

#### 4 DON AMBROSE

### **INVIGORATING INNOVATION AND COMBATING DOGMATISM THROUGH CREATIVE, METAPHORICAL BUSINESS LEADERSHIP**

**ABSTRACT** The influence of metaphor on human thought and action is ubiquitous and powerful. At the deepest levels of cognition four root metaphors compete for our attention and trap us in dogmatic, insular perspectives. Understanding these four metaphorical worldviews can expand the vision of organizational leaders and their colleagues, freeing them from implicit thought imprisonment and enabling them to perceive new opportunities. Each of the worldviews encourages a unique perspective on barriers and opportunities confronted by enterprises. The mechanistic worldview encourages us to view people and processes in organizations as machinelike, magnifying the importance of precision, detail, reductive thinking, and objectivity. Based on the metaphor of an intricately integrated organism, the organicist worldview emphasizes the coherence and totality of systems, with the whole transcending the parts. It magnifies the importance of integrative connections and long-term, holistic developmental processes. Based on the metaphor of an ongoing event within its context, the contextualist worldview highlights the importance of contextual influences and the unpredictable emergence of novelty. Finally, based on metaphorical similarities, the formist worldview encourages us to seek patterns of similarity in diverse phenomena. With appreciation for the ways in which each worldview provides a unique perspective on an enterprise and its market niches, organizational leaders can avoid narrow-minded, dogmatic entrapment within a single perspective, thereby strengthening their chances for dynamic innovation.

#### **Invigorating Innovation and Combating Dogmatism Through Creative, Metaphorical Business Leadership**

Creativity in business and organizational leadership is drawing attention, especially in today's complex, unpredictable, globalized environment (see Mumford, 2011; Runco & Kim, 2013). While market niches can be found within isolated, local contexts, most organizations are influenced by rapidly shifting opportunities and problems within intricately interconnected transnational communication networks (Rodrik, 2007). This magnifies the importance of creativity. The creative minds of leaders and employees represent the new capital of the 21st century.

In such conditions one of the biggest threats to organizational survival is the possibility of implicit mind entrapment within a conceptual framework that limits or distorts creative thinking. Stempfle (2011) used the term *organizational fixation* to represent this problem

and to show how habit-bound thinking can limit the capacity for organizational change. A primary responsibility of organizational leaders is to recognize and overcome organizational fixation to prevent it from becoming an excessive threat that hides problems and obscures opportunities for productive innovation.

### **Dogmatism Eroding Our Cognition and Causing Immense Damage**

Organizational fixation is one aspect of a larger problem that has plagued the human mind from the first glimmers of cognition in the ancient past. Dogmatism might be the most powerful and difficult enemy of creative thought (see Ambrose & Sternberg, 2012). A dogmatic mind is plagued by some combination of narrow-mindedness, shortsightedness, and superficial thinking. It is trapped implicitly within a particular conceptual framework such as a cultural or ideological belief system, a research paradigm, or a favored problem-solving methodology. Examples of the enormous harm dogmatism causes are ubiquitous. Here are a few:

- War is a crapsheet with the dice loaded heavily against the "player." History unfortunately repeats over and over again when the excessive optimism of dogmatic policymakers and military leaders forces nations into costly, unpredictable military incursions (Bacevich, 2005, 2012).
- Genocide occurs when the dogmatic minds of societal leaders are trapped within any of four causal notions: (a) fear of pollution from another "impure" population; (b) favoring preemptive attacks due to irrational fear of attacks from outsiders; (c) revenge for past transgressions that might be decades or even centuries old; and (d) the convenience of capturing resources owned by outsiders (Chirot, 2012; Chirot & McCauley, 2006).
- Those who cling dogmatically to insular notions of identity formation tend to see outsiders as less worthy, even less human than those within their own cultural, ethnic, or religious group (Gewirth, 1998; Monroe, 2004, 2011).

### **Metaphorical Dogmatism**

These examples exert most of their impact within the sociopolitical and cultural dimensions of our lives. But there are forms of dogmatism that have more impact on creative business and organizational dynamics. One especially powerful and little recognized form of dogmatism comes from implicit entrapment within metaphors. It sounds incongruous to think of metaphor as having much impact beyond the high school English classroom; however, researchers and theorists in linguistics, philosophy, cognitive science, and creative studies have revealed the potential it has for powerful, implicit influence in a wide variety of human experiences.

Lakoff and Johnson (Lakoff, 1993; Lakoff & Johnson, 1980, 1999) revealed some ways in which metaphor implicitly shapes our thinking. For example, we tend to think of theories as buildings when we talk about "shaky or solid arguments," or "theoretical foundations and frameworks." Our conceptions of the human mind are shaped metaphorically as well. For example, when we say "I'm a little rusty," or "the wheels are turning," or "we are grinding out a solution," we are reinforcing the notion that the brain-mind system is a

machine. The brain-mind may operate somewhat like a machine but it is not very machine-like. Nevertheless, these mechanical metaphors can incline us to think about our minds in excessively mechanical ways.

This became particularly evident when two prominent cognitive scientists disagreed over a metaphor. Marvin Minsky, a pioneer of cognitive science, once made the comment that "the brain is a meat machine" (paraphrased in Clark, 2001, p. 7). This prompted another leading cognitive scientist, Joseph Weizenbaum (1995), to wrangle with Minsky's comment, arguing that Minsky had ignored contextual influences on the mind while demeaning humanity with the metaphor because meat is dead and can be burned and eaten. Weizenbaum was concerned that the meat machine metaphor exerted downward pressure on the value of human life and expectations for ethical behavior because it encouraged us to conceive of ourselves as nothing more than chunks of meat.

### **Metaphorical Worldviews**

These examples just scratch the surface of the literature on the impact of metaphor on thought but they provide some sense of the ways in which our minds can fall into metaphorical traps. Long ago, Stephen Pepper (1942), a leading philosopher, determined that four world hypotheses vie for attention at the implicit level in our minds. He named these four world hypotheses *mechanism*, *organicism*, *contextualism*, and *formism*. According to Pepper, these world hypotheses are metaphorical windows through which we view the world. Each one provides a different perspective on phenomena and they are incommensurable with one another, which means that each perspective is unique. It is extremely difficult to view the world simultaneously through more than one of these metaphorical windows.

These world hypotheses later became known as *worldviews*, which were used to analyze phenomena in cognitive science (Gillespie, 1992) and creative studies (Ambrose, 1996, 2009), among other fields. Each worldview has a "root metaphor" that structures the thinking of the person who is trapped within the framework. Each root metaphor encourages the thinker to perceive phenomena through the lenses of particular tenets.

For example, the mechanistic worldview is based on the root metaphor of a machine. This means a thinker trapped within mechanism tends to see the world as machinelike. The basic tenets of the mechanistic worldview include reduction of the whole to its component parts, strivings for precision and detail in one's work and thought, the search for causal mechanisms that shape phenomena and events, and the valuing of objectivity in investigation. An example of the influence of mechanism is the reduction of the complexities of human intelligence to a precisely measurable IQ score.

In stark contrast, someone trapped within the organicist worldview is guided by the root metaphor of an organism developing through stages toward a particular end. The basic tenets of organicist thought include a strong focus on the coherence and totality of systems with the whole transcending its parts, the importance of integrative connections, and attention to long-term developmental processes. An example of the influence of organicism is the attention to the "whole child" by educators who follow constructivist philosophy (see Duckworth, 1987; Popkewitz, 1998). Instead of emphasizing just the development of cognition (acquisition of factual knowledge and skills) the constructivist educator integrates cognition with the emotional dimensions and physical experiences of learning. The integration of knowledge through interdisciplinary work is another example of organicist thought (see Ambrose, 2009).

The contextualist worldview is based on the root metaphor of an ongoing event within its context. Its basic tenets include a penchant for going beyond the particularities of the phenomenon under study to look carefully at contextual influences on that phenomenon. Another tenet is attention to the unpredictable emergence of novelty in the ongoing event of interest. An example of contextualist influence is the emergence of cognitive scientists who study the context-embedded mind (e.g., Descombes, 2001; Gillespie, 1992). They go beyond the emphases on brain structures and electrochemical processes in neural networks, which are favored by mechanistic cognitive scientists, to see how cultural influences and other external pressures shape cognition in emergent, novel ways.

Finally, the formist worldview is based on the root metaphor of similarity. Its basic tenets include a search for patterns of similarity in diverse phenomena. Real-world examples of formist thinking include complexity theorists who study patterns of similarity in the dynamics of complex, adaptive systems such as human brains, national economic systems, populations of animals in ecosystems, and intriguing similarities at different levels of scale in fractal mathematics (see Lineweaver, Davies, & Ruse, 2013; Miller & Page, 2007; Page, 2010; Porter & Derry, 2012; Richards, 2001, 2010; Schuldberg, 1999).

Pepper (1942), who initiated the notion of root metaphors, and those who have followed with studies of worldview influence in various disciplines, point out that none of these worldviews are right or wrong in and of themselves. They provide unique perspectives on phenomena but those perspectives are incomplete. To gain a comprehensive understanding of complex phenomena one must employ multiple worldview perspectives. Given the incommensurability of worldviews, gaining multiple perspectives by looking at a phenomenon through multiple worldview lenses is not easy. Nevertheless, it is worth attempting because each worldview by itself gives an inadequate portrayal of the phenomenon.

For example, some excessively mechanistic theories have dominated in some fields and this has led to mixed results. Behaviorist psychology in the mid-20th century portrayed the human mind as exceedingly machinelike and this led to excessively manipulative behavioral interventions based on reward and punishment. The long-term, intrinsic motivation that would be available through organicist perspectives on psychology were marginalized. As a result, psychology made progress but down an increasingly barren, hyper-mechanistic path (Ambrose, 2009). Similarly, the rational actor model that has dominated neoclassical economics portrays the human as an exceedingly rational being who makes logical, self-interested choices based on complete information sets. While this model led to empirical progress in the field it didn't map onto reality very well because humans are much less rational than the model allows (Stiglitz, Sen, & Fitoussi, 2010).

In essence, any field or collection of professionals striving to understand complex phenomena would do well to look through these multiple worldview windows from time to time. This advice applies to business leaders just as it does to cognitive scientists, psychologists, economists, philosophers, and educators.

### **Looking for Creative Business Opportunities Through Four Worldview Windows**

Organizational leaders who want to inject creativity into their systems must consider the intricate, multiple dimensions of those systems. They must think about the products and

services that are at the core of their mission; the ever-evolving market niches that largely determine the level of success the organization will enjoy; the managerial structure of the organization; the aspirations, talents, and motivation of employees; the relevant communication networks within and beyond the organization; the evolving nature and initiatives of competitors; and more. In addition, as mentioned earlier, the rapid evolution of markets and communication in the 21st-century globalized environment adds much more complexity to the work of leaders and employees. Bearing in mind this heavy load, expecting them to consider all of these dimensions of the enterprise through multiple worldview lenses seems to be somewhat unreasonable; however, entrapment within a single worldview can lock an organization within a dogmatic approach and set it on a path toward its own destruction. Consequently, to the extent it is possible to provide multiple worldview perspectives on organizational processes and structures it is well worth doing so.

There is another, related reason for employing these diverse perspectives on the organization and its contexts. Page (2007), an economist and complexity theorist, reported the results of large-scale analyses of group problem-solving outcomes in a wide variety of organizations. The analyses revealed that a cognitively diverse team provides significant advantages over a homogenous team when it comes to solving complex problems. The members of a cognitively diverse team bring together diverse theories, and/or problem-solving heuristics, and or belief systems. In contrast, a homogenous problem-solving team tends to automatically follow the tenets of a single, dominant theory, and/or a favored problem-solving method, and/or a single, dominant cultural or philosophical belief system. Even if a homogenous team is somewhat superior to a diverse team in measured intelligence the diverse team likely will generate superior performance. Interestingly, cognitive diversity turns into a disadvantage when teams deal with simple, algorithmic problems.

Given the complexity of the problems that organizations must deal with in the 21st-century it makes sense that cognitive diversity is becoming more of an advantage in team problem solving. Also, given that the root metaphors that frame thinking within each worldview represent differing belief systems and theoretical perspectives, and the basic tenets of each worldview include guidelines for research and problem solving, a team made up of individuals who bring differing worldview perspectives together into a common forum will be cognitively diverse. So what would organizational leaders and employees who align their minds with particular worldview frameworks bring to a business or enterprise? Table 1 shows the four worldviews, the root metaphors that frame thinking within each worldview perspective, and the basic tenets of each prospective. The right-hand column includes some examples of ways in which each worldview can bring differing influences to bear on the structure and dynamics of organizations and enterprises. These examples are elaborated in the following subsections.

### **Mechanistic Influences**

Mechanistic individuals or groups will focus on reduction, prediction, control, and objectivity because they will view the organization as machinelike. They will assume that work processes can be measured and guided with precision because employees are viewed as cogs comprising components within larger mechanisms. Taylor's (1911) scientific management was an early example of strong mechanistic influence and it still shapes many of the structures and processes within a large number of organizations. Taylor's highly mechanis-

tic time-motion microanalyses of industrial processes produced very specific guidelines for the reorganization of work. Scientific management contributed to the development of Fordism—the highly mechanized, mass production manufacturing processes Henry Ford developed in the early 20th century. The standardized mass production of Fordism made mass production highly profitable because tightly disciplined labor engaged in repetitive, simple processes driven by the speed of assembly line machines (Rupert, 1995).

But mechanistic processes were not confined to the early part of the last century. They have a place in 21st century work processes as well. For example, the rapidly emerging industries revolving around biotechnology and nanotechnology require at least some degree of exquisite reduction, prediction, and control (Carlson, 2010; Interrante & Chandross, 2014; Rose, 2006). The major difference between the early 21st century and early 20th is that successful enterprises will require high levels of creativity from everyone, not just from those in the executive offices.

An enterprise that includes mechanistic perspectives will benefit from order, predictability, precision, and efficiency and there is room for creativity in the refinement of the mechanical aspects of the system, especially when it comes to the invention of new mechanistic procedures and structures. However, if the thought processes of the system are confined excessively to the mechanistic worldview, creativity will suffer. Work processes may be driven somewhat by the tenets of mechanism but the other worldviews also must contribute. The minds of employees must include the higher-level thought processing that comes from organicist connection making, contextualist novelty generation, and formist pattern finding.

### **Organicist Influences**

If an organization includes organicist thinkers when it hires employees and executives it will benefit from holistic thinking that breaks down silos and establishes creative connections. There also will be more of an emphasis on the long-term development of the enterprise, as opposed to excessively mechanical achievement of short-term goals driven by quarterly reports.

Organicist thinkers will encourage the establishment and integration of creatively productive social networks that will sprout, grow, and bloom around promising ideas for new processes and products. For example, Baer (2010) and von Held (2012) found that effective networking through strong relationship building improved the chances of creative ideas being accepted and implemented in organizations. Mathisen (2011) discerned that collegial support for creativity contributed to feelings of creative self-efficacy and work performance. Collegial support is a spinoff benefit of organicist networking. Murray (2013) argued that virtual networks are growing in importance and will change organizational dynamics. In other words, networking technology could magnify and refine the nature of organicist influence on organizational creativity.

Organicist thinkers will attend to the long-term development of new knowledge and relevant skills that are important to the enduring sustainability of the system (for example, see Gilley, Shelton, & Gilley, 2011). The interpersonal and emotional dimensions of work processes will be important considerations because team building will be viewed as an important dimension of the creative work of the enterprise. For example, Barczak, Lassk, and Mulki (2010) argued that healthy emotional intelligence in teams builds trust that strengthens the culture of creative collaboration.

Given the holistic emphasis of the organicist worldview, at least some of the attention given to team building will revolve around the establishment of interdisciplinary integration. For example, enterprises that involve scientific knowledge and skill must get beyond notions of reliance on the atomistic, lone scientific genius (a reductive, mechanistic conception). Instead, they should heed advice given by Subra Suresh (2013, October), former director of the National Science Foundation and current chair of the Global Research Council. Suresh argued that transdisciplinary, international collaboration among scientists is becoming the norm in scientific work because innovation flourishes when research teams make room for the integration of diverse ideas and perspectives. Organizations that want to thrive in the 21st century can give themselves better opportunities to do so if they include the holistic, integrative mindset of organicist thinkers.

An organization that makes sufficient room for the organicist worldview has a chance to approximate the best characteristics of the high-performing creative individual as portrayed by the pioneering developmental psychologist and creativity researcher Howard Gruber. According to Gruber, such an individual develops a *network of enterprises*, which is a collection of diverse but productively integrated projects that feed into and inspire creative growth in one another (see Gruber, 1989, 1999). Some of these projects will truncate or die on the vine while others will thrive and grow into long-term, purposeful initiatives. The long-term development of creative work is guided by a sense of purposeful direction, metaphorically conceived as an inner gyrocompass. But that purposeful direction makes room for deviation from the long-range trajectory when there are opportunities that are worth pursuing. The entire creative system of the impressive creative individual is fueled by relevant knowledge, affect, and, of course, the evolving, strengthening sense of purpose. An organization that collectively embodies these traits of a highly creative individual will give itself significant long-range advantages when it comes to innovation.

Nevertheless as with any of the worldviews there can be too much of a good thing. An organization that becomes excessively organicist can find itself too bound up in group dynamics, even groupthink, and may forget to ensure that processes and products include the precision of mechanism, the novelty of contextualism, and the pattern discovery of formalism.

### **Contextual Influences**

An organization that includes contextualist leaders and employees will strengthen its context sensitivity and its ability to recognize and capitalize on the unpredictable emergence of novelty. Context sensitivity includes the ability to understand the nature and dynamics of market niches and competitors as well as the cultural contexts of the society in which the organization is embedded. Possibilities for contextual awareness come from studies of cultural influences on creativity. For example, Lan and Kaufman (2012) discovered interesting differences between the ways in which Americans and Chinese perceive creative novelty. Americans tend to appreciate groundbreaking novelty while the Chinese incorporate more traditional ideas into their conceptions of creativity. They tend to favor creativity within the constraints of tradition.

This interesting cultural difference connects with another concept related to contextualism. The interdisciplinary field of complexity theory includes analyses of the chaos-order hypothesis, which portrays the behavior of complex adaptive systems as navigating along a

continuum from chaos to order with a complexity generating space in the middle (Ambrose, in press; Kauffman, 1995; Langton, 1990; Packard, 1988). Complex adaptive systems are ubiquitous. Examples include chemical solutions, animal populations and ecosystems, traffic patterns in cities, the mind of a creative individual, and the collective minds of creative teams in organizations.

Excessive chaos arises when there is too much turbulence in a complex adaptive system so elaborate, creative complexity cannot emerge. Excessive order locks complex adaptive systems into a rigid pattern that also does not allow for the emergence of creative complexity. Looking at the Lan and Kaufman (2012) analysis through the lens of complexity theory reveals that Americans tend to locate themselves a little toward the chaos side of the middle of the continuum because they are less bound by the order of tradition whereas the Chinese locate themselves a little toward the order side of the middle due to the order provided by tradition. Complexity rises dramatically when one finds the middle of the continuum where an exquisite balance between order and chaos is achieved at the edge of chaos. Adding nuance to the model, the edge of chaos is a shimmering, shifting point on the continuum that moves a little toward chaos or order depending on contextual conditions and the shifting nature of a complex adaptive system itself.

Part of this shifting nature of a complex adaptive organization is its working atmosphere, which includes the organizational climate for creative thinking and innovation. Leadership support is an important element of a creative organizational climate (Isaksen & Akkermans, 2011). Recognition that leaders cannot predict and control everything in a mechanistic way is an important dimension of an organization's creative climate. For example, nonlinear management theories encourage leaders and personnel to back away from conceptions of excessive control to make room for the unpredictable emergence of novelty (Pellissier, 2011).

Another aspect of organizational creativity that fits on the chaos-order continuum is the increasing recognition of the decision-making nuances required by the dynamics of constraints on creativity. Deviating from the notion that creativity requires unrestrained freedom, some creativity researchers have recognized that constraints imposed by processes, structures, and contexts can both inhibit and strengthen creative work (e.g., Haught & Johnson-Laird, 2003; Rosso, 2014). According to Rosso, work teams that are able to embrace constraints as opportunities as opposed to insurmountable barriers will be able to use the pressures of those constraints to their creative advantage.

### **Formist Influences**

Formist thinkers can contribute some useful creative thought processes to the creation and refinement of products, processes, and organizational structures. They are inclined to seek out patterns of similarity when they simultaneously consider diverse ideas. One way they can do this is through the creative use of metaphor. As mentioned earlier, metaphor is fundamental to cognition, especially to creative thought. Organizational leadership is particularly conducive to creative, metaphorical insight. Leaders who can use metaphor artfully and creatively to inspire the members of an organization to think beyond the orthodoxy can be very good at shifting enterprises in productive new directions (Nguyen & Umemoto, 2012). Martin Luther King's powerful metaphors such as "I've been to the mountaintop



and I've seen the promised land" were particularly inspiring examples of metaphorical leadership.

For organizations operating in the STEM fields, there is another highly creative use for pattern-finding metaphor. According to analysts of scientific thought processes, metaphor is a highly creative conceptual tool that allows scientists to build bridges from the known to the unknown. It enables them to develop productive theories that lead to scientific progress (Arecchi, 1996; Feist, 2006; Gruber, 1974; Gruber & Wallace, 2001; Hallyn, 2000; Harmon, 1994; Holton, 1996; Larson, 2014). Metaphors can trap minds in singular ways of viewing the world but they also can serve as catalysts for insight generation and creative pattern perception.

Formist pattern perception also is evident in the processes of creative association, which entail the smacking together of remotely associated concepts to generate creative mind sparks, as in the collision of flint and steel (Koestler, 1964; Mednick, 1962, 1976). Creative association works when the mind perceives a similarity in two concepts that normally reside separately, far apart in the mind. For example, assume that you are having difficulty with grease spots on your driveway. You mull over the annoying problem while mowing your lawn. Suddenly, you see a push broom leaning up against the garage door. A creative association mind spark fuses the concept of the bristles from the broom with the blade of your mower. You envision taking off the blade, replacing it with a bristled circular brush pad, removing the wheels, and setting the mower down on your driveway. You imagine tossing some soapsuds and water onto the driveway, starting the mower, and driving it around on the cement, rapidly washing away the grease spots. Of course, the idea isn't perfect and will need refinement but it's a creative idea nonetheless. Similar formist insights can be generated by creatively connecting processes, products, organizational structures with random, remotely associated concepts. Most of these connections will be unproductive but a few might lead to highly innovative ideas. If you have formist thinkers in your midst you magnify your chances of success.

### **Concluding Thoughts**

Creativity in business can be elusive but is well worth pursuing. Productive, creative thinking can enable organizations and enterprises to come up with new products, services, processes, and organizational structures. It also can provide the tools necessary for breaking free from entrapment within dogmatic belief systems and habit-bound thinking. Access to creative ideas and freedom from dogmatism are more accessible if we recognize some of the ways in which our thought is framed implicitly. Perceiving the power of metaphor on thought is a particularly effective form of such recognition. Understanding and capitalizing on the root-metaphorical worldviews can generate highly productive thinking while providing a useful conceptual framework for establishing cognitive diversity in the workforce of an organization.

#### *Correspondence*

Don Ambrose, PhD  
College of Liberal Arts, Education, and Sciences  
Rider University, 2083 Lawrenceville Road  
Lawrenceville, NJ, 08648-3099  
phone: (609) 895-5647  
email: ambrose@rider.edu

**Author's Brief Bio**

Don Ambrose is professor of graduate studies at Rider University Lawrenceville, New Jersey, USA, editor of the *Roeper Review*, and past chair of the Conceptual Foundations Division of the National Association for Gifted Children. He serves on the editorial boards of most of the major journals in the field of gifted studies and for several book series. Don has initiated and led numerous interdisciplinary scholarly projects involving eminent researchers and theorists from gifted studies, creative studies, cognitive science, ethical philosophy, psychology, political science, economics, law, history, sociology, education, and critical thinking. Most of his scholarship entails theoretical syntheses and philosophical analyses based on a wide-ranging, interdisciplinary search for theories, philosophical perspectives, and research findings that challenge, refine, and expand thinking about the development of creative intelligence. Some of his books include *How Dogmatic Beliefs Harm Creativity and Higher-Level Thinking* (Routledge, with Robert J. Sternberg); *Confronting Dogmatism in Gifted Education* (Routledge, with Robert J. Sternberg and Bharath Sriraman); *Expanding Visions of Creative Intelligence: An Interdisciplinary Exploration* (Hampton Press); *Morality, Ethics, and Gifted Minds* (Springer Science, with Tracy L. Cross); *Creative Intelligence: Toward Theoretic Integration* (Hampton Press; with LeoNora M. Cohen and Abraham J. Tannenbaum); *Imagitrionics* (Zephyr Press); *A critique of creativity and complexity: Deconstructing clichés* (Sense, with Bharath Sriraman and Kathleen Pierce), and *The Roeper School: A model for holistic development of high ability* (Sense, with Bharath Sriraman & Tracy L. Cross). Venues for some of his recent and forthcoming keynote presentations include Dubai, United Arab Emirates; Istanbul, Turkey; Ulm, Germany; Winnipeg, Canada; Jerusalem, Israel; and Kraków, Poland.

**References**

- Ambrose, D. (1996). Unifying theories of creativity: Metaphorical thought and the unification process. *New Ideas in Psychology*, 14, 257-267.
- Ambrose, D. (2009). *Expanding visions of creative intelligence: An interdisciplinary exploration*. Cresskill, NJ: Hampton Press.
- Ambrose, D. (in press). The ubiquity of the chaos-order continuum and its impact on creative aspiration development. In D. Ambrose, B. Sriraman & K. M. Pierce (Eds.), *A critique of creativity and complexity: Deconstructing clichés*. Rotterdam, the Netherlands: Sense.
- Ambrose, D., & Sternberg, R. J. (Eds.). (2012). *How dogmatic beliefs harm creativity and higher-level thinking*. New York, NY: Routledge.
- Arecchi, F. T. (1996). Complexity in science: Models and metaphors. In B. Pullman (Ed.), *The emergence of complexity in mathematics, physics, chemistry, and biology* (pp. 129-160). Vatican City: Pontifical Academy of Sciences.

- Bacevich, A. (2012). Next time victory. In D. Ambrose & R. J. Sternberg (Eds.), *How dogmatic beliefs harm creativity and higher-level thinking* (pp. 29-32). New York, NY: Routledge.
- Bacevich, A. J. (2005). *The new American militarism: How Americans are seduced by war*. New York: Oxford University Press.
- Baer, M. (2012). Putting creativity to work: the implementation of creative ideas in organizations. *Academy of Management Journal*, 55(5), 1102-1119.
- Barczak, G., Lassk, F., & Mulki, J. (2010). Antecedents of team creativity: An examination of team emotional intelligence, team trust and collaborative culture. *Creativity and Innovation Management*, 19, 332-345.
- Carlson, R. H. (2010). *Biology is technology: The promise, peril, and new business of engineering life*. Cambridge, MA: Harvard University Press.
- Chivot, D. (2012). Dogmatism and genocide. In D. Ambrose & R. J. Sternberg (Eds.), *How dogmatic beliefs harm creativity and higher-level thinking* (pp. 33-36). New York, NY: Routledge.
- Chivot, D., & McCauley, C. (2006). *Why not kill them all? The logic and prevention of mass political murder*. Princeton, NJ: Princeton University Press.
- Clark, A. (2001). *Mindware: An introduction to the philosophy of cognitive science*. New York, NY: Oxford University Press.
- Descombes, V. (2001). *The mind's provisions: A critique of cognitivism* (S. A. Schwartz, Trans.). Princeton, NJ: Princeton University Press.
- Duckworth, E. (1987). *"The having of wonderful ideas" and other essays on teaching and learning*. New York, NY: Teachers College Press.
- Feist, G. J. (2006). *The psychology of science and the origins of the scientific mind*. New Haven, CT: Yale University Press.
- Gewirth, A. (1998). *Self-fulfillment*. Princeton, NJ: Princeton University Press.
- Gillespie, D. (1992). *The mind's we: Contextualism in cognitive psychology*. Carbondale, IL: Southern Illinois University Press.
- Gilley, J. W., Shelton, P. M., & Gilley, A. (2011). Developmental leadership: A new perspective for human resource development. *Advances in Developing Human Resources*, 13, 386-405.

- Gruber, H. E. (1974). *Darwin on man: A psychological study of scientific creativity* (2nd ed.). London, England: Wildwood House.
- Gruber, H. E. (1989). The evolving systems approach to creative work. In D. B. Wallace & H. E. Gruber (Eds.), *Creative People at Work* (pp. 3-24). New York, NY: Oxford University Press.
- Gruber, H. E. (1999). Evolving systems approach. In M. A. Runco & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 1, pp. 689-693). New York, NY: Academic Press.
- Gruber, H. E., & Wallace, D. B. (2001). Creative work: The case of Charles Darwin. *American Psychologist*, *56*, 346-349.
- Hallyn, F. (Ed.). (2000). *Metaphor and analogy in the sciences*. Norwell, MA: Kluwer.
- Harmon, J. E. (1994). The uses of metaphor in citation classics from the scientific literature. *Technical Communication Quarterly*, *3*, 179-194.
- Haight, C., & Johnson-Laird, P. N. (2003). *Creativity and constraints: The production of novel sentences*. Paper presented at the 25th Annual Meeting of the Cognitive Science Society, Boston, MA.
- Holton, G. (1996). On the art of scientific imagination. *Daedalus*, *125*, 183-208.
- Interrante, L. V., & Chandross, E. A. (2014). Celebrating twenty-five years of chemistry of materials [special issue]. *Chemistry of Materials*, *26*, 3-4.
- Isaksen, S. G., & Akkermans, H. J. (2011). Creative climate: A leadership lever for innovation. *The Journal of Creative Behavior*, *45*, 161-187.
- Kauffman, S. (1995). *At home in the universe: The search for the laws of self-organization and complexity*. New York, NY: Oxford University Press.
- Koestler, A. (1964). *The act of creation*. New York: Macmillan.
- Lakoff, G. (1993). The contemporary theory of metaphor. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 202-251). New York, NY: Cambridge University Press.
- Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago, IL: University of Chicago Press.
- Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to Western thought*. New York, NY: Basic Books.
- Lan, L., & Kaufman, J. C. (2012). American and Chinese similarities and differences in defining and valuing creative products. *The Journal of Creative Behavior*, *46*, 285-306.

Langton, C. G. (1990). Computation at the edge of chaos: Phase transitions and emergent computation. *Physica D: Nonlinear Phenomena*, 42, 12-37.

Larson, B. (2014). *Metaphors for environmental sustainability: Redefining our relationship with nature*. New Haven, CT: Yale University Press.

Lineweaver, C. H., Davies, P. C. W., & Ruse, M. (Eds.). (2013). *Complexity and the arrow of time*. New York, NY: Cambridge University Press.

Mathisen, G. E. (2011). Organizational antecedents of creative self-efficacy. *Creativity and Innovation Management*, 20, 185-195.

Mednick, S. A. (1962). The associative basis of the creative process. *Psychological Review*, 69, 220-232.

Mednick, S. A. (1976). The associative basis of the creative process. In A. Rothenberg & C. Hausman (Eds.), *The creativity question* (pp. 227-237). Durham, NC: Duke University Press. (Reprinted from *Psychological Review*, 69, 220-232, 1962).

Miller, J. H., & Page, S. E. (2007). *Complex adaptive systems: An introduction to computational models of social life*. Princeton, NJ: Princeton University Press.

Monroe, K. R. (2004). *The hand of compassion: Portraits of moral choice during the Holocaust*. Princeton, NJ: Princeton University Press.

Monroe, K. R. (2011). *Ethics in an era of terror and genocide: Identity and moral choice*. Princeton, NJ: Princeton University Press.

Mumford, M. D. (Ed.). (2011). *Handbook of organizational creativity*. Boston, MA: Academic Press.

Murray, B. (2013). The challenge of simultaneous management and creativity. *Organization Development Journal*, 31, 27-35.

Nguyen, N. T., & Umemoto, K. (2012). Leading with metaphoric intelligence. *Journal of Leadership Studies*, 5, 41-51.

Packard, N. H. (1988). Adaptation toward the edge of chaos. In J. A. S. Kelso, A. J. Mandell & M. F. Shlesinger (Eds.), *Dynamic Patterns in Complex Systems* (pp. 293-301). Singapore: World Scientific.

Page, S. E. (2007). *The difference: How the power of diversity creates better groups, firms, schools, and societies*. Princeton, NJ: Princeton University Press.

Page, S. E. (2010). *Diversity and complexity*. Princeton, NJ: Princeton University Press.

- Pellissier, R. (2011). The implementation of resilience engineering to enhance organizational innovation in a complex environment. *International Journal of Business & Management*, 6, 145-164.
- Pepper, S. C. (1942). *World hypotheses*. Berkeley, CA: University of California Press.
- Popkewitz, T. S. (1998). Dewey, Vygotsky, and the social administration of the individual: Constructivist pedagogy as systems of ideas in historical spaces. *American Educational Research Journal*, 35, 535-570.
- Porter, T., & Derry, R. (2012). Sustainability and business in a complex world. *Business and Society Review*, 117, 33-53.
- Richards, R. (2001). Millenium as opportunity: Chaos, creativity, and Guilford's structure of intellect model. *Creativity Research Journal*, 13, 249-265.
- Richards, R. (2010). Everyday creativity: Process and way of life-four key issues. In J. C. Kaufman & R. J. Sternberg (Eds.), *Cambridge handbook of creativity* (pp. 189-215). New York, NY: Cambridge University Press.
- Rodrik, D. (2007). *One economics, many recipes: Globalization, institutions, and economic growth*. Princeton, NJ: Princeton University Press.
- Rosso, B. D. (2014). Creativity and constraints: Exploring the role of constraints in the creative processes of research and development teams. *Organizational Studies*, 35(3). doi: 10.1177/0170840613517600
- Runco, M. A., & Kim, D. (2013). Four Ps of creativity and recent updates. In E. G. Carayannis (Ed.), *Encyclopedia of Creativity, Invention, Innovation and Entrepreneurship* (pp. 755-759). New York, NY: Springer.
- Rupert, M. (1995). *Producing hegemony: The politics of mass production and American global power*. Cambridge: UK: Cambridge University Press.
- Schuldberg, D. (1999). Chaos theory and creativity. In M. A. Runco & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 1, pp. 259-272). New York, NY: Academic Press.
- Stempfle, J. (2011). Overcoming organizational fixation: Creating and sustaining an innovation culture. *The Journal of Creative Behavior*, 45, 116-129.
- Stiglitz, J. B., Sen, A., & Fitoussi, J. (2010). *Missmeasuring our lives: Why GDP doesn't add up*. New York, NY: The New Press.
- Suresh, S. (2013, October). To tap the world's vast and growing potential for new ideas, we need new rules. *Scientific American*, 309(4), 60.

Taylor, F. W. (1911). *The principles of scientific management*. New York, NY: Harper & Row.

von Held, F. (2012). *Collective creativity: Exploring creativity in social network development as part of organizational learning*. New York, NY: Springer.

Weizenbaum, J. (1995). The myth of the last metaphor. In P. B. S. Payr (Ed.), *Speaking minds: Interviews with twenty cognitive scientists* (pp. 249-264). Princeton, NJ: Princeton University Press.

World View	Root Metaphor	Basic Tenets (what the world view emphasizes)	Examples of Influence in Business and Organizational Structure and Dynamics
Mechanism	Machine	Reduction of the whole to its component parts; precision; detail; linear causality; objectivity	The precision and predictability of scientific management; attending to the important technicalities of process and product innovations
Organicism	Organism developing through stages toward a particular end	Coherence and totality of systems (the whole transcending its parts); integrative connections; long-term development	Integrating systems and departments; interdisciplinary work; teambuilding; establishing long-range vision
Contextualism	Ongoing event within its context	Contextual influences; unpredictable emergence of novelty	Establishing sensitivity to the cultural context surrounding the organization; organizational climate as creative opportunity or barrier; sensitivity to unpredictable creative sparks; finding creative opportunities between stultifying order and frenzied chaos
Formism	Ubiquitous similarity (e.g., Plato's ideal forms)	Search for patterns of similarity in diverse phenomena	Motivational metaphors used as leadership tools; using the process of creative association to generate creative processes, products, and organizational structures

Table 1. Root-metaphorical world views as alternative perspectives on phenomena in business.