

the content. This will appeal to the many lay readers to whom the book is primarily pitched. She defers deeper mathematical explanations to the end-notes.

Whereas Part 2 develops important ideas relating to modeling life and evolutionary processes in silico, Part 3, *Computation writ Large* (Chs. 10 to 14) moves to examine the extent to which nature computes. With the same effectiveness and economy as the two first Parts, Mitchell presents a concise and potent introduction to cellular automata and the work of Stephen Wolfram which opens the door to a discussion of computation/information processing in the immune system, ant colonies, cellular metabolism and unresolved questions around what constitutes consciousness and how meaning might be made in living and artificial intelligence systems through analogy and conceptual slippage. The final chapter in this section is devoted to providing important caveats and clarifications of the purposes and limitations of idea models in the complexity sciences using research on The Prisoner's Dilemma and its extensions regarding the evolution of cooperative behavior to exemplify.

The final major excursion, *Network Thinking* (Chs. 15 to 18), provides a foundation for lay readers on advances in Network Theory, whose significance for the complexity sciences Mitchell describes as providing "a novel language for expressing commonalities across complex systems in nature, thus allowing one area to influence other, disparate areas" (p.252). Applications of concepts such as small world networks, scale-free networks, power law distributions, preferential attachment, scaling, random Boolean networks and resilience, are applied in discussing biological examples which include brain function, genetic regulation, metabolism, epidemiology and ecological food webs. As in the previous section Mitchell does not shy away from presenting important skeptical, alternative or oppositional positions. This deliberate attention to the ongoing controversies is one of the features that make this text stand apart from others in this field. She portrays the reality, undecidedness, and complexity of an as yet nascent field in which many terms, including complexity

itself, are not well defined and where concepts are still contested and require further evidence. Additionally, she highlights important open problems such as: understanding the origins of power-law distributions across disciplines, determining how, why, and *if* evolution creates complexity and hints at the significant impact that future work in this area is likely to have across all knowledge domains and in social and political life. This is the section most likely to stimulate those new to the field and inspire renewed inquiry from those already working in it.

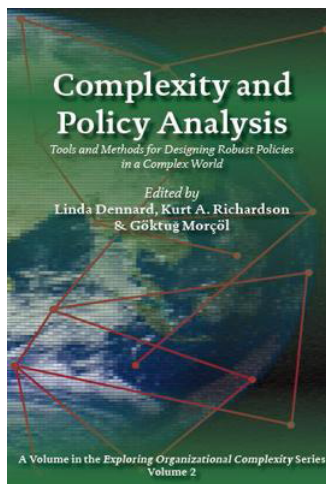
In bringing the tour to a close, Mitchell as guide offers a timely historical warning for complexity scientists as they look to the future namely the overshadowing, fragmentation and loss of enthusiasm for parental disciplines such as cybernetics and general systems theory which she suggests had more "extent than content...ranged over too disparate an array of subjects, and [whose] theoretical apparatus was too meager and cumbersome" (p.297) to achieve their ends. She also identifies what she believes is needed—"the right vocabulary to precisely describe what we're studying... that not only captures the conceptual building blocks of self-organization and emergence but can also describe how these come to encompass what we call *functionality, purpose, or meaning*" (p. 301, italics in original).

There have been many excellent introductions to the various "sciences of complexity" written over the last quarter-century by pioneers in the field. Mitchell's adds another, though one that pays attention to some of the pedagogical and conceptual difficulties that have limited laypersons' understanding of the content, controversies and significance of the complexity sciences especially in their potential to radically alter the reductionist ethos in science, transform the disciplinary divides among academic disciplines and change the way we think about social institutions and relationships. The book will be of interest to students and instructors at the undergraduate and upper high school levels across a wide range of disciplines. The freshness of the book's presentation of the core ideas of the main branches of the complexity sciences, its deliberate attempt

to foreground the ongoing debates in the field, its reminders of the limitations of models, cautions, and its pointing out important future directions that the field might take, or needs to take, is likely to render it an oft-recommended starting point and perhaps one of this generation's standard introductions to the exciting worlds of the sciences of complexity.

A Review of Complexity and Policy Analysis; Tools and Methods for Designing Robust Policies in a Complex World

edited by Linda Dennard, Kurt A. Richardson and Göktuğ Morçöl
reviewed by Lasse Gerrits
published by ISCE Publishing, USA
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Introduction

For some years, complexity theory gains popularity in the realm of the social sciences, organization studies and management studies. However, complexity theory in the domain of public administration and policy analysis is still a minority interest. There are some authors who find that complexity theory has an added value to understanding public policy processes and public decision making, among others Peter Allen, Tony Bovaird, Henk Wagenaar, Phil Haynes, Walter Kickert, Göktuğ Morçöl, Mary Lee Rhodes, Geert Teisman and your reviewer. Some books have been

published and some journals issued special issues, such as the special issues of *Emergence, Complexity & Organization* (vol. 7, issue. 1, 2005), *Public Management Review* (vol. 10, issue 3, 2008) and *Public Administration Quarterly* (vol. 32, issue 3, 2008).

However, applications of complexity theory in public administration have mostly received a rather lackluster response by mainstream scholars. Complexity theory for public policy analysis is, in the words of Professor Christopher Pollitt, weak and does not add anything to what is already known: “So, we must ask, what is it that complexity theory adds? Certainly not the ideas of dynamism, or of unforeseen events, because both these are fully present in more traditional accounts. Another tendency found among complexity theorists [...] is to claim as new some concept or insight which has in fact been arrived at previously by researchers working in one or more quite different theoretical traditions. [...] these elements do not yet amount to a *theory* of complexity in public administration, in the sense of a propositional explanation of actions and outcomes.” (Pollitt, 2009: 229). In other words: there is a clear need for more consistent, high quality work on complexity in public administration. Such research needs to transcend the level of metaphors and to move beyond merely copying some of the core concepts that originate in physics and chemistry because, regardless of their beauty, there are fundamental differences between physical and social reality. Also, it should bring additional explanatory value that other theories would not be able to deliver.

It is against this background that ISCE published this book. It is to my best knowledge so far one of the few elaborate books on complexity to emerge from the domain of public administration and its arrival is timely given the rising interest in complexity theory from this domain. But will it stand the criticism voiced by, among others, Pollitt?

Goal and Structure of the Book

This book is an edited volume. The first versions of the chapters in this book were presented as papers at the First In-

ternational Seminar on Complexity and Policy Analysis in Cork (Ireland). The scope of the book is relatively broad and the different topics are arranged under different headers. There is ample attention for the nature of complexity theory (or complexity theories, as pointed out correctly by Morçöl) and the implications of complexity for public policy. There is attention for (agent-based) modeling, and also for qualitative case studies. The editors state that the group of authors of this book resembled a “microcosm of global complexity” (2008: 2). They are correct. The book covers a wide range of topics and offers many different approaches to complexity. The editors also state that the book is first and foremost a reflection of a learning process that the group of authors went through.

First Impression

For someone trained in public administration and with a strong focus on complexity, the book offers a familiar yet challenging read. Many of the authors manage to connect the ideas of complexity theory with more common notions and theories in public administration such as policy network theories and rational choice theories, and that is a welcome addition to the existing literature for two reasons. First of all, there is an increased interest in complexity theory in the domain of public administration. Exactly how the two connect has so far received minor attention in books (exceptions here are e.g. Haynes, 2003; Mitleton-Kelly, 2003; Teisman, Van Buuren & Gerrits, 2009) and this book helps in understanding the connection. Secondly, public administration as a scientific domain can contribute to complexity theory because of its vast body of knowledge on the messy reality of day-to-day decision making (as opposed to elegant computational models) so again this book is very helpful. It supports my belief that a marriage between complexity theory and Public Administration is fruitful.

Between simplicity and complexity

As stated before, complexity theories have received a very mixed response in the realm of Public Administration.

Major criticism has been voiced by, among others, Kickert and Pollitt. Their criticism reads that complexity theory is often incompatible with theories in Public Administration because complexity theory sometimes departs from assumptions that are mere copies from computational models or physics, chemistry or biology. The fact that flocks can self-organize because of simple programmed rules of behavior does not mean that officials and politicians work in the same way (although March’s conceptualization of individual behavior of decision makers comes tantalizingly close, see his 1994 book). The main criticism boils down to one question: can concepts from natural sciences be copied to social sciences?

Byrne (2005) makes an elegant distinction between simplistic complexity and complex complexity. This distinction helps shedding more light on this issue. Simplistic complexity is essentially complexity within closed systems, with the emergence of structures and processes depending entirely on the (fixed) variables within the system. Such systems display complex behavior but are deemed simplistic because the roots of this complexity always remain within the closed system. This is functional in demonstrating the principles of, for example, non-linear change. In social reality, however, the number and nature of variables defining an emerging structure or process are not fixed but rather changeable. Social complex adaptive systems are open by definition, and are constantly exchanging energy with other systems. Moreover, what constitutes and limits a system is relative to the observers’ and agents’ locality and is therefore subject to debate (see e.g., Byrne 2005, Gerrits, 2008).

This point is also made in the chapter by Levick. He argues that awareness of the perspective of the observation is important because subjective positioning (i.e., the observer is positioned within complexity rather than outside complexity) helps understanding the dynamics of policy making. Also, he argues that objective positioning gives a false sense of being able to control complexity. I concur with this. Richardson addresses the tension between bottom-up modeling and understanding social reality. While non-linear models can be help-

ful, they are still limited because they are computational and still build on the premise that complexity can be traced back to its root. This is an important message because the (implicit) assumption among many policy makers seems to be that society is a watch that can be manipulated at will. The fact that this society doesn't change accordingly is often contributed to lack of understanding of the watch. I agree with the editors that this assumption needs careful reconsideration and the book offers refreshing ideas about this, such as the chapters mentioned above.

However, at the same time it features chapters about for example (agent-based) modeling that, as far as I'm concerned, are still very much within the boundaries of the 'old' reductionist science and that do not challenge readers to rethink their assumptions of how society works. Modeling can indeed show patterns that are not easily accessible, as demonstrated in the chapter by Meek. But it is not a break-away from the 'old' Newtonian science, an ambition stated in the opening chapter of the book. It is useful to remind us of what Sokal and Bricmont, both professors in physics, have to say about this issue. They observe that complexity science advocates non-linearity as opposed to linearity, the latter being associated with a mechanical world that is understood through reductionism. However, they argue that non-linearity fits perfectly into a Newtonian worldview and the concept actually reconfirms that worldview rather than break away from it. In their own words: "[I]n actual fact, Newton's 'linear thought' uses equations that are perfectly *non-linear*; this is why many examples in chaos theory come from Newtonian mechanics, so that the study of chaos represents in fact a *renaissance* of Newtonian mechanics as a subject for cutting-edge research" (1999: 144). In other words: non-linearity is not a change from 'old' science and should not be advocated as such.

If the public administration community wants to inform policy makers about the workings of the capricious world they find themselves in (and it should!), it needs to be done with care and the debate should focus on the question what is really new and what is ac-

tually already known under a different header. I find this book to offer ample clues to start such a debate but this opportunity could have been presented more prominently. Having said that, there are still many contributions that do offer thought-provoking ideas about complexity, modeling and the world of policy making, among others the chapters by Morçöl (on complexity theory and policy analysis), Bankes (on uncertain policy outcomes and planning), and Faggini (on realistic modeling of the dynamics of economics). And while there is ample attention for modeling and its implications for policy analysis and policy making, there are also qualitative studies such as the chapters by Arthur & Hammond (on network rules in technology transfer) and Runhaar, Dieperink & Driessen (on the analysis of policies promoting sustainable development).

Final Verdict

This book, as a self-proclaimed microcosm of global complexity, is definitely attractive for the readers of this journal. It addresses the many issues public policy makers are faced with when they set out to get things done in an erratic world. It offers good discussions on the implications of complexity for policy making and offers ideas about how to achieve (among others) robustness and adaptivity in the face of the uncertainties that are inherent to this real world. It is a must read for both scientists who want to get a quick update on the state of complexity thinking in public administration, and practitioners who keep wondering why policies often bring about different results than expected. The many connections between concepts from complexity theory and mainstream theories from public administration are proof that authors are able to move beyond mere metaphors and use complexity theory in a useful way.

My only critical remark is that the book could have been more explicit about the nature of complexity modeling for policy analysis, even though it is addressed here and there. I'm not entirely sure if this book can answer the criticism voiced by opponents of the use of complexity theory in public administration. In order to do that, it would need to address

the differences between simplistic complexity and complex complexity more explicitly and it would need to develop a more coherent and, ultimately, testable theoretical framework. Perhaps that is a bridge too far if one considers that complexity theory is ultimately a large set of theories, but it is worth pursuing a more coherent story.

However, this all doesn't mean that the book is weak. On the contrary, it has many useful contributions and it was a pleasure to read. I really recommend this for anyone interested in complexity and public policy analysis.

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