DAVID SPROTT DISTINGUISHED LECTURE BY

# DAVID L. DONOHO

## DAVID L. DONOHO

David Donoho is a Professor of Statistics and the Anne T and Robert M Bass Professor of the Humanities and Sciences at Stanford University. He earned his AB in Statistics from Princeton and his PhD in Statistics from Harvard. He began his career in the Department of Statistics at the University of California Berkeley and later moved to the Department of Statistics at Stanford University. He has also worked for Western Geophysical Company and Renaissance Technologies. He was co-founder of network management software company BigFix. His publication list covers Robust Statistics, Signal and Image Processing, Mathematical Statistics, Harmonic Analysis, Scientific Computing, and High Dimensional Geometry. He has made ground-breaking contributions to theoretical and computational statistics, as well as to signal processing and harmonic analysis. His algorithms contributed profoundly to the understanding of the maximum entropy principle, of the structure of robust procedures, and of sparse data description.

He is a member of the United States National Academy of Sciences as well as a foreign associate of the Academie des Sciences of France and has been named a MacArthur Fellow, a Fellow of the American Academy of Art and Sciences, a Fellow of the Society for Industrial and Applied Mathematics, and a Fellow of the American Mathematical Society. He has received the COPSS Presidents' Award, the John von Neumann Prize, and the Norbert Wiener Prize. He holds an honorary doctorate from the University of Chicago and in 2013 became a Shaw Prize Laureate in the Mathematical Sciences.

# Factor Models and PCA in light of the spiked covariance model

**Thursday, October 20, 2016 | 4 p.m.**
**M3 1006, University of Waterloo**
Reception will follow in the M3 Bruce White Atrium

Principal components analysis and Factor models are two of the classical workhorses of high-dimensional data analysis, used literally thousands of times a day by data analysts the world over. But now that we have entered the big data era, where there are vastly larger numbers of variables/ attributes being measured that ever before, the way these workhorses are deployed needs to change.

In the last 15 years there has been tremendous progress in understanding the eigenanalysis of random matrices in the setting of high-dimensional data in particular progress in understanding the so-called spiked covariance model. This progress has many implications for changing how we should use standard `workhorse' methods in high-dimensional settings. In particular it vindicates Charles Stein's seminal insights from the mid 1950's that shrinkage of eigenvalues of covariance matrices is essentially mandatory, even though today such advice is still frequently ignored. We detail new shrinkage methods that flow from random matrix theory and survey the work of several groups of authors.

### David A. Sprott (1930-2013)

Professor David Sprott was the first Chair (1967-1975) of the Department of Statistics and Actuarial Science at the University of Waterloo and first Dean of the Faculty of Mathematics (1967-1972). The David Sprott Distinguished Lecture Series was created in recognition of his tremendous leadership at a formative time of our department, as well as his highly influential research in statistical science.

**UNIVERSITY OF WATERLOO**
**FACULTY OF MATHEMATICS**
Department of Statistics
and Actuarial Science

C011665