UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING

Memorial Tribute to

KEITH G. BALMAIN

Professor Emeritus
The Edward S. Rogers Sr. Department of Electrical & Computer Engineering

February 27, 2019

Be it resolved –

> THAT the Council of the Faculty of Applied Science & Engineering record with deep regret the death on January 2, 2019 of Professor Emeritus Keith G. Balmain.

Keith G. Balmain, a world leading scholar in Electromagnetics, Antennas, Electromagnetic Compatibility and Antennas in Plasmas, passed away on January 2, 2019 at the age of 85. Keith had a sharp and clear mind, and could simplify and explain complex concepts with ease. He was a scholar of high integrity and a great mentor.

Keith was born in London, Ontario on August 7, 1933 and spent his teenage years on the Whaley family farm after his father passed away. He received the B.A.Sc. degree in engineering physics from the University of Toronto, Toronto in 1957. He received the M.S. and Ph.D. degrees in Electrical Engineering from the University of Illinois, Urbana, in 1959 and 1963, with theses on printed-circuit dipole antennas and spacecraft-borne dipole antennas in anisotropic plasma. He was an Assistant Professor of Electrical Engineering at the University of Illinois until 1966. He then joined what is now The Edward S. Rogers Sr. Department of Electrical & Computer Engineering, University of Toronto, holding the positions of Professor, and later on Professor Emeritus. From 1991 to 2001, he was the Senior Chairholder of the NSERC/Bell Canada/Nortel Industrial Research Chair in Electromagnetics. He chaired the Division of Engineering Science for two and a half years until 1987, after which, for a three-year term, he chaired the University of Toronto's Research Board. His research has included antennas in plasma, broadband antennas, electromagnetic compatibility, human electrostatic discharge, radio wave scattering from power lines and buildings, Space Shuttle EMC prediction, electrostatic charging and discharging in spacecraft dielectrics, and microwave metamaterials.

Keith Balmain co-authored (with EC Jordan) the second edition of *Electromagnetic Waves and Radiating Systems* (Englewood Cliffs, NJ: Prentice-Hall, 1968) which is a highly-regarded textbook in Electromagnetics and Antennas. He also co-edited (with GV Eleftheriades) one of the first books on metamaterials *Negative-Refraction Metamaterials: Fundamental Principles and*

Applications, (John Wiley & Sons and IEEE Press June 2005). Professor Balmain was a Life Fellow of the IEEE "for contributions to the understanding of log-periodic antennas and antennas in plasmas." He was the co-recipient of the IEEE Antennas and Propagation Society (AP-S) 1970 Best Paper Award, and was a co-recipient of a 1992 NASA Group Achievement Award for an "exceptional engineering assessment of plasma effects from electrical grounding for the Space Station Freedom program." Keith Balmain's scientific papers exude the ingenuity, precision and clarity that were the characteristics of the high-caliber researcher that he was. He was a member of AP-S AdCom (1974–77), an Associate Editor of Radio Science (1978–1980), chair of the Technical Program Committee for the Quebec City 1980 IEEE AP-S International Symposium, and chair of the local Organizing Committee for the Toronto 1999 General Assembly of the International Union of Radio Science (URSI).

Keith was predeceased by his beloved wife Shirley in 2011. He is survived by cousins Tanis, Lorie, Ross and Douglas, and their families. His intellect, integrity, humour, professionalism and humanity will be greatly missed.

Be it further resolved –

> THAT this tribute to Professor Emeritus Keith G. Balmain be inscribed in the minutes of this Council meeting, and that copies be sent to his family as an expression of the respect and gratitude of the members of this Council.

Prepared by Professor George V. Eleftheriades in consultation with
Professors Costas D. Sarris and Sean V. Hum.