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Careers in a Complex World: The Search for New Perspectives from the "New Science"

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The papers that comprise this Special Issue represent a variety of attempts at exploring the potential contributions to careers scholarship that might emerge from applying concepts and models from the so-called "new sciences," a term widely used to denote a large area of enquiry in the physical and complexity sciences. This article introduces the special issue. It explains its origins, and defines the territory that it covers, specifically, the kinds of career on which the articles focus, the meaning of the term "new science," and the kind of connections that we believe can be made between the two. Finally, we briefly introduce each of the papers in the Special Issue.

This collection of papers had its origins in a workshop meeting of a small group of scholars who shared an interest in the study of work careers. The group was trying to explore an idea: were there concepts and models from the physical sciences—for example, evolutionary biology, complexity theory, quantum theory—that might provide helpful insights for their own field? Others were working with this idea in different branches of the social sciences, perhaps the best known at the time in management social sciences being Wheatley (1992). However, nobody seemed to be doing so in the careers field. At the end of the meeting views in the group ranged from enthusiasm to skepticism. Part of this reflected a not unreasonable discomfort: how much did they really understand the ideas they were discussing? It is a characteristic of fields such as quantum theory that they puzzle even those closest to them[1], and nobody in the group could claim such familiarity. But part of the range of reactions stemmed from a different uncertainty, which still runs through this collection of papers: can one import ideas from such different areas of science, even assuming one understands them adequately? And if one does, how does this help?

Many members of the group continued to work on their ideas. A call for papers found more potential contributors to the project, and eventually, after the usual processes of attrition that such exercises involve, the papers in this special issue emerged. In this Introduction we shall trace the ideas that underpinned the thinking behind the original workshop, explain what we mean by the terms "career" and "new science", and

1. «The whole fifty years of conscious brooding have not brought me nearer to the answer to the question "What are light quanta?" Nowadays every scalawag believes that he knows what they are, but he deceives himself.» (Einstein, 1951); nor was Feynman notably more comfortable with «understanding the world view that quantum mechanics represents (…) I haven't got to the point that this stuff is obvious to me» (cited in Gleick, 1992: 436).

introduce both the major themes that run through the papers and the papers themselves.

It is important to be clear about what we shall not be doing in this Introduction. The fields of science from which the authors eclectically draw their ideas are vast and changing rapidly. We can do no more than refer to a few key ideas from these fields; we cannot pretend to "explain" them, even if we were qualified to do so. We shall leave more detailed accounts of the ideas that the authors worked with to the authors themselves. Nor will we be attempting to argue conclusively for or against the success of our collective enterprise; indeed, we include one contribution (Baruch) that argues that it is «plausible but futile» (2002, this issue: 20). We believe that the ideas in the papers are intriguing and provocative, but the real test of their usefulness will come from a great deal more exploration than this preliminary survey can give them. Our purpose here is to do no more than try to convince the reader that the question of what connects careers and the "new science" is worth raising.

The spark that lit this project can be briefly described as follows. Careers—and here we focus on one specific form of career, commonly referred to as the "work career"—are extremely complex social phenomena which can be studied from many different angles. In addition, they appear to be changing dramatically as new economic orders emerge. This combination of complexity and change is a theme that can be found in a great deal of turn-of-the-century writing in the social sciences, and an increasing number of scholars have turned to the physical sciences to look for approaches that might help them make sense of it all. Our aim, quite simply, was to see whether careers scholarship might benefit from these approaches too. Next, we expand on these points.

The term "career" is extraordinarily varied in its meaning. As we shall argue below, even in the restricted sense we use the term here (the work career), careers are so integral a part of the social fabric that they are extremely complex phenomena. It is, therefore, perhaps not surprising that they have attracted scholars from so many different disciplines to study them (Van Maanen, 1977; Arthur, Lawrence and Hall, 1989a). This diversity of disciplines has produced a diverse and rich set of insights (see, for example, Nystrom and McArthur, 1989). This, in turn, has given rise to regular attempts to take stock of the state of the field (e.g., Arthur, Lawrence, and Hall, 1989b; Peiperl, Arthur, Goffee, and Morris, 2000).

In addition, there is evidence in Western economies that the nature of careers is changing as a result of the widespread change happening in the larger socioeconomic systems of which careers are an integral part. Business activity is carried out in an increasingly global context, introducing a wider variety of cultural, regulatory and institutional considerations into the conduct of work. At a growing rate organizations themselves are undergoing downsizings, mergers, realignments and restructurings. More and more, interfirm relationships are characterized by continuously shifting webs of strategic alliances and contractual networks, in turn changing the social contract between employer and

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employee away from long-term, informal and implicit understandings, towards contractual and short-term arrangements. It is less common than it was to encounter writers who see careers occurring within fixed lattices of stable organizations over time. Instead, discussions of newly emerging career phenomena tend to be framed in terms such as "careers by reputation" (Kanter, 1989), "boundaryless careers" (Arthur and Rousseau, 1996) and "careers as repositories of knowledge" (Bird, 1996), a trend which reflects a search for new understandings of what constitute these emerging careers and how best to describe them.

Other areas of social enquiry are also encountering similar problems of complexity and turbulence (Kiel and Elliott, 1996). Perhaps as a result, a growing number of researchers (cf., Drazin and Sandelands, 1992; Wheatley, 1992; Parker and Stacey, 1994; Kiel and Elliott, 1996; Eve, Horsfall, and Lee, 1997; White, Brazeal, and Friedman, 1997) have suggested turning to the physical sciences, specifically those which have proven successful in dealing with highly complex phenomena. While many such proponents within the management sciences have focused specifically on chaos and complexity theory, Wheatley (1992) suggests that a wider avenue of inquiry—quantum physics, chaos/complexity theory, field theory, and evolutionary biology—may offer fertile sites for developing at least metaphorical, and possibly literal, understandings of new managerial and organizational phenomena. Our aim in this collection of papers is to try to show that separately, and as a group, these fields provide provocative perspectives for the development of career theory.

In this special issue, we take Wheatley's lead in exploring the contribution that a range of perspectives from what she called "new science" (a term we explain below) can make to an improved understanding of careers. To begin with, we define the sense in which the term "career" will be used in the following papers, outline the variety of approaches that have been taken to studying it, and explain why we felt that, despite this plethora of approaches, we wanted to introduce yet more.

CAREERS

We shall take careers to be the life-stories of people; as noted above, the part of their life-stories in which we are specifically interested is one commonly referred to as the "work career". These work careers collectively shape and are shaped by the institutions within and between which people live their lives, taking form from, and lending form to, these institutions along the way. For this reason the study of careers can lead in so many directions that the phenomenon can prove slippery to grasp. A comprehensive review of these directions is well beyond the scope of an introduction such as this. We shall, however, briefly refer to a few of the major approaches that have been taken, in order to give a sense of their diversity.

Careers may be approached from many different levels of analysis. At the individual level of analysis they are specifically about the life-stories to which we have just referred. At the organizational and supra-

organizational levels, careers are demographic phenomena, in which the objects of interest are mobility patterns within and between organizations, geographical areas, generations, and so forth. In addition, the object of interest may be the role of individual choice in the shaping of careers, the socioeconomic factors that constrain this choice, or the ways in which constraints might be enacted by the individuals experiencing them.

Even the overtones attracted by the word "career" say much about the society in which the observer lives. In Western economies it is common for the term to imply progress, typically in connection with work: progress up some imagined corporate ladder, or progress in the personal development of an artistic life. But the group of Chicago sociologists led by Everett Hughes who were responsible for many of the concepts that have been introduced into the careers lexicon, focused also on the individual career-holder's perspective, the subjective aspect of careers; for example, Hughes and his students were «just as willing to talk about the careers of marijuana users (…) as they were about the careers of doctors (…) and executives» (Barley, 1989: 45). They drew attention to what they called the "ontological duality" of the career: «Career was a Janus-like concept that oriented attention simultaneously in two directions (…). On one hand, careers pointed to those institutional forms of participation characteristic of some social world: a stream of more or less identifiable positions, offices, statuses, and situations that served as landmarks for gauging a person's movement through the social milieu (…). On the other hand, the notion pointed away from the career's structure toward the individual's experience of the career's unfolding. This, the so-called subjective face of the career, consisted of the meanings individuals attributed to their careers, the sense they made of their becoming.» (Barley, 1989: 49).

In different societies the predominant form of economic activity can change the nature of careers dramatically. Recent research on careers in Asian societies (Baba, Granrose, and Bird, 1995; Chow, 1995; Lin, 1995; Peng, 1995) points to significant differences among nations with regard to regulatory systems as well as firm and industry organizing structures leading to diverse conceptualizations of careers and disparate career processes and structures.

As these few brief examples suggest, it is not surprising that the field is so balkanized. Careers thread their way throughout the social canvas, and there is very little in social enquiry that they do not pass by. In addition to Hughes' group of sociologists who are seen by many as the founders of the field, a brief and highly selective list of the disciplines that have contributed to the careers field would include sociologists interested in intergenerational mobility and societal life-changes, the structure and behavior of business elite studies specifically, and the social origins and demography of managers in general; organizational demographers studying the factors underlying promotion rates and mobility; labor economists investigating the structure of inter- and intra-firm labor markets; organizational theorists working on the structure of careers within and between organizations; developmental psychologists investigating the life-stages through which people pass;

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educational and other psychologists involved in education and counseling; social psychologists and sociologists with an interest in the patterns of work experience and the interaction of the many roles which people experience sequentially and in parallel; sociologists and social psychologists with an interest in comparative studies of careers in different societies, and in the impact of new organizational forms on careers in developed societies; strategic management and finance scholars studying the impact of managerial background on the strategic behavior of companies and their experience with capital markets.

With such a diversity of approaches, why are we trying to introduce yet more? Paradoxically, our primary motivation springs from our quest for ideas that might help us draw the field together. Much of the work to which we have briefly referred has been shaped by the intellectual traditions from which it emerged; the results are not so much contradictory as scattered. Perhaps if we can adopt a perspective that is radically different from these, we may come up with insights that are sufficiently novel to spark the creative insights that will generate the theory that will, in turn, allow us to start drawing these threads together. For example, as we shall see in one of the papers in this collection (Gunz, Lichtenstein and Long), complexity theory is proving remarkably successful in showing commonalities between what have been thought hitherto to be quite unconnected phenomena; the founders of cybernetics experienced much the same thing in the 1940s (Beer, 1976). Creativity, after all, often flows from viewing problems from differing frames of reference (Koestler, 1964). Of course our aim is grand, perhaps even pretentious, and we have no way of knowing whether it will succeed. But it did at least seem worth a try.

WHAT IS "NEW SCIENCE"?

New science is a label—and, as we shall see below, a somewhat misleading one—that has been used to encompass a diverse set of concepts, principles and theories spanning an increasingly larger quadrant of the physical sciences universe. These fields have a rigorous grounding in traditional scientific method and in an empirical perspective. New science is not New Age, nor is it postmodern, though adherents of both often seek to adopt its principles. Developing within the physical sciences, new science addresses the inherent inadequacies of reductionist classical models of science but, nevertheless, remains firmly grounded within a scientific tradition that emphasizes rigor and empirical validation.

The boundary surrounding the new science is extremely fuzzy. For some, it can be as exclusive as a focus on nonlinearity, while for others it can be very inclusive. As currently addressed among managerial and organizational scholars and practitioners, new science perspectives and concepts have been grouped under several headings but with a strong interest in emergent phenomena such as chaos (Parker and Stacey, 1994), complexity (Lewin, 1951) and complex adaptive systems (Garcia, 1996). Wheatley's (1992) attempt to use

concepts from a variety of physical sciences to illuminate the understanding of leadership drew on an eclectic selection, ranging from quantum physics to chaos theory. In a recent survey of various disciplines within the physical sciences, however, Lichtenstein (2000) argues that new science concepts range far beyond those specific to the mathematical fields of chaos theory, non-linear dynamics and complex dynamical systems.

It is important to recognize that "new science" is a misnomer for the many sciences that tend to get grouped under this heading: new science is not new. Some of its central concepts and principles can be readily recognized in mid-nineteenth-century writing on thermodynamics, and even the more recent fields that are typically included, such as chaos and complexity theory, are several decades old. The new sciences may be novel to some of us whose last encounter with the physical sciences was high school chemistry and physics, and that perhaps explains the origin of the term. Were it not for the way the term seems to have been appropriated by social scientists interested in searching for useful ideas in non-social-scientific fields, we would have preferred not to have used it. But since it does appear to have, at least for now, achieved a certain presence, we shall use it here.

The influence of new science in the social sciences is not a recent phenomenon. For example, Mead's (1932) ideas on process and emergence reflect an awareness of the dynamics of complexity. Similarly, Lewin (1951) drew directly from contemporary writings on quantum physics in developing his concepts supporting field theory in the social sciences. Turning toward early writings on organizational and managerial theory, Follett's writings are replete with references to concepts drawn from new science (Mendenhall, Macomber, and Cutright, 2000). More recently, Ogilvy and Schwartz (1980) foreshadowed many of the streams of thought that will be addressed in the papers of this special issue, in fields ranging as widely as mathematics, physics, ecology, psychology, linguistics, politics, philosophy and the arts. Within each field they identified shifts in thinking—for example from a focus on continuous functions to mapping discontinuities, from universality to complementarity, and from equilibrium to far-from-equilibrium systems—and argued that these represented an "emerging paradigm" in Western thought.

Later in this chapter, we will suggest some examples of analogies between ideas from the new sciences and career phenomena. One such example is the so-called butterfly effect, which emerged from non-linear dynamics. Just as the weather can be conceived as extraordinarily sensitive to trivial changes in the wind, so can careers be thought of as extraordinarily sensitive to seemingly trivial events, such as chance encounters. We return to these themes in the next section, in which we explore some of the insights that the new sciences potentially provide to career theory. But first, we need to focus on an obvious implication of the use of the term "analogy". Can the new sciences only contribute to career theory at the level of analogy (or metaphor), or are there more rigorous models that can be imported?

In many cases there is little choice: many physical sciences deal with phenomena which simply cannot be identified at the social level of

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analysis, so the only possible contribution is metaphorical. Quantum mechanics, for example, deals exclusively with the very small, and has nothing whatsoever to do with people. On the other hand Wheatley's treatment of "new science" includes objects that are emergent phenomena, such as skill sets, unfolding relationships, and adaptations to the work environment. Here it is possible to conceive of frameworks, which might move beyond the realm of metaphor, and, possibly, supply models which themselves could form the basis of useful careers theory. Yet, as Wheatley (and, of course, Morgan, 1986) showed, even the introduction of fresh metaphors to an established field can be enlightening—for example, the use of field theory concepts and the notion of "action at a distance" to describe the power of vision and mission statements within an organization (Wheatley, 1992). This has encouraged us to make a similar attempt to "apply" such ideas to the field of careers.

It is important to distinguish between the enlightening use of metaphor and the discovery of an analogy, which, while intriguing, does not advance understanding. For example, perhaps the most obvious parallel between physical and social sciences lies in the recognition that the observer and the observed are inextricably connected. Heisenberg's "uncertainty principle", which emerged from quantum theory, quantifies the uncertainty surrounding our knowledge of a particle's behavior as a result of observing it. Its central thesis, that observation changes that which is observed, was enunciated at much the same time as the Hawthorne Effect in social science. This is not the subjectivity of certain postmodernists who assert that there is no objective reality (Price, 1977), but an acceptance of the reality that the process of observation is real too. Although scholars in the physical sciences believe in an objective reality, they recognize that the observer is an influential part of that reality (e.g., Prigogine and Stengers, 1984: 42). By the same token, a researcher can never be sure that the apparently simple act of asking someone to tell their life story does not set thought processes in train which cause the subject to reinterpret their past and rethink their future. However, for the analogy with Heisenberg to be useful to a social scientist one needs a good answer to the question: what have we learned by identifying the link that we didn't know before? Heisenberg's mathematics is about subatomic particles interacting with photons, so it is not immediately obvious how they help the social scientist.

The challenge faced by the authors of this collection of papers is to see whether they can move beyond uninstructive analogy either to enlightening metaphor or to useful model. We now examine these connections in greater detail.

CAREERS AND THE NEW SCIENCE

What, then, are the kinds of association that can be made between careers and the new science? **Table 1** exemplifies several possibilities. The list is neither systematic nor comprehensive, but simply a

set of illustrations of how the ideas from new science might be borrowed to re-frame career phenomena. It is derived from several sources, among which we found the work of both Liechtenstein (forthcoming) and Turner (1997) particularly helpful. Some terms have now crept into popular usage, others remain obscure, but all of them hold out opportunities for us to re-frame the way we conceive of the world of career.

We have already mentioned the "butterfly effect," concerned with the emergence of apparently random events from distant and seemingly trivial influences. It must often seem that way with careers, as employment systems respond to new production arrangements in distant countries, or when technological advances have unpredictable effects on the demand for certain kinds of workers. However, as Turner (1997: xiv) points out, unpredictable does not mean unintelligible. People's life stories are replete with tales of chance events bringing unanticipated consequences. Perhaps we can be more open to chance from the start, and less distracted by orderly but potentially deceptive pictures of, for example, continuous employment or linear career progression?

A related idea from chaos theory is that of a "strange attractor." The "attractor" of a system is the path that the system follows over time (strictly, the path that the system follows through its state space). Chaotic systems appear to behave randomly, in the sense that there seems to be no pattern to what happens to them. Yet if the path of a chaotic system is plotted over time, a pattern does indeed emerge, such as the famous butterfly-shaped attractor discovered by Lorenz (1963). It is this pattern that has been called a "strange" attractor, to distinguish it from the different kinds of attractors associated with systems that behave in simpler ways. It carries with it the intriguing implication that, if it turns out that career systems behave chaotically as so many complex systems do, there may paradoxically be patterns that can be uncovered in their behavior.

What about various strands of complexity theory, which suggest that the complex systems of social mobility we call careers may play a key role in absorbing shocks and ensuring a greater degree of continuity than is often supposed? To some extent this is a return to the sociologist's concept of careers as systems of social reproduction (Gunz, 1989: 33-34), but with the important difference that it may contain within it the seeds of a theory of the dynamic behavior of career systems. It may also provide a framework for computer-based modeling to study the behavior of complex career systems similar to the remarkably successful modeling of other systems too complex to be studied by traditional analytic methods (e.g., Kauffman, 1973; Bak and Chen, 1991).

The preceding paragraphs anticipate much of the work of the contributors to this volume. For example, a number of authors explore the possibility that the emergent property of a chaotic system called its attractor might provide a useful model for making sense of unpredictable career phenomena. Others examine concepts from recent work on self-organization in systems as disparate as the genome and

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Table 1. Disciplines and Theories of New Science with Possible Applications to Careers

Originating Discipline	New Science	Core Idea	Example	Careers Analogy
Mathematics	Non-Linear Dynamics	Sensitivity to initial conditions	The "butterfly effect" of weather changes at a remote distance from the point of disturbance	Chance introductions or unforeseen circumstances having dramatic effects out of all proportion to their apparent importance, perhaps by influencing differences in career opportunities for two apparently similar actors
	Chaos	Strange attractor: the pattern traced by the state of a chaotic system over time	The changing velocity and direction of a waterwheel, as the turning of buckets affects the distribution of incoming water	The patterns in people's life stories, such as patterns of employment, which exist despite changes in external circumstances
	Fractals	Iteration and self-similarity across different scales	Replication and iteration of a basic "form", such as the parts of a fern leaf and its overall shape	Characteristics of individual behavior and personality being replicated at the level of the work group or larger institution
Quantum Theoretical Physics	Wave mechanics	Particle-wave duality: both fundamental particles such as electrons, and electromagnetic energy "packets" (photons), behave both as particles and as waves	Tunneling effect: electrons penetrate barriers which ought to be impervious to them, because their wave functions extend beyond what would appear to be their "surface" if they were thought of as particles	Even the most impervious career boundary can be crossed by even the most unlikely person
Complexity theory	Self-Organization	Action and change arise from within	Dynamic action and change within an ecosystem give rise to stability and growth of that system	Self-organizing of a company work force into current and new responsibilities and outcomes as skills and markets develop over time
Thermodynamics	Dissipative structures	Self-organization at far-from-equilibrium	Open systems such as living organisms, which dissipate entropy and import energy continuously in order to maintain themselves	Social structures as open systems maintain themselves by importing energy, materials and people to replace exports of people, goods, services and waste materials, thereby providing career opportunities for the people
Chemistry	Auto-Catalysis	Chemical reactions generating products which in turn affect the rate of the reactions that generated them	A "chemical clock" in which the reaction process produces rhythmic color changes	A process whereby people experience new career pathways and provide role models which in turn accelerate subsequent movement along the same pathways
Theoretical Biology	Complexity	Simple underlying rules leading to emergent complex order	Comparatively simple rules governing the interaction between the large number of genes in the human genome produces surprisingly ordered behavior in the genome ("order for free": Kauffman, 1995)	A limited set of human needs producing a complex range of career behaviors
Biology of Cognition	Autopoiesis	The nervous system functioning as a network of interactions that specify the way an organism relates to its environment	Living systems—bacteria, vegetables, animals, etc.—are organized as sets of relations among their components, and these relations create the boundary between the system and its outside environment	The tendency for employment systems to reproduce themselves and thereby, shape, rather than be shaped by, the external market for work
Interdisciplinary	Systems Thinking	The world is made up of interdependent systems	Life forms involve interdependent systems, e.g., rabbits, lynxes and foxes, whereby each system affects the other	Careers unfold through interdependent employment, occupational and labor market systems that both affect and are affected by career behavior

The first three columns of the table are adapted from B. M. Lichtenstein (2000), Valid or Vacuous: A Definition and Assessment of "New Paradigm" Research in Management, *American Behavioral Scientist,* 43 (8): 1334-1366, and used by permission.

piles of sand, and show that there are reasons for expecting that career systems might also display similar emergent behaviors. These in turn might help to understand why, for example, organizations might experience sudden spasms of turnover. These explorations are examples of making use of what Turner (1997: xi) calls «a new anthology of recognizable shapes». They also usefully direct attention, as Turner points out, to the inherent stability that complexity theory, and perhaps other new science formulations, can confer.

A final observation to be made about new science here concerns its potential relevance to the study of careers. Much social science research, and more specifically careers research, suffers from frequent bouts of self-doubt over its relevance to the larger society. However, new science suggests both a connectivity across the physical sciences and, as **Table 1** illustrates, a possible bridge to the social sciences. Though still incompletely constructed, the shape of such a bridge is sketched out by Harvey and Reed (1996), who have posited a framework for delineating the relationship between the physical and the social worlds with regard to research methodologies. They argue that, though there is divergence between the physical and social sciences in a/ the degree of deterministic suppositions, and b/ the extent to which we can specify system properties, it is nevertheless possible to identify similarities. These similarities encourage the invocation of theoretical perspectives from the physical sciences in the hope that we can advance our understanding. They encourage a hope for this volume that careers research predicated on a new science paradigm may connect us to a larger world, perhaps far larger than many of us might previously have imagined.

THE CONTRIBUTIONS THAT FOLLOW

This collection of papers consists of five pieces exploring different aspects of the territory we have briefly scanned above.

The first paper in the collection, by Lichtenstein, Ogilvie and Mendenhall, introduces concepts from complexity research and dynamic system theories—discontinuity, non-proportionality of effect, mutual causality, sensitive dependence on initial conditions and viewing systems in terms of external constraints on action and internal triggers for change. Applying these concepts to career events, they demonstrate through case examples the explanatory power of a non-linear dynamics perspective. They conclude by considering the implications of a non-linear perspective. They note that recognition of non-proportionality and mutual causation should lead to an emphasis on perseverance and responsibility on the part of individuals. Moreover, sensitivity to initial conditions and a focus on internal triggers suggest the need to look for leverage points in career events that will allow for significant shifts in opportunities and outcomes.

Drodge continues with the theme of the individual-level implications of complexity science by exploring the ways in which it can help the career counselor whose clients are struggling with multiple changes in

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the career system posing new challenges which encompass greater uncertainty and change than hitherto experienced in Western cultures. He argues that complexity science and the new career share a number of metaphorical concepts such as non-linearity, bifurcation, complexity and self-organization, providing rich opportunities for counselors to address clients' experiences of uncertainty and helping them to understand the patterns that might be underlying their careers. By showing order in apparent disorder, complexity science provides a metaphor that involves working with clients «to recognize patterns evolving in the work career domain and patterns in their own personal and interpersonal functioning as a first step to a (…) change (…) point.» (pp. 60-61).

Gunz, Long and Lichtenstein examine a number of threads in the complexity literature for clues about the self-organizing properties of career systems. Systems as diverse as sandpiles, earthquake zones and the genome appear to evolve naturally to a state of "self-organizing criticality" on the boundary between a frozen, unchanging stability and an unstable, unpredictable chaos. Published data from White's (1970) study of clergymen and Pinfield's (1995) study of a forest products company's employees are interpreted as characteristic of systems at "the edge of chaos". The authors proceed to raise the possibility that the labour market, too, may exist at this boundary state, which allows change without that change leading to collapse. The paper speculates on some of the necessary conditions for labour markets to exist in this state, and therefore to accommodate career adaptation in a changing economic environment.

Chakrabarti and Chakrabarti inject a cautionary note into the argument supporting the end of the organizational career. They explore the nature of emergent order in organizations, and of the organizational career as a connecting frame between the individual and the organization. They argue that the increasingly common exhortation that organizations should be more like organisms than machines misses the point that organisms are in many ways more rigid, formalized and machine-like than the bureaucratic organization. The organizational career was, they argue, an important organizing innovation that allowed organizations to connect two purposeful entities: the natural person, and the synthetic, "corporate" person. While acknowledging that organizational careers are becoming outmoded, the authors remind us that they play an important role in allowing organizations to exhibit the goal-seeking behavior central to their purpose.

The final contribution by Parker and Arthur comes at the special issue's theme from a different direction. Undertaking the development of a survey instrument in order to study properties of "intelligent careers", the authors begin with a traditional quantitative approach only to become frustrated with the constraints that they meet. Qualitative methods offer an alternative perspective, but the authors feel that they are being pushed into a different corner, being forced to choose between two approaches, quantitative and qualitative. Retiring from the field to search for alternative conceptualizations of the phenomenon in order to overcome traditional methodological constraints,

they find encouragement in new science to resist the limitations that normal science would impose. As a consequence of adjusting their theoretical framework they find a resolution to their methodological concerns.

The Parker and Arthur contribution closes this collection on a note we hope will apply to many subsequent research endeavors. It is that the twin themes of normal science constraints and new science possibilities may come together to help the researcher make more informed choices about his or her work.

We have left the first contribution in the collection, by Baruch, to introduce last. Written as a critique of this introduction, it clearly invites debate and we follow it with a brief rejoinder of our own. Baruch adopts the role of a friendly curmudgeon, arguing that in an area of research characterized by so much diversity, the introduction of new science perspectives exacerbates rather than ameliorates the confusion. We were particularly pleased to include it in the collection, because it returns us to the doubt we raised at the beginning of this introduction: it usefully challenges the basic precepts of this project. As such, it makes a most fitting contribution.

Allan Bird is Eiichi Shibusawa-Seigo Arai Professor of Japanese Studies in the College of Business Administration, University of Missouri-St. Louis. His work has appeared in the *Academy of Management Journal,* the *Strategic Management Journal,* the *Journal of Organizational Behavior,* the *Journal of International Business Studies* and other academic and practitioner journals. Allan's career-related interests are two-fold, with one research stream focusing on the careers of Japanese executives and the other focusing on a conception of careers as repositories of knowledge.

Hugh P. Gunz has PhDs in Chemistry and Organizational Behaviour. He is currently Professor of Organizational Behaviour at the University of Toronto, having previously taught at University of Manchester. He has published papers on the careers of managers, professionals and others, the management of technical professionals, and management education, and is the author of the book *Careers and Corporate Cultures.* His research interests include the structure of managerial careers in and between organizations and their impact on firmsí strategic management, the application of complexity science to careers, and ethical dilemmas experienced by employed professionals.

Michael B. Arthur is Professor of Management at the Sawyer School of Management, Suffolk University, Boston. He has written and researched widely on the subject of careers, including as editor of the *Handbook of Career Theory* (1989), *The Boundaryless Career* (1996) and *Career Frontiers* (2000). Michael is also a co-author of *The New Careers* (1999) and of a series of articles into the application of "intelligent career" principles in the contemporary economy. His research focuses on alternative ways to link between individual career theory and collective action. Michael holds MBA and PhD degrees from Cranfield University, UK.

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