The Chaos Theory of Careers: A User's Guide

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The purpose of this article is to set out the key elements of the Chaos Theory of Careers. The complexity of influences on career development presents a significant challenge to traditional predictive models of career counseling. Chaos theory can provide a more appropriate description of career behavior, and the theory can be applied with clients in counseling. The authors devote particular attention to the application of attractor concepts to careers.

The purpose of this article is to set out the key elements of the Chaos Theory of Careers and to illustrate how these fundamental concepts are particularly relevant to contemporary career development. In the process, we show how we have applied some of these concepts to counseling practice and have used a time-honored, but infrequently acknowledged, method of reasoning in an effort to illustrate how the demanding aspects of chaos theory can be communicated in user-friendly ways.

Traditional approaches to career development typically aim to understand the key attributes of the person and then match these to compatible or congruent environments (jobs). A recurring theme in the criticisms of traditional person–environment fit models by authors such as Savickas and Baker (in press); Krumboltz (1979); Mitchell, Levin, and Krumboltz (1999); Vondracek, Lerner, and Schulenberg (1986); and Lent, Brown, and Hackett (1996) is that the person–environment interaction has been characterized in trait-oriented terms (e.g., Dawis & Lofquist, 1984; Super, 1990). The relatively static nature of the terms of the interaction, *person* and *environment,* is no longer appropriate, given the complexities and change that are observed in modern careers. Arnold (2004) noted that congruence between the person and environment has been shown in several metastudies to correlate poorly (between 0.1 and 0.2) with outcome measures such as satisfaction (e.g., Assouline & Meir, 1987; Tranberg, Slane, & Ekeberg, 1993; Young, Tokar, & Subich, 1998). Arnold high-

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lighted the problem by observing that the concept of congruence in J. L. Holland's (1997) theory accounts for only 1% to 4% of the outcome measure variance. He proposed 14 problems with the theory, including inadequate conceptualization of the person and the environment, inadequate measurement of the environment, and the fact that job environments are increasingly demanding variety and diversity and that jobs are continually changing.

Several of vocational psychology's leading authorities (e.g., Mitchell et al., 1999; Pryor & Bright, 2003a, 2003b; Savickas & Baker, in press) have openly questioned the continuing value of traditional person–environment fit models of career choice, wondering whether they fail to capture adequately the complexities, uncertainties, and dynamic aspects of modern work. As Savickas and Baker have pointed out, "With less stable personalities and occupations, vocational psychology's basic model of person-environment fit with its goal of congruence seems less useful and less possible in today's labor market."

Career theorists are increasingly interested in approaches that characterize the individual and the environment in more complex and dynamic terms than the traditional person–environment approaches. Vondracek et al. (1986) directed attention to the multiplicity of contextual factors in career development. Mitchell et al. (1999) explored the role of unplanned events in career choice. Patton and McMahon (1999) used systems thinking to illustrate the complex interconnectedness of multivariate influences on individuals' career decision making. Savickas (1997) focused attention on individuals' capacities for change and creativity in the crafting of a career. As an extension of such thinking, we pose the question, "What conceptual framework of careers might be able to incorporate coherently such new ideas as complexity, change, and chance?"

Recently, several authors (e.g., Bloch, 1999; Drodge, 2002; Pryor & Bright, 2003a, 2003b) have begun to investigate the potential of chaos and complexity theory to explain career behavior. Chaos theory challenges traditional approaches to scientific explanation and goes to the heart of issues relating to what can be known and how it can be known. In chaos theory, two key concepts are nonlinearity and recursiveness. In linear systems, all the elements add up to make the whole, such as a credit card balance being equal to the amount of money spent plus interest and plus a monthly card fee. A nonlinear system is characterized by the elements adding up to more (or less) than the sum of the parts. For instance, the air time a song receives on the radio increases as the sales of the song propel it up the charts, which, in turn, increases the air time the song receives. In this scenario, the sales and airplay increase rapidly and nonlinearly. Of course, the final outcome sees a sharp decline in sales and airplay as the market becomes saturated and also tired of the song. This example also includes recursiveness—one variable influences another, which in turn influences the first one, and so on. Chaos theory (Gleick, 1988; Stewart, 1989) presents an account of the recursive application of several nonlinear equations to system behavior, resulting in elements of both stability and susceptibility to sudden and dramatic change at the same time. Furthermore, chaotic systems display other characteristics such as a lack of predictability at the micro level, while at the same time appearing to have a degree of

stability at the macro level. In addition, their nonlinear nature means that minor events can have a disproportionate outcome on the system. Such ideas are permeating many areas of contemporary science. To cite just one example from Peacocke (2000), "[W]e know, through key developments in theoretical biology and physical biochemistry, that it is the interplay of chance and law that allows the matter of the universe to be self-creative of new forms of organization" (p. 44).

Chaos theory describes a series of features of complex system behavior that many social science researchers have identified in their own areas of study. For instance, in social psychology, Arrow, McGrath, and Berdahl (2000) have described in great detail how the tenets of chaos theory provide a compelling account of small group behavior. They highlighted how chaos theory can provide useful insights into the development of teams, how conflict arises in teams, and how teams adapt to change. In the management literature, Stacey, Griffin, and Shaw (2000) presented chaos theory as a way to consider change, creativity, and crisis in organizations. They highlighted how traditional systems approaches in management theory are conceptually and practically flawed in approach and scope and why chaos theory provides a more complete account of human behavior in organizations and of the behavior of the organizations themselves. Chaos theory approaches to counseling have been applied in psychoanalysis (Van Eenwyk, 1991) and in family therapy (Chubb, 1990). Duffy (2000) outlined how the tenets of chaos theory might be useful in assisting a worker whose career has plateaued.

In fact, careers counselors are already confronting the realities of 21st century career development, including the implications of complexity, chance, and change, with their clients. Chaos theory may provide a theoretical basis for career counseling practice and a conceptual framework through which further counseling advances might be made.

Career Counseling and Prediction

A prerequisite to adopting a chaos theory approach is to accept that career development is subject to a wide range of different influences, many if not all of which are continually changing at different paces and in different degrees. In other words, career development and the influences upon it are highly complex. Furthermore, it is increasingly accepted that career behavior is influenced by unplanned and chance events to a much more significant degree than has been typically acknowledged (e.g., Bright, 2003; Bright, Pryor, & Harpham, in press; Bright, Pryor, Wilkenfeld, & Earl, in press; Mitchell et al., 1999; Osipow, 1973; Williams et al., 1998). Incorporating this wide array of influences and acknowledging the central role of chance events in careers, however, present a significant challenge to the possibility of accurate prediction. This challenge is important, because often when providing career advice, career development professionals are explicitly or implicitly making predictions about the suitability of different courses of action or jobs for a client on the basis of past behavior, knowledge, skills, or interests. As Savickas (1997) said, "the career counselor's job is to see life prospectively, to extend a life theme into the future" (p. 14).

Abduction and Communication

The difficulty for both counselors and clients of grasping some of the fundamental notions of chaos theory is not to be underestimated. Moreover, chaos theory acknowledges the finitude, and therefore the limits, of the capacity of human understanding. This appears to contradict the aspirations of much previous science, which emphasized the apparently boundless ability of humans to research, understand, and control the world and the things in it. Various attempts by writers in the counseling field (e.g., Amundson, 2003b; Gabriel, 2000; White & Epston, 1990) are being made to use metaphors, myths, archetypes, poetry, heroes, and stories to deal with the challenges of complexity, change, and chance that their clients face. In doing so, they point to a form of reasoning that is different than the forms that are typical of "scientific psychology." The traditional forms of reasoning in scientific psychology have been deductive reasoning (syllogistic logic) and inductive reasoning (generalizing from observation). However, drawing on the work of Bateson (1979), Patton and McMahon (1999) indicated that an additional form of problem solving, called "abductive reasoning." should be used. Unlike the traditional forms of reasoning, abductive reasoning is not linear but lateral; it deals with patterns and relationships and accepts that all knowledge is open to doubt and revision and open to interpretations from different perspectives. It is often analogical in form, such as techniques based on metaphor and myths. Duke (1994) was one of the earliest researchers to argue that chaos theory can be usefully applied in psychology, pointing out that its application was likely to be analogical and metaphorical in nature. Following this lead, we proffer the following vignette to illustrate some of the major concepts of the Chaos Theory of Careers.

Ping-Pong Balls and Puppies: An Abductive Illustration of the Chaos Theory of Careers

Imagine you are in a room alone with a Ping-Pong ball. If you repeatedly drop the ball from waist height, you can be fairly confident of correctly predicting that it will fall to the ground somewhere near your feet. We call this Scenario 1.

However, suppose now that an eager ball-chasing puppy is in the room with you and also that a strong electric fan is brought into the room, placed near you, and switched on. Now, when you drop the Ping-Pong ball, how certain can you be that the ball will land near your feet? Presumably much less certain, because the puppy might catch it or the fan might blow it off course. We call this Scenario 2.

Now suppose there is a pack of eager puppies in the room and a series of electric fans; someone has opened the window and a howling gale is blowing; and, furthermore, you are now obliged to stand on an electric treadmill programmed to randomly vary its speed! Now when you drop the ball, how confident are you that it will land near your feet? Indeed, how confident are you in making any prediction about where the ball might end up? We call this Scenario 3.

In Scenario 1, the system is very predictable for two reasons. First, the person and the environment are fairly static and unchanging. Second, there are no unplanned events intruding. This is essentially the world as

characterized in traditional person–environment models of career development, such as J. L. Holland's (1997).

In Scenario 2, there is a broader range of variables with the addition of the puppy and the electric fan, but we are probably still confident of working through most of the possible outcomes. In career development terms, this is not dissimilar to frameworks such as Gottfredson's (1981), in which gender, prestige, and interests are characterized as the key influences on career choice. With the "zone of acceptable alternatives," there is a constrained influence of happenstance (Chen, 2002).

In Scenario 3, there are many different variables to consider: Each puppy has a mind of its own, the treadmill is randomly programmed, the airflow is confused by the various fans blowing, and the gale force winds outside will all combine to confound our attempts at predicting where the ball will go. Such a scenario is closer in spirit to the wide range of influences identified by Krumboltz (1998) and Lent et al. (1996). This scenario also resembles the type of complex dynamic system that can be well accounted for in chaos theory (Pryor & Bright, 2003a). Here is an example where broad predictions can be made about the future behavior of the room. For instance, the ball will end up somewhere. It is highly likely the ball will remain in the room, because the gale force winds blowing in are more powerful than the fans in the room. So in the short term, we can make broad predictions, but we are unlikely to be able to make specific and accurate predictions. In the longer term, due to the characteristics of the system, things could alter dramatically, thereby making prediction impossible. For instance, if the gale abated, it is possible the ball would be blown out of the room, or a dog with the ball in its mouth could escape through the open window. If either of these happened, the dynamics of the system would be radically altered. Either one would have to find something other than the ball to drop or go after the ball (and the puppy).

Stacey et al. (2000) argued that chaotic systems are predictable at the global or macro level, but only in qualitative terms. In the short term, they argued, short-range, micro-level predictions might be possible, but these will have little or no bearing on long-range predictions. In Scenario 3, in order to make accurate long-range predictions, it would be necessary to measure the effect of every minor alteration of the initial state of the person, the treadmill, the fans, the outside weather, and those pesky puppies! The number of possible ways that all these states could vary—and the manner in which they could interact—makes it impractical and probably impossible to record. Arrow et al. (2000) argued that chaos approaches to prediction differ in three crucial respects from "positivist-reductionist analytic" approaches:

1. The operation of the system is observed in its entirety and not in terms of the directional causal effects of specific individual features.
2. The rules and principles that govern the interaction of individual features are investigated rather than trying to predict the exact values of specific variables.
3. The focus of interest is on how the system changes over time—its trajectory—and not the "average" levels of certain variables over time.

In the career development literature, there is evidence that the unpredictability of life experience does influence career paths. For instance, Morrison (1994) found that a group of people with similar Holland codes diverged in their career paths over time in ways that were not predictable from the original descriptions of their Holland types. Bright, Pryor, Wilkenfield, et al. (in press) found that 70% of a large sample of university students reported that their careers were significantly influenced by unplanned events. These events ranged from unplanned meetings to illness to messages from God.

In summary, what we have described in the Ping-Pong ball analogy is a complex or chaotic system because it contains the key elements of chaotic systems: complexity, emergence, nonlinearity, unpredictability, phase shifts, and attractors. In the remainder of this article, we highlight how these chaotic elements apply to career behavior and suggest how they might be used in counseling.

Complexity and Career Counseling

Careers are influenced by parents, social and environmental context, gender, age, political and economic climate, interests, abilities, geography, and many other events (Patton & McMahon, 1999). All of these factors, and many more, are inherently unpredictable and subject to change. For instance, economies can change rapidly and unexpectedly, political scandals can emerge from left field to change the political landscape, and acts of terrorism can have profound influences on career behavior (e.g., negative impacts on tourism, impacts on the victims and their families and communities). In counseling terms, career counselors must take this complexity into account and encourage clients to reflect on the variety of influences in their lives.

The emphasis here is on understanding processes and influences and how these have shaped and continue to shape individuals' experience of the world. Narrative counseling techniques emphasize the role of story and construction in understanding careers (Amundson, 2003a; Savickas, 1997). Narrative provides a vehicle for understanding the motive processes in a person's career. It focuses on *interests*—as understood in the word's derivation from "between–being,"—such as those described by Savickas (2005) in which he described career construction in the following terms: "[I]ndividuals construct their careers by imposing meaning on their vocational behavior and occupational experiences" (p. 43). Savickas argued that constructivist counseling focuses not on the person or the environment of the person–environment fit, but rather on the " - - - - " (i.e., the series of dashes) that make up one's career. Such an approach is entirely consistent with the chaos theory's emphasis on understanding the process and the patterns in careers rather than on defining or predicting stable variables as outcomes.

The complexity of the influences on career alerts career counselors to the need to avoid traditional approaches of seeking causes or trying to explain behavior in terms of one factor influencing another factor. Rather, counselors should look at each client in that client's entirety and then help the client understand the patterns and processes in his or her life. Counselors should not try to "narrow down" conversations to only "career-related" topics. Clients should be encouraged to reflect on many

different aspects of their lives, such as their familial circumstances, their childhood, their hobbies, their reading, and key events and tragedies, and on more general environmental factors, such as global political issues and concerns. Clients should be encouraged to reinstate contextual factors when recalling previous career decisions. Techniques for working with clients using these techniques can be found in Bright and Pryor (2003) and Pryor and Bright (2005).

Emergence and Career Counseling

Essentially, emergence is a process that runs in a counter direction to reductionism (Morowitz, 2002). The latter, traditional, scientific approach is to seek ever narrower, more precise explanations of behavior in terms of the nature of the constituent system agents. The problem with always looking at finer and finer distinctions is that interaction of the components is neglected. In sport, for example, a team of champions is not the same as a champion team. Teams have properties over and above the total of the skills and performance of individual players. Teamwork, morale, combinations of moves, strategies of play, and so on cannot be accounted for by specific reference to each particular team member. As Polkinghorne (2000) noted about science in general, "there are two levels of description. One involves energy and bits and pieces. The other involves the whole system and pattern" (p. 135).

Emergence involves going up a level or more in description to look for patterns of behavior that appear to emerge from the complexity. Inevitably, such approaches appear to lack the scientific precision of measurement that is often claimed in reductionist approaches, and the forms of description are typically qualitative, such as narrative, analogy, and metaphor. In such an endeavor, the emphasis becomes to describe the system behavior in ways that are meaningful to clients at their current stage and understanding of themselves, as opposed to trying to "nail" the essence of a person or making long-term predictions. In pursuing this goal, career counselors recognize the limitations of their knowledge, in that they can never fully know what influences a person or how that person will respond in the future. However, career counselors can attempt to identify some of the emergent patterns of behavior and link these to past career events. In this way, clients can come to a greater understanding of how their life story is playing out; this, in turn, can provide them with some ideas for future career exploration.

Emergence as a counseling process essentially makes sense of the client's past behavior in terms of themes, narratives, preoccupations, and the unpredictable nature of a range of influences in the past. The role of counselors in this process is to assist their clients to understand their career behavior and to highlight the range of influences, including happenstance, on their careers. Then, techniques for capitalizing on some of these influences, events, and themes can be developed with the client (e.g., Krumboltz & Levin, 2004).

Nonlinearity and Career Counseling

As J. H. Holland (1995) demonstrated, nonlinear equations prevent the description of behavior in terms of aggregates or averages, because very

small changes in an input variable can lead to dramatic changes in the output. This is the essence of nonlinearity: There is potential disproportion between a change in one part of a complex system and its subsequent effect in another part of the system. Strogatz (2003) argued that most things in nature are nonlinear, whereas linear equations tend to describe idealized situations (such as somebody dropping a Ping-Pong ball in the absence of any complicating factors like puppies and fans). Strogatz argued that "every major unsolved problem in science from consciousness to cancer to the collective craziness of the economy is non linear" (p. 182). In nonlinear systems such as career behavior, small or seemingly trivial events can have significant career implications. For example, a young engineer working for a construction company has one sick day off in the first 2 years that he is with the company. However, that is the day an urgent overseas project meeting is held. A team is assembled from those attending the meeting and within a few days is sent to work on the project. Subsequently, the project is a great success, and all those on the team are promoted ahead of our only slightly sick, but certainly hapless, young engineer who only missed one meeting.

Memon (1999) recommended that clients be asked to recall everything, no matter how trivial, when the aim is to obtain a full understanding of a past event, because it is the seemingly trivial that can shed light on the significant subsequent event. Savickas (1997) recommended that counselors listen carefully to the language used by clients, because language can reveal important information about their preoccupations and, hence, how they may behave in the future. In chaos theory, the future is conceptualized not principally as some place or time out on the horizon; rather, the future is essentially an individual's next thought, word, or action. Furthermore, nonlinearity reminds the counselor that interventions do not need to be large, long, or painful to effect change in a client's career. Nonlinearity means that a single word may be sufficient to effect change. For example, one of the authors of this article was 14 years old when, after irritating his high school Spanish teacher through classroom misbehavior, he was chastised, with the teacher saying "when you go to university you will not be able to behave like that." Had the teacher said, "*if* you go to university," it would have had little impact. The use of the word *when* and the backhanded high expectation were sufficient to change the 14-year-old's self-efficacy and expectations after having never considered himself able to gain entry to college.

Unpredictability and Career Counseling

In career development terms, chance events can and often do have significant influences on an individual's career (e.g., Bright, Pryor, & Harpham, in press; Bright, Pryor, Wilkenfield, et al., in press; Krumboltz, 1998). Career counselors must encourage clients to explore the impact of chance in their careers and find ways to help clients capitalize on chance events. As Gelatt (1991) termed it, they must encourage clients to embrace positive uncertainty. Krumboltz and Levin (2004) have set out a series of principles to assist individuals to capitalize on chance events.

Helping clients to understand the uncertain nature of careers can definitely be a challenge. First, clients' expectations of career counseling typically involve some notion of the counselor narrowing down a wide array of

possible steps or jobs to a manageable few options and, hence in so doing, reducing the uncertainty of the future. Consequently, attempts by the counselor to increase or underline the high level of uncertainty in life may be met with active resistance or pessimistic fatalism. Second, when clients think of chance events, they tend to bring to mind situations in which they have little or no control over the aftermath of the event, such as being injured in a motor vehicle accident requiring a month in hospital. Typically, a client does not consider the events in which he or she has a great deal of discretion over the outcome, such as unexpectedly meeting someone at a party who suggests that the client contact him or her at work the following week to discuss a job opportunity. In this circumstance, the client has much more discretion over whether to capitalize on this event by making an appointment or failing to do so by ignoring the invitation.

Conversely, discussing happenstance in a client's life can often serve to relax him or her and remove the self-imposed burden that some clients carry to present all of their career decisions and history in strictly rational terms. When clients present their history in rational terms, they are very often overlooking or ignoring the chance events, and the opportunity can be lost to discuss strategies to stimulate future positive chance events.

Counselors might wish to ask questions about unplanned and unpredictable events when asking their clients about their past. They can normalize chance events by citing statistics that show that most people report that chance events have played a major role in their life. Furthermore, they could work with clients to develop strategies to capitalize on chance events in the future (Pryor & Bright, 2005).

Phase Shifts and Career Counseling

In the scenarios presented earlier, a small change in the behavior of one of the fans could have blown the ball out of the room. This could change the dynamics of the system radically. The function of the system, the person's behavior, might change from an investigation of gravity to a search for a Ping-Pong ball. Similarly in careers, people can undergo radical changes in career direction. Sometimes, this is caused by significant external events such as a major workplace injury. Alternatively, it can be more subtle: When an employee has attended countless pointless meetings previously and then is called on to attend one more, it may be the "breaking point" that provokes the employee to resign.

Using Attractors in Career Counseling

Just as a single job in a particular organization can be seen as a single set of interrelated influences or constraints (on a system), so, too, the person's work history, or career, can be seen as a more complex system. According to chaos theory, a common theme is patterns within patterns (Kauffman, 1995). Understanding how such patterns at differing levels of generality and complexity function has given rise to the adoption of the mathematical notion of "the attractor" within chaos theory.

Attractors are descriptions of the constraints on the functioning of a system. They are called attractors because they influence behavior by drawing it in particular directions or constraining the behavior in some way. Four major types of attractors are generally recognized in chaos theory.

Point Attractor and Career Counseling

The simplest is the point attractor. The point attractor describes behavior when the object in question (a thing or person) is attracted to one specific thing or point. In Scenario 1, the floor directly below is a point attractor for the Ping-Pong ball: The ball falls directly to the ground when dropped (in the absence of any complicating influences). In career terms, the point attractor could be a particular vocational goal—such as being promoted to the next level in the corporation. Point attractors generally occur when the individual or some other agency places artificial constraints on the individual's behavior. Person–environment fit models of career decision making (e.g., Dawis & Lofquist, 1984; J. L. Holland, 1997) are examples of point attractor models. They assume there is an optimal vocational direction or space in which personal interests or other personal attributes match suitable jobs. Constraining a client's behavior by imposing a point attractor can be motivational (i.e., by setting a goal), but chaos theory reminds individuals of the need to continually revise goals as they are seeking to attain them and also to make alternative plans in the event of unforeseen circumstances becoming insuperable barriers to the fulfillment of goals.

Counselors should recognize the strengths and weaknesses of goal-setting behavior. Goals have been demonstrated to be effective in motivating behavior; however, Landy (1989) pointed out that evidence for goal setting was far stronger in laboratory settings than when applied in real-life settings because of the complex and unpredictable nature of the world. Counselors should be alert for self-limiting behaviors characterized by setting overly narrow or unrealistic goals and encourage clients to develop resilience strategies or insurance policies to deal with unforeseen future events that prevent their reaching their goal. In addition, reality checking about the true value of the goal is a recommended action (Gelatt, 1991).

Pendulum Attractor and Career Counseling

The second form of attractor is called the pendulum attractor. A pendulum attractor constrains behavior to a regular, predictable pattern. Behavior can move from one extreme through to a midpoint and out to an opposite extreme. The behavior then moves back toward the midpoint and out toward the original position. Behavior is regular, unchanging, and defined. Pendulum attractors might be observed in the career behaviors of clients who are torn between two career options. They gradually build up their determination to follow one course of action, and then this determination gradually recedes to indecision and then to intentions to follow the alternative course of action. In turn, the strength of this intention wanes back into indecision and ultimately back through to the conviction to follow the first course of action. Pendulum attractors are a reflection of significant constraints being imposed on career behavior, either self-limited or overly narrow thinking, or some external pressures, such as family pressure to study medicine combined with an individual interest to pursue psychology. Identifying the action of the pendulum (also known as periodic) attractor is an important first step in understanding the nature of the career indecision (Bright, 2003).

The pendulum attractor can be seen in clients who hold rigid and extreme beliefs. Such thinking is generally a barrier to effective thinking

and hence prevents insights and the generation of solutions. Counselors should encourage clients to consider issues from multiple perspectives, and, in so doing, the clients appreciate that the problem is likely not to be reduced to a simple either/or scenario (Amundson, 2003a). Clients in the grip of pendulum thinking will rarely be able to generate win–win scenarios, and furthermore, solutions that present "balance" as the desirable outcome may be aggravating the situation by attempting to stop the pendulum at the lowest point!

Torus Attractor and Career Counseling

The third form of attractor is called the torus attractor. The torus attractor describes behavior that is more complex but that is still ultimately constrained and repeating. A client may perceive that his or her job is well described by this attractor. For instance, an indoor nurseryperson produces plants indoors all year round. He or she follows routines in terms of planting, nurturing, harvesting, and selling the plants. This person may see his or her world as predictable and repetitive; however, he or she is placing artificial constraints on business as a way to beat an inherent unpredictability: weather. Although the nurseryperson has gone to great lengths to minimize unpredictability, it cannot be removed entirely and it takes only a hailstorm to break a greenhouse or a disease to devastate the crop. In the same fashion, many people express feelings of boredom or frustration with what they see as endless routine. In thinking about their work in these constrained terms, however, they may be overlooking possibilities and opportunities for change.

This attractor can be the hardest to identify in clients and the hardest to demonstrate to clients, because the apparent complexity of its action serves to mask its ultimately bounded nature. Consequently, clients may perceive their careers as changing and varied while at the same time feeling empty or stuck in a rut (Covey, 2004). Appeals to creativity, uncertainty, and further change, as implied by chaos theory, may be interpreted as more of the same and, therefore, may be rejected. The challenge here is to identify the routine nature of the career as constructed by the client and highlight how all possibilities within this structure can be ultimately anticipated. As a consequence, the lack of challenge may be exposed and understood. Clients may then need to be challenged about the barriers and constraints that they are placing on initiating phase-shift change in their lives (Amundson, 2003b). At this point, issues of purpose, meaning, contribution, and passion may need to be raised and confronted as the driving forces to motivate personal change by the client.

Strange Attractor and Career Counseling

The strange attractor is the attractor that typically characterizes chaos models. It is also the most complex and counterintuitive. Strange attractors, at one level, seem to have no constraints or rules governing their dynamics. Indeed, it may appear as though there are no patterns or relationships between their elements. In this sense, they are chaotic; however, over time and when considered from the appropriate perspective, a pattern, albeit exceedingly complex, can be discerned. It is characterized as never repeating, but self-similar. The identifiable and psychometrically assessed skills and traits of individuals are examples of such patterns.

However, psychologists' limitations in predicting specific behavior at a particular future time from such assessed results may owe as much if not more to the inherent changeability of individuals as to the technical limitations of the measuring instruments.

Change and unpredictability are constants within the strange attractor. Minute changes in initial states can result in profound nonlinear changes in the behavior of the attractor. Furthermore, the strange attractor can reconfigure radically into a different attractor unpredictably and unexpectedly. In counseling terms, understanding a client's strange attractor in all its complexity, stability, and vulnerability will help both counselor and client understand current and past behavior and help prepare the client for his or her future journey. Counselors are increasingly using myths, mind maps, movies, metaphors, pattern identification, and client journaling, along with narrative therapy strategies, to encourage clients to explore the order and disorder of their experiences.

For clients, the goal of counseling is to gain an appreciation of their careers in all of their complexity. By recognizing the inherently unpredictable nature of their careers at the micro level and how this unpredictability can lead to possibilities at the macro level, clients can begin to develop strategies to deal with change and uncertainty at work. Such strategies might be risk-minimization strategies or more positive strategies to embrace and thrive on chance and uncertainty (Pryor & Bright, 2005). Furthermore, clients can be encouraged to consider patterns and themes—and the rich variety of influences upon them—and how small changes to any of these things may lead to profound changes in their careers. Counselors using this approach move away from notions of the ideal or perfect career and consider clients in their entirety and in their context in order to assist them to discover purpose and meaning within their own frame of reference (Covey, 2004).

McKay, Bright, and Pryor (in press) recently compared traditional trait-matching approaches to career counseling with a chaos theory approach. Clients were randomly allocated to traditional, chaotic, and wait-list control groups. Outcome measures were used to assess such variables as satisfaction, self-efficacy, career exploration, and irrational career-related beliefs before, after, and 1 month after the counseling. The chaotic approach was found to be equal to or superior to traditional counseling and the control group on all the measures. We concluded that approaches using chaos theory that emphasize uncertainty, continual change, and adaptation have a legitimate role in career counseling and may be more appropriate and better received than the more traditional, static, matching approaches.

Conclusion

In this article, we have attempted to indicate the potential worth of the Chaos Theory of Careers (Pryor & Bright, 2003a, 2003b), which may represent a significant development in the understanding of career behavior. The theory deals with reality as individuals experience it as richly complex, nonlinear, and serendipitous. We believe this is why when we present chaos theory in presentations or individually in counseling, so many people—professional counselor and client alike—can identify with

it. Chaos theory points to some of the neglected realities of career decision making, such as chance, unpredictability, the limits of knowledge at the point of decision making, the limitations of goals, and the nonlinearity of change. The Chaos Theory of Career Development also links career development with some of the most profound thinking in other parts of science (Pryor & Bright, 2004). We suspect that this approach is the only theoretically coherent account of chance, the unplanned, and serendipity in contemporary career development theory. The approach is inherently dynamic in nature and points to the importance of continual change and adaptation in careers, because both the careers of those around us and the world around us change.

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