to show how institutions could arise in specific domains, and his effective use of numerous examples both large and small. In all of these respects, the book succeeds in its mission.

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The Complexity Vision and The Teaching of Economics
David Colander (Ed.), Edward Elgar, Northampton, MA, 2000, 328 pp. with Index, US$ 95.00, hardcover (US$ 25.00, paperback), ISBN 1-84064-252-1

If you stand in front of 100 intelligent people and show them time series plots of almost any important economic and social variables such as unemployment rates, interest rates, the Dow Jones industrial average, per capita income, crime rates, the balance of power in the house of representatives, percent voter turnout, etc. . . . And then ask these people to choose one of two words to describe these phenomena either (a) complex or (b) equilibrium.

My experiences to date suggest that approximately 93 of these people will choose the former. The other seven will be economists.

Now these economists do not really believe that these systems are all in equilibria. Instead, they believe that an equilibrium-based theory can explain many of these phenomena shown in the graphs. And you know what? They would be correct. They can. But they cannot explain them all. And, the question for the discipline is whether we tweak the existing theory to fill in these gaps—some of which are rather large and embarrassing, or do we experiment with new paradigms? And if we choose the latter course, what approach do we take?

One proposed alternative is the complex systems approach, which I think that it is fair to say has emerged as the most compelling alternative paradigm to neoclassical economics. When complex adaptive systems first hit the radar screen in the mid 1980s its advocates highlighted several key divergences from standard economics: (i) learning, psychology and mental models, (ii) heterogeneity, (iii) networks and interaction structures, and (iv) dynamics. These models generated path dependence, lock-in, and multiple equilibria. They were less predictable, and the policy implications differed—market competition did not always fairly allocate wages or select the best product.

Since that time, learning and psychology have become part of mainstream theory. Many macro-economic models now include heterogeneous agents. There have also been a growing number of papers written on networks and social capital. The prevalence of multiple equilibria is well accepted, though there may be some disagreement of how often we lock-in the wrong one. And finally, the word complex seems to pop-up quite regularly in seminars, papers, at conferences and even in coffee shops. To a large extent, the intellectual battle would seem to be completed. The complex systems' vision, articulated by Ken Arrow, Murray Gell-Mann, Phil Anderson and others would seem to have found a place in the paradigm. What remains might be just some cleaning-up around the margins.

But this is surprisingly not true. The problem has been that complex systems has been divided and conquered. Complex systems have been stripped, like a fancy new car parked in a dicey neighborhood. Its parts have been stolen and adapted to fit within other research agendas within the discipline. The behavioral economists and micro-theorists who champion the ideas of learning and bounded rationality do not consider themselves followers of complex systems, nor do the heterogeneous actor macro-economists, nor do many of the people who look at models of multiple equilibria or the micro-theorists who study evolutionary dynamics. As a result, the new paradigm risks becoming undone by the success of its component parts.

This readable and careful collection of essays calls our attention to this problem. It attempts to articulate the complexity vision and to demonstrate how we might introduce it into the classroom. It is the hope of the contributors to this volume that one day soon an economics professor will run a simple market experiment in the classroom and after 5, 10 or 20 trials when the economy gets close to equilibrium, he will not shout "look! equilibrium! Our theory works!" but instead, he will talk about how the agents learned, how information passes over the network of connections, how the micro-level behaviors determine the aggregate patterns, etc. . . .

The book contains an introduction and 17 essays divided into five parts. The first two are about complexity and its importance in economics and policy. The last three deal specifically with how to incorporate complexity into our curriculums. The introduction provides a sufficient, though brief, introduction to the main concepts and principles of complex systems. With so many papers, it is impossible to discuss them all in any reasonable amount of time. The papers in the first two sections, which further articulate the complexity vision are well worth reading but are intended more to bring readers up to speed with complex systems than to push forward new ideas. For that reason, I shall focus on the latter three parts of the book.

In separate essays, David Colander, Roger Koppl, James Stodder, and Duncan Foley paint the broader picture of the move toward a complexity vision in the classroom. Colander presents three examples: sequential decision making, learning curves, and multipliers. I wish that his chapter had been longer. I finished wanting more details. Koppl, an unabashed Hayakian, emphasizes the emergence of macro-level phenomena, in this case, the spontaneous order that emerges in markets. Stodder gives some wonderful examples of experiments in which students do not learn to optimize. He makes a strong case for the balancing of induction and deduction in the classroom. And finally, Duncan Foley pushes this distinction between deduction and induction even further, arguing that the future will see the rise of the former at the expense of the latter.

The next section looks at the specifics. The chapters by Robert Prasch and Kevin Hoover describe how they introduce complexity into their macro-economics classes. These are excellent "how I do it" personal histories. In contrast, Sunder Ramaswamy's essay on development economics and complexity is more historical in aim, and Barkley Rosser's on mathematical economics more prescriptive. Rosser describes the concepts that need to be added to our mathematical economics books—such as spatial interactions—while at the same time promoting the need for simulation based books. Peter Hans Matthews concludes this section with specific advice about how to deal with non-linear econometric models.

The final section of the book contains essays by Stephen P. Magee and Michael Rothschild. Rothschild's chapter beats home three points: learning curves are ubiquitous;

learning curves effect investment decisions; and learning curves create the possibility of winner take all markets. I agree. Magee's chapter is an expansive tour through the implications of the biological perspective. He touches on topics as diverse as testosterone, flying phalangers, democracy, the fidelity of DNA transmission, and altruism. This chapter seems to fit better within the complexity vision portion of the book. It is more about the ideas themselves than how or why to get them into the curriculum.

This book's shortcomings are mostly sins of omission, which are understandable given its length. To give just one example, I wish that it contained a chapter on the teaching of micro-economics. Without such a chapter, the book seems incomplete, particularly in that it does not give readers any idea how to construct cognitively diverse agents apart from Arthur's brief descriptions of rules in the bar problem. Such small gaps notwithstanding, this book provides a solid introduction to the growing literature in and ideas of complex systems. It merits reading by proponents and skeptics of complex systems alike. It accurately presents the powerful ideas that provide the framework for complex systems and demonstrates how those ideas can be included in the classroom.

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