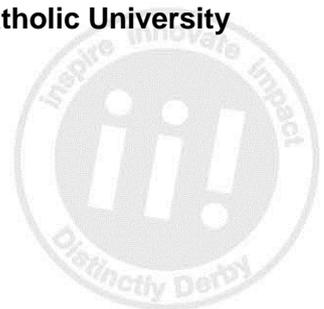


The uncertain story of career development

Inaugural lecture by Professor Jim Bright

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Abstract

In this paper, the central role of uncertainty in career development and its implications for counselling, coaching and education practice as well as policy will be explored. It is argued that although uncertainty was recognised in the earliest formulations of career counselling models, it was subsequently largely ignored or deemed unimportant in nearly all of the dominant theories of career development for the remainder of the 20th century. More recently theorists have begun to acknowledge once more the central importance of uncertainty in career development, and more broadly in areas as diverse as science and politics. The reasons and importance of this renewed focus is explored with particular emphasis on chaos and complexity theories. The Chaos Theory of Careers (CTC) (Pryor & Bright, 2011) will be presented as theory that provides a powerful way of understanding the relationship between order and chaos, pattern and surprise as composites not opposites. Accepting that uncertainty is an inevitable, inescapable and ubiquitous part of life leads to new approaches to career development practice, theory and policy.

1. Introduction

This paper attempts to address the role of uncertainty in career development highlighting the relevance and utility of the Chaos Theory of Careers in addressing contemporary career realities. The aim is to show how centrally important, yet historically neglected the role of uncertainty has been in career development and that is being addressed with one contemporary approach. This requires some description of the Chaos Theory of Careers, but inevitably, close to two decades worth of theoretical, empirical and practical work cannot be covered adequately. Space does not permit a full exposition of the theory and readers are directed to Pryor and Bright (2011) for the fullest exposition to date of the theory. Similarly, space does not permit any systematic coverage of the counselling tools and techniques that have been developed for use with the CTC. Nor is there room to summarise the growing empirical evidence base providing support for the theory and longitudinal counselling outcome studies indicating the positive and frequently superior results that using the CTC can have when working with clients who are confronting a complex, changing and uncertain world. In addition to our book, we have published a growing body of evidence that supports key elements of the theory, or provides outcome data validation of the efficacy of interventions based upon the theory. Readers are directed to not only the book previously mentioned but also to (amongst others) the following papers: McKay, Bright & Pryor, 2005; Davey, Bright, Pryor & Levin, 2005; Bright Pryor & Harpham, 2005; Bright, Pryor, Chan & Rijanto, 2009; Borg, Bright & Pryor, 2006; 2014).

2. The uncertain story of career development

The problem with certainty is that it applies to very little besides death. While it is now a cliché to use the quote commonly ascribed to Benjamin Franklin from 1789 that “nothing can be said to be certain except for death and taxes”, it turns out that there is considerable uncertainty regarding the originator of this observation. According to Shapiro and Epstein (2006) at least two other authors made similar observations over 50 years before Franklin. Similarly, two other quotations relating to uncertainty have uncertain provenance, “life is what happens when you are making other plans” and “making predictions is hard, especially about the future”. The former is commonly attributed to John Lennon from 1980, but appeared in the Reader’s Digest in 1957 and possibly in a comic before that (Shapiro and Epstein, 2006), and the latter has been attributed to a physicist, a baseball coach, a movie mogul, and a Danish parliamentarian amongst many others including Nostradamus! It seems that certainty is generally uncertain, or to use another aphorism whose origins are cloaked in uncertainty, the more I learn, the less I know.

Uncertainty is “pervasive, written into the script of life” (Nowotny, 2015: 1). In science, Nowotny argues that “a culture of embracing uncertainty reigns” (xi.). Indeed I, discovered Nowotny’s work on uncertainty, by chance, listening to a BBC radio interview while driving to the University of Derby to give my inaugural lecture on the topic of the uncertain story of career development!

It is difficult to think of examples in life that are certainties. From the very beginnings of a life, uncertainty is present. While infant mortality rates have dropped dramatically over the last century, the process and nature of a birth is far from certain, nor is a child’s development. As that child grows older, their health, education, social connections and experiences are all subject to uncertainty. Even the certainty of death is often preceded with uncertainty, in relation to how and when it will occur, or the course that a terminal illness might take. Some are pronounced dead, only to be discovered alive in mortuary freezers, the living embodiment of Mark Twain’s observation that rumours of my death have been greatly exaggerated.

Our beliefs about the world are also subject to uncertainty. Things that we believe to be true at one time, are shown to be false subsequently. In our attempts to stave off the certainty of death, for the last third of the twentieth century, we were advised with the backing of medical science, to limit or avoid consuming butter and other saturated fats. At the time of writing, current scientific understanding suggests that not only were we wasting our time, we may have been substituting the saturated fats with substances more injurious to our health. It is easy to be smart after the event, but that is the point. Life is uncertain.

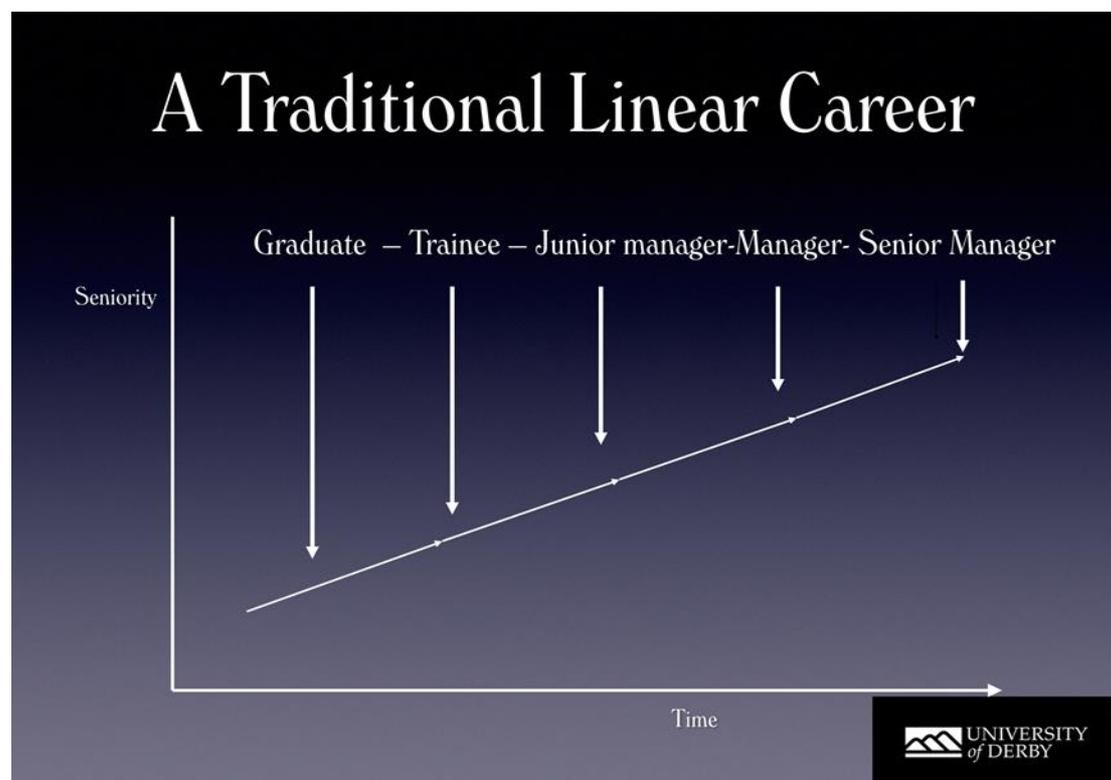
Given that uncertainty permeates most if not all aspects of our lives, it should be no surprise that careers are uncertain. However, one might be forgiven for thinking they are not from a perusal of career development textbooks. As Patton and McMahon (2014: 256) point out “the ‘successful’ career is still viewed as one which has advanced vertically as opposed to having moved horizontally, and the suggestion of

the existence of a 'backward' career move remains in the literature" . Careers are no longer linear, if they ever were.

The idea that took hold in the twentieth century was that career 'success' was reflected in the straight line with a positive gradient that could be drawn when we plotted the key developments in our careers against time. Climbing the corporate ladder was the sine qua non of any successful career. With institutions and organisations almost universally adopting a hierarchical management structure, career advancement and hence success could be readily measured by one's position within the organisation, and the speed and angle of one's trajectory – i.e. upward, flat, downward, rapid, fast-tracked, slow, or plateaued. Such a pattern is described by Wilensky (1960: 554) who defined a career as "a succession of related jobs, arranged in a hierarchy of prestige, through which persons move in an ordered, predictable sequence".

The "traditional" career path can be seen in figure 1.

Figure 1: A traditional linear career



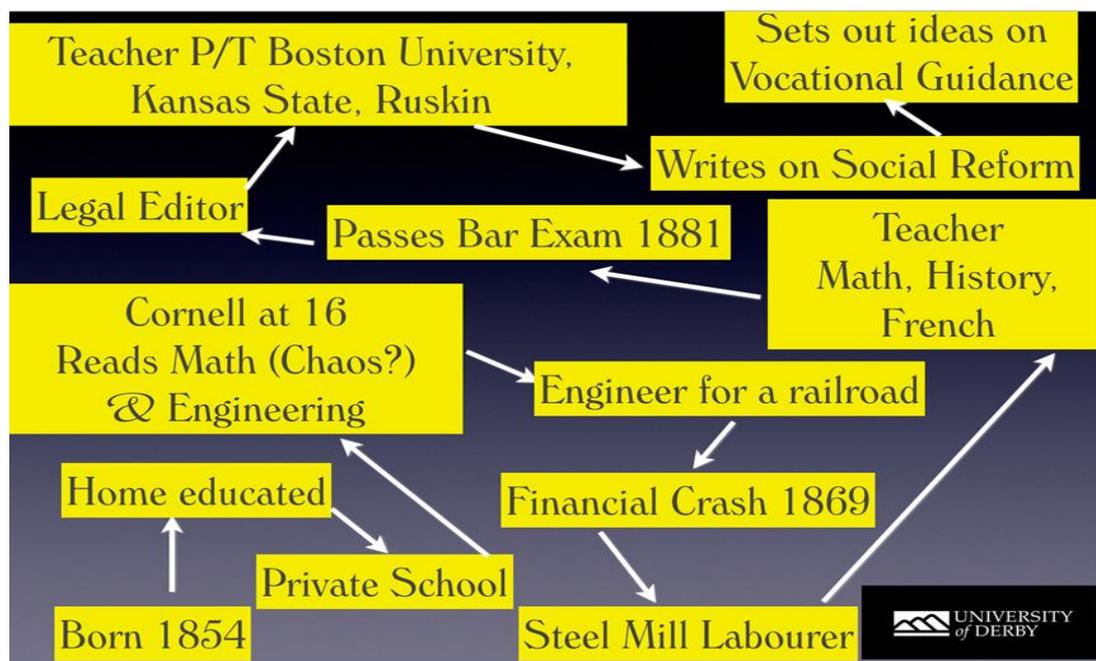
However, empirical support for this type of career path is curiously lacking. Indeed there is good reason to believe that career ladders are increasingly rare (e.g. Claman, 2012). Cascio (1991) has documented the impact of large-scale downsizing of the white collar workforce in the 1980s. This had the impact of removing large tranches of the managerial workforce, and hence many of the rungs of the old career ladder. This happened for largely the same reasons as it happened more gradually to blue-collar workers over the previous 30 years, namely automation and increasingly low-cost labour in Asia (Pink, 2005).

This restructuring of the workforce in the western world has gathered apace with the increasing casualisation of the workforce and the embrace or imposition of free market philosophies into hitherto highly regulated sectors such as primary, secondary, tertiary and higher education, healthcare and the public service. The expectations of permanent jobs and the concept of academic tenure is giving way to short-term contracts, and in the United Kingdom to so-called zero-hours contracts. In the higher education sector, 35% of academic staff (both full-time and part-time) were on fixed term contracts in the 2013/14 period (HESA, 2016).

However it would be a mistake to see career uncertainty as a recent phenomenon. Within the history of my own family, my maternal great grandfather and my maternal grandmother provide examples of the insecure and uncertain nature of employment about a century ago. My great grandfather was blackballed by employers in his native Oldham having been accused of trying to organise labour into an early union. He was obliged to walk 10 miles to Manchester to find work as a labourer each day. His daughter, Violet Parsons was sent to work in the cotton mills of Lancashire as a young teenager, and into a job that was commonly associated with horrific scalping injuries caused by the moving machinery of the cotton looms. The working lives of the working class were characterised by uncertainty.

The uncertainty that arises from complexity, change and chance was recognised from the very beginning of the formal discipline of career development. Frank Parsons, a key figure in the rise of Career Development in North America at the start of the last century (and no relation as far as I can tell!), is credited with formalising a rational model of careers advising and decision-making resting upon “true reasoning”. Perhaps Parsons was motivated by his own career path, which was far from the logical linear path to which we have been encouraged to aspire. Parsons’ career path is set out in Figure 2.

Figure 2: Frank Parsons Career Path



Parsons (1909) in his seminal text, *Choosing a Vocation*, acknowledges the role of complexity, change, chance and uncertainty in career development. He clearly saw the world as complex:

We guide our boys and girls to some extent through school then drop them in this complex world. (p.4).

He recognised the role of environmental factors in career choice:

Boys generally drift into some line of work by chance , proximity, or uniformed selection (p.4)... “never the less it must not be forgotten that all such indications [ancestry, family, education, reading etc] are only straws, hints to be taken into account with all the other facts of the case (p.8).

Parsons understood the presence of continual change:

A man cannot be fully successful, nor secure against change constantly occurring in the industry, unless he knows a good deal besides the special knowledge applicable to his business. (p.12).

Finally, Parsons identified the key role of adaptability, well before Donald Super and others since:

The fundamental question that outranks all the other is the question of adaptation. (p.13).

Despite Parsons acknowledgement of these realities, the role of chance, complexity, and change have been largely overlooked or at least underestimated in subsequent theorising. ¹

Empirical studies from the early 1920s reported that young people experienced change in their vocational aspirations. “Fryer, in a study of high school seniors, found that about half of them had already had at least one change of vocational intention” Hollingsworth (1929) citing Fryer (1923).

Chance events were first formally recognized in mainstream career development theories in the 1950s. Sociologists Miller and Form (1951) and Caplow (1954) presented Accident Theory as an explanation of career choice. Choices were seen to arise out of the accidental (chance) opportunities that arose. However this theory did not enjoy widespread support, and was dismissed by prominent researchers such as Crites (1969) who described it as the “layman’s theory” (p.79) and points out that “It is a basic assumption of all but one of the theories of vocational choice that the

¹ It must be said that I join a list of authors, perhaps even a tradition who have identified theoretically sympathetic themes in Parsons’ work – e.g. O’Brien (2001) - O’Brien, K. M. (2001). The legacy of Parsons: Career counselors and vocational psychologists as agents of social change. *The Career Development Quarterly*, 50, 66-76; Patton & McMahon (2014); and Pope, M., & Sveinsdottir, M. (2005). Pope, M., & Sveinsdottir, M. (2005). Frank, we hardly knew ye: The very personal side of Frank Parsons. *Journal of Counseling and Development*, 83, 105-115.

individual systematically chooses the occupation he intends to enter. Only accident theory posits that he chooses randomly or by chance” Crites (1969: 117).

Super (1957) was equally as dismissive, stating confidently that “Given sufficient knowledge, there is no such thing as chance” (p.278). He provides an illustration of this point “being hit by a car or having a brick fall on one’s head from the roof of a building does appear to be chance factors in the true sense of the word. But even these contingencies can be predicted, in the sense that their incidence in the general population and in certain classes of population are known” (p 277).

Super’s overconfidence in prediction fails to appreciate that what is generally true can be specifically false. Furthermore, supposing the hapless individual indulging in the reckless pursuit of walking out of their own front door fully in receipt of the most accurate actuarial data on falling masonry, nonetheless experiences the statistical outlier of a collision with a brick travelling at terminal velocity. Explaining after the fact that the odds of this occurring were less than million to one, is no solace to the injured party, and such an event may, and indeed does result in significant impacts upon careers.

While it is generally true that most car journeys are uneventful, it is specifically true that a not insubstantial proportion result in career changing injuries. To all intents and practical purposes these events are invariably experienced as chance by those injured. There is uncertainty at the level of the individual which is why prudent people take out insurance, however there is less uncertainty (but still plenty) at the societal level which is why insurance companies underwrite risk. Unfortunately, career counsellors work at the individual level where uncertainty is experienced most keenly.

Other influential theorists tend also to underestimate the impact of change. For instance Holland (1997: 12) claimed that “stability is the norm...because employers discourage change”. This observation, which might have been true in the 1950s seems positively false in current turbulent times. Indeed Baruch (2004) went so far as to say “With the turbulence and lack of structure and order evident in the realm of careers, even Chaos Theory may well prove useful” p.9

A central problem for career development theorising is to balance generalisations or abstractions against the specific circumstances of individual clients. Reductionist theories that seek to reduce career behaviour to the consideration of a limited set of variables, most notably Holland and Super, rest upon two assumptions: the *ceteris paribus* assumption or “all things being equal” and the assumption that past behaviour predicts future behaviour. The former asserts that any deviations from a predicted pattern will balance out over time and people – in any group there will be some that have lucky breaks and some that unfortunately have unlucky breaks. Consequently, it is assumed that theories can largely ignore these deviations or “errors” and focus on a limited set of variables.

However the first assumption often breaks down when dealing with individual clients in all of their complexity. All things are not equal for them. A client who was in the wrong place at the wrong time may have suffered injuries that influence or even

determine their career prospects. Their good and bad luck does not even itself out. They may continue to have measured vocational interests that point to a career doing manual work, however they have a back injury that precludes any such work.

Leigh (2015) recounts the story of José Sanjuro, leader in waiting of Spain and in exile at the end of the Spanish Civil war. Being a proud man, he insisted on packing all of his military regalia onto the small plane that was to fly him back triumphantly to his homeland. Unfortunately, the overloaded plane crashed, killing Sanjuro and handing the Spanish leadership to Franco. Things didn't even out for Sanjuro, or for Franco for that matter. Chance events changed the course of not only Sanjuro's and Franco's lives, but those of the whole Spanish nation. Leigh presents many more such cases in politics. To argue after the fact that this event was entirely foreseeable and a matter of the physics of the aircraft versus that of a trunk full of medals rather misses the point, and fails to take in account the pompous preening of Sanjuro. There is no model in physics that I am aware of that takes into account human idiocy.

Secondly, while past behaviour (biodata) may be one of the best predictors of future behaviour, it is still not a particularly good predictor. Altink (1991) reported correlations of 0.4 between biodata and job performance, a result that is toward the upper end of such reported relationships. Thus on the best accounts, reliance on biodata still leaves us 84% uncertain about future performance. Complexity and non-linear relationships between performance and predictors has been shown to explain why the results are so unimpressive. For instance, it has been shown that a personality dimension, openness to experience, is a poor predictor of performance in the short term, but over a period of four years, graduate employees with lower levels of openness showed greater declines in performance, compared to their more open counterparts. However both groups displayed non-linear performance curves (Minbashian, Earl and Bright, 2012). In other words the simple and linear assumptions of past performance predicting future performance are undermined by complexity and non-linearity. We cannot be as confident in our predictions as these assumptions would have us believe.

It seems that no matter how much one seeks to reduce or eliminate uncertainty, the "cunning of uncertainty" (Nowotny, 2016) means we are left with the inevitable choice to ignore it, underestimate it, or embrace it. In the short-term, we can make reasonable predictions sufficient for us largely to act as though uncertainty can be controlled or diminished. However, in the longer-term such a naïve reliance on certainty and a hubristic sense of personal or societal control is likely to be reckless. The US Marines have a saying, plan early and plan twice, US General Dwight Eisenhower said "in battle plans are useless, but planning is indispensable"(Nixon, 1962). Both recognise, the inevitability of uncertainty.

Complexity is to blame for uncertainty. Pryor and Bright (2006, 2011) introduced the parable of the puppy and ping pong ball to illustrate how increasing complexity rapidly results in increased uncertainty. If one drops a ping pong ball from waist height, it is easy to make accurate predictions about where the ball will initially land. However if you introduce a playful puppy into the room, it less predictable where the ball will land. The more puppies you put into the room, the less predictable it becomes. Place the person on a treadmill programmed to vary its speed randomly

and add in a couple of powerful cooling fans, and it becomes more or less impossible to predict where the ball will end up. The addition of relatively few influences on the system can have a profound impact on predictability. Given the legion of influences that impact upon a career, it should be obvious that long-term deterministic predictions of career paths are hazardous at best. Complexity inevitably increases uncertainty. Careers are uncertain.

In the field of meteorology Edward Lorenz in the 1960s came to a similar conclusion with regards to predicting the weather (Lorenz (1993). Lorenz is seen one of the founding fathers of Chaos theory. He discovered that his mathematical models developed to predict emerging weather patterns, displayed what he termed sensitivity to initial conditions. That is, he found that very tiny changes in the starting values of his models led to radically different predicted weather patterns. His models demonstrated non-linearity, whereby small changes in the inputs could lead to dramatic changes in the outputs, and conversely, dramatic changes in the inputs could result in little or no change in the outputs.

Lorenz's mathematical models when plotted out would often follow a circular or spiral shape (figure 3), however at certain critical values, the pattern would radically change and describe the shape of a figure eight on its side, or that of a butterfly (figure 4). Indeed Lorenz used a butterfly metaphor to illustrate non-linearity when he famously asked "if butterfly in Brazil flaps its wings does it cause a tornado in Texas?" He argued that due to the weather being a complex dynamical system, it was impossible to make long-range deterministic predictions.

Figure 3: Lorenz Equation

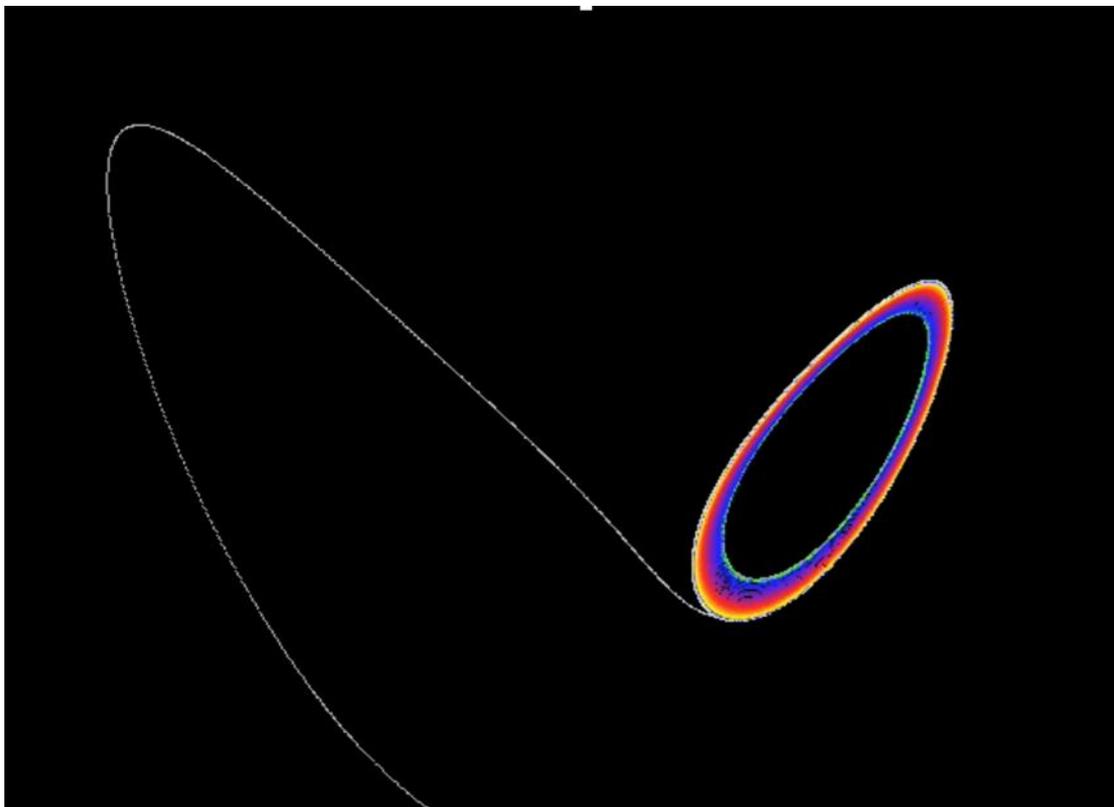
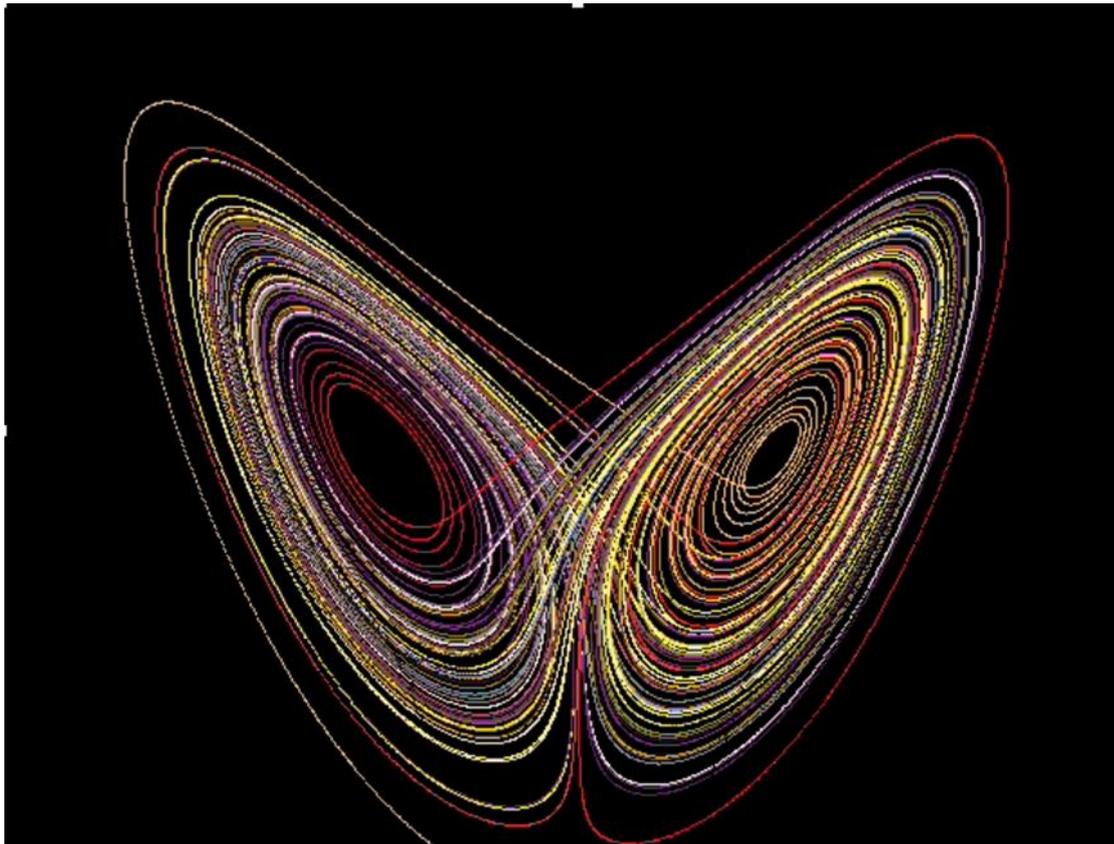


Figure 4: Lorenz equation with small adjustment to starting value



If we think of the trajectories in figures 3 and 4 as career paths, figure 3 could represent a teacher following a predictable career path. Perhaps they graduated with a teaching qualification and then continued to work in teaching throughout their career. Figure 4 might resemble the identical twin who also started out in teaching, but after a chance meeting at a party was introduced to world of finance and ended up retraining and working as a stock broker.

The CTC (Pryor and Bright, 2003ab, 2011; Bright and Pryor, 2005, 2011) was developed around 2000, in an attempt to develop a theory that better captured the career development realities that previous attempts at theorising had overlooked or failed to adequately capture. In developing this theory the authors wanted an account of career development that captured complexity, change, and chance events. The theory was in part inspired by the authors' work in medico-legal assessment where we encountered clients whose careers had been dramatically and unexpectedly transformed by workplace and motor vehicle injuries. Further research with university students (Bright, Pryor, Wilkenfeld and Earl, 2005) provided evidence for the multiplicity of influences on career development supportive of taxonomy adumbrated by Patton and McMahon, (2014), and the frequency of chance events consistent with the previous work of Betsworth and Hanson, 1996, Krumboltz, 1998, Miller, 1983; and Williams et al 1998.

The theory was also inspired in part by what we saw as the shortcomings in extant theories. At that time of the new millennium, the dominant theoretical perspectives remained Holland (1959, 1997) and Super (e.g. Super, 1957, 1980). We wanted to

go beyond the static person-environment fit model of Holland, that has been subject to an increasingly critical commentary (e.g. Arnold, 2004, Patton and McMahon 2014). We wanted a model that took account of the complex array of influences on a career, and one that could provide a principled account of chance events. By the same token, we were not looking for a theoretical account that ignored or diminished the contribution of extant theory, rather one that could cover the same theoretical ground and then some.

At the time, we began developing our theory, there was increasing interest in postmodern theories, most notably Savickas' (1993, 1995) Career Construction Theory and Patton and McMahon's Systems Theory Framework (2014). These approaches criticised traditional modernist theories as failing to take into account the personal constructions of the career experience of individuals, as well as being "simplistic" (Patton and McMahon, 2014:42) and also "the process of career development that is to a large extent overlooked in these theories" (p.47).

Both Career Construction Theory (and its more recent guise as Life Designing, Savickas et al 2009) and the Systems Theory Framework adopt a social constructivist framework, where in "the only reality is the reality construed by the observer in interaction with the observed" Patton & McMahon (2006:180). Consequently a lot of emphasis is placed upon capturing a client's narrative which is seen as an expression of their personal career constructions, in contrast to traditional approaches where clients are typically compared to others using psychometric tests of interests, values, career maturity and other measures.

While traditional models have been criticised for failing to capture the personal experience of career, and falsely claiming objectivity in measurement, the social constructivist approaches faces the challenge of linking an individual's personal constructions to a broader reality. The insistence that "objectivity and pure knowing is impossible" (Patton and McMahon, 2006:180) seems hard to sustain, especially in a discipline where one is assisting individuals to make social connections with others through work. It seems fundamental, that both people and jobs exist, as do barriers to employment including economic, educational, and health amongst many others. We do not behave as though we do not know these things directly, rather we behave as naïve realists. Jobs exist, interviewers exist as do interview processes. We can directly know what it is like to board a bus or a train en route for an interview, and know how we feel when the bus is stuck in traffic and we will be late for the interview.

This point becomes more than theoretical when considering the case of a worker who has lost an arm in an industrial accident. Whilst it is undeniable that the individual may well construct a narrative about what it means to have lost their limb, and this may influence how they react to their circumstances and therefore must be taken cognisance of, the loss of the limb will limit that person's vocational options irrespective of their constructions.

In other words, reality exists above, beyond and around a person's constructions of it, and that reality is not determined by the mutual agreement of a series of observers. Just because many people believe that Elvis lives, does not alter the fact that he died in August 1977. The emphasis social constructivists place on how we

know things can, when taken to an extreme, come at the cost of any consideration of how we do things. The focus is on examining a client's explanations or constructions of reality, usually in the form of narratives, more so than exploring that reality by taking action – an approach to career counselling promoted by Krumboltz and Levin, 2004. Taking action such as trying things out, turning up to events, conducting controlled experiments, cold calling, networking or making an application can and do lead to new possibilities and can lead to unanticipated or previously unappreciated perspectives or outcomes that cannot result from merely thinking about ones circumstances. While social constructivism provides a powerful way of understanding how a client construes the world and has an important role to play in career counselling, ultimately, most career counseling is not only about self-insight but it has the pragmatic goal of also helping a client act in a real world that does not necessarily bend to our constructions of it. As Kitching (2008) points out, no matter how often I say I am walking across the room and turning on the light switch, no matter whether I believe it or not and no matter how many people I tell, the reality is I am sat in my armchair. Social constructivism privileges epistemology over ontology.

For these reasons, the CTC adopts a “realist-constructivist” perspective (Pryor and Bright, 2003a), that while we all construct personal meaning, reality exists beyond that point. Consequently the CTC does not sit any more easily within a designation of a post-modern theory than it does within a more modernist framework.

The CTC (Pryor and Bright, 2003ab, 2011; Bright and Pryor, 2005, 2011) characterises people as complex dynamical systems that interact with and are embedded within other complex dynamical systems and are comprised of complex dynamical systems. They are complex because they are subject to a multitude of different influences and they are dynamical because all of these different influences are continually changing.

The human body is an example of this idea. Contained within our bodies are multiple embedded systems such as the cardio-vascular system, the nervous system, the integumentary system, the respiratory system, the lymphatic system and the muscular system. These systems are complexly connected and also inter-connected with the other systems in the body. These systems are open systems and can be impacted by a range of factors including nutrition, toxins, exercise, injury, under or overuse and many others. The human body is systemic but also immensely complex. For instance there are approximately 37.2 trillion cells in the average human body. The average human has 50 million fat cells. What follows for this author, is that he must be even more complex than average!

The weather is also a complex dynamical system. There are a wide range of factors that influence weather patterns including geography, the sun, the moon, carbon emissions, and even, apparently, flatulent cows. However, like the human body, over time emergent patterns of behaviour can be observed. Humans have characteristics, even if they are far from entirely predictable. The weather falls into seasons, even if predicting the weather on any one day months in the future is a hazardous business. Indeed the worst storms to hit Britain in 300 years in 1987 was grossly underestimated in forecasts less than 12 hours before it hit land.

We chose the name “The Chaos Theory of Careers” to reflect the intellectual pedigree of the ideas that come out of meteorology, mathematics, evolutionary biology and physics, amongst others. The name is not a good one, it was the one chosen by researchers in those disciplines and we are stuck with it! Perhaps the biggest problem with the name is the assumption that chaos is being used in the vulgar sense to mean totally out of control. In fact chaos and complexity (we use the term interchangeably for our purposes, but are aware of the theoretical differences) are theories about the relationship between order and disorder. In particular it challenges simplistic dichotomies that characterise order and disorder as opposites. Rather they are seen as composites.

Chaotic and complex systems demonstrate stability through a characteristic property of emergence (Morrowitz, 2002). Complex dynamical systems exhibit self-organising properties. That is, over time these systems settle into characteristic patterns of operation or trajectories. These patterns themselves (ie the nature of the system’s operation) is also subject to discontinuous change over time. That is, over time, these systems begin to emerge into a pattern of operation that is self-similar and sort-of-like-old repeating. These patterns are called Fractals (Mandelbrot, 1975). The patterns never exactly repeat, but are generally sufficiently self-similar to be considered “the same”.

Consider your commute to work. Even if you take the same bus, train or car journey, each trip is at least subtly different to the one before. You may drive the same road, but each trip you will cover slightly different parts of the road at slightly different times. Most of the time these differences are trivial, however, being in the wrong place at the wrong time on a stretch of road – a time that can be measured in milliseconds might make all the difference between a collision or a near miss.

Living organisms display these characteristic fractal patterns. Trees and flowers grow branches or petals, branches grow on the branches, and each one is like the one before but never exactly the same. Our faces (assuming you have had no work done!) look the same as the day before, but at the same time age over time. Nonetheless even after the passage of decades, strangers can match photographs of adult faces to their child photo counterparts at above chance levels. Here we see the seeming paradox of stability and change or order and disorder within the same face. The CTC describes a dynamical order or stability, it does not posit that everything is out of control.

However whilst chaos systems display this fractal quality, they also demonstrate what is called sensitivity to initial conditions. That is Lorenz’s butterfly effect. Small differences in the initial conditions can have profound impacts on the system subsequently. This is observed in fractal patterns that change suddenly and dramatically, or equally slowly over time. In some systems this change is highly predictable – for instance when water turns from a liquid into ice, or steam. However in other systems it is highly unpredictable when the so-called phase shift will occur. In humans it may be the result of the onset of an illness, an injury or a chance meeting and lucky break. It can come from a revelation about a new philosophy of living or religious conversion, or from an addiction or recovering from an addiction. Thus the CTC captures both the changing nature of people, which can vary from glacially slow

to dramatically fast and the chance events to which they are subject that may be trivial or highly influential. It is a theory that captures both the orderliness and disorder in life, the pattern and surprise, the linearity and non-linearity. It is a theory that recognises the limits of certainty and promotes the embrace of uncertainty.

From a CTC perspective, we look to consider clients holistically in all of their complexity. The idea is to get a sense of the emergent pattern of a person's fractal. This provides richer insights into a Person's identity, values, limits, potentials and history. However, the non-linearity of the system reminds us that past behaviour will not necessarily predict what is going to happen next. Consequently there is an emphasis on building opportunity awareness or Luck Readiness, (Neault, 2002; Pryor and Bright, 2011), complexity awareness (Pryor and Bright, 2011) and adaptability, as much as there is an emphasis on plans.

Understanding people's reactions to change and uncertainty is a central theme of the CTC. Uncertainty is seen as threatening to many. Uncertainty brings with it a lack of a sense of control, and this has been shown repeatedly in the context of work to be inherently stressful (e.g. Jones & Bright, 2001, Jones, Bright, Searle and Cooper, 1998). Consequently it is perhaps not surprising that responses to uncertainty very often involve the imposition of closed system thinking on an open systems reality. An open system as the name implies is one in which not all of the variables that make up or influence the system can be specified in advance. It is a bit like trying to describe the members of a family. Over time the membership keeps changing due to births, deaths, marriages, divorces, and paternity tests! The nature of the family may change over time and sometimes in unexpected ways.

A closed system by contrast is one in which all of the variables are fully specified in advance and whose nature cannot be altered. It should be immediately apparent that closed systems are ultimately predictable. An internal combustion engine is an example of a closed system. The engines cylinders fire in a strict and repeating pattern. However if leaks occur in the engine, for instance a valve splits, then the engine behaves erratically.

In reality it requires a lot of effort to maintain a closed system, even static objects have to change to remain the same. For instance many of the materials on the Sydney harbour bridge have been replaced as they rusted away, the road on the bridge has been resurfaced many times. It is continually being painted. Closed systems can also be conceptual, such as rules, routines or taxonomies.

Within the CTC, there are four general responses to uncertainty that reflect closed and open systems thinking. They correspond to ways of constraining the operation of the system, called Attractors. Three of these are closed system responses called the Point or Goal, Periodic or Role and Torus or Routine Attractors. As their name suggests, they represent attempts to reduce complexity to simpler more manageable systems that allow for predictions and control (Pryor and Bright, 2007). Thus from a CTC perspective, popular approaches to career development problems such as goal setting is understood as an attempt to simplify complexity. This may aid or motivate action in the short term, but it comes at the risk of over-simplification and the inability to spot other, better opportunities.

The final Attractor, called the Strange Attractor is an open-systems attractor that is characteristic of chaos systems. The attractor limits the system sufficiently for it to be a clearly identifiable system, while at the same time having permeable boundaries that allow external influences to alter the functioning of the system. This attractor is where order and disorder are composite, where change, renewal and adaptation can take place. From a career counseling perspective, the aim is to move clients to embrace and understand as much as possible of their Strange Attractor.

The Strange Attractor limits the system, and in this it can be thought of as reflecting a person's values (e.g. Brown 1995). The imposition of a Torus attractor represents self-limiting thinking, or a deliberate attempt at increasing personal control. This has many advantages in providing for a sense of continuity and predictability, but risks inflexible, rigid and unoriginal thinking and behaviour that can make individuals (or organisations) vulnerable to any externally imposed change. It should be apparent, that through the idea of attractors, individuals exert a degree of control and intentionality. It is a misconception to construe the CTC as characterising people as lacking any control, or intention, rather, it reminds us that our efforts and intentions to control are not absolute, are subject to limitations, and this for this reason, complexity theorists prefer to talk about influencing systems rather than controlling them. Table 1 summarises and contrasts the four attractors.

Table 1 – The four attractors

Attractor	User-friendly name	Type of System	Characteristic Constraint on System to:	Example	Pros	Cons
Point	Goal	Closed	move to a pre-defined point	Goal setting that directs behaviour to toward a defined outcome	Focuses attention, priorities and resources	Reduces flexibility, focus may miss better opportunities,
Periodic / Pendulum	Role	Closed	swing between two types of point	Black and white, either/or thinking	Reduces to manageable competing options	Rigid and extreme thinking, over-simplification
Torus	Routine	Closed	Move between a series of pre-defined points	Rigid adherence to a routine or set of rules	Provides sense of certainty, reduces need to make decisions	Rigid, unoriginal responses, predictability at expense of creativity, eliminates opportunity to practice embracing uncertainty
Strange	Change	Open	Constantly changes, but typically repeats in a self-similar but not identical fashion	The normal state of living/growing things	Continual adaptation, opportunity awareness, flexibility, creativity	Need to embrace uncertainty, limitations of knowledge and control, accept risk

Thus the CTC aims to provide an account of both stability and change, as well as a principled account of chance events in career development. In terms of counselling techniques to help understand and explore a person's complex fractal pattern, both traditional psychometric tools such as interest, values and work rewards inventories, and techniques that assist in exploring the personal and unique emergent qualities of a person's fractal, such as narrative, collage and anecdotes are seen as both valid and complementary. Used in combination they assist in understanding a person's uniqueness as well as how they relate to others and work.

The CTC has the potential to contribute to policy in relation to career development. Career Development policy benefits when it is informed by high quality research and evidence. The CTC offers policy-makers a framework in which career education and interventions that focus on developing adaptability, embracing change, enterprise,

resilience, creativity and innovation can be coherently located. Recent welcome UK Government initiatives such as the Careers and Enterprise Company (CEC) recognise that young people are emerging into a world where the “the world of work is changing fast” (Careers and Enterprise Company, 2016). Indeed it is noted that one of the “core beliefs” of the CEC is to “Encourage young people to create and take opportunities that continuously challenge or reframe career direction – in stark contrast to a ‘job for life’” (Careers and Enterprise Company, 2016). CTC tools such as the Luck Readiness Index (e.g. Pryor and Bright, 2011) that measures opportunity awareness, as well as the emphasis it places on coaching people to embrace uncertainty and change provides a practical tool to begin to address these important priorities. The Change Perception Index (Bright and Pryor, 2007), is also useful in understanding a person’s response to change and uncertainty, by providing a platform to develop strategies to leverage career opportunities and to make the most of change in one’s career. The CTC and its tools are entirely consistent with contemporary career development policy. Similar policy emphasis in other developed nations such as Australia, where creativity and innovation are being strongly promoted, are equally compatible with the core messages of the CTC. Career Development practice that emphasises complexity, change, chance and opportunity awareness can make a valuable and relevant contribution to policy development.

Assisting people to embrace uncertainty seems to me to be a worthy task for career counsellors. As Nowotny (2016) asserts “embracing uncertainty ...brings forth the potential to transcend human limits and limitations. It pushes us towards some of the greatest achievements in the sciences and the arts” (p.163).

3. References

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