THE DAVID CRIGHTON MEDAL

Report

The 2015 IMA-LMS David Crighton Medal was awarded to Professor Frank Kelly, CBE, FRS, Hon FIMA, at The Royal Society on 12 May 2016.

The audience of IMA members, LMS members and invited guests was welcomed by the President of the IMA, Professor Chris Linton, CMath FIMA, who reminded the audience that the David Crighton Medal was instituted in 2002 in memory of Professor David Crighton, who was President of the IMA and President-designate of the LMS.

Professor Simon Tavaré, FRS FIMA, LMS President, then introduced Frank Kelly, reading the citation below and introducing Frank's talk with the observation that Frank has always had a way of making very difficult things seem very simple. The citation reads:

Frank Kelly is awarded the David Crighton Medal of the London Mathematical Society and the Institute of Mathematics and its Applications for services both to mathematics and to the mathematical community. Kelly's work on the fundamental properties of communication networks has had direct application to the design of telephone networks and internet protocols. The importance and impact of his work more broadly is reflected in the large number of citations his papers receive, together with the award of international prizes. He is the Head of a Cambridge college, and has chaired groups working to improve children's experience of mathematics. He has been Chief Scientific Adviser to the Government (Department for Transport) and chaired the Council for the Mathematical Sciences at an important time for the mathematics community. He was elected a Fellow of the Royal Society in 1989 and awarded a CBE in 2013.

Professor Frank Kelly began his engaging lecture by remembering how well-loved David Crighton was at Cambridge and showing us some photos at www.damtp.cam.ac.uk/about/dgc/.

The lecture, *Mathematics and Financial Markets,* centred around a simple and analytically tractable model of a limit order book that Frank developed with Elena

Simon Tavaré presents the award to Frank Kelly

Frank Kelly

Simon Tavaré, Frank Kelly and Chris Linton (l to r)

Yudovina (http://arxiv.org/abs/1504.00579). Frank suggested that this simple model could be used to gain insight into trading strategies and allow regulators (and society) to decide which trading behaviours they would like to encourage. Frank also noted that many mathematics graduates are traders, but few are regulators and suggested that the market needs more advanced mathematics (not less) as is often suggested after the 2008 financial crash.

After the lecture Chris Linton thanked the speaker for an excellent talk that demonstrated how a simple mathematical model can have real world applications.

Rebecca Waters
IMA Editorial Officer
Mathematics Today

CECIL KING TRAVEL SCHOLARSHIP

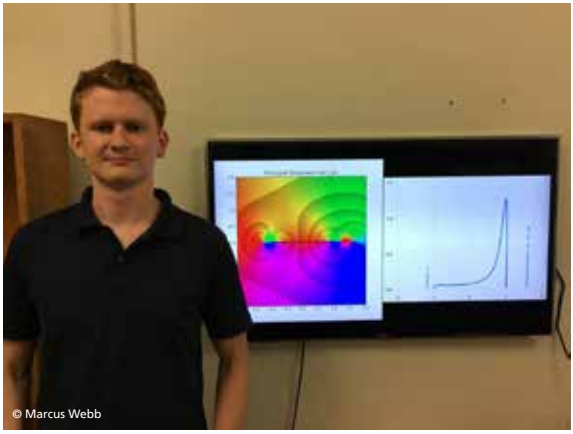
Report

I used the Cecil King Travel Scholarship to travel to visit Sheehan Olver at the University of Sydney for three months from January to April 2016. We worked on some problems in computational spectral theory and related problems in orthogonal polynomials.

The first outcome of my research was that the so-called connection coefficient matrix, which is the change of basis matrix between two families of orthogonal polynomials, is a useful new tool for the spectral theory of the Jacobi operators. I proved that for Jacobi operators that are a finite rank perturbation of Toeplitz, the connection ceofficients matrices provide an explicit, computable formula for the spectral measure.

We also investigated the infinite dimensional QL algorithm, which allowed us to formulate a method of transforming these Jacobi operators to a canonical form and implement a functional calculus. We were able to store these highly structured infinite dimensional matrices in finite memory and perform the operations without losing that information: it is an early example of truly infinite dimensional numerical linear algebra.

Alex Townsend (MIT) also visited Sheehan for three weeks in February. We discovered that the connection coefficient matrix for Jacobi polynomials with different parameters can be decomposed using Hadamard products of Toeplitz and Hankel matrices, leading to a new class of fast polynomial transforms.



Marcus Webb

I am very grateful to the London Mathematical Society and the Cecil King Foundation for not only giving me an opportunity to develop as a researcher, but also to escape the British winter.

Marcus Webb
University of Cambridge