filled. Questions regarding the position should be directed to Dr. Subhash C. Sarin, ISE Department Head Search Committee Chair, at sarins@vt.edu or 540-231-7140.

Virginia Tech is committed to a culturally and ethnically diverse campus environment and to principles that promote inclusive practices. Virginia Tech does not discriminate against employees, students, or applicants on the basis of age, color, disability, gender, gender identity, gender expression, national origin, political affiliation, race, religion, sexual orientation, genetic information, or veteran status. Virginia Tech is the recipient of a National Science Foundation ADVANCE Institutional Transformation Award to increase the participation of women in academic science and engineering careers. The ISE Department strongly supports the Virginia Tech Principles of Community.
Columbia Engineering invites applications for two faculty positions in the Department of Industrial Engineering and Operations Research. One position is for candidates with research interests in the area of data/business analytics and is open-ranked. The second position is at the level of assistant professor and is open to candidates with research interests in all areas of operations research, broadly defined, including optimization, applied probability, data/business analytics, financial engineering, and high-dimensional statistics. Applicants should have a record that demonstrates potential for research and teaching excellence. Applicants for senior faculty positions are expected to have a proven record of research and teaching excellence.

Successful candidates are expected to contribute to the advancement of their field and the department by developing an original and leading research program, and to contribute to the department’s undergraduate and graduate educational programs. Columbia fosters multi-disciplinary research and encourages collaborations with academic departments and units across the university. The Department is particularly interested in qualified candidates who can contribute to the diversity and excellence of the university community.

For additional information, please see: http://engineering.columbia.edu/faculty-job-opportunities. Applications should be submitted electronically and include the following: curriculum-vitae including a list of publications, a description of research accomplishments, a statement of research and teaching interests and plans, contact information for three experts who can provide letters of recommendation, and up to three pre/reprints of scholarly work. Applicants should apply at one of the following links, depending on rank:

Professor: http://academicjobs.columbia.edu/applicants/Central?quickFind=65497
Associate Professor: http://academicjobs.columbia.edu/applicants/Central?quickFind=65500
Assistant Professor: http://academicjobs.columbia.edu/applicants/Central?quickFind=65476

All applications received by December 15, 2017 will receive full consideration. Applicants can consult www.ieor.columbia.edu for more information about the department.

Columbia University is an Equal Opportunity/Affirmative Action employer—Race/Gender/Disability/Veteran

The Grado Department of Industrial and Systems Engineering (ISE) at Virginia Tech invites applications for a tenure-track faculty position at the rank of Assistant Professor, effective August 2018. We seek outstanding candidates in the area of Decision Analysis, with an emphasis on decision-making to inform the design, verification, deployment, operation, and management of engineered systems or socio-technical systems. Candidates with theoretical interests and the potential to conduct translational research will be strongly preferred. Candidates will have the opportunity to work with a wide range of research groups and faculty within the department, including those that are working in the areas of data analytics, decision science, systems engineering, and systems science with applications in management systems, health systems, engineering economics, and intelligent infrastructure systems, among others.

The ISE Department is comprised of 30 full-time faculty with approximately 550 undergraduate students, 170 master’s students, and 90 doctoral students. The undergraduate and graduate ISE programs are currently ranked eighth and sixth, respectively, by U.S. News & World Report. Additional information about the department can be found at www.ise.vt.edu.

Candidates are expected to lead innovative and high-quality research, build a strong sponsored-research program, develop and teach graduate and undergraduate courses in ISE, and advise and mentor graduate and undergraduate students. The position requires a Ph.D. in Industrial and Systems Engineering, Systems Engineering, or a closely related field. Preferred qualifications include demonstrated experience with teaching or research in areas that align with existing departmental research strengths and with Virginia Tech’s university-wide, transdisciplinary focus on Data and Decisions.

In addition to collaborating with faculty in ISE, the successful candidate will have the opportunity to engage in transdisciplinary research, curriculum, and outreach initiatives with other university faculty members working in the university’s Data and Decisions Destination Area (https://provost.vt.edu/destination-areas.html). The Data and Decisions Destination Area is focused on advancing the human condition and society with better decisions through data. Faculty working together in this area are integrating data analytics and decision sciences across the transdisciplinary research and curriculum efforts at Virginia Tech and beyond.

Interested individuals should apply online at jobs.vt.edu (posting number TR0170183). Candidates should submit a cover letter, current CV, research statement, teaching statement, one or two relevant research publications, and the names of at least three references. Review of applications will begin immediately, and the deadline for ensuring full consideration is December 31, 2017. The position will remain open, and applications may be considered until the position is filled. For more information or for any questions about the search, please contact the Search Committee at (ise-search@vt.edu).

Virginia Tech is committed to a culturally and ethnically diverse campus environment and to principles that promote inclusive practices. Virginia Tech does not discriminate against employees, students, or applicants on the basis of age, color, disability, gender, gender identity, gender expression, national origin, political affiliation, race, religion, sexual orientation, genetic information, or veteran status. Virginia Tech is the recipient of a National Science Foundation ADVANCE Institutional Transformation Award to increase the participation of women in academic science and engineering careers. The ISE Department strongly supports the Virginia Tech Principles of Community.
For over 90 years, The Walt Disney Studios has been the foundation on which The Walt Disney Company was built. Today, the Studio brings quality movies, music and stage plays to consumers throughout the world.

I work in one of the most exciting businesses in the company. I support creative executives that create advertising materials – to pretty much put butts in seats at the movie theatres – and data is not in their day-to-day vocabulary. It’s always great to put something on a piece of paper for a creative executive just to see their eyes open up. They are often too afraid to see the numbers, but once you distill a bunch of data and use it tell a story, you get to be creative in sharing those analytics. It motivates me to see their faces. There is a variety of things I’ve done over the last 10 years at Disney that gets me going and I take pride in working for The Walt Disney Studios.
The Department of Operational Sciences at the Air Force Institute of Technology invites applications for a civilian tenure-track faculty position at the rank of Assistant, Associate, or Full Professor. Candidates should possess an earned doctorate in Operations Research, Industrial Engineering, Management Science, or a related field at the time of employment and experience appropriate for the position. The Department seeks applicants whose specialty and interests are in Applied Statistics but will consider qualified candidates with qualifications in other fields of Operations Research. Rank and salary are commensurate with qualifications. This is a three-year, renewable, excepted position. United States citizenship is required for the position.

The Department offers the M.S. and Ph.D. degrees in Operations Research. Successful applicants must have a strong commitment to teaching, research, publishing in high-quality journals, working within a research team, and a strong methodological foundation. Interdisciplinary research and multidisciplinary collaborations are encouraged.

To apply, submit a cover letter, résumé, teaching and research interests, and unofficial copies of academic transcripts and the names and addresses (including e-mail) of at least three references in pdf form via email to msworkflow@afit.edu. The application window opens on January 3, 2018. Questions and copies of your application package should be directed to Dr. Raymond R. Hill Jr., Search Committee Chair, OR.Hire.AFIT@gmail.com.

First consideration of applications is February 1, 2018. Applications will be accepted until the open position is filled. Expected start date is Summer or Fall 2018, but will be negotiable.

The Air Force Institute of Technology is a Doctoral/Research university and is an equal opportunity/affirmative action employer. Women and minorities are strongly encouraged to apply.

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**FACULTY POSITION**

**IN SUPPLY CHAIN & OPERATIONS MANAGEMENT**

**KRANNERT SCHOOL OF MANAGEMENT**

The Supply Chain & Operations Management Group at the Krannert School of Management, Purdue University seeks applications for a tenured associate professor position starting Fall 2018. Applicants currently at the assistant professor level with a strong research record are also encouraged to apply. We look for candidates with a strong commitment to produce high-quality research, particularly in the areas of e-commerce operations, smart manufacturing, behavioral operations, and healthcare operations. A Ph.D. in supply chain and operations management, industrial engineering or a related area is desired. All candidates are expected to supervise Ph.D. dissertation research and to teach at the graduate and undergraduate levels.

The Supply Chain & Operations Management faculty at Krannert is a vibrant group, fostering a supportive and productive environment. For more information about the group and our faculty, please visit our web site at http://www.krannert.purdue.edu/academics/operations/.

The search committee is being chaired by Professor J. George Shanthikumar, to whom all inquiries should be directed at shanthikumar@purdue.edu.

Applicants should submit a letter describing their research accomplishments, a current curriculum vitae and three representative publications to https://webapps.krannert.purdue.edu/kars/Apply/scm/. A background check will be required for employment in this position.

Purdue University’s Krannert School of Management is committed to advancing the diversity in all areas of faculty effort, including scholarship, instruction and engagement. Candidates should address at least one of these areas in their cover letter, indicating past experiences, current experiences or activities, and/or future goals to promote a climate that values diversity and inclusion.

The review process will begin immediately, and applications will be accepted until the position is filled.

Purdue University is an EOE/AA employer. All individuals, including minorities, women, individuals with disabilities, and veterans are encouraged to apply.

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Cornell University’s School of Operations Research and Information Engineering (ORIE) seeks to fill multiple tenured/tenure-track faculty positions for its Ithaca campus. We will primarily consider applicants with research interests in the areas of integer programming and financial engineering, though we welcome strong applicants from all research areas represented within ORIE, especially those in resonance with the College of Engineering Strategic Areas: www.engineering.cornell.edu/research/strategic

Requisite is a strong interest in the broad mission of the School, exceptional potential for leadership in research and education, an ability and willingness to teach at all levels of the program, and a Ph.D. in operations research, mathematics, statistics, or a related field by the start of the appointment. Salary will be appropriate to qualifications and engineering school norms.

Cornell ORIE is a diverse group of high-quality researchers and educators interested in probability, optimization, statistics, simulation, and a wide array of applications such as e-commerce, supply chains, scheduling, manufacturing, transportation systems, health care, financial engineering, service systems, and network science. We value mathematical and technical depth and innovation, and experience with applications and practice. Ideal candidates will have correspondingly broad training and interests.

Please apply online at https://academicjobsonline.org/ajo/jobs/9654 with a cover letter, CV, statements of teaching and research interests, sample publications, at least three reference letters and, for junior applicants, a Doctoral transcript. We strongly encourage applicants attending the INFORMS annual meeting to submit all application materials by October 15, 2017. All applications completed by November 15, 2017 will receive full consideration, but we urge candidates to submit all required material as soon as possible. We will accept applications until we fill the positions.

ORIE and the College of Engineering at Cornell embrace diversity and seek candidates who can contribute to a welcoming climate for students of all races and genders. Cornell University seeks to meet the needs of dual career couples, has a Dual Career program, and is a member of the Upstate New York Higher Education Recruitment Consortium to assist with dual career searches.

Visit www.anyherc.org/home to see positions available in higher education in the upstate New York area.

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Diversity and Inclusion are a part of Cornell’s heritage.

We are a recognized employer and educator valuing AA/EOE, Protected Veterans, and Individuals with Disabilities. We strongly encourage qualified women and minority candidates to apply.
The Department of Industrial and Engineering at Florida A&M University and Florida State University invites applications for a tenure-track faculty position in the area of optimization. The preferred candidate would be hired as the assistant professor level, although applicants with outstanding qualifications and experience may be considered for appointment at a higher rank, and tenure can be considered. Successful candidates are expected to develop a strong externally-funded research program and demonstrate excellence in teaching undergraduate and graduate courses and serving on advisory committees. Applicants should hold a Ph.D. in Industrial Engineering, Systems Engineering, Operations Research, Computer Science, or a related discipline. The desired research and teaching areas of interest are in optimization theory including stochastic programming and integer programming with applications in machine learning, data science, energy systems, healthcare systems, transportation systems or resilient infrastructure.

The FAMU-FSU College of Engineering is unique in combining two outstanding universities with overlapping but distinct missions. The nation’s top historically Black College/University with one of the nation’s ~100 highest research activity universities. As such, we provide an outstanding research and entrepreneurship based education to one of the most diverse student populations in the U.S.

The Department of Industrial Engineering at Florida A&M University and Florida State University invites applications for a tenure-track faculty position in the area of optimization. The preferred candidate would be hired as the assistant professor level, although applicants with outstanding qualifications and experience may be considered for appointment at a higher rank, and tenure can be considered. Successful candidates are expected to develop a strong externally-funded research program and demonstrate excellence in teaching undergraduate and graduate courses and serving on advisory committees. Applicants should hold a Ph.D. in Industrial Engineering, Systems Engineering, Operations Research, Computer Science, or a related discipline. The desired research and teaching areas of interest are in optimization theory including stochastic programming and integer programming with applications in machine learning, data science, energy systems, healthcare systems, transportation systems or resilient infrastructure.

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Successful candidates will be expected to engage in transdisciplinary research, curriculum development, and global outreach with other faculty working in the DD-DA. Candidates with demonstrated experience in interdisciplinary teaching or research that aligns with the Data and Decisions vision are particularly encouraged to apply.

Applications will be accepted online at https://listings.jobs.vt.edu/postings/80309 or TR0170147. Candidates should submit a cover letter, current CV, research statement, teaching statement, a diversity statement describing the applicant’s interest or experience in working with diverse groups and underrepresented populations, three relevant research publications, and the names of at least three references. Review of applications will begin immediately, and the deadline for ensuring full consideration is December 31, 2017. The position will remain open, and applications may be considered after the deadline.

Applications are encouraged from individuals who have a commitment to the principles of diversity and inclusion in the classroom and professional settings. Women, minority group members, individuals with disabilities, and veterans are encouraged to apply. Virginia Tech is an equal opportunity/affirmative action employer. Virginia Tech does not discriminate against employees, applicants for employment, or students with respect to race, color, national origin, sexual orientation, gender, gender identity, genetic information, age, political affiliation, or status as a veteran or disabled person.

The IME Department presently has 14 faculty members, ABET accredited B.S. programs in industrial engineering with 175 undergraduate students, and M.S. and Ph.D. programs in industrial and manufacturing engineering and engineering management with over 60 graduate students. Home to the High-Performance Materials Institute, the IME Department annual research expenditures have averaged approximately $2.5 million over the last five years from multiple sources including active NSF and DoD grants. Applicants should submit:

- Cover letter
- Full curriculum vitae
- 2-page research statement
- 1-page teaching statement
- No more than four selected publications for review
- Names and contact information of three potential references
- EECC form (https://www.eng.famu.fsu.edu/resources/pdfs/FAMU-FSU-COE-EEOC-Form-for-Applicants.pdf)

Application documents should be sent in PDF format to optimsearch@eng.famu.fsu.edu. Any questions about the position should be directed to Prof. Arda Vanli at ovanli@eng.famu.fsu.edu. Review of applications will begin November 1st 2017, but applications will be accepted until Dec. 15th or later if the position is unfilled.

Florida A&M University and Florida State University are Equal Opportunity/Affirmative Action employers that encourage applications from minorities and women, and comply with the American Disabilities Act. Both are public records agencies pursuant to Chapter 119, Florida Statutes.
Fox School of Business
TEMPLE UNIVERSITY®

FOX SCHOOL OF BUSINESS, TEMPLE UNIVERSITY
FACULTY POSITION IN OPERATIONS MANAGEMENT

The Department of Marketing and Supply Chain Management in the Fox School of Business at Temple University invites qualified applications for a tenure-track appointment at the Assistant, Associate, or Full Professor level. We seek applicants with research interests in operations management, including areas such as logistics and supply chain management, analytics, optimization, and behavioral operations. Candidates with a crossover interest in marketing and/or information systems will also be considered. The successful candidate will have a Ph.D. or foreign equivalent in operations management or a related field, as well as an outstanding record in research and a commitment to excellence in teaching. For further information about the MSCM department, please visit http://www.fox.temple.edu/departments/marketing-supply-chain-management/.

The Fox School of Business is the largest and most comprehensive school of business in the greater Philadelphia region, with over 9,000 students and more than 200 full-time faculty members. It is accredited by the AACSB and continues to be highly ranked nationally and internationally by leading business publications such as U.S. News & World Report, Businessweek, the Financial Times, and The Economist. For a full list of our rankings, please visit http://www.fox.temple.edu/about-fox/why-fox/rankings/.

Applications and nominations will be accepted until the position is filled. We will be able to meet a limited number of candidates at the upcoming INFORMS and DSI Conferences.

To apply, please send a cover letter, CV, research statement, and up to three sample publications to Professor Edward C. Rosenthal in the Marketing and Supply Chain Management department, at edward.rosenthal@temple.edu.

Temple University is an Affirmative Action/Equal Opportunity Employer with a commitment to diversity in the workplace.

Department of Marketing & Supply Chain Management
1801 Liacouras Walk, 502A Alter Hall
Philadelphia PA 19122-6083
USA

Faculty Position in the Grado Department of Industrial and Systems Engineering
Virginia Tech - Instructor

The Grado Department of Industrial and Systems Engineering at Virginia Tech is seeking outstanding candidates to teach undergraduate courses in a variety of industrial engineering and related areas. These areas include probability and statistics; data management (advanced Excel & database design, implementation, and operation); manufacturing processes; facility layout and design; and discrete-event simulation. The appointment will be considered at the Instructor rank for the 2018-2019 academic year.

The ISE Department is comprised of 30 full-time faculty with approximately 550 undergraduate students, 170 master’s students, and 90 doctoral students. The undergraduate and graduate ISE programs are currently ranked eighth and sixth, respectively, by U.S. News & World Report. Additional information about the department can be found at www.isc.vt.edu.

Applications must have at least 5 or more years of teaching experience, must have experience teaching undergraduate courses, and must have experience teaching in one or more of the aforementioned areas. The position requires a Ph.D. degree, with at least one degree in industrial and systems engineering or a closely-related field.

Applications must be submitted online at jobs.vt.edu (posting number TR0170182) and include a cover letter, current vita, teaching statement, and the names of at least three references. Review of applications will begin on January 15, 2018 and will continue until the position is filled. For questions about the position, please contact the search committee at ise-search@vt.edu.

Virginia Tech is committed to a culturally and ethnically diverse campus environment and to principles that promote inclusive practices. Virginia Tech does not discriminate against employees, students, or applicants on the basis of age, color, disability, gender, gender identity, gender expression, national origin, political affiliation, race, religion, sexual orientation, genetic information, or veteran status. Virginia Tech is the recipient of a National Science Foundation ADVANCE Institutional Transformation Award to increase the participation of women in academic science and engineering careers. The ISE Department strongly supports the Virginia Tech Principles of Community.
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The neighborhood holiday party had reached the point where people loosened up and started talking a bit more about work. This was somewhat unusual, as it happened that many of the people at the party had government security clearances. Everyone there had been visited, at one time or another, by an investigator checking whether someone else in the neighborhood seemed to have a flashy lifestyle, loud quarrels with family members, friction with neighbors or other troublesome behavior. From time to time they compared notes on who had asked what about whom. And, of course, talking about one's classified work was one of the things investigators always asked about, so these people were generally reticent.

Still, they had common interests to talk about – especially the restrictions on their activity. Some of these restrictions could be burdensome, like having to report foreign travel and contacts, but at least the reasons were understandable. More vexatious were the difficulties they encountered trying to get other agencies to share information, even when such sharing was mandated from on high. “Some outfits always have some bureaucratic procedures you just have to go through, and somehow those procedures take weeks, when you needed an answer in a few days,” Howard lamented. “Or sometimes they’ll just claim they have to double-check the data. It’s not as if we’re going to base national security decisions on the third decimal place, we just want a ballpark figure. But noooo!”

Bob added, “And, of course, if you try to escalate the issue to higher management, the bureaucrat worker bees decide that it must be important, so they’d better make sure every box is checked showing that proper procedures and reviews were followed – which slows it down by a factor of three or four.”

Everyone laughed. Bob went on, “And sometimes it’s bureaucratic politics. Agency A may be holding out for a trade: Hey, Agency B, give us the data we want, and then we’ll let you have what you requested. Or Agency A is afraid Agency B might issue a scathing critique of Agency A’s analysis as soon as it’s released, so they want to hold off to get their story right. Forget national security secrecy; what may really be holding up the action is internal competition.”

“I don’t remember where I heard this or who said it,” Howard recounted, “but at some conference years ago, this very knowledgeable speaker explained: We don’t have any silos, but we do seem to have an awful lot of cylinders of excellence.”

They all laughed again. Then Sheila agreed, “Walt Kelly didn’t live long enough to find out how right he was. Remember that classic ‘Pogo’? We have met the enemy, and they is us.”

Tim noted, “I worked in R&D in private industry for several years, and there it’s a little different. Some things are trade secrets. How you do certain things, or which customers you’re selling them to, is information you want to protect ferociously. You don’t even want to let on that you have certain kinds of secrets, let alone what they might be. But for some methods and systems, where you can expect that competitors will figure out the main idea fairly quickly once they see some of your results, what you want to do is file for patent protection, then publicize the invention as widely as possible. If you ever want to sue someone for patent infringement, you want as much evidence as possible that they should have known you were there first.”

“But sometimes it’s even cruder than that – just not wanting anyone to know what wrongdoing you committed. I think we might be seeing some of that in the news these days, don’t you?”

This generated some hollow laughs and a number of eye rolls. Nobody seemed to need to ask what he meant. A couple of people reached for their drinks. “And it just keeps on coming,” Tim growled. “It’s a good time to be a comedian; there’s no shortage of material.”

Sheila responded quietly, “You’re reminding me of a good story I heard many years ago, a joke Nikita Khrushchev used to tell on himself. He said that a man had run through the streets of Moscow shouting, ‘Khrushchev is a fool!’ He was sentenced to 16 years in Lefortovo Prison – one for ‘Khrushchev is a fool!’ The KGB told him he couldn’t leave ‘because you know too much about our research.’ He protested, ‘I work in microcomputers. The Americans are at least five years ahead of us in every area I work on.’ And the KGB guy said, ‘Yes, and that, Comrade Scientist, is exactly the information we do not want you to share with them.’”

“Less even in that case there was an issue of letting the other side know how the competition stood,” Howard said. “But sometimes it’s even cruder than that – just not wanting anyone to know what wrongdoing you committed. I think we might be seeing some of that in the news these days, don’t you?”

It’s not as if we’re going to base national security decisions on the third decimal place, we just want a ballpark figure. But noooo!”

“And then,” Tim added, “there’s always the possibility that the information is secret simply because it might be embarrassing. I remember a story from the 1980s when a computer scientist wanted to leave the Soviet Union. The KGB told him he couldn’t leave ‘because you know too much about our research.’ He protested, ‘I work in microcomputers. The Americans are at least five years ahead of us in every area I work on.’ And the KGB guy said, ‘Yes, and that, Comrade Scientist, is exactly the information we do not want you to share with them.’”

Doug Samuelson (samuelsondoug@yahoo.com) is president and chief scientist of InfoLogix, Inc., in Annandale, Va.
How do you define “analytics”?
Analytics has become such a buzzword and definitions vary depending on who you ask. To me, “analytics” is a mathematical approach to gain insights from data to address business questions and help drive better decisions.

Tell us about how your involvement in WORMS has impacted your life/career.
I have had a blessed life with good role models and have been surrounded by people who have had faith in my abilities. I realize that opportunities are not always accessible to everyone, which is why I am committed to promoting underrepresented groups in STEM fields. Serving as the VP of Communications for WORMS has awarded me with the opportunity to further this passion.

Congratulations on being awarded the VCU 10 Under 10! Do you feel your involvement in INFORMS helped you achieve this?
Absolutely! INFORMS has enabled me to grow professionally and has also helped me give back to the community, both of which made me qualified to be nominated for the award.

What recent project have you been involved in that you are proud of?
I have been involved in designing a study to help our business understand how Asian minorities approach their careers. Working on this project has enabled me to go on a journey of introspection and reflection. I am both proud and grateful for having been a part of this project.

What do you think are the most significant barriers for women/minorities in analytics careers? How could they be remedied?
I believe the most significant barriers for women in analytics careers, at least in industry, has been the lack of strong, positive role models and appropriate training. In order to overcome these barriers, women need to network more and develop skills that will help them succeed. It is great to see the tides begin to turn, as more and more women are breaking the glass ceiling and successfully balancing their work and life.

More questions for Sudharshana? Ask her in the Open Forum on INFORMS Connect!
http://connect.informs.org
Rescheduling Exams at USMA with GAMS

The announcement that the US Military Academy’s football team, the Army West Point Black Knights, had received a bid to the Armed Forces Bowl on 23 Dec was good news for the team and its fans and supporters everywhere, but it posed a problem for those tasked with scheduling the Term End Exams at the Academy: It meant the rescheduling of 566 exams of 141 affected cadets.

The published exam schedule conflicted substantially with the team’s travel to Texas for the bowl game. Fortunately, the Academy is using a system that integrates the registrar’s databases, a scheduling engine based on several GAMS models, and other tools to create a complete exam schedule for both the courses and the students. This schedule assigns each exam to an exam period and each student to all of her exams. The system balances the competing goals and constraints involved in preparing a schedule that is fair and balanced for the students and faculty, limits the number of make-up exams required, and fits within the constraints of the available rooms and the 11-period allocated for the exams.

Faced with the unexpected requirement that some students would need to complete exams early to allow for travel to the bowl game, the exam scheduling group was able to quickly reschedule affected students. The automated nature of the system allowed them to quickly experiment with different scenarios and see what an exam schedule would look like for each alternative: Do just the players leave early? What about the band and the Rabble Rousers? How many additional exam periods need to be introduced? Ultimately, 3 early exam periods were added and at most one additional make-up exam per course was introduced to reschedule all 566 individual exams of 141 affected cadets to allow the football team to complete their exams prior to leaving for the bowl game in Forth Worth, TX.

GO ARMY! BEAT NAVY!