The Maurice A. Biot Lecture

Department of Civil Engineering & Engineering Mechanics, Columbia University
Engineering Mechanics Committee, ASCE Metropolitan Section
Engineering Mechanics Institute, ASCE

Contact and Inclusion Problems in Poromechanics

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November 19, 2012 (6:30-7:30 pm)
Room 825 S.W. Mudd Building

Abstract: Contact and inclusion problems in poromechanics serve as a real test for the applicability of Biot's theory of poroelasticity for the solution of problems of interest to geomechanics. The lecture first discusses a classical study by Biot that provided an estimate for the elusive spring constant for a Winkler medium. The lecture then discusses an early study by Biot that extends the work to poroelasticity. The extensions to problems in contact mechanics represents the rigorous formulation of mixed boundary value problems resulting from well-posed initial boundary value problem. The lecture discusses some classical approaches for developing solutions to contact problems and outlines hitherto unsolved problems in this area. The extensions of the work to include damage mechanics of the porous skeleton are also discussed. Solutions to disc inclusion problems are a natural extension to the contact problem.

Biosketch: Dr. A.P.S. Selvadurai obtained his PhD degree in Theoretical Mechanics from the University of Nottingham under the tutelage of the eminent continuum mechanicist the late A.J.M. Spencer FRS. In 1986 he received the DSc in Theoretical Mechanics for research into *"Mathematical Modelling of Problems in Geomechanics and Elastomechanics"*. In 1993, he became Chair of the Department of Civil Engineering and Applied Mechanics, at McGill University, a position he held till 1997. In 1998, he received the *Humboldt Forschungspreis* and in 2000 *Killam Research Fellowship* of the Canada Council for the Arts. In 2003 he received the prestigious *Max Planck Forschungspreis* in the Engineering Sciences and in 2007, the *Killam Prize in Engineering* from the Canada Council for the Arts and the *Gold Medal* of the Canadian Congresses of Applied Mechanics. In 2008 he received the *IACMAG Medal* for Outstanding Accomplishments in Geomechanics and in 2010, the *ALERT Research Medal* by the Alliance of Laboratories in Europe for Research and Technology.

He has held Visiting Professorships at the University of Nottingham, U.K, Universität Stuttgart, Germany, The Laboratoire 3S-R, Université Joseph Fourier, Grenoble, France; The University of Canterbury , Christchurch, New Zealand; The Hong Kong Polytechnic University; The University of New South Wales; Département de Genie Civil, École Polytechnique Fédérale de Lausanne, and The Technical University Delft.

He has published over 255 research papers in archival journals devoted to applied mechanics, geomechanics and applied mathematics, transport in porous media and computational mechanics. He is the author or co-author of texts devoted to *Elastic Analysis of Soil-Foundation Interaction* (Elsevier, 1979), *Elasticity and Geomechanics* (with R.O. Davis) (Cambridge University Press, 1996), *Partial Differential Equations in Mechanics, Vols. 1&2* (Springer-Verlag, 2000), *Plasticity and Geomechanics* (with R.O. Davis) (Cambridge University Press, 2002) and *Transport in Porous Media. Aspects of Micro/Macro Behaviour* (with Yasuaki Ichikawa) (Springer-Verlag, Berlin, 2012). He serves on the Editorial Boards of nine leading International Journals devoted to *Geomechanics, Applied Mechanics, Computational Mechanics* and *Engineering Mathematics*. Dr. Selvadurai is a Fellow of the Engineering Institute of Canada, American Academy of Mechanics, Canadian Society for Civil Engineering, The Institute for Mathematics and its Applications and the Canadian Academy of Engineering. In 2007 he was elected Fellow of the Royal Society of Canada.

The Maurice A. Biot Lecture was established at Columbia University in 2004 in remembrance of the late Prof. Maurice Anthony Biot and his renowned achievements as an engineer, physicist, and applied mathematician. Biot was a professor of mechanics at Columbia University in the period 1937-1945.

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