

impact

Alumni & Industry Magazine
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Donald R. Sadoway
MMS MASc 7T3, PhD 7T7

TIME 100 Most Influential People
in the World 2012

**MSE Alumni Remember
Prof. Torstein A. Utigard**
1954–2012

100

**Years of
Materials Innovation**
1913–2013



Materials Science & Engineering
UNIVERSITY OF TORONTO

Publisher’s Letter



Welcome to Impact II½—a mini-issue themed around celebration. Our cover story congratulates alumnus Dr. Donald Sadoway—one of TIME magazine’s 100 Most Influential People in the World for 2012. Inside, our alumni honour the late Professor Torstein Utigard, whose dedication to research and education is celebrated in the hearts and minds of our graduates.

The celebration continues as we mark 100 Years of Materials Innovation in a historical timeline that begins in 1913—the founding year of Department Eight: Metallurgical Engineering. On October 23 & 24, 2013, we will celebrate our centenary with a series of events that will include the 3rd Annual Winegard Visiting Lectureship, featuring Professor Michael F. Ashby of the University of Cambridge.

I hope you will join us in celebrating our centennial next fall.

Jun Nogami, PhD, FAAAS, PEng
Professor & Chair

PUBLISHER Jun Nogami, EngSci 8To Professor & Chair	WITH THANKS TO Elizabeth Do Maria Fryman Raj Grainger Benjamin D. Hatton Michael G. Helander Nazir P. Kherani Kitty Kumar Fanny Manousos Alexander McLean Doug D. Perovic Steven J. Thorpe Ronald Victorino	Impact is produced with partial support from the Ontario Research Fund–Research Excellence (ORF–RE)
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Soaking Up the Sun

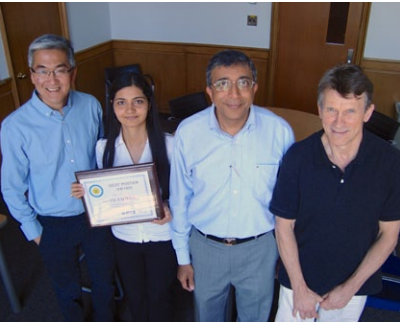
Without special treatment, a silicon solar cell reflects approximately 40% of the sun’s light off the front surface, reducing its ability to convert solar energy into electricity.

PhD candidate **Kitty Kumar** came up with a solution to address this refraction issue and received international recognition for her work. Using high-resolution laser writing on thin wafers of crystalline silicon (c-Si), Kumar enabled a unique chemical etching process lending to a nano-scale surface structure that drastically reduced light deflection over an unprecedented range.

In June 2012, Kumar was awarded a top prize for this work at the 38th Annual IEEE Photovoltaic Specialists Conference in Austin, Texas. Her poster titled, “Ultra-Fast Laser Direct Hard-Mask Writing for High-Performance Inverted-Pyramidal Texturing of Silicon,” was selected as the best of over 900 presentations from candidates around the globe.

Shine on, Ms Kumar. ☀

Kitty Kumar (centre) with supervising professors (from left) J. Nogami (Chair, MSE), N. P. Kherani (ECE/MSE) and P. E. Herman (ECE)



Donald R. Sadoway

EngSci 7T2, MMS MASc 7T3, PhD 7T7

TIME 100 Most Influential People in the World 2012

MSE alumnus and Massachusetts Institute of Technology (MIT) professor **Donald R. Sadoway** was named one of TIME magazine’s 100 Most Influential People in the World this year as an icon of sustainable energy engineering.

Professor Sadoway received his PhD in metallurgy and materials science under the supervision of the late Professor Emeritus **Spyridon N. Flengas** in 1977. He has kept close ties with his Alma Mater ever since—Dr. Sadoway served on the Department’s External Advisory Board from 1998 to 2002. In 2010, he helped launch the annual Winegard Visiting Lectureship as its inaugural distinguished speaker where he spoke on the topic of “New Materials Engineering and the Path to Sustainability.”

At MIT, he is the John F. Elliot Professor of Materials Chemistry in their Department of Materials Science & Engineering where he is renowned for his instruction of 3.091: Introduction to Solid-State Chemistry. The combination of his teaching methodology and unique lecture style has made the class one of the largest in the history of MIT.

To the public, Professor Sadoway is regarded as one of the world’s foremost experts in electrochemical materials engineering for renewable energy storage technologies. In a recent TED chalk-talk that



has logged more than 380,000 views, titled “The Missing Link to Renewable Energy,” Sadoway spoke about his latest creation: low-cost, high-capacity, grid level-ready liquid-metal batteries that can enable the deployment of renewable energy resources on a city-wide scale. To boot, his spin-off company, Liquid Metals Battery Corporation (LMBC), has attracted some notable supporters like Microsoft’s Bill Gates.

Sadoway’s impact on our energy future is apparent, but what may be less noticeable is his influence on others—LMBC was established with two of his graduate students.

“In a battery, I strive to maximize electrical potential,” he says, during his TED2012: Full Spectrum talk. “When mentoring, I strive to maximize human potential.” ☞

Other distinguished speakers of the Winegard Visiting Lectureship

2011–2012: Professor Sir **Colin Humphreys**, University of Cambridge, “How Materials Science Can Help to Solve Some Major World Problems”

2012–2013: Professor **Michael F. Ashby**, University of Cambridge, Distinguished Centennial Speaker: October 23 & 24, 2013



MSE Welcomes Benjamin D. Hatton

Warmest welcome to Assistant Professor **Benjamin Hatton** (MSE PhD oT5). Effective July 1, 2012, Dr. Hatton returns to his Alma Mater after serving as a staff scientist in the Wyss Institute for Biologically Inspired Engineering at Harvard University.

Dr. Hatton obtained his undergraduate degree in Materials Science at Queen’s University, and his master’s from McMaster University. In 2005, he received his PhD in MSE here at Uof T under the co-supervision of Professor Doug Perovic and University Professor Geoffrey Ozin (Chemistry) on self-assembled, nanoporous silica as microelectronic insulators. Subsequently, he held research positions at the National Institute for Materials Science in Tsukuba, Japan, and at Bell Labs in New Jersey, USA. In 2007, he continued his research in microstructured surfaces and adaptive materials with Dr. Joanna Aizenberg at Harvard University.

“I have had an amazing experience developing biological design principles for technological applications at the Wyss Institute,” says Dr. Hatton. “I look forward to pursuing that kind of research here at Uof T.” ☞



MSE Alumni Remember Professor Torstein A. Utigard 1954–2012

On April 11, 2012, our community was saddened by the loss of Professor **Torstein A. Utigard** (MMS MASc 8T3, PhD 8T5), who passed away peacefully after a long battle with cancer.

Dr. Utigard began his teaching career at U of T as an assistant professor in 1989. During this time, he supervised 22 MASc and 8 PhD graduates, 7 researchers and post-doctoral fellows, and mentored numerous undergraduate students. Impact asked alumni to submit personal memories of our esteemed teacher and friend. Here are several select submissions.



01 Professor Torstein A. Utigard circa 1990s

02 Toguri Research Group circa 1981, with Professor **James M. Toguri** (front row, left) and Torstein A. Utigard (back row, 2nd from left). Photo submitted by **Roland T. C. Choo**, MMS 8T3, MASc 8T5 (back row, 1st from left)

I think anyone who knew Professor Utigard would attest to his sense of coolness! He wasn’t just a professor but also an active participant outside the classroom. He would find time to interact with us socially—like defeating all of us each year in the Torstein A. Utigard (TAU) Table Tennis Tournament! He set a great example for being active and involved—an example I try to follow to this day.

I had the chance to work with him one summer. One thing that stood out to me is how much he respected us. He would always be open to different ideas, even from a summer student. He gave me the confidence to achieve my best. That summer turned out to be one of the most fulfilling—we built our first lab-scale silicon-refining reactor.

As a supervisor he knew his students’ talents. He guided us when we needed it and gave us the freedom to explore and experiment. He was the reason I decided to pursue my MASc. I will always remember Professor Utigard as open, generous, and kind.

Nikrooz Farsad, MSE oT7, MASc 1To

Professor Utigard asked me a simple question in 2008 that helped me establish my career direction. At that time, when I had almost completed my MASc, he asked me whether I would like to continue onto PhD studies under his supervision. At that point, I had no clue as to what I was going to do upon graduation. Half out of not wanting to look for work, I accepted his offer. Looking back, I feel so thankful that he provided me with the opportunity—I have

enjoyed my PhD studies and now look forward to pursuing a career in research.

Mark Xiang Li, MSE oT7, MASc oT8, PhD Candidate

I remember Professor Utigard teaching us Heat & Mass Transfer with great passion in my 3rd year. It became one of my favourite MSE classes—he made what could have been a dry and incomprehensive course seem intuitive, simple, and fun. Every time you asked him a question, he would answer with a thought-provoking question and a big smile to make you think—in hopes of guiding you to the answer.

He’s also the only person that can make you laugh while he’s beating you at ping-pong!

It saddens me that no future students will experience his lectures, and be inspired by him. I will always remember him as a brilliant professor, enthusiastic lecturer, athletic, and a humble man.

Betty Lin, MSE oT3, MASc oT5

I remember Professor Utigard visiting me after my cancer surgery back in 1994, when I was completing my MASc under his supervision. Torstein, as everyone used to call him, opened the doors to a better life in Canada for me—as a new immigrant—by accepting me as his graduate student with open arms and heart, just one year after my arrival into this country. He was a great teacher, leader, mentor and above all—a great

friend and human being in every sense. He is dearly missed and will be in my thoughts forever.

Henry Nazeri, MMS MASc 9T4

My favourite memory of Professor Utigard took place outside of the classroom, when I was trying to suffer through a torturous hour at the Hart House gym between lectures. As I struggled away on an elliptical, he hopped on a machine beside me, cranked up the intensity, and proceeded to outpace me shamefully. I tried to keep up but was clearly failing—he then laughed at me and said, “You’re half my age! You should be beating me! Want to race?”

This sort of easy camaraderie and perennially cheerful attitude is what we loved most about Professor Utigard. He will be missed.

Varuna Prakash, MSE oT8

Professor Utigard was a great inspiration to me during my time at U of T. He was not only wise, but also well-rounded. He had a fascinating background and great character. In my 4th year, he advocated one of my favourite courses, MSE 404: Extractive Metallurgy, to be offered even though there were only a handful of students enrolled for the class. Furthermore, his participation in student activities, like the TAU Table Tennis Tournament, made him approachable and allowed students to learn from him, in and out of the classroom. I will miss him and I wish his family all the best—he was a good man.

Laszlo Zsidai, MSE oT5

An Open Letter to Alumni




As I look back on the years of my undergraduate studies, I realized that one of the most important influences on my student experience was the strength of our community. Entering my final year, I felt inspired to give back—I wanted to ensure that my positive journey could be forged for other students as well.

Together with a small team of like-minded and passionate peers, we set out on a mission to further strengthen the spirit within our student community. From a re-purposed MSE Dinner Dance that celebrated our achievements and community contributions, to the first Leaders of Tomorrow: Technology Feasibility Competition, we created opportunities that not only enhanced our academic studies, but forged memories and connections with one another that may last a lifetime.

We are in your debt—MSE alumni and friends—as we could not have done this without you. Your generous support to the MSE Department funds student initiatives, like the ones we had this past year. To mark the occasion of our entry into the alumni community, we—the MSE graduating class—championed the strongest participation to date in Gratitude rT2 as a gift dedicated to our Alma Mater. We hope our support creates some of the same positive experiences you have enabled for us.

On behalf of the student body—thank you, MSE alumni—for making our journey remarkable and memorable. To all future MSE students and alumni—best of luck!

Ronald Victorino, MSE rT1+PEY
MSE Club Chair, 2011–2012 

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www.mse.utoronto.ca

Impact Speaker Series

Established in 2011, the Impact Speaker Series features Materials Science & Engineering alumni to share professional experiences and insights with current MSE undergraduate and graduate students.

Talks are held on Fridays, once per month, typically around the lunch hour. All are welcome to attend.

September 21, 2012 | MB 128 | 11am–12pm

Diana Facchini, MSE oT2, MASc oT5
Integran Technologies Inc. | “The All-Purpose Engineer: Life in a Small Business”

October 19, 2012 | MB 128 | 11am–12pm

Varuna Prakash, MSE oT8, BME MHSc rTo
Healthcare Human Factors, University Health Network | “The Multi-Disciplinary Engineer: From Materials to Healthcare and Beyond...”

January 18, 2013

Patrick Burke, MMS 8T1, MASc 8T6, PhD 9T9
Industrial Design, Humber College
“Industrial Design: Engineering the Link between Products & the User”

February 1, 2013

Matthew Graff, MSE oTo
Bereskin & Parr LLP | “Switching Gears: Law after Engineering”

Visit www.mse.utoronto.ca for more information about the speaker series. Contact 416.946.3211 or mse.external@utoronto.ca if you are interested in becoming an Impact speaker.



Materials Science & Engineering
UNIVERSITY OF TORONTO

100

Years of Materials Innovation 1913–2013

Centennial Celebrations October 23 & 24, 2013

3rd Annual Winegard Visiting Lectureship, featuring:

Michael F. Ashby, CBE, PhD, FRS, FREng
Royal Society Research Professor
Department of Engineering, University of Cambridge

www.mse.utoronto.ca



A Historical Timeline of the Department of Materials Science & Engineering at the University of Toronto 1913–2013

1913

Department Eight: Metallurgical Engineering, established; Professor George A. Guess as 1st Department Head

Degrees offered: Bachelor of Applied Science (BASc) and Master of Applied Science (MASc) in Metallurgical Engineering

1920s

Ceramics Engineering option established under direction of Professor Robert J. Montgomery

1943

Professor Lloyd M. Pidgeon joins Department from the National Research Council of Canada and appointed Head; significant department expansion ensues

1947

First PhD granted in Metallurgical Engineering

1948

Professor Bruce Chalmers recruited from the United Kingdom: major graduate program in Physical Metallurgy established, leading to the formation of the world's preeminent research group in the study of the solidification of metals

1950s

Department of Metallurgical Engineering established as research powerhouse in Canada: majority of research funding received by the Faculty of Applied Science & Engineering from the National Research Council of Canada (NRC) was designated to metallurgy

1964

Department name changed to “Metallurgy & Materials Science (MMS),” reflecting broader coverage of research areas involving non-metallic materials

1965

Interdepartmental Materials Science Centre established in the Faculty of Applied Science & Engineering under MMS leadership

1967

66 PhDs conferred in metallurgy; new building constructed (now L. M. Pratt Building) to accommodate rapid department expansion

1969

Professor Pidgeon retires; Department confers 72 PhDs to date—a number greater than many U of T departments at the time

Professor C. Benjamin Alcock recruited from Imperial College (London, UK) to succeed Professor Pidgeon as Chairman

1970s

Expansion of research and teaching offerings via faculty cross-appointments to include Physics, Electrical Engineering, and Dentistry / Biomaterials

1984

Centre for Nuclear Engineering moved to MMS under direction of Professor O. John C. Runnalls, and subsequently Professor Brian Cox

1986

Centre for Chemical Process Metallurgy (CCPM) based in MMS under leadership of Director Roland Bergman

1980s & 90s

Continued department expansion under leadership of Professor W. Alfred Miller (Chairman: 1982–1992) via partnerships with NSERC and industry—MMS held highest number of NSERC Industrial Research Chairs (IRCs) for a single academic department in Canada at the time

IRCs established: Steelmaking, Welding, Chemical Process Engineering, Nuclear Engineering, Electromagnetic Processing, and Nanomaterials Engineering

Professor Alexander McLean (Chair: 1992–1997) establishes Departmental Strategic Planning Committee: undergraduate curriculum transformed and renamed ‘Materials Engineering’ to reflect broader fundamental learning areas and applied knowledge

Late-90s to Mid-2000s

Department's first External Advisory Board established under leadership of Professor Doug D. Perovic (Chair: 1997–2008): membership included Canada's top industry leaders in Metallurgy / Materials Engineering—independent status of academic unit strengthened and secured

Department name changed to “Materials Science & Engineering (MSE)” in 2001, reflecting strategic expansion and faculty appointments in advanced and performance materials. Undergraduate specialization areas redeveloped to include: nanomaterials, biomaterials, materials in manufacturing, and materials processing & sustainable development

Undergraduate admissions quality and enrollment quantity increased to ~50 students per year; U of T becomes home to one of the largest MSE departments in North America

Three endowed Chairs established: Energenius / Stan Meek Chair in Advanced Nanotechnology, Gerald R. Heffernan Chair in Materials Processing, and Celestica Chair in Materials for Microelectronics

Canada Research Chair in Smart & Functional Materials also established in conjunction with the Department of Mechanical & Industrial Engineering (MIE)

2010

Department hosts 1st Annual Winegard Visiting Lectureship: Professor Donald R. Sadoway (MIT) as inaugural distinguished lecturer on “New Materials Engineering & the Path to Sustainability”

Canada Research Chair in Organic Optoelectronics established

2011

Inaugural edition of Impact published

Department celebrates 10 years of UT², an annual academic exchange program between the 2 MSE departments at the University of Tokyo and the University of Toronto

2012

2nd Annual Winegard Visiting Lectureship: Professor Sir Colin Humphreys of the University of Cambridge as distinguished lecturer on “How Materials Science Can Help to Solve Some Major World Problems”

Department receives \$1 million gift from alumnus Dr. Walter Curlook to advance research and teaching facilities in Materials Processing & Characterization

2013

100 Years of Materials Innovation: the Department of Materials Science & Engineering at the University of Toronto marks a century of world-class research and education in materials engineering. With close to 2000 alumni, 200 current undergraduate students, 80 graduate students, and 17 core faculty members, MSE at U of T continues to be one of the largest and most reputable materials / metallurgy academic units in North America.

On October 23 and 24, 2013, please join us in marking our Centennial year. The 3rd Annual Winegard Visiting Lectureship will be held as part of our celebratory events with Professor Michael F. Ashby of the University of Cambridge as the distinguished lecturer.

Heads & Chairs

Professor George A. Guess	1913–1943
Professor Lloyd M. Pidgeon	1943–1969
Professor C. Benjamin Alcock	1969–1976
Professor James M. Toguri	1976–1981
Professor W. Alfred Miller	1981–1992
Professor Alexander McLean	1992–1997
Professor Doug D. Perovic	1997–2008
Professor Jun Nogami	2009–PRESENT

By the Numbers: Degrees Conferred

Year	BASc	MASc	MEng	PhD
1913–1919	1			
1920–1929	7			
1930–1939	58	1		
1940–1949	187	13		3
1950–1959	127	45		30
1960–1969	98	55		39
1970–1979	120	71	11	26
1980–1989	185	74	20	31
1990–1999	178	107	13	50
2000–2010	398	122	44	57
2011	44	13	3	6
2012	46	12	7	9
Total	1,449	513	98	251