SUMMARY

The process of psychological change is complex, mirroring the complexity of life (Mahoney, 1991). Such complexity is nonlinear. Essentially, people are nonlinear dynamical systems and are characterised by an ever-changing, ever-adaptive movement from one state of order to another. This movement is a sequential flux, a turbulent ebb and flow of forces and form. Psychological change, too, follows this chaotic process of change (Butz, 1997). This is in line with the 'new science' of complexity. A postmodern vision, this is an ecological worldview that sees the world in terms of wholeness, interconnectedness, context, and nonlinear process (Goerner, 1995a).

Three fields characterised by and concerned with complexity and which embrace the postmodern, ecological worldview are constructivism, ecopsychology, and chaos theory. Constructivism holds that people are meaning-making individuals who construct their own versions of reality; people are proactive, self-organising, and ever adapting to higher levels of complexity (Masterpasqua & Perna, 1997; Neimeyer & Mahoney, 1995). Ecopsychology is a synthesis of psychology and ecology; it is inspired by a holistic version of reality and posits the mutual embeddedness of humans and nature, the systemic connectedness of all that exists, and the evolutionary flux of the universe (Goerner, 1995a; Metzner, 1999). Chaos theory is the face of complexity; it is concerned with nonlinear dynamic systems as they evolve over time and the patterns and processes underlying such change (Cambel, 1993; Kellert, 1993). Although individually powerful and relevant for psychology, these fields are highly fragmented and often impractical. Much potential lies in their integration.

Against this background, two goals were pursued in this study: 1) primarily, to simply and clearly demonstrate the concepts and application of chaos theory in a therapeutic situation; 2) to integrate the fields of constructivism, ecopsychology, and chaos theory relevant to the main goal of the study. Constructivism served as a grounding epistemology and, within this, ecopsychology served as a context within which chaos theory was utilised as a therapeutic applicatory model.

The grounding epistemology, integration, and intervention are premised on the notions that: a) nature and humans are mutually and crucially embedded in each other; b) nature is characterised by nonlinear dynamical systems and the chaotic process of change, and thus humans (ie: dynamical systems) are also necessarily subject to such natural laws and principles; c) humans are proactive and may utilise the principles of chaos theory – notably self-organisation – to consciously initiate their own chaotic process of psychological change.

The fields of constructivism, ecopsychology, and chaos theory are characterised by new and innovative forms of research and design methods. Such a pioneering spirit underpinned this study. The emphasis was on simplicity and pragmatic utility, using down-to-earth methods geared to producing practical and relevant data for use in therapy. A prime consideration was to ground the study in real-life. An empirical, descriptive field study was thus used, utilising an intensive single-case quantitative (time-series) design for data collection and a qualitative analysis. The intervention was aimed at initiating and facilitating psychological change, and was conducted with three participants. A nature-based metaphor and related guided imagery were used as a structure for the intervention. The intervention was conducted over three months. Participants completed self-report scales four times daily for the duration of the intervention, yielding time-series data. Analysis was by means of interpretation of three-dimensional geometric phase portraits and time-series graphs. Interpretations were used heuristically, triangulating them with clinical observations and verbal feedback from participants.

Results showed that each of the three participants changed psychologically in different ways in the intervention, with certain aspects of chaos theory more applicable to one or the other. Considered together, the data pertaining to the three participants were clearly related to the principles of chaotic change.

It was concluded that the concepts of chaos theory were shown to be relevant for therapy and that their application could be demonstrated simply and clearly. Chaos theory holds much potential as an applicatory model in psychology and would be well served by the use of more simple and pragmatic research methods. The use of triangulation in chaos theory analysis was found to be a particularly powerful

methodology. The integration of constructivism, ecopsychology, and chaos theory proved to be a powerful framework for therapy and holds much potential for future development as a framework for broader psychological investigation and application.

Much future research could be pursued from where this study leaves off. More studies focusing on simple and clear applications of chaos theory in therapy could be undertaken. Practical studies conducted in real-life therapeutic situations using innovative methodology would be particularly useful. A more comprehensive integration of constructivism, ecopsychology, and chaos theory could be undertaken. This could be a rich synthesis, going beyond unification of the core fundamentals to consider more widely related aspects of therapy and psychology.

CHAPTER ONE

OVERVIEW OF THE STUDY

"We are embedded in an ongoing evolutionary process that moves inexorably and opportunistically toward increasing levels of ordered complexity. We are finding an evolving ecological world. It is quite a change in vision." (Goerner, 1995a, p. 37).

"Most of reality, instead of being orderly, stable, and equilibrial, is seething and bubbling with change, disorder, and process." (Toffler, 1984, p. xv).

1.1 INTRODUCTION

The process of psychological change is complex in the extreme, and a research endeavour concerned with exploring change should ideally pay due regard to such complexity (Abraham, Abraham & Shaw, 1990). This study attempts to do just that, describing the process of psychological change from the perspective of chaos theory, an approach that focuses on the seething and turbulent flux – a chaotic sequence of pattern, process, and change – that characterises the movement from one state of order to another in nonlinear dynamical systems (which includes human beings). The study utilises constructivism as a grounding epistemology, ecopsychology as context, and chaos theory as a therapeutic applicatory model. It further integrates these three fields to create a working framework for intervention (and for psychological investigation and application beyond this).

1.2 BACKGROUND INFORMATION

In very broad terms, this study is postmodern in orientation and is rooted firmly in the 'new science' of complexity.

The postmodern vision is one that sees the world in terms of wholeness, interconnectedness, inclusivity, and context. This is an evolutionary, ever-changing, ever-adapting world of nonlinear dynamical systems characterised by relativity and relatedness, process and context, ambiguity and paradox. The notion of a fixed and objective reality is decried. Instead, realities are personally and socially constructed and there are thus multiple invented realities. Realities are seen as dynamic and ambiguous, constantly shifting, and constituted in terms of probabilities and relationships. There is a multitude of possibilities within multiple contexts. Matter is seen as energy, not just substance, and energy is in flux, transition, and process. There is thus an essential interconnectedness and dynamic flux in the universe (Cox & Lyddon, 1997) and with deeper inquiry the world may be seen as a unified, dynamically ordered whole (Du Nann Winter, 1996).

The new science of complexity is a revolutionary, nonlinear form of science that subsumes Newtonian linearity and Cartesian duality. It is a science of wholeness, where the gap between mind and matter is bridged (Butz, 1997) and the interconnectedness of things is made explicit (Goerner, 1995a). Scientists in this paradigm seek to investigate the complexity of the world, as opposed to pursuing the traditionally reductionist approach (Lotter, 1997). Complexity offers a new, exciting, and potentially revolutionary leap forward in the evolution of scientific thinking. The science of complexity challenges the established laws of order and predictability (Butz, 1997). The new science shifts its focus to those aspects of reality concerned with disorder, instability, diversity, disequilibrium, nonlinear relationships, and temporality (Prigogine & Stengers, 1984). At last, science can again encompass surprise, transformation, unpredictability, and pattern (Chamberlain & Butz, 1998). There is more inter-disciplinary openness, as science itself is taken to be an indivisible whole (Lotter, 1997). In line with this new openness, the approach provides a unifying language for psychology (Robertson, 1995).

Constructivism, ecopsychology, and chaos theory, then, subscribe to the bold and sweeping vision of postmodernism and complexity. Individually, they offer powerful and relevant approaches to psychology. Integrated, they offer a working framework that is strong and coherent, of considerable utility, and which can harness, channel, and develop such power and relevance to their full potential.

The core of this study, the underpinning epistemology, is the notion of constructivism. Essentially, constructivism is a philosophical stance that decries the notion of a fixed, objective reality. Instead, reality is held to be a construction of the individual and there are thus multiple realities (Lyddon, 1995). People live in their own, subjectively unique worlds. However, reality is intersubjective and shared, and common consensus operates to create socially constructed realities that necessarily interplay dialectically with personal realities (Greenberg & Pascual-Leone, 1995). Constructivism posits a postmodern self, an individual characterised by multiple selves, multiple experiences, and multiple realities – a core-structured, multi-faceted, ever-adapting individual who is in a constant state of becoming (Cox & Lyddon, 1997). Constructivism utilises a wide diversity of approaches and is characterised by a mix of high-level abstraction, eclecticism, and pragmatic utility (Neimeyer, 1995). The constructivist approach to therapy favours deep-level change (Neimeyer & Mahoney, 1995). The therapeutic encounter is co-constructed between therapist and client, and a high level of commitment and responsibility is required from both (Efran, Lukens & Lukens, 1992). Additionally, both bring their respective personal realities to the situation (Ivey, Ivey & Simek-Morgan, 1997). In constructivist research, the key issue is pragmatic utility (Mahoney, Miller & Arciero, 1995). Nonlinear processes are implied in constructivist ontologies and thus time-series, qualitative, process-oriented research methods are typically used. There is a commitment to idiographic, client-specific research (Mahoney, 1991). Overall, while constructivism's core fundamentals are unified the field suffers from a lack of paradigmatic coherence (Neimeyer, 1997).

Ecopsychology, the contextual backdrop of the study, is a highly diversified field that attempts to synthesise psychology and ecology (Fisher, 1996). Ecopsychology champions an ecological worldview, a holistic version of reality concerned with the nonduality of people and nature, the systemic connectedness of all that exists, and the ever-evolving processual flux of the universe (Metzner, 1999). People and nature are held to be largely alienated from each other, and healing the perceived split between the two is considered a priority for both psychological and planetary well-being. Widely diverse methods and approaches are used to pursue the aims of ecopsychology (Clinebell, 1996). The ecopsychology approach to therapy focuses mainly on the alienation between person and planet, and accordingly aims to help people reorient themselves to nature. Context and connectedness are consequently paramount, and

there is a focus on both the inner and outer landscape and the interplay between them (Conn, 1998; Segal, 1997). In ecopsychology research, philosophy and conjecture abound. There is a dearth of scientific rigour, and the establishment of an empirical research tradition is seen as an important future focus (Bragg, 1997). A pluralistic epistemology is utilised (Keepin, 1995). Overall, ecopsychological approaches share fundamental concepts and tenets, but it is nevertheless a highly fragmented field that is characterised by abstraction and impracticality (Metzner, 1999).

Chaos theory, the applicatory model used in this study, falls under the banner of nonlinear dynamical systems theory and can be seen as the face of complexity (Cambel, 1993). It is focused on the dynamic, sequential flux of pattern, process, and change that characterises nonlinear systems in nature (Chamberlain & McCown, 1998). It is concerned with the balance between stability and instability, the condition of a system as it changes over time, and the underlying patterns of the evolving system (Butz, 1997). Chaos theory is based on a concept of reality that is seething with spontaneous change, irregularity, disorder, and chance. It also provides a common language for science and psychology, and has the potential to unify psychology (Chamberlain & Butz, 1998). Therapy from a chaos theory perspective can be conceptualised as a process of order transition from one state-of-being to another in an individual (Schiepek, Fricke & Kaimer, 1992). There is a commitment by therapist and client to movement (Kruse, Stadler, Pavlekovic & Gheorghiou, 1992). Chaos is considered to be a necessary part of psychological change as it is only when a system's well-ordered pattern of functioning is disrupted that it is able to move to a higher, more adaptive state-of-being (Guess & Sailor, 1993). In chaos theory research, complex phenomena are observed over time. Descriptive designs, single-subject studies, and time-series measurement are typically used (Williams, 1997). It is difficult to categorically discern chaos in real-life data, so heuristic understanding and comparison are seen as more useful than literal interpretation of results. Research is generally complicated and often impractical, but is characterised by innovation (Johnson & Dooley, 1996). Overall, chaos theory is an inchoate field. There is a unity of core concepts, but much diversity of opinion and disagreement abounds (Masterpasqua & Perna, 1997).

It can thus be argued that constructivism, ecopsychology, and chaos theory – individually and collectively – have great relevance for psychology. Despite this, they are highly fragmented, inchoate fields characterised by a diverse, often confusing, and impractical mix of approaches and methods. In particular, there is a conspicuous dearth of simple, down-to-earth, pragmatic investigative and analytical approaches and methods which can be used practically in therapy, are easy to use and understand, and yield practical and relevant data – a lack which seriously constrains the potential and applicability of these fields.

1.3 MOTIVATION FOR THE STUDY

There are three motivations for the study:

- The main motivation is the conviction that chaos theory offers tremendous power, potential, and usefulness as a practical approach to therapy. The study's demonstration of it in a real-life intervention serves to highlight such.

- A second motivation is the conviction that chaos theory research need not be complicated, difficult, and impractical, as is very often the case. A simple research design strategy and methodology, geared to pragmatic utility, can be utilised to good effect in this approach.

- A third motivation is the belief that the integration of constructivism, ecopsychology, and chaos theory offers the potential for the development of a particularly powerful framework for psychology. Although limited in scope, this study's integration can represent an important step in this direction.

1.4 GOALS OF THE STUDY

Very broadly, the study aims to shed light on the application of chaos theory in therapy, increasing knowledge with regard to both chaos theory as an applied therapeutic model and the process of psychological change relevant to it.

More specifically:

1) The main goal is to simply and clearly demonstrate the concepts and application of chaos theory in a therapeutic situation. This entails: a) creating a conceptually sound, relatively simple research design, procedure, and analysis, and b) demonstrating aspects of the chaotic process of psychological change in a real-life therapeutic intervention.

2) A second goal is to integrate the fields of constructivism, ecopsychology, and chaos theory, relevant to the main goal of the study.

1.5 IMPLEMENTATION VALUE OF THE STUDY

Implementation value of the study is arguably very high. In particular:

- Chaos theory offers a powerful way of conceptualising the process of psychological change. Demonstrating it practically in a real-life intervention amplifies that power, and indeed highlights the potential of the approach. The study may well stimulate more, similarly focused research endeavours.

- Investigating chaos theory is generally a complicated and difficult research undertaking, making it notoriously impractical for use in real-life therapeutic work. This study demonstrates that chaos theory can, in fact, be investigated simply and innovatively, and that practical data relevant to real-life therapy can be obtained from such studies. The study may well stimulate others to conduct similarly simple and pragmatic research on chaos theory and therapy.

- The integration of constructivism, ecopsychology, and chaos theory offers an arguably powerful framework for psychological investigation and application. While the integration is necessarily limited to the context of the study, it may nevertheless be used beyond its confines. Indeed, it lays the groundwork for a more comprehensive integration of the three fields.

1.6 RESEARCH DESIGN

The new, postmodern sciences of complexity open the research door to an exciting world of quantitative and qualitative exploration. This calls for new forms of research methodology, innovative and pioneering approaches that utilise elegant research designs and methods. Such a pioneering and adventurous research spirit serves as an inspiration behind the design employed in this study.

The research design is a descriptive field study. The intensive single-case quantitative (time-series) design is used for data collection. A qualitative, graphical analysis is undertaken by means of three-dimensional phase space and linear time-series graphs and this is triangulated with clinical observations and feedback from participants in the intervention. The design is in line with the constructivist orientation of the study. Specifically, the investigation is empirical in character, the focus is on participants' subjective realities, and the emphasis is on yielding results that are of pragmatic utility.

1.7 SUMMARY OF CHAPTERS

Chapter One essentially provided an overview of the study. Sections on background information, motivation for the study, goals, significance, and research design were presented with the aim being to clearly and concisely provide a contextual and conceptual map of the project.

Chapter Two offers a review of the relevant literature. It is beyond the scope of the study to fully explore the incredible diversity that characterises the fields of

constructivism, ecopsychology, and chaos theory. Nevertheless, the review arguably highlights the fundamental principles and tenets of the respective fields and seeks to present a distilled essence that captures some of the subtleties and nuances that make them such rich, vibrant, and exciting fields.

Chapter Three presents an integration of constructivism, ecopsychology, and chaos theory. It is argued that while these fields are highly diverse and inchoate, they nevertheless share fundamental principles and tenets that make them highly complementary. As such, they arguably offer formidable potential and power for psychological investigation and explanation. It is beyond the scope of this study to fully and comprehensively integrate the three fields, but the integration is offered relevant to the main goal of the study.

Chapter Four deals with the methodology of this study. In its barest essence, this study aims to demonstrate how useful the concepts of chaos theory are in real-life therapy and it is argued that, despite the level of complexity inherent in the approach, very simple methods may in fact be used to conduct associated research. The need for pragmatic utility is argued, in concert with due regard to the need for scientific rigour and empirically-grounded data. The chapter provides a succinct account of the methods employed, aims to clearly delineate the logic of the design, procedures, intervention, and analysis, and argues for the investigative strength thereof.

Chapter Five presents the results of this study and discussion thereof. The chapter aims to clearly show the chaotic process of psychological change, as manifested in the results of real-life therapy conducted with three participants. The graphical analysis of each participant's results showed particular aspects of the process of change. Taken together, they arguably offer a rich demonstration of the chaotic change process. Clinical observations and verbal feedback from participants in relation to the results are also discussed, demonstrating the heuristic potential and related pragmatic utility of the approach. It was concluded that the goals of the research were met: 1) the chaotic process of change was simply and clearly demonstrated; 2) constructivism, ecopsychology, and chaos theory were integrated in a meaningful way, relevant to the study.

1.8 SUMMARY

An overview of this study was presented, with the aim being to provide a clear and concise contextual and conceptual map of the project. The background information section characterises the study as postmodernist and places it in the realm of the new science of complexity. Brief sketches of constructivism, ecopsychology, and chaos theory were drawn, revealing widely diverse fields that have great relevance for psychology but which are hampered by inchoateness, abstraction, and impracticality. Motivation for the study was offered, with three points relating to the goals of the study outlined: a) conviction of the power and utility of chaos theory as an approach for therapy; b) conviction of the need for a simple approach to chaos theory research; c) belief in the potential usefulness of the integration of constructivism, ecopsychology, and chaos theory as a framework for psychology. Two main goals of the study were delineated: 1) demonstrate the application of chaos theory in a real-life therapeutic intervention; 2) integrate constructivism, ecopsychology, and chaos theory. The implementation value of the study was made explicit; i) the power and utility of chaos theory as an approach to therapy is considerable; ii) simple and pragmatic research methods and approaches can be utilised with chaos theory; iii) the integration of constructivism, ecopsychology, and chaos theory has potential value outside the confines of the study. The research design was outlined. It is a descriptive field study, utilising the intensive single-case quantitative (time-series) approach for data collection and a qualitative analysis by means of graphical modelling in geometric phase space and time-series graphs triangulated with clinical observations and participant feedback. The intervention was described as an applied ecopsychological model, utilising guided imagery within nature as metaphor.

The following chapter presents a review of the relevant literature, expanding upon this overview and providing a solid base for the subsequent integration and therapeutic intervention.

CHAPTER TWO

CONSTRUCTIVISM, ECOPSYCHOLOGY, AND CHAOS THEORY

2.1 GENERAL BACKGROUND INFORMATION

The following is a review of the literature on constructivism, ecopsychology, and chaos theory. The focus is on highlighting the main principles and practices of these fields, drawing the essence from the three bodies of knowledge that, individually, tend to be somewhat fragmented and inchoate. Indeed, it is this distillation of the essence that will become critical in the later integration of the three fields into a unitary conceptual and applied framework – a nonlinear dynamical systems integrative framework – for therapeutic practice, at which time the essence will be expanded and elaborated upon.

Constructivism, ecopsychology, and chaos theory will each be discussed separately, in turn. The order is not arbitrary, but is presented with the ensuing integration in mind. Specifically, constructivism is an epistemological stance concerned with knowledge of reality and which philosophically undergirds the integration, ecopsychology is a particular way of constructing reality, and chaos theory is concerned with the subtle patterns and processes that underlie that reality.

It is stressed that the distillation presented is a personal construction of reality, a drawing together of a multitude of complex and diverse – and often contradictory – threads that represents but one version of potentially many similar offerings.

2.2 CONSTRUCTIVISM

"Speaking of 'constructivism' as a singular noun is more rhetorical than realistic, in that any close listening to the postmodern chorus reveals a polyphony of voices, not all of which are singing in the same key." (Neimeyer, 1997, p. 57).

2.2.1 Introduction to constructivism: Multiple meanings, multiple realities

Constructivism is a philosophical explanation about the nature of knowledge, an epistemological perspective that holds that people actively create the realities of their world (Airasian & Walsh, 1997; Lyddon, 1995). Constructivism is a metatheory that emphasises the proactive, core structured, and self-organising features of human knowing and experience and their implications for human change (Mahoney, 1995; Neimeyer, 1995a). It is postmodern in orientation and empirical in character (Ford & Urban, 1998), and combines realism (objective reality exists independently of people's sense experience) and idealism (objective reality exists only in people's consciousness) (Chiari & Nuzzo, 1996; Ford & Urban, 1998). Essentially, knowledge is constructed by mental processes that utilise but go beyond direct experience (Ford & Urban, 1998; Raskin, 1999). Constructivism is a form of evolutionary epistemology, whereby a continuous interplay between experience and cognitive construction produces a diversification of ideas and representations about reality and humans' relationship to it which are adopted or not depending on their adaptive utility or viability (Ford & Urban, 1998). Essentially, constructivism holds that human beings create their own version of reality, that experience of the world is not a one-to-one correspondence with an objective reality but rather a filtered, subjective experience that results in a personally constructed world.

The term constructivism derives from the Latin *construere*, which means 'to interpret' or 'to analyse', with emphasis on a person's active construing of a particular meaning or significance (Mahoney, 1991). Meaning is thus held to be a constructed product of human activity rather than an innate characteristic of the mind or an inherent property of objects or events in the world (Mascolo & Pollack, 1997). Crucially, it is not so much the actual event that impacts upon a person but the subjective meaning that he

or she attributes to it. Associated to this is the notion of criticality of the observer: whatever the individual attends to in the world becomes that person's experience. Essentially, people construct their personal reality in the process of observing the world. However, in virtue of perceptual and conceptual filters that make reality unknowable, observations are subjective experiences that take on the meaning that the observer attributes to them (Meyer, Moore & Viljoen, 1997).

People thus construct their personal realities by linking observations and meanings (Brower, 1996; Granvold, 1996). The resulting realities are edited, however, in that existing beliefs about the world are confronted and what is perceived is always limited (Bateson, 1972, 1979). The notion of one correct, objective reality is consequently rejected. Instead, multiple meanings and thus multiple realities are stressed (Neimeyer & Mahoney, 1995). People's constructed worlds and identities are crucially shaped both internally (in virtue of their personal subjective filters) and externally (in virtue of social forces and interaction with others) (Mascolo & Dalton, 1995). People collectively experience a shared world by the use of language and symbol, and there is dialectic interdependence between the individual and social forces (Marshall, 1996). The heart of constructivism, then, is the recognition that people's hypotheses about the world are not directly provable. 'Utility' as opposed to 'truth' is high on the constructivist psychologist's agenda (Efran, Lukens & Lukens, 1992).

There are problems and limitations inherent in constructivism. Raskin (1999) broadly encapsulates these as: 1) the choice of discriminate dimensions that are unable to make sense of the complex articulation of the constructivist domain, 2) the fact that many authors misunderstand the views of other scholars of constructivism, 3) a minor source of confusion regarding the use of terms (eg: intention, representation, construction) whose prevailing meaning is different from that given to them by some authors. More specifically, Neimeyer (1997) outlines the problems as: a) the high level of abstraction in which constructivist theory is framed, b) a lack of coherence among competing versions of constructivism, c) the question of whether or not constructivist therapists abdicate responsibility to clients when they adopt the typically egalitarian co-constructive mode of therapy, d) the question of whether or not constructivist therapy can generate or find support from a body of empirical

research, e) progress in constructivist therapy is tied to its capacity to organise itself as a community of scholars and practitioners.

2.2.2 The history of constructivism: A process of becoming

Just as constructivism champions the notion of a self in process, of emergence, of becoming, of dialectic interplay between proactive agency and response to the environment, so does the rise of constructivism as a force in psychology parallel that process. Essentially, constructivism grew out of disenchantment with the scientific paradigm of logical positivism and is both philosophically and psychologically inspired (Ford & Urban, 1998).

Constructivism's philosophical roots can be traced back to Giambattista Vico in 1725 with his revolutionary concept of 'imaginative universals' (Lyddon, 1995). Vico presented the first organised account of the role of powerfully constructive processes in perception, imagination, and knowing. He emphasised that humans create order in their experience by projecting familiar categories onto unfamiliar particulars. Immanuel Kant's *Critique of Pure Reason*, published in 1791, was the next milestone and many believe this to be the true roots of constructivism. Kant argued that the human mind imposes its own inherent structure on the particulars of thought and experience (Mahoney, 1991). In doing so he synthesised rationalism and idealism, postulating a 'noumenal world' beyond direct human knowing which could only be approximated by human observation. Following on from this, Nietzche's influential 'perspectival approach' in 1887 was a rejection of ultimate reality in favour of a kind of human comprehension (Lyddon, 1995). The next major constructivist was Hans Vaihinger, whose 1911 dissertation on 'the philosophy of as if' proposed that human mentation serves a purposive, organic function, and that the psyche is an organic formative force. The object of the world of ideas is not to portray reality but rather to provide individuals with an instrument for negotiating the world (Mahoney, 1991). Each of these theorists emphasised the proactive, form-giving, or fictional character of human mentation and its role in configuring the very 'realities' to which people respond (Neimeyer, 1995b).

Constructivism's psychological roots can be traced back to the first half of the 20th century, during which time constructivist views of mind and mentation are scattered across many works (Lyddon, 1995; Mahoney, 1991). Wilhelm Wundt outlined an essentially constructivist theory of human experience at the turn of the century. Buhler and Brentano at Wurzburg were amiable to constructivist notions, as were some of the early workers in Gestalt psychology. There was also a constructivist thread in the work of pioneer neuroscientist Charles Sherrington and in the later studies spawned by motor theories of mind. Jean Piaget produced his influential genetic epistemology in 1926 and Frederic Bartlett's assertions on abstractive processes offered an explicit invitation to constructivist thinking in 1932. Friedrich Hayek's treatise, *The Sensory Order,* in 1952 stands out as perhaps the single most elegant theoretical expression of constructivism, at least theoretically (Mahoney, 1991). The contributions of pragmatists William James and John Dewey were influential, as was the work of social interactionists Charles Herbert Mead and Charles Colley. It was George Kelly's 1955 pioneering work on personal constructs that heralded constructivism as a genuine approach to psychotherapy. Overall, the rise of constructivist psychology paralleled the rise of postmodernism (Lyddon, 1995).

Over the past few decades, the progress of constructivist thinking in therapy has been rapid, although often turbulent due to contradictory crosscurrents. In particular it has been shaped by the influence of postmodernism with its penchant for celebrating the multiplicity of belief systems, resisting methodological prescriptions, and undermining faith in the 'timeless truths' embedded in society and even science itself (Neimeyer, 1995b).

The postmodern paradigm in which constructivism is located underscores the importance of context, interconnectedness, and evolutionary process (Cox & Lyddon, 1997) – aspects which become explicit in broader consideration of the constructivist domain.

2.2.3 The constructivist domain: Unity within diversity

In spite of their common embeddedness in constructivist epistemology overall, constructivist theories do not reflect a similarly consistent philosophical base (Lyddon, 1995) and accordingly do not have a unitary viewpoint (Airasian & Walsh, 1997). A fundamental unifying factor, however, is the notion that psychological constructivist theories share an attempt to overcome the traditional philosophical opposition between realism and idealism (Chiari & Nuzzo, 1996).

Indeed, a wide variety of constructivist approaches have been advanced, offering diverse means of conceptualising the ways in which human functioning is predicated on constructed systems of meaning (Mascolo & Pollack, 1997). Thus, speaking of constructivism as a singular noun is more rhetorical than realistic (Neimeyer, 1997). Essentially, there are multiple constructions of constructivism! Nevertheless, constructivism can usefully be seen as a family of theories related to one another by shared assumptions and assertions, a group of abstractions that allows great diversity of practice within limits imposed by the conceptual features that define the metatheory (Mahoney, 1991).

Fragmented and inchoate as the field is, three conceptual features are considered central to constructivist metatheory: 1) humans are proactive participants in their own experience; 2) there is a nuclear structure of human psychological organisation, with the vast majority of ordering processes operating at tacit (unconscious) levels of awareness; 3) humans have self-organising characteristics of psychological development (Mahoney, 1995). More specifically, the proactive nature of cognitive processes asserts that human knowing is an active, anticipatory, and constructive process (Mahoney, 1991). The organism's activity itself is held to be its basic mediator and this activity is constantly expressed at a motor level (environmental exploration), a sensory level (constructing perceptual regularities), and a cognitive level (making and matching hypotheses) (Guidano, 1995). The nuclear morphogenic structure refers to the assertion that humans are organised with a central/peripheral structure such that their central (core, nuclear) processes are given special protection from challenge (and hence change) and that these central processes constrain the range of particulars that can emerge at a peripheral (surface structure) level. Self-

organising development holds that individual human systems organise themselves so as to protect and perpetuate their integrity. Each person is literally the central reference point for all of their experiences and survival efforts, and feed-forward mechanisms serve to prepare the organism for some selective subset of possible experiences (Mahoney, 1991).

Chiari and Nuzzo (1996) usefully encapsulate the diversity of approaches with a metatheoretical perspective in which they utilise a continuum with the extreme forms of idealism and realism at either pole. Focusing on the distinction between epistemological constructivism (personal construction of reality) and hermeneutic constructivism (social construction of reality), they place epistemological constructivism in the centre of this continuum. They further compartmentalise constructivism into various categories which highlight the essential differences: trivial vs radical constructivism (relationship between knowledge and reality), exogenous vs endogenous vs dialectical constructivism (relationship between external and internal stimuli as sources of knowledge), weak vs strong constructivism (relationship between personal and social construction of reality), and naïve or first-order constructivism vs second-order or social constructionism (relationship of self-reflexivity to other people's reality).

Definitions and types of constructivism are legion, as are the ways of conceptualising and categorising them. In essence, though, the two main forms of constructivism are the radical and critical approaches and the various types are aligned toward either ends of this philosophical spectrum to greater of lesser degree. The radical and critical approaches are differentiated in terms of their stance regarding idealism and realism. Radical constructivism is on the idealist end of the spectrum and holds that there is no (even hypothetical) objective reality beyond personal experience, that people's worlds are purely active products of ideation. Critical constructivism – a more widely held view – holds that an objective reality does exist but that, because of their personal filters, humans cannot directly know it. At best, people can only approximate reality through their constructions and through such try to discern meaning, order, and predictability in their subjective experience (Ford & Urban, 1998; Mahoney, 1991). This is a limited realism stance in which an individual's reality may or may not correspond with an external, objective reality (Chiari & Nuzzo, 1996). Both forms of

constructivism decry the notion of a fixed, singular reality, stressing instead multiple meanings and thus multiple realities – a stance known as constructive alternativism – and assume that people's reality is language-defined (Ford & Urban, 1998).

The various forms of constructivism give greater or lesser primacy to personal or social agency in the construction of reality, reflected in constructivism and social constructionism respectively. There is tension between the two stances and an uneasy alliance between them (Neimeyer, 1997). Where constructivism and social constructionism differ is that constructivism is person-focused, referring to the constructions that the person makes as an individual and is concerned with the internal process of constructing reality, whereas social constructionism is interpersonal and focuses on the social institutions and language processes that shape people's lives (Shawver, 1998). Mascolo and Pollack (1997) are among several influential theorists (eg: Burr 1995; Sarbin & Kitsuse 1994; Shotter 1994) who point to a sensible middle path in suggesting that people function as self-organising systems that co-act with other self-organising systems within larger organism-environment relations. As a result, although self and other are inseparable as causal factors in the development of action and meaning, individuals nevertheless have integrity as self-organising systems and contribute directly to their own development. Importantly, they voice the need to maintain a role for individual agents as constructors within a constructivist model of human activity.

Relevant to these stances are the closely related and very important variants of exogenous, endogenous, and dialectical constructivism. Simply stated, exogenous constructivism accords primacy to influences from social forces and environment, endogenous constructivism accords primacy to the individual in constructing reality, and dialectical constructivism holds that the two exist in a relation of reciprocal constraint and facilitation whereby there is a continuing interaction between self and environment and neither can simply impose itself on the other (Moshman, 1982). Each variant offers a valuable way of conceptualising human experience, but it is the dialectical approach that allows for the fullest range of explanation as it pays particular regard to the internal complexity of the individual and the pervasiveness of external forces and their synthesis in the construction of subjective meaning. More specifically, dialectical constructivism holds that the individual constructs his or her

version of the world by means of a constant interplay between person and environment, that meaning-making is a constant flow resulting from this dynamic interaction. Dialectical constructivism also posits an ongoing interplay between two streams of consciousness, explanation and direct experience: respectively, the individual consciously mediates conceptualisations while at the same time automatically processes direct experience. Dialectical constructivism therefore explains human functioning and development in terms of the relations between parts, the whole being the dynamic system of the person's psychological processes (Greenberg & Pascual-Leone, 1995). This form of constructivism, then, contends that psychological realities are inherently private, that the forum of significant psychological change lies in the domain of the self, and that the self in turn is a dynamic complexity originating in and modified by interpersonal relationships (Mahoney, Miller & Arciero, 1995).

Importantly, nowhere is the importance of the impact of the social more crucial than in grounding the nature of reality in intersubjectivity. One of the most widespread and mischievous misinterpretations of constructivist thinking is the notion that since reality is 'invented' anyway, 'anything goes'. This interpretation misses the fact that people do not live alone and that their realities are subject to scrutiny and constraint from others in the social world. Constructivism is thus not a licence to fabricate realities indiscriminately (Efran, Lukens & Lukens, 1992).

Paradigmatic coherence is thus lacking in the constructivist world and tensions are inherent in the approach (Neimeyer, 1997). Notwithstanding the differing philosophical bases, it is held that the integration of constructivist approaches is possible. Importantly, each approach considered singly offers a unique and viable conceptual lens for understanding experience and, taken together, they provide a full rendering of the nature of phenomena and their inherent properties of stability and change (Lyddon, 1995).

This study is explicitly aligned with the critical and dialectical variants of constructivism. To summarise, this assumes an objective reality which is not fully knowable by the individual and which pays due regard to the reciprocal interplay of person and environment and of the tacit and explicit levels of consciousness. Thus,

although both personal and social forces are held to be crucially important, this study nevertheless concentrates more on the personal construction of reality in the belief that personal agency holds primacy over social forces in the construction of reality.

2.2.4 The constructivist self: Many selves, many possibilities

The constructivist self is not simply defined. There is much overlap between the different conceptions of self, with the main differences being the respective emphasis placed on the degree of agency accorded to the individual. They all, however, have a strong common thread in that the self is seen as being constructed in a processual manner and due regard is paid to the dynamic nature of construction (Cox & Lyddon, 1997). More specifically, the individual is seen as a meaning-making, proactive, goal-directed, and purposive organism (Neimeyer, 1995a) that is constantly in process and characterised by the principles of self-organisation, self-construction, and self-reconstruction through disorganisation and subsequent reorganisation (Ford & Ford, 1987). This is a dynamic state of constant becoming (Prigogine & Stengers, 1984) in which the self is active and dynamic, and is forever changing and adapting to the demands of life (Wetherell, 1996). The individual develops multiple identities to cope with multiple life roles and demands, and these change over time with personal circumstances. The self is thus viewed as a multiplicity of possible selves and the sense of self is formed, challenged, and reformed throughout the lifespan (Cox & Lyddon, 1997). Constructivist approaches take a more teleonomic (self-directional) than teleological (goal-directed) stance (Mahoney, 1991).

Cox and Lyddon (1997) usefully categorise the different conceptions of constructivist self, delineating these as: self as self-theory, self as evolving process, transcendental self, narrative self, and self as social/economic/political construction. The self as self-theory is more process than substance, temporal and dynamic, in a state of continual flux that constructs, maintains, and revises a coherent sense of self that is both contemporary and continuous. The self as evolving process is more a developmental process than entity; the self is a self-organising, dynamic process with an innate tendency to adaptively evolve into more differentiated and complex ways of functioning. The transcendental self is a dynamic process of becoming, a part of

nature's fluctuating cycle of creation, destruction, and transformation whereby traditional ego boundaries expand to include all creation in one's sense of self. In narrative self a person's identity does not exist in any ultimate, empirical way, but is rather a personal story – not just one story, but a collection of potential stories, many of which actively impact upon the person's overall sense of self. The self as a social/economic/political construction is a socially constructed identity and cannot be defined outside the larger context of the society in which he or she is embedded. The first three of these conceptions of self accord the individual with a high degree of agency, while the latter two accent the primacy of the social.

Importantly, the constructivist self is a postmodern self. Unlike the modernist self, who assumed that there was only one reality to be observed, the postmodernist self is an open system suspended in a milieu of multiple perspectives. In this view, persons exist in a state of continuous construction and reconstruction. This postmodern self is never solidified once and for all but is always in a state of becoming and thus potentially sensitive to perturbations in context (Masterpasqua & Perna, 1997).

In considering the constructivist self, then, there is a paradoxical, holistic view of self as constancy through flux, of self defined by other, of self with a centre yet intrinsically part of everything else (Barresi, 1999).

2.2.5 The constructivist approach to therapy: A co-constructed journey

The constructivist approach to therapy is not so much a technique as a philosophical context within which therapy is done. The context is quintessentially postmodern and, as such, the various constructivist theories are united in their rejection of the assumption that any beliefs that fail to correspond to objective reality are, by definition, dysfunctional. Rather, they hold that the viability of any given construction is a function of its consequences for the individual or group that adopts it as well as its coherence with the larger system of personally or socially held beliefs into which it is incorporated (Neimeyer, 1995a). Constructivist therapies thus begin with the recognition that humans are meaning-makers who construct, not simply uncover, their psychological realities (Hoyt, 1998). Due regard is shown for the client's personally

constructed world, and intervention aims to reconstruct or alter that world if necessary (Ford & Urban, 1998).

There is much that constructivist therapists do that is exploratory, experimental, and otherwise fundamentally existential (Mahoney, 1995). Thus, constructivist therapy is an engaging, interactive vehicle for the negotiation of new meanings (Neimeyer, 1995). This entails active, creative, and inventive ways of facilitating new understandings and representations of the individual's world (Raskin, 1999). Therapeutic possibilities open when there is an emphasis on the enhancement of choice through respectful collaboration and the fuller utilisation of clients' competencies and resources (Hoyt, 1998). The goal of constructivist therapy is thus ultimately more creative than corrective. Accordingly, therapy is likely to be more exploratory than directive and tends to target the family and systemic processes that validate an individual client's constructions (Neimeyer, 1995). Indeed, the person in context is considered and people are understood in terms of embeddedness in their socio-cultural experience (Neimeyer & Mahoney, 1995).

A hallmark of the constructivist approach is its mix of high-level theory and experientially-grounded practice (Neimeyer & Mahoney, 1995). Intervention typically takes place at the strategic rather than tactical level, and constructivism favours an eclectic approach with a willingness to use what is perceived to be the most appropriate technique in a given situation (Ford & Urban, 1998). Special value is placed on variety of intervention techniques, in recognition of the view that there are many ways to approach knowledge and clients' concerns (Neimeyer, 1993). As therapy is process-oriented and centred on meaning-making rather than dysfunction and deficit, it tends to result in relatively deep levels of intervention (Neimeyer & Mahoney, 1995). Indeed, because these therapies attempt to foster profound changes in the client's core ordering processes, they have been described as seeking 'second-order' change in belief systems. The twin processes of exploration and elaboration serve as the linchpins of the therapeutic process (Neimeyer, 1995a). The client can feel free to experiment with changes without necessarily jeopardising or assaulting existing meaning structures, thereby circumventing much of the threat and anxiety associated with significant personal change (Neimeyer, 1995). Importantly, the therapist can only try to set forth conditions capable of triggering the process of

change but cannot determine or control what the exact final outcome of reorganisation will be (Guidano, 1995). Intervention can be short-term or long-term (Neimeyer, 1993).

One of the strong attractions of constructivism is its affinity with the major psychological theories in one way or another (Woolfe & Dryden, 1996). This commonality has major implications for therapy in that virtually any mainstream approach can usefully incorporate constructivist elements or even be integrated with it. This reflects constructivism's openness to valuable contributions from a diversity of sources (Ford & Urban, 1998).

A premium is placed on forging an intimate therapeutic bond between client and therapist (Neimeyer, 1995). The therapeutic relationship must be a safe, secure, and specific context for collaborative work (Guidano, 1995). The therapist typically adopts an empathetic, collaborative, respectful stance toward the client and takes the role of a co-constructor. Therapist style tends to be non-directive, non-confrontational, explanatory, reflective, elaborative, and personal (Ford & Urban, 1998).

Against the prerequisite backdrop of a strong working alliance, there are three central features of constructivist therapy: 1) the primacy of personal experience (the therapist explores the client's reality with particular regard for personal meanings), 2) the importance of novel enactment (therapist and client participate jointly in conjuring a variety of alternative worlds to be explored and elaborated), and 3) the role of language in developing new patterns of personal meaning (it is the security associated with the preservation of existing meanings that often enables the client to explore new ones) (Neimeyer, 1995; Neimeyer, 1995a).

Four basic metaphors for therapy are explicit or implicit in constructivism: 1) therapy as personal science (the client is considered to be a scientist, actively formulating personal hypotheses and refining, revising, or elaborating these in the course of ongoing experience), 2) therapy as selfhood development (the client is assisted in facing the emotionally charged 'personal rules of living' or 'early maladaptive schemas'), 3) therapy as narrative reconstruction (the client is assisted in

‘rebiographing’ stories that have become constraining or incoherent, requiring significant editing or elaboration), 4) therapy as conversational elaboration (therapy is an exercise in co-creative ‘languaging’ within the client’s system) (Neimeyer, 1995b; Raskin, 1999).

The issue of personal responsibility is of paramount importance, for both therapist and client. Each must accept full responsibility for the consequences of their association with one another, even though those consequences are not entirely predictable at the outset. Therapy is a dialogue about the interlocking wants, desires and expectations of all the participants including the therapist (Efran, Lukens & Lukens, 1992). The onus is on the therapist to construct a workable conception of what therapy is all about (Ivey, Ivey & Simek-Morgan, 1997).

Commitment is seen as a vital element in therapy. A clear therapeutic contract that spells out everyone’s obligations in no uncertain terms is needed. This serves as the vehicle for monitoring progress, for establishing the criteria of success and failure, and for keeping everyone honest. It is the contract, not objective authority, which grounds the work of the constructivist therapist (Efran, Lukens & Lukens, 1992).

Constructivists prefer to evaluate progress and outcomes in terms of ongoing judgement during therapy, in line with the emphasis on collaboration. Significant changes are taken to be a reconstruction of the client’s personal meanings, their personal reality, their values, and their capabilities (Neimeyer, 1993).

Crucially, the therapist also lives in his or her own self-constructed reality (Ivey, Ivey & Simek-Morgan, 1997) and, as such, must recognise and acknowledge the active role he or she plays in creating a view of the world and interpreting observations in terms of it. With this realisation the constructivist therapist has no trouble acting unashamedly in accordance with the current dictates of his or her conscience, but at the same time is left with a sobering but simultaneously freeing realisation – namely, that ‘the buck stops here’. Constructivist therapy thus puts the therapist at risk. It is designed to support enquiry and works best when conceptualised as hands-on adventure rather than as a purely academic pursuit (Efran, Lukens & Lukens, 1992).

2.2.6 Constructivist research: Exploring the subjective

Constructivism presents unique challenges (and resources) for psychological research (Neimeyer, 1995a). Postmodern investigators work within a new worldview of relativity and relatedness, of process and context, of ambiguity and paradox. They speak of multiple, dynamic, invented realities and question the assumptions of truth presumed inviolate by modernists. At the heart of this thinking is an essential interconnectedness and dynamic flux of the universe (Cox & Lyddon, 1997).

The distinction between validity and viability is central to the constructivist approach to research. Constructivism asserts that the function of data in knowledge development is essentially one of selecting or winnowing enacted hypotheses. Thus, data do not authoritatively justify or form the foundations of valid knowledge but instead selectively eliminate less viable explorations and conjectures. The key issue is pragmatic utility rather than bedrock validity, and constructivism is thus a complexly commonsense approach to research (Mahoney, Miller & Arciero, 1995).

Language is very important in constructivist investigation. Units of analysis are definitions in language and have an arbitrary quality in that they can be created, selected, rearranged, and dissolved. Any unit of analysis selected for attention has an impact on the direction a therapist's thinking takes and the problem-solving pathways that appear to open up. New units suggest new possibilities. Analysis may focus on different levels, with each one opening up new possibilities for intervention. Given that a construed system is a kind of interlocking jigsaw puzzle of arrangements among the defined parts, the constructivist maintains an interest in the intersections of the units that have been separately defined (Efran, Lukens & Lukens, 1992).

There is a commitment to idiographic (client-specific) hypotheses regarding changes in construing over treatment, which is essentially a focus on individuality. Constructivist researchers are also more likely to study specific change processes that occur across a range of therapies at an individual rather than a normative level (Mahoney, 1991).

Constructivists face unique methodological requirements in virtue of their epistemological commitments. Researchers typically have great ambivalence toward the data collection methods and analytic procedures that characterise most social science research. In particular, they are uncomfortable with the assumption of linear relationships among variables that are presumed by the most commonly used statistical procedures. Procedures such as stochastic modelling and time-series analyses might be more useful for detecting the nonlinear processes implied in constructivist ontologies. Qualitative, process-oriented research is also attractive to constructivists (Mahoney, 1991).

2.3 ECOPSYCHOLOGY

"There is no field. It is still forming, waiting to be articulated, hardly used anywhere. Perhaps you know of some missing pieces to the ecopsychological puzzle; perhaps you will be the one to click a coherent ecopsychology into place." (Greenway, 2000, p. 1).

2.3.1 Introduction: The search for an identity

Ecopsychology is a rapidly developing field used by different practitioners and researchers in many different ways and has no single definition as yet (Davis, 1999). It is essentially an umbrella term for a wide range of activities and approaches that describes the interface between ecology and psychology (Hill, 1999) and describes a promising new field that seeks to synthesise the two disciplines (Fisher, 1996). Ecology is the study of connection, of the interrelationships among all forms of life and the physical environment while psychology is the study of the human psyche and is concerned with how people perceive, feel, think, and act; ecopsychology brings the two fields together, to study the human psyche within the larger systems of which it is a part (Conn, 1998).

The practice of ecopsychology is based on the recognition that the needs of the earth and the needs of people are interdependent and interconnected and that human well-being must include sustainable and mutually-enhancing relations with the natural world. The understanding of what constitutes healthy human-earth relationships is thus at the heart of ecopsychology (Conn, 1998). As such, the concerns of ecopsychology are the role of people's actions in the global ecological crisis and the effects of ecology (including planetary crisis) on the psychology of people (Scull, 1999). Ecopsychology, then, brings psychological principles and practices to environmental work and ecological thinking and the values of the natural world to psychotherapy, personal growth, and community development (Naropa University, 1998).

In pursuing these ends, ecopsychology is an approach which critically examines the role of psychology in a world that is in crisis (Shaw-Jones, 1997). It has positioned itself as an alternative to, or a revisioning and expanding of, mainstream psychology to take the ecological context of human life into account (Hill, 1999; Metzner, 1999). This is essential, as people's relationship with nature is not a matter of choice – people are inescapably in and of nature (Hill, 1999). In doing so, ecopsychology brings together the sensitivity of therapists, the expertise of ecologists, and the ethical energy of environmental activists (Brown, 1995).

Cutting through the many definitions and approaches, in very broad terms ecopsychology is rooted in three insights: 1) there is a deeply bonded and reciprocal relationship between humans and nature, 2) the illusion of separation of humans and nature leads to suffering both for the environment (as ecological devastation) and for humans (as grief, despair, and alienation), and 3) realising the connection between humans and nature is healing for both (Davis, 1999).

Within these broad parameters, there exists a bewildering plethora of activities and practices ranging from the fanciful and esoteric to determined attempts at scientific rigour. Indeed, the diversity of approaches within ecopsychology is pronounced. Ecopsychology has a very wide reach, endorsing individual and collective action for change, from one-to-one contact in the therapy room to efforts to bring about global conscientisation (Hill, 1999) Accordingly, ecopsychology tends to be interdisciplinary

and spans a range of issues and questions from ecology through such diverse areas as religion, anthropology, sociology, and political economy to the psychology of individuals.

Ecopsychology is an idea in progress (Shaw-Jones, 1997). Metzner (1999) highlights the inchoateness of ecopsychology and stresses the difficulty of synthesising ecology and psychology, in virtue of the fact that ecology can mean anything from talking about nature to hard scientific ecology and psychology can mean any one of many fields. Greenway (1999) makes the point that ecopsychological approaches are often very vague or simplistic and tend toward a generalised form of pop-psychology. He stresses the need for a strong, coherent, accurate language so that ecopsychologists can at least communicate with each other in search of strategies and solutions.

2.3.2 The history of ecopsychology: Old seeds, new fruit

Ecopsychology has many roots. Its cultural and intellectual beginnings are to be found in Buddhist philosophy, various mystical traditions within most religions, the romantic movement in Europe, the transcendentalist movement in the United Sates of America, and the organismic phenomenology of the Gestalt movement (Reser, 1995). Aldo Leopold and philosopher Paul Shephard are probably the most direct intellectual ancestors of ecopsychology (Scull, 1999). Many psychologists have considered various aspects of the human-nature relationship through the years. In particular, the work of James, Freud, Jung, and Skinner considered this connection and their writing was infused by the general evolutionary spirit of their times (Reser, 1995; Scull, 1999).

The emergence of the field, however, can be traced to the 1960s when various worldwide conflicts and upheavals and an increasing awareness of environmental problems throughout the world came to the fore. The field is, in part, an epiphenomenon of this socio-geo-political contest and part social movement that arguably started with the first Earth Day on April 22, 1970 (Reser, 1995). It was in the 60s, too, that therapy and education began to be practised in a wilderness setting, notably by Michael Cohen and Robert Greenway (Scull, 1999). According to

Greenway (in Scull, 1999), the foundations of ecopsychology were laid in a series of meetings in San Francisco that included Robert Greenway, Ellen Shapiro, Allen, Kanner, Mary Gomes and, later, Theodore Roszak. Ecopsychology as a proper field may well have been started by philosopher Arne Naess in the mid 70s with the introduction of deep ecology (Rathbun, 2000).

It wasn't until the early 90s, however, that ecopsychology emerged with its own identity. An important early pioneering effort was the work done by the Ecopsychology Institute at California State University. Social historian Theodore Roszak gave the first public definition of the field of ecopsychology in his book *Voice of the Earth* in 1992, and further elaboration of the field took place with his co-edited *Ecopsychology: Restoring the Earth, Healing the Mind* in 1995, although many of the central ideas of ecopsychology can be found in his earlier work and in the work of Paul Shepard. The emerging field has blossomed since those early days with a host of publications, organisations, and individuals flocking to the ecopsychology banner (Scull, 1999).

Importantly, while the field has been slowly developing as an intellectual endeavour, some psychologists have been practically addressing the concerns of the human-nature relationship. In the 20 years before the appearance of Roszak's ground-breaking book which put the field on the map, behavioural researchers published more than 100 experimental papers on how to change people's environmental behaviour. At the same time, sociologists and social psychologists were exploring the human-nature relationship using the tools of social and behavioural science. Rather than develop a new theoretical ecopsychology, these researchers applied existing theory to problems of environmentally significant behaviour (Scull, 1999).

While the central idea of ecopsychology has a long history, what is new is that the long experience of alienation from nature is being examined in the light of modern knowledge of personal and evolutionary psychological development, motivation, and behaviour (Hill, 1999).

2.3.3 Ecopsychology: Great diversity, but little unity

Although there is no clear-cut definition of ecopsychology, there is no shortage of principles, perspectives, and practices falling under its banner. A limited excursion into this highly fragmented field underlines the heterogeneity of viewpoints.

In very broad terms, four tasks are seen as paramount for ecopsychology: 1) ecologise psychology (to rekindle the human bond with the earth and develop theoretical and practical tools for awakening ecological identity); 2) psychologise ecology (to explore the psychological roots of ecological destruction and assist the environmental community in communicating effectively with the general public); 3) politicise ecopsychology (to carry key insights and compassionate practices into political, social, and institutional arenas, and broaden today's environmental activism to address causes as well as symptoms of ecological destruction); 4) articulate and model the principles and practices of an earth-based spirituality (Shavano Institute, 1998).

Roszak (1992), the much-recognised pioneer of the field, outlines eight principles which have provided a window and frame of reference for discussing ecopsychology: 1) the core of the mind is the ecological unconscious (repression of the ecological unconscious is the deepest root of collusive madness in industrial society, while open access to the ecological unconscious is the path to sanity); 2) the contents of the ecological unconscious represent, in some degree, at some level of mentality, the living record of cosmic evolution (ecopsychology draws upon the findings of the new cosmology, striving to make them real to experience); 3) the goal of ecopsychology is to awaken the inherent sense of environmental reciprocity that lies within the ecological unconscious, and to heal the fundamental alienation between the person and the natural environment; 4) the crucial stage of development is the life of the child, for it is here that the ecological unconscious is regenerated in the newborn's enchanted sense of the world (ecopsychology seeks to recover the child's innately animistic quality of experience in functionally sane adults, and strives to create an ecological ego); 5) the ecological ego matures toward a sense of ethics that is vividly experienced as an ethical responsibility to other people, and seeks to weave that responsibility into the fabric of social relations and political decisions; 6) among the therapeutic projects most important to ecopsychology is the re-evaluation of certain

compulsively ‘masculine’ character traits that permeate the structures of political power and which drives society to dominate nature (this draws upon ecofeminism and feminist spirituality with a view to demystifying sexual stereotypes); 7) whatever contributes to small scale social forms and personal empowerment nourishes the ecological ego and, as such, ecopsychology deeply questions the essential sanity of the prevailing gargantuan urban-industrial culture (recognising the genius of technology, ecopsychology is post-industrial and not anti-industrial); 8) ecopsychology holds that there is a synergistic interplay between planetary and personal well-being (the needs of the planet are the needs of the person, the rights of the person are the rights of the planet).

Although highly influential, Roszak’s overtly psychodynamic formulation has not gone unchallenged. Nevertheless, several others in the field (eg: Ecopsychology Institute, 2001; Keepin, 1995; Shavano Institute, 1998) have used these principles among others as a basis for defining ecopsychology, elaborating and modifying them to suit their particular purposes.

Other conceptualisations exist, which emphasise ecology or psychology to greater or lesser degree. The integration of the two fields is particularly well captured by the Ecopsychology Institute (2001): 1) the earth is a living system, part of the universe which is also a living system (systems, from cells to organisms to ecosystems, are each wholes consisting of interrelated and interdependent parts, which are at the same time parts of larger wholes, all of which are continuously self-maintaining and self-organising, becoming more complex and more differentiated over time); 2) human beings, including their psychological experiences as well as their products and cultures, are integral and crucial parts of this system; 3) healthy human development, which includes physical and psychological dimensions, must include realisation of the interconnectedness and interdependence of the human and non-human aspects of the world; 4) the health of an entire system and any of its parts requires sustainable and mutually nurturing relationships among the parts, and between the parts and the whole (in terms of healthy human development, this means diversity in ways of knowing, participation in community, embeddedness in place, and ecological identity); 5) the ecological self develops an ethical responsibility based on identification with the

planet as a whole and all its parts which is as vivid as the ethical responsibility to people (this responsibility is manifested in active participation in the world).

Greenway (2000) presents six core aspects of ecopsychology: 1) ecopsychology as an umbrella container for discussions about nature; 2) ecopsychology as a basis for healing, for a new therapy; 3) ecopsychology as field-oriented; 4) ecopsychology as experiential, with a call for less talk and more walk; 5) spiritual practice as ecopsychology, with the underlying assumption that nature is spirit; 6) core ecopsychology language.

Couched within these fundamental principles are very diverse approaches including environmental education and action, psychological work with ecological activists, the promotion of sustainability, ecotherapy, encounters with wilderness, the use of nature as healer, the sacred dimensions of human-nature relationships, spiritual practices and philosophies, deep ecology, experiential modalities, gender healing, ecofeminism, internet courses and workshops, habitat restoration, sensory-based educational and counselling techniques, work on grief and despair about environmental destruction, shamanic work, and psychotherapeutic practices (Davis, 1998; Keepin, 1995; Naropa, University, 2001).There has also been an emphasis on small group, community, and face-to-face contact as a way to change ecologically significant behaviour and establish healthier relationships (Scull, 1999). While these approaches are highly diverse, a common thread is attention to the human psyche's disconnection from the non-human world and to the ways this separation has truncated and deadened human experience, both individually and collectively (Conn, 1998). A central assumption of ecospychology is that people's inner worlds and outer worlds are intimately connected and, as such, the 'violence' people do to themselves and to the natural world results from their psychological and spiritual separation from nature (Fisher, 1996).

Ecopsychology can be seen as a manifestation of the emerging new ecological worldview, which is concerned with revisioning people's understanding of human identity in relationship to place, ecosystem, and nature. This is essentially a thrust to heal the person-nature split and calls for a new kind of psychology. Ecopsychology offers a critique of all existing schools of psychology for focusing their research on

the intrapsychic, interpersonal, and social dimensions of human life and ignoring the ecological foundation. Ecopsychology parallels similar revisionings taking place in other knowledge disciplines including philosophy, economics, religion and theology, sociology, and history. The new worldview can be called ecological postmodernism. Underlying these fundamental revisionings of systems of knowledge is a major paradigm shift in the natural sciences, a shift from physics to ecology and evolution as the foundational or model science (Metzner, 1999). Essentially, psychology needs to extend its horizon and engage the world with a more pronounced psychological ear and at the same time let the world enter the province of psychology admitting that air, water, and place play as large a role in the problems psychology faces as do moods, relationships, and memories (Hillman, 1995).

It will be useful to highlight some areas that have received particular attention in ecopsychology. These are: caring for the planet, issues of relatedness, social justice, ecological identity, spirituality, health and nature, inherent radicalness, and the potential for the emergence of a new ecopsychological profession.

Caring for the planet is a fundamental and much-vaunted tenet of ecopsychology (Harms, 1997). The sources of, consequences of, and solutions to environmental destruction are deeply rooted in the psyche, in people's images of self and nature and their resulting behaviour (Davis, 1998). Perhaps the major contribution that ecopsychology promises to make to environmentalism is the identification of the 'irrational' forces that tie people to their bad environmental habits (Harms, 1997). Ecopsychologists consider the human psyche as an integral part of the web of nature and assert that people cannot restore their own health and sense of well-being unless they restore the health of the planet (Brown, 1995). In getting its environmental message across, ecopsychology addresses the problem of effective communication with the general public (Harms, 1997). In doing so, the ecopsychological paradigm shifts the source of environmental action from shame, blame, coercion, and sacrifice to devotion, love, joy, and invitation (Davis, 1999). Accordingly, a major thrust of ecopsychology is to change the way environmentalists try to change the public. It is more productive to focus on people's common needs for the life support systems that the earth provides as well as other species. However, the issues ecopsychology raises amount to more than a matter of public relations and personal therapy: there is an

underlying philosophical issue that has to do with the understanding of human nature (Harms, 1997). There are, of course, many ways of promoting environmental responsibility and this can be seen as service to the earth (Scull, 1999).

Broadening the field within which interconnectedness and interdependence are investigated and encouraged is another major contribution of ecopsychology (Conn, 1998). As such, ecopsychology raises many questions about the relationship of self to society and of person to planet, and asks people to face the implications of these relationships (Shaw-Jones, 1997). New models of health need to be developed which articulate and promote sustainable and mutually-enhancing relationships, not just at the intrapersonal or interpersonal levels (within and between people) but also at the level of inter-being (between humans and the non-human world). This requires methods which enable individuals to sense, think, feel, and act as interdependent beings, interconnected within the whole community of life at all levels from the individual psyche to the universe (Conn, 1998). In terms of human relationships, people need to work together and reconsider the extremes of individualism (Shaw-Jones, 1997). In terms of the relationship between humans and nature, people need to see nature as home and its residents as family (eg: siblings, Mother Earth) as well as nature as self whereby self-identifications are broadened to include non-human nature and the planet itself (Davis, 1998). Ultimately, from this perspective, ecopsychology is concerned with the transformation of hearts and minds essential to reawakening people's sacred connection with other living beings and their planetary home. Ecopsychology thus offers a positive, inspired vision of how human beings can create and live together in an ecologically sustainable society (Shavano Institute, 1998). Essentially, ecopsychology is something very personal and intimate, a sense of belonging – or not belonging – on the earth (Rathbun, 2000). It is about feeling one's place in the world. Human beings are a part of this planetary existence, not above it or in charge of it but a part of the web of life (Greenway, 2000).

A concern for social justice is yet another core concern of ecopsychology.
Healing the split between planet and self cannot simply be a matter of personal transformation, but must be undertaken as a project with political and economic policy dimensions as well as spiritual and psychological ones (Du Nann Winter, 1996). Ecopsychology promotes social justice in its intent to create healthy, diverse,

and multifaceted communities, taking diversity as the basis of an enduring environmental and social ethic. In this sense, inclusivity is the key to ecopsychology. Ecopsychologists hold that psychological approaches to healing people's relationship with nature and repairing communities fractured by racism are parallel. A key component to healing such rifts is developing the capacity to hear, respect, and incorporate the stories and realities of another, be they human, plant, or animal. Racism may be overwhelming, but viewing it from an ecopsychological perspective gives rise to new information and possibilities of healing (Anthony & Soule, 1998).

The promotion of an ecological identity is yet another central theme in ecopsychology. Ecological self is a wide, expansive, or field-like sense of self that ultimately includes all life-forms, ecosystems and the earth itself. Experiences of ecological self involve an emotional resonance with other life-forms, a perception of being similar, related to, or identical with other life-forms, spontaneously behaving towards the ecosphere as one would towards one's small self (Bragg, 1996). Ecological identity refers to all the different ways people construct themselves in relationship to the earth as manifested in personality, values, actions, and sense of self. Nature becomes an object of identification and as people cultivate ecological identity they learn how to find nature everywhere (Thomashow, 1995). Experiences of ecological self are a crucial step toward changing individual and collective relationships with the natural world and behaving in an environmentally responsible way (Bragg, 1996). Creating opportunities for experiencing an expanded sense of identity can support the development of a more ecological sense of self, one that ultimately includes all life-forms and ecosystems (Conn, 1995). This is essentially a concept of the self that is relational and inclusive. Different writers have put forward various concepts in this regard, notably the ecological self (Roszak, 1992), a psyche the size of the earth (Hillman, 1995), and the more-than-human self (Conn, 1995).

References to spirituality, sacredness, and the transpersonal can be found in much of ecopsychology. The key for ecopsychology is to grasp the nonduality of psyche and nature, but this cannot come from idealising, sentimentalising, or romanticising nature. Rather, it must be centred in spirit or the cosmos, the result of discovering and developing awareness of the source of both psyche and nature. This calls for development beyond the self (self-transcendence) to an identification with the spirit or

mystery which gives rise to all manifestations, human, nature, and otherwise (Davis, 1999). At their deepest, psyche and nature emerge as expressions of the same whole and reveal themselves as essentially spiritual (Fox, 1990). This view recognises humans and nature as two seamlessly connected forms. Humans and nature, looked at beyond the surface, thus lead to a deeper and more fundamental level of being (Davis, 1999). At this deeper level the world becomes more authentic, beautiful, alive, and whole (Davis, 1998). Ecopsychology can thus be a path to the spiritual (Berry, 1990).

One of the things that ecopsychology has the ability to examine closely is the relationship between health and nature (Duncan, 1998). The healing effect of wilderness is particularly well documented. The very experience of wilderness (direct and meaningful contact with nature) is often the most profound and wisest of teachers and the most powerful of spiritual mentors and allies (Eagle Mountain Institute, 2001). Wilderness experience increases self-actualisation by means of challenging participants to learn new skills, face personal hardship, and get along with others. This can lead to an improvement in personal development, physical health, spiritual well-being, and self-sufficiency (Duncan, 1998). As such, wilderness is an ideal catalyst for self-enrichment, rejuvenation, empowerment, and spiritual clarity (Eagle Mountain Institute, 2001). Wilderness can thus facilitate meaningful changes in a person's psychological well-being (Duncan, 1998). Favourite places tend to promote emotional and self-regulation processes, relaxation, and experiences of beauty, control, freedom of expression, and escape from social pressures. Essentially, favourite places enable therapeutic experiences (Korpela & Hartig, 1996). There is a reduction of social and psychological problems when clients are in natural areas (Cohen, 1995).

There is an inherent radicalness in ecopsychology. Psychology's ignoring of the nonhuman environment is held to be a staggering oversight, and ecopsychologists are highly critical of a mainstream psychology that presently limits the relevance of ecology and even makes it hostile to ecological concerns as well as promoting adjustment and conformity to an ecocidal social order. Ecopsychologists need to offer models of human psychology in which the earth is not a resource-filled background to the human enterprise, but is rather the living matrix out of which people are born and in relation to which self-understanding and well-being are found. They must also

illuminate the deep psychological conditions (including the socio-historical contexts) that tend to contribute to, and result from, the ecological crisis (Fisher, 1996). On a practical and positive level, ecopsychology is throwing out a challenge to psychology as a discipline and profession to get involved with the real work of making the world as real as it is and for people to find themselves as real as they are within it (Reser, 1995).

Roszak (1996) believes that a new profession can be born from the partnership of ecology and psychology, an ecopsychology that combines the expertise of the ecologist with the sensitivity of the therapist. The value of such a new body of professionals reaches well beyond individual healing. Implicit in this project is the need for a scientific paradigm that gives life and mind a new central status in the universe. Building such a paradigm as part of an ecopsychology would make the effort more than merely an academic exercise. It would become part of a practical healing mission. Issuing a call for such a new profession is concrete, specific, timely, and deeply imaginative. Its object is to heal both psyche and planet as a single, continuous project. Ecology needs psychology, and psychology needs ecology.

2.3.4 Ecopsychology and therapy: A natural affinity

The essence of ecopsychology as a therapeutic approach lies in acknowledging the importance of a meaningful personal relationship with the natural world. Recognising that this psychological relationship is severely damaged for much of modern humanity, ecopsychologists have developed theories and practices to help restore this bond and the resulting sense of belonging to and being a part of the world (Segal, 1997).

An ecopsychological perspective on therapy invites people to rediscover themselves as dwellers within the earth as a living system. Therapy becomes a place where clients' personal problems can be seen not only in their vivid particularities but also as microcosms of the larger world. Then the goals of therapy become not just personal release but also participation in and contribution to the healing of the world and the Earth (Conn, 1998). This connectedness to self, others, earth, and spirit will go farther

in the process of healing than the view that a client is ‘broken’ and needs fixing (Freeman, 1999).

Essentially, therapists need to expand their focus beyond the inner landscape (Conn, 1998). Nevertheless, deeper therapeutic work such as exploring individual ecology of mind and state-of-being may be pursued. By encouraging clients to open themselves to experience the healing power of nature they can be enabled to discover an invaluable source of both healing and growth (Clinebell, 1996). Ecopsychology thus expands the therapeutic context by attending to the interplay between the inner and outer landscape (Conn, 1998).

Ecological principles (eg: inclusivity, interconnectedness, diversity, nourishment patterns) can be used as a framework for psychologically exploring both the inner and outer landscapes in which the client is embedded (Conn, 1998). Indeed, therapy is in dire need of an ecological component (Freeman, 1999). Somehow, ecological consciousness misses the devoted psychological attention it deserves. Therapists of all persuasions rarely make ecological interpretations, despite there being a place in the consulting room for an ecological sensitivity (Clinebell, 1996).

There needs to be vision that places therapy in a larger context (Freeman, 1999). The problematic patterns that sabotage people and relationships are the very patterns that on an ecological level endanger the world. To change these patterns is to change not just people’s lives but their relationship to the planet (O’Connor, 1992). People’s emotional ties to the earth are as important as their personal relationships (Harms, 1997). There is a human-nature split, and the psychological consequences of clients’ disconnection from the natural world show up in symptoms. These symptoms can be seen as signals, feedback within a larger system that includes the more-than-human world. The earth speaks through the client’s problems. A therapist needs to be a naturalist of the psyche, exploring the landscape in both inner and outer dimensions thoroughly. This involves learning to hear, see, and feel the earth speaking through the client’s symptoms. Therapists can also learn to let the earth speak through them in their practices and understandings to broaden the field in which they work (Conn, 1998).

While an ecopsychological perspective can be brought into the therapy session, how this will happen will vary depending on the theoretical orientation of the therapist (Segal, 1997). Practical techniques that therapists use include: identifying the nature-based metaphorical images that the client uses; using illustrative examples from nature (eg: growth from seeds, balance in life, mutual dependence); highlighting the bountifulness of nature with its goodness, beauty and infinite variety; emphasising nature's thrust to heal what is broken; demonstrating relaxation and recreation; expressing conviction of the healing power of nature; using nature metaphors; highlighting the cycles of nature and the fact that things can, do, and will change (Scull, 1999); experiential techniques; floratherapy (Freeman, 1999); horticulture therapy (Lewis, 1996); greening and cleaning (Clinebell, 1996); animal-assisted therapy (Nebbe, 2000). Therapists must use their therapeutic tools with awareness of a rapidly and profoundly changing planet (O'Connor, 1992). The ecopsychological therapeutic perspective can often be an important means of introducing clients to aspects of their lives that may be undervalued or overlooked. How this will happen will vary depending on the theoretical orientation of the therapist (Segal, 1997).

2.3.5 Ecopsychology and research: Unlimited potential

Ecopsychology is, in the minds of many, synonymous with new age pseudo-science and the alternative environmental and therapeutic fringe (Reser, 1995). Accordingly, ecopsychology runs the risk of alienating a large number of people simply through its extensive use of 'new paradigm' language. Unless ecopsychologists take care the field may remain in the realms of philosophy and conjecture, recycled from text to text without being grounded or tested in the real world. The development of a research tradition might keep ecopsychology from trapping itself in an ivory tower (Bragg, 1997).

It is possible and important to scientifically study many aspects of ecopsychology (Davis, 1998), although the field utilises a much wider, pluralistic epistemology and methodology drawing on mythological and archetypal understanding, spiritual practices, and intuitive and emotional modalities (Keepin, 1995). Indeed, rigorous

empirical research is a keen tool for critically examining the theoretical assumptions of ecopsychology (Bragg, 1997).

Empirical research can also give voice to ordinary people A love of nature is as ordinary as a love of family, accessible to everyone, a sacred experience of the earth not often expressed in academic discourse. There is in fact a tendency within academia to shy away from matters of the sacred, the spirit or soul, within mainstream psychology. By grounding the field in the experiences and language of ordinary people, topics such as sacred places or spiritual connection with the earth become academically appropriate while retaining their radical nature. This is particularly true if a social constructionist or phenomenological approach is taken, where participants' experiences are the focus of research rather than some objective truth. By remaining in touch with the way which ordinary people articulate their relationships with nature, ecopsychology can maximise its accessibility and relevance to the larger society of which it is a part. Indeed, effectively conducted research in ecopsychology, whether qualitative or quantitative, involves actively listening to the broader society and giving voice to otherwise unheard sections of the community (Bragg, 1997).

An important ecopsychological research area is that of acquainting the environmental movement with a subtler, more sensitive approach to the public it seeks to win over to its cause, and this means asking searching questions about the values and motivations that change human behaviour. It also means listening to the answers people give when these questions are raised, and doing so with the sort of patience and respect that therapists bring to their clients. By listening in such a way, empirical research can also become an agent of profound personal transformation and a step toward broader social change. The most dramatic potential for change which this type of interviewing offers is within the researchers themselves, providing an opportunity to develop a more self-reflexive routine (Bragg, 1997).

Research in ecopsychology is opening out into areas such as ecologically-oriented child psychology, integrating the healing techniques of traditional cultures into western therapy, ecopsychological impact statements for businesses, dreams, the ecological unconscious (Harms, 1997), and the transpersonal characteristics and

consequences of nature experiences and the implications of transpersonal practices for environmental attitudes and behaviours (Davis, 1998).

2.4 CHAOS THEORY

"It is a theory that focuses on change, process, and pattern rather than stability, causality, and control." (Chamberlain & McCown, 1998, p. 72).

2.4.1 Introduction to chaos theory: A dynamical vehicle for complexity

Chaos theory falls under the broad banner of nonlinear dynamical systems theory, which in turn is embedded within complexity theory. There is a lack of clear-cut agreement as regards what chaos theory actually is, with scientists often vehemently disagreeing with each other (Butz, 1997). Indeed, there is no one standard starting point to explain chaos theory. It is a heterogenous amalgam of different techniques of mathematics and science (Cambel, 1993). The terms used to describe chaotic and complex processes vary depending on the vantage point of the researcher or theorist – an indefiniteness that is in line with the sciences of chaos and complexity themselves being inchoate, as they are too young to be grasping for consensus (Masterpasqua & Perna, 1997).

Yet despite the confusion and contradictions, there is agreement that nonlinearity is a central concept in chaos theory and that complexity is involved (Marion, 1999). Further, there is some sense of underlying continuity and unity in that the theme is the process of change and of how to explain the inherent vagaries and complexities of change (Masterpasqua & Perna, 1997).

Chaotic change occurs only in nonlinear dynamical systems that are held to be dynamic, nonequilibrium, randomly deterministic, extremely sensitive to initial conditions, and characterised by strange attractors (Cambel, 1993). Chaos may perhaps best be understood as a dynamic view of phenomena that represents systems

behaviour at a midpoint between strict determinism and total randomness. Its primary point of application occurs when the condition of a system changes over time (Guess & Sailor, 1993). The essence of chaos is a delicate balance between forces of stability and instability, a powerful interplay of forces on atomic and everyday scales (Gleick, 1987). The fundamentals are change and time, and the concern is with how a system evolves over time (Williams, 1997).

Essentially, chaos theory investigates complex behaviour and looks for the underlying patterns in what appears to be random behaviour (Chamberlain & McCown, 1998). Natural and human systems are complex nonlinear dynamical systems and contain essential elements of uniqueness, randomness, and irreversibility, and are thus well suited to the chaos science paradigm of pattern (Chamberlain & Butz, 1998). The term ‘chaos’ is actually a misnomer in its semantic sense, then, as it implies random disorder. In the scientific sense chaos refers to underlying, implicate order (Butz, 1997).

Chaos is thus an epistemology based on a concept of reality that, instead of being intrinsically orderly, stable, and equilibrial, is seething with spontaneous change, irregularity, disorder, and chance (Chamberlain & McCown, 1998). As such, chaos theory offers an alternative model for psychology (Chamberlain & Butz, 1998). It allows for the investigation of human functioning at many levels and enhances the concepts of description, understanding, and influence (Chamberlain & McCown, 1998). Importantly, as it offers a common language that can be used by different approaches, it also offers unique possibilities for unifying psychology (Chamberlain & Butz, 1998).

In definitional terms, then, it can be said that the term chaos theory is a shorthand description for nonlinear dynamics in general (Robertson, 1995). In an attempt to standardise at least the core concept of chaos, an influential international conference on the subject in 1986 defined chaos as ‘stochastic behaviour occurring in a deterministic system’. The definition contains an implicit paradox: ‘stochastic’ means random, lawless, and irregular while ‘deterministic’ means ruling by exact and causally determined laws – so chaos is lawless behaviour governed by law. Very

simply put, chaos can be defined as ‘nonlinear deterministic behaviour’ (Masterpasqua & Perna, 1997).

2.4.2 History of chaos theory: Emergence from the theoretical mire

Chaos theory can be seen in both philosophical and scientific terms. The philosophical concept of chaos goes back aeons in time, being a mythological explanation that describes the unsettling experience of change (Butz, 1997). The scientific concept can be traced to roughly 100 years ago when a number of scientists began constructing a new epistemology of spontaneous change, irregularity, and disorder that would call into question the classic laws of physics (Butz, Chamberlain & McCown, 1997).

The philosophical roots of chaos can be traced as far back as 2500 BC with references to chaos found notably in Asian, Egyptian, Chinese, and Mayan cultures (Butz, 1995). Reference to chaos can also be found throughout the ages in fairy tales, myths, religious belief, ritual, and superstition (Wieland-Burston, 1992). Essentially, ancient people believed that chaos was something immense and creative and that the forces of chaos and order were part of an uneasy tension, a harmony of sorts (Briggs & Peat, 1989). Despite this early tradition, it is the Greeks who are credited with introducing chaos in philosophical form with Hesiod’s *Theogeny*, dated around 800 BC, popularly taken to be the philosophical origin of the concept (Butz, 1997; Cambel, 1993). The early Greek philosophers ‘improved’ on the mythical idea of disorder by injecting it with a scientific attitude, and others later elaborated on their thinking (Briggs & Peat, 1989). Such elaboration can be seen clearly in religion, where it has had many different and ambiguous meanings over many centuries (Williams, 1997). The Middle Ages was a particularly volatile time, when the Greek scientific spirit contended with the old mythologies. By the time of Galileo, Kepler, Descartes, and Newton, the scientific spirit and its suppression of chaos had gained the upper hand. Science – more specifically reductionist science – had cast a powerful spell that suppressed chaos for centuries (Briggs & Peat, 1989).

Various snatches of what constitutes deterministic chaos appeared in scientific and mathematical literature in the 19th century. James Clarke Maxwell and Jacques Hadamard touched on the concept of sensitivity to initial conditions, while the notion of entropy was tackled by Sadi Carnot, Rudolp Clausius, and Ludwig Boltzmann. The Lyapunov exponent, a means of measuring chaos, was put forward by Aleksandr Lyapunov and a major contributor was Sofya Kovalevskaya (Williams, 1997). Henri Poincare, a turn-of-the-century scientist is generally considered the grandfather of the concept, gaining this distinction for his work on the 'three body problem' that refuted Newton's clockwork-like laws of planetary motion. Edward Lorenz revived Poincare's work in the early 1960s and is generally credited with initiating the modern emergence of chaos theory. Lorenz's initial encounter with chaos theory was inadvertent. In his attempt to predict the weather, he discovered nonlinear phenomena and concluded that initial conditions, inputs, or variables are vitally important and sensitive – a startling discovery then, because classical scientific theory had historically disregarded the impact of very small units of information.

The term 'chaos' entered the scientific literature in 1975 when Li and Yorke published a paper in which they characterised certain flows as being 'chaotic'. Indeed, it was James Yorke who properly coined the term 'chaos' in 1975, using the term as the apparently random behaviour that he encountered looked like disorder. He actually used the term in the mythological sense but it was not long before it assumed contemporary scientific significance, and chaos theory had emerged (Butz, 1997). In an important 1976 paper, Robert May referred to the Li-Yorke paper, and pointed out that certain apparently simple equations may represent very complicated, nonlinear dynamics. May's paper was widely read and greatly contributed to the acceptance of the term 'chaos' (Cambel, 1993). Thus the scattered bits and pieces of chaos began to congeal into a recognisable whole in the early 1970s. It was about then that fast computers (which could powerfully utilise chaos theory) started becoming more available and affordable, and simultaneously the fundamental and crucial importance of nonlinearity began to be appreciated (Williams, 1997).

The momentum of chaos theory has steadily increased over the years since the 1970s. A great many books and articles have appeared (Williams, 1997) and there are even societies and journals dedicated to chaos theory (Butz, 1997; Sulis & Combs, 1996).

Ten years ago chaos theory was thought of as at worst a fad, while others saw it as an arcane set of pseudo-theories with limited applicability in the real world. Today, however, ideas about chaos are more respectable and have become mainstream. Some even argue that chaos theory represents the third great scientific revolution of the 20th century, a scientific revolution of the same magnitude as relativity theory and quantum mechanics (Butz, Chamberlain & McCown, 1997).

2.4.3 Chaos theory: Principles and practice

As has previously been stressed, chaos theory is deeply embedded in complexity and nonlinear dynamical systems theories. To properly understand the concept and its features, it is first necessary to understand complexity and nonlinear dynamical systems.

Complexity is an inseparable part of the world of dynamical systems (Nicolis & Prigogine, 1989). Complexity is ubiquitous, is in nature as well as artifice, occurs in large and small systems, and can be tangible or intangible (Cambel, 1993). Very simply, complex systems (including human beings) may be described as systems composed of many parts, elements, or components that may be of the same or of different kinds and which are connected in a more-or-less complicated fashion. The resulting behaviour, too, is complex (Haken, 1988). Complex systems are characterised by nonequilibrium, nonlinearity, and unpredictability. In short they are nonequilibrium dissipative structures, processing systems that absorb and utilise matter and energy to renew themselves, to adapt, and to change (Streufert & Satish, 1997). Chaos theory lends itself to the study of complexity because it, too, is characterised by nonequilibrium, nonlinearity, and unpredictability (Cambel, 1993).

Complexity arises out of deep simplicity. Systems are built from basic elements that obey simple rules and there is an emphasis on process (Streufert & Satish, 1997). Complexity is not random but organised and purposive. The various parts of a complex system come into being by the coordinated integration and differentiation of its adaptive functions to increase its stability in the face of specific internal or environmental conditions (Goldsmith, 1993). Simple systems give rise to complex

behaviour, complex systems give rise to simple behaviour and, most important, the laws of complexity hold universally, caring not at all for the details of a system's constituent parts (Gleick, 1987).

The term 'complexity' has many meanings (Lorenz, 1993). Relevant to this study are the meanings of complexity as a paradigm of science, as a framework for chaos, and as a special edge-of-chaos system condition in the chaotic process of change (Butz, 1997; Butz, Chamberlain & McCown, 1997; Goerner, 1995a; Lotter, 1997).

While the new science of complexity provides an overall scientific framework, nonlinear dynamical systems theory – also known as nonlinear dynamics – stands at the centre of the new paradigm and is emerging as the metalanguage, the metaparadigm, of science. This is so because it provides a unified philosophic view, a basic, core, unifying language and a metamodelling strategy for this kind of science. As such, it is a world-view as well as an elegantly simple modelling strategy (Abraham, 1992).

Nonlinear dynamical systems theory is an extension of general systems theory, which was introduced by Ludwig von Bertalanffy in 1968 (Marion, 1999). The glaring weakness in general systems theory was that it did not describe transformative states very well. This is exactly where nonlinear dynamics comes in, for it explains the process of transformation, its shape, and its evolutionary path (Chamberlain & Butz, 1998). General systems theory emphasises structural aspects of a system while chaos theory is more comprehensive in that it explains the structure, process, and probability under which certain processes lead to a certain structure (Iwakabe, 1999).

Nonlinear dynamical systems are a class of system that meet two criteria: complexity (the elements that compose the system interact in nonlinear and nonhomogenous ways) and dissipative dynamics (the system exists in a far-from-equilibrium state) (Thelen & Smith, 1994). As such, nonlinear dynamical systems are complex systems whose internal microscopic or external macroscopic patterns are affected by one or more forces. They are classified as being deterministic, and a fundamental characteristic is that they are self-organising. Crucially, nonlinear dynamical systems are open systems; that is, they are systems with permeable walls so that matter,

energy, and information may cross them in either direction (Cambel, 1993). Such a system displays remarkable properties of organisation and capabilities for change. The system maintains a dynamic balance between the opposing processes of stability and variability. Stabilising forces maintain the coherence or integrity of the system, whereas variability provides the flexibility necessary for growth and change. Change is viewed as movement through a series of states of stability, variability, and shifts (Thelen & Smith, 1994). The history of a system can reveal its current dynamics and likelihood for change (Hayes & Strauss, 1998). The main aspect is that such a system changes continuously over time and the underlying patterns associated with change take the form of an elaborate sequence, or process, between simplicity and complexity that captures the essence of dynamical systems (Thelen & Smith, 1994). Importantly, nonlinearity and chaos are not synonyms; even though chaos demands nonlinearity, nonlinearity does not ensure chaos (Lorenz, 1993). Chaotic systems represent only a portion of all of the conceivable types of nonlinear systems (Kincanon & Powel, 1995).

In sum, nonlinear dynamical systems are structured and display a self-organising coherence, and within this are the unpredictable gyrations known as chaos. Chaos can thus be seen as the process of complexity and nonlinear dynamical systems (Waldrop, 1992). More specifically, chaos is concerned with the underlying order and unpredictability of nonlinear systems while complexity accounts for both the paradigmatic framework and transformative self-organisation that emerges from such unpredictable, chaotic order (Brack, Brack, & Zucker, 1995). Nonlinear dynamical systems theory provides the structural, processual, conceptual, and applied framework for this (Abraham, 1992; Iwakabe, 1999;).

Chaos is a science of pattern, not predictability (Chamberlain, 1995). People usually assume that chaos means random disorder and that order means predictable stability. Both notions are true, but order is not always ordered and symmetrical (especially in nature, individuals, and society) and chaos need not be random. Chaos is the spice of order (Marion, 1999). It is not chance or randomness (Peak & Frame, 1994) but an unstable state that a system moves through in the process of transformation to a more adaptive state. Chaotic behaviour is a system's attempt to adapt. Greatly simplifying, the system looks all over the place for the solution to new environmental demands. It

looks near and far because it does not have a solution in its repertoire for the given problem, and in doing so deviates from its stable pattern or steady state – a search for adaptation that merely looks random but which is, in fact, highly ordered (Butz, Chamberlain & McCown, 1997).

Chaos theory, then, is essentially about change and the potential for change and is concerned with relative stability and instability. Chaos theory describes both equally well and holds that systems are inherently stable and unstable. The consideration of stability and instability lies at the core of the chaotic process of change. Stability and instability are relative, depending when, and under what conditions, the system is being observed. In either case, the observer must monitor the system long enough to understand its intricate dynamics (Butz, 1997). All references to stability should thus be prefaced with the world 'relative' (Thelen & Smith, 1994). Importantly, chaos theory describes both stable and unstable systems equally well (Butz, 1997). Coherence is a key, closely related factor to relative stability and instability. Coherence is the rich integration of the whole organism that leads to subtle behaviour and appropriate responses (Peat, 1995).

Possibly the most fundamental concept in chaos theory is that of the attractor, which is a dynamical system's set of states-of-being. Essentially, if a system is considered to be in a certain state at a given time, attractors are points within that state toward which the dynamics (trajectories) of the system gravitate. There are four types of attractors: 1) fixed point (static), 2*)* limit cycle (periodic), 3) torus (quasi-periodic), and 4) strange (chaotic). Strange attractors are so-called because of their unfamiliar, unknown, unpredictable, and seemingly random – chaotic! – behaviour. Strange attractors are extremely and critically sensitive to initial conditions, and are easily perturbed (Williams, 1997). Chaotic attractors can further be divided into two types: low-dimensional (some observable periodic movement or patterns) and high-dimensional (no observable movement of patterns) (Abraham, 1995). Attractor states come into being when a dynamic system self-organises and the components settle into preferred patterns of behaviour. Attractors that have been approached repeatedly over time are particularly stable, are activated over a variety of conditions, and require a significant amount of energy – perturbation – to move from their preferred state. Attractors with less of a history or less stability are most sensitive to perturbation and

thus have the greatest potential for change (Hayes & Strauss, 1998). Convergence and divergence are important concepts associated with strange attractors. A chaotic attractor exists because there is a mixture of forces being resolved, some of which are convergent (ie: move trajectories toward the attractor) and some of which are divergent (ie: tend to repel trajectories away from the attractor) (Abraham & Gilgen, 1995).

Bifurcation is another key concept. When a system is perturbed by either an internal or external influence, it starts to evolve from its relatively stable or unstable attractor state. As it moves from that ordered starting point it has greater difficulty returning to its previous level of stability and eventually reaches a point where it is faced with alternative possibilities for change. This is a bifurcation point (Butz, 1997), a threshold of stability at which a system may either break down or break through to one of several new states of order. What exactly happens at this critical point depends on the system's previous history. Depending on which path it has taken to reach the point of instability, it will follow one or another of the available branches after the bifurcation (Capra, 1997). The routes not taken, as well as those followed, remain as possibilities in the behaviour of the system (Briggs & Peat, 1989). The farther from equilibrium a system moves, the greater its potential for sudden change (Butz, Chamberlain & McCown, 1997). At a bifurcation point, a system shows extraordinary sensitivity to fluctuations in its environment and even a tiny, random fluctuation can induce the choice of path (Capra, 1997). Bifurcations are of three main types: 1) subtle (one kind of attractor changes to another), 2) catastrophic (an attractor appears or disappears), and 3) plosive (a sudden shift in the magnitude of the attractor) (Abraham, 1992). Once the bifurcation occurs and a new behaviour or form is introduced, the system will magnify that difference and transform itself until some more adaptive level is reached (Butz, Chamberlain & McCown, 1997). Importantly, in bifurcation the system changes in a major, qualitative way rather than just in a small quantitative way. Nonlinear dynamical systems tend to evolve through a whole sequence of bifurcations during the process of change (Abraham, 1995).

Sensitive dependence on initial conditions is a distinguishing characteristic of chaotic behaviour (Kellert, 1993) and indeed can even be seen as the hallmark of chaotic phenomena (Marks-Tarlow, 1995). The key feature about sensitivity to initial

conditions is that a seemingly tiny or insignificant difference in input conditions becomes amplified or compounded over time and eventually can lead to a large difference in outcome, ultimately to very different evolutionary paths (Williams, 1997). Sensitive dependence on initial conditions is also known as the 'butterfly effect', whereby the flap of a butterfly's wings in Brazil today may make the difference between calm weather and a tornado in Texas next month (Kellert, 1993). The butterfly effect describes the importance of even infinitesimal elements of a system in influencing and changing the structure of the entire system. It is important to note that sensitive dependence on initial conditions pertains to the small differences in initial conditions and not to their magnitude (Kincanon & Powel, 1995). Unpredictability in terms of the system's future state, condition, or behaviour is the most common interpretation of sensitive dependence on initial conditions (Williams, 1997). Only short-term predictions about the system may be made in detailed terms, but long-range predictions can be made at a more macro scale (Kellert, 1993). Sensitive dependence on initial conditions accordingly places limits on predictability (Abraham, 1995).

Complex systems somehow have the ability to bring the underlying patterns of order and chaos into a special kind of balance. This is the edge-of-chaos condition where the components of a system never quite lock into place and yet never quite dissolve into turbulence either. This is the balance point between order and chaos, where a system has enough stability to sustain itself and enough creativity to adapt to new forms. The system is in a state of supreme complexity and a situation of perpetual novelty, a particularly adaptive state in which it is able to creatively choose between the alternatives that lie before it (Waldrop, 1992). Systems may teeter at the edge-of-chaos to enliven enough diversity to adapt to environmental demands in a novel way (Butz, 1997). From the increasing complexity, organisation can occur that maintains an order with its own energy – a process of self-organisation in which the system interacts in original ways either within itself or with the environment (Butz, Chamberlain & McCown, 1997). Indeed, changes in a system at the edge of chaos have as much to do with what systems adjacent to it are doing and the changes they are undergoing, as with what it is doing within itself (Parry, 1996). The more complex a system is, the more likely it is that a spontaneous, adaptive organisation will occur (Butz, Chamberlain & McCown, 1997). At the edge of chaos, relative stability is

punctuated by periods of chaos in which the system shifts back and forth between predictable behaviour and chaotic activity. It is in this processual flux that the system may undergo important transformations that can produce growth (Combs, 1995). These are self-organised transformations that allow for adaptation, creativity, and self-renewal (Kossmann & Bullrich, 1997). It is thus at the edge-of-chaos and not amidst order, predictability, and certainty that change most readily occurs and complex systems self-organise (Parry, 1996).

A crucially important aspect of chaos theory is that of self-organisation (Peat, 1995). Self-organisation is the process whereby a self-propagating system takes itself from seeming irregularity into some sort of order (Williams, 1997), a newly-formed stability that is not only a new order but also a more complex and adaptive one (Butz, 1997). The new order emerges as a result of the inherent nonlinear interactions among the elements that compose the system, the constraints of the system, and the energy flux (Thelen & Smith, 1994). Kauffman (1995) calls self-organisation 'order for free' – that is, self-organisation arises naturally. A fundamental principle of complex, self-organising systems is that they are adaptive. They do not just passively respond to events but actively try to turn whatever happens to their advantage (Waldrop, 1992). Self-organisation serves to maintain and extend the dynamic equilibrium of the system (Mahoney, Miller & Arciero, 1995). In self-organisation, the dimension of stability and instability of system behaviour is of central importance. During instability very subtle and far-reaching interactions between the elements of the system occur which enable spontaneous order formation. In the phase of maximal instability, little causes have great effects (Kruse et al, 1992).

The geometry of chaotic systems changing over time reveals a fractal structure (Marks-Tarlow, 1995). A fractal is essentially a geometric structure that repeats the same design and detail or definition over a broad range of scale and has no characteristic size. The central theme is the preservation of detail upon magnification (Williams, 1997). When fractals are magnified at different scales, pattern can be found within pattern at various levels of the system and these are often incredibly complex and beautiful structures (Gleick, 1987). Self-similarity (also known as scale invariance) is apparent at different dimensions and levels of analysis (Cambel, 1993). The fractal object lacks a preferred or characteristic size and looks much the same at

all sizes (Williams, 1997). Fractals are also characterised by bounded infinity. Within the constraint of a bounded shape a fractal possesses infinite depth and complexity, and the closer it is inspected the more there is to see (Marks-Tarlow, 1995).

Fractals are usually generated by many repetitions of a given trajectory in phase space and in geometrical character tend to be rough, broken, disorganised, jagged, bumpy, or shaggy. Fractals are of two types: deterministic – ordered or exact, whereby they look exactly the same (even in minute detail) at all levels of magnification, and natural – approximate, statistical, or stochastic as found in nature (Williams, 1997). Fractals themselves go through a sequence of order to chaos to order (Butz, 1997).

Importantly, chaos theory is also holistic in that due regard is paid to the inseparability of the system from the environment and the importance of constantly changing and developing contextual factors. It is because of the notion of holism that even small changes in the system can lead to large and widespread change (Butz, 1997).

2.4.4 Chaos theory and therapy: Implicate order reigns

Therapy can be conceptualised as a process of autonomous order transition (Schiepek, Fricke & Kaimer, 1992). An individual's state of order can be seen as a state of dynamic equilibrium where the system's attractor configuration consists of well-organised patterns of cognitive, affective, behavioural, and somatic functioning. A client in therapy is typically experiencing a pattern that is interfering with his or her well-being and everyday functioning. Stabilising forces tend to maintain these patterns even if the existing system does not function optimally, and the prevailing attractor state (eg: state-of-mind, lifestyle, areas of concern) of the system will thus perpetuate these patterns unless challenged and perturbed in some way, as in therapeutic intervention (Guess & Sailor, 1993). Importantly, chaos is perfectly at home in both stable and unstable systems. It is likely that all varieties of attractors can represent both desirable and undesirable and both normal and abnormal conditions. Knowing a psychological process is chaotic tells nothing about whether it is healthy or not (Butz, 1997).

Therapy can follow two different courses, which will usually be combined: it may be geared to decreasing the dominance of the individual's present state of order, or it can encourage more intensive fluctuations of the system to a new state. These two approaches are complementary. Thus, it is the function of therapy not only to transfer the system dynamics into the regime of a different attractor but also generally to increase accessibility to alternative attractors (Schiepek, Fricke & Kaimer, 1992).

The therapeutic contract is committed to movement (Kruse et al, 1992). The aim in therapy is to achieve a shift to a different state of order in the individual from one state-of-being to another. The function of therapy is to establish boundary conditions that are tailored as optimally as possible to the client and his or her development in order to allow for the process of self-organisation to take place (Schiepek, Fricke & Kaimer, 1992).

Importantly, self-organisation from one state-of-being to another can be planned to a degree, empowering the growth potential of the individual (Abraham, 1992). The implication is that the therapist can assist the individual to self-organise to a more adaptive state. Control is gradually turned over to the client, facilitating a process whereby he or she is effectively able to take responsibility for his or her own growth (Butz, 1997). As new order formation is left to the self-organising process of the system, therapeutic competence and responsibility have to be assumed in a more process-oriented manner (Kruse et al, 1992).

In terms of intervention, old patterns must be destabilised and shaken loose to allow for new configurations to emerge. If destabilisation occurs when the client is ready, it can herald movement toward an attractor state that is more flexible and adaptive than the one maintaining current problems (Guess & Sailor, 1993). Some well-defined 'push' (ie: perturbation) must be given to the system so that it can achieve a new state (Haken, 1988). However, once the system begins to fluctuate and move away from its existing state of order it is impossible to determine where it will settle (Chamberlain & McCown, 1998). This has important ramifications in terms of prediction of outcome in therapy. Prediction is limited to very short-term quantitative prediction (Peak & Frame, 1994) and long-term qualitative prediction to a broad and limited degree (Kellert, 1993).

Importantly, the therapeutic relationship is one of high connectedness, a complex system of therapist and client in interaction with one another. Both therapist and client demonstrate self as well as mutual regulatory functions within the relationship, which then evolves as a system (Perna, 1997). Indeed, the therapeutic alliance self-organises as a communicative system. A therapeutic social system is created (eg: boundaries, identity, structure, environments, rules) and thus represents a self-constituting and self-organising dynamical system, within which transition is similarly from order to chaos to order (Schiepek, Fricke & Kaimer, 1992).

Importantly, chaos should not be seen as something undesirable but as a part of a healing process (Francis, 1995). Only when there is sufficient unrest in a system is it likely to be amenable to transformation, and it is during such periods of chaos, when the old structure or approach to solving problems and coping with life no longer works, that people are able to make significant leaps out of previous patterns into new behaviours (Butz, Chamberlain & McCown, 1997). It is further posited that the healthiest state-of-being is that of the system poised at the edge-of-chaos, the state of complexity where individuals are most capable of adaptation and growth (Masterpasqua & Perna, 1997).

2.4.5 Chaos theory and research: Dynamical and daunting

The new science of complexity requires new methods of research. While traditional approaches are still useful and are certainly retained, the emphasis has shifted to methods that are able to deal with the seething and tumultuous pattern, process, and change that so characterise human life. Theoretical advances in nonlinear dynamics (ie: chaos theory) have caught the attention of researchers looking for an alternative to the traditional linear modelling paradigm. Concepts from nonlinear dynamics promise more realistic representations of a fundamentally nonlinear world and offer the potential of detecting deterministic components in what was once explained away as random variation (Johnson & Dooley, 1996).

Nonlinear dynamics essentially takes a complex set of interrelated phenomena, observes the pattern of their behaviour over time, and attempts to model them. This is

a graphical process that measures variables representing the system and models the changing state of the system over time. The component variables measured should clearly represent the system but are nevertheless arbitrary and may even be hypothetical. Variables are often chosen for explanatory convenience, and construct reification should be guarded against. Crucially, the measures involve the dependency of some or all of the variables on some or all of the others and thereby represent the complex and mutually interactive features of the system. The difficulty of specifying variables which best represent the system and of specifying the boundaries between the measured variables and the processes they are embedded in, must be borne in mind. Nevertheless, even an inadequate set of variables may reveal many important properties about the behaviour of a given system (Abraham, 1992).

It is stressed that nonlinear dynamics research is notoriously difficult at the best of times, and even more so when real-life data are involved. Quality of data has to be good, and there has to be enough observations (minimum 300) (Johnson & Dooley, 1996). It takes hundreds – usually thousands! – of measured points to adequately demonstrate the existence of chaos (Butz, Chamberlain & McCown, 1997). Fortunately, there are several techniques available that require shorter time-series and which are analytically simpler. What these techniques lose in terms of precision, they make up for in usefulness (ie: the sophisticated procedures are able to quantitatively detect chaos in the system, while the 'rougher' methods are very capable of graphically identifying attractors and qualitatively showing the state of a system over time). Quantitative 'precision' is, in any case, highly suspect. The principle of sensitivity to initial conditions means that small error in measurement can lead to huge error in analysis (Johnson & Dooley, 1996). The complicated nature of the subject and the technical difficulties associated with it have thus limited research (Butz, Chamberlain & McCown, 1997).

Due to methodological and computational difficulties, then, results should not be taken literally. They are arguably better used for comparison and for offering a heuristic understanding of the system – the client – being studied. Theoretical caution is thus necessary, but this should ideally be mixed with a willingness to experiment (Johnson & Dooley, 1996).

Chaos theory offers some elegant and sophisticated mathematical and statistical methods for examining chaos and the state of a system. It is prudent to triangulate different statistical procedures, depending upon the extent and nature of the data collected (Cambel, 1993). While psychology does have nonlinear tools available, they are not utilised as much as they can be nor is the basis for using them well understood (Butz, 1998). The tools available look attractive and enticing, but they were developed for highly idealised conditions. One of the biggest problems is that, when applied to ordinary data, the present methods often give plausible but misleading results, suggesting chaos when in fact there isn't any. Having said that, applying chaos analysis to a set of data (even if these data aren't ideal) can reveal many important features that other, more traditional tools might not disclose. Description and theory of chaos are far ahead of identifying chaos in real world data. However, new and improved methods are emerging regularly (Williams, 1997). The pathway from models and metaphors to methods is perhaps the hardest step in validating the dynamical systems approach (Heppner, Kivlighan, & Wampold, 1999).

Data analysis may thus be both quantitative (ie: nonlinear statistical analysis) and qualitative (ie: description of the chaotic process of change and graphic modelling of the evolving system), and the two in combination offer a very powerful means of analysis. Importantly, traditional linear methods may be used to complement the nonlinear approach, potentially adding richness to the research. Indeed, the combination of nonlinear and linear research methods holds much promise and should become an important focus of future work (Johnson & Dooley, 1996).

Descriptive field designs are particularly powerful in nonlinear dynamics research, as they are able to deal with the natural occurrence of the chaotic process of change. These are most usefully conducted in terms of time-series measurement (ie: multiple observations over time). The use of single-subject studies is particularly powerful in counselling research, as it approximates the one-to-one situation encountered in therapy. Indeed, it can be considered critically important in research that real clients are used in real-life settings (Heppner, Kivlighan, & Wampold, 1999). One aspect of science that chaos theory emphasises is the necessity for subjects to be studied in the contextual situations in which they evolve (Butz, Chamberlain & McCown, 1997).

Other research perspectives may also be used. In particular, qualitative perspectives – particularly at a metaphorical level – offer useful frameworks, if matched carefully to theory. In this form of research, single case studies are typically analysed to look for the structural characteristics of dynamical systems and the associated chaotic process of change (eg: dominant attractors in the person's life, bifurcational decision points) (Butz, 1997).

2.5 SUMMARY

This literature review has aimed to give a concise overview of the very fragmented and complex – yet highly complementary – fields of constructivism, ecopsychology, and chaos theory. The fundamental tenets and principles of constructivism were discussed. The core concept is that humans proactively construct their own versions of reality. It was explicitly stated that this study is aligned with critical and dialectical forms of constructivism. Critical constructivism holds that objective reality exists but is not fully knowable by people in virtue of their personal filters, and dialectical constructivism holds that reality is both personally and socially constructed. The constructivist approaches to therapy and research were also discussed. Ecopsychology was seen to be a particularly wide and diverse field, with little coherence. The discussion cut a broad swathe through the field, aiming to draw some of the threads together. The core issue, however, is essentially that there is a human-nature split and that reconnection between the two is essential for the health and well-being of both person and planet. Research and therapy considerations with respect to ecopsychology were also discussed. The journey into the field of chaos theory necessitated encompassing complexity and nonlinear dynamical systems theories, and delved into the pattern, process, and change that so characterise chaos theory. It was shown that while chaotic change appears to be random, there is in fact an implicate order. Crucially, it was shown that a nonlinear system (eg: a human being) can orchestrate its own change. Chaos theory was also considered in relation to therapy and research. A distillation of the fundamental concepts and principles of constructivism, ecopsychology, and chaos theory was presented, and it is this essence that will be utilised in Chapter Three to integrate the core fundamentals of the three fields.

CHAPTER THREE

INTEGRATION OF CONSTRUCTIVISM, ECOPSYCHOLOGY, AND CHAOS THEORY

3.1 INTRODUCTION

As has been shown, the fields of constructivism, ecopsychology, and chaos theory each hold considerable relevance for psychology but their potential is arguably not fully exploited. A major drawback is that each field has no coherent base and is united only in terms of a cluster of shared tenets and core principles, a nucleus of core fundamentals around which the characteristic diversity is structured. While the diversity of each field is staggering, the core nuclei are nevertheless strong and inviolate and constitute vital pillars for the respective fields. Importantly, the core fundamentals of constructivism, ecopsychology, and chaos theory are remarkably complementary and lend themselves to synthesis. Integrated, the core fundamentals offer a working framework that is arguably strong and coherent, of considerable utility, and which can harness, channel, and develop the power and relevance of these fields to their full potential.

In integrating the three fields a great many strategies could be employed, each of which would, of course, be the personal construction of a given investigator and thus reflect his or her version of reality with regard to these fields – differing personal perspectives that would reflect the multiple possibilities and multiple realities inherent in such integration. This particular integration is focused squarely on making the essential links between the nuclei of core fundamentals of the fields. The graphical representation in Figure 4.1 makes this explicit. This focus is not arbitrary, but a deliberate attempt to go beyond the myriad surface parallels and likenesses and concentrate on the distilled essence of each field and how they relate to each other. In this way, the integration is deep-level and aims to seek and bind the unifying threads that run through them; breadth is thus sacrificed for depth.

The integration is premised on the same strategy that underpins the study as a whole: ecopsychology provides the context (ie: a broad conceptual backdrop), chaos theory provides a working framework (ie: makes explicit how chaos physically manifests) within this context, and constructivism provides an epistemological base and at the same time allows for the personal use of these concepts for increased psychological well-being (ie: personalises the principles concerned). This leads to the key points upon which the integration is predicated:

- humans are necessarily and crucially embedded in nature, and nature is embedded in humans;

- nature is evolutionary, systemic, and characterised by the chaotic process of change, and humans, being mutually embedded in nature and subject to its laws, are also necessarily subject to such a process;

- humans are proactive and may consciously utilise the principles of chaos theory – notably self-organisation – to initiate their own chaotic process of psychological change.

3.2 THE ECOLOGICAL WORLDVIEW: HOLISTIC AND DYNAMICAL

The ecological worldview is fundamental to constructivism, ecopsychology, and chaos theory, and lies at the heart of this integration. A postmodern concept, the ecological worldview is essentially one that stresses the holistic, unified character of all existence (Lemkow, 1990). There is a shift in viewpoint from the part to the whole, whereby the properties of the parts can be understood only from the dynamics of the whole. Ultimately, there are no parts at all. What is called a part is merely a pattern in an inseparable web of relationships. The whole is embedded in larger wholes, and the concern is with the functional interrelatedness of all its parts (Capra, Steindl-Rast & Matus, 1991).

This holistic view entails a fundamental embeddedness of all phenomena – living (biotic) and non-living (abiotic) – in the cosmos. Humans are thus an intrinsic part of nature and may be seen as a special strand in the fabric of life. The concern is with a sense of belonging to the greater whole of the universe, of the earth, as a living system (Capra, Steindl-Rast & Matus, 1991). The holistic theory in effect treats all nature as alive (Sheldrake, 1990). Human embodiment is entirely internal to, and thus wholly dependent upon, the vaster body of the earth (Macauley, 1996). This encompasses the notion of *anima mundi*, the whole of the cosmos as a single great organism, an intricately connected and balanced organic-inorganic system that can be considered a living being (Du Nann Winter, 1996); the related concept of the earth as a living organism is called *Gaia* (Gleick, 1987). Embeddedness necessarily entails a nonduality between humans and nature: humans are in nature, and nature is in humans. Nature's ways are thus humans' ways.

The notions of wholeness and nonduality necessarily entail a fundamental interconnectedness and interdependence of all phenomena (Cox & Lyddon, 1997). Humans are members of a larger community of being. There is an inseparability of all elements that leads to a profoundly deep-level ecological vision (Goerner, 1995b). At its deepest level, the ecological worldview is concerned with spiritual or religious awareness and experience (Capra, Steindl-Rast & Matus, 1991).

At its core, the ecological worldview relies on fundamental concepts derived directly from the scientific study of ecosystems and living organisms (Oates, 1989). These ecosystemic concepts (eg: organisation, structure, dynamic equilibrium, cybernetics, perturbation, pattern, cooperation, competition, symbiosis, ecological niche) are used to describe human functioning in the world, and are natural laws (Meyer, Moore & Viljoen, 1997; Smith, 1990).

These natural laws are characterised by complexity. Complex systems – including human beings – are open systems and have complex interactions with the environment and with themselves (Butz, Chamberlain & McCown, 1997). Complex systems are characterised by nonequilibrium, nonlinearity, and unpredictability (Streufert & Satish, 1997). Nonlinearity is central. Complex, nonlinear dynamical systems change continuously and produce patterns that evolve in time (Thelen &

Smith, 1994). They change by means of a process of chaotic flux, a sequential movement from one state of systemic order to another, higher ordered state of complexity (Butz, 1997).

The universe is directed toward the creation of increasingly ordered forms. There is an evolutionary, self-organising process that moves inexorably and opportunistically toward increasing levels of ordered complexity. Humans are embedded in this process and live and evolve in concert with it (Goerner, 1995a). Crucially, complex systems are adaptive and do not just passively respond to events. They actively try to turn whatever happens to their advantage (Waldrop, 1992). Central to this is the concept of self-organisation, which may be seen as the hallmark of life (Capra, Steindl-Rast & Matus, 1991).

The eocological worldview also posits a postmodern self – an ecological self – who is a self-organiser supreme. The self is stable and has a core structure but is nevertheless always in a state of flux, a state of adaptive becoming, ever changing in the face of internal and external environmental demands. Importantly, moves to new states-of-being are self-organised (Cox & Lyddon, 1997). Crucially, the self is proactive – the individual can consciously initiate a move toward a new state-of-being.

Worldviews are important psychological phenomena (Du Nann Winter, 1996). The worldview lies at the centre of consciousness and is an organising power drawing all phenomena into stable constellation in the life of an individual. The importance of the ecological worldview thus cannot be overemphasised. The ecological revolution challenges virtually every basic tenet of belief about human identity, the shape of society, and the nature of the world – and it demands not just new conclusions but a whole new style of thinking (Oates, 1989).

In sum, then, the ecological worldview holds that nature and humans are mutually embedded. This nonduality is characterised by an inextricable interconnectedness and interdependence, and a necessary subjection to natural, ecological principles and processes (natural laws). Such processes are characterised by complexity, nonlinear systems, chaotic flux, and an evolutionary process of change. A postmodern, ecological self is postulated. This self is a meaning-making individual who is

proactive, core-structured, and self-organising. It is these fundamental principles common to constructivism, ecopsychology, and chaos theory that form the framework of this integration and which will be expanded upon.

3.3 THE MUTUAL EMBEDDEDNESS OF HUMANS AND NATURE

The mutual embeddedness of humans and nature is an all-encompassing principle of existence, yet it is little recognised and rarely made explicit either in psychology or with people in general. Human embeddedness in nature is, in fact, profound. It is a foundational factor that impacts and influences people's overall well-being, yet it is so basic that people usually do not examine this crucial aspect of their lives critically (Clinebell, 1996). Essentially, embeddedness implies that humans and nature are inextricably interlinked. This is a crucial relationship which necessarily results in shared fundamental characteristics of existence and an all-encompassing, reciprocal influence and impact upon each other.

Ecopsychology is central to the notion of embeddedness, making explicit the human-nature connection and relationship. Chaos theory is the physical science that makes embeddedness manifest and observable, serving as the crucial, bridging link between concept and the real world. In constructivism, the essential points are that personally constructed reality is necessarily created through nature-filtered conceptual and perceptual lenses and that the dynamic, ever-changing state-of-being of humans is a manifestation of the expression of nature.

In terms of this integration, three aspects of embeddedness are of particular importance: a) nonduality, b) interconnectedness and interdependence, and c) subjection to natural laws.

3.3.1 Nonduality

Ecopsychology makes the principle of embeddedness explicit, asserting an indivisible link – an essential nonduality – between humans and nature. Indeed, the main thrust of the field is concerned with the perceived human-nature split and the conviction that the relationship between person and planet is so intertwined that the well-being of each is dependent upon the well-being of the other. Nonduality is essentially a continuity of humanity with nature (McDaniel, 1990). Common thinking tends to dichotomise humans and nature, but the separation is artificial (Horesh, 1998; Shore, 1995).

People are part of a global life system, a beautiful, intelligent global life community that exists within and around them. Lives and nature are intertwined (Cohen, 1993), and people are thus intricately connected to the natural world (Feral, 1998). Humans are holistic living organisms interacting with the world, which in turn must be understood as a living organism (Clinebell, 1996). There is a great, interdependent network of nature and humans are an integral aspect of it, a part of the total expression of life (Lewis, 1996). All the variations and differentiations of existence are inseparably and dynamically interwoven, and there is thus an all-embracing unity. Nonduality is inescapable, and it exists at all levels of existence from the micro (eg: atoms, cells) to the macro (eg: cities, societies, nations) (Lemkow, 1990). There is a critical relationship between humans and nature (Lewis, 1996). Rather than being housed by, in conflict with, or even tending nature, people should recognise that they are co-evolving with it (Horesh, 1998). Nonduality, then, is crucial in that it firmly binds humans and nature in an indivisible unity. It necessarily follows that nature's ways are humans' ways.

Nature's ways are made manifest in chaos theory. Chaos theory represents a physical science branch of a deeper ecological vision, rendering the evolving ecological metaphor a real model of the world. Nonduality is central to that model. It suggests that humankind is embedded in, and is part of, a vast, interconnected process that created, and is still creating, all the intricate order of the universe (Goerner, 1995a). Indeed, nonduality is the key to chaos theory. Chaos theory is the science of wholeness. It points to a world of seamlessness, the scientific fact that everything is

connected to everything else in unbroken wholeness. Each part is the whole (Gelatt, 1995). Chaos theory makes explicit the chaotic flux – the ongoing sequence of pattern, process, and change – that undergirds nature and is characteristic of all systems, living and non-living, from the micro to the macro. The chaotic flux is the fundamental, underlying process common to both humans and nature. It is the processual 'glue', so to speak, that physically cements their nonduality.

In terms of constructivism, nonduality manifests in the individual in two distinct ways. Firstly, at a purely physical level, the individual is constrained and entrained by the underlying physical processes of nature and thus subject to the ongoing, chaotic flux of evolutionary change. These physical processes set very real limits for the individual, yet at the same time offer the potential for highly adaptive change (Ford & Ford, 1987). Secondly, the meaning-making so central to human experience and the personal realities constructed by the individual are necessarily nature-filtered expressions of existence (Horesh, 1998). Reality itself is thus an expression of nature and is best characterised as a vast network of interdependent, interfusing events – an essential nonduality of experience (McDaniel, 1990). In this view, nature and the realities of human existence (eg: culture) may be seen as relative gestalts that encompass both internal, subjective experiences as well as the natural backdrop in which those experiences take place; they are no different (Horesh, 1998). This is also true at the social level. Societies cannot divorce themselves from their mutual embeddedness with nature (Young, 1995) and in the dialectical interplay with the individual necessarily impart their nature-based reality. As an individual's personal constructs of reality are experienced at both conscious and tacit levels, the nature-based character of reality may be experienced consciously or at a deep level. Nonduality, then, is central to personally constructed reality.

3.3.2 Interconnectedness and interdependence

The embeddedness of human beings and nature and the nonduality thereof, implies an inextricable interconnectedness and interdependence between all elements of the world, both living and non-living (Greenway, 1999). Ecopsychology stresses such interrelatedness, at both deep and surface levels. At its deepest level, this essential

interrelatedness is a spiritual notion, a view that recognises the wholeness of all life (Anthony & Soule, 1998; Fox, 1990). On a different, but similarly deep level is the notion that, because all of nature is composed of atoms, at the level of exchange of matter and energy all are part of one inseparable web of connections. The parts are the whole. As inhabitants of the universe people are part of this inseparable web of connections (Feral, 1998). There is interconnectedness and interdependence with others of the human species, with other species, and with ecosystems. Humans are thus radically interrelated with everything else in the universe (Rockefeller & Elder, 1992). At a more surface level, humans are individuals-in-community. Communities must be seen in relation to other communities, and their destinies are interdependent. The web of life is thus best conceived as a collective 'we' (McDaniel, 1990) in which each individual is important (Gomes, 1998). Crucially, nature is dynamic and deeply systemic. Interconnectedness and interdependence are thus dynamic, systemic relationships. Chaos theory makes explicit, conceptually and physically, the processes that characterise the interconnectedness and interdependence of dynamic systems (including humans) in nature. All dynamic systems interact with each other (Ainslie, 1995). Such interaction is purposive in that every single part of the planet serves life, and thus dynamic systems serve the whole (Gomes, 1998). Dynamic systems are interlinked at some level or other, either directly or indirectly and to greater or lesser degree, and it is this essential connectedness that makes the chaotic flux of nature possible (Ainslie, 1995). The chaotic flux is an inherent characteristic of a special kind of connectedness, a shared global balancing mechanism that guides and integrates people and all other entities of nature (Cohen, 1993).

Interconnectedness and interdependence are stressed in constructivism, with its emphasis on the importance of human relationships and their role in both personal and collective experiences (Mahoney & Moes, 1997). This dialectical interplay between the personal and the collective is most evident in social constructionism, in its explication of the crucial connection between individuals and social forces. This essential interrelationship is particularly emphasised in dialectical constructivism – the stance espoused in this study – with its strong emphasis on the reciprocal interplay between individual and environment. At its highest, the notion of interconnectedness and interdependence ideally leads to the individual living in connection, feeling the connection, honouring it, and then acting from that place of being connected

(Anthony & Soule, 1998). Importantly, constructivism's postmodern orientation makes for an individual that can be seen as a community of personal selves. The self is multiple, and the interconnectedness and interdependence of these multiple selves is just as important for the individual's well-being as connectedness with society (Wetherell, 1996).

3.3.3 Human subjection to natural laws

Ecopsychology asserts that human beings, in virtue of embeddedness and nonduality, are inherently subject to natural laws. This is so at all levels, from the micro to the macro. Essentially, human beings are animals (ie: mammals) and exist alongside other organisms in a physical environment. Although humans have managed to isolate themselves from other organisms and the extremes of nature to a degree, they are still subject to the principles of nature. Indeed, human life processes are similar to those of most other animals (Storer, Usinger, Stebbins & Nybakken, 1979), and just like other animals people inherently have internal needs and ways of meeting them (eg: hunger, survival, hunting, finding shelter) (Goldsmith, 1993). At the most obvious level, people are fundamentally affected by and dependent upon natural ecosystem basics (eg: climate, moisture, temperature, light, nutrients, energy flow, ecological niche) and ways of functioning and behaviour (eg: intraspecific and interspecific competition, parasitism, disease, mutualism) in the world (Smith, 1990). Less obvious levels (eg: genetics, cellular activity, organic functioning, evolutionary processes) are staggering in their complexity.

It is the less obvious levels of system process that chaos theory is concerned with. Essentially, chaos theory makes the deeper workings of natural laws physically explicable (Goerner, 1995b). Chaos theory is concerned with the workings of natural law, in terms of explicating the processes that characterise dynamical systems (including the human animal). Chaos theory thus penetrates the face of nature and reveals its hidden implicate order. The chaotic flux of pattern, process, and change is intrinsic to nature's order. It is the chaotic flux that is the means whereby nonlinear dynamical systems exist and function in the world. Crucially, such interactions go

beyond a mere relationship with the natural environment; they are ecological relationships (Willi, 1999).

The human animal is a supremely adaptive organism, maximising the potential of self and environment to a large degree (Smith, 1990). Nevertheless, as constructivism emphasises, the individual is constrained by personal and conceptual filters and by the impact of environmental factors. The individual, then, cannot escape the contextual backdrop of natural law. All of the core fundamentals applying to the individual, from the constructivist perspective, are necessarily subject to natural law. The constraint of natural law sets a limit on the potential of the individual, but at the same time it provides principles that simultaneously allow for optimisation of the individual's development. The constructivist self is a proactive, ever-evolving self, and these principles may be consciously used to good account for personal benefit.

3.4 PATTERN, PROCESS, AND CHANGE: THE EXPRESSION OF NATURE

The lawfulness of nature that humans are subject to, in virtue of their embeddedness, is manifest in a certain systemic manner that can be said to express the character, structure, process, and driving force of nature. In ecopsychology, the crucial point is that nature is incredibly complex, deeply systemic, and characterised by an evolutionary, chaotic sequence of pattern, process, and change that masks an underlying, implicate order. Chaos theory shows how these principles are expressed, particularly with regard to the sequential chaotic flux. Constructivism personalises nature in this regard; the individual is also a complex, nonlinear dynamical system and thus expresses the same natural laws.

This is a deeply systemic view, in which there are four vital aspects to consider: a) complexity (the character of nature), b) nonlinear dynamical systems (the structure of complex systems), c) chaotic flux (the process inherent in complex, nonlinear dynamical systems), d) evolutionary process (the driving force of existence).

3.4.1 Complexity

Ecopsychology provides a broad and sweeping conceptual backdrop for complexity, asserting that nature as a whole and systems at all levels, from the immensity of the universe to the minutest of elements, are characterised by complexity. Indeed, the universe is seen as being infinitely complex, a creative unfolding of existence that is co-created by its elements (Goerner 1995a). The universe evolves in the direction of increasingly complex and cooperative interactions between systems, leading to the formation of emergent, higher-order systems. Complexity is witnessed in the physical universe as well as in the evolution of life. It also characterises the evolution of social systems (eg: economic, political) (Combs, 1995). Complexity rests upon diversity, both of the self and of nature as a whole (Anthony & Soule, 1998).

Chaos theory explains complexity, stressing the flexibility, dynamism, spontaneity, disorder, and aliveness of systems that have the ability to change, evolve, adapt, learn, and reorganise their own structures over time – a complexity that results from the collective behaviour of the interacting components of such systems (Lotter, 1997). The dynamic balance between the opposing processes of stability and variability is stressed. Stabilising forces maintain the coherence or integrity of a system, whereas variability provides the flexibility necessary for growth and change (Hayes & Strauss, 1998). The importance of the edge-of-chaos state-of-being is highlighted, in that it is an especially adaptive kind of complexity (Waldrop, 1992). The more complex a system is, the more likely it is that a spontaneous organisation will occur which establishes a different, more adaptive order. Importantly, it is the interaction of the elements in the system or their interaction with the environment that generates a different structure (Butz, Chamberlain & McCown, 1997). Complexity is organised and purposive (Goldsmith, 1993), and emergence is its central feature (Lewin, 1993).

Crucially, in virtue of being dynamical systems, human beings are characterised by complexity and are thus subject to the same pattern, process, and change that govern such. In terms of constructivism, then, all that can be said about complex systems pertains to the functioning of the individual. Living beings utilise energy available in their environments to reorganise themselves to increasingly higher orders of

complexity (Combs, 1995). This is done at a physical, self-constructing level and at a conceptual, meaning-making level.

Importantly, while evolutionary flux exhibits an inherent tendency for adaptation to higher and higher forms of complexity, humans' meaning-making capacity can crucially thwart the drive to higher adaptation and manifest instead in a downward spiral of self-destructive behaviour. Essentially, meaning-making has central importance in the creation of people's realities. Meaning-making results in the creation of a worldview for the individual that necessarily colours experience in every sphere of his or her existence (Wieland-Burston, 1992). This also happens at the social level, with collectives such as groups and nations having particular worldviews that manifest in strongly held beliefs and ideologies. Worldviews are so strong and so central to the individual and the collective that conflict often manifests as a result of differences of belief (Kiel & Elliot, 1996). Such conflict may be confined to a relatively small scale (eg: neighbour versus neighbour, group versus group) or be manifest at a global scale (eg: capitalism versus communism, Christians versus Muslims). It can, of course, be speculated that when considered on a very long-term, macro scale such conflict is part of a greater evolutionary, chaotic flux moving the world as a whole to an ultimately more adaptive state-of-being. Notwithstanding, the capacity for self-destruction – driven by meaning-making – is very predominant and strong in the human condition. This capacity for a seemingly backward-moving form of evolution is consistent with the lifespan development perspective – a theory central to constructivist thought – which holds that development is not always for the better (Hultsch & Deutsch, 1981).

The individual's complexity can thus be seen structurally and conceptually. While both aspects are important, it is the conceptual level that is seen as the driving force of the system (Ford & Ford, 1987). It is the richness of the complex interactions of its many parts that allows the system as whole to undergo adaptive self-organisation (Lotter, 1997).

3.4.2 Nonlinearity

Ecopsychology asserts that nonlinearity is present throughout the physical and biological universe (Thelen & Smith, 1994). Nonlinearity is integral to nature, is completely common, and is utterly simple. All it means is that the relationship between phenomena is not always proportional. Nonlinear interdependent dynamics have a penchant for creating such things as patterns, coherence, stable dynamic structures, networks, coupling, synchronisation, and synergy (Goerner, 1995b). Nonlinear dynamical systems are essentially manifestations of nature's complexity. They serve as the 'container' for such dynamics and may usefully be seen as the structure of complexity.

Indeed, chaos theory asserts that the incredible complexity of interrelating and interdependent elements of a system are structured by nonlinearity – and it is a dynamic, ever-changing structure. Chaos theory reveals the nonlinear world, where order is not dominant but complementary (Ainslie, 1995). Understanding nonlinear interdependence is the key to understanding how and why systems structure themselves. Nonlinear interdependent dynamics have a penchant for creating wholes out of parts. The spontaneous creation of assemblies of units through self-coordination is quite natural. Nonlinear systems may exhibit qualitative transformations of behaviour. A single system may exhibit many different forms of behaviour, all the result of the same basic dynamic. Crucially, nonlinear dynamical systems may be studied as a physical science. As such, it creates a profound form of ecologism by making the evolving ecology metaphor – ecological thinking – fully physical (Goerner, 1995a).

Humans are complex, nonlinear dynamical systems supreme (Butz, 1997). Constructivism holds that the individual is an adaptively evolving, open, dissipative system that self-organises and changes continuously over time (Kossmann & Bullrich, 1997). The individual is thus structurally linked to the world in a nonlinear manner, and all that can be said about nonlinear systems in general can be said about the individual.

3.4.3 Chaos

Ecopsychology posits that chaos is inherent in nature. The world is in a constant state of movement, change, and growth – a chaotic flux – and within such a world, chaos is an integral part of nature (Gleick, 1987). Implicate order is hidden in chaos. It is a holistic order, resulting from the complex interactions of interdependent variables co-effecting each other into a coherent pattern. It is order of the whole. This complex mutual-effect system is subtle, omnipresent, and potent. Before chaos, ecology was merely a metaphor for explaining how the world works. Now it is known that the world is, in fact, ecological. Essentially, nonlinear interdependent ecological dynamics generate ecologies everywhere from the molecular to the economic. These ecological dynamics lead to new images of when, how, and why structures arise and change. Chaos thus provides an ecological sense of how things work, providing the foundations of an ecological physics. As such, it produces an altogether more profound form of ecological thinking (Goerner, 1995b).

Chaos theory, then, is concerned with the process inherent in complex, nonlinear dynamical systems. It focuses on the sequence of evolutionary change over time and asks questions about order and disorder in nature (Gleick, 1987). The focus is on how order gives way to chaos, how order is discovered within chaos, and how order is again created out of chaos (Loye, 1995). The sequence of chaotic flux connects to order-building and an ecological sense of how nature works, providing the foundations of an ecological physics. The order in chaos provides a physical explanation for mysterious hidden global ordering. The activity of the elements of a mutual-effect system creates global order and this mutually created global order in turn puts pressure on each individual element toward conformity to the global pattern. The evolving ecological universe is thus lawful and physical. However, chaos is not completely predictable, controllable, or knowable, and this makes the universe a bit more illusive and endlessly mysterious (Goerner, 1995b). Indeed, chaos has a penchant for openness, spontaneity, and freedom that provides the matrix for evolutionary creativity (Sheldrake, 1990).

Constructivism personalises chaos. Humans, too, are subject to ongoing, adaptive, chaotic change. It is a fundamental tenet of constructivism that the self is in a constant

state of becoming. There is a core-structured centre, but this is ever-changing in response to internal and external circumstances (Cox & Lyddon, 1997). This constant state of becoming is a constant state of chaotic flux, for being complex nonlinear dynamical systems renders humans subject to the same chaotic process of change that characterises nature from the micro to the macro.

3.4.4 Evolutionary process

Ecopsychology holds that evolutionary process drives existence (Goerner, 1995a). All forms of being are part of one evolutionary flow, and all entities in existence are a manifestation of this underlying process (Capra, Steindl-Rast & Matus, 1991). Nature is in a continual state of flux and flow, sensing alterations in conditions and adapting to them, seeking order for new circumstances (Wieland-Burston, 1992). Everything in existence is part of an ongoing physical order-building process that has produced everything from molecules, to life, to galaxies, to civilisation. Evolution is a general process that proceeds inexorably and opportunistically to higher and higher levels of ordered complexity (Goerner, 1995a). Purposefulness is seen as a feature of life processes at all levels of organisation, and in particular that of the biosphere. It is the dynamism of living things that makes evolution possible (Goldsmith, 1993). Above all, such a universe is a vastly more integrated, holistically interconnected unity than was previously realised (Goerner, 1995a). It can thus be said that the evolutionary process is the driving force of all existence.

Chaos theory describes the evolutionary process as one of ongoing constancy and change. The evolutionary process entails oscillations between stability and instability, order and disorder, local constancy and global change – a turbulent sequence of chaotic change, where absolute rest and permanence do not exist. Indeed, the only real constant is the ongoing process of evolution. Order production is driven by the rules of energy flow. An energy-driven, evolving universe moves toward higher and higher levels of complexity. It is active, creative, goes in a direction, and is capable of producing both order and disorder. It is not regular, but it is lawful and patterned. Change is not gradual, but punctuated (Goerner, 1995a).

Constructivism embraces an evolutionary epistemology and is thus crucially concerned with the chaotic process of change. This manifests physiologically and conceptually. Physiologically, the individual is forever changing and adapting to the demands of life (Wetherell, 1996), and is subject to continuous self-organisation, self-construction, and self-reconstruction (Ford & Ford, 1987). Conceptually, life is active in its relationship to the environment. The individual is transformed by what the senses take in. The meaning-making so central to human experience is the result of interdependent systems shaping one another's organisational activity (Kossmann & Bullrich, 1997). In both cases, feedback and feed-forward mechanisms are involved. There is reciprocity between sensation and action and between individual and environment (Mahoney, Miller & Arciero, 1995). Present events and experiences are crucially connected to the past and crucially influence the future direction the individual takes. Present events and experiences occurring within the depths of matter and in the life of the individual are the result not only of physical influences from the past but also of creative decisions made consciously or unconsciously by the individual (McDaniel, 1990). As part of nature, the individual possesses the capability to adapt physiologically and psychologically to the modifications in his or her life circumstances (Wieland-Burston, 1992).

3.5 THE CONSCIOUS INITIATION OF THE CHAOTIC PROCESS OF CHANGE

As has been shown, the individual is embedded in nature and is subject to the processual laws of nature. These processes happen whether the individual is aware of them or not. Crucially, however, the individual can consciously harness the forces of nature – more specifically the chaotic process of change – for personal benefit. Ecopsychology provides a contextual backdrop for this, promoting the notion of a postmodern, ecological self that is pregnant with multiple possibilities of expression in life. Chaos theory gives flesh to this notion, making explicit the mechanics of the process of self-initiated change. Constructivism focuses on specific, crucial aspects of that process in relation to the individual and in doing so provides a coherent account of how self-initiated change is possible.

Four constructivist concepts allow for this: a) a postmodern conception of the self, b) a proactive self, c) nuclear core structure, d) self-organisation.

3.5.1 The postmodern self

Ecopsychology embraces the notion of a postmodern self, but takes this further by positing that the self is inherently ecological. The postmodern, ecological self is rooted in context, interconnectedness, interdependence, and evolutionary process (Cox & Lyddon, 1997; Stein & Markus, 1994). The self is essentially a construct co-created by culture, society, and individuals at a particular time and place, constituted in and through connections and relationships with others. It is an ecological self, in the sense that it involves a wide, expansive, field-like construal of self. It embodies a systems view of the individual in social and cultural context. Essentially, the self is part of an ecological system that is a conjunction of other people, environments, and objects. The self both shapes this ecological system and is a reflection of it (Fox, 1990). In this ecological construal, then, the self is not an isolated psychological entity (Mahoney & Moes, 1997). As such, the focus is not on the inner self but rather on the relationships of the person to the natural environment (including other human beings) (Fox, 1990). There is thus not only an individual self but also a family self, a community self, a human self, an earth self, and even a universe self (Berry, 1990).

Chaos theory takes the concept of the postmodern, ecological self out of the realm of the abstract and concretises it. In physical terms, the individual is an active complex of systems nested within systems that are seeking to preserve and elaborate their viability and coherence in the face of lifelong internal and external challenges to their integrity (Mahoney & Moes, 1997). The complex, nonlinear dynamical systems of the individual are in a constant interplay with other systems in the environment and both display the characteristics inherent in the chaotic flux of change. Importantly, systems do not function in isolation. The development of any given system is constrained and entrained by other systems involved in their own chaotic flux of change (Parry, 1996). The postmodern, ecological self is thus deeply systemic at all levels and, crucially, displays the physical, processual characteristics inherent in the chaotic process of change.

In constructivism, the notion of a postmodern, ecological self is wholeheartedly embraced and, indeed, is central to the approach. The individual is held to be a historically and contextually situated construct (Cox & Lyddon, 1997). In this view the self is a dynamic, highly diversified, and thoroughly connected complex of ongoing, self-organising processes. The self is inextricably embedded in social systems, which pervade the self so that developments in one necessarily influence the other to greater or lesser degree (Mahoney & Moes, 1997). Realities are thus multiple personal and social constructions. Crucially, the self is in a constant process of becoming and should be viewed as a multiplicity of possibilities or possible selves (Cox & Lyddon, 1997).

3.5.2 The proactive self

In terms of ecopsychology, the whole of nature is proactive (Goerner, 1995a; Oates, 1989). Nature is not passive. Entities that are complex nonlinear dynamical systems constantly seek out opportunities for ever-higher complexity and adaptation, an evolutionary process that is purposive (Neimeyer, 1995). This is linked to the notion of the universe being an ever-adaptive, ever-changing, living organism that constantly seeks higher levels of ordered complexity. This is true from the macro to the micro. Complex systems at all levels proactively seek to maximise their existence.

Chaos theory makes it clear that proactivity is an important element of a dynamical system's evolutionary seeking for higher forms of complexity. A dynamical system proactively attempts to adapt. Complex, nonlinear dynamical systems are far from passive in terms of finding solutions to environmental demands (Butz, Chamberlain & McCown, 1997). Such a system is a proactive agent and is capable of self-movement, participating in its own dynamics of change (Mahoney & Moes, 1997).

Constructivism is central here. Above all, the individual is seen as proactive. Human beings are active agents who, individually and collectively, co-constitute the meaning of their experiential world (Neimeyer, 1995) and co-create the personal realities to which they respond. They participate in a reciprocal manner between themselves and their environment and within different levels of their own activities, creating a life

theme that is progressively and dynamically constructed moment by moment, day by day, year by year – and the individual is the basic mediator in this process (Guidano, 1995). While there is a dialectical interplay between person and environment, psychological realities are nevertheless inherently private and the forum of significant psychological change lies in the domain of the self (Mahoney, Miller & Arciero, 1995) – crucially, a proactive self who has the capacity to initiate personal change.

3.5.3 Core structure

In terms of ecopsychology, core-structure is central to nature. While nature is in a state of constant, evolutionary, chaotic flux there is nevertheless permanence to it (Goerner, 1995a). Form is constant. Although ever-evolving and changing in the striving for higher and higher states of adaptive complexity, the underlying core structure remains true to its blueprint. Thus while there is a constant state of evolutionary, chaotic flux in the universe, the core structure remains constant. This is true on all scales, from the micro to the macro (Lemkow, 1990).

Chaos theory demonstrates the functioning of the core structure of complex, nonlinear dynamical systems. The core structure displays a protective tendency that serves to maintain system integrity and coherence in the face of internal or environmental threat, and can clearly be seen in the observation of system dynamics of change (Butz, 1997). The initial state of a system, whether relatively stable or unstable, is often remarkably resistant to change. The core structure is well formed and entrenched, and often it takes a very firm perturbation to move the system toward another state of order. Even then, the system may start to change but may subsequently revert to its previously dominant state. At other times (ie: chaotic instability), even small changes can initiate a huge, cascading sequence of chaotic change (Kruse et al, 1992). At a purely physical level, then, chaos theory explains how and why a system resists change and tries to maintain its core structure.

In terms of constructivism, human self-organising processes are functionally structured so that the centre of the living system – its core ordering processes – is given special protection against change. Such protection is most apparent when

demands for change are extensive and urgent, when the system experiences itself as being pushed too quickly or too far beyond the boundaries of its familiar functioning (Mahoney & Moes, 1997). The individual has both a physical and conceptual core structure. The physical structure is well described by the aforementioned processes inherent in dynamical systems, while the conceptual nucleus is the presence of deep-seated, form-generating, abstract ordering rules that impose constraints on what may be meaningfully expressed by the individual at any given time (Mahoney, Miller & Arciero, 1995). The deep-structure ordering rules that organise ongoing experience are tacit processes, well beyond conscious awareness (Guidano, 1995). The core structure is there to protect the internal coherence and integrity of the individual (Neimeyer, 1995). Importantly, the core structure is dynamic, developmental, and dialectical (Mahoney, Miller & Arciero, 1995).

3.5.4 Self-organisation

Ecopsychology holds that the universe and all the complex, nonlinear dynamical systems within it are self-organising. Nature's systemic determinism and randomness, order and disorder, stability and instability are allies, and combine to trigger spontaneous pattern formation inherent in a given system. The system's hidden potential is unfolded and the implicit is made explicit. New structures emerge, and these are co-determined by their boundaries in a kind of co-evolution. This is a marked type of self-organisation (Kratky, 1992) and only occurs in open, dissipative systems (Prigogine & Stengers, 1984). Self-organisation is a principle of individuation whereby intrinsic individuality is consistent with nature's essential interconnectedness and interdependence (Mathews, 1991).

Chaos theory, too, asserts that self-organisation is an inherent physical characteristic of complex, nonlinear dynamical systems and makes explicit the process of such. Self-organisation found in non-living systems provides both a metaphor and a conceptual model for living systems and supra-living systems (eg: cities) (Goerner, 1995a). Self-organising development is a principled process of nonlinear dynamics. It is a fundamentally dialectical process, in which order emerges out of a system's attempts to elaborate a dynamic balance in the face of interacting contrasts (eg:

instability and instability) (Francis, 1995). New forms of organisation emerge through the process of order through fluctuation, and this only occurs when a system is in a far-from-equilibrium state. Self-organisation is usually a result of a small fluctuation in a system being amplified into a new form (Goerner, 1995a). Chaos theory thus clearly explains the system's attempts to adapt to perturbation: the system seeks solutions beyond its previous parameters and, having found some sort of solution, begins to self-organise toward a new, more complex, and adaptive state of order. Essentially, new information found through chaotic behaviour allows the system to become more complex and more adaptive in the face of novel situations or stimuli (Butz, Chamberlain & McCown, 1997).

This self-organising, evolutionary striving for higher complexity is a crucial, key concept in constructivism. Individual human systems self-organise so at to protect and perpetuate their integrity, and in doing so develop via structural differentiations (Mahoney, Miller & Arciero, 1995). The individual is essentially a system devoted to its own realisation. To this end it satisfies its own energy requirements, grows, repairs or renews its own tissues and reproduces itself (Mathews, 1991). Human beings are waking self-organisations in need of energy to keep going, and the individual is essentially directed by nature to satisfy this need (Goerner, 1995b). Human systems maintain and elaborate themselves in the context of ongoing interactions with themselves, their medium, and other systems (Mahoney & Moes, 1997). In doing so, the individual is literally the central reference point for all of his or her experiences and survival efforts (Mahoney, Miller & Arciero, 1995). Human self-organisation is particularly complex in that the individual has the capacity for symbolic processes. This is a necessary requirement, in that the individual's self-organising processes are embedded in social and symbolic contexts. Importantly, the process of active self-organisation continues throughout the individual's life-span in response to both internal and external dynamics, and the order of experience becomes complex and unique to each individual (Mahoney & Moes, 1997).

Crucially, while much of self-organisation occurs at a level beyond conscious awareness, it is nevertheless the case that self-organisation can be consciously initiated (Abraham, 1992). The crucial message of constructivism is that self-organisation may be consciously initiated by the proactive self. The individual is not a

slave to the self-organising process of evolutionary unfolding. Each living moment arises out of a simultaneous act of effecter and effected, and the individual co-creates the unfolding self-organisation (Goerner, 1995a).

3.6 SUMMARY

This chapter aimed to integrate constructivism, ecopsychology, and chaos theory. The strategy employed was to focus on the core fundamentals of each field, integrating them in a manner relevant to the needs of the study. It was stressed that a full and comprehensive integration is beyond the scope of the study, but that the integration could nevertheless be used beyond the confines of the paper and serve as a basis for the development of a strong and coherent conceptual and applied framework for psychology. This could help to counter the high fragmentation, inchoateness, abstraction, and impracticality that characterises these fields and help fulfil their potential in psychology. The integration was predicated upon the logic that humans and nature are mutually embedded, and as such humans are necessarily subject to nature's laws. Humans are nevertheless proactive and may utilise such principles to initiate their own chaotic process of psychological change. The foundation of the integration was taken to be the ecological worldview, a holistic viewpoint that stresses the unity of existence. This entails a fundamental embeddedness of all phenomena in the cosmos. A systemic viewpoint, it sees all existence as a unified living whole. Accordingly, humans and nature are necessarily mutually embedded and this entails nonduality (inseparability of humans and nature), interconnectedness and interdependence (ongoing interrelationships between all systems), and subjection to natural law (inescapable constraints imposed on humans). Natural laws were discussed: systemic complexity, nonlinearity, chaos, and evolutionary process were conceptualised as the character, structure, process, and driving force of nature respectively. Within this conceptualisation, the dialectical interplay between individual and environment and the ever-changing, ever-adapting, sequential process of chaotic flux – characterised by order and disorder, stability and instability – was stressed. The notion of a postmodern, ecological self was discussed. The individual was held to be proactive, core-structured, and self-organising – an individual with the capacity to consciously initiate the chaotic process of psychological change.

CHAPTER FOUR

METHODOLOGY

4.1 THE RESEARCH PROBLEM

The review of the literature shows clearly that constructivism, ecopsychology, and chaos theory are of great relevance for psychology and, individually and collectively, hold great potential for psychological investigation and application. Despite this, they are highly fragmented, inchoate fields characterised by a diverse, often confusing and impractical mix of approaches and methods. In particular, there is a conspicuous dearth of simple, down-to-earth, pragmatic investigative and analytical approaches and methods which can be practically used in therapy, are easy to use and understand, and yield practical and relevant data – a lack which seriously constrains the potential of these fields.

4.2 GOALS OF THE RESEARCH

The aim of the research, in operational terms, is to demonstrate the psychological process of change in terms of the principles of chaos theory. The process of psychological change is demonstrated by analysis of graphical maps of the observed variables and corresponding chaotic process of change in three-dimensional phase space and time-series graphs. Graphical analysis is triangulated with clinical observations and verbal feedback from participants.

In pursuing this overall aim, two goals emerge:

1) The main goal of the research is to simply and clearly demonstrate the concepts and application of chaos theory in a therapeutic situation.

   This goal entails: a) creating a conceptually sound, relatively simple research design, procedure, intervention, and analysis, and b) demonstrating aspects of

the chaotic process of psychological change by means of conducting a real-life therapeutic intervention.

As has been shown, a gap exists for the development of relatively simple and practical explanatory and applicatory methods utilising chaos theory that can yield pragmatically useful data. There is also an acknowledged need for innovative research methods that can draw out the nuances of the approach and advance its real-life applicability, and it is in this spirit that this research goal is pursued.

2) The second goal is to integrate the fundamental concepts of constructivism, ecopsychology, and chaos theory, relevant to the study's main goal.

Although fundamental to the main goal of the research, this goal nevertheless constitutes an important aim in its own right. These fields have been variously linked in the literature in different ways, but as yet have not yet been integrated into a cohesive framework – a surprising omission, given that the core concepts and principles are so highly complementary. It is argued that the integration of these three fields, by means of drawing upon the distillation of their fundamental principles and tenets, yields a potentially powerful framework for psychological investigation and application. This framework arguably has development potential for application far beyond the limits of this study.

4.3 SELECTION OF PARTICIPANTS

Three participants were chosen, by means of snowball sampling. Such a sampling technique requires approaching a small number of people in the target population who are asked to introduce the researcher to other people who, in turn, are invited to help recruit others to assist. In this way, an initial small sample may 'snowball' into a larger one (Breakwell, Hammond & Fife-Schaw, 1997). This is also called network, chain referral, or reputational sampling and is based on the analogy of a snowball, which begins small but becomes larger as it is rolled on wet snow (Neuman, 1997).

This technique was chosen, as a primary consideration in the selection of participants was to make recruitment as near to real-life conditions as possible. Accordingly, it would be the potential participant – the client – who would take the initiative in coming forward as opposed to being directly asked to take part in the study.

Accordingly, news of the proposed study was spread by means of word-of-mouth to colleagues, friends, and acquaintances with the request that they in turn announce the proposed study to people within their respective social circles. This resulted in several people expressing interest in the study. The deciding factor for acceptance of candidates was the perceived willingness to commit to the study, as determined by the researcher. One woman in particular expressed a great desire to participate. The woman's husband then asked to take part and, in turn, the woman's daughter (from a previous marriage) subsequently expressed interest in participating. Each individual appeared to be seriously committed to the study and were thus deemed ideal participants.

Before accepting the participants, it was stressed that the study would be quite time-intensive and demanding. Essentially, it would entail an hour of therapy each week and the completion of a self-report rating scale four times a day, seven days a week, for three months. The ramifications and risks of psychological intervention with respect to initiating a chaotic process of change were fully explained. It was further made clear that participation was entirely voluntary and that any participant could withdraw from the study at any stage.

4.4 THE RESEARCH DESIGN

The research design is a descriptive field study, utilising the intensive single-case quantitative (time-series) design for data collection and a qualitative analysis by means of graphical analysis, clinical observations, and verbal feedback from participants. The design is in line with the constructivist orientation of the study, in that the overall investigation is empirical in character and the focus of interest is on the participants' subjective realities.

The descriptive design is a research strategy that enables the investigator to define the existence and delineate characteristics of a particular phenomenon (Heppner, Kivlighan & Wampold, 1999). More specifically, it is an investigative focus that seeks to carefully map out a situation or set of events in order to describe what is happening behaviourally (Rosnow & Rosenthal, 1996).

The goals of descriptive research are all relevant to this study to greater or lesser degree: describe a process, mechanism, or relationship; give a verbal or numerical picture of data; find information to stimulate new explanations; present basic background information or a context; create a set of categories or classify types; clarify a sequence, set of stages, or steps; document information that contradicts prior beliefs about a subject (Neuman, 1997).

In pursuing these goals, the researcher begins with a well-defined subject and conducts research to describe it accurately (Neuman, 1997). Observation is at the core of the descriptive strategy. As such, the utility of a descriptive study is directly dependent on the quality of observations, instruments, or assessments. Descriptive designs do not attempt to exercise experimental control but are rather conducted in a real-life setting. This makes the descriptive field study generally high in external validity but low in internal validity (Heppner, Kivlighan & Wampold, 1999). Essentially, the outcome of a descriptive study is a detailed picture of the phenomenon under investigation (Neuman, 1997). A descriptive design is used in this study, then, as the aim is to clearly describe the natural occurrence of the chaotic process of change.

In counselling psychology, single-subject studies are a common example of the descriptive research strategy and have many advantages (Heppner, Kivlighan & Wampold, 1999). The single-subject design is concerned with the systematic, repeated, and multiple observation of an individual. This involves the intensive and rigorous examination of relevant variables, which are typically planned before the beginning of data collection. Repeated observation allows for a comparison of variables over time, and the focus is on their temporal unfolding. Observations are often made from multiple sources, allowing a multi-modal investigation (eg: cognitive, behavioural, affective). Single subject designs are versatile and are

especially well suited to testing new research methodologies, allowing the investigator to 'experiment' with a new methodology or procedure. The rich source of data yielded can also spark ideas or hypotheses. The design also approximates the one-to-one situation encountered in therapy – an important consideration, as in counselling psychology research it can be critically important that real clients are used in a real-life setting. The single subject design is particularly well suited to describing the idiosyncrasies of individual clients. This is important as individuals differ from each other in significant ways and process information about themselves and their experiential worlds in idiographic ways. It is also one of the primary strategies used to isolate and clarify the mechanisms of change within the therapeutic process – a crucial aspect, given the overall aim of this study. The intensive single subject design additionally provides strong empirical support and thus lends greater utility to the research design.

The application of time-series measurement strategies and the utility of idiographic assessment are particularly important considerations in nonlinear dynamical modelling (Haynes, 1995). Although the time-series approach is amenable to tracking dynamic dimensions of variables, it has seldom been used for this purpose (Haynes, Blaine & Meyer, 1995). In general, there is a need for more temporally sensitive measurement approaches and data analytic techniques in this line of investigation (Heiby, 1995). The defining characteristic of time-series measurement is multiple observations over time (Heppner, Kivlighan & Wampold, 1999). The sequence of observations is examined for each individual participant, and data pooling across participants is avoided (Levine & Fitzgerald, 1992). The threat to internal validity, as a result of the effects of history, is a major drawback to this approach (Heppner, Kivlighan & Wampold, 1999). The problem of history, however, is encountered in real-life therapy on a day-to-day basis as many random factors influence progress during therapy (Heath, 2000). As a prime consideration in the study is to ground it in real-life, this must of necessity be a design shortcoming.

4.5 PROCEDURE

Once the research goals, design, intervention, and method of analysis had been determined, the procedure was as follows:

- Three participants were recruited. They were briefed on the proposed study with special emphasis being placed upon the purpose of the research, the inherent risks associated with undertaking psychological change, the time required for weekly therapy, and the level of commitment necessary to complete self-report rating scales four times daily for three months. Formal consent to take part in the study was subsequently obtained.

- The therapeutic intervention was conducted, over a three-month period (July 2, 2001 to September 30, 2001). The first week (July 02, 2001 to July 7, 2001) of the intervention was a pilot period, during which time participants were instructed to acquaint themselves with the self-report rating scales and the routine of completing them, and were given the opportunity to ask questions and raise concerns regarding the study. The constructs and variables to be measured were co-constructed by the participants and researcher, and the self-report scales were specially designed for each individual.

- The psychological process of change was recorded over the entire intervention period. Participants completed the (pen and paper) self-report rating scales four times daily (morning, noon, afternoon, night) at four-hour intervals (8am, 12 noon, 4pm, 8pm), yielding an overall reflection of their state-of-being throughout the day with regard to their three measured variables. A total of 364 observations per variable were recorded for each participant.

- After the intervention, the participants were debriefed. This was in line with the basic tenets of debriefing: providing the participants with any

required or requested information concerning the nature of the study, discussing the participants' experiences of the research process to check for the presence of any unintended or unanticipated effects of the research, and checking to see if any further intervention was necessary to negate the effects of the investigation (Breakwell, Hammond & Fife-Schaw, 1997). Indeed, therapy continued beyond the time-frame of the research programme in the form of closely monitoring and further facilitating the participants' continuing chaotic process of change.

- At the end of the intervention the self-report measurements obtained were collated and input into a desktop personal computer, utilising SPSS 10 and SigmaPlot 2000 software. Both software programmes generated graphs that reflected each participant's system evolution over the three months of the intervention as well as an overall system state. The SPSS 10 programme yielded time-series graphs and the SigmaPlot 2000 programme yielded three-dimensional phase space plots.

- A qualitative analysis of the three-dimensional geometric phase space and time-series data was then conducted, linking the concepts and principles of the chaotic process of psychological change to the graphical data resulting from the analysis. Clinical observations and verbal feedback from participants were triangulated with results from the graphical analysis.

4.6 PRINCIPLES OF THE INTERVENTION

A therapeutic intervention utilising the integrated principles of constructivism, ecopsychology, and chaos theory was conducted. This was an applied ecopsychological intervention, following the recognised framework of therapy stages (ie: exploration, goal-setting, action) (Egan, 1998). The intervention was individually

tailored for each participant, using specially designed self-rating scales unique to the individual. The overriding aim was to construct a simple and practical intervention that would yield useful data relevant to the chaotic process of psychological change.

The intervention was grounded upon certain basic principles:

1) The integrated concepts and principles of constructivism, ecopsychology, and chaos theory served as a broad conceptual and theoretical framework for the intervention. Within this, the use of metaphor and guided imagery provided a narrower working structure.

   The metaphor was nature-based (ecopsychology), likening the planting of a seed in soil to that of planting the image of a desired state-of-being in mind. The guided imagery rested on the notion that individuals have the capacity to proactively initiate their own, self-organised process of psychological change (constructivism). Individuals may choose and plant only those seeds in soil that they wish, and similarly may choose and plant only those images in mind they wish to see manifest in their life. The process of a seed's growth was likened to the chaotic process of psychological change (chaos theory).

2) In the nature-based metaphor, the recognised stages of therapy were synchronised metaphorically with the stages of the chaotic process of change and the stages of choosing, planting, and nourishing a seed to growth in soil.

   Specifically:

   - the initial stage of exploration (ie: eliciting, defining, clarifying, and exploring themes of concern to the individual) in therapy was likened to exploring the client's attractor constellation (ie: the prevailing state of the individual's system), which in turn was likened to exploring natural areas to find fertile ground where a seed may be planted;

- the goal-setting stage of therapy was likened to deciding what new attractor constellation was desired by the participants, which in turn was equated with deciding which kind of seed to plant;

- the action phase of therapy was linked to a change in one control parameter of each participant's system and resulting self-organisation, which in turn was likened to the sequence of preparing the ground, planting the seed, and nourishing it.

Essentially, then, by the use of metaphor each participant was led in therapy through a process of exploring current life concerns, deciding which problem area to work in, and taking action to reach agreed-upon goals.

The use of metaphor as a means of intervention was carefully considered. Metaphor can usefully be defined as a figure-of-speech in which a word, phrase, or concept is applied to something else that it does not literally denote in order to imply a resemblance (Barker, 1985). Essentially, metaphor carries meaning over from one domain to another (Kopp, 1995). At the same time, a metaphor can be developed and extended beyond a brief statement of applicability or relevance (Rosenblatt, 1994), effectively communicating in several dimensions (Combs & Freedman, 1990). In doing so, metaphor can become a key that unlocks new possibilities for self-insight and therapeutic change (Kopp, 1995), facilitating experiences that can bring forth resources and provide new perceptions and possibilities (Combs & Freedman, 1990). Above all, metaphor must make sense within the context of the therapy used. The use of metaphor in psychology and therapy is widespread and very powerful in that people easily relate to metaphor and tend to be receptive to it (Barker, 1985). The nature metaphor used in the intervention was, arguably, a relatively easy-to-grasp metaphor which nevertheless lent itself to rich exploration on multiple levels.

3) In terms of the use of guided imagery, participants were progressively instructed how to visualise their desired state-of-being (ie: the desired therapy outcome):

- in the first month, participants were instructed a) how to visualise using all of their sensory modalities (ie: vision, hearing, touch, smell, taste) and modes of functioning (ie: thoughts, emotions, behaviour, physical sensations), b) how to experience visualisation as both a participant (ie: experiencing the image from their own perspective) and observer (ie: watching the chosen image from a distance, as in looking at a video), c) how to control and manipulate objects in mind, and d) how to interact with others a given image;

- In the second month, visualisation skills were focused on constructing and sharpening a picture that would constitute the 'image-seed' to be planted;

- in the third month, after planting the chosen image-seed (ie: getting a rich and detailed image and experience of the image in mind, and then keeping it fixed there), other scenes related to the successful growth of the image-seed (ie: scenes that implied the successful outcome of therapy) were visualised.

Guided imagery (also known as visualisation and mental rehearsal) can be defined as a polysensory experience using all the senses to create or recreate an experience in the mind, and is of demonstrated effectiveness in therapy (Williams, 1998). Guided imagery entails the conscious creation and direction of images by the individual (Peper & Holt, 1993). Importantly, guided imagery can be used to create new experiences in the mind and envision potential futures. Because imagery is embedded in a human nonlinear dynamical system, even slight changes cognitively effected can have powerful reorganising effects on all other parts of the self (ie: self-organisation). In this manner, imagery becomes a creative force that can drive the emergence of a more complex, more adaptive self (Abraham, 1992). Images are self-programming devices (Nucho, 1995), which enable the individual's future actions to be more effectively targeted toward his or her goal (Marks, 1999). Imagery for change is a powerful skill that works in harmony with other agents for change in an individual's life and is one of the most natural, gentle,

and safe means of psychological intervention (Fanning, 1994). Crucially, as humans are proactive and construct their own versions of reality, they can consciously choose to envision a desired future and proactively image their way to a desired outcome.

4) The intervention followed a well-defined sequence and process:

- two extended sessions were held to explore the participants' current concerns and presenting problem, at the end of which an agreed-upon goal for each participant was co-constructed by researcher and participants;

- a hypothetical construct taken to represent the system of each individual in relation to the presenting problem was modelled, consisting of component variables (ie: the dominant thought, emotion, and behaviour associated with the presenting problem) jointly decided upon by participant and researcher;

- the intervention was then conducted, with the aim of effecting change in a particular component variable (ie: control parameter), again co-constructed by researcher and participants;

- constructivist-oriented therapy (eg: narrative, gestalt, artwork) was then conducted over the three-month period, within the integrated conceptual and theoretical framework as outlined.

4.7 MEASURING INSTRUMENTS

The specially designed measuring instruments used were numerical self-report rating scales (see Appendices A, B, and C), measured at the interval level. The rating scales pertained to each individual's system and measured the modalities of thought, emotion, and behaviour in relation to the person's chosen area of concern targeted in

therapy. The scales were rated from 0 to10 in an attempt to capture optimum variability of rating and allow for meaningful graphical mapping of the individual's evolving state-of-being.

The choice of self-report measurement is a crucial factor in the research design. The constructivist underpinning of the study stresses the unique subjectivity of the individual, and accordingly it was deemed imperative that the state-of-being measured for change should reflect the uniquely constructed world of each participant. Self-report methods are ways of data collection in which the research participants describe their own behaviour or state-of-mind (Rosnow & Rosenthal, 1996). While they have unknown psychometric properties, subjectively scored self-reports can be very rich in that they may better reflect the construct being measured (Heppner, Kivlighan & Wampold, 1999). The assumption is made that participants respond honestly and accurately and that the measures accurately reflect the true state-of-being of the individual (Breakwell, Hammond & Fife-Schaw, 1997). Self-reports are particularly advantageous in therapy, as the subjective quality of response is deemed more important than indicators using a locus other than the self. Ad hoc rating scales created by a researcher – as in this study – can be particularly useful, as they can be tailored to measure just what the researcher has in mind (Heppner, Kivlighan & Wampold, 1999).

The four-hourly measurement interval adhered to in the self-rating scales was a carefully chosen strategy. Time series measurement can provide accurate information about the evolution of a system only to the degree that the sampling rate is sufficient to capture its time course. The sampling must occur at a rate that enables any single measure to be placed in a dynamic time course context (Haynes, Blaine & Meyer, 1995). The four-hourly measurement interval ensured a morning, noon, afternoon, and evening representation of the participants' systems. This was a consistent interval, and the representation would thus have coherent meaning (Chamberlain & Butz, 1998).

Rating scale is the common name for a variety of measuring instruments in which the observer or judge gives a numerical value, either explicitly or implicitly, to certain judgements or assessments (Rosnow & Rosenthal, 1996). Rating scales may be nominal, ordinal, interval, and ratio in character, reflecting progressively higher levels

of measurement (Neuman, 1997). Interval scales were used in this study. In this method of rating, different numbers reflect more or less of some underlying dimension and numerically equal distances on the scale represent equal distances on the underlying dimension (Grimm, 1993). Using an interval scale assumes an arbitrary, relative zero point in measurement. Essentially, there is no absolute or meaningful zero point – the arbitrary zero is just there to help keep score (Neuman, 1997). The interval scale uses continuous variables, whereby an infinite number of possible values fall between any two observed values and there is no gap between the adjacent numbers (Grimm, 1993). Continuous variables can be divided up into an infinite number of fractional parts. A single figure is recorded when measuring a continuous variable, but this really represents an interval on the measurement scale rather than a single value. It is therefore always an approximate value (Breakwell, Hammond & Fife-Schaw, 1997).

4.8 DATA ANALYSIS

A triangulation of methods was used. Three-dimensional geometric phase space plots, linear time-series graphs, clinical observations, and verbal feedback from participants were used in combination in an attempt to provide a rich and coherent picture of the systems under investigation.

Chaos is measured by the characteristics of its dynamics. To study the chaotic process of change, time-series analysis must be undertaken. Many of the techniques used for this are extremely complex and sophisticated (Kellert, 1993) while others tend to be simpler, both conceptually and methodologically (Abraham, 1992; Butz, 1997). As a key factor in this study is that of pragmatic utility, the analysis is aligned with the latter orientation and thus opts for a graphical, qualitative treatment of the data that is relatively easy both to conduct and interpret. In this kind of analysis, so-called statistical precision is arguably lost in favour of a ‘rougher’, more heuristic approach (Johnson & Dooley, 1996). Accordingly, three-dimensional phase space plots have been used to model the process of change in each of the participants. The phase space plots map the evolving state of the system month-by-month and overall.

Traditional, linear time-series graphs were also used, as these are a useful adjunct to nonlinear analytic techniques. Indeed, there is much scope for the integration of linear and nonlinear methods of analysis (Johnson & Dooley, 1996). Time-series graphs add a different dimension to the analysis. Essentially, graphical information yielded by three-dimensional and time-series graphs are limited on their own. Taken together, however, they provide a far richer and more nuanced picture of the system under investigation.

Clinical observations and verbal feedback from participants were used in combination with the graphical analysis. Again, these added further important dimensions to the analysis. The analysis of chaos in the 'rough' (ie: heuristic) way it was used in this study means that interpretation of the graphs was necessarily highly subjective. The judicious use of clinical observations was thus used as a means of validating interpretations of the graphical data. Verbal feedback enhanced this strategy, utilising the participants' comments regarding their process of change to further validate interpretations.

4.9 SUMMARY

This chapter outlined a relatively simple, easy-to-use, conceptually sound methodology designed to yield practical and relevant data in a real-life therapeutic intervention based on the highly complex principles of chaos theory. The goals of the research were outlined in detail: 1) simply and clearly demonstrate the concepts and application of chaos theory in a therapeutic situation; 2) integrate the concepts of constructivism, ecopsychology, and chaos theory, relative to the main goal. The snowball sampling technique used for the selection of participants was discussed. The research design was delineated as a descriptive field study utilising the intensive single-case quantitative design for data collection, and a qualitative analysis by means of a triangulation of graphical modelling in geometric phase space, time-series graphs, clinical observations, and verbal feedback from participants. The empirical character of the study and focus on participants' subjective realities were highlighted. The procedure of the study was discussed, outlining the steps taken in detail from recruitment of participants to debriefing. Basic principles of the intervention were

discussed. The intervention rested on the integration of constructivism, ecopsychology, and chaos theory, and utilised a nature-based metaphor and guided imagery – essentially an applied ecopsychological intervention. Measuring instruments were discussed; these were self-report rating scales, specially designed for each participant. Data analysis was discussed; this was by means of studying the pattern of the participants' system behaviour in geometric phase space, time-series graphs, clinical observations, and participants' verbal feedback.

CHAPTER FIVE

RESULTS AND DISCUSSION

5.1 INTRODUCTION

In presenting and discussing the results of this study, it is first and foremost important to stress that references to chaos and principles of the chaotic process of change are not to be taken literally in the analysis. No claim is made to having detected chaos in the quantifiable, statistical sense in the systems under investigation. The aim is to simply and clearly demonstrate the concepts and application of chaos theory in a therapeutic situation. Accordingly, the terminology of chaos and its principles is used in a heuristic manner to understand and describe the process of change in therapy relevant to the participants.

This heuristic kind of application of chaos theory should not be underestimated. It is considered to be a powerful method of analysis and explanation (Abraham, 1992; Butz, Chamberlain & McCown, 1997). When used in conjunction with clinical observations, the heuristic approach potentially yields penetrating insight and a good understanding of clients. It is also a good starting point for further exploration with clients and for generating hypotheses regarding intervention (Reiter, 1992). In this vein, results were discussed with clients in debriefing and verbal feedback was thus also used as an aid to understanding. Accordingly, clinical observations and verbal feedback are discussed in conjunction with the graphical analysis. The graphical analysis is conducted by reference to three-dimensional phase portraits and linear time-series graphs.

The strategy for discussion is to consider each aspect of the chaotic process of change with reference to the three cases taken together. Each individual changed in therapy to greater or lesser degree, showing clear evidence of certain aspects of chaotic movement in particular. As such, the full sequential process of chaotic change cannot be demonstrated with reference to only one individual. Taken together, however, the

three cases offer a rich description of the chaotic process of change and indeed clearly demonstrate the concepts and application of chaos theory in therapy.

An overview of each case study is presented first, in summarised form, to provide background information and contextualise the results and discussion. A short section on graphical analysis is presented, to aid understanding of the discussion. The chaotic process of change is briefly summarised, to provide further context. Each relevant principle of chaos theory is then presented separately. Very short introductory comments on each principle are offered, to further contextualise the results and discussion and aid understanding thereof. The results of the graphical analysis are given first and discussion thereof follows with reference to clinical observations and verbal feedback. The separate treatment of each aspect of chaos theory and the integrated presentation of results and discussion is a strategy designed to yield a particularly clear, coherent, and rich description of the concepts and application of chaos theory in therapy. Importantly, the discussion of chaos theory concepts is integrated with aspects concerning their therapeutic application as they are too interwoven to be discussed separately.

5.2 CASE STUDIES

5.2.1 Case study 1: Darryl

Darryl (39) is a South African male educated to matric level. He has been married to his present wife for two years. He has an 11-year-old daughter from his previous marriage, but she does not live with him. Darryl is a fitter by trade, working for a relatively small company. Darryl's presenting problem was a general feeling of dissatisfaction and distress due to what he perceived as a lack of fulfilment in life.

In the exploration phase of therapy, Darryl's major areas of concern were revealed as: work (underutilised), finances (a chronic shortage of money), friends (an inability to maintain relationships), interests (not being pursued due to money problems), and separation from his daughter (legal problems preclude their reunification). Darryl was particularly distressed at the sense of underutilisation he experienced at work. He

reported that he had “lots of energy” which was not being used at work, and that this was causing a great deal of frustration in his life.

Accordingly, in the goal-setting phase of therapy Darryl decided that he would like to tackle the problem of underutilisation at work as it was his most pressing issue and most strongly linked by him to his lack of fulfilment in life. Darryl felt that sorting out his work problem would be the key to improvement in other areas of his life. Specifically, he believed that an improvement in his work situation would likely improve his financial situation, and that in turn would increase his motivation with regard to pursuing interests, friendships, and reunification with his daughter. The overall therapy goal, co-constructed by participant and researcher, was thus to increase Darryl’s fulfilment in life.

Darryl and the researcher co-constructed the self-report scale (see Appendix A) for the research, choosing three variables that would represent Darryl as a system. The variables chosen were: degree of underutilisation at work (thoughts), level of frustration (emotions), goal-orientation of actions (behaviour). The variable of underutilisation at work was chosen as the system control parameter to target for change (ie: the primary area of intervention).

In the action phase, therapy proceeded accordingly, utilising the nature-based metaphor of planting a seed and nurturing its growth. Visualisation of the desired outcome (ie: experiencing greater utilisation at work) was taken as a metaphorical seed, which was nurtured by therapeutic work. The focus of therapy quickly shifted toward a much broader and longer-term perspective when it became apparent that enjoying greater utilisation at work meant that Darryl would perhaps have to find and pursue a new line of work.

The outcome of therapy in terms of the initial aim of an increased experience of work utilisation was met to a limited degree. It should be seen as change-in-progress, however, as Darryl was looking at different fields of endeavour to pursue in the future. Clear-cut progress in terms of bettering his work situation, in turn, led to a reported sense of greater fulfilment in life for Darryl. He further reported that the most valuable outcome of therapy was that of greatly heightened self-awareness.

5.2.2 Case study 2: Belinda

Belinda (33) is a South African female who is educated to matric level. She is married to Darryl, and this is her third marriage. She has an 18-year-old daughter from her first marriage, but they do not live together. Belinda is a housewife and self-employed seamstress with her own home-based business. Finding and holding a job has always been difficult for Belinda as she suffers from dyslexia. Belinda's presenting problem was a high level of frustration, due to what she perceived as the impact of numerous life circumstances beyond her control.

In the exploration phase of therapy, Belinda's current concerns emerged as the lack of finances (a chronic shortage), the after-effects of a serious motor vehicle accident (financial and physical problems), relationship problems (with various people connected to the family), and lack of self-esteem (in particular, no assertiveness). The lack of money was particularly distressing for Belinda. She saw no hope of improvement in her financial situation whatsoever, and she believed that most of her frustration emanated from this source.

In the therapy goal-setting phase, Belinda accordingly expressed a keen desire to tackle the issue of lack of finances. Improving her financial standing, she believed, would make a huge difference to her life both materially and in terms of increasing her motivation to deal with the other negative life circumstances that she currently believed to be beyond her control. Success in therapy would be measured by a decreased level of frustration in Belinda's life.

In co-constructing the self-report scale (see Appendix B) for the research, Belinda and the researcher chose the variables of level of hope (thoughts), level of frustration (emotions), and level of withdrawal (behaviour) as a meaningful representation of her system. The level of frustration was chosen as the system control parameter to target for change.

In the action phase, therapy proceeded accordingly, utilising the nature-based metaphor of planting the seed of the desired outcome in visualisation and facilitating its growth by means of therapeutic work. Belinda gradually came to the realisation

that improving her situation would require personal change. Specifically, earning more money would be the end result of personal inner change and doing things differently in her life and could not be seen as a goal in itself.

The outcome of therapy for Belinda was one of limited success in various areas. Belinda successfully explored new ways of making money, she felt more positive overall, became more assertive, was more open with people, was full of enthusiasm over her proposed new income-producing work, was generating more practical ideas for problem-solving, had learned to relax more, and had increased control over her life. However, her level of frustration was still high. For Belinda, the most valuable aspect of therapy was that her mind was now more open to new suggestions and input.

5.2.3 Case study 3: Carmen

Carmen (Belinda's daughter) is an 18-year-old South African female (she turned 18 half-way through the intervention). Carmen lives with her grandparents, but stays with her biological father on weekends. She was estranged from her mother for several years, but was subsequently reunited with her and now visits her often. Carmen is in Grade 11 and is currently doing fairly well academically. Carmen's presenting problem was a lack of motivation at school. This was particularly distressing for her as, firstly, she realised the importance of getting good academic results for the future and, secondly – and most important for her – she was keen to prove a point to everyone around her that she could perform well academically.

Indeed, in the exploration phase of therapy the underlying need to prove a point to others was very pronounced, surfacing to greater or lesser extent in all of Carmen's life issues. The main areas of concern were school (in particular, lack of motivation and feeling left out), family (relationships, unresolved issues), relationship with boyfriend (he's much older), work (part-time job badly needed), future education (great desire to attend college or university), and living overseas (great desire to emigrate to the UK).

In goal-setting, Carmen expressed a strong desire to work on increasing her level of motivation at school. If she could do this, she believed, her marks would dramatically improve and the rest of her life would fall into place. In particular, she would show others what she was capable of and thus prove the point that she so desperately wished to make. Increased level of motivation was thus set as the goal of therapy, and would also serve as the measurement of outcome.

In co-constructing the self-report scale (see Appendix C) for the research, Carmen and the researcher chose the variables of level of motivation (thoughts), level of anger (emotions), and level of withdrawal (behaviour). The system control parameter chosen to target for change was level of motivation.

In the action phase, therapy proceeded accordingly, utilising the nature-based metaphor of planting the seed of desired outcome in visualisation. Therapeutic work was aimed at nourishing and facilitating growth toward the desired therapy outcome.

In terms of outcome, Carmen did not show any marked improvement in her level of motivation. She did, however, report that her level of motivation increased dramatically after every therapy session but that it gradually plummeted again in the week to follow. The most useful aspect of therapy for Carmen was the focused use of visualisation (she was already familiar with visualisation, in a different context and at a different level).

5.3 THE GRAPHICAL ANALYSIS OF CHAOS

Before presenting and discussing the results of the study, it is prudent to take a brief look at the relevant principles of the graphical analysis of chaos. This will aid and enhance the understanding of the analysis.

The graphical analysis of chaos in this study is relatively simple and straightforward, but it does presume a certain familiarity with the principles and terminology of chaos theory and a working knowledge of how to read both three-dimensional phase portraits and linear time-series graphs. In using graphs in chaos theory application in a

qualitative, heuristic manner as an aid to understanding clients, as in this study, mathematical or statistical skills are not a prerequisite as there is no attempt made to detect chaos in the quantitative sense. Far more valuable is an intuitive 'feel' for the graphical pictures displayed and the ability to relate this to the principles and dynamics of the chaotic process of change and the participants' experiences. As chaos is assessed and measured by and in relation to its dynamics (Abraham, 1992; Cambel, 1993), an intuitive understanding is arguably a prerequisite for this kind of analysis. Important, too, is an ability to integrate the different kinds of information yielded by the different graphical pictures.

Two graphical means of analysis were used in this study: three-dimensional phase portraits and linear time-series graphs. Although these will be discussed separately, they cannot be seen in isolation. No graph taken in isolation will yield comprehensive information about chaotic change in a system. The information from different graphs is best used in tandem to form an integrated picture of a given dynamical phenomenon.

One of the best ways to analytically understand the principles of chaos theory and the chaotic process of change is to make the dynamics of the system under investigation visual, particularly be means of three-dimensional phase space (also known as state space). Phase space is an abstract mathematical space in which coordinates (ie: a composite vector of the system's component variables) visually represent the state of a given dynamical system (Williams, 1997). Each dimension (ie: graphical axis) of the three-dimensional phase space plot corresponds to one variable of the system (Kellert, 1993). The three axes of the graph thus represent three different variables that are taken to represent the system being investigated, and are termed the system's control parameters (Abraham, Abraham & Shaw, 1990).

When the measures of each variable at a given time are plotted graphically as a composite point (ie: measurements of the three variables are combined into one measurement) in three-dimensional phase space, this point represents the state of the system at that time. The plotted composite points of all the measurements represent the system state over a specified period of time. The resulting array of composite points is joined together on the graph by either straight or curved lines, and the

resulting continuous line – the trajectory – traced in graphical phase space represents the system's evolution over time. Essentially, every point in phase space represents a full description of the system in one of its possible states and the evolution of the system manifests itself as the tracing out of a trajectory (Kellert, 1993).

Phase space thus allows for the visualisation of many numbers simultaneously (Abraham, Abraham & Shaw, 1990), and is the graphic representation of all the possible states the variables may take on (Abraham & Gilgen, 1995). This method thus tracks a complex set of interrelated phenomena over time and shows the evolving pattern of the system. The resulting shape, or pattern, displays the overall state of the system (Cambel, 1993; Kellert, 1993). The graphic state of the system at any given time in phase space is known as a phase portrait, and the movement of the system from one state to another is known as a phase shift (Abraham, 1992; Kellert, 1993). The shape traced by the trajectory is essentially the 'signature' of the system, and can be subjected to analysis (Abraham, Abraham & Shaw, 1990).

Phase space plots may contain hundreds or even thousands of chronologically plotted points (Williams, 1997). Analysis is focused on the qualitative features of a system's behaviour rather than precise, quantitative values of its variables at a particular time. This kind of qualitative analysis essentially aims to describe what processes are occurring and details differences in the character of those processes over time (Breakwell, Hammond & Fife-Schaw, 1997). Essentially, the study of the phase portrait gives a qualitative grasp of a system's functioning, and the geometry is idiosyncratic and recognisable for that system (Chamberlain & Butz, 1998). The main value of this approach is to provide a quick, visual grasp of system change (Abraham, Abraham & Shaw, 1990). Also, pattern and structure that might not be seen on a conventional time-series graph often comes out in striking fashion on the phase space plot (Williams, 1997).

Very simply, then, the phase portrait is essentially a graphical representation of the state of a nonlinear dynamical system (including a person) in three-dimensional space. In understanding phase portraits it is thus important to be able to properly read a three-dimensional graph. This implies an understanding of how a composite point is plotted. There are different ways of plotting such points, but all arrive at the same

result. Essentially, the three variables being measured in a three-dimensional phase portrait are plotted systematically along the different axes, one after the other. This study systematically plots the variables first on the *X*-axis (facing the graph, the axis on the right), then on the *Y*-axis (the axis in the middle), and finally on the *Z*-axis (the upright axis on the left). It is noted that the axes could have been labelled differently, but this is the conventional format in three-dimensional phase portrait graphical configuration (Abraham, Abraham & Shaw, 1990).

A composite point is plotted in the following manner. Say a given observation for 'variable one' is recorded as 5. It is measured along the *X*-axis (clearly labelled 'variable one') from 0 (the point of origin) until the point of 5 units is reached. From that point, the recorded score for 'variable two', say 4, is counted parallel to the *Y*-axis (clearly labelled 'variable two') until a point four units away is reached. From that point 'variable three', say 6, is counted up parallel to the *Z*-axis (clearly labelled 'variable three') until a point six units away is reached. Very differently, and very simply, first move along the *X*-axis, then move parallel to the *Y*-axis, and then parallel to the *Z*-axis; the point at which measurement stops is the composite point for the three variables (Wheeler, Neal & Hofmann, 1996). (Plotting a few hundred composite points by hand is a good way of gaining an understanding of three-dimensional phase space!).

It is, of course, possible to pinpoint specific points in the graph but as phase portraits are concerned mainly with the overall state of the system, analysis is more usefully focused on regions (eg: attractor areas) and patterns (eg: oscillations) traced by the trajectory. Bearing in mind that the trajectory represents the evolution of the system over time, it is useful in analysis to develop a 'feel' for the 'motion' of the trajectory in 'space'. Essentially the trajectory is graphed as if it were 'hanging' in mid-air, tracing out a portrait of the system's movement in space, and analysis is geared to recognising and interpreting that pattern of movement and the overall state of the system (Abraham, Abraham & Shaw, 1990).

Reading a phase portrait, then, is simply a matter of tracking measurements along the graphical axes until the region of the system that the analyst is interested in is found.

Trial and error in negotiating phase space may be required at first, but the method is essentially very simple.

Chaos is generally inferred when the trajectory of a system shows an apparently random orbit (ie: pattern), with points scattered relatively far and wide in phase space. Periodicity is generally inferred when there is clear oscillatory movement within a given range of values as a result of the system moving between relatively high and relatively low scores. It is unlikely that a fixed-point pattern (no system movement at all) would be encountered in real-life chaos analysis.

Linear time-series graphs provide a lot of detail with regard to the state of a system under investigation. They are particularly easy to read, understand, and interpret, and powerfully complement phase portrait analysis. For example, inferences regarding analysis of an area of phase space that shows a dense trajectory pattern (ie: a possible attractor region) may be usefully amplified and clarified by analysis of a a time-series graph depicting the same period of system evolution. Essentially, the linear time-series graph takes a different kind of picture of a given system than the phase portrait does. The three-dimensional phase portrait gives an overall view of the system while the time-series gives a kind of 'side-on' view. The state of the system is inferred by the pattern of the oscillations of measurements graphically displayed. Time-series graphs in chaos theory application are particularly good at displaying change in therapy, as the variation of scores depicting oscillations and sudden jumps in system state that are characteristic of chaos theory are very easy to see.

It is stressed that offering these suggestions regarding system state identification are generalisations. Crucially, chaos is relative. Apparently random behaviour is not always indicative of chaos, and tightly ordered patterns are not necessarily indicative of order. It is the subjective state of the individual being investigated that is the crucial factor in determining the state of the system (Butz, 1997). It is for this reason that graphical results and interpretations are usefully triangulated with clinical observations and verbal feedback from participants.

Although based on empirical results, graphical analysis is nevertheless highly subjective and the investigator needs to have a certain creativity in interpretation,

courage to stand by his or her convictions, flexibility to deal with the inevitable ambiguities of interpretation that arise, and a willingness to forge ahead in spite of the notorious and acknowledged difficulties of chaos theory analysis in real-life therapy. In true constructivist tradition, the process is indeed hands-on adventure! (Efran, Lukens & Lukens, 1992).

5.4 THE CHAOTIC PROCESS OF CHANGE

There are many theories and viewpoints concerned with the process of psychological change. This study is concerned with the constructivist orientation to such and the sequential, chaotic process of change that it necessarily entails.

In this view, the person is made up of multiple selves (Wetherell, 1996) that combine to create an infinitely unique self (Mahoney, 1991). The individual can be seen as a system (Neimeyer, 1995). This system is open, nonlinear, and dynamical and is characterised by dialectical interplay with the world. Consistent with the lifespan approach, the individual is ever-changing and adapting to internal and external demands (Hultsch & Deutsch, 1981). In dealing with the demands of life the person as a dynamical system is in a constant state of process (Butz, 1997). The self constantly attempts to organise and reorganise its patterns of action and experience in relation to engagements with the world, and this necessarily entails psychological change (Mahoney, 1991). Change is thus endemic to human life, is ongoing, and occurs at both surface and deeper levels of being (Neimeyer, 1995).

Essentially, the individual is in a constant state of becoming (Prigogine & Stengers, 1984). As a dynamical system, the individual is necessarily subject to the principles that govern such a process of becoming. The process is characterised by a constantly shifting flow of forces and form within which the system is ever-adaptive, moving from one state of order to another in a turbulent, sequential flux of state-of-being (Butz, 1997). This is the chaotic process of change.

It is stressed that while the chaotic process of change is sequential, it is also complex and nonlinear. As such, the chaotic process is characterised by incredibly subtle and

illusive dynamics. The clear-cut delineation of chaos theory principles in analysis is thus made for the purposes of explication only. In reality, the principles are inextricably intertwined.

The sequence of the chaotic process of change is outlined as: change and the potential for change; order and disorder; stability and instability; coherence; attractors; bifurcation; sensitive dependence on initial conditions; unpredictability; edge-of-chaos; self-organisation; fractal structure; holism. The results and discussion follow this sequence.

The chaotic process of change will now be discussed in relation to the intervention conducted and the results thereof. It is assumed that, by now, the reader is familiar with chaos theory concepts and principles. Accordingly, explication of such is limited to clarification where necessary.

5.4.1 Change and the potential for change

Chaos theory is concerned with change and the potential for change. This is seen in terms of movement (ie: change in system state over time) from one state of system order to another. Movement is essentially seen in terms of the direction of change. The concern is with how existing order gives way to chaos and how new order emerges out of chaos (Robertson & Combs, 1995). No matter what the direction of change, the system necessarily moves away from a prevailing state of order, through disorder, to a new state of order (Chamberlain & Butz, 1998).

5.4.1.1 Results and discussion

Darryl's results can be found in Appendix D (Figures 5.1 to 5.8). There is evidence in analysis of both the three-dimensional phase portraits and the linear time-series graphs that Darryl's system state showed a marked change over the three months of the intervention. In the phase portrait for the first month (July) (Figure 5.1), Darryl's system can be said to be in a chaotic state. Chaos is evident in that the trajectory (ie: the plotted lines within the graph representing the system state) appears to display a

zig-zag random movement over a wide range in phase space (ie: the space within the graph delineated by the axes). In the graph for August (Figure 5.2) there is a pronounced reduction of chaos. The system state is now predominantly periodic (ie: the trajectory oscillates between certain areas), as evidenced by the zig-zag orbit traced between the left and right extremes of the system's shape. There is still some chaos present as evidenced by the high-density area (ie: an attractor area, with a great deal of random motion within it) and extremes of the trajectory. In September, the phase portrait (Figure 5.3) arguably shows an edge-of-chaos (ie: between chaos and order) system state. The graph (Figure 5.4) depicting the system state overall for the three-month intervention clearly shows the chaos in the system (ie: the extremes and zig-zag motion of the trajectory and the high density attractor area).

Darryl's system state movement is similarly pronounced in linear time-series graphical analysis. In the graph for July (Figure 5.5), it can clearly be seen that there are oscillations between very high and very low values on all variables and that these are interspersed with bursts of more limited oscillations – a characteristically chaotic pattern. The graph for August (Figure 5.6) clearly shows the periodicity in the system and a reduction in chaotic movement. The graph for September (Figure 5.7) clearly shows the same range of periodicity as the previous month and a noticeable lack of chaos. The composite picture displayed by the overall time-series graph (Figure 5.8) clearly shows marked changes in system state around observations 121 and 241, representing the shifts from month to month. At these points both the wider oscillations and the interspersed bursts of narrow oscillations are markedly reduced.

In sum, it can be said that Darryl's system changed markedly in the three-month intervention from a state of chaos to one of periodicity and finally to an edge-of-chaos state. The edge-of-chaos condition is interpreted in virtue of the progressively reduced amount of chaos evident in the system's trajectory over the three months, with a final system state characterised by a fairly wide range of movement that is not tightly ordered. The relatively wide-ranging movement is a 'fluid' type of motion, indicative of a manner of functioning that is not tightly ordered yet is not fixed and rigid – essentially a flexible style of functioning between chaos and order, and hence an edge-of-chaos state.

Belinda's results can be found in Appendix E (Figures 5.9 to 5.16). Graphically, Belinda's system state shows minimal change throughout. The phase portrait for July (Figure 5.9) shows periodicity within an extremely limited range of values, as evidenced by the very limited range of the system trajectory. There are clear geometric patterns evident in the graph, suggesting a very fixed and rigid order to her functioning. The August graph (Figure 5.10) shows an even more limited range of periodic motion, while the graph for September (Figure 5.11) shows a similarly restricted range of motion. The overall phase portrait (Figure 5.12) clearly indicates the limited range of motion of the trajectory. It is notable that the range of motion is so fixed and rigid that the scale of measurement representing 'hope' had to be scaled from 1 to 5 (ie: effectively 'stretching' the phase space within which the trajectory moves) just to allow for any pattern of trajectory movement to show at all. On a scale from 1 to 10, movement is barely indicated! The time-series graphs show this even more clearly. The three graphs (Figures 5.13, 5.14, and 5.15) representing the system states over the three months of the intervention show very little difference from each other. The composite time-series graph (Figure 5.16) gives a very clear picture of the limited range of movement of the three variables (ie: the system) throughout the three months.

Carmen's results can be found in Appendix F (Figures 5.17 to 5.24). Carmen's graphical system state throughout is characteristic of low dimensional chaos (ie: a pattern of movement is detectable within the chaos). Essentially, there is no graphical evidence of change over the three months. The July phase portrait (Figure 5.17) clearly shows the wide fluctuations to extremes on all variables, with the trajectory tracing a clearly visible oscillating trajectory (ie: top left to bottom right of the graph). The graph (Figure 5.18) depicting Carmen's August system state shows very little change, as does September's graph (Figure 5.19). Taken together (Figure 5.20), the measured variables fluctuated to extremes throughout, producing periodic oscillations and the random-looking zig-zag trajectory characteristic of chaos. The time-series graph for July (Figure 5.21) clearly shows the wide-ranging oscillations and bursts of narrower fluctuations interspersed within this – a pattern that is highly characteristic of chaos. The time-series graphs for August and September (Figures 5.22 and 5.23) display a similar pattern. The overall time-series graph (Figure 5.24) gives a very clear picture of the extent of Carmen's low-dimensional chaotic system and of the

periodicity within it. High, low, and intermediate scores are mixed together to give a picture of a system state that has no apparent order.

Clinical observations and verbal feedback support the graphical analysis of Darryl's direction of system movement from an initial state of chaos to a highly adaptive edge-of-chaos condition – a system state movement from chaos to order. Darryl had been in a state of distress and confusion at the start of therapy, regarding issues in his life. He was still in a confused state at the end of the intervention, but it was arguably a more adaptive state in that he was responding and behaving in a different manner to the same circumstances that he faced before (eg: he was seeking ways to improve relationships at work, trying to find new ways of being better utilised in his current work, and even investigating the possibilities of changing his line of work altogether). Essentially, he was more proactive and this could be construed as being more flexible and adaptive in dealing with his pressing life situation. Darryl's potential for further change was good as he appeared to be committed to personal change. It was unlikely that he would revert to his previous state of order as he had completed the chaotic sequence of change and the new manner of functioning he displayed appeared to be well established.

While graphical analysis suggests that Belinda's change in therapy was minimal, clinical observations and verbal feedback taken at face value suggest otherwise. Belinda started to change in overt ways within two weeks of starting therapy. She revamped her sewing room, became more assertive in dealing with customers, charged higher fees consistent with her talent and experience, looked for new business, and even started to look for new work fields to conquer. Indeed, at the close of therapy she was enthusiastically working on ambitious plans to start a property renovation business. While Belinda apparently did not recognise these changes in her functioning, it could nevertheless be said that she certainly moved at least a bit from her rigid order in the direction of chaos. As she had moved so quickly in observable ways and was proactively shaping her future at the close of therapy, Belinda's potential for further change was arguably good if her new-found variability of functioning could be maintained.

Clinical observations and verbal feedback support the graphical analysis that Carmen's system state barely moved. Observationally, Carmen's lack of change throughout therapy was pronounced, as she displayed no novel ways of functioning. Verbal feedback similarly indicated that there was no marked change in her system state, as she gave no indication of any particularly new way of dealing with her issues. Having said that, Carmen did start to question things about herself and her issues in a progressively deeper manner. Already an insightful young woman with a high degree of self-awareness, she seemed set on a path that sought answers to the mysteries of her life. While not enough to warrant the interpretation of marked system change, her progressively deeper questioning was arguably indicative of imminent system change. Indeed, it can be said that Carmen, with her extreme state of chaos, perhaps had the most potential for change out of the three participants. This is so in virtue of the volatility of the chaotic state and its inherent potential for rapid change when suitably perturbed (Butz, 1997). If and when Carmen's system was to move, it would be in the direction of chaos to order.

Importantly, the relative change or lack thereof evidenced by each of the participants must be seen in the broader context of their entire lifespan. General patterns of personal experience can be described as lifelong spirals with recurrent phases. Dynamic balance is periodically challenged by circumstances. If the challenge is accommodated, life returns to a new dynamic balance but if not then cycles of system-wide disorder and disequilibria emerge (Mahoney & Moes, 1997). Each of the participants reported an increased state of confusion at different points in therapy, and this was unanimously experienced as negative to greater or lesser extent. Yet, in terms of the broader lifespan picture, the chaotic state is a healthy and necessary part of system evolution. Chaos implies maximum probability and serves the dual purpose of functional adaptation and system evolution (Perna, 1997). Consequently, the discomfort that participants felt as their regular pattern of functioning unravelled and changed can actually be seen as healthy and adaptive functioning. Chaos and disorder are not to be feared. Indeed, the therapist's stifling of this natural process may be damaging to the client (Wieland-Burston, 1992).

5.4.2 Order and disorder

The movement of change in a given dynamical system gives it its characteristic pattern (ie: structure). An important way to gauge the presence and state of chaos in a system is thus to analyse the system's pattern, and this is best considered in terms of relative order or disorder (Chamberlain, 1995). The state of order or disorder may be seen as the characteristic manner of functioning of the system. Crucially, the prevailing system state is relative, and must be seen in context (Butz, 1997).

5.4.2.1 Results and discussion

In terms of graphical analysis, a system's shape evidences a particular visual picture – a pattern – of a given state of order. As such, the graphical results from the previous section on change are pertinent here. All the graphs depicting Darryl's system state (Figures 5.1 to 5.8) show a chaotic and periodic pattern throughout his process of change from chaos to edge-of-chaos. Graphs of Belinda's system (Figures 5.9 to 5.16) display a periodicity over time with trajectory oscillations displaying a fixed and rigid pattern throughout. Graphs of Carmen's system (Figures 5.17 to 5.24) display a highly chaotic state with an underlying pattern of periodicity.

While pattern essentially displays the structure of a system, the state of order or disorder refers to the characteristic way in which the pattern is functioning at any given time. Order and disorder are subtle processes and must be seen in context (Cambel, 1993). Graphical analysis can thus visually determine the characteristic pattern of a given system but it cannot gauge the relative order or disorder that is inherent in that pattern. It is, however, necessarily the case that each participant was in a relative state of order (ie: chaotic or periodic) at the beginning of therapy. The exploration phase of therapy revealed that each individual had been psychologically functioning according to a certain pattern for a considerable period of time, and his or her respective states of order were thus well established. The prevailing order in each individual's system subsequently gave way to a greater or lesser degree of disorder as therapy proceeded. In this sense, disorder can be seen as destabilisation of the prevailing state of system order.

Inferences about the state of order or disorder of a system can be made from a given graphical pattern (eg: Belinda's ongoing fixed and rigid pattern and Carmen's ongoing state of extreme chaos are arguably suggestive of distressing states-of-being). Collateral information such as clinical observations and verbal feedback are needed to either support or refute such inferences. Indeed, observation and feedback shed important light on the relative states of order and disorder as inferred in the participants' graphs. Darryl's relative state of order at the beginning of therapy was that of chaos. He reported that he was quite confused about his life situation at the beginning of therapy and that this state had markedly increased throughout. This can be taken as clear evidence of a shift from relative order to disorder. Belinda's relative state of order at the beginning of therapy was that of rigidity. While this did not change in terms of the graphical depiction of her system state, clinical observations and feedback suggest a move toward disorder. Her outward behaviour of proactively trying to increase her earning power is evidence of at least some destabilisation of her prevailing state of order in the direction of disorder. Belinda also reported great confusion at times. Given the initial rigid state of Belinda's functioning, even mild disorder might seem extremely threatening to her and so this was also arguably evidence of at least some disorder. Carmen's prevailing state of order at the beginning of therapy was one of great chaos. Observationally, this state of order did not change. She seemed to be in a state of considerable disarray throughout therapy. Feedback confirmed that her ongoing state of chaos was indeed a continuation of her prevailing state of order as opposed to a shift to disorder. It can be speculated that it was the inflexibility of their prevailing, relative states of order that created difficulties for each individual in the first place.

Importantly, the presence of chaos is not a problem in and of itself (Wieland-Burston, 1992). Although experiencing life difficulties, Darryl and Carmen were nevertheless functioning fairly well in their chaos at the start of therapy. Belinda, on the other hand, was not functioning well in the face of her difficulties despite her high state of order. Order intuitively seems to be a more desirable system state than chaos, yet this is not necessarily the case. Order tends to be dull, boring, and dysfunctional while chaos tends to foster creativity and herald new possibilities. The type of order needed must be flexible and have a high degree of chaos tolerance. Order and disorder, then,

are crucially relative and must be seen in context. Essentially, what constitutes chaos for one person may not be chaos for another (Wieland-Burston, 1992).

5.4.3 Stability and instability

Stability and instability refer to the system's susceptibility to perturbation and thus its propensity for change. A stable system tends to be robust in the face of challenge to its prevailing state, while an unstable system tends to change even if mildly perturbed. Importantly, a chaotic state does not necessarily mean that the system is unstable and an ordered state does not necessarily imply stability (Thelen & Smith, 1994). Stability and instability are relative, and need to be seen in context (Butz, 1997).

5.4.3.1 Results and discussion

Given that stability and instability of a given system are relative, it is not possible to determine the state of stability or instability of a given system from graphical analysis alone. At best, intuitive inferences regarding such can be made, which can be subsequently checked against collateral information.

Darryl's graphs display a system state that is intuitively suggestive of a marked degree of relative instability to begin with (Figures 5.1 and 5.5), moving progressively toward more stability. The oscillations in each of his individual system parameters clearly reduced as therapy proceeded (Figures 5.2, 5.3, 5.6, and 5.7), which further suggests a shift from instability to stability. Belinda's graphical results intuitively suggest that a stable system state was maintained throughout therapy. The highly limited trajectory in the three-dimensional phase portraits (Figures 5.9 to 5.12) suggests remarkable system stability. Such stability is also suggested by the time-series graphs (Figures 5.13 to 5.16), which show remarkably little fluctuation of values. The widely oscillating parameter values evident in Carmen's graphs throughout (Figures 5.17 to 5.24) intuitively suggest great system instability (particularly Figures 5.20 and 5.24, which show the overall system state).

Verbal feedback arguably gives credence to the inference that Darryl moved from a system state of relative stability to one of instability. Darryl was quite confused about his life at the beginning of therapy and had been that way for some time. He reported that his confusion intensified in therapy and that it was quite a "difficult and scary" experience for him at times. As the circumstances in his life had not appreciably changed outside of therapy, this feedback could be construed as indicative of a measure of system instability. Crucially, Darryl arguably moved to an edge-of-chaos state and this necessarily entails going through a period of instability. In Belinda's case, observation and feedback give support to the inference of ongoing stability throughout. In fact, Belinda was so fixed and rigid in her functioning that it could be termed stasis, a condition of stability that occurs when change seems impossible and an antiquated system order is held onto (Wieland-Burston, 1992). The discrepancy between her graphical results indicating rigidity and the clinical observations and feedback of her being proactive in terms of finding ways to earn more money intuitively indicates a move toward instability, but this was arguably at best a very slight shift in system state. In Carmen's case, observation and feedback give support to the inference that her system state did not become unstable. There were no observational signs of a shift to instability. Also, any diminishment of her chaos overall would likely be felt experientially as instability, but this was not reported.

Intuitively, stability appears to be a desirable state and instability seems to be undesirable. Indeed, destabilisation and the resulting instability tend to provoke distinct feelings of insecurity in the individual (Wieland-Burston, 1992). Regardless of graphical results, this was certainly the case with the participants as each individual evidenced insecurity in therapy (eg: wanting to know how long it would be before results in therapy were evident, wanting to know if their experiences in therapy were "normal"). In fact, negative feelings are common in therapy when the individual's system is destabilised. Destabilisation is essential in harnessing the beneficial potential of instability. Destabilisation pushes the individual away from stagnant ways of functioning, initiating a process that begins with instability and ends with adaptive transformation (Butz, Chamberlain & McCown, 1997). Instability necessarily precedes change (Butz, 1997). The sequence of destabilisation and subsequent instability is a necessary and natural process that allows for growth and change (Hayes & Strauss, 1998).

Importantly, stability and instability need to be looked at in a broader, lifespan perspective. People change constantly in the evolutionary process of change and it is helpful to think of the initial starting point in therapy as a state of dynamic equilibrium – either stable or unstable – that may be seen as an initial equilibrium-dominated phase of a wider non-equilibrium evolutionary trajectory (Goldstein, 1995). Essentially, psychological growth is a lifelong process that is characterised by periods of stability and instability (Hayes & Strauss, 1998). Further, an individual may be unstable in a given situation yet be stable in other areas of life, and vice-versa. The person may also be stable or unstable on a daily basis, but display a dominant state over time. It was, of course, beyond the scope of the intervention to fully explore these wider, lifespan dimensions with the participants. However, an attempt was made to understand the participants' lives from this broader perspective. This deeper understanding arguably adds weight to the validity of the inferences made regarding their system states.

5.4.4 Coherence

Coherence arises out of the openness of a system to its environment (Peat, 1995). A certain, sustaining tension holds the system together and organises energy for transformations of system state. Coherence (or lack thereof) thus crucially influences the different change processes that a system goes through, making for differences in the adaptation of the system (Butz, 1997). Coherence is essentially an ordering and integrating principle that determines the inner order and outwardly directed behaviour of a system. A coherent system is able to display appropriate responses in the face of whatever perturbances and circumstances it encounters (Peat, 1995).

5.4.4.1 Results and discussion

It is not possible to accurately determine the extent of interior system coherence of the participants from graphical analysis alone, as the concept is concerned with the subtleties of the individual's integrative functioning. Tentative inferences can be made, however, which can be checked against clinical observations and feedback.

Darryl's movement of change over the three months from chaos to a periodic pattern is clearly evident in Figures 5.1 to 5.8. The transition from month to month shows a progressively narrower range of system fluctuations, both in the phase portraits (ie: a progressively less 'wandering' trajectory) and the time-series graphs (ie: progressively narrow range of oscillations of measurement). This is indicative of increased interior coherence, as the narrower pattern of movement suggests purposive, focused functioning as opposed to highly fluctuating movement and random functioning. Belinda's rigid limit cycle pattern, indicative of very low interior coherence, is evident in all graphs of her system functioning (Figures 5.9 to 5.16). The graphs depicting her overall functioning (Figures 5.12 and 5.16) in particular show her rigidity of functioning. The phase portrait (Figure 5.12) is almost geometric in its rigidity and the time-series graph (Figure 5.16) evidences a pronounced flatness of oscillations. Carmen's state of low dimensional chaos, with its wide fluctuations of system state, clearly evident in all of the graphs depicting her system state, is similarly suggestive of a lack of integration and indicates a distinct lack of interior coherence. The graphs depicting Carmen's overall state (Figures 5.20 and 5.24) show the fluctuation of movement characteristic of low coherence particularly well.

Clinical observations and verbal feedback support the interpretation that Darryl had high coherence. An individual with coherence is characterised by openness to the environment, a concern with long-range plans, purposeful behaviour, a strong sense of identity, the ability to direct attention in meaningful ways, a rich sense of inner life, a strong sense of meaning and direction, creativity in action, a deep sense of interior integration, and the ability to tolerate a degree of chaos in virtue of having rich responses (Peat, 1995). Darryl displayed all of the aforementioned hallmarks of the phenomenon to a greater or lesser degree. In particular he progressively showed an increasing concern with long-range planning, became very purposeful, and was very concerned about issues of personal identity. Essentially, Darryl became very focused on who he is and where is going in life, and was starting to take action to get there. He also showed a great deal of flexibility of functioning toward the end of therapy, reacting to negative circumstances in a more relaxed and creative way than he did earlier on (eg: he was noticeably more relaxed about pressing financial issues).

Belinda, by contrast, appeared to have very low interior coherence. Notably, she did not appear to be open to her environment. This was seen in two ways. Firstly, while she did have friends and contact with the outside world, there was nevertheless limited interaction with her environment and a consequent sense of isolation. This was confirmed in discussion with her in therapy. Secondly, she was very closed to outside influences and suggestions, as was evidenced in interaction with family members (eg: she seemed to resent being given advice by those close to her). Indeed, in debriefing, Belinda made the point that a main benefit of therapy for her had been the opening of her mind to suggestions. Closure to the environment leads to the experience of being overwhelmed by external events, which was very much the case with Belinda. Time and again in therapy, Belinda was focused on whatever negative life circumstances had occurred in the previous week. She also displayed little sense of meaning in life, a negative view of the world, and a lack of sensitivity – all of which are hallmarks of low coherence. Systems that are less sensitive and far from chaos tend to settle into rigid, repetitive behaviour such as limit cycles (ie: periodicity). In such cases, the individual tends to get locked into a repetitive cycle. The more trapped in repetitive responses, the more the person's life becomes impoverished and meaningless. Indeed for an individual with such a state of mind there may well appear to be no way of escaping from the predicament (Peat, 1995). This was exactly the case with Belinda, as reported by her on several occasions. Clinical observations (particularly the relatively good outcome of therapy in behavioural terms) and feedback suggested that Belinda was, in fact, starting to break out of her repetitive pattern but she was nevertheless a long way away from displaying full and healthy interior coherence.

Carmen also displayed little interior coherence. Chaos can be either adaptive or maladaptive. When the system is moving to a higher state of complexity it is pregnant with possibility, being rich in information and highly sensitive to contents and changes in the environment. This is the adaptive aspect of chaos. However, chaos that is entrenched may also yield seemingly random system responses as a result of an impoverishment of the individual in response to the environment. This reflects an inability to process both interior and exterior information in appropriate ways. The result is a lack of interior coherence, resulting in a breakdown of inner order and outwardly directed behaviour. The boundaries between inner and outer tend to be very

loose, and interior integration is so weak that a person becomes overwhelmed by external contingencies (Peat, 1995). This was particularly the case with Carmen. She was constantly overwhelmed by external circumstances and these had a huge impact upon her as evidenced by her frequent, obvious distress in therapy. Essentially, her wildly fluctuating system state was more often than not in response to environmental stimuli. So pronounced was her susceptibility to external contingencies, that Carmen could be said to be 'ruled' to a large extent by the events and experiences that were taking place in her life.

5.4.5 Attractors

When a given system settles into one or a few modes of functioning that it prefers over all possible modes, this characteristic mode of functioning is called an attractor state. Essentially, the system has an 'affinity' for that state-of-being. Attractors in a system can be few or many, subtle or overt, and dominant or of lesser importance (Thelen & Smith, 1994). Attractors describe a system's evolution in time and space, and are particularly important descriptively (Butz, 1997).

5.4.5.1 Results and discussion

The presence of internal attractors in the participants' systems can be determined clearly from the graphical results. Three-dimensional phase portraits are particularly powerful at identifying attractors, which show up as dense areas traced by the trajectory pattern in phase space.

Darryl's overall phase portrait (Figure 5.4) shows a dominant attractor area in the region of average-to-high level of work utilisation, low level of frustration, and average goal-setting orientation. The attractor area is evident to a lesser extent in the graphs for July and August (Figures 5.1 and 5.2), but it has largely dissipated in September's graphs (Figure 5.3). (This is consistent with the edge-of-chaos end-state interpretation, being midway between chaos and order.) There is no clear dominant system attractor in terms of individual variables (ie: system parameters).

Belinda's limited periodic pattern is very clear in the overall graph (Figure 5.12) of her end-state in therapy. The attractor area is the region of low hope, high frustration, and average withdrawal. Her dominant attractor is overwhelmingly that of a low level of hope, which critically influences the trajectory of her system in the phase portrait (ie: it critically impacts the other two variables and thus constrains the trajectory). Evidence displayed by the linear time-series graphs (Figures 5.13 to 5.16), showing the continuous, low and barely fluctuating measurement of the system parameter of hope, suggests that this is indeed a very dominant attractor in her system.

Carmen's overall phase portrait (Figure 5.20) has a particularly dense area in the region of low-to-average motivation, average-to-high anger, and average-to-high withdrawal. The density and far-reaching extent of the trajectory in the graph suggests the presence of a strange attractor, which is highly characteristic of chaos. As such, there is a great deal of seemingly random movement in the system's trajectory. There is also no evidence of a dominant attractor, in terms of a single system parameter. Carmen's lack of a dominant attractor area is well supported by the time-series graphs (Figures 5.21 to 5.24), which are pronounced by their seeming randomness.

While graphical analysis of attractors is powerfully able to identify attractor regions in phase space, a much richer picture is obtained when the results are triangulated with clinical observations and verbal feedback. The added perspective is necessary, as the concept of attractors is a particularly subtle one. In terms of therapy, attractors refer to areas of personal functioning and concerns in life where the individual's energies are focused and invested. Attractors are both internal (ie: psychological functioning) and external (ie: areas of concern). Both internal and external attractors operate in an individual's life which, taken together, constitute the person's world and experience. Synthesis of interior and exterior attractors thus provides the clinical attractor constellation, which is a kind of a map of the individual's life at a given time (Reiter, 1992). It is, of course, impossible to completely understand let alone describe a clinical constellation (Mahoney & Moes, 1997) but it nevertheless serves as a powerful heuristic tool in therapy. The idea is to develop a focus out of the complexity of client complaints (Reiter, 1992).

The attractor constellation was particularly obvious in Belinda's case. She had clear-cut concerns. They were highly 'compartmentalised' and were not linked (by her) in any meaningful way beyond a very surface level. Essentially, Belinda's rigidity of psychological functioning and persistent low level of hope for improvement in her circumstances dominated all aspects of her life. She did make the important link between personal change (ie: doing things differently) and earning more money, but there was nevertheless little complexity of relationship between her attractors. Darryl's attractor constellation was less obvious. It was quite diffuse, in that the links between attractors were not clearly defined by him in therapy. He was nevertheless quite aware of the links, and there was thus arguably a fair degree of complexity in his constellation. Carmen's internal and external attractors were very diffuse indeed. The links between her psychological functioning and external concerns were not clear, as were the links between attractors, and her attractor constellation was accordingly difficult to clearly define and differentiate.

Importantly, the clinical constellation must be seen on different levels, internal and external, broad and wide (Reiter, 1992). Indeed, it is only when considered in the broader context that the subtlety of connections and interplay of attractors may be properly appreciated. The subtlety is considerable. The intensity of any given attractor may shift continuously from day to day and indeed from moment to moment with any given attractor becoming dominant in a given situation. This was obvious with the participants. Their states-of-being were sometimes very different from week to week, and discussion in therapy revealed how their states had changed in that time. Attractors may also have attractor states within them. In Belinda's case, for example, it could be inferred from clinical observations and feedback that her internal attractors of rigid thinking and low hope were 'overlaid' upon all areas of her life. Indeed, the interconnections and interrelationships between attractors were pronounced in the intervention. As therapy proceeded, the attractors accordingly took on a vibrant vitality, rich with subtlety and nuance. This was pronounced in Carmen's case. The convoluted and intricate relationship between the many concerns in her life and her psychological functioning became increasingly apparent. Richness was compounded by an acknowledgement and appreciation of the presence of 'hidden' attractors in the participants' clinical constellations. Hidden attractors are those that are beyond awareness and those that the client chooses not to divulge in therapy. Recognising the

potential of hidden attractors to impact and influence the chaotic process of change is a vital consideration in therapy (Reiter, 1992).

The subtlety of attractors is perhaps best seen in the relationship between the internal self and the external world. They are mirror images of each other. The internal field within the self is organised by the layout of psychological attractors. These attractors constrain the system's functioning, and the external attractor constellation embodies the internal constraints on action (Abraham, 1992). Belinda's interior and exterior rigidity were extremely obvious in that she had very few concerns in both domains, all of a very similar nature and all very clearly defined. Her outer world thus mirrored her interior state. Darryl's outer and inner worlds could also be said to match. As therapy proceeded there was a certain broadening of his attractor constellation in tandem with the internal, psychological expansion he was experiencing. Carmen's chaotic inner state and chaotic world could be said to be clear mirror images of each other.

Therapeutically, attractors serve as an initial starting point for intervention. The goal may be either to effect a change within an existing attractor or to move the system state to a new attractor constellation (Butz, 1997). The therapeutic goal with all the participants was both to make adjustments within each individual's existing attractor state (ie: find new ways of dealing with old problems) and facilitate a shift between existing attractor states (ie: visualising the desired outcome of therapy and working toward achieving it).

Importantly, the therapist may act as an attractor in stabilising the therapeutic relationship (Reiter, 1992). This was certainly the case in the intervention. Verbal feedback from the participants indicated that the Friday therapy sessions were an important occasion for them. Therapeutically, the sessions provided a holding container for each participant during the process of change. These were regular and structured occasions that afforded needed stability in each individual's process of chaotic change toward an altered attractor constellation.

5.4.6 Bifurcation

Bifurcation is essentially a transformative state that follows destabilisation. Pressure exerted on any element of a system or its environment may gradually force the system into a far-from-equilibrium condition and threaten its structure (Thelen & Smith, 1994). At a critical point the system loses its ability to maintain its existing state and reaches breaking point (Butz, Chamberlain & McCown, 1997). A bifurcation point is reached. The system faces alternative possibilities for new states-of-being, and must 'choose' between them. It subsequently bifurcates to the new state in a spontaneous 'leap' (Butz, 1997).

5.4.6.1 Results and discussion

Three-dimensional phase portraits do not display clear evidence of bifurcational jumps in a system. While phase portraits show the shape and evolution of a system over time, it is not possible to identify the critical moments in the system's evolution when a bifurcational choice was made. Time-series graphs, on the other hand, with their linear character do provide clear evidence of bifurcation. Darryl's time-series graphs show clear evidence of two bifurcations. His system movement made dynamic shifts in pattern – bifurcations – at the end of the first month (Figures 5.5 and 5.6) and at the end of the second month (Figures 5.6 and 5.7). The progressively narrower range of oscillations in each of the measured variables is very clear. Belinda's time-series graphs (Figures 5.13 to 5.16) show no evidence of bifurcational jumps whatsoever. There is no sudden change in any values of the parameters either individually or overall that could be construed as sudden shifts in her system. Carmen's time-series graphs (Figures 5.21 to 5.24) similarly show no evidence of bifurcation. There are no changes in the oscillations of variables that suggest any sudden change in her system state.

The graphical evidence of Darryl's successive bifurcations amply demonstrates an important characteristic of chaotic change. A destabilised system is inevitably faced with points where the evolving system must choose between alternative routes to take. These are bifurcation points, places where the system is poised to make a clear qualitative change. After the first bifurcation, more usually follow. Bifurcation may

usefully be seen as a critical decision point in the life of an individual. The individual is faced with alternative choices for the future and must make a decision as regards which route to take (Butz, 1997). In Darryl's case, he was tentatively offered a new job position after about a month of being in therapy. The offer fell through, but it was nevertheless an important moment for him. It was a bifurcation point, in that he realised that he was not limited to his present work but that he could take control of his life and move into a new career if he so desired. In making this choice, Darryl arguably negotiated a bifurcation point and made further bifurcation in his system probable.

Darryl could well have slipped back into his old style of functioning at the first bifurcation point. After bifurcation there is an ongoing process of 'trial and error' in system functioning until the new attractor states stabilise with repeated 'practice' (Hayes & Strauss, 1998). The bifurcation point is very unstable and very critical, and the individual may fall back into old patterns or move on to new ones (Abraham, 1992). However, Darryl made a conscious decision to change further and this was reflected in his system's second bifurcation. This occurred at the end of the second month, when therapy required that Darryl take active steps toward his chosen goal. This again seemed to be another critical life moment for him, and again his system shifted accordingly. Darryl's bifurcations were clear-cut and spontaneous jumps. This is consistent with the tenet that chaotic change is not likely to be an orderly, step-by-step, slow process (Chamberlain & McCown, 1998).

Systems negotiate bifurcation points beyond awareness as part of the natural process of life, but it is the case that the individual can consciously negotiate bifurcation points and steer himself or herself in a desired direction (Abraham, 1992; Chamberlain & Butz, 1998). Essentially, the individual is proactive and may consciously steer his or her life in a given direction – presumably toward a new, more adaptive attractor constellation. This was very clear in Darryl's case. He made a clear and conscious choice to move forward in a new direction. Even though the job offer fell through, the very act of mulling it over and considering new-found opportunities was enough to set Darryl on a path to investigate new career paths. And when it came to action in therapy, the second bifurcation point, he made a conscious and active

effort (eg: phoning prospective employers, garnering information about different careers) to do something meaningful toward his desired change.

Clinical observations and experiential feedback support interpretation of Belinda's graphical results. While it is true that Belinda did change considerably in observational terms during the three months, there was no indication of any sudden, bifurcational jump to a new state. Belinda's sudden jump into action near the start of therapy, when she became very proactive in terms of finding new ways to earn money, was not a bifurcation point. System destabilisation is a prerequisite for bifurcation. Belinda's system was not destabilised, so the sudden flurry of activity she evidenced could not be construed as a bifurcation. Clinical observations and experiential feedback similarly support Carmen's graphical analysis. Throughout, she neither displayed nor reported any jumps in functioning that could be construed as bifurcational jumps.

The high connectedness of the therapeutic alliance required in applied chaos theory means that the therapist simultaneously has great influence in helping clients to choose from the alternatives at a critical moment – a bifurcation point – and great responsibility to act as a holding container for them while they do so (Perna, 1997). Essentially, it was important to make sure that the participants had a 'safe place' in which to undergo therapy. This entailed fostering a high quality therapeutic relationship within which they could feel safe and contained. Feedback confirmed that although therapy had at times been difficult for them, the therapeutic alliance had been a strong one and the necessary holding container was created.

5.4.7 Sensitive dependence on initial conditions

Sensitive dependence on initial conditions pertains to the notion that very small influences impacting on a system are amplified over time and may lead to great changes in the system's future state that are out of all proportion to the input (Williams, 1997). Crucially, sensitive dependence also refers to small differences in the initial conditions and not just their magnitude (Kincanon & Powel, 1995). The importance of sensitive dependence on initial conditions should not be

underestimated. Even infinitesimally small influences may have overwhelmingly far-reaching effects on a system (Chamberlain & McCown, 1998).

5.4.7.1 Results and discussion

In terms of graphical analysis, it is not possible to clearly demonstrate sensitive dependence on initial conditions in the intervention. In virtue of the potentially infinitesimal amounts and differences of input in a system that the phenomenon necessarily entails, sensitive dependence on initial conditions refers to a moment in the evolution of a system that is essentially far too subtle to show up on a graph. All that can be said with any degree of confidence about the graphical pictures is that the systems they depict are a product of their history and thus are, necessarily, at least partly a picture of the outcome of moments of sensitive dependence in their past.

At best, very tenuous speculations can be made from reading the graphs. It can be speculated from analysis of Darryl's graphs that his bifurcation from a state of periodicity at the end of August (Figures 5.2 and 5.6) to the edge-of-chaos condition in September (Figures 5.3 and 5.7) was a result of a critical moment experienced during therapy in August. This is plausible. As discussed, Darryl's system was unstable during August and it is in times of instability that small influences crucially impact upon the system and lead to potentially great change. Given that instability is a necessary prerequisite for sensitive dependence to make its mark, it can be speculated from analysis of the graphs of Belinda and Carmen that, as their systems were stable throughout, sensitive dependence was not an overt factor in their system states in the intervention. It is stressed that these are tenuous speculations indeed.

Such is the subtlety of sensitive dependence on initial conditions that even insightful clinical observations and clear feedback do not yield much more than speculation. Yet it can be reasonably speculated that important and dynamic processes of change within the participants may well have been initiated as a result of the intervention. Therapy shows time and again that seemingly innocuous gestures or comments on the part of a therapist may spark terrific change in a client at a later date (Schiepek & Tschacher, 1992). Certainly, the intervention was aimed at planting the seed of a desired outcome in participants' minds. These were seeds that, when they unfold, may

well have far-reaching effects on the lives of the participants in time. In fact, any small gesture or influence during the intervention could have had huge effects on the participants' systems. For example, ideas that seemed to take root with all of the participants were the almost trite observations that "life is a choice" and that "nothing would change in their lives unless they change"! The import of such influences – if any – in the lives of the participants will, of course, only be evident in time to come.

Small differences in functioning, in the way people do things, can herald great system change later on. Each participant certainly made small changes in functioning, but it was only Darryl who experienced a system state of disorder and instability and a subsequent shift to a new system state. Darryl's shift from being stuck in a job he didn't like to that of accepting the notion of a possible career change seemed to be a very significant moment for him. As Darryl's system appeared to destabilise the most, he would have been most susceptible to the impact of small influences. Also, his aforementioned interior coherence made for an adaptive type of chaos and thus readiness for change. Belinda's rigidity of functioning and lack of interior coherence by contrast, reduced her susceptibility to small influences. Similarly, Carmen's prevailing chaotic pattern was not an adaptive type of chaos, and this reduced her susceptibility to small influences.

In terms of sensitive dependence on initial conditions, the quality of the therapeutic alliance is crucial. Given the potentially life-changing impact of infinitesimally small influences and small differences in the way of doing things, therapist competence and responsibility become issues of critical importance (Butz, 1997). It was evident in therapy that the participants were very eager to know more about themselves and find solutions to their problems. Given their thirst for knowledge and insight, it was particularly important to provide a safe and 'neutral' space from which the participants could explore their issues. Thus, apart from facilitating the planting of a seed of desired outcome that the participants chose, the alliance was geared for safety. This latter aspect is of particular importance as the intervention aimed to facilitate destabilisation of the participants' existing states of order and assist them to move toward a new state. This necessarily made each participant particularly susceptible to small influences as such take root more easily in a disordered system.

Ideally, sensitive dependence needs to be seen in much broader context. The present is essentially a product of the past and the future will be a product of the present. Past, present, and future are thus linked in a seamless whole, and the potentially tremendous effects of the multitudinous small influences occurring in daily life, past and present, can only be guessed at. Given the complexity of life and the inherent complexity of interconnectedness and functional relatedness, the strands that weave the fabric of an individual's life together are too interwoven to be so simply separated and labelled. The full, epic sweep of the participants' lives, then, could not be explored fully within the confines of the intervention. Nevertheless, the impact of small influences from the past on their current lives and the potentially huge impact of small influences in the present on their future were nevertheless important considerations that were borne in mind in therapy.

5.4.8 Unpredictability

In chaos theory, there are constraints on the limits of prediction. It is not possible to precisely predict the future functioning or state of a given nonlinear dynamical system. It is possible, however, to speak probabilistically of such (Butz, Chamberlain & McCown, 1997). Useful predictions may be made about the qualitative features of the systems involved, in terms of foreseeing the overall behaviour of that system both in the short term and the long term (Kellert, 1993).

5.4.8.1 Results and discussion

From graphical analysis alone, it cannot be predicted with any definite certainty what state the participants' systems would gravitate to in the future. However, in line with the notion that broad predictions can be made, tentative predictions about the participants' future system states can be made with some degree of confidence from the graphical analysis.

It could be predicted that Darryl's edge-of-chaos system state (Figures 5.3 and 5.7) at the end of therapy would either remain in that highly adaptive region or bifurcate further to a more ordered stability. Having gone through a process of change, it would

be unlikely that he would return to his previous system state. It could be predicted that Belinda's system state would continue its highly limited periodicity (Figures 5.11 and 5.15) in the foreseeable future. Belinda's system was not destabilised to any marked degree at the end of therapy and thus not yet in a condition conducive to marked change. As such, she would likely stay in that system state in the absence of further intervention or perturbation. It could be predicted that Carmen's chaotic state (Figures 5.19 and 5.23) would continue for the foreseeable future without further intervention or perturbation. Her system was not destabilised in therapy and thus not in a state conducive to change.

Clinical observations and feedback lends support to these predictions. In Darryl's case, he appeared to be very committed to change. Observationally, this was reflected in such actions as proactively seeking out new career information and asking many questions about career-related issues. He verbally confirmed in feedback that he was seeking a new course in life and that he would keep pursuing this in the future. It was thus doubtful that he would revert to old ways of functioning. In Belinda's case, it was clear in observation that she had not changed at a deeper level. It was true that she had taken important overt actions to improve her financial situation, and that this had yielded a good therapy outcome for her in some ways, but there was still a rigidity of functioning apparent that precluded marked system change. Essentially, even in Belinda's new actions there was still a paucity of response (eg: although advertising her business was a new way of functioning, she had limited creativity of ideas in doing so and found it hard to move beyond her initial ideas). Feedback indicated that she was finding it very difficult to generate novel ideas and, although she acknowledged that there were marked differences in her life, she could still not see any hope for the future. In Carmen's case, observation showed that she was not so much 'stuck' as caught up in a wildly oscillating see-saw of extreme periodicity and chaos. Although Carmen was very insightful and expressed a clear wish to break out of the cycle, observation and feedback indicated that this wasn't likely to happen on its own as her system state was remarkably stable. The potential for change was certainly high, in virtue of the inherent volatility of the chaotic state, but her system would not be likely to change without further intervention or perturbation.

While the participants' system states for the future could reasonably be predicted in very general terms for the future, there remained a degree of unpredictability with regard to the specific details of their functioning. This is wholly in accord with the principles of chaos theory. The movement of chaotic states is far more difficult to predict than that of more rigidly functioning states. Darryl's and Carmen's functioning were accordingly harder to predict from week to week in therapy. Belinda's functioning, on the other hand, was fairly predictable throughout.

Importantly, unpredictability does not imply a lack of control over the future. Unpredictability is inextricably interlinked with questions of personal agency. At the heart of all situations calling for prediction is the perspective of the human not simply as a passive observer but as an active agent in the creation of his or her own destiny (Loye, 1995). Accordingly, the participants and researcher attempted to look ahead, to try and predict the effects of personal change and co-create a desired system state to move toward in therapy. It can be said that Darryl, Belinda, and Carmen carefully chose the future direction of their lives while in therapy.

Therapeutically, unpredictability necessarily entails cautions. Happy endings in therapy are not guaranteed. The future cannot be exactly predicted or controlled, nor can the consequences of a particular course of action ever be completely known. Well-reasoned plans of action often lead to consequences and later choice points that were never anticipated. Indeed, the sought-after destabilisation is not always a prelude to the emergence of a healthier and happier system (Mahoney & Moes, 1997). Essentially, there was no guarantee that the participants would be satisfied with their outcomes in therapy or that would indeed be in a better state at the end of the intervention. Indeed, while the participants stated that therapy had benefited them in different ways, each one also noted a certain degree of unexpected discomfort in terms of heightened confusion at various stages of the process. While this was to be expected, there was no way of telling beforehand who would be affected most by therapy and how that would transpire. Importantly, a degree of unpredictability – while often unsettling for both client and therapist – is generally an indicator of optimal responsiveness to the ever-changing demands of life (Marks-Tarlow, 1995).

5.4.9 Edge-of-chaos

The edge-of-chaos system state can be seen as the balance point between the forces of chaos and order, and is a supremely adaptive condition that harnesses the power and potential of both (Waldrop, 1992). Systems on the edge of chaos shift back and forth between predictable behaviour and chaotic activity and in so doing may undergo important transformations that can produce growth to higher complexity (Combs, 1995). Greater complexity in turn opens up an abundance of choices to the system that were not available before for higher and higher forms of adaptation and evolution (Chamberlain & McCown, 1998).

5.4.9.1 Results and discussion

Graphical results pertaining to Darryl's system state show a clear progression from initial chaos to a more ordered and focused periodicity (Figures 5.1 to 5.4 and 5.5 to 5.8), and his system state at the end of therapy (Figures 5.3 and 5.7) is highly indicative of an edge-of-chaos condition. The three-dimensional phase portrait (Figure 5.3) in particular is very informative in this regard. There is no clear chaos or order evident. Rather, there is a range of trajectory movement that suggests a system state poised between chaos and order. The limited (but not tight) range of movement is suggestive of focused and purposive functioning as there is a relatively free range of movement and a lack of rigidity. This is characteristic of the edge-of-chaos state. Graphical results pertaining to Belinda and Carmen display no evidence of edge-of-chaos characteristics. Belinda's system state (Figures 5.11 and 5.15) at the end of therapy is as tightly ordered (indeed, perhaps even more so!) as it was at the beginning. This system state is very far away from edge-of-chaos. Carmen's graphical results (Figures 5.18 and 5.23) of her system state at the end of therapy do indicate a lessening of chaotic movement from the previous two months (particularly evident in Figures 5.17 and 5.18), but although the movement is clearly more focused it is still very chaotic. Being already in chaos, however, she is arguably not far from an edge-of-chaos condition.

Clinical observations and verbal feedback support the interpretation of Darryl's edge-of-chaos state-of-being. Darryl progressively displayed more focused and purposeful

responses and behaviour throughout therapy. In particular, his self-insight increased and he coped in a far more adaptive way with the often negative circumstances he experienced at work (eg: responding with much less anger than usual to an argumentative workmate, standing up for himself in the face of unjust criticism from his employer). He exhibited particularly flexible behaviour (eg: phoning different companies regarding new work, obtaining information from education institutions, buying career books) at the end of the intervention. All this was indicative of increased personal integration – a key factor in the edge-of-chaos condition. Essentially, Darryl displayed a new-found state-of-being that was characterised by personal creativity and novelty of functioning. There is a natural tendency of systems on the edge-of-chaos toward this kind of supple flexibility, and this is psychologically healthy (Combs, 1995). Healthy individuals are those who respond to feedback from the environment with a variety of responses, whereas unhealthy individuals are unresponsive (Brack, Brack & Zucker, 1995). Darryl's new-found flexibility of functioning, then, could be seen as indicative of psychological health.

The confusion that Darryl reported experiencing several times in therapy, presumably due to the increased instability of his system, is very characteristic of the edge-of-chaos state. This is a desirable condition as it is this instability that allows the shifting back and forth between predictable behaviour and chaotic activity, and which protects the system from getting stuck in a rut. It allows for personal transformation that can produce growth. Essentially, the system searches its way to new, more adaptive attractors (Combs, 1995).

Darryl's improved functioning can be related to energy usage. Chaos takes a tremendous amount of energy to navigate, which perhaps accounts at least partly for the distress he was experiencing when he came into therapy. The edge-of-chaos state is much easier. Life evolves freely here. Energy requirements are more reasonable and the complexity generated is sufficient to make ongoing 'just good enough' adaptations (Butz, Chamberlain & McCown, 1997).

Clinical observations and feedback support the interpretation of Belinda being far away from an edge-of-chaos state. As previously discussed, Belinda was doing things differently in terms of trying to better her financial position but there was nevertheless

still a paucity of functioning evident and an inability to see a positive outcome in her life. Essentially, Belinda was very stuck. Her system would need to be destabilised and move through a state of chaos before reaching an edge-of-chaos state. Having said that, the move to edge-of-chaos would not necessarily take a long time. Systems self-organise according to their adaptive requirements, and there is no set time for this to happen (Kratky, 1992).

Clinical observations and feedback support the interpretation that Carmen was not far from an edge-of-chaos state. In terms of the chaotic sequence of change, a system in chaos is necessarily only a step away from the edge-of-chaos. The order of movement in therapy for Carmen was from chaos to order. As such, destabilisation in her case would lead to stabilisation and it would be this increasing order that would disrupt the pattern of wide fluctuations and eventually lead to an edge of-chaos state.

Importantly, Darryl's edge-of-chaos state could be kept in that condition by means of small, timely interventions made both in therapy and by himself. The individual can consciously keep his or her system in an ongoing adaptive state of complexity rather than allowing it to gravitate to a fixed and more rigid style of functioning. This is done by the conscious use of self-organisation (Kratky, 1992).

5.4.10 Self-organisation

A system that looks chaotic on a macro level actually has its own inherent order at the micro level. Self-organisation can be seen as the process whereby that underlying, inherent order in the system emerges out of chaos. Thus, out of chaos a new stability and system state forms (Butz, 1997). All living systems are self-organising. That is, they can control their own control parameters, giving them the capability to induce bifurcations within their own systems (Abraham, 1995).

5.4.10.1 Results and discussion

Self-organisation cannot be pinpointed specifically in graphical analysis. It is, however, implicit that the system state under investigation is constantly self-

organising. Although not graphically detectable the evidence is necessarily there, 'hidden' in the graphical pictures. It can be said, then, that evidence of self-organisation is present in the participants' graphs but is not detectable.

The distinctive, sequential change in Darryl's system shown earlier in graphical analysis (Figures 5.1 to 5.4 and 5.5 to 5.8) clearly displayed all the hallmarks of chaotic change. If it is indeed a clear process of chaotic change, as has been strongly argued, self-organisation is necessarily at work. Clinical observations and feedback support this inference. Observations suggested that Darryl was very much in a 'rut' at the beginning of therapy and this was confirmed by feedback. His system was perturbed and went into instability. It was during this period of instability that Darryl made a conscious decision to seek better work or to make more of the work he had. Self-organisation occurs most dramatically in a state of change. When the system is unstable and susceptible to influences, it may move in a given direction as a result of such. Crucially, the individual can consciously influence self-organisation and evolve in a desired direction in life. Individuals are proactive agents who organise their worlds largely by organising their selves. In doing so, they literally co-create the realities to which they respond (Mahoney & Moes, 1997). As such, people can use their imagination and make choices that empower their future, shaping their development in a preferred direction. Essentially, the individual can boldly go where he or she has not previously ventured, exploring conjectured attractors, making informed choices concerning potential trajectories, and making bifurcational leaps to desired states (Abraham, 1992). This is exactly what Darryl did. He took control of his life and moved forward in the direction of a perceived better life.

This is also what Belinda and Carmen did. Although they did not move so obviously as Darryl, their commitment to change and to the therapy process was apparently just as wholehearted and it can be speculated that their process of change and self-organisation was just happening more slowly or even outside of awareness. Crucially, the direction of self-organisation can be controlled but not the process itself. Like a growing seed, self-organisation to a given state unfolds in it own time and way according to the newly forming system state's 'inner blueprint'.

The assumption that self-organisation is an ongoing phenomenon inherent in all dynamical systems is no trivial point. It essentially means that whatever the condition of an individual's system, it is nevertheless self-organising constantly to make the best of that situation and to move to ever-higher levels of complexity (Wieland-Burston, 1992). This view necessarily entails taking a broader, lifespan perspective. People develop constantly throughout life. Self-organisation is necessarily an inherent part of that development and must be seen in terms of process as opposed to event (Thelen & Smith, 1994). Seen in this light, all of the participants could be seen to be functioning in a manner that was appropriate for them during the intervention, even if that manner of functioning was psychologically distressing for them.

The deliberate use of self-organisation is an empowering concept in therapy. The therapist helps the individual to self-organise, at the same time empowering the person to do this for himself or herself in the future. The implication is that the therapist can assist the individual to self-organise to a more adaptive state. Control is gradually turned over to the individual, facilitating a process whereby the person is effectively able to take responsibility for his or her own growth (Masterpasqua & Perna, 1997). There was a strong emphasis in the intervention on empowering the participants. Essentially, while the participants were being guided to different attractor constellations in the intervention they were also being empowered to take control over their lives in the future. The notion of deliberately initiated self-organisation was constantly stressed in the hope that each individual would learn how to change their own control parameters and effect their own change in the future. Observationally, the participants certainly appeared to be more in control of their lives to greater or lesser degree at the end of therapy and this was confirmed in feedback.

It is, of course, possible for the therapist to take a more dominant role in guiding the individual's process of self-organisation. Essentially, the therapist establishes new attractor points for functioning. This is typically done by providing the individual with alternative possibilities of the world and of the self. Ideally, these new alternatives coax the individual into turmoil or far-from-equilibrium conditions. The person is then open to new information from the world or the therapist that can create a new attractor or point of dynamic equilibrium (Brack, Brack & Zucker, 1995). Variability in activity is a prerequisite to self-organised change, and often an integral

element in the creative solutions or expressions that may emerge. Homework assignments are particularly powerful (Mahoney & Moes, 1997). Indeed, in the intervention great stress was laid on homework and trying out novel ways of functioning.

Self-organisation also occurs within the therapist and in the therapeutic alliance. Essentially, there is a traversing of boundaries between therapist and client that inevitably impacts both parties (Goldstein, 1995). This was the case in the intervention. A particularly close alliance was forged between researcher and participants, which would have inevitably affected each other's self-organisation to greater or lesser degree in ways that are not readily apparent.

5.4.10 Fractal structure

The structure of dynamical systems is fractal in character. A fractal is a pattern that repeats the same design and detail or definition over a broad range of scale, from the macro to the micro (Williams, 1997). As such, a given system's geometry exhibits a self-similarity at different dimensions and levels of analysis (Cambel, 1993). Fractal geometry is the geometry of chaos (Marks-Tarlow, 1995). Essentially, the system and its characteristic functioning looks the same at all levels and from all angles.

5.4.11.1 Results and discussion

Fractal self-similarity is clearly evident in the graphical results for each participant, particularly so in the three-dimensional phase portraits with their highly graphic depiction of system dynamics. Each person's self-similar shape can be seen as a kind of 'signature' that characterises his or her system.

Even though Darryl's system state changed markedly over the three months of the intervention, there is a pronounced self-similarity in each of his graphs. A kind of 'pincer' shape is evident throughout. In July (Figure 5.1), the chaotic motion shows a wide range of functioning and the extremes of the trajectory at the front of the graph form the 'pincer' shape. Figure 5.2, depicting August, is almost like a small copy of

the previous month's system state. The chaotic movement is gone, but the 'pincer' shape is retained. In September (Figure 5.3), the range of motion is again reduced, but the basic shape is retained. Belinda's graphs (Figures 5.9 to 5.11) are remarkable in terms of self-similarity. Not only is the basic overall shape retained, but also clearly observable similarities of small geometric patterns in the three graphs. Carmen's graphs (Figures 5.17 to 5.19) are very self-similar over the three months, with the extreme oscillations being the characteristic signature of her system. Chaos is reduced somewhat after the first month, but the three graphs are essentially like copies of each other.

Clinical observations and feedback support the graphical interpretations. Darryl did change markedly and showed a great deal more flexibility, but there was still a characteristic style of response to his functioning that was evident across all the areas of concern that he brought to therapy (eg: he approached each situation in a very logical and philosophical manner). Belinda's functioning remained rigid throughout. Even though she did display behavioural change, this was still characterised by a self-similar paucity of functioning across all her areas of concern (eg: she displayed a limited ability to generate novel ideas in each situation). Carmen evidenced a high degree of self-similarity of functioning throughout (eg: the keen insight she showed about herself in therapy extended to keen insight being shown with regard to all her areas of concern). This is consistent with the notion that people tend to resemble themselves in fundamental ways that are independent of spatial, temporal, or situational scales of observation. When they possess a certain psychological characteristic, they tend to exhibit that characteristic at many, if not all, levels (Marks-Tarlow, 1995).

This, in fact, is a natural self-similarity. In nature, pattern is found within pattern (Gleick, 1987). Humans and nature are mutually embedded, and thus the individual is necessarily subject to fractal self-similarity. The world is a network of dynamic and systemic webs of relationships and processes, and fractal self-similarity is important because the individual must be seen in the larger context of such (Marks-Tarlow, 1995). Self-similarity of functioning thus ideally needs to be seen deep and wide and over the long-term, a perspective that is very complex. Essentially, the processes and structure at one level of observation reverberate throughout many levels of the system

within the individual's psyche (Perna, 1997). This is bounded infinity, the notion that attests to the infinite depth and variety that each individual possesses. The closer, deeper, wider, and more expansively that a therapist looks at an individual, the more the person's characteristic functioning is seen to extend across the range of functioning. There is essentially an infinite depth and complexity to the individual, and this is coloured by characteristic ways of functioning (Marks-Tarlow, 1995).

In therapy, then, it is crucially important to examine the patterns that emerge in the tapestry of the individual's life, looking for the fractal self-similarities that yield clues as to the person's underlying dynamics. These similarities are manifest at all levels of the psyche, in all areas of functioning, and in all spheres of life such as family, social, and cultural situations (Hudgens, 1998). It was beyond the scope of the intervention to explore the participants' self-similarity to the extent that it warranted. Nevertheless, a keen appreciation for the presence and influence of self-similarity was held by the researcher throughout.

5.4.11 Holism

Life is incredibly complex, and chaos theory pays due regard to this. Chaos theory holds that all of existence is interconnected and interrelated at deep and subtle levels. As such, dynamical systems are necessarily embedded in and inseparable from their environment. A given system must therefore be seen in context, and not in isolation. Further, a given influence on any one part of a system or its environment necessarily affects the entire system to greater or lesser extent (Butz, 1997).

5.4.11.1 Results and discussion

Holism can only be inferred in graphical analysis. Referring as holism does to the embedded interconnectedness of the individual with all that exists at surface, deeper, and subtler levels and the multitudinous interrelationships necessarily inherent in such, the full complexity of a given system cannot possibly be captured in graphs. Notwithstanding, system constructs intended for graphical analysis – if constructed judiciously – are taken to be representative of a given system (Abraham, 1992). As

such, holistic complexity is implicit therein. In the three-dimensional phase portraits utilised in the study, each composite point is taken to represent a full picture of a participant's system state at a given point in time. In the linear time-series graphs, the three parameters depicting the individual's system state are taken to be inextricably intertwined. As the construct parameters of each individual's system were co-constructed by researcher and participant, and done so after extensive exploration of the participants' functioning and attractor constellation, it is thus reasonable to infer that the graphs are holistically representative of the participants' systems.

So complex are systems, however, that at best it may be said that the graphs depict a 'snapshot' of each participant's system from a certain angle. Had other construct parameters been chosen, different snapshots from different angles would have been taken. This does not diminish the power of the graphical representation of the system. Rather, it highlights the incredible holistic complexity surrounding people and life. Essentially, Darryl, Belinda, and Carmen are incredibly complex individuals and their graphical results can, at best, only give hints as to the full extent of such complexity. Each individual is unique. Even though people may display similar patterns, each expression reflects the individual history and unique parameters of that person's life (Mahoney & Moes, 1997). This is a holistic view that essentially takes cognisance of all possible interconnections and interrelations in a person's life. It considers all levels of all possible influences, and links past, present, and future.

Clinical observations and verbal feedback made it clear that each participant was crucially embedded in family, community, society, and indeed the planet. Further, they were crucially affected by events in these domains, each of them in different ways and to different degree. Mostly national and local events affected Darryl, mostly family issues affected Belinda, and mostly family and school issues affected Carmen. Both Belinda and Carmen were particularly influenced by both external (eg: unexpected and undesirable life circumstances) and internal (eg: moods, tiredness, aches and pains) stimuli.

Being a family unit, the participants also influenced each other to greater or lesser extent. Although individual therapy was conducted it was evident both from clinical observations and verbal feedback that the sessions were having an effect on the family unit as a whole. The therapeutic goals being pursued inevitably impacted upon each

other in both positive and negative ways. Darryl's increasing sense of self and his search for a better way of life was 'out of synch' with Belinda's stuck condition. At the same time, Belinda's burst of activity in terms of renovating her sewing room put pressure on the family precarious finances. In turn, Darryl's lack of positive response to what she was doing irritated Belinda. Carmen's therapy was having a positive effect on her home life. In particular, her increased presence at her mother's home appeared to be having a beneficial effect on cementing the mother and daughter relationship. However, Carmen's presence seemed to cause Belinda considerable distress in that she did not have the necessary finances to provide fully for her daughter and exacerbated the bitterness she holds towards her former husband. Family issues were not pursued as that was not the focus of the intervention, but the systemic interconnectedness was nevertheless very obvious throughout therapy.

Therapy is also complex. The therapeutic process is characterised and influenced by multiple levels. These levels exist within the intrapersonal sphere, the interpersonal sphere, and the global sphere. Each could potentially be connected to or influence another, thus contributing to system evolution and the process of change. Growth and change of any one component has the potential to influence and be influenced by the other components with which it interacts. It is therefore impossible to analyse a single part or individual in isolation, and the therapist must seek to discover and describe the embeddedness present among the various levels (Burlingame, Fuhriman & Barnum, 1995). While such holistic embeddedness could not be fully explored in the intervention, the sense of the participants' incredible complexity as individuals and the complexity of their lives was nevertheless recognised, acknowledged, and celebrated throughout. The therapeutic alliance must also be seen holistically. It is also a complex system that evolves in a situation of high connectedness (Perna, 1997). Darryl, Belinda, and Carmen all connected to the researcher in different ways and the resulting therapeutic alliances were rich and rewarding.

5.5 LIMITATIONS OF THE STUDY

The limitations of the study pertain to constraints of scope.

Chaos theory is a complex and complicated field, and any discussion of its concepts and application in therapy must necessarily take cognisance of such. The explanation of the concepts given was highly simplified for the purposes of the study, but such a summary treatment of an incredibly rich and fascinating field inevitably bypasses some interesting territory. The distillation of these concepts was a carefully considered and executed one, made in terms of the study's goals of simplicity and clarity, but the shortcoming of lack of complexity in this regard is nevertheless acknowledged.

In demonstrating the concepts and application of chaos theory in therapy, a similar constraint was inevitable. In its applied mode, chaos theory is wonderfully complex and is subject to a depth of interpretation that is limited only by the therapist's depth of understanding and insight. Essentially, the subtleties and nuances of chaos theory in therapy are boundless. Such have barely been scratched in the above interpretation of the results and discussion thereof. The aim of the study was to simply and clearly demonstrate chaos theory as applied in therapy. Within the constraints of the study that goal necessarily entailed brevity, but it is acknowledged that much richness of interpretation has been bypassed.

In terms of the integration of the fields of constructivism, ecopsychology, and chaos theory, a similar lack of complexity is acknowledged. The aim of the integration was indeed to distill the essential concepts of these fields and synthesise the core fundamentals into a closely woven, functional working framework relevant to the main goal of the study. This was arguably done, but was achieved at the cost of bypassing a great deal of the richness and diversity inherent in these three fields.

5.6 FUTURE RESEARCH

Many fruitful avenues of research could be pursued from where this study leaves off, and these may usefully be explored in relation to the goals of the study. A broad perspective is considered as opposed to making suggestions for particular studies, as the scope of the subject matter is essentially epic in character and boundless in potential.

More studies focusing on simple and clear applications of chaos theory in therapy could be undertaken. The proliferation of complex and confusing studies in this field almost demands a move toward applications that cut through the conceptual denseness that characterises the field. If these can be conducted in real-life therapeutic situations, so much the better. The chaotic process of change is all about living systems evolving and adapting in response to circumstances, and there is arguably no better way to investigate such than in dealing with the issues inherent in the daily cut-and-thrust of people's lives. Studies committed to pragmatic utility would be particularly welcome – the field desperately needs this! Related to this, there is great scope for innovation and creativity in research design and methodology. There is room in particular for studies utilising triangulation of methods.

A more comprehensive integration of constructivism, ecopsychology, and chaos theory could be undertaken. The fields are so highly complementary that their synthesis could be very rich and deep indeed. A comprehensive integration has the potential to not only fuse the core concepts of the three fields – as was done in a limited way in this study – but to gather together their more diffuse and disparate strands and seek to bind them into one. The potential of such an integrated framework for psychology is considerable.

5.7 SUMMARY

In this chapter, the three case studies of the research participants were first presented, to provide background information and contextualise the ensuing results and discussion. A short section on the graphical analysis of chaos was presented, as an aid

to clarification and understanding of the results and discussion. The process of chaotic change was very briefly summarised, to provide further context. Results of the graphical analysis were presented, and these were followed by a discussion of the results. The results from graphical analysis were triangulated with clinical observations and verbal feedback from participants to simply and clearly demonstrate the application of chaos theory in therapy. The limitations of the research were outlined. These pertain to the constraints of the scope of the study and highlight the complexity that was necessarily bypassed in the pursuit of conceptual distillation and synthesis. Suggestions for future research were made. Rather than delineating particular studies that may be undertaken, a broad perspective of potentially useful research was considered.

5.8 CONCLUSION

This study's main goal was to simply and clearly demonstrate the concepts and application of chaos theory in a therapeutic situation. To this end, three fragmented but highly complementary fields of psychology were integrated to support a real-life therapeutic intervention and an innovative research design focused on pragmatic utility was implemented. The results and discussion arguably show that, despite the notorious difficulties inherent in utilising chaos theory in real-life applications, the approach can be used simply and practically in therapy and that it is of pragmatic utility. The complex nature of applied chaos theory and its analysis presupposes a certain degree of technical language and complex explanation, but it is argued that the approach is nevertheless simple and clear and that its pragmatic utility has been demonstrated. It is thus concluded that the concepts of chaos theory can be demonstrated in therapy and that their use can be demonstrated in a simple and clear manner. It is further concluded that chaos theory holds much potential as an applicatory model for psychology. This potential would be greatly enhanced by the use of more simple and pragmatic research methods as an alternative to the generally complicated methods associated with the approach. The triangulation of analytical methods holds particular promise in chaos theory application.

The study's second goal was to integrate the fundamental concepts of constructivism, ecopsychology, and chaos theory, relative to the main goal. This was done to provide a platform for the study's intervention, which utilised the core fundamentals of these fields as a working framework. The integration duly served its purpose, proving to be a firm platform for therapeutic work and investigation. It is thus concluded that the integration of constructivism, ecopsychology, and chaos theory offers a potentially powerful framework for therapy and broader psychological investigation and application.