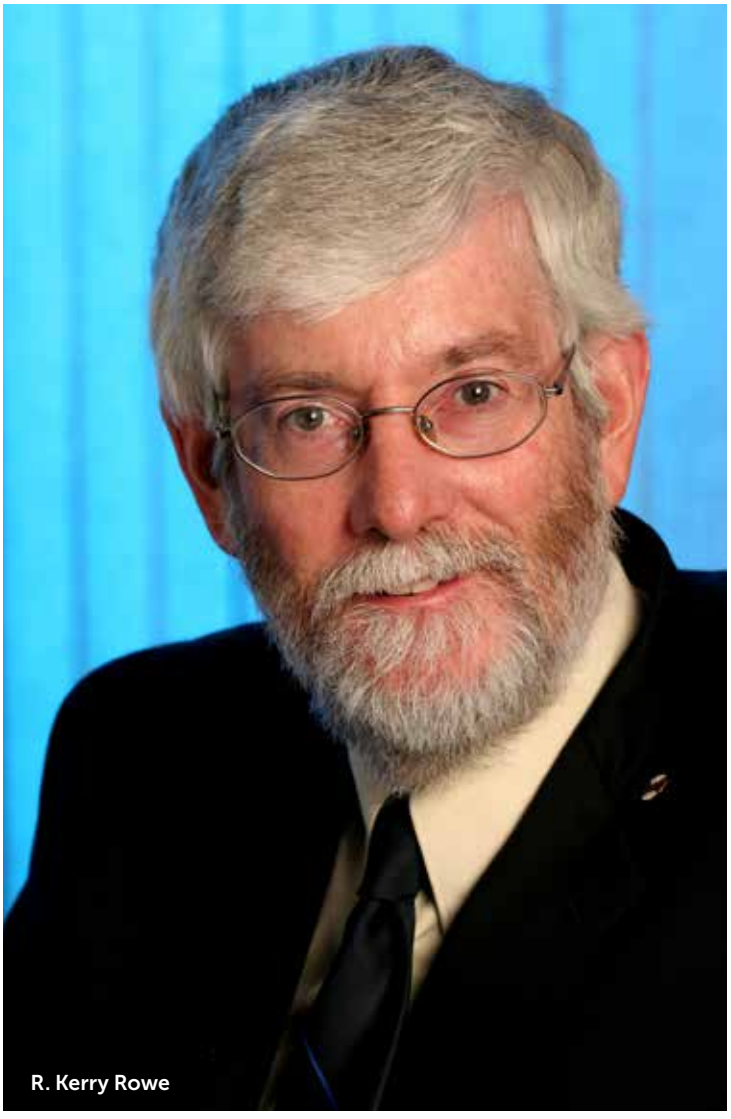
R. Kerry Rowe,
OC, PhD, DEng., DSc(hc), FRS, NAE, FREng, FRSC, FCAE, Dist.M.ASCE, FEIC, FIE(Aust), FCSCE, P.Eng, CP.Eng

By Cameron Ross, P.Eng, and Jean-Luc Armstrong

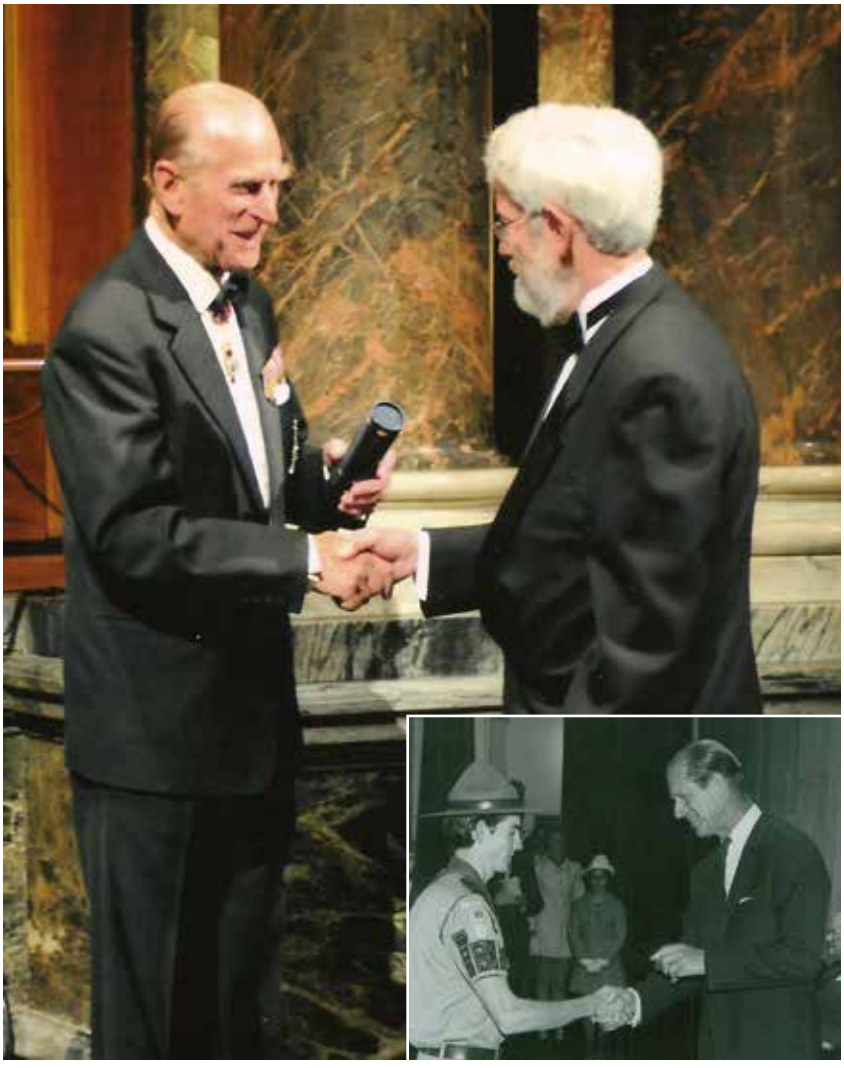


R. Kerry Rowe

R. Kerry Rowe is the Barrington Batchelor Distinguished University Professor and Canada Research Chair in Geotechnical and Geoenvironmental Engineering at Queen's University in Kingston, Ontario, Canada. He has made significant contributions in numerous areas of geotechnical engineering over his 40-year academic career, split between the University of Western Ontario (Western) and Queen's University (Queen's). His areas of expertise include geosynthetics, contaminant migration and containment, hydrogeology and landfill design, embankments on soft soils, soft-ground tunnelling, foundations in soft-rock, tailings facilities, heap leach pads, and dams. His legacy includes authoring multiple books, publishing approximately 400 peer-reviewed journal articles and 350 full conference papers, and supervising more than 125 graduate students.

Raised and educated in Australia, Rowe attended the University of Sydney and worked as a geotechnical engineer with the Australian Government Department of Works (DPW) before accepting a professorship at the University of Western Ontario and emigrating to Canada in late 1978. He spent 22 years there, including eight as chair of the Civil and Environmental Engineering Department. In 2000, Rowe moved to Queen's, where he spent the first 10 years as vice-principal of research, administering all research across the University. He maintained his own research interests within the Department of Civil Engineering, and established the collaborative Queen's-RMC (Royal Military College of Canada) Geoengineering Centre with Ian Moore and Richard Bathurst during that time.

Following his 2013 induction into the Royal Society, the UK's national science academy, Rowe signs the Book of Fellows. Formed in 1660, the Book has been signed by all elected Fellows, including Sir Isaac Newton, Benjamin Franklin, Charles Darwin, Albert Einstein, and Stephen Hawking.



Rowe and Prince Philip at Rowe's induction into the UK Royal Academy of Engineering (2010); Inset — Rowe being presented the Duke of Edinburgh Award by Prince Philip (1969).

Rowe has received innumerable accolades and awards from the engineering community and has given some of the most prestigious lectures in geotechnics, including the Rankine Lecture (2005), the Casagrande Lecture (2011), the Terzaghi Lecture (2017), and most recently the Mercer Lecture (2019-2020), which recognizes individuals who have made significant technical contributions to the advancement of geosynthetics. He is a past president of the International Geosynthetics Society, the Canadian Geotechnical Society, and the Engineering Institute of Canada. He is a Fellow of the Royal Society and was appointed Officer of the Order of Canada in 2018.

Q: Tell us about growing up in Australia and your decision to leave that country to settle in Canada.

I grew up in the Snowy Mountains of southeastern Australia during the period when the country was building a major hydroelectric scheme to take water flowing to the east coast and transfer it to the dry regions of central New South Wales and Victoria. That development meant building many dams and tunnels. I lived in a construction town called Adaminaby Dam, where every day I could see the progress of building the dam, so from the time I was a little kid, that's what I wanted to do. My father was a public servant and moved our family around after the dam was complete. I lived in small places in New South Wales and boarded in Sydney for the early part of high school before eventually attending the University of Sydney in 1970.

Rowe's first experience using a geogrid to control embankment settlements during roadway construction over peat near London, Ontario, in 1990.

Good mentoring is more important than money. Choosing a job for good mentoring will be much better in the long term than money in the short term.

Dr. Harry Poulos [profiled as the March/April 2016 GeoLegend in *GEOSTRATA*] was an incredible influence on me at the University of Sydney and the person who persuaded me to apply for a PhD there. Later, while on sabbatical at the University of Western Ontario, Poulos learned that Western had been searching for someone who could do sophisticated numerical analysis. He told me that if I applied, Western would hire me, I would get three years of experience there, and then I could return to a job at the University of Sydney. That sounded like a pretty good plan, so I applied and got offered the job. That's how I ended up in Canada.

Q: Your first degree was in computer science, but you quickly reapplied yourself to civil engineering. How did you come to that decision, and what then appealed to you about civil/geotechnical engineering?

I had always intended to be a civil engineer, so it wasn't a change in direction. In the early 1970s, the use of computers for solving practical problems was relatively new, and civil engineers were at the forefront of developing computing algorithms. This included the professor of computer science at the University of Sydney, who was a structural engineer. It seemed to me that this combination would be important going forward, so I selected courses that enabled me to obtain a major in computer science and mathematics (1972) while pursuing my B.E. in civil engineering (1974). That put me in a very strong position with the DPW, where, as a cadet engineer, I wrote their very first computer program to balance cuts and fills, and automate various aspects of airport runway design.

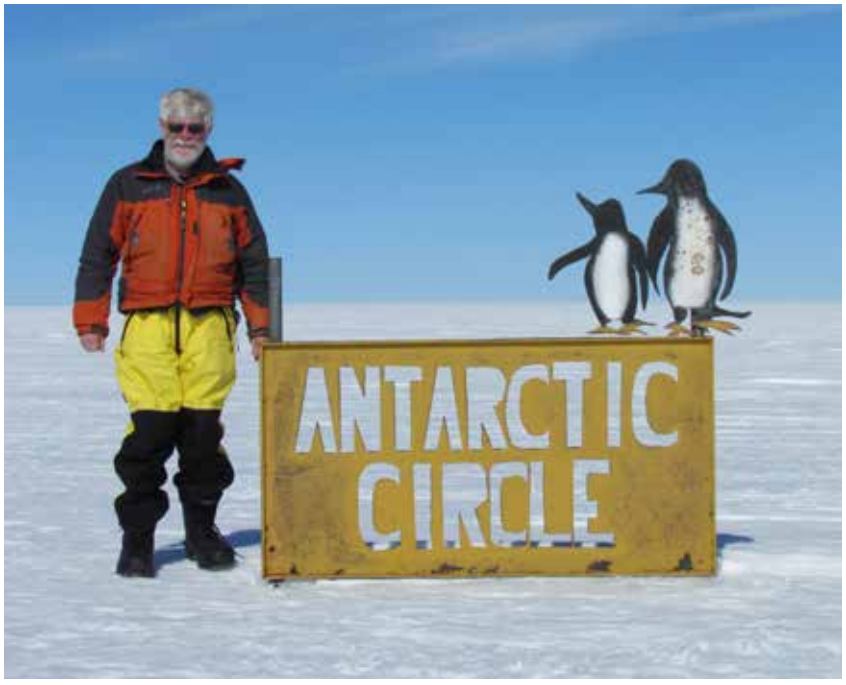
When Poulos persuaded me to do a PhD, I was well positioned because I had that background in computer

Members of the "exclusive" Geosynthetics GeoBeard Club at the GeoAmericas 2016 conference in Miami, FL. (L-R: Kerry Rowe, Bob Holtz, Richard Bathurst, and Ian Peggs.)

science and mathematics, which really played into the work my professor, Dr. Ted Davis, wanted me to do on advanced plasticity analysis. At the time, I was one of a very small group of people to be doing real plasticity and finite element analyses applied to geotechnical engineering. Ultimately this became the core of my PhD thesis. It also positioned me to work with Dr. John Booker, who had a background in applied mathematics, but worked in civil engineering. He and I collaborated from the time I was a PhD student up to his untimely death in 1998. A lot of my early research was built around high-level mathematics and computational theory, and testing theory in practice. This work set me up for my career.

Q: After four years as a geotechnical engineer with the DPW, why did you transition from engineering practice to academia?

I joined the DPW as an indentured cadet engineer (contracted to work for the department for four years after I graduated) early in 1971 and received great training every summer



Rowe at the Antarctic Circle in 2014. He was there to assist the Australian Antarctic Division during construction of a geosynthetic barrier system for the bioremediation to clean up hydrocarbon-contaminated soil.

For research possibilities, I look for problems with important unanswered questions — ones that could have a significant impact if we can resolve the issues and preferably ones on which not too many people are working already. You have a much better chance of making an impact if you don't move into a crowded field!

until I graduated. I worked in the structural design, construction, and roads and aerodromes sections. When I graduated, the head of the investigative section, Bruce Rodway — a fantastic mentor and a good friend to this day — asked me to work in his group. It was a fantastic place to work because we were always trying to push the envelope of what a government department could do: trying new techniques and developing new design methods.

Bruce facilitated my opportunity to do a PhD while I was still under contract to the DPW. As a unionized, public servant, I could work only 35 hours a week. That allowed me lots of spare time to do other things, including modelling that went along with the experimental work at the university. I was spending a lot of time, even after I had submitted my PhD thesis, doing research work at the university in collaboration with Dr. Philip Pells. At that point, I really got interested in pursuing academia. I could also see then that the government was talking about cutting down the size of its public service and transferring work from the DPW to private industry. That's when I realized that my idea of joining as an indentured cadet and retiring as a senior engineer in the DPW probably wouldn't work out for me. This situation positioned me to go into academia.

Q: You're considered one of the "Pioneers in Geosynthetics." How did you first get involved in the field?

It was in many respects fortuitous, as often things are in life. I had arrived at Western because they needed somebody who could do numerical analysis. I went there primarily to work with Dr. K.Y. Lo, who was working on embankments on soft soil and tunnelling. The Ministry of Transportation of Ontario approached him, saying the Ministry had heard about this new material called filter fabric (geotextiles), and they'd been told it was going to do amazing things for soft-ground construction. Geotextiles were not

widely used at the time, and they wanted to try it out on a road they had to build over a peat bog. They wanted someone to help them monitor it and develop some design guidelines. K.Y. was very generous by suggesting that I be asked to do it. We instrumented two sections of the embankment over a 6.9-m-thick peat deposit underlain by sand. The embankment was built placing a different woven geotextile in each instrumented section overtop the closely-cropped vegetation, and then placing the embankment fill over the basal reinforcement geotextiles. The analyses required some fundamental research understanding peat properties. We then developed a model and came up with some design guidelines that are still used today for embankments over peat. That's how I first got involved with the reinforcement side of geosynthetics.

On the environmental side, Dr. Bob Quigley, another very senior engineer and professor at Western, had been looking at contaminant diffusion profiles in thick clay beneath landfills in southern Ontario. He asked me if I would help with the analysis of these profiles, which got me into the area of geoenvironmental engineering, a term that didn't even exist back then. Later, I worked on diffusion through compacted clay liners and thick natural clay profiles common in southern Ontario. My interest then turned to using geosynthetics for lining landfill facilities, which got me investigating geomembranes and geosynthetic clay liners as well as geotextiles, particularly in leachate collection systems.

Q: How do you get your research ideas? Do they spontaneously come to you, or is there a methodical process you follow?

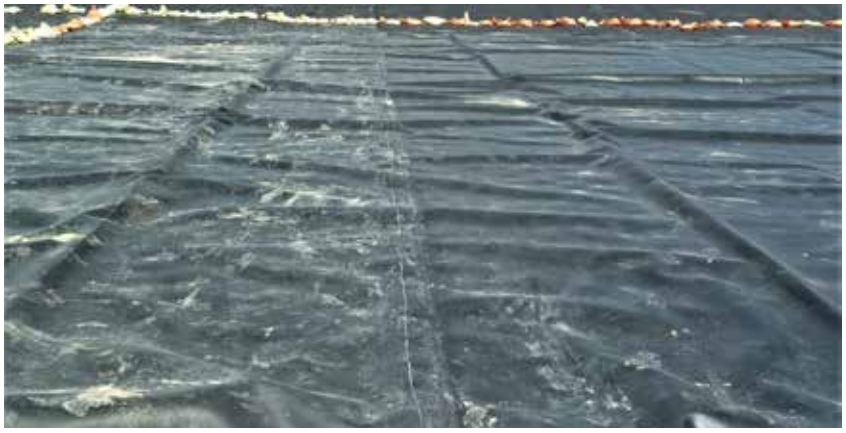
They're often revealed during a consulting assignment. For research possibilities, I look for problems with important unanswered questions — ones that could have a significant impact if we can resolve the issues and preferably ones on which not too many people are working already. You have a much better chance of making an impact if you don't move into a crowded field!

Once starting something, I prepare a plan for what I'm going to do, typically for the next five years. Then I modify the plan as needed as the research progresses. As the research proceeds, you'll get to a point of diminishing returns when you've got a reasonable answer to the question. Then it's time to move on to something else.

Q: Which of your publications is the most impactful or important, and is there one that surprised you with its success, or one that you think is an underappreciated gem?

Probably the biggest surprise was some of my papers on anchor plates from my PhD studies. One of the great bits of advice I got from my PhD supervisor, Ted Davis, was to never limit yourself to what you think is the practical range when you are doing a parametric study. His advice turned out to be very consequential because one of the major applications of my work on anchor plates turned out to be buried pipelines. That was a surprise to me when it happened, and I give full credit to Ted for encouraging me to look broader than the immediate problem I was trying to solve. Having learned that lesson early, that's something I've continued to apply throughout my career.

The underappreciated publication would be, at least until fairly recently, my 1998 keynote lecture at the 6th International Conference on Geosynthetics in Atlanta. An important part of the paper was developing analytical equations to calculate leakage through wrinkles in geomembranes. At the time, leakage was calculated by assuming that geomembranes sit flat on top of the clay liner. After visiting numerous sites, it struck me that there were lots of wrinkles being buried when the drainage layer was placed, and it seemed to me that wrinkles were likely places to get a hole. The probability would be high



V-shaped wrinkles formed in a geomembrane at Queen's University's experimental liner site (2012).

Rowe canoeing with son Kendall at Algonquin Park in southeastern Ontario, Canada (2006).

that there would be at least one hole in a wrinkle, even if it wasn't a biased distribution. But it's biased because wrinkles act as a target for damage. I published an equation in 1998 that could be used to calculate this leakage, but it didn't get much traction. It took almost two decades of patient work to document (with great colleagues and students) the frequency and length of wrinkles, and demonstrate the relationship between the leakage being monitored below primary liners and holes in wrinkles to get it accepted. Sometimes you must exercise a lot of patience.

Q: Did you ever have a failure in your professional life? What did you learn from the experience?

Early on, I was an expert witness in a legal case. Scientifically, we clearly proved that the failure wasn't due to a design flaw as alleged, but the company being sued still lost the case. The company lost not because its engineer had done things that were technically wrong, but rather hadn't documented and communicated the work properly. This upset the judge, and, notwithstanding the engineering facts, he ruled against the company. This experience taught me that being technically right is not always going to win the case, and how important human factors are in engineering failures. To help young engineers appreciate the importance of these things, I now teach a graduate course on human factors in engineering failures that goes through my 40 years of this type of experience.

Q: How does your career compare to what you envisioned when you began?

Apart from the fact that I became a civil engineer and ultimately a geotechnical engineer, in no way has it had any similarity to my initial plan for the first 30 years! But as the song goes, "Life is just a circle." Over the last decade, I've at least approached a realization of my original ambition to build dams. I've been quite involved in a number of different dam projects, including new build, and rehabilitation and upgrading of dams built 50 to 60 years ago. What's amazing is how the many things I had done during the previous three decades positioned me with very useful and uncommon expertise that's applicable to these projects.

Q: What's your most significant contribution to the geotechnical engineering profession, and what are you most proud of from your career?

That's a tough one. Ultimately, my greatest contribution will be people. I'm proud to have trained and mentored so many. Obviously, some have just graduated, and some who graduated almost 40 years ago are now very senior. I've tried hard to keep in contact with most of them.

Technically, the answer is more difficult because it's hard to be objective. I believe the work in understanding the performance of composite liners, in particular their interactions and longevity, is probably the most significant. That work has made its way into the design guidelines and codes, and will likely be even more impactful in the next few years. But if you ask me again next year, my answer may be different.

Q: What advice would you give to engineers looking to pursue an academic career?

I gave this question some thought while preparing for a speech when I was given an honorary degree from Western. First, not all opportunities are good ones, so choose wisely. Second, good mentoring is more important than money. Choosing a job for good mentoring will be much better in the

long term than money in the short term. Also, listen and learn from other people, including your role models and those people you supervise. Everyone comes from a different background from which you can learn. I've had graduate students, particularly the ones from industry, who thought of things I wouldn't have considered.

Q: As an avid outdoorsman, where's your favourite place for an adventure, and what would you be doing?
It depends on your definition of adventure; I would say Antarctica was pretty good. That was work, but also an adventure. In terms of what I would do more regularly, I'm a very keen canoeist. I like to go canoeing, particularly in places like Algonquin Park, once you get away from where the other tourists go.

Q: What are your plans for the future?
Health permitting, for the next 5–10 years I don't see myself doing anything very different from what I'm doing now. Obviously, as I get older, I may slow down a bit, but I don't see any signs of slowing down yet. I'm not even thinking of retiring right now.

That's good news for us. GS

Rowe (center) with co-authors Jean-Luc Armstrong (l) and Cameron Ross (r).

CAMERON ROSS, P.Eng., is a doctoral student in civil engineering at the Royal Military College of Canada in Kingston, Ontario, Canada. His research involves using numerical modeling to improve the understanding of how deep permafrost responds to long-term climatic variability and anthropogenic forcing at the surface. He can be reached at *cameron.ross@rmc.ca*.

JEAN-LUC ARMSTRONG is a captain in the Canadian Armed Forces (CAF) and completed his MASc in civil engineering at the Royal Military College of Canada in Kingston, Ontario, Canada. His research involved the study of cut and filled reservoirs used as wastewater-treatment lagoons, operated by the CAF. He can be reached at *jean-luc.armstrong@forces.gc.ca*.