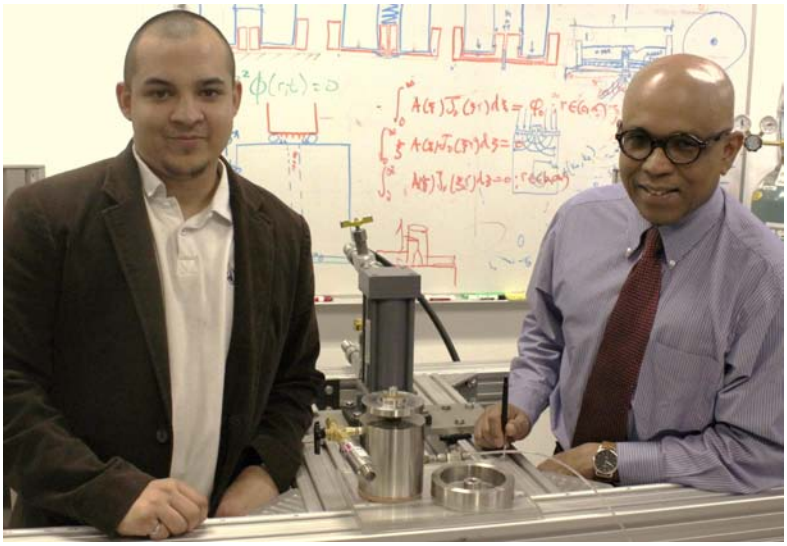
Father-Son paper by McGill Researchers to appear in the prestigious journal *Proceedings of the Royal Society A: Mathematical and Physical Sciences*



The year 2010 marks the 350th Anniversary of the *Royal Society of London*, which publishes *Proceedings of the Royal Society A*, featuring articles across the chemical, computational, Earth, engineering, mathematical, and physical sciences. The research work, conducted by Professor of Civil Engineering and Applied Mechanics A.P.S. Selvadurai FRSC and research assistant Paul Selvadurai, titled "*Surface Permeability Tests: Experiments and Modelling for Estimating Effective Permeability"*, will be published this week in

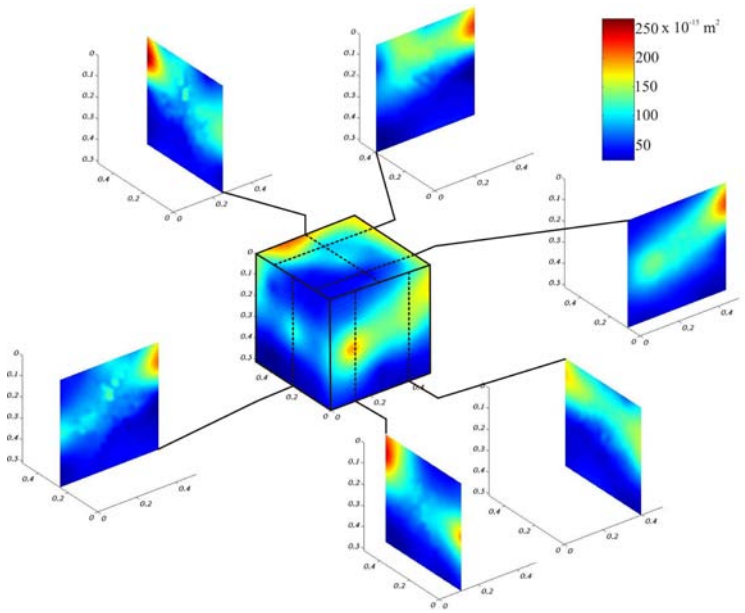
Proceedings of the Royal Society A: Mathematical and Physical Sciences

It appears that this father-son effort may be a modern Royal Society first and represents a successful culmination of research work that started while Paul Selvadurai was an undergraduate in mechanical engineering at McGill; he is currently completing his master's degree in civil engineering with a specialization in geomechanics.

Patrick Selvadurai is *William Scott Professor* and *James McGill Professor* in the Department of Civil Engineering and Applied Mechanics and is recognized world wide for his research accomplishments that led to the *Killam Prize*, the *Max Planck Prize*, the *Killam Research Fellowship* and the *Humboldt Senior Scientist Award*, all within nine years. He comments, "There is a famous saying by Albert Einstein, 'Make everything as simple as possible but not simpler', which summarizes my philosophy to research. I had the good fortune of having as my doctoral supervisor the late A.J.M. Spencer FRS, of the University of Nottingham, UK, whose research epitomized this philosophy. Whatever he worked on resulted in a "gem" of a contribution to the discipline of theoretical solid mechanics; this is, of course, a hallmark of the British tradition in applied mathematics in general; utilitarian, and answers the question without frills!!. I try to follow Tony

Spencer's example quite literally and instill in my students the benefits of this philosophy. The problem that Paul and I worked on required the development of novel experimental techniques, mathematical solutions and computational approaches for determining mathematical descriptions of how fluids flow through porous media. This is a topic for the century where problems related to geomechanics, in particular the environmental geosciences problems dealing with nuclear waste management, carbon dioxide sequestration, contaminant migration in the geosphere and geothermal energy extraction requires knowledge of fluid transport processes in geomaterials, specifically how to upscale the information in a practical and usable way. The applications of the research transcend geosciences; researchers in advanced materials, biomechanics of bone, etc., can benefit from the results of this research approach. What made the research acceptable for publication in the Royal Society Proceedings was its all-encompassing philosophy of experimental research, mathematical modelling and computational modelling and the novelty of the methodologies involved. In particular, the proposal to use an effective permeability to characterize a porous medium is always appealing to the user. This work goes a long way to providing support to the relevance of the approach and to simplifying the modelling in a realistic way."

Paul Selvadurai obtained his undergraduate degree in mechanical engineering at McGill University. As he comments "The undergraduate program in mechanical engineering gave me a solid background in mathematics, mechanics and experimental techniques, which were invaluable to my research efforts. I must also add that I spent two years working as an undergraduate research assistant in Professor Selvadurai's Laboratory, when I had the opportunity to actually fabricate the components required for this research. The access to the Physics Workshop was a real bonus and you begin to appreciate the advice of superb technical staff such as Steve Kecani. The Royal Society paper will be a major milestone in my research career, and to get a publication in such a prestigious journal speaks for the quality and relevance of the geomechanics research being done at McGill. I want to particularly acknowledge the help of McGill professors Yixin Shao, Saeed Mirza and Abdul Ahmed, who were very supportive of my research pursuits. It was difficult to work in an area where McGill's rules of conflict of interest prevented me from even taking much needed graduate courses given by my father. This unnecessarily lengthened my master's program at McGill since I had to audit courses that I would otherwise have taken for credit. During my second year in the Master's program at McGill, my presentation at the Eighth Annual Brace Research Day, Brace Centre for Water Resources Management, was awarded first prize.



The spatial distribution of the permeability in a cube of rock measuring 500 mm, determined from the surface values calculated using mathematical and computational simulations of experiments and extrapolated using kriging procedures.

So what's in store for my future? I have really got interested in geosciences and geomechanics and I think I can make useful research contributions to the application of geomechanics in the enhancement of geothermal energy extraction. I have been admitted to the University of California, Berkeley on a full scholarship, to work towards a PhD degree to study this topic under the supervision of Professor Steven Glaser, a world authority in acoustic emission techniques related to geosciences. The University of California, Berkeley is an outstanding institution with an international reputation, and this is a unique opportunity. In March of this year, I also received an NSERC Fellowship, which is very gratifying. My father is particularly keen that I leave McGill; he does not advise anyone to stay at the same institution for all three degrees, unless this is dictated by other factors. He believes that this leads to a kind of 'academic inbreeding', which is not helpful in the long run…."