Department of Mathematics and Statistics

INAUGURAL LECTURE

University of Reading

School of Mathematical, Physical and Computational Sciences

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From the human eye towards the eye of the storm: a journey in sparsity

A constant requirement in scientific computing is to solve larger or harder problems or to solve existing problems faster and more accurately. Frequently, this involves solving linear systems of equations. Such systems arise both in their own right and as vital sub problems when solving nonlinear problems. In many industrial applications, such as the analysis of very large structures, industrial processing of complex non-Newtonian fluids, and the simulation of car bodies, the solution of large, sparse linear systems of equations is the single most computationally expensive step. Thus, reducing the linear system solution time results in significant savings in the total simulation time and allows real-time decision making, while novel approaches that allow larger systems to be solved accurately enables the solution of previously intractable problems.

From my first experience of sparse matrices, which involved calculating temperatures in the human eye, to my current role in the Mathematics of Planet Earth Centre for Doctoral Training, my research over the past 30 years has focused on the development of algorithms for solving linear systems and on the design, development and maintenance of mathematical software for implementing these algorithms. This software is available to the academic community and to commercial customers and it is used worldwide to solve a huge diversity of computational problems.

In this talk, I will present an overview of some of the key issues that have to be addressed in the development of algorithms and software for solving sparse linear systems. I will look back at what has been achieved in the field and highlight current and future challenges.

Friday, 24th November 2017 at 3pm

In Chemistry LT1