Peggy Holman

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Complexity, Self-Organization, and Emergence

In 1984, Ilya Prigogine, winner of the 1977 Nobel Prize for chemistry, and philosopher Isabelle Stengers published the best-selling book *Order Out of Chaos*. Three years later, journalist James Gleick released another best seller, *Chaos: Making a New Science*. It is no coincidence that two books on a new scientific idea made an impression on the public consciousness. They were pointing to something that struck a chord, mirroring lived experiences of changing times.

Dialogic OD practices were in their infancy during that period. Eva Schindler-Rainman and Ron Lippitt worked with communities in the 1960s to find common cause among diverse people with vested interests, blazing a trail for collaboration within large groups. Concurrently, Fred Emery and Eric Trist of the Tavistock Institute in the United Kingdom began experimenting with democratic principles and self-management in organizations through what they ultimately named "Search Conferences." Both of these streams of OD practice influenced Future Search (Weisbord, 1992). In 1981, Kathie Dannemiller hosted a series of meetings, each with about 130 managers, for Ford Motor Company as it sought to move from a "command and control" culture to a more participative style, breaking ground for the practice of Whole Scale Change (Holman, 2010). Harrison Owen designed the 1985 Organization Transformation Conference based on extended coffee breaks, creating an approach—Open Space Technology—that allowed hundreds of people from diverse backgrounds to manage themselves for multiple days (Owen, 1992). Along with other pioneers of the last few decades, they defied prevailing wisdom about optimum group size and methodologies for accomplishing meaningful work (Purser and Griffin, 2008). As these practices evolved, they relied less on formal facilitation and more on self-management. What was going on?

A few forerunners, notably Margaret Wheatley (1992), Ralph Stacey (1991), and Harrison Owen (1998), found that emerging scientific research complemented their lived experience. As Stacey noted, he was "searching for some more meaningful way of making sense of life in organizations" (Stacey, 1996, 312). Wheatley (1992, p. 1) said it this way: "I am not alone in wondering why organizations aren't working well." Stacey and Wheatley discovered what they were seeking in what Wheatley dubbed the "new science"—a scientific movement toward holism, understanding the system as a system, and giving primary value to the relationships that exist among seemingly discrete parts.

In this chapter, we will follow two streams to understand how new scientific theories and dialogic practices converged into what we are calling "emergence" in social systems. The scientific stream traces the evolution of chaos into complexity science, bringing its cousin, self-organization, to the awareness of change practitioners. Key players in this stream are chemist Ilya Prigogine, journalist James Gleick, biologist Stuart Kauffman, and the Santa Fe Institute, its story told by Mitchell Waldrop.

The dialogic stream follows three people who were influenced by these emerging sciences and who in turn influenced others: Margaret Wheatley, Ralph Stacey, and Harrison Owen. While others have written on these subjects, this chapter tracks the trail of these frequently cited authors. Further, Wheatley has been vital in making the connection between emerging trends in science and in leadership widely accessible. Like Gleick and Waldrop, she has reached hundreds of thousands of people with her *Leadership and the New Science* (1992). Stacey is instrumental in bringing academic rigor to this discourse by pursuing research on the relationship between management and complexity. He founded the University of Hertfordshire's Complexity and Management Centre in 1992 with two of his students, Patricia Shaw and Douglas Griffin, providing a place for in-depth study. Harrison Owen gave us an embodied experience of self-organization through the elegant simplicity of Open Space Technology, mirroring hallmarks of chaos—complex behavior arising through simple rules and attention to initial conditions. Hundreds of thousands of people around the world have experienced the power of self-organization because of his work.

The chapter then follows developments in the 2000s as complexity made its way into the leadership and management literature. It also notes an emerging generation of practitioners influenced by a complexity perspective. The chapter ends with ideas developed in *Engaging Emergence* about the systems of thought that complexity, self-organization, and emergence provide for the practice of Dialogic Organization Development. By then, readers should have an appreciation that just as theory informs practice, practice is essential for defining theory. They may also find some useful frameworks for their own practice.

A Changing Worldview

What is it like when your peers' assumptions about how the world works seem fine to them, yet you turn up nothing but contradictions? Such is the fate of those poised to reinvent the world. The prevailing wisdom doesn't fit your data. The implications . . . they could change everything.

The dominant cultural narrative when this story begins is often called "Newtonian" or "classical science." "They pictured a world in which every event was determined by initial conditions that were, at least in principle, determinable with precision. It was a world in which chance played no part, in which all the pieces came together like cogs in a cosmic machine" (Prigogine and Stengers, 1984, p. xiii). This narrative was the perfect metaphor for the rising Industrial Age, and still influences the dominant approaches to leadership, strategic planning, and "change management" (the name itself a misnomer through the lens of complexity) today. "We have broken things into parts and fragments for so long and have believed that was the best way to understand them that we are unequipped to see a different order that is there, moving the whole" (Wheatley, 1992, p. 41).

Early in the nineteenth century, a few scientists were running into contradictions that defied explanation. For example, thermodynamics indicated that if the universe was a machine, it was running down, yet Darwin's followers found that biological systems were running up, becoming more organized. The complex whole exhibited properties that could not be readily explained by understanding the parts (Prigogine and Stengers, 1984).

A handful of explorers, each in their own discipline, forged on, living through a human version of the sorts of disruptions that they saw in the phenomena they studied. Slowly, these innovators found partners and started discovering patterns that crossed disciplines such as biology and economics, giving form to ideas that they named "chaos," "complexity," "self-organization," and "emergence," among other terms. Ultimately, through the generosity of established leaders, like Murray Gell-Mann, "aging academics rich with privilege, fame, and Nobel Prizes" (Waldrop, 1992, p. 54), a space—the Santa Fe Institute—was founded for creative, interdisciplinary exploration. They came together exhilarated and inspired to be part of rethinking, for the first time since Newton, the basic assumptions of how the world works.[1] What they might not have realized is the ripple effects their work would have on virtually every realm of human endeavor, including Organization Development.

1. Ironically, Western culture missed an earlier opportunity to pursue the path of complexity. A few years after Newton, Goethe recognized the inherent order in everything, or "self-organization," approaching science as a conscious participation with nature. Sadly, Goethe's view was overshadowed, but it is ably documented by Henri Bortoft in *The Wholeness of Nature* (Bortoft, 1996).

Chaos Named

James Gleick (1987) introduced us to the handful of mathematicians, physicists, biologists, and chemists who were finding contradictions in the 1970s with the prevailing notion of a clockwork universe in which the future can be predicted from the past given enough time, technology, and information. They sought to explain irregularities in systems as different as the rise and fall of species populations, weather patterns, and stock market behavior. They focused on strange phenomena that they were seeing: messiness, uncertainty, disruption that somehow resulted in self-organized order.

At the heart of their work was what they called chaos: complex behavior deriving from a few simple principles in which different initial conditions lead to wildly different outcomes. Gleick chronicled shifts in thinking from a Newtonian worldview to one in which chaos is a source of order. He offered the following five premises.

Simple principles lead to complex behavior: a counterpoint to entropy. The second law of thermodynamics (that the entropy of a system never decreases) according to which everything tends toward disorder, has been used to explain far more than energy conversion—for example, the fall of societies and the decay of economies. Chaos offered another view, in which complexity flourishes as nature moves between stability and instability. Mathematician and meteorologist Edward Lorenz discovered patterns in the fluctuations of weather. He also found that it was not necessary to track every variable to make sense of a complex system. The art was in discovering the few rules that mattered. As the notion of simple rules leading to complex behavior spread, others discovered new applications. For example, a mathematical map for understanding trajectories lent insight into measles infection rates and led to effective inoculation plans (Gleick, 1987, p. 316).

Initial conditions matter. Lorenz coined the term "butterfly effect" to capture the sensitive dependence in which a small change in conditions leads to large differences downstream. Lorenz used the term to describe the theoretical example of a butterfly flapping its wings in one part of the world and generating a storm a month later, halfway around the globe. We all have experience with this phenomenon. Your plane arrives late, you miss your connection, a critical meeting happens without you, and you lose a contract. A pragmatic Dialogic OD example: how the space is set for a convening—chairs in a row or in a circle—sets the stage for the nature of the interactions of a group.

Table 6.1 captures Gleick's reflections on the shift in worldview that he chronicled through the stories of the scientists he followed. Gleick concludes

Table 6.1. Shifting Worldviews from Gleick's *Chaos*

Newtonian View	Chaos View
Simple systems behave in simple ways. Like a pendulum swing, by reducing the number and types of variables involved to a few deterministic values, outcomes are predictable.	**Simple systems give rise to complex behavior.** Like the butterfly effect, fluctuating patterns in chemical reactions or insect populations can be understood through discovering a few key variables that make sense of seeming randomness.
Complex behavior implies complex causes. A wildlife population or an economy must be governed by many independent components.	**Complex systems give rise to simple behavior.** Out of highly diverse interactions, flora and fauna form coherent ecosystems and functioning cities.
Different systems behave differently. There is no point in working across disciplines. What could a neurobiologist, an aircraft designer, and an economist have in common?	**Laws of complexity hold universally, whatever the details.** The chemistry of neurons, the aerodynamics in a wind tunnel, and the psychology of purchasing all benefit from finding patterns in unexpected fluctuations.

that over time, these shifting assumptions meant an end to a reductionist approach to research, as more scientists realized the futility of studying parts isolated from the whole. For a handful of people seeking to understand organizations as systems, Gleick's compelling story of the birth of a new scientific discipline paralleled their own quest. All of them read his work. For Stacey, it was a revelation: He "wandered through a bookstore looking for a novel to read . . . chanced upon Gleick's *Chaos* . . . and life has never been the same since" (Stacey, 1996, p. 312).

Like Gleick's *Chaos,* Prigogine and Stengers's *Order Out of Chaos* influenced the forerunners seeking to understand organizational life. What made their work so compelling? So much of Newtonian science worked by limiting the variables, treating natural systems as if they were closed so that they were easier to study. Prigogine worked to understand the reality of open systems. He said all systems contain subsystems that are continuously fluctuating. He demonstrated that in the chemical systems he called "dissipative structures" disruption did not necessarily cause a system to die. Rather, in a "singular moment" or "bifurcation point," the outcome became unpredictable.

Prigogine's research gave us the distinction of systems in "equilibrium," "near equilibrium," and "far from equilibrium," where order arises out of chaos. He explored the role of positive feedback loops as key to reaching that singular moment of dissipation. Finally, he called determinism—the belief in

a causal universe in which all events follow from prior events, implying there is no free will—into question, noting that this foundational assumption of Newtonian science ceases to make sense when time is understood to be like an arrow, irreversibly moving in one direction.

Structures dissipate when they are far from equilibrium. A stable system—for example, one in which birth and death rates are equivalent—is considered to be in equilibrium. Introduce a small change, like a slight increase in births, and such near-equilibrium changes may be absorbed by the system with little noticeable effect. If population booms with no compensating increase in deaths, the system's response becomes unpredictable. Prigogine found that when a system was pushed far from equilibrium it reached a "bifurcation point" in which it transformed into something else. While the bifurcation point could be predicted and the range of possible transformations could be mapped, what any one system would do was unpredictable. He used the term *bifurcation point* because the system either fell apart into a more or less fragmented state or reorganized into a more complex adaptive state. Order could emerge out of chaos. Prigogine sought to answer the question, where does such order come from? The key to his answer was *positive feedback*.

Order arises through positive feedback. Positive feedback tells a system to keep doing more of the same. Consider a chemical reaction that produces an enzyme. The existence of that enzyme encourages further production of the same enzyme. Continued fluctuations ultimately lead to the far-from-equilibrium state wherein the compound has so much of that enzyme that it cannot remain stable. In economies, concerns about a bank impel some people to withdraw their money, leading to greater fear and ultimately to a run on the bank and its collapse. In social systems, the output from one interaction influences the next interaction. We talk to a neighbor, who shares the discussion with friends, and suddenly everyone knows that Sally married Harry. They become a couple in the eyes of the community. Coherence arises.

Time flows in one direction, while being reversible in isolated (mechanical) systems. Prigogine sought to resolve the paradox of time. Whether past, present, or future, the classical equations that set the Industrial Revolution in motion were time reversible. A clock can go backward or forward without altering its mechanics. You can put a machine together and take it apart. Classical science saw a clockwork universe in which the whole could be reduced to its parts and put back together. Yet, the second law of thermodynamics makes it clear that time moves in one direction; as Waldrop neatly characterizes it, you can't unscramble an egg (1992, p. 33). Devoting the last third of *Order Out of*

Chaos to the subject, Prigogine and Stengers propose a synthesis that allows classical mechanics and biology to coexist. The key is a small phrase that brackets the conditions where the second law holds: "isolated system." In the real world, almost nothing is isolated. Energy flows, materials are added or lost. Some systems break down. Others grow increasingly coherent. Still, within the narrow but useful isolated systems of classical mechanics, reversible time gives us the ability to build steam engines, weaving machines, airplanes, and so much more that populates our world today.

These dynamics have attractive parallels with our social processes. Prigogine and Stengers introduced many to the philosophical implications in *Order Out of Chaos*, notably breaking free of a deterministic worldview. They proposed a synthesis in which free will dominates in moments of bifurcation while determinism operates in stable times. Controversial in the Newtonian world in which he worked, Prigogine's dissipative structures inspired pioneering research into self-organizing systems in both biology and the social sciences. Stuart Kauffman carried the work into biological systems, influencing thought leaders of Dialogic OD practice.

Conditions for Self-Organization

In 1998, Owen "encountered Kauffman's work and experienced a satisfying Aha" (Owen, 1998, p. 4). Kauffman's years spent studying self-organization are chronicled for a lay audience in *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity* (1995). While broadly influential on those focused on leadership, management, and organizations, he was particularly important to Harrison Owen. Owen found clear parallels between Kauffman's conditions for self-organization and his conditions for Open Space.

Owen writes:

> Kauffman set himself the considerable task of determining the means whereby we (and all living creatures) progressed from primordial molecular stew to you—me and all the rest. Through extensive computer modeling, real life laboratory work, and a combination of both, Kauffman came to the conclusion that given a few very simple pre-conditions, systems will self-organize. Kauffman's preconditions, which probably are not unique to him, include the following:
>
> - A relatively safe environment.
> - High levels of diversity in terms of the elements to be found in that environment.
> - Great potential complexity in terms of the possible inter-relationships of the elements present.

- A drive (urge) towards improvement, usually manifest as the necessity of finding a better fit with the environment.
- A sparcity of prior connections (the elements are not "hard wired" together).
- The whole mess is on the edge of chaos.

Given these pre-conditions, self-organization is a natural consequent.

Kauffman's term for the resultant self-organized system is "Complex Adaptive System." It is complex in that the elements present are multiple and interrelated in a complex fashion. It is adaptive in that the system can continue to evolve in positive ways relative to the environment in which it is found. (1998, p. 2).

Compare that to Owen's description of the conditions for using Open Space Technology, derived through experience: "Use Open Space in any situation characterized by high levels of complexity in terms of the issues to be resolved, high levels of diversity in terms of the people involved, high levels of potential or actual conflict (a situation at the edge of chaos), and when the decision time was yesterday. Never use Open Space when the issues and their resolution are already known—when the connection of issues and people is firmly established, meaning that the scarcity of connections between elements is not in operation (Owen, 1998, p. 4)."

Kauffman, who ultimately found fellow travelers in the search for the laws of complexity when the Santa Fe Institute was founded, dedicated *At Home in the Universe* to his colleagues (Kauffman, 1995).

The Birth of Complexity Science

With the 1984 founding of the Santa Fe Institute as a cross-disciplinary meeting place for scientists seeking to understand the compelling and complex problems of our time (Santa Fe Institute, 2013), some clarity began to emerge.

By the 1990s, the evocative "chaos" began giving way to the more encompassing "complexity." Gleick described chaos as the "irregular side of nature, the discontinuous and erratic side" (1987, p. 3). Waldrop offered this description of complexity: "systems at the edge-of-chaos, in which the components of the system never quite lock into place, yet never quite dissolve into turbulence, either. In this place, life has enough stability to sustain itself and be creative. It is where new ideas and innovations nibble away at the edges of the status quo. . . . The edge of chaos is where centuries of slavery and segregation suddenly give way to the civil rights movement of the 1950's and 1960's . . . the place where a complex system can be spontaneous, adaptive, and alive" (Waldrop, 1992, p. 12). Waldrop's *Complexity* appeared on the scene in 1992, the same year as Wheatley's *Leadership and the New Science*. Both became sources of inspiration for the subsequent work of those looking at the implications of complexity for leadership, management, and orga-

nizations. See Mitchell (2009) for an overview of more recent developments in complexity theory.

Having followed the scientists who gave rise to a new worldview for thinking about organizational life, it is time to explore a second stream: the evolution in organizations, as expressed through the writing and practices of Margaret Wheatley, Ralph Stacey, and Harrison Owen.

Wheatley, Berkana, and Making It Real

Margaret Wheatley arrived on the leadership and management scene when she connected emerging scientific ideas with organizational life. Wheatley describes the beginnings of the exploration:

> High in the air as a weekly commuter between Boston and Salt Lake City . . . I opened my first book on the new science—Fritjof Capra's The Turning Point, which described the new world view emerging from quantum physics. This provided my first glimpse of a new way of perceiving the world, one that comprehended its processes of change and patterns of connections. . . . From that first book, I took off, seeking out as many new science books as I could find in biology, evolution, chaos theory, and quantum physics. . . . It was a world where change and constant creation signaled new ways of maintaining order and structure. (Wheatley, 1992, pp. 1–2)

In *Leadership and the New Science,* Wheatley made the case that organizations were designed according to a Newtonian view of the universe, expecting predictability and order. She argued that we need to ground theories, designs, and actions in today's science and described how they can inform beliefs and actions around participation and relationships, the role and use of information, and the importance of autonomy and self-reference.

Participative management leads to a richer, more diverse, and vital organization. Quantum physicists tell us that whether there is a particle or a wave depends on the participation of an observer. By attending to events and interactions rather than things, physicists came to recognize that nothing is outside. Everything is connected. Consider the implications for participation as an organizational strategy. Making room for multiple perspectives broadens the field of possibility. Many intersections between observers and data and a multiplicity of interactions make for richer information, setting the stage for many interpretations for discussion and a more diverse, more textured sense of what is going on and what needs to be done.

If participation is a key strategy, Wheatley named some challenges for organizations. How do you design groups so that people work well together?

How does diversity become a source of strength and creativity? How do you resolve conflicts? Or include different stakeholders? Dialogic OD becomes a viable means for addressing many of these questions.

Relationships are key to forming structures that work. Do we see a particle or a wave? Physicists tell us that relationship is the key determinant of what is observed and what manifests. Particles do not exist independently of the relationship. In other words, unseen connections among entities are fundamental to understanding the whole. These invisible forces shape space and behavior.

Consider the implications for ideas like organizational vision. A vision can act like a wave—washing over and through everything—rather than a linear destination to be reached. If vision, values, ethics permeate the organization, the people who touch that organization are influenced by it. Rather than designing organizations to run via rules and procedures, Wheatley suggested that a quantum organization works through clear purpose and principles informed by its values and ethics.

Information organizes matter into form. Over the previous decades, information theory had treated information as a thing—bits to be transmitted and received. Wheatley noted that emerging evolutionary theories considered information as alive, dynamic, and consisting of both structure and process. Information becomes a source of novelty through which new structures emerge. She identified chaos as the greatest generator of information. When it is freely generated and exchanged, order and growth arise. Knowledge is created from new connections.

The implications according to Wheatley: be open to more information from more places. Seek information that is ambiguous, complex, of no immediate value. Take a whole-system view. Play and observe. Try different variables to learn critical points. By giving participants voice, listening to different interpretations and processing them together, information becomes amplified. In a sense, she said, to create order, invite conflicts and contradictions and provide time, colleagues, and opportunities to process them.

Autonomy and self-reference, with a strong frame of reference, generate coherence and continuity. Self-organization teaches us that order emerges out of the interactions among individual agents. Many of us fear that the increased autonomy implicit in that idea will lead to things falling apart. Wheatley encouraged us to make a different assumption: that the world is inherently orderly. In such a world, every agent is both unique and connected with its environment. Boundaries preserve us and connect us. Nature seeks simplic-

ity. Order, conformity, and shape are created not through complex controls but through a few guiding principles. From leaves to galaxies to organizations, key patterns express a system's overall identity, leaving great autonomy for individual agents.

Wheatley described a principle of all self-organizing systems: self-reference—the notion that "instead of whirling off in different directions, each part of a system must remain consistent with itself and with all other parts of the system as it changes. There is, even among simple cells, an unerring recognition of the intent of the system, a deep relationship between individual activity and the whole" (1992, p. 146). Said in management terms: clear core values and vision kept in motion through continuing dialogue can lead to order. It can be tough to believe that a deep relationship exists between individual agency and the whole. Perhaps one of the most challenging management tasks is to support the messy ebb and flow of creative endeavor, trusting that order emerges. Wheatley acknowledged this challenge and offered an alternative perspective: "We have created trouble for ourselves by confusing control with order" (1992, p. 23). The lessons of self-organization tell us that by replacing rules and procedures designed to control with visions and values that encourage lively, independent action, both organizations and individuals benefit.

Theory into Practice

Shortly before *Leadership and the New Science* was published, in partnership with Myron Kellner-Rogers and others, Wheatley formed the Berkana Institute. It became the testing ground for applying the concepts in her writing. A history of their work is on Berkana's website. The following are a few high points (Berkana Institute, 2013a).

From 1992 to 1996, Berkana hosted quarterly dialogues to consider implications of new science for human organizations. These sessions deepened the participants' understanding of the science and the process of dialogue. They used Bohm dialogue, a process for enabling meaning to flow among all participants, ideally in groups of twenty to forty. The process focuses on inquiry and suspending assumptions so that shared meaning might arise (Bohm, 1989). When Wheatley and Kellner-Rogers published *A Simpler Way* in 1996, they took their experiments in dialogue on the road, hosting conversations about the book around the country. Berkana even experimented with online conversations in 1997, with about three hundred people from around the world.

"From the Four Directions," which lasted from 2000 to 2004, marked a shift to a global outlook. Berkana used PeerSpirit circles, a dialogic process

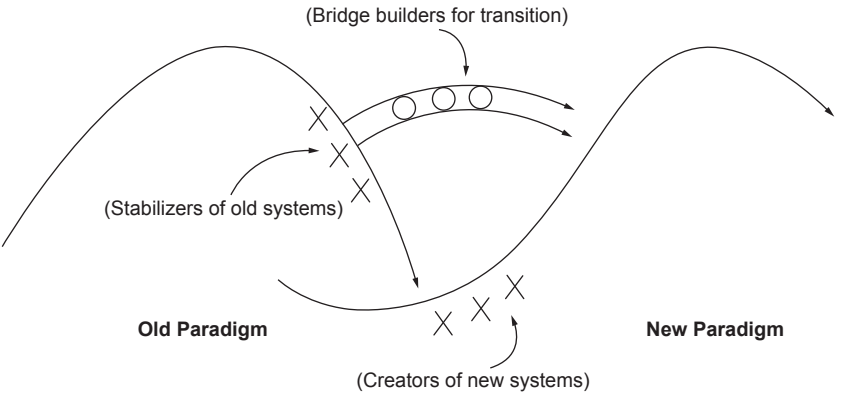

Figure 6.1 Berkana Two-Loop Model. From Stilger, 2013.

grounded in indigenous practices, to train young leaders in thirty countries as conversation hosts. They connected the circles through a newsletter and events, building a worldwide network of community leaders. In recent years, Berkana has incubated the Art of Hosting, a dialogic practice conceived by Toke Paludan Møller and Monica Nissén and grounded in complexity science. It has grown a global community of practitioners who use dialogic processes such as World Café, Open Space Technology, Appreciative Inquiry, and Circle process to engage groups and teams in meaningful conversation, deliberate collaboration, and group-supported action for the common good (Holman, 2010).

Berkana has developed a simple, powerful expression of its theory of change, the two-loop model (shown in Figure 6.1). In brief, as one system peaks and begins to falter, alternatives start to arise in isolation. Slowly, the old collapses and the new arises. The essential work in organizations is to hospice the old, midwife the new, and build bridges between worldviews (Stilger, 2013; Berkana Institute, 2013b).

While Wheatley moved theory into practice, Ralph Stacey took complexity into the academy.

From Chaos to Complex Responsive Systems

Stacey may have been the first to write a book on chaos and its implications for management and organizations. In 1991, influenced by his strategic planning work, he published *The Chaos Frontier: Creative Strategic Control for Business*. It was followed two years later by *Strategic Management and Organisational Dynamics*, a textbook, now in its sixth edition (1993, 2011). It located complexity thinking in the wider strategy and organization theory literature.

Stacey's 1996 *Complexity and Creativity in Organizations* benefited from the increased complexity literature, drawing from the writings of many of the scientists Waldrop introduced in *Complexity*.

Like the scientists who inspired him, Stacey characterized his intent as an invitation to members of organizations to develop a new frame of reference for understanding organizational life. He made a compelling case that "left to self-organize in what looks like a mess with no apparent order, agents interacting in a system can produce, not anarchy, but creative new outcomes that none of them ever dreamed of. . . . The price is an inability to know the final destination or to be in control of the journey" (Stacey, 1996, p. 13). He went on to offer key insights into organizational life:

- Creativity lies at the edge of disintegration. It exists in a space between stability and instability.
- Paradox and creative destruction are part of organizing. Inherently messy, true dialogue involves difference, conflict, fantasy, and emotion.
- Links between cause and effect disappear. They are replaced by individual agents interacting in spontaneous self-organization producing emergent strategies.

In 1995, Stacey met Patricia Shaw and Douglas Griffin, as their PhD supervisor. Together, they cofounded the Complexity and Management Centre at the University of Hertfordshire, perhaps the first center of its kind and a primary site for research in complexity and organizational life. His continuing collaboration with Shaw and Griffin marked a turning point in Stacey's work. He moved from thinking of complexity as one of many situations managers might find themselves in to seeing all organizational phenomena as inherently complex. With Shaw and Griffin, he developed a theory of "complex responsive processes of relating," in which "human futures are under perpetual construction through interaction between human bodies in the living present" (Stacey, 2001, p. 4). Key to the concept is the notion that knowledge is not static but is created and lives in the interactions among people. No one stands outside of the system. Unlike Wheatley and Owen, Stacey, Shaw, and Griffin regard the complexity sciences as providing useful analogies, but not as directly applicable to human systems. For example, the act of modeling requires an external modeler, while an evolutionary process does not "depend on any outside design and may not even be usefully thought of as a system" (Stacey, 2001, p. 54). An additional distinction Stacey and his colleagues draw is to focus not on whole systems but on local interactions between people in the living present.

Chapter 7 of this book is by Stacey himself. His theories and Patricia Shaw's (2002) book on consulting have influenced a generation of Dialogic OD practitioners, especially in Europe.

Practice First: Open Space

Harrison Owen posted a message to the Open Space listserv that frames the notion of doing, then reflecting on theory afterward. In his words:

> As the perpetrator of some dozen books, I would be somewhat less than genuine not to acknowledge the power of words. But I think I have also learned something about when they are most powerful. It is true that some good words might interest somebody in trying something new, OS [Open Space] for example. But nothing compares with the experience. Words that come afterwards as a reflection and deepening of the experience really seem to work. This sounds so obvious when you say it that it hardly seems worthwhile saying . . . but the common practice in schools and training situations is precisely the opposite. We give all the theory and explanations and then say have the experience. (Owen, 2013)

Owen's injunction to experience first and think later is apt given that Open Space as a method preceded theories about why it worked. His first explanation for the way in which organization emerged from Open Space built on his theological studies of transformation in religious and mythic texts (Owen, 1987). Ordained as an Episcopal priest, he spent the mid-1960s as a graduate student and ancient language scholar studying chaos, order, and the creative process in the Old Testament in the original Aramaic. This experience informs his perspective on chaos and order:

> But the new news of Chaos and Complexity theory is really no news at all. For millennia the great traditions of the world have understood that the forces of chaos and order conspire in a great cosmic dance to bring forth all that is. Shiva dances as creator and destroyer. The Tao manifests in the yin and yang of shadow and light, order and destruction. And according to the Prophet Isaiah, God said, "I create light and darkness. I create peace and chaos" (Isaiah 45:7). It would seem that it has always been so, it is only that we may have forgotten, or more likely deluded ourselves. But no matter the source, Contemporary chaos theory, the Wisdom of ages, or your own experience when you roll out of bed to face a new round of transformation . . . the message is clear. Things ain't what they used to be, and all signs point to more of the same and different. (1988, 37)

In the 1990s, chaos and complexity theory entered into Owen's work (Owen, 1994). His 2000 book, *The Power of Spiri*t, explicitly links Open Space to complexity, matching his principles to Kauffman's principles of self-organization, described earlier.

The essence of Owen's perspective on complexity is as follows:

- All systems are open. All systems, human and otherwise, are open to each other, interconnected, interdependent, and always moving.

- All systems are self-organizing. Open, interconnected systems interact and coevolve, each making demands and offering gifts. The result is a living community that dies, in whole or in part, when it runs out of time or space in which to grow.
- Opening space provides the essential condition for continuing life. When space is opened for human communities, life can be renewed. This is an ongoing and natural process. We have learned to initiate the process intentionally—which is what happens with Open Space Technology (2011).

Owen's theory is visible in action via the remarkable growth of a vibrant, self-organizing worldwide Open Space community of practice. While there are a few formal Open Space Institutes around the world, they are a small part of a larger phenomenon. The Open Space community began gathering online in 1985 to explore theory and practice using an early forum service. In 1996, a university professor, inspired to use his expertise to support the community, started a listserv. With more than thirty thousand messages and over one thousand members, this real-time learning laboratory is a source of creative and generous interactions among novices, long-time practitioners, and Owen. It forms a hub in this international community. With no formal moderators, it is an ongoing space for interaction and learning as questions are posed and answered, along with playful activities like a periodic poetry contest. An annual worldwide gathering was first convened by Owen in 1992. Each year since, someone has stepped forward to invite the international community to his or her country. Other activities spring up, led by anyone who chooses. For example, local "Stammtisches," informal meetings announced on the OSlist, began with an invitation by Michael M. Pannwitz in Berlin in 2004. They now happen around the world. Michael Herman created the Open Space Technology website, www.openspaceworld.org. Artur Silva, Shufang Tsai, and Lisa Heft, from Portugal, Taiwan, and the United States, started a website where conversations take place in Spanish, Basque, Russian, and other languages. And there is much more. With no formal organization, these activities arise through individual initiative, yet act as a glue that connects the community. According to the Open Space World Map (another initiative undertaken by Michael Pannwitz), Open Space has traveled to at least 136 countries. Owen's rough estimate, developed for Wave Riders in 2008, is that space has been opened more than one hundred thousand times.

Complexity and Organizational Life

In the early 2000s a few notable works by business leaders and academics influenced thinking about complexity as applied to leadership and management. Without mentioning complexity, Ronald Heifetz, professor of leadership in the Kennedy School of Government at Harvard, gave us a distinction between

technical problems and adaptive challenges (Heifetz, 1998; Heifetz and Linsky, 2002). Richard Pascale and colleagues used in-depth organizational experiences to distill four principles from complexity science and create a management model (Pascale, 1999; Pascale, Milleman, and Gioja, 2001). Often used as an assessment tool, David Snowden's Cynefin framework was informed by his work in knowledge management and organizational strategy (Snowden, 2000; Snowden and Boone, 2007).

Adaptive Challenges

Though Heifetz did not use complexity science as a lens for understanding organizations, his descriptions of effective leadership processes for complex, uncertain, multistakeholder "adaptive challenges" are profoundly similar to Dialogic OD. His work can help leaders understand the utility of emergent Dialogic OD processes.

When facing the unknown, fear of losing the familiar runs high. Most look for an authority figure with answers. Unfortunately, that often leads to what Heifetz calls the greatest single leadership failure: treating adaptive challenges like technical problems (Heifetz, 1998). His distinction between technical problems and adaptive challenges is an important contribution to the management literature.

Technical challenges are rationally definable and responsive to operational fixes. Authority, expertise, and procedures work for addressing technical problems. While technical problems can be defined, adaptive challenges are complex and confusing and generally produce different opinions on whether an issue even exists, much less how to define it. Adaptive challenges take time, requiring experiments, discoveries, and adjustments throughout an organization or community. The implication is that the people affected must be involved, learning new attitudes, values, and behaviors to adapt and thrive.

One way to think about the distinctions between technical problems and adaptive challenges is to consider how leadership responsibilities differ. Heifetz, with Donald Laurie, suggested the following actions that highlight the differences (Heifetz and Laurie, 1997). When dealing with technical problems, a leader sets direction, defining the problems and finding solutions. In contrast, when facing adaptive challenges, direction setting involves identifying the challenge and framing key questions and issues. With technical problems, leaders focus on protecting organizations from external threats. With adaptive challenges, the organization benefits from feeling the pressure from those threats. According to Heifetz and Laurie, that requires a leader to help members feel the pressure within a tolerable range. Technical problems are aided by clarifying roles and responsibilities. Adaptive challenges put existing roles in question. Appropriate leadership action is almost diametrically

opposed. For adaptive challenges, leaders must stay with the ambiguity and resist the urge to define new roles too quickly. When the problem is technical, conflict gets in the way. The leader's job is to restore order. When the challenge is adaptive, conflict becomes a source of creative tension. A leader's job is to expose conflict, to let it emerge. Finally, Heifetz and Laurie encourage maintaining norms when tackling technical problems. Adaptive challenges are best addressed by challenging norms that no longer serve.

Heifetz and Linsky (2002) provided remedies for adaptive challenges that encourage the spirit of complexity-oriented responses from those with authority and responsibility. They offer people with positional authority five actions:

Get on the balcony. Seek perspective—understand the whole as well as the details. Step in and out of the dance, intervene, observe the impact, and step back on the dance floor. Stay aware of your role and responses.

Think politically. Find allies for protection and partnership. Keep opponents close. They tend to have the most to lose, so compassion matters. Work with the uncommitted, owning your role, if any, in the situation. Acknowledge their loss, why it matters, and the challenge of what you are asking of them. Model the behaviors you ask of others. Accept that not everyone will make it.

Orchestrate the conflict. Conflict is a given in adaptive challenges because they involve engaging with something perceived as outside current boundaries. Work creatively with difference, passion, and conflict. Sound familiar? Without the language of Dialogic OD, Heifetz and Linsky define Dialogic OD–like actions. Show participants the future by continually returning to the vision that makes the challenges worth the risk. Create a holding environment, or as Dialogic OD practitioners call it, a container. Control the temperature, attending to the heat of the issues while maintaining enough cool for people to take responsibility for the situation. Set the pace, recognizing the emotional as well as the practical journey. A later article explicitly encourages leaders to "embrace disequilibrium" (Heifetz, Grashow, and Linsky, 2009).

Give the work back. If you hold on, you become the issue. Perhaps the biggest challenge for those accustomed to being in charge is recognizing that the work belongs with those most affected. Solutions to adaptive challenges usually cut across organizational boundaries. Engage stakeholders in developing the solutions they will have to implement. These are exactly the kinds of processes Dialogic OD practitioners know well.

Hold steady. "People do not resist change, per se. People resist loss" (Heifetz and Linsky, 2002, p. 11). Heifetz and Linsky remind us that "leading" is most dangerous when no one knows whether the new situation will be better than the current one. The more leaders self-regulate their emotions, the more effective they will be in tackling adaptive challenges. Find equanimity and poise as you take the heat, pace yourself as issues ripen, and stay focused on what matters.

Heifetz gave us the language of technical and adaptive challenges. Richard Pascale, a former McKinsey consultant and academic, saw the possibilities in complexity science for addressing adaptive challenges and made those linkages explicit for business leaders.

Complexity and Business Strategy

In *Surfing the Edge of Chaos*, Pascale and his coauthors propose a management model informed by "the nature of nature" (Pascale, Milleman, and Gioja, 2001, p. 5). Using examples from Sears, Monsanto, the U.S. Army, and others, they bring four principles to life: prolonged equilibrium is a precursor to death, living things move toward the edge of chaos, living systems self-organize at the edge of chaos and new forms emerge, and living systems cannot be directed, only disturbed. Here are some organizational examples from Pascale's work:

Equilibrium as a precursor to death. Most of us consider equilibrium a good thing. Yet nature teaches us that without variety, which can put us off balance, we perish. When Jack Welch took the helm of General Electric in 1980, he found a company "too comfortable in their markets." His strategy: introduce some disequilibrium by challenging each business to be number one or two in its industry or be divested. He then unleashed "Workout"—an approach for streamlining business processes through fast and concentrated decision making and empowerment (Ashkenas and Murphy, 2007). At the heart of Welch's success was his decision to "amplify threats and foster disequilibrium to evoke fresh ideas and innovative responses" (Pascale, Milleman, and Gioja, 2001, p. 28).

The edge of chaos. Novelty requires the unexpected but not the chaotic, the space between rigidity and complete randomness. Robert Shapiro, CEO of Monsanto, inspired by visiting the Santa Fe Institute, took his company to the edge by divesting its mainstay chemical business to focus on being a pioneer in life sciences. Tradition bound, conservative, highly siloed, Monsanto was not bound to succeed. Shapiro used the notion of a strange attractor to convene extended dialogues among the scientists and professionals, posing inspirational challenges such as solving hunger and health issues globally.

Given the chance to make a difference, employees stepped in and achieved remarkable outcomes. While financially successful, innovations in modifying genes raise ethical issues that keep the company on the edge today (Pascale, Milleman, and Gioja, 2001, p. 80).

Self-organization and emergence. Like his counterparts in studying organizations, Pascale found inspiration in Stuart Kauffman's work. In an example from Shell Oil, he tells of managing director Steve Miller tapping the intelligence in the trenches to turn Shell into a highly competitive and profitable company. Through workshops with small retail operating teams that connected multiple levels and functions with customers, an informal, give-and-take culture that encouraged an entrepreneurial spirit emerged. Miller's measures not only dramatically increased profitability, but also created an innovative, high-energy, engaging place to work (Pascale, 1999).

To innovate, disturb. Complexity teaches us that living systems don't function through cause-and-effect relationships. Rather, nuanced interactions and happy accidents can be pivotal. Take Sun Microsystems' development of Java. Try connecting these dots: a chance conversation between CEO Scott McNealy and a young employee, which occurred because they played together on a hockey team; a laser-enhanced rock concert that triggered a programming insight; a deal for a TV set-top box with Time Warner that almost came off; the unexpected arrival of the World Wide Web; and the leap of faith associated with giving away a product. These seemingly random events conspired to launch Java and resurrect a struggling Sun (Pascale, Milleman, and Gioja, 2001).

The implications of these principles for how leaders work are profound. As Pascale notes, "The leader becomes a context setter, the designer of a learning experience—not an authority figure with solutions. Once the folks at the grassroots realize they own the problem, they also discover that they can help create and own the answers, and they get after it very quickly, very aggressively, and very creatively, with a lot more ideas than the old-style strategic direction could ever have prescribed from headquarters" (Pascale, 1999, p. 191).

Pascale's stories are mostly from traditional settings. While they tap the potential of complexity, like Heifetz and Linsky, Pascale assumes that organizational hierarchies are a given. For the Dialogic OD practitioner, this may be good news, since it opens the way for bringing dialogic practices into these organizations. Ironically, as organizations embrace these ideas, they may shift to more nimble, self-organizing leadership and management structures based in networks, not hierarchies.

Cynefin: A Model for Decision Making

What would it mean for business leaders to have a framework that helps them act based on the complexity of their situation? Snowden's framework puts the mystery of complexity in four boxes (and a center)—a gift to leaders and policy makers as diverse as the U.S. Department of Defense, which has used it in counterterrorism work, and a pharmaceutical company developing a new product strategy (Snowden and Boone, 2007). Snowden named the model "Cynefin" (pronounced ku-*nev*-in), a Welsh word conveying the idea that multiple factors in our environment and our experience affect us in ways we can never understand.

The model, depicted in Figure 6.2, defines five contexts based on their cause-effect relationships. Leaders can assess their situation and choose actions based on four of the contexts: simple, complicated, complex, and chaotic. When it is not clear which context dominates, disorder applies.

- *Simple Contexts.* When stability exists and cause-and-effect relationships are clear, sense the situation, categorize the facts, and act based on established practices.
- *Complicated Contexts.* When multiple options exist and cause and effect may not be apparent to everyone, analysis comes into play. Experts thrive in this context, identifying trade-offs among multiple viable options.
- *Complex contexts.* When no obvious answer exists, experimentation and probing for what is emerging sets the stage to sense and respond.
- *Chaotic contexts.* There is no point in seeking to understand cause and effect because the situation is in constant flux. Act rapidly to stop the bleeding. Once some order is created, sense where stability exists and where it does not. Seek to transform the situation from chaotic to complex.

When *disorder* reigns, there is a cacophony of perspectives jostling for position. Factions go to war with each other. Seek to understand different aspects of the situation and deal with them separately via the other contexts.

Dialogic OD practices are particularly relevant in complex situations to generate probes and experiments from which leaders can learn (Bushe, 2013). Collins and Hansen (2011) studied businesses that thrived in uncertainty, using the phrase "fire bullets, then cannonballs" to describe the practice of following small, successful experiments with big bets that exploit what you learn. This improvisational or emergent approach to change is discussed in Chapter 15.

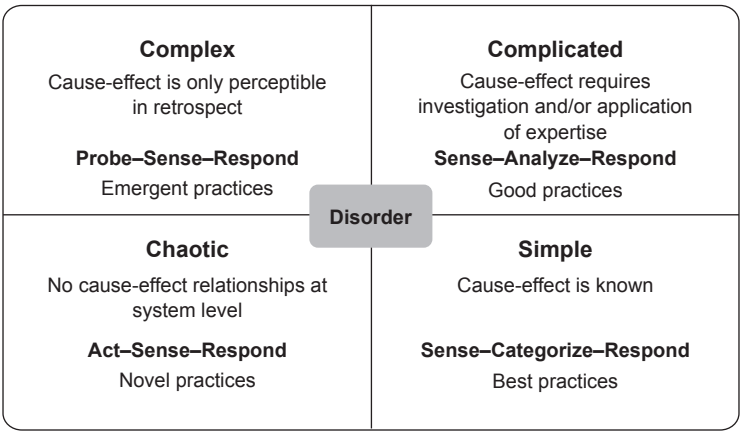

Figure 6.2 The Cynefin Model. Adapted from Snowden and Boone, 2007.

Other Institutes Bringing Complexity Perspectives to Dialogic OD

As a new generation of practitioners enters the field, they, too, are making their mark. Patricia Shaw and Douglas Griffin coedited a series with Ralph Stacey on Complexity and Emergence in Organizations (Griffin, 2001; Shaw, 2002). Their theory of complex responsive processes of relating, as described by Stacey in Chapter 7, underlies the series.

Another academic center focusing on organizational systems and complexity is the University of Waterloo's Institute for Social Innovation and Resilience (Waterloo Institute, 2013). Faculty member Frances Westley and coauthors Brenda Zimmerman and Michael Patton gave us *Getting to Maybe* (2006), which grounds complexity in examples of social innovation, offering rules of engagement such as the essential nature of questions to reveal tensions and ambiguity, the importance of relationships for engaging the complexity of a system, and the need for an inquiring mindset to embrace paradoxes and tolerate multiple perspectives.

The Plexus Institute "fosters the health of individuals, families, communities, organizations and our natural environment by helping people use concepts emerging from the new science of complexity" (Plexus Institute, 2013). With contributions from Lisa Kimball, Keith McCandless, and Henri Lipmanowicz, Plexus is the birthplace of "Liberating Structures," nuggets drawn from dialogic practices to make it possible for people and organizations to create, to do new things, and to be innovative (Group Jazz, 2010).

Human Systems Dynamics Institute offers a collection of concepts and tools that help make sense of the patterns that emerge from chaos when people work and play together in groups, families, organizations, and communities (Human Systems Dynamics Institute, 2010). At the heart of founder Glenda Eoyang's work is the CDE model (Eoyang, 2007) describing three conditions that shape the path and outcome of self-organizing: Containers ("C") define the "self" that is to organize. Difference ("D") provides the motivation for change. Exchange ("E") connects individuals or groups to each other across their differences.

Having reviewed the landscape that has influenced our thinking about complexity and organizations, what does it mean for Dialogic Organization Development? My work in emergence offers some insight.

Implications for Dialogic Organization Development: A Pattern of Emergence

If *self-organization* depicts the nature of complex systems, *emergence*, a term coming into wider use, describes the process through which order arises out of chaos. Think of it as looking at self-organization from the inside out. Connecting what science has taught us about emergence (Corning 2002; 2003; Holland 1999; Johnson 2001) with experiences and observations of a variety of dialogic processes led to my work with emergence in organizational life (Holman, 2010, 2013). While the description that follows may sound neat, tidy, and linear, that is far from the case. It just makes it easier to read.

A disturbance (chaos) interrupts the status quo. In addition to natural responses, like grief or fear or anger, people differentiate—take on different tasks. For example, in an earthquake, while many are immobilized, some care for the injured, others look for food and water. Someone creates a "find your loved ones" site on the Internet. A few blaze the trails and others follow. They see what is needed and bring their unique gifts to the situation. A new order begins to arise.

Figure 6.3 depicts the flow of this pattern of change:

- *Disruption* breaks apart the status quo.
- The system *differentiates*, surfacing innovations and distinctions among its parts.
- As different parts interact, a new *coherence* arises.

Whether one works with an organization, a community, or other social system, knowing of this pattern can inform dialogic practice. Three activities support engaging (shown in Figure 6.4):

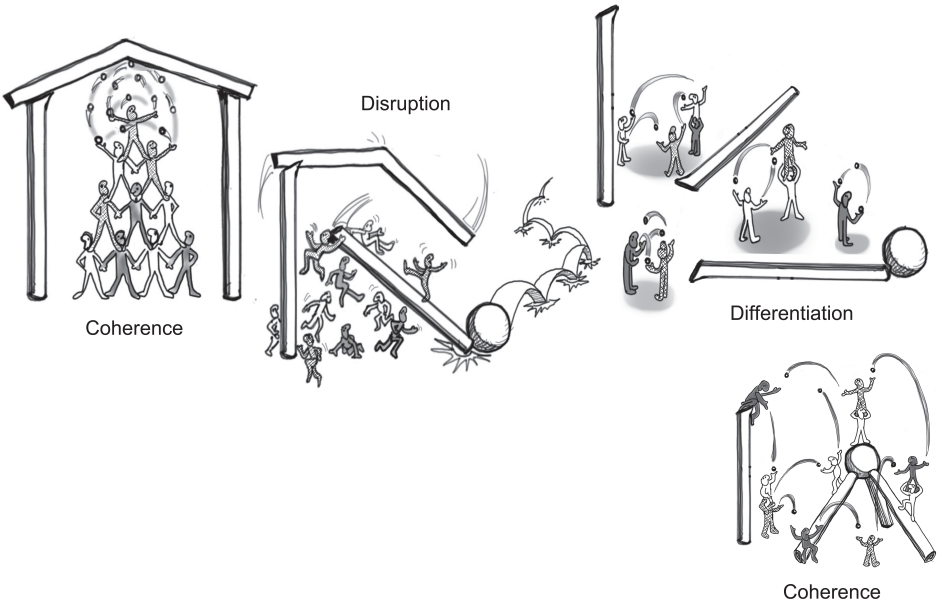

Figure 6.3 Emergence: A Pattern of Change. Adapted from Holman, 2010; thanks to Steven Wright for the illustrations (Seattle, WA), steven@wrightmarks.com.

Create a Container

Containers help us face disruptions compassionately. Three actions weave spacious containers for supporting random encounters among the diverse and possibly conflicted agents of a system:

- Asking possibility-oriented questions;
- Inviting diversity—involving all aspects of the system; and
- Being welcoming.

See Chapter 13 on hosting containers for more information.

Create Opportunities for Individual Expression and Connection

This activity brings out the creativity in differentiation. A lesson from Open Space: the heart of self-organizing in human systems is the invitation to take responsibility for what you love. A seeming paradox: when we are invited to pursue what authentically matters to each of us, rather than selfishness our actions become acts of service, of contributing what we love on behalf of the

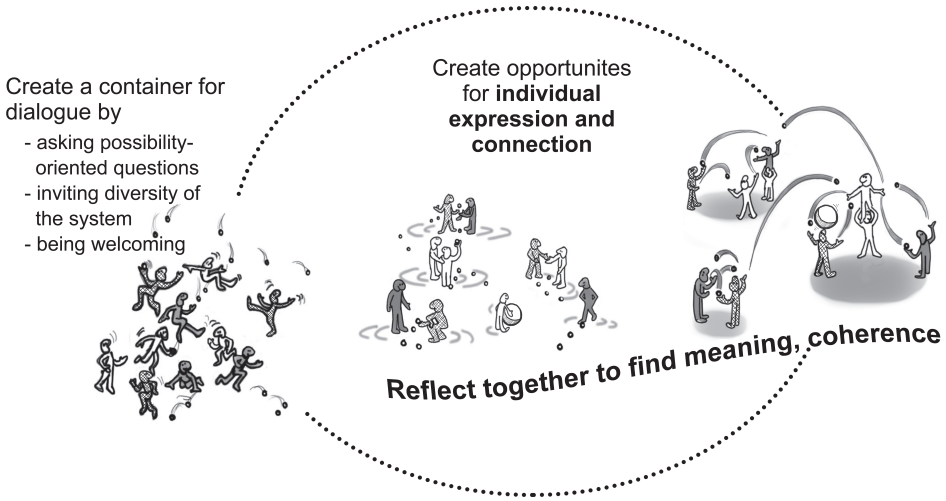

Figure 6.4 Actions for Dialogic Engagement. From Holman, 2013; thanks to Steven Wright for the illustrations (Seattle, WA), steven@wrightmarks.com.

whole. What in other circumstances might be disruptive differences can become gifts to the whole.

Reflect Together to Find Meaning, Coherence

This activity may just help us discover wise coherence. We learn through reflection. Stepping out of the flow of activity supports us in sensing larger patterns taking shape. What "simple rules"—patterns, assumptions, principles—are surfacing? What new order is arising now?

These actions are intended to work with—not control—natural patterns of emergence, self-organizing out of chaos. The more we, as dialogic practitioners, employ our trade, the more we help to seed an adaptive worldview.

Conclusion

Our Newtonian worldview has been disrupted by contradictions that sent scientists searching for answers. As they found each other and compared notes, useful patterns and distinctions appeared, beginning the process of differentiation, defining a new language—chaos, complexity, self-organization, emergence, and much more—that brings a new worldview to life. From chaos, we learned that complex behavior arises through the interactions of individual agents following simple rules. Further, initial

conditions can have significant impact. We came to understand that complexity is a just stable enough state—far from equilibrium, a dynamic tension between order and chaos. Self-organization spontaneously arises when diverse agents of a complex system interact with each other and their environment. Emergence offers a lens into the nature of those interactions, focusing on novelty—new properties, different from their component parts, arising.

The shift in worldview implied in this emerging science of complexity includes the capacity to adapt, to engage the unexpected, to be our unique, authentic selves, inviting others to do the same as we interact with each other and our environment, generating novelty and innovation.

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