



What Can Industrial Engineering Skills Do in the Wake of Disasters and Their After Effects?

Although IE has been traditionally defined as the integration of machines, staff, and resources, nowadays IE has been widely generalized. Many other industries such as transportation, healthcare, energy and finance have become so reliant on IE skills. Most people often label IE as management engineering because in most cases IE is concerned with increasing productivity through the management of people, methods of business organization, and technology. The IE skills can also be used to solve many complex real world problems including disaster management.

The recent Deepwater Horizon Explosion incidence is arguably one of the biggest manmade disasters in US history. BP has recently issued a report claiming decisions made by multiple companies and work teams contributed to the accident. Until now the government has still questioned whether a piece of failed equipment designed to prevent the disaster was inspected on schedule. Knowledge in reliability and maintenance is extremely vital in industrial process areas such as petroleum refining process, chemical, petrochemical plants, oil terminal, etc. Our department is renowned in reliability research and education. Our graduates are familiar with reliability and system safety measures, system reliability models, and reliability and safety analysis. They can provide technical assistance and advice in developing and coordinating required engineering studies for monitoring, controlling, and provisioning offshore drilling and petroleum refining processes. In a recent arrangement with Schlumberger, the world's leading oil-field services provider, we are fortunate to have several company engineers enrolled as

full-time students in our reliability engineering option. Our program was chosen by Schlumberger from among competitive programs at other major universities.

Katrina's aftermath is another example. Wal-Mart has been cited as an exemplar of hurricane relief as it was the first organization to deliver staples such as water, fuel and food to thousands of evacuees in Louisiana and Mississippi. Wal-Mart was held up as a model for logistical efficiency and nimble disaster planning. Logistics has been one of the main foci of our ISE department. Our

supply chain track trains students to be more familiar with emerging logistics and supply chain models, operations, and coordination policies. Recently, we have partnered with Rutgers Business School to create a 5 year B.S./M.B.A. program with concentration on supply chain management. Our curriculum focuses on technology, logistics, distribution and transportation to provide our students skills that are an important sustainable competitive advantage in the job market. Our graduates can help their companies determine the most effective ways to use the basic factors of production—people, machines, materials, information, and energy—to make the best product and/or provide the finest service. ■

Sustainable Production Systems

Professor Mohsen A Jafari, along with his research group, has been working on the sustainable production/consumption infrastructure. Every consumer product or service has its signatures on many sectors of the economy and across many borders. Transportation of raw materials, semi-finished goods and components are elements of the transportation economy. Design of products and any service-related processes that go into marketing, maintaining, and other activities are part of the commercial sector. The global economy has translated product supply chains to a global network of producers and suppliers. Transformation of the production and service industry from its current state to efficient quasicyclic and cyclic systems cannot be achieved unless the costs and risks associated with the transformation are shared and balanced between consumers, producers and government. Eco-labeling of

products and services is already envisioned in Europe and some examples are already underway. Carbon trading is already being exercised on a small scale and will eventually be the means for the producers and service providers to streamline their processes and make money at the same time.

Professor Jafari's team is developing the necessary value-based analytics and tools to translate the market demand and price elasticity for environmentally friendly consumer products and services to cost effective and efficient supply chains. A unique two-dimensional flow model on lifecycle and supply chains is developed which provides the basis for optimization and negotiation for different stakeholders. The team is also conducting market surveys to measure the consumers' willingness to pay premiums for eco-friendly products and services. ■

CHAIRMAN'S MESSAGE

**Dear alumni, colleagues,
fellow ISEs and students,**

Greetings from the Department of Industrial and Systems Engineering of Rutgers, The State University of New Jersey. This newsletter brings you exciting news about our department activities and highlights of some of our ISE faculty accomplishments during the fiscal year 2009–2010.

Strengths in research and scholarships have always been the defining marks of the ISE faculty at Rutgers. The department is doing great. Our faculty continue to produce high quality research and scholarly publications, and are actively involved in professional societies and services. This past year the faculty have received about \$3 million in new grants; served as President of the Institute for Operations Research and the Management Sciences (INFORMS), editors-in-chief of three international journals including the *IIE Transactions*; editors, associate editors or on the editorial boards of more than 40 international journals; published 52 journal articles and one book, edited three books, and delivered more than a half-dozen keynotes and plenary speeches at major international conferences, received honors and awards including the 2009 Engineer of the Year award. With a 12 member faculty-size, such accomplishments and activities are truly exceptional.

We congratulate Dr. Wanpracha (Art) Chaovalitwongse for being promoted to Associate Professor with tenure and Dr. David Coit to Professor. We are excited and look forward to welcoming a new faculty member, Dr. Kang Li, a graduate from the University of Illinois at Urbana-Champaign, who will be joining us in January 2011.

It was a great honor for me to meet our distinguished alumni Mr. Edgar A. Sandoval (IE' 89) who has accomplished so much and came back on campus in May to speak at the 2010 School of Engineering Graduation Ceremony. Mr. Sandoval is currently vice president of North America Marketing for Procter & Gamble and has also been honored by New York Mayor, Michael Bloomberg.

Our student enrollments continue to grow slightly this Fall 2010 with approximately 115 undergraduates and 95 graduate students including 37 Ph.D. students. ISE students are continuously thriving and have received several academic awards including the IIE Regional Technical Paper Competition, the IIE's Marvin Mundel Memorial Scholarship, IIE's Dwight D. Gardner Scholarship, the

Material Handling Education Foundation Scholarship, and the excellence award from the Material Handling Society of New Jersey.

The first ISE Outstanding Graduate Student Award is given this year to a graduate student who has demonstrated exceptional performance in research. Yada Zhu is the first recipient of the ISE Outstanding Graduate Student Award.

I would like to personally thank Dr. James Luxhøj for his tremendous effort and time in serving as the Director of the department's undergraduate program in the past three years. We

were grateful for his service to the department, especially to most, if not all ISE undergraduate students. Dr. Art Chaovalitwongse is now the new Director of the department's undergraduate program, and we are confident that Dr. Chaovalitwongse will continue to provide the best care and support for all of our undergraduate students.

I am very encouraged as we head into another exciting and productive year. Thank you all for your support of the Department of Industrial and Systems Engineering!

Hoang Pham



Dr. Hoang Pham

DEPARTMENT NEWS

Dr. David W. Coit has been promoted to the academic rank of Professor. He started at Rutgers in 1996 as an Assistant Professor and was promoted to Associate Professor in 2002.

Dr. W. Art Chaovalitwongse has been promoted to the academic rank of Associate Professor (with tenure). Dr. Chaovalitwongse joined our department in 2005.

Dr. Jim Luxhøj served as member of the NSF/AUVSI/FAA/DHS Research Advisory Group to the FAA's Unmanned Aircraft Program Office.

Dr. M. K. Jeong has been invited to serve as an Associate Editor of the *IEEE Transactions on Automation Science and Engineering*.

Keynote and Plenary Addresses at International Conferences

Dr. Elsayed A. Elsayed, Keynote Speaker, "Reliability Engineering in Oil and Gas Industry," 2nd Gas Processing Symposium, January 10–14, 2010, Doha, Qatar.

Dr. Elsayed A. Elsayed, Keynote Speaker, "Industrial Engineering and the Global Economy," XII International Industrial Engineering Congress, October 6–8, 2009, Puebla, Mexico.

Dr. Hoang Pham, Keynote Speaker, "Research Challenges in Reliability Computing," The 4th International Conference on Quality, Reliability and Infocom Technology, ICQRIT-2009, Delhi, India, December 18–20, 2009

Dr. Hoang Pham, Guest of Honour Speaker at the Valedictory Function of the 4th International Conference on Quality, Reliability and Infocom Technology, ICQRIT-2009, Delhi, India, December 20–22, 2009

Dr. Hoang Pham, Plenary Speaker, "The Importance of Reliability Computing Throughout the Product Development Process," The 2nd International Conference on Advances in Product Development and Reliability (PDR'2010), Shenyang, China, July 28–30, 2010

Patents and Licenses

Basily, B. B., Elsayed, E. A. and Kling, D., Technology for Continuous Folding of Sheet Materials, Patent 7,691,045, April 6, 2010

ALUMNI CORNER

Edgar A. Sandoval, BS'89 2010 Graduation Speaker for Rutgers School of Engineering Graduation

As another successful academic year comes to an end, the outstanding achievements and prestigious honors of many accomplished students, faculty, and alumni are reflected upon during graduation. Rutgers School of Engineering (SOE) looked for a graduation speaker that was an inspiring example for the newest graduates this year. Edgar A. Sandoval, a Rutgers ISE alumnus and current Vice President of North America Marketing for Procter & Gamble (P&G), was chosen for his exceptional accomplishments during his time at Rutgers as well as his professional endeavors and contributions to the community since.



Sandoval received his double-major undergraduate degree in Industrial & Systems Engineering and Sociology with a minor in Mathematics from Rutgers University, and continued his education in pursuit of his M.B.A. at University of Pennsylvania's Wharton School of Business. At P&G, a company that has over 4 billion consumers in 180 countries, he has played a huge role in advancing diversity within the corporate culture and has been heavily involved in building brands such as Tide, Crest, and Downy. These achievements have ultimately rewarded him with the Goldstein Award, Procter & Gamble's most respected marketing honor. While Sandoval received many accolades over the years, including being inducted into the Hispanic Scholarship Fund Hall of Fame and being honored by New York Mayor, Michael Bloomberg, he has continued to stay true to his alma mater, and returned to speak at the 2010 SOE graduation ceremony. Through his inspiring messages derived from his journey to success, Sandoval will truly leave a mark on our newest ISE graduates.

Haitao Liao, Ph.D.'04 Wins National Science Foundation Career Award

Haitao Liao is an Assistant Professor in the Nuclear Engineering Department and Industrial and Information Engineering Department at the University of Tennessee, Knoxville.



Dr. Liao received his Ph.D. in Industrial and Systems Engineering from Rutgers University in 2004. He holds a B.S. in Electrical Engineering from Beijing Institute of Technology, Beijing, China and M.S. degrees in Statistics and Industrial Engineering both from Rutgers University.

Dr. Liao also worked the Industrial and Manufacturing Engineering Department at Wichita State University where he served as Director of the Reliability and Maintenance Engineering Laboratory (RMEL). At the University of Tennessee, Dr. Liao teaches courses in Reliability Engineering, Maintainability Engineering, and Probabilistic Risk Analysis, is currently a group member of the Prognostics, Reliability Optimization and Control Technology (ProAct) Laboratory. His laboratory research is directed toward the development of diagnostic and prognostic methods for complex engineering systems, modeling and analysis of reliability testing and service logistics, and development of instrument and control technologies.

Dr. Liao's current research efforts focus on accelerated testing, coordination of life cycle reliability and service logistics, applied statistics, renewable energy, and energy saving technologies. His research is funded by the National Science Foundation, the Department of Energy, the Nuclear Regulatory Commission, Hong Kong Research Grant Council, and Industry. Dr. Liao is also an Assistant Area Editor of *Computers & Industrial Engineering*, and is the author of more than fifty peer reviewed publications. He is a recipient of the National Science Foundation CAREER Award in 2010.

Jose Ramirez-Marquez, Ph.D.'04 Promoted to Associate Professor and Awarded Tenure at Stevens Institute of Technology

Dr. Jose Emmanuel Ramirez-Marquez has been promoted to the academic rank of Associate Professor of the School of Systems & Enterprises at Stevens Institute of Technology.



A former Fulbright Scholar, he holds degrees from Rutgers University in Industrial and Systems Engineering (Ph.D. and M.Sc.) and Statistics (M.Sc.) and from Universidad Nacional Autonoma de Mexico in Actuarial Science. His research efforts focus on the reliability analysis and optimization of complex systems, the development of mathematical models for network operational effectiveness, the computational analysis of resilience, and the development of evolutionary optimization algorithms.

Dr. Ramirez-Marquez has conducted funded research for both private industry and government. He has also published more than 70 refereed manuscripts related to these areas in technical journals, book chapters, conference proceedings and industry reports. Dr. Ramirez-Marquez has presented his research findings both nationally and internationally in conferences such as INFORMS, IERC, ARSym and ESREL. He is an Associate Editor for the *International Journal of Performability Engineering*. Dr. Ramirez-Marquez is currently serving as the current president of the Quality Control and Reliability division board of the Institute of Industrial Engineers (IIE). Internationally, he is a member of the Technical Committee on System Reliability for the European Safety and Reliability Association.

Xuemei Zhang, Ph.D.'99 has co-authored *Practical Reliability Engineering in 2009*

Dr. Xuemei Zhang has published a book entitled *Practical Reliability Engineering* published by John Wiley & Sons. The book gives readers a solid understanding of modeling and managing system and



software availability and reliability through the development of real applications and products, and about what reliability engineers can do to improve reliability throughout the product development life cycle.

Dr. Zhang received her Ph.D. in Industrial Engineering and her M.S. in Statistics from Rutgers University, New Brunswick, New Jersey. Currently she is a principle member of technical staff in the Network Design and Performance Analysis Department in AT&T Labs. Prior to joining AT&T Labs, Dr. Zhang has worked in Performance Analysis Department and Reliability Department in Bell Labs in Lucent Technologies (and later Alcatel-Lucent), in Holmdel, New Jersey. She has been working on reliability and performance analysis of wire line and wireless communications systems and networks. Dr. Zhang's major work and research areas are system and architectural reliability and performance, product and solution reliability and performance modeling, and software reliability. She has published more than 30 journal and conference papers, has six awarded and pending patent applications in the areas of system redundancy design, software reliability, radio network redundancy, and end-to-end solution key performance and reliability evaluation. Dr. Zhang is the recipient of a number of awards and scholarships, including the Bell Labs President's Gold Awards in 2002 and 2004, the Bell Labs President's Silver Award in 2005, and Best Contribution Award 3G WCDMA in 2000 and 2001.

Let's Hear from our Recent Graduates

"Industrial Engineering was not the major I was planning to pursue when I first attended Rutgers back in the fall of 2006, but only because I didn't truly understand what it was. When I watched a presentation of what ISE does in the Engineering Orientation course I got more insight, but was still a little lost as to what could define an IE. Now that the Rutgers ISE department has taught me what IEs do—analyze and improve any type of system dealing with people, equipment, money, energy, and so much more—I truly value my choice in pursuing a degree in Industrial Engineering. This discipline applies to EVERY industry, and in economic times like these where cost savings and efficiency are paramount, an IE is a company or government's most valuable resource. I recently began my career in the Operations division at Goldman Sachs and was shocked to see how much of this degree can be applied at an investment bank. That's not to say I am doing probabilistic models at my job, but all the courses I took enhanced the way I approached problems and developed my thought process. It's the IE way of thinking that will lead to success for anyone who pursues this degree."

—Anthony Rosa, BS'10
(now at Goldman Sachs)

"Graduating from the Industrial and Systems Engineering department at Rutgers was one of the foremost enablers of my professional career. The skills I first learned and subsequently honed while a student of ISE, have in my opinion, enabled me a leg up on my peers. Suffice it to say, I would not be where I am today without the dedicated attention from the ISE faculty and well structured curriculum of the program."

—Scott Peters, BS'10
(now at LogTech)

"As an undergraduate, one of the hardest decisions I was faced with was deciding my major. I can say with full confidence that choosing Industrial Engineering as my major was the right choice and fit for me! The ISE program, my peers, and my professors were crucial in helping me to develop my problem solving, critical thinking, and team collaboration skills as an undergraduate. I learned the importance of hard work and determination in accomplishing your goals, and I will always look back towards my undergraduate ISE experience for guidance and inspiration in my future endeavors."

—Daniel Jeng, BS'10
(now at Accenture)

"My time in the Industrial Engineering department at Rutgers University has adequately prepared me for life in the professional world. I am currently in the Wealth Management Americas Department at UBS Financial Services. Although this is not a typical job for one with an engineering background, I feel as though I am not at any disadvantage. I attribute this to the nature of industrial engineering as well as the way it was taught to me. The concepts behind the topics, such as development, improvement and implementation of methods in Industrial Engineering can be applied to almost any field. My superiors have found that the skills I have developed through engineering allow me to approach problems in Wealth Management with different look from those coming from business school. Also the professors at Rutgers IE were excellent in my experience. They do an excellent job applying the concepts to real world situations across industries."

—Adarsh Dasika, BS'10
(now at UBS Financial Services)

GRADUATING INDUSTRIAL ENGINEERS

Ph.D.

Michel Anzanello
Erhan Deniz
Rodrigo Duran
Ya-Ju Fan
Ahmet Oztekin
Hatice Tekiner
Haleh Valian

M.S.

Joseph Butewicz
JaeHo Chung
Cenk Demir
Vikrum Ingle

Punit Khosla
Michael Koskulics
Chen Li
Shu Ma
Diana Mathew
Jimit Shah
Chandra Shekhar
Guioma Vergara
Lobos
Hao Xu

B.S.

Fraz Ashraf
Eric Berntson

Raymond Chan
Colman Cheung
Adarsh Dasika
Jacob Fastiggi
Marc Fridson
Joshua Greenhaus
Ying Hong
Vicky Huang
Daniel Jeng
Walter Kaminski
Erik Kelmartin
Jayson Kolb
Christopher Kreiger
Ying Tung Lau

Joel Lora
Peter McGuinness
Ramey Packer
Scott Peters
Kashyap Purohit
Anthony Rosa
Haithum Salem
Sunil Sanghani
Christopher
Tanglaw
Maggie Yang
Eric Yu
Mike Zhang
Lizbeth Zuniga

FACULTY NEWS

RESEARCH

Dr. Tayfur Altioik, "Regional Transit Behavioral Assessment Training," Pennsylvania Emergency Agency and Delaware River Port Authority, \$391,700

Dr. Tayfur Altioik, "Analysis of the Supply Chain for Critical Medical Resources," University of Medicine and Dentistry of NJ and the U.S. Army, \$89,940

Dr. Tayfur Altioik, "Port of Paulsboro—Delaware River Vessel Traffic Modeling," South Jersey Port Corporation, \$152,104

Dr. Tayfur Altioik, "Port Awareness and Response in Delaware River and Bay Area," NJ Office of Homeland Security and Preparedness, \$100,000

Dr. W. Art Chaovalitwongse, "Collaborative Research: Computational Framework of Robust Intelligent System for Mental State Identification and Human Performance Prediction with Biofeedback," National Science Foundation, \$206,816

Dr. David Coit, "Integrated Modeling and Optimization of Manufacturing Variability and Product Reliability for Advanced and Evolving Technologies," National Science Foundation, \$460,000 (with Co-PI Dr. Qianmei Feng of University of Houston)

Dr. Elsayed A. Elsayed, Supplement to "Optimization and Design of Low-Cost, Low-Altitude (LCLA) Aerial Drop Cushioning System," Battelle Pacific Northwest Division, \$165,793 (with Co-PI **Dr. B. Basily**)

Dr. M. K. Jeong, "Development of the Latent Competitor Detection Models Using Multi-

level Networks", Korea Institute of Science and Technology Information (KISTI), \$43,860

Dr. H. Pham (PI of Rutgers University), "EU-US Atlantis Programme—Cooperation in Higher Education and Training," U.S. Department of Education, \$415,958 (Layek Abdel-Malek, Lead PI of NJIT)

FACULTY AWARDS

Dr. W. Art Chaovalitwongse has been awarded a **Rutgers Presidential Fellowship for Teaching Excellence** "as one of the university's most distinguished young faculty members." This award is to recognize his outstanding teaching and scholarly work as well as his dedication to advising and mentoring undergraduate and graduate students to help them learn and succeed in their chosen profession and research. Dr. Chaovalitwongse is the first engineering professor to receive this award.

Dr. W. Art Chaovalitwongse has been awarded an **Outstanding Service Award** by The Association of Thai Professionals in America and Canada (ATPAC) to recognize his dedication to promoting the advancement of scientific knowledge, technology and education in Thailand.

Dr. Jim Luxhøj is the recipient of the **2009-2010 Rutgers Engineering Governing Council's Excellence in Teaching Award**.

Dr. Hoang Pham received the **2009 Engineer of the Year Award** by the IEEE Reliability Society "For Many Accomplishments in the Reliability Profession with an Emphasis on Analytical Techniques for Modeling the Reliability of Software and Systems."

Dr. Hoang Pham is the recipient of the **2009 William A.J. Golomski Award** by the Institute of Industrial Engineers (IIE). This award is for the Best Paper entitled "Reliability Analysis of Dynamic Fiber Bundle Models," from the Reliability, Availability, and Maintainability Symposium (RAMS), January 28, 2010.

Dr. Hoang Pham has been awarded an **SRE-QOM International Award** by the Society for Reliability Engineering, Quality and Operations Management (SREQOM) "For International Exceptional Contributions as an Author and Researcher in Reliability Engineering," December 2009.

Dr. Tugrul Özel has been elected to become associate member of the CIRP (International Academy for Production Engineering) for his work on computational and physics-based simulation modeling of machining processes. CIRP is the world leading organization in production engineering research and is at the forefront of design, optimization, control and management of processes, machines and systems. The Academy has restricted membership based on demonstrated excellence in research and has some 550 academic and industrial members from 40 industrialized countries.

BOOKS

Dr. Hoang Pham coauthored *Maintenance for Industrial Systems* (Springer, 2010).

Dr. W. Art Chaovalitwongse (coauthors: **P.M. Pardalos** and **P. Xanthopoulos**) edited *Computational Neuroscience* (Springer, 2010).

STUDENT NEWS

STUDENT AWARDS

Outstanding Senior, Junior and Sophomore Awards are given to students who have demonstrated exceptional performance in senior year, junior year and sophomore year, respectively. This year the department is proud to present the Outstanding Senior award jointly to **Anthony Rosa**, the Outstanding Junior award to **Kevin Tang** and **Blake Cignarella**, and the Outstanding Sophomore Award to **Richard Lou**.

The **Alfred A. Kuebler Award** was established in memory of Prof. Kuebler, who provided the inspirational force for the establishment of industrial engineering at Rutgers.

The annual award, provided by a fund that was established by Mrs. Eleanor Kuebler, is given to a student with high academic standing and involvement in a sports activity. **Zack Shands** was the recipient this year.

The **Robert & Carole Michna Award** is given to a full-time undergraduate student with the initial award being made to a rising sophomore. **Tarun Jada** and **Lauren Wagner** was the joint recipients of this scholarship in the amounts of \$5,400 and \$2,000, respectively.

The **2010 Roy Chen Award** is given to **Ashley Lytle**.

The **IIE Outstanding Teaching Assistant Award** is given to a graduate student who is a Teaching Assistant and has voted the best Teaching Assistant by the ISE undergraduate students. **Yaping Wang** was the recipient of the award this year.

Outstanding Graduate Student Award is given to a graduate student who has demonstrated exceptional performance in research. **Yada Zhu** was the recipient of this year's award. **Zhe Liang** and **Christina (Schroepfer) Young** were recognized, and received honorable mentions.

STUDENT AWARDS

continued from page 5

ISE juniors win Institute of Industrial Engineers' Scholarships

Blake Cignarella (ISE junior) received the IIE's Marvin Mundel Memorial Scholarship in the amount of \$1,000. **Kevin Tang** (ISE junior) received the IIE's Dwight D. Gardner Scholarship in the amount of \$3,000.

ISE seniors win Excellence Awards from Material Handling Society of New Jersey

The Material Handling Society of New Jersey (MHSNJ) Award of Excellence is presented to a group project that has used theoretical knowledge in the design and construction of a successful working model. This year's award is presented to **Avinash Danashekar, Michael Holenstein, and Kevin J. Tang.**

ISE students received scholarships from the Material Handling Education Foundation

The Material Handling Education Foundation Scholarship Program promotes the study of material handling and the exposure of students to the material handling industry. **Blake Cignarella** (ISE junior) is a recipient of Material Handling Education Foundation Scholarship in the amount of \$2,100.

ISE students win the Regional IIE Technical Paper Competition

Adarsh Dasika, Jayson Kolb, Christopher Krieger, and Anthony Rosa (ISE seniors) won the IIE Regional Student Technical Paper Competition. Their technical paper is based in the senior design project "iServe: Fully Automated Tennis Ball Server." The objective of this project was to design a fully automated tennis ball serving machine that improves upon the designs and capabilities of servers available on the market today. The server created from this project is called the iServe. It includes all the features on today's most advanced ball servers while also having the ability to launch balls at random, correlating locations while it translates along the serving line of the court. These added capabilities give the user a truly dynamic experience in that no two drills will ever be the same.

Institute of Industrial Engineers Gold Award

Rutgers IIE Chapter #841 was the recipient of a 2010 Chapter Recognition Gold Award. The award was earned under the leadership of **Scott Peters** as student president, under the direction of **Dr. Jim Luxhøj** as faculty advisor. This is the fifth consecutive year that the Rutgers Chapter has earned the IIE Gold Award.

This newsletter is published for alumni, faculty, staff, and friends, by the Department of Industrial and Systems Engineering of Rutgers, The State University of New Jersey, Piscataway, NJ 08854

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