

Selected research topics in Biomedical Engineering: Novel Phenotyping and Diagnostic Tools

Location: Lecture room 14.03.002, Department of Biomedical Engineering, Allschwil,

Date and time: Thursday, 12.12.2019, 2019, 12:30-14:00

## ***General axial resolution limit for tissue imaging***

*Prof. Martin Leahy*

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**Abstract:** This talk will discuss the depth-resolution limit for medical and biological imaging and the strategies to challenge this limit. I will argue that the depth to axial resolution ratio is capped at  $\sim 200$  for all practical forms of medical imaging in scattering tissues. I will further discuss some attempts to circumvent this limit to extract nanoscale structural and functional information from deeper tissue

### **Curriculum:**

Martin Leahy completed a DPhil in Biophotonics at Oxford, is the Chair of Applied Physics at NUI Galway, Distinguished Visiting Professor at ICFO and a serial entrepreneur having been technical and/or managerial lead of five successful spin-out companies in biophotonics and energy. His main research interest is in the development of new modalities such as TiVi and cmOCT for 2D, 3D and 4D imaging of the microcirculation. His group has invented cmOCT to image the microcirculation, nanosensitive OCT to sense nanostructure, the brightest available nanoparticle for photoacoustic imaging and multiple reference OCT to achieve a 100-fold reduction in size and cost. However, his group is probably best known for the invention of the heart rate app, which is now in use by more than 200 million people and is integrated into IOS and Android. More recently, his group have developed a label-free superresolution microscope and the brightest nanoparticle for deep *in vivo* imaging. He has secured more than €14M in external R&D funding since 2007, including industry, EU and SFI. Since 2010 he has delivered 40 international invited lectures and published 43 senior author journal articles and more than 500 patents cite his work. Professor Leahy retains a healthy involvement in industrial R&D, collaborating with start-ups such as Compact Imaging and multinationals like Covidien, Fujifilm and VisualSonics. TOMI NUI Galway will substantially expand its facilities following several recent major funding wins from EU Horizon 2020, SFI, IRC and industry totalling €7 million. These wins acknowledge progress in miniaturizing Optical Coherence Tomography (OCT), providing label-free nanosensitivity and superresolution deep within samples and the development of the brightest nanoparticle for in vivo deep tissue imaging.