CHAPTER 1

Introduction

Robert Geyer and Jan Bogg

In his most famous work, *The Communist Manifesto*, Karl Marx proclaimed that 'a spectre is haunting Europe – the spectre of Communism'. We want to claim that a new spectre is haunting Europe and beyond: the spectre of complexity. Our claim may not be wrapped in so flowery and revolutionary prose, but the long-term impact of complexity thinking on the fundamental understanding of our natural and social worlds may be even more radical and revolutionary. For both of us, complexity thinking has drastically reshaped our perceptions of our own fields, the nature of higher education, interactions between academic disciplines, the constraints and potential of public policy and the role of social systems in human development. In essence, we have undergone a so-called 'paradigm shift' in our own thinking. Or, as the Nobel Prize winning Ilya Prigogine eloquently argued:

> '*We believe that we are actually at the beginning of a new scientific era. We are observing the birth of a science that is no longer limited to idealized and simplified situations but reflects the complexity of the real world, a science that views us and our creativity as part of a fundamental trend present at all levels of nature*' [1].

What is complexity and how has it developed as an academic discipline?

We see complexity as a broad term for describing and understanding a wide range of chaotic, dissipative, adaptive, nonlinear and complex systems and phenomena. Emerging out of the physical sciences in the early to mid-20th century and increasingly spilling over into the social sciences at the end of that century, complexity is a new and exciting interdisciplinary approach to science and society that challenges traditional academic divisions, frameworks and paradigms.

Until recent decades, many of the discoveries in the natural sciences were formulated within a linear paradigm that emerged during the Enlightenment. Descartes and Newton were the principal architects of the new paradigm: the former advocated intellectual rationalism, whereas the latter presented a whole raft of fundamental physical laws. Given this belief in human rationality and fundamental physical order, there seemed to be no limit to the ability of human beings to

comprehend and hence control the natural world. The phenomenal success of the Industrial Revolution was built on this paradigm.

However, during the 20th century the natural sciences began to experience a Kuhnian 'paradigm shift' that propelled them beyond the confines of the Newtonian linear paradigm. The extraordinary mathematical work of Henri Poincaré, insights into the butterfly effect of the American meteorologist Edward Lorenz, Nobel Prize-winning work of physicist Murray Gell-Man, biological studies of Stuart Kauffman at the Santa Fe Institute and work of many others probed and then expanded the limits set by Newton and Descartes.

Not surprisingly, the earlier success of the linear paradigm in the natural sciences had a profound effect on the social sciences. Surrounded by the technological marvels of the Industrial Revolution, it did not take much of an intellectual leap to apply the lessons of the physical sciences to the social realm. Adam Smith and David Ricardo claimed to have captured the laws of economic interaction. Karl Marx wedded his vision of class struggle to an analysis of the capitalist mode of production to create the 'immutable' and deterministic laws of capitalist development. Economics, politics, sociology all became 'sciences', desperate to duplicate the success of the natural sciences. Moreover, this desire was institutionalised through the development of modern universities that created and reinforced the disciplinarisation and professionalisation of the social sciences [2].

Using the Newtonian frame of reference, modern social scientists assumed that physical and social phenomena were primarily linear and therefore predictable, orderly and would reach stable endpoints. The notable international success of Francis Fukuyama's book, *The End of History and the Last Man* (1993), which claimed that history had reached its endpoint, demonstrates the enduring attraction of the linear framework. However, in the past two decades complexity has begun to permeate the social sciences as well. Like the transformation in the natural sciences, the complexity paradigm does not disprove linear social science, but argues that there is a range of social phenomena beyond the boundaries of that framework. For the social sciences, complexity acts like a bridging strategy between order and disorder and significantly refocuses the basis for understanding social life and state action. Instead of searching for and trying to impose some type of final order (be that a new 'Third Way' or a 'new and improved' health system), researchers and policy practitioners are starting to look for ways of promoting complex interactions and systems for enhancing rather than eliminating complexity.

How did the 2005 Complexity, Science and Society Conference emerge and what did we learn?

Excited by the growing potential of complexity for public policy and the social sciences and as a tactic for breaking down the barriers between the social and natural sciences, Robert Geyer and Samir Rihani founded the Complexity Network (CN) in January 2002. It was designed as an informal network to promote complexity theories and applications in the University of Liverpool and Merseyside region, and increase symbiotic linkages between regional, national and international complexity organisations and activities. Its first meeting attracted academics from 20 different departments, the most interdisciplinary event that many of the

participants had ever attended. Subsequently, the CN organised a website and held a conference, 'Introducing Complexity', in April 2002, which attracted participants from 35 different academic departments as well as several other business and governmental representatives.

Building on the success of the CN, the Centre for Complexity Research (CCR) was created in April 2003, directed by Robert Geyer. Jan Bogg joined as Co-Director in October 2004 and the CCR instigated several complexity-related events and began supporting various complexity research projects and initiatives. Meanwhile, the CN continued to grow to over 750 members from every major academic discipline in 45 different countries.

In 2003, we began planning for the 2005 Complexity, Science and Society (CSS) conference. We knew what we wanted, a major international event that would show the unique interdisciplinary power of complexity, but we did not really know what it would look like. Our first step was to organise subject coordinators who could provide the necessary linkages to the different disciplines. During 2003 and 2004, subject areas began to solidify, a conference website was put together and all of the detailed work of planning the conference venue and accommodation began. The conference was very successful, attracting over 400 participants in 18 subject areas from 30 different countries. Full conference details are available at www.liv.ac.uk/ccr.

Conference evaluations were very positive and we learned several key lessons about organising interdisciplinary complexity conferences, including:

- Subject coordinators are the real strength of a successful conference. Like any complex system they must be given general parameters and then allowed to develop their own strategies. Some will fail and some will succeed. Accepting that inevitable unevenness is part of the process.
- Different disciplines have different academic 'currencies'. We were constantly surprised by the different social norms and tactics of different disciplines. From the need to publish conference papers, to organisational structures, to approaches to conference pricing (some wanted high conference registration fees to attract 'respect' for the conference), each discipline had distinctive aspects that needed to be integrated or compromised.
- Linking activities are essential. To encourage interdisciplinary interaction we kept the daily sessions to a minimum and allowed for plenty of 'coffee time', hosted daily plenary sessions and organised coordinated social events. However, we could have done more with 'break out' sessions, open workshops or even assigning people to take part in the activities of unrelated disciplines.
- Get the basics right, but don't forget about the little things. We were very happy with the basic structure of the conference, but as some of the evaluations pointed out, what people often remember is the little things. Is the coffee good? Were the biscuits nice? It was amazing how much these things mattered. In essence, the butterfly effect still counts even at conferences.

And the results

Of the 18 subject areas, we selected nine to include in the book as a 'taster' of what the conference was like. We asked the subject coordinators to choose the papers that were interesting, groundbreaking and accessible to as wide an audience as possible.

Obviously, these aspects are not all mutually compatible, but the following sections are a very good representation of the core developments of complexity thinking in several major fields. We realise that not all chapters will be of equal interest to every reader. However, our intention was to provide an accessible interdisciplinary introduction to the wonderful intellectual breadth that complexity can offer. Moreover, we sincerely hope that some of the excitement that we felt at the conference has carried over into the book. In some small way, we hope that this book will help to bring about what Stephen Hawking said in early 2000:

> *'I believe the next century will be the century of complexity'* [3].

References

1. Prigogine I. *The End of Certainty: Time, chaos and the new laws of nature*. New York: Free Press. 1997.
2. Gulbenkian Commission. *Open the Social Sciences: Report of the Gulbenkian Commission on the Restructuring of the Social Sciences*. Stanford: Stanford University Press. 1996.
3. See www.comdig.org.