

## BUA's 40 Anniversary – Is It About Time?

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### Introduction:

The presentation will provide an overview of my fortunate BUA medical device innovation journey - from initial concept, through prototyping, to commercialisation and clinical trials; as well as the shift from immersion to contact coupling. The 40 year old question of 'What is BUA measuring?' will also be discussed, incorporating the concept that phase-interference may be the primary attenuation mechanism.

### Biosketch



Christian Langton developed the technique of broadband ultrasonic attenuation (BUA) for osteoporosis assessment. He was awarded a DSc (University of Hull, UK) in 2007 and Honorary PhD (University of Eastern Finland) in 2015 for his extensive contributions to science, technology and clinical utility. His research has attracted over 7500 publication citations with a h-index of 43. Dr Langton currently serves as a Chief Investigator and Senior Research Fellow for an Australian NHMRC funded research project aimed at improving residual limb health for amputees, hosted by the Griffith Centre of Biomedical and Rehabilitation Engineering.

### Top 10 Ultrasound Characterisation of Bone Innovations

- 1) Broadband ultrasonic attenuation (BUA) for assessment of osteoporotic fracture risk; 1984
- 2) World's first immersion commercial ultrasound bone analyser, UBA1001; 1986 US patent
- 3) Contact ultrasound bone analyser, McCue CubaClinical; 1993 US patent
- 4) Electronic Phantom, simulating ultrasound propagation through cancellous bone; 1996 US Patent
- 5) ZSD (standard deviation of Z-score): a universal parameter for measurement precision; 1997
- 6) *Langton Concept*, phase-cancellation is primary attenuation mechanism in cancellous bone; 2011
- 7) Ultrasound transit time spectroscopy for improved material characterisation and imaging; 2014
- 8) Combined transmission / pulse-echo ultrasound computed tomography system; 2017
- 9) 3D-printed ultrasound phase-interference compensator to reduce transcranial degradation; 2018
- 10) Dynamic Anatomical Ultrasonography to assess residual limb bone movement during motion; 2019