Joint Seminar

Schools of Earth Sciences + Mathematics and Physics

Wednesday 25th November
3pm CODES Conference Room
(Earth Sciences)

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When one of the things that you don't know is the number of things that you don't know.

In the Earth Sciences when we fit parameters (or models) to data it is common to fix the number of unknowns in advance. This can be troublesome, because if too few are chosen then the data are poorly fit. If too many, then we risk building unduly extravagant models that may have little to do with the real world, or worst still the problem becomes intractable. In some cases arguments can be used to bound the maximum number of parameters that need to be considered, or statistical tests used to choose an optimal number of unknowns to fit.

In recent times the nature of the parametrization itself has come under scrutiny. As a result variable, or self-adaptive, parametrizations have gained in popularity, particularly in applications like seismic imaging for subsurface structure. Rarely, however, is the number of unknowns itself directly treated as an unknown to be solved for. This presentation will focus on this problem and outline a powerful methodology for its solution. Examples to be presented include simple curve fitting of x,y data as well as more complex examples from geophysics (including seismic imaging), geochronology and geochemistry (including the reconstruction of holocene climate variations from peat cores). The ideas here are quite general and can be readily applied to other problems where we would prefer to relax arbitrary and often unjustified assumptions about the number and type of unknowns.