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The interplay of the concrete and general: from PDEs to medical imaging

Athanassios S. Fokas

Department of Applied Mathematics and Theoretical Physics
University of Cambridge, Cambridge, CB3 0WA, UK
T.Fokas@damtp.cam.ac.uk

Abstract

The need to solve a concrete problem of physical significance occasionally leads to the development of a new mathematical technique. It is often realised that this technique can actually be used for the solution of a plethora of other problems, and thus it becomes a mathematical method. In this lecture a review will be presented on how a problem posed by the late Julian Cole led to the development of the so called unified transform, which provides a novel and powerful treatment to boundary value problems for linear and integrable non-linear PDEs. Interesting connections with the Riemann hypothesis, as well as the development of several effective algorithms for Medical Imaging, will also be reviewed.