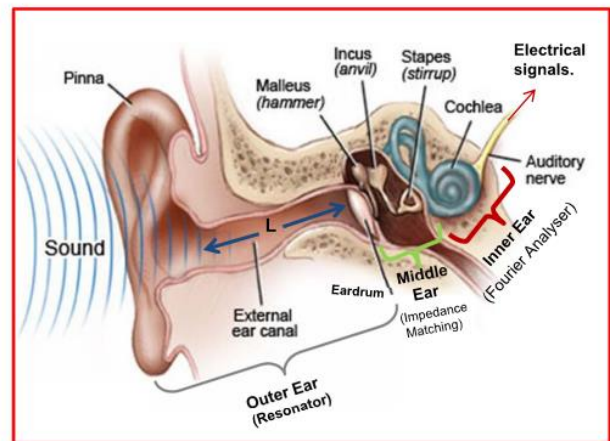# Cochlear Modelling: Future Directions

by Professor Eliathamby Ambikairajah, BSc (Eng), PhD, FIET, CEng, FIEAust, CPEng, SMIEEE, Head of School of Electrical Engineering & Telecommunications, UNSW, Sydney, Australia

Public Lecture held on 16th June 2019 at UNSW Electrical Engineering Building in Sydney.

The human cochlea is a critical part of the human auditory system, serving as the main sensory organ that transforms the acoustic signal to a mechanical movement and thereafter to a neural signal. The cochlea is unique and has some amazing characteristics, including very fine frequency resolution, wide dynamic range and rapid adaptability to different input sounds levels. Its importance as a spectrum analyser has been recognised in the design of cochlea implants and speech and speaker recognition systems. In the presentation, cochlear modelling was discussed from simple through to more advanced cochlear filter models. The application of these models to key speech processing systems, and the evolution of their design was explained. Future approaches to cochlear models in a deep learning paradigm were discussed, including building an active cochlear model. During question and answer session two participants with cochlear implant discussed the problems they had before the cochlear implant. They mentioned that the cochlear technology helped to improve their quality of life. Another highlight in the presentation was when Prof Ambikairajah paid tribute to the free education, the quality of the education he received from Sri Lanka. He told the audience that

Peripheral Auditory System

consisted of mainly UNSW academics that all what he achieved was due to the free education he received in Sri Lanka from primary to University. The presentation slides can be found here. The live broadcast video can be found here.

Professor Eliathamby Ambikairajah received his BSc(Eng) (Hons) degree from the University of Sri Lanka, Katubedde Campus and received his PhD degree in Signa l Processing from Keele University, UK. He was appointed as Head of Electronic Engineering and later Dean of Engineering at the Athlone Institute of Technology in the Republic of Ireland from 1982 to 1999. His key publications led to his repeated appointment as a short-term Invited Research Fellow with the British Telecom Laboratories, U.K., for ten years from 1989 to 1999.

He is currently the Head of School of Electrical Engineering and Telecommunications, University of New South Wales (UNSW), Australia. His research interests include speaker and language recognition, emotion detection and biomedical signal processing. He has authored and co-authored approximately 300 journal and conference papers and is the recipient of many competitive research grants. He is also a regular reviewer for several IEEE, IET and other journals and conferences. Due to his contributions to speaker recognition research, he was appointed as a Visiting Scientist with the Institute of Infocomm Research (A*STAR), Singapore in 2009-2018, and is currently an Advisory Board member of the AI Speech Lab at AI Singapore.

Early in his career, Prof Ambikairajah earned the Best Paper Award for Younger Members by the IEE (UK). He received the UNSW Vice-Chancellor's Award for Teaching Excellence in 2004 for his innovative use of educational technology, the School Awards for Teaching Excellence in 2003, Academic Management in 2001 and again in 2014 he received the UNSW Excellence in Senior Leadership Award.

Professor Ambikairajah was an APSIPA Distinguished Lecturer for the 2013-14 term. He is a Fellow and a Chartered Engineer of the IET UK and Engineers Australia (EA) and is a Member of the IEEE and APSIPA.