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Introduction to *Leadership Quarterly* Special Issue on Leadership and Complexity

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Russ Marion and Mary Uhl-Bien

Eric Bonabeau & Christopher Meyer (2001) have devised a simple "cocktail party" game that they use to introduce complexity dynamics. Imagine a party in which everybody present is instructed to follow a simple rule: Silently select two people at random, A and B, and position yourself so that A is always between you and B. Under these conditions, the party-goers will wander around the room, forming small, transient groups and meeting a number of people. Then halfway through the party the rule changes: Instead of positioning A between yourself and B, position yourself in the middle between A and B. The dynamic changes, and everyone drifts together into a tight cluster.

The point of the exercise is to demonstrate a common element of dynamic behavior and complexity theory: that complex, unscripted behavior can emerge from simple rules. Complex, unscripted behavior is the theme of complexity theory and serves as the backdrop for this special issue of *The Leadership Quarterly*. Complex behaviors can be catalyzed by a number of dynamics, and they are useful because they generate creativity, learning, and adaptability. In this issue, the editors posed the question, "What role does leadership play in complex interactive dynamics?" This broader question generated more specific questions, such as: What is leadership? How are complex dynamics coordinated and motivated? What implications do emergence and adaptive tension have for organizations and leadership? How are traditional top–down leadership styles and emergent bottom–up processes coordinated in complex adaptive systems? How do leadership processes unfold over time? And, how can dynamic leadership processes be studied?

Addressing these questions shifts the focus in leadership from traditional emphases on hierarchical leaders, alignment, and control to leadership in contexts of complex behavior, such as that derived from numerous dynamics in addition to the simple adaptive rules illustrated above. In contrast to bureaucratic notions, complexity theory focuses us on the study of the dynamic behaviors of neural-like networks of interacting agents (an agent is technically a "node" in a network but practically it can be a person, group of people, a bit of information, or a variable). These nodes interact in ways that produce nonlinear, emergent dynamics (as the simple cocktail party simulation illustrates). Complexity theorists would argue, for example, that the nonlinear collapse of the USSR in the late 1980s emerged from a complex interaction, over years, of (among other things) economic conditions, political pressures, international pressures, arms and space races, and the difficulties of managing diverse cultures, rather than from the actions of single hierarchical leaders such as Ronald Reagan and Mikhail Gorbachev.

Like natural selection, complexity theory provides an explanation of how new things emerge. Whereas selection attributes newness to random mutations, however, complexity attributes it to the transformative nature of interactive mechanisms. Very simply put, the interaction of different "things" (people, ideas, chemicals, species, etc.), combined with various mechanisms that emerge when adaptive entities interact (catalysis, elaboration, alteration, interdependency, etc.), produce novel outcomes. Like natural selection, this process is driven by adaptive tension, but whereas selection tension comes from outside the system (e.g., competition from other species), tension in complex systems can be derived from internal mechanisms (e.g., pressure to adapt to demands generated by conflicting constraints, or difficulty reconciling differences among agents).

The science of complexity is, of course, far more complex than can be represented here. Natural selection and complexity, for example, are not necessarily competing explanations, as would seem to be suggested above, and indeed the two dynamics interact in nature and in society. The science is further complicated by the fact that there are two schools of thought among complexity theorists on how emergence occurs: the American school centered in the Santa Fe Institute and the European school centered around

the work of Nobel prize winner Ilya Prigogine. The American school is more oriented to the internal, interactive dynamics of complex networks, and is particularly applicable to ecology or to economics. The European school focuses on the buildup of tension and resultant destabilization of a system, which eventually dissipates the tension with nonlinear, unpredictable phase transitions.

Regardless of the school, complex adaptive systems exhibit certain common characteristics. Paul Cilliers (1998) has summarized these well: Complex networks have fairly rich patterns of interaction (the balance is important; too much interaction would overwhelm the system). Interactions are, for the most part, short-ranged; that is, the influence of any given agent is limited. There are direct and indirect influence loops in the network (Cilliers calls this recurrency). Complex systems operate far-from-equilibrium, which is a relatively unstable state. Complex systems are influenced by their history; that is, they have memory. Moreover, each agent is unable to comprehend the systems as a whole; that is, its understanding is rather localized to its own sphere of interaction.

As illustrated in this special issue, complexity science poses rather unique problems and opportunities for analyzing leadership in organizations. Most social scientists are schooled in statistical analysis, and that traditional science is indeed applicable to the analysis of complex systems, as Stephen Guastello's article in this issue illustrates. However, the design issues posed by complexity theory tend to differ from those with which social scientist usually deal. Complexity methodology needs to model interactions among agents and variables, and should follow those dynamics over a period of time. In large measure, complexity focuses on mechanisms (processes such as catalysis and aggregation; see Uhl-Bien, Marion, and McKelvey's article) more than variables, which, again, poses challenges for methodology.

Fortunately, several research strategies have been developed (or adopted) for dealing with these issues. Qualitative research, for example, is used by Donde Plowman and her colleagues in this special issue to investigate leadership from the standpoint of emergence in a case study of "Mission Church" (a church located downtown in the tourist center of a large city). Jim Hazy, also in this issue, discusses computer simulation methodologies, and provides a detailed review of fourteen distinct approaches that have appeared to date in which computer simulation is used to model networked interactions among agents or variables. Stephen Guastello applies differential equations and statistics to describe the emergence of small group leadership in terms of movement on a "cusp" topology. It is also possible to develop observational protocol for small group dynamics that would be useful for complexity study (e.g., Dooley & Lichtenstein, in press). Whatever the approach, however, the methodology must accommodate the unique characteristics that are studied by complexity theory.

The nature of these unique characteristics and what they mean theoretically for the study of leadership is explored in several papers. Mary Uhl-Bien, Russ Marion and Bill McKelvey provide a new "paradigm" for thinking about leadership in the development of their conceptual framework, Complexity Leadership Theory. In this article, the authors propose complexity inspired concepts they call adaptive and enabling leadership that complement more traditional perspectives of leadership. Dick Osborn and Jerry Hunt struggle to reconcile complexity perspectives of leadership with the bureaucratic realities of modern organizations. They tackle issues of "order-for-free" and try to understand how to decompose complex systems for analysis that are by nature non-decomposable. Kim Boal discusses the implication of complexity theory for strategic leadership and how strategic leaders can help to move systems toward "the edge of chaos" with storytelling and temporal outlooks. Finally, Mary Hogue and Bob Lord apply complexity theory, along with multilevel and connectionist theories, to explain gender bias and how leadership processes can negatively affect the status of women in organizations.

To bring this special issue to press, we processed over 20 manuscripts—a job that could never have been accomplished without the tremendous support of the many reviewers who unselfishly gave of their time to read papers and provide developmental comments to authors. For their willingness to serve, we express our deepest gratitude to the following reviewers:

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