Complex Systems and Applied Linguistics
Diane Larsen-Freeman and Lynne Cameron. Oxford: Oxford University Press. 2008. Pp. xi + 287.

With this monograph, Diane Larsen-Freeman and Lynne Cameron unveil a complex systems approach to applied linguistics in the first book-length introduction to the topic. Stirrings of a shift in this direction have begun to appear in Larsen-Freeman's publications this past decade (e.g., 1997, 2002). Expanding on those early papers, this work is intended "to open the conversation" (Larsen-Freeman & Cameron, 2008, p. 255) about complex systems among applied linguists; however, it is not intended to be the last word. As such, it is a rich introduction for teachers, researchers, and students who want to foreground a dynamic worldview in their theory and method for understanding complex systems. This book begins a new chapter in the intellectual history of applied linguistics by repositioning our understandings and making change central. At the very least, the development of a complex systems approach to applied linguistics at the hands of two well-respected applied linguists, each with distinguished publications records, is cause enough to engage with its ideas.

The book is divided into eight chapters. Chapters 1-3 describe chaos/complexity theory, summarize the theory's development from its antecedents in the ancient Greek philosophy of Heraclitus (Western civilization's father of flux) to modern views of mathematics and the physical world, explain the nature and characteristics of complex systems, and define different types of change. With these theoretical underpinnings, chapters 4-8 sketch the application of this new way of knowing to five domains of applied linguistics: (1) language and its evolution; (2) first and second language development; (3) discourse; (4) the language classroom; and (5) language research design.

In chapter 1, complexity theory is described as a perspective on complex systems that emphasizes their dynamic, open, and adaptive behaviors across time, space, and levels of understanding. It is a theory that explores patterns of nonlinearity and unpredictability in a complex system, and avoids marking this as a hybrid state. As a result, the theory relegates a more Cartesian approach to marginal significance — at least with respect to understanding complex systems. Finally, according to Larsen-Freeman and Cameron, complexity and chaos are perspectives on a world where metaphor is an initial bridge into an additional way of framing research and practice. The authors provide examples of the bridging role of complexity theory. They accomplish this through a series of brief, poignant "what if" meditations that are developed in later chapters (e.g., What if we abandon the dichotomy between language performance and competence? Answer: Linguists need a complex theory to take its place). It is useful to remember the authors have advised us that this is the beginning of a conversation. In their careful, yet insistent hopefulness, they suggest that the field might be at the threshold of a paradigm shift. At the very least, these meditations convincingly demonstrate that the authors have made the shift already and are attempting to redraw boundaries for others.

Examples of simple and complex systems are vividly illustrated in chapter 2. A simple system is illustrated by a traffic light and a heating system. In each case, causation follows a simple linear path. Examples of complex systems are illustrated by an ecosystem of a forest (for its many types of agents and nonlinear examples of change); a city (with many subsystems); and

applied linguistics (with subsystems such as speech communities and individual brains/minds). In a simple system, the relations among the component parts are predictable and unchanging; however, in a complex system, links among components do change in often unpredictable ways in what complexity theory calls non-linear relations. The chapter concludes with a discussion of the integration of powerful computer software and mathematical modeling to address complexity in efficient ways.

Chapter 3 describes steady and sudden complex changes. The chapter also includes a presentation of a complexity thought model and a discussion of the connection between human agency and complex systems. The complexity thought model is a practical sixteen-step guide researchers and practitioners can use to think about problems from the perspective of the theory. It is a highly practical protocol for graduate student research projects because it can be used for the planning and development of a complex systems study. The discussion on the fate of human agency vis-à-vis the designs of complex systems presents the authors' acknowledgement of an ethical dimension that lies beyond the theory they address—a stance in favor of people taking responsibility for their actions rather than viewing themselves as pawns of simple or complex systems. This is an important discussion that is addressed and readdressed throughout, and it deepens the book's appeal. This discussion shows the authors' sensitivity to their critics, recognizes the intricacies involved in changing the applied linguistics paradigm (if there ever was just one), and exhibits some of the leadership qualities necessary to navigate a changing paradigm — such as a moral dimension (Fullan, 2001).

Language and its evolution are presented through the perspective of complexity theory in chapter 4. The theory views language as "a dynamic system that emerges and self-organizes from frequently occurring patterns of language use" (p. 111). The authors argue that the emergent and self-organizing properties of language dynamism transpire on different levels (e.g., individual, interacting pairs, speech communities) and on different timescales (e.g., milliseconds of neural connections, millennia of evolution). Language is viewed as the product of multiple, patterned, and non-linear integrated contexts and times. Nevertheless, language maintains an identity in the face of constant change not unlike the cells of the human body dying and growing anew while the body remains recognizable. For instance, over a certain amount of time a standard of language forms as a result of the formation of a social and national identity, but attempting to keep language in a state of status quo in order to keep it "true" to the standard is a doomed enterprise. At individual levels, people co-adapt language resources for each other. These resources both influence and are influenced by the particular emotional, cognitive, and sociocultural histories that each person brings to the interaction. Each moment of human experience reflects and constitutes a snapshot of flux. Thus, argue the authors, change is an everyday, natural occurrence that should be documented and made the focus of applied linguistic research and practice.

Chapter 5 presents first and second language development through the lens of complexity theory. Language development in the individual organism is conceived as a synthesis of change occurring at different times rather than as a cumulative process. Language development transpires on multiple timescales and on multiple levels. The authors point out that conventional studies of first and second language acquisition have identified both variable and systematic language. Variability in non-complexity science is often viewed as a threat to understanding

causation and establishing a scientific explanation. However, with a complex systems approach, researchers would look for systematic patterns in variability. An extended explanation is dedicated to applying complexity theory to a second language acquisition study (Larsen-Freeman, 2006) and illustrates how the theory might be applied. Like the sixteen-step complexity thought model, this could be a highly useful section for graduate students considering adopting a similar perspective because it is a small study that could be extended and applied in different contexts, with participants of different ages, and with different languages.

Chapter 6 presents ways to investigate discourse from a complexity perspective. Participation in conversational discourse is not framed as a set of individual contributions, but instead becomes a shared trajectory of change and development. The language in a single conversational turn is not viewed as the property of an individual conversant; its ownership is transferred to the discourse that arises through the conversation with other interlocutors. Contributions to conversational discourse are thus framed as shared and co-constructed. This shift in perspective acknowledges the social construction of language. The chapter also suggests that genres and idioms can be described by a complex system. Through these demonstrations, the role of everyday figurative language is shown to play the important role of packaging ideas in ways that create cohesive patterns. In turn, these patterns reflect and constitute shared understandings within discourse communities and within particular time frames and localities.

A complexity-based perspective on second language classrooms is provided in chapter 7. While there is no complex systems method for language instruction proposed, sketches are provided of classroom interactions, language-use, co-adaptations, collective variables to describe complexity, teacher and learner trajectories, language assessment, and the social dimension of language testing. Examples of classroom discourse are cogently discussed and analyzed from this new perspective. The authors argue that when students have "multiple experiences with words and phrases in meaningful communicative situations" (p. 219), the result is patterns in data for learning and for discussion. In order to explain these patterns, applied linguists have to be willing to explore the conditions which created them. Teachers and trainers are encouraged to use the sixteen-step guide to complexity thought modeling from chapter 3 when seeking deeper insight into language classroom culture and when embarking upon investigations into the complex, dynamic reality of a language classroom.

Chapter 8 concludes the book by addressing issues germane to research. These include proposed changes to the nature of explanation and prediction, a shift in data and evidence, and modifications to research methodologies. Larson-Freeman and Cameron argue that prediction and single cause variables are not trustworthy; instead, good complexity theory "describes the system, its constituents, their contingencies, and also their interactions" (p. 237). Clearly reducing effects to simple, focused causes is no longer adequate because it is fundamentally detached from and unaccountable to the "nested levels and timescales that exist" (p. 241) in natural phenomena. We are told that complex systems researchers should be ecologically minded, avoid reductionism, think in terms of dynamism rather than stasis, move beyond dualistic thinking, and embrace collective variables rather than single variables in order to refocus the research endeavor. Total objectivity—the separation of the researcher from the object of research—is unattainable in a complex systems perspective. The use of ethnography, action research, longitudinal case studies, time-series approaches, microdevelopmental approaches,

computer modeling, brain imaging, and the blending of these research approaches are encouraged.

Complex Systems and Applied Linguistics resonates with a rich new lexicon to describe what applied linguists do and, by implication, possible new ways of angling how to plan research or prepare an action plan to facilitate L2 learning in the classroom (e.g., the complexity thought model in chapter 3). It is necessary to remember that this is an introduction to a complex systems perspective, and students of applied linguistics, researchers, and teachers who are unfamiliar with complexity theory may at first struggle with the concepts presented. Fortunately, the authors present these ideas as simply and directly as possible by defining terms throughout the monograph and illustrating them with concrete examples related to language research and teaching. Additionally, researchers might be perturbed by the anti-reductionist focus that characterizes the chapter on researching complex systems. Nevertheless, if they accept the premise that change, interconnectedness, and self-organizing emergent behaviors are central to a complex system, a collective rather than a single independent variable would characterize most research endeavors.

Overall, the book is indeed a journey into an integrated and colorful landscape of cognitive, sociocultural, and psychological understandings. The range of resources underpinning the reasoning in the monograph is impressive. Knowledge is remapped in order to begin a task of unifying language and experience into a complex system — the important work of applied linguistics with its many concordances and dissonances. Fundamentally, this adventure is epistemological at its core. And it is — of necessity — ontological too, for it cuts to the core of human experience.

ARIEH (ARI) SHERRIS
Center for Applied Linguistics

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