

Preface

This book grew in part out of a weekly interdisciplinary Chaos and Complex Systems Seminar¹ that was founded in 1993 at the University of Wisconsin–Madison and that we have nourished along over the past decade. The seminar draws an eclectic audience of which we are but two examples, representing an unlikely collaboration between a plasma physicist (JCS) and a child language researcher (RC). Over the years we have listened to colleagues from Madison and elsewhere speak on topics as diverse as the nature of consciousness, robotic chemical analysis, black holes, the epigenetic control of spots on the buckeye butterfly, the dynamics of love and happiness, predator-prey relationships, chaos in plasmas, policy effects on the health care system, chaotic compositions for string quartets, cellular automata and the Game of Life, strange attractors, the dynamic control of millipede walking and healthy hearts, the economics of currency exchanges, weather prediction in a time of global warming, the evolving landscape, child language development, and much more. You will encounter many of these topics in the poems here.

Our individual interests led to a textbook on chaos² and work on a dynamic systems approach to child language development.³ It also led us into work on the art that arises from depictions of complex system dynamics in space and in language. The images and poems of a complex world are the subject of this book, meant for the reader interested in the art, poetry, and the ideas of chaos. This is a book for browsing, for picking up and putting down, for clarifying the mathematician's use of a term, even for testing one's comprehension, for translating ideas into daily life, and seeing the complex way our lives evolve. It is for finding images that you enjoy and poems that speak to you. It is for appreciating the great diversity of artistic patterns that a few simple equations or rules can engender and for offering both metaphorical and mathematical ways to think about dynamical systems concepts through poetry and more formal definitions. We have tried to honor both logic and intuition, both eye and ear, and the different ways of knowing and perceiving.

The art here comes from simple equations, summarized in the appendix, and programs investigating millions of versions of these equations with changes in their parameters.⁴ Through human artist tutors, one of us (JCS) taught the computer to choose the patterns most likely to

¹ <http://sprott.physics.wisc.edu/Chaos-Complexity/>

² J. C. Sprott, *Chaos and Time-Series Analysis*, Oxford University Press: Oxford (2003).

³ R. S. Chapman, Children's language learning: An interactionist perspective. *Journal of Child Psychology and Psychiatry* 41, 33–54 (2000).

⁴ J. C. Sprott, *Strange Attractors: Creating Patterns in Chaos*, M&T Books: New York (1993).

appeal to the human eye, and printed them in vivid colors. Out of years of computer search, producing hundreds of thousands of examples, we have chosen the patterns included here, instances of strange attractors, Julia sets, and iterated function systems (of which, more in the book!) that pleasingly portray the fingerprints of chaos.

The other one of us (RC) has composed poems that come from attention to changes in the natural world and human experience, and, in many cases, from seminar topics. Poems themselves are dynamic systems of sound and meaning, needing surprises for the ear, heart, and mind as they evolve through the reader's experience. These are poems that debate ideas — free will versus determinism, finite versus infinite, and join them to the topics that are poetry's themes: life, love, death, and nature. They are poems of science and philosophy; but also of children's games, family lost and gained, and our only Earth.

We have put together in these pages ideas, words, and images that have delighted, surprised, puzzled, entertained, and educated us. We hope you will find your own favorites. You can see us or view our work in detail at our Web sites.⁵

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⁵ <http://sprott.physics.wisc.edu/> (JCS),
<http://www.madpoetry.org/madpoets/chapmanr.html>, and
<http://www.comdis.wisc.edu/facstaff/rchapman/index.htm> (RC)