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Colm Connaughton is an associate professor at the University of Warwick. His research is focused on non-equilibrium statistical mechanics, fluid dynamics and inter-disciplinary mathematics. He is particularly interested in the statistics of fluctuations in out-of-equilibrium systems and the formation of coherent structures from stochastic dynamics.

Originally from Ireland, he got his PhD in applied mathematics from Warwick in 2003. He subsequently held fixed term research appointments at the Ecole Normale Superieur in Paris and at the Center for Nonlinear Studies at Los Alamos National Laboratory in the United States before returning to the UK to join the faculty at Warwick in 2008.

He is currently the course coordinator for Warwick's Mathematics of Real World Systems Centre for Doctoral Training and from October of this year will take over as the director of the Warwick Centre for Complexity Science.

Stochasticity in Models of Complex Dynamics

A common qualitative feature of complex systems is that they are neither completely random nor completely ordered. Rather they are somewhere in between. Coherent patterns or structures coexist with disordered fluctuations which often look random in nature. One might ask the following question: if one observes the dynamics of a complex system for long enough, can one quantify the amount of randomness present? This is not an easy question to answer. While we may think we have an intuitive picture of what randomness looks like, in many situations our intuition can be misleading. It seems the human mind is not very good at thinking probabilistically.

In this talk I will give a personal and non-technical perspective on some of the issues which arise when using stochastic processes (i.e. random functions) as tools to think about, or to model, complex dynamics. In particular, the statement "on average A causes B" is an example of the kind of conclusion one might hope to draw after bringing a "complexity lens" to bear on the dynamics of a real-world complex system. If we pick such statements apart however, we find we must confront concepts such as predictability, ergodicity, causality and correlation which require going beyond purely descriptive statistics. Mathematical models sometimes provide a useful complementary perspective on problems for which descriptive statistics fail to provide fundamental understanding. Accounting for randomness in such mathematical models introduces additional conceptual subtleties, some of which we will discuss.