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Meet the Editors

SUSAN STEPNEY

Susan Stepney is Professor of Computer Science and Director of the York Centre for Complex Systems Analysis at the University of York, UK.

Her first degree is in Natural Sciences (Theoretical Physics) at the University of Cambridge. She followed this with Postgraduate Certificate of Advanced Study in Mathematics ("Part III Maths"), and a PhD in Theoretical Astrophysics at the Institute of Astronomy, Cambridge, researching relativistic astrophysical plasmas, which involved solving analytical equations, and also writing a numerical radiative transfer simulation in Fortran IV, using an IBM 370 and a Cray I.

After a stint as a postdoctoral research fellow, she left academia to work in the software industry. She spent five years at GEC-Marconi Research in Chelmsford. There she was a member of the ParSiFal (Parallel Simulation Facility) project, a collaborative Alvey project involving Transputers and occam; she designed and implemented the GRAIL (Graphical Representation of Activity, Interconnection and Loading) tool. She did her first formal methods work then, on the collaborative Alvey Admiral project, using the Z formal specification language. This involved specifying an access control system in Z, then animating it, which included writing a VT100-graphics user-interface in Prolog.

Next she spent 13 years as a consultant with Logica in Cambridge, specialising in Z specification and proof, and other mathematical modelling, of IT systems. She applied these techniques to the DeCCo high integrity compiler, and to E6 Smart Card Applications including the Mondex Purse. She also supported Logica's Formaliser formal language tool, which involved her learning the object-oriented language Smalltalk. At Logica she was also involved in various collaborative DTI and IED research projects—PROST Objects, ZIP, ORCA—and was a member of the BSI/ISO international Z standardisation team.

In 2002 the opportunity arose to return to academia. She joined York, and started researching unconventional computation, complex systems, and artificial life.

Her work on unconventional computation focuses on physical computation: what are the challenges of unconventional computing (Stepney et al., 2005); what does it mean for a physical system to compute (Horsman, Stepney, Wagner, & Kendon, 2014); what are the requirements for programming unconventional devices (Stepney, 2012); and what are the connections between different models of physics and of computation (Stepney, 2014).

Her work on complex systems has focussed on building principled computer simulations of artificial and natural complex systems, in terms of "simulation as a scientific instrument". The approach is called CoSMoS (Complex Systems Modelling and SImulation) (Hoverd & Stepney, 2014). She is using the CoSMoS approach in the EU-funded EvoEvo (Evolution of Evolution) project to design and implement a novel evolutionary algorithm that incorporates concepts from the latest research on biological evolution. In recent work, ideas from computational modelling and CoSMoS have contributed to a definition of open ended novelty (Banzhaf et al., 2016).

Her work on artificial life focusses on Artificial Chemistries (AChems), and on sub-symbolic AChems in particular. AChems use inspiration from chemistry to build and explore combinatorically vast spaces of complex constructions; sub-symbolic AChems take further inspiration from chemistry in allowing the "chemical" properties to emerge from underlying structure (Faulconbridge, Stepney, Miller, & Caves, 2009).

She is a member of the Engineering and Physical Sciences Research Council's ICT Strategic Advisory Team. She is currently Vice President of the International Society for Artificial Life. She serves on the editorial board of several international journals: IJUC, IJPEDS, Natural Computing, and Artificial Life.

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