

Mathematician in a Minefield

Professor Bill Lionheart
(University of Manchester)

6.00pm on Thursday 29th November 2018
[Refreshments for IMA Members at 5.45pm]

University of Manchester
Room G107, Alan Turing Building, M13 9PL

Abstract

Anti personnel land mines contain a small amount of metal to make them hard to detect, and millions of these still pose a danger long after conflicts have ceased. Conventional metal detectors beep in proximity to metal. Mine clearance standards mean that every piece of metal has to be dug up before a minefield is declared to be cleared. Most of the time is taken up by false positives. Our aim is to improve metal detectors so that they can locate and characterize multiple metal objects.

In this talk I will tell you the story of the mathematical journey to get to the theory we needed to do this. On the way I will talk about measuring the rank of a symmetric tensor, and how to choose six measurements to determine a rank 2 tensor. I will tell you how this relates to Pascal's classical theorem in projective geometry. I tell you how we got the theory wrong before a conference talk and spent a Thursday in Dunkin' Donuts in Korea reworking the theory, redoing the calculations and rewriting the talk for Friday. I will show you pictures of my visit to a minefield in Cambodia, and tell you how far my colleagues in Elec Eng have got with developing a new mine detector.

If you know the first thing about tensors you will probably understand all of the talk, and if not you may still enjoy the story.

About the Speaker

Bill Lionheart is Professor of Applied Mathematics at the University of Manchester. He works on inverse problems, typically making images of the inside of things from measuring on the outside and is interested in every thing involved in that from analysis and geometry to practical numerical calculations; and applications including medical imaging, security screening, materials science and non-destructive testing. He is a vegan, even though he has four upper canine teeth.



For further information, please contact Margaret Eastwood margareteastwoodimanw@gmail.com

No charge is made to attend meetings. Non-IMA members are welcome.