

Canadian Association of Physicists and UNBC Department of Physics

Optoacoustic Imaging: Lightning and thunder in tissues

Abstract:

For centuries, humans have been mesmerized by the light and sound display during a lightning and thunderstorm. In 1880 Alexander Graham Bell observed a similar phenomenon in his lab, generating sound waves by exposing selenium cells to a modulated beam of light. He called his discovery, the photophone, and although this was the first-ever wireless sound transmission, Bell focused his efforts on another invention, the telephone. Today 135 years later, with advances in photonics, ultrasonics and nanomaterials, the production of sound by optical interactions at the nanoscale is being used to develop new medical imaging technologies, referred to as optoacoustic imaging.

Think lightning and thunder in tissues. First nanosecond pulsed laser light is sent into tissues and absorbed by tissue chromophores such as hemoglobin (the lightning strike). This results in thermal expansion of the target and subsequent generation of sound waves (thunder) that travel back through the tissue and are collected by transducers. By measuring the time delay between the lightning and thunder, one can locate the target (eg tumour) inside the body. By measuring the frequency of the sound waves, one can distinguish between healthy tissues and diseased tissues, such as cancers. Yes, recent studies demonstrate that cancer emits unique sound frequencies. This talk will lead you on an international expedition of new optoacoustic imaging technologies and their medical applications, all of which are positioned to have a significant impact on health care.

Short Biography:

Bill Whelan grew up on PEI and received a BSc (Physics) degree from the University of Prince Edward Island - UPEI, and MSc and PhD degrees (Medical Physics) from McMaster University. Immediately after graduate school he joined the faculty at Ryerson University in 1996. Then in 2008 he accepted a Tier II Canada Research Chair appointment at UPEI. Currently he is a Professor with the Departments of Physics and Biomedical Sciences at UPEI. Dr. Whelan's research interest is in the field of biomedical optics with a focus on optoacoustic imaging and near infrared optical spectroscopy for cancer diagnosis and treatment monitoring. He has served as Chair of the Division of Medical and Biological Physics and Director of Communications for the Canadian Association of Physicists (CAP), and he is currently Chair of the CAP-NSERC Liaison Committee. In the community, Dr. Whelan is Chair of the PEI Science Fair, he Co-Chaired the Canada Wide Science Fair in 2012 and he served as a Director of the Canadian Cancer Society.

Dr. William M. Whelan

**Departments of Physics and Biomedical Sciences
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3:30 – 5:00 PM

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