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**The necessary chaos of development: Chaos theory, and a new
symbolic developmental paradigm**

Bütz, Michael Ray, Ph.D.

The Wright Institute, 1992

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The Necessary Chaos of Development

I

THE NECESSARY CHAOS OF DEVELOPMENT:
CHAOS THEORY, AND A NEW SYMBOLIC DEVELOPMENTAL PARADIGM

A dissertation submitted to the Wright Institute

Graduate School of Psychology in partial fulfillment of the requirements
for the Degree of Doctor of Philosophy in Psychology

by
MICHAEL R. BÜTZ
AUGUST 1992

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The Necessary Chaos of Development

II

THE NECESSARY CHAOS OF DEVELOPMENT:
CHAOS THEORY, AND A NEW SYMBOLIC DEVELOPMENTAL PARADIGM

by

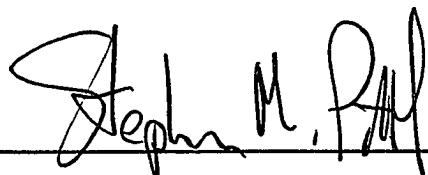
MICHAEL R. BÜTZ

Abstract

Here the basic tenets and philosophical roots of chaos, and chaos theory are explored. Some of the main features of chaos theory are applied to developmental and therapeutic models in psychology. In the second segment, an enlargement of Kuhn's (1970) concept, the paradigm, is advanced via the concept of dimensionality (Bütz, 1990a, 1991c). The discussion is based upon concepts found in chaos theory, most notably self-similarity and nonlinearity, in an examination of the paradigms currently operating in science, psychology, developmental psychology and clinical psychology. In the final segment, chaos theory is addressed in terms of its promise not only for the proposed novel perspective it lends to the developmental cycle, but also for its implications in a therapeutic context, and as a model for the unification of psychology. Concepts such as the Transcendent cycle (Bütz, 1990b), the Transitory self (Bütz, 1991a) and the Symöbia (Bütz, 1992b, d, e, f) are offered in order to provide a new symbolic developmental perspective from a chaos theory point of view. The implications for therapy are discussed, and a case illustration is offered. Finally, Prigogine's work of dissipative structures is featured as a model for unifying different perspectives in theories of aging, in a self-similar model to psychology as a whole.

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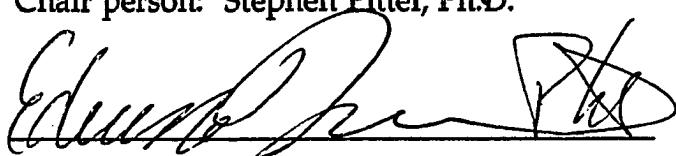
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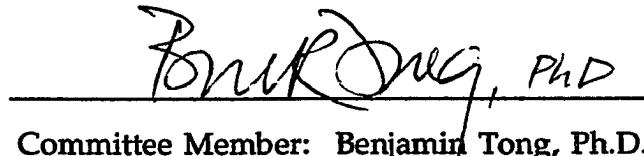
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1

An Introduction

Chapter 1

Segment I: Chaos and Chaos Theory

The Necessary Chaos of Development

2



Figure 1-I

This is a figure out of the Rosarium philosophorum that depicts the masculine-Sol, and the feminine-Luna in interaction (Jung, 1966, pp 213).

The Problem with Opposites

"O Luna, folded by my embrace,
Be you as strong as I, as fair of face.
O Sol, brightest of all lights known to men,
And yet you need me, as the cock the hen."
Rosarium philosophorum (1550)

Although it may not be apparent at first, the ancient alchemical statement above has a great deal to do with the subject matter that we are about to broach. What Sol and Luna¹ represented in alchemy were the "supreme opposites," that when united produced powerful even frightening forms such as "dragons" (Jung, 1970a, p 210, 144).

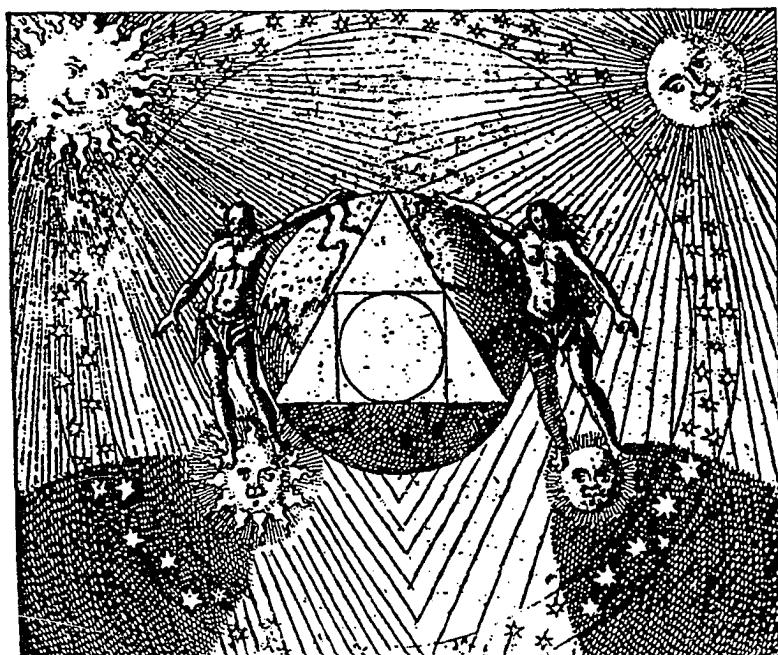


Figure 1-II

This is the symbol of the *opus alchymicum* that breaks down the original chaotic unity into four elements and then "combines them into a higher unity." (Jung, 1968, pp 124-125). Also, here we again have the masculine represented in conjunction with Sol, and the woman represented with Luna.

¹ Sun and Moon.

Order and chaos are also opposites, but in a much larger context. In our culture we have placed great value upon the idea of order. On the other hand, chaos has typically been something we, as a largely Euro-Christian culture, have devalued or even feared. It seems that in this culture chaos has always been aligned with darkness and evil, perhaps the dark side of Luna. This may be largely due to the influence of Christianity upon this culture. As we may know, change is always frightening and it may feel like chaos; facing the dark side of ourselves, our fears, or intrepitations. Like our culture, the dark side of science has long been associated with problems that do not have foreseeable answers, chaotic looking problems. Problems like this, have been called nonlinear. Just the phrase: "nonlinear equations," typically brought most scientist's hackles up. However, recently a new scientific discipline has looked into the darkness of nonlinearity and is emerging unscathed. This new discipline is called chaos theory, and as the name implies, it deals with problems that appear to be chaotic. Just as Sol and Luna once united were able to produce frighteningly powerful forms, so too are chaos theorists producing powerful forms of theory in their continued efforts to unite the linear and nonlinear aspects of science.

Chaos Who?

Chaos theory is a popularized term given to this rising school in the "hard"² sciences, which describes new theoretical ideas such as dissipative structures, dynamical systems and fractal geometry. Chaos was the expression initially chosen in 1975 by James Yorke in an attempt to bring the work of Lorenz (1962) to a wider audience (Gleick, 1987, p 65-69). This expression has remained, and chaos theory has

² Meaning sciences such as biology, chemistry, mathematics and physics.

become the dominant phrase to describe the "constrained randomness" that occurs during the time evolution of large classes of dynamical systems" (Masters, 1990).

Chaos theory has already made some important strides in the hard sciences. It has inspired scientists in widely different fields to re-evaluate old theories and create new ideas based upon the nonlinear dynamics inherent in many aspects of scientific inquiry. Among the pioneers in this field you will find names such as Bohm (1980), Feigenbaum (1978, 1979), Lorenz (1962), Mandelbrot (1977), May (1976), and Prigogine (1984). Each pioneer was unique in their own right, where Bohm advanced his theory of implicate order (1980), Feigenbaum put forth his concept of the universality (1978, 1979).

More recently, chaos theory has started to be used as a model in the social sciences. There, it is often described as a creative synthesis between simple and complex interactions that is able to explain both linear and nonlinear relationships (Loye & Eisler, 1987; Bütz, 1990a, 1990b; Chamberlain, 1990; Marks, 1991; Schwalbe, 1990; Vandervert, 1990a, 1990b, 1991b).

In psychology, chaos theory has been used to describe models of learning, (Abraham, et al, 1990; Freeman, 1991), information processing and brain physiology, (Freeman, 1991; Skarda & Freeman, 1987), as well as the brain-mind relationship (Vandervert, 1988, 1990b, 1991a). Several theoretical models have used chaos theory to describe psychological dynamics in the area of psychotherapy (Sabelli & Carlson-Sabelli, 1989, 1990a, 1990b; Bütz, 1990a, 1990b, 1991a, 1991b; Hawkins, 1990; Abraham, et al, 1990; Chamberlain, 1990).

According to Masters (1990), and a great many others these days, chaos is "constrained randomness." But, as scientists we cannot separate chaos theory from

the philosophical idea of chaos, since we use it to describe what we are at one level perceiving. In the past, nonlinearity has typically engendered feelings of chaos within ourselves as a Western culture. It seems we have enjoyed life best when it has been in a "nice orderly package." So what does chaos mean to Western science and culture? Where are its roots? It seems we must first consider the philosophical history of chaos in order to place the science of chaos squarely in its foundation. In order to do this, chaos must be considered in cultures such as the Asian, Egyptian, Native American, Greek, and Christian to lead us to Poincaré's encounter with the nonlinear and chaos. We must understand what chaos has historically meant in the philosophy of the human race in order to understand why it has been ignored, even avoided, for so long by Western science and culture.

Given the variety of scientific disciplines represented above, it is perhaps surprising that each of them share one common theme in their theoretical approach: they redefine how we think about the development of systems. In the past, it has generally been believed that when a system's behavior was outside the bounds of linear behavior, that its behavior was random or disorganized. The first indication of an approach that differed was *general systems theory* (Bertalanffy, 1950) that describes open rather than closed systems. In general systems theory it is stated that most living systems are characterized as having two apparently divergent functions, the tendency toward a steady state, and the capacity for transformation. What these new ideas in chaos theory tell us is that during this transformative process systems may behave in a manner difficult to analyze, and that their behavior *may appear to be random*. However, given enough time these systems demonstrate an underlying order (Lorenz, 1962; Mandelbrot, 1977; May, 1976; Feigenbaum, 1978, 1979; Bohm,

1980). In fact, according to Prigogine and Stengers (1984) they self-organize. What appears to be chaos is only one stage of a systems development. After a chaotic period the system may become ordered, it may self-organize. What does this mean for psychology? It means a fundamental shift when viewing the psychological development of an individual, family or community. In the past, the views in psychological theory have largely been consistent with those of science, prior to general systems theory in that chaos was perceived as random or disorganized behavior. This type of behavior indicated to theorists and clinicians a fundamental breakdown or weakness in a system. For example, a system such as an individual's personality. Now instead of viewing a system's behavior as random or disorganized, we can understand it as *apparently chaotic* with an underlying order that may be a precursor to growth (Bütz, 1990a, 1990b, 1991a, 1991b). Therefore, how we address or even think about development must be carefully reconsidered.

In sciences such as biology, chemistry, mathematics and physics, chaos theory has been utilized to address both linear and nonlinear properties of systemic behavior. The theory better describes how a system moves in and out of order and chaos in its own unique pattern of behavior. Meaning, that this theory is able to describe not only what a system has in common with other systems, but also what is distinctly different about that particular system. The particular stability of a system is addressed through concepts such as: sensitive dependence on initial conditions, self-similarity, strange attractors, and self-organizing structures. These concepts carefully applied to psychological development may lead to a more explanatory theory of development, and even therapy.

Paradigm Problems

Given the emphasis upon what systems share as well as what is unique about them, development is not the only aspect of psychology or science that must be reconsidered. Some of the fundamental landmarks that scientists have been accustomed to utilizing must also be reevaluated. One such concept is the paradigm advanced by Kuhn (1970). Kuhn's paradigm has been no less than a landmark by which scientific mariners have been able to steer their inquiries into the heart of nature and man. Still, in psychology it has been a troublesome concept, since according to Kuhn's definition, psychology is not a science. In emphasizing misunderstood aspects of the paradigm Kuhn put forth two ideas that lend the paradigm to a chaos theory interpretation. Making use of the ideas Kuhn advances in two essays: Postscript (1970), and Second Thoughts on Paradigms (1977), it seems that I may apply a concept that was originally developed to address the topological aspects of psychological development called *dimensionality* (Bütz, 1990a; Bütz, 1991c). Dimensionality gives Kuhn's paradigm a broader interpretation for both psychology and science. With a dimensional interpretation of the paradigm, one may think in terms of the scope of both the shared and contrary aspects of scientific thought. In addition, one may consider the difficulties scientists may encounter in their discussions at the boundaries of their disciplines. One may then discuss the idea that within smaller scientific disciplines such as psychology, or even developmental psychology, there are paradigms at work that have just as much import as those found in larger scientific contexts. Consequently, it will be important in this paper to review and reevaluate the existent and changing paradigms found in science, psychology, developmental psychology and clinical psychology from a dimensional vantage point.

During the era spanning approximately nineteen hundred to the mid-nineteen-sixties, the primary models of development were based upon the quasi-paradigmatic contemporary scientific theory found largely in physics and biology. The theories of Freud, Jung, Piaget and Erikson may all be considered as part of this era, where theorists were inspired by the quasi-paradigmatic theories found in these other fields. While these theories were no less than paradigmatic shifts in the study of development and therapy, just because these theorists translated physics and biology into psychology does not mean that there is reason enough to now likewise borrow principles from chaos theory and apply them to psychology. More recently, psychological theorists such as Levinson (1978), Gilligan (1982), and Jordan, Kaplan, Miller, Stiver, and Surrey (1991), have generated developmental theory based upon their observations from clinical research. This new group of developmental theories may be cautiously considered a paradigm shift because they are highly dependent upon the unique experiences of each individual studied as well as the clinician(s) involved.³ Rather than base their theoretical superstructure on theories from the hard sciences. These studies focus upon the qualitative aspects of human experience and their generalizability only insofar as stated within the subgroups that were studied, and limited even in that respect. So this leaves the field of psychological development in a quandary. Do we focus upon what human beings hold in common, as early theorists seemingly attempted to do in borrowing from scientific theories in physics and biology? Or, do we follow a more qualitative path as in

³ It is obviously true that Freud, Jung, Piaget, and Erikson did indeed base their theories on their observations, but what differentiates them from this group is their reliance on physics and biology as the backbone for their early theoretical work.

contemporary theory, concentrating upon the distinctive aspects of the individual?⁴ Ostensibly, the next generation of developmental theory must do both tasks equally well, it must describe what people share in their developmental paths as well as illustrate what is unique to each group or individual in a robust and qualitative manner. The models available to us through chaos theory seem to show this type of promise.

Chaos: Process, Perspective and Symöbia

In the course of this exposition the focus will turn to what is common to developmental cycles as well as what is unique about them. I contend that what is common among all developmental paths is the experience of crisis at both the local and global level of psychological development. What is distinctive about each individual's developmental path is how the individual grapples with these crises. Crisis is defined as: "a turning point for better or worse...(or) an unstable or crucial time"...(Webster, 1989). Commonly crisis drums up images of an abyss, death, a void, something most people would rather escape. As a consequence, many of the models of development, and in fact therapy, warn against crisis and seem to implicitly direct one to avoid crisis. On the other hand, this crisis is perceived differently if it is a step toward a greater psychological capacity, rather than one's felt sense of destruction⁵.

⁴ Contemporary meaning strangely 1978, 1982 largely, since Jordan et al, 1991 does not add greatly to Gilligan's argument in my view.

⁵ Grotstein (1990) discusses this idea in that the client perceives the chaos as randomness, and therefore fears it. While I attempted to emphasize this in an earlier work (Bütz, 1990), I believe Grotstein discusses it quite clearly and may well have preceded me in his formulation of it. Still, while he talks about chaos, he never actually defines what it is other than emotional turbulence. In my initial work I tied chaos to overwhelming anxiety.

According to Prigogine's work (1984) on dissipative structures, what follows crisis, and in his term chaos, is a new and more complex form of order.

To make this presentation consistent with my previous work (Bütz, 1990a, 1990b, 1991a, 1991b), and metaphorically analogous with the tenets of chaos theory, crisis will be defined as either a period of bifurcation or chaos. In human development these periods seem to be manifested by the experience of anxiety, or overwhelming anxiety. In this view, human development is typified by periods of chaos that are resolved and followed by periods of order, and visa versa. In each system this cycle is different depending upon the system's own form of stability. To gain a perspective of how these processes unfold, one need only consider the concept of dimensionality with it's self-similar emphasis (Bütz, 1990a, 1991c). While gaining a developmental understanding of both process and perspective is important, equally important is a consideration of the being itself.

The human being seems to differ from other beings in its use of symbolism as a focal point for growth (Bütz, 1990a, 1990b, 1991a, 1991b, 1992b, 1992c, 1992d, 1992f, 1992g). In their model, Maturana and Varela (1992) speak of autopoietic unities that are self-creating in nature, but they do not attend to the importance of the symbol in terms of the self-referential process that follows from an encounter with novel material (Bütz, 1990a, 1990b). We are more than simply autopoietic, we are at least human beings.⁶ However, our growth is not described adequately by either term, nor is our essence. Therefore, I offer the term *symöbia* to describe the self-organizing, self-referential and symbiotic being that we appear to be.

⁶ Human being roughly translated means, one and the same as the progenitor.

The term symōbia was chosen to emphasize our symbolic capacity, and to illustrate through the Möbius strip, how simple, and yet, complex we are as a being.



Figure 1-III
Möbius Strip

The power of symbolic expression has been emphasized since time immemorial (Bütz, 1992g), and some of the reasons for this will be presented in the next chapter. What is important to understand here is how confusing a being we are. The Möbius strip provides a wonderful metaphor to describe our paradoxical simplicity and complexity that makes us unique. The Möbius strip is:

"a one sided surface that is constructed from a rectangle by holding one end fixed, rotating the opposite end through 180 degrees, and applying it to the first end." (Webster, 1989, pp 762).

What this means for us is that in one moment the Möbius strip can look one dimensional, but with a twist it can look three dimensional. Still, both dimensions are represented in the same object. Its complexity only manifests itself through a manipulation. The same is true for beings such as ourselves. If one were only to look at our biology, as complex as it is, they may only view us in terms of certain capacities. On the other hand, if we examine the creations and capacities of our mind in concert

with our bodies, there is a complexity that transcends biological description. This transcending agent is our symbolic capacity. The symöbian being's capacity for transcending previous levels of existence lies in its ability to be self-referentially symbolic. This makes us unique in spite of our biology, and at the same time we are not terribly autonomous. Our capacity for growth both psychologically and biologically is symbiotically tied to our relationship with our environment. Meaning, that in order to enact the self-referential process of producing a symbol we must encounter novelty.⁷ In this experience we find the uncertain feeling of chaos, which, seems to be a precursor to growth (Bütz, 1990a, 1990b).

A Bigger Picture

As I have mentioned, viewing chaos in development as a stage necessary for constructing a more complex and adaptive psychic structure calls for a re-evaluation of developmental theory. Moreover, if we view development through new lenses, we must also reconsider therapy through these lenses as well. This seems to be a necessity, since it is only logical that how we think about development guides and influences how we do therapy with the many and varied therapeutic tools at our disposal. Therapeutic intervention then, must at least be considered, given that developmental tasks in the life cycle are to be reframed as the primary thesis of this exposition.

Indeed, reframing is one of chaos theory's most important theoretical aspects, since we as scientists are able to reframe what has heretofore been labelled as random into a complex underlying order. This is not simply renaming a concept or a group of

⁷ Baars (1988) discusses a similar process in his work on representations.

concepts. By reframing, as one would reframe a picture, the perspective is completely altered, giving each concept an interconnected significance it did not have before. By reframing the boundaries of concepts like the paradigm, and ultimately science in general, chaos theory brings out the texture and hue of each brush stroke that each scientist lends to the concepts they have created. Through these new frames disparate fields may appear to be unified. Take for example the field of aging: more specifically theories of successful aging. Utilizing Prigogine's concept of the dissipative structure (1984) as a guide, I contend that the three dominant theories: activity, disengagement and continuity, all represent different aspects of the same developmental path. It seems reasonable to attempt to unify other disparate areas of psychology and science given chaos theory's ability to reframe different aspects of theory in a unified manner.

The chapters that follow are organized in a manner that introduce the basic tenets and philosophical roots of chaos, and chaos theory, to the reader followed by analogical application of some of the main features of chaos theory to models found in psychology. An enlargement of the concept of the paradigm is advanced in the second segment of this exposition. Here, the discussion is based upon concepts found in chaos theory in an examination of the paradigms currently operating in science, psychology, developmental psychology and clinical psychology. In the final segment of the work, chaos theory is addressed in terms of its promise not only for the novel perspective it lends to the developmental cycle given the universal experience of crisis/chaos and how its resolution is acquired in each individual case, but also for its implications in a therapeutic context and as a model for the unification of psychology.

The Philosophy of Chaos

Chapter 2

Segment I: Chaos, and Chaos Theory

At the outset of this chapter, I must modestly state my credentials for this historical-philosophical journey into the what chaos has meant to the human race and where the idea comes from. I do not claim expertise as a historian or as a philosopher, and it is my hope that the reader will take this into account in reading the paragraphs that follow. Still, I do want to paint for the reader a philosophical history about the concept of chaos that to my knowledge has not been told so far by chaos theorists.⁸ I am able here only to point out roughly the key examples of when, and in what civilizations the concept of chaos has occurred, often as a central part of their creation mythology. What I have found so dubious in previous accounts is the frequent reference to Greek civilization, and Hesiod in particular (700 B.C.), being given credit for the concept of chaos. One example would be Krippner's (1992) recent article in which he states: "Chaos theorists appear to be inadvertently returning to Hesiod's original concept." This strikes me as Eurocentric, especially given the knowledge that this concept existed possibly as far back as 2500 B.C. in Asian and Egyptian cultures.⁹ Consequently, in this chapter we will examine, as best we can, the historical philosophical roots of chaos given the concept's attention in light of the new science of chaos theory.

It seems important to emphasize that chaos theory like many other theories in physical science was derived from a largely Western and/or EuroAmerican point of view. The emphasis of "science" for well over the past century has largely been to explain complex systems in the simplest manner possible through linear models. In

⁸ Briggs and Peat (1989) have indeed supplied a casual history of chaos, but they do not point out the implications of the absence of chaos in a historical-political context.

⁹ B. C. is also very irritating to have to use, since this also is clearly a Christian-Eurocentric definition of time.

the past, nonlinear, "chaotic" types of equations or systems were largely avoided.

With the popularization of chaos theory, Western scientists, and I posit the Western culture, is asked to come to grips with the non-linear/chaotic aspects of their existence.¹⁰ Other cultures outside of the European tradition of the West, have historically valued the non-linear/chaotic realms of existence which lie beyond the control of science or culture. Chaos theory reintroduces the philosophical roots of chaos to both Western science and culture.

The Problem of Eurocentric Presentation

This story starts with the inaugural conference of the Society for Chaos Theory in Psychology (1991), where I was stirred by the many, and poignant, references to historical philosophers. Philosophers such as Hegel, Heraclitus and other individuals who originate from European decent, were frequently invoked to lend a historical lineage in order to discuss chaos theory. The apparent depth of thought, enthusiasm and painful struggle many of the theorists must have endured to describe their translation/application of chaos theory into psychology was impressive. Although, the work of these theoreticians was striking, their papers were also disconcerting because of the seeming overemphasis upon the European tradition that apparently overlooked the contributions of much older and well established philosophical heritages. Admittedly, European philosophers such as Hegel and Heraclitus predate our current conceptualizations by a hundred, if not two thousand

¹⁰ Parts of this chapter are comprised of other articles (Bütz, et al, 1991d) and presentations (Bütz, et al, 1992g) in which I had the assistance of several people more knowledgeable than myself in an appropriate cross-cultural approach to the idea of chaos. I am indebted to these individuals for their help: Eduardo Duran, Robert Morgan, Benjamin Tong, May Tung, and many of the supervisors associated with the National Asian American Psychology Training Center.

years. Furthermore, I did hear presentations that did attempt to give non-European traditions credit, but their references were sparse in comparison. There are several non-European traditions that also come to mind such as the Asian, Egyptian and Native American. This type of Eurocentric presentation that excludes mention of other cultures is nothing particularly new, and has dominated Western science and history to a large extent. It seems important to understand, that though these ideas may appear to be new scientifically, and new in the Western philosophical tradition; *that they are in fact not new at all.*

Ancient Civilizations and Chaos

Asian Civilization

Ideas of a nonlinear holistic existence were brought forth in much older civilizations of the world, and understood as an integral part of these civilizations. A nonlinear understanding of the world has been implicitly understood by these civilizations long before Europe and Greece existed. The Chinese symbol of Yin and Yang, predates Greek civilization by at least two thousand years.¹¹

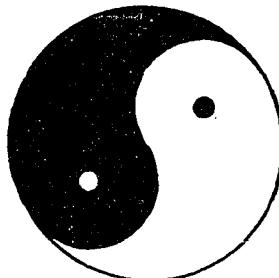


Figure 2-I

In the Tao is both chaos and harmony, with the white aspect representing Yin, and the Black aspect representing Yang.

¹¹ A significant part of what is described below on Asian culture came from several conversations with Benjamin Tong, after the collaborative piece with other authors (Bütz, et al, 1991e).

This symbol, the Tao, was developed during the rein of Huang Ti, The Yellow Emperor, who lived from 2598-2698 B.C.. The Yellow Emperor is also credited with being the first Taoist, as well as the wellspring for Chinese Medicine.¹² The Yellow Emperor's classic of internal medicine (Veith translation, 1972). The Tao emphasizes the central role of opposites and their powerful influence upon one another. The Tao is mentioned quite often in Chinese civilization, since all things began with Tao according to the Taoists. The one essential element of the Tao is that it is not constant or predictable, it is chaotically fluid. The chaotic essence of the Tao is illustrated in the following passage from Lao Tzu.

The substance of the great Life
completely follows Tao
Tao brings about all things
so chaotically, so darkly
chaotic and dark
are its images
unfathomable and obscure in it
is the seed.
This seed is holy true.
In it dwells reliably.
Lao Tzu, Tao Te Ching
(Wilhelm translation, chapter 21, 1985)

We can see that the Tao brings about all things through the chaos, and in the chaos is the seed of creation. Chuang Tzu, a Taoist who followed Lao Tzu speaks of chaos in the concept and creature of "Hun-t'un" (Graham, 1981).¹³ According to Graham, Hun-t'un is the:

"primordial blob which first divided into heaven and earth and then differentiated as the myriad things. In Chinese cosmology the primordial is not a chaos reduced to order by imposed law, it is a blend of everything rolled up together" (p 98-99).

¹² In the West this is often called generally "Acupuncture," or with a bit more sophistication refers to the use of herbal formulas and preventative medicine.

¹³ Briggs and Peat (1989) also discuss this concept by relating the story of "Hun-Tun" (p 19-20) via the same translation seen on Graham's (1981, pp 98).

Another such example in present day Asian culture is the Mandarin saying: "ma ma hu hu," translated as horse horse, tiger tiger, which seems to emphasize a non-specific/nonlinear understanding of the world.¹⁴ This common saying simply means that the difference between a horse and a tiger is so minimal that it is not worth worrying about the specifics. Also, a recent example may be found in the Buddhistic writings now available: Orderly chaos, the mandala principle (Trungpa, 1991).

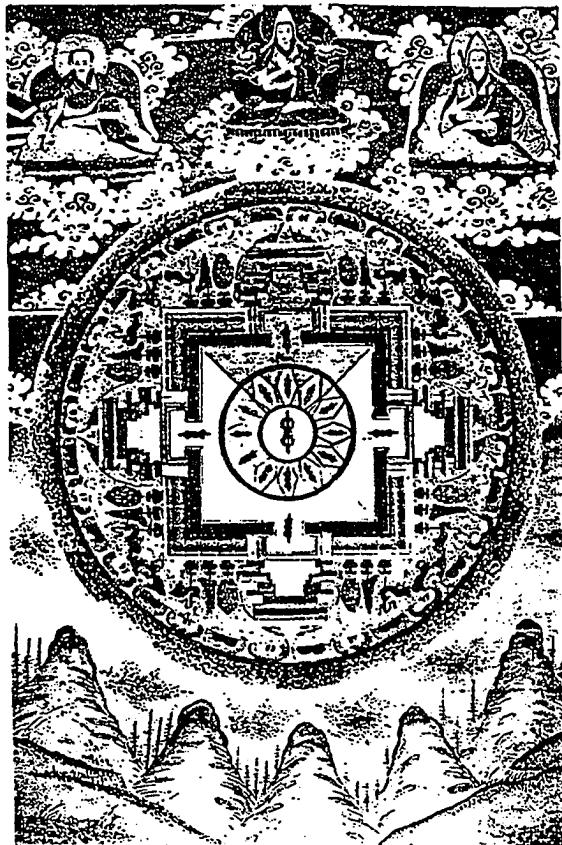


Figure 2-II

This is an example of the type of mandala Trungpa is referring to in his description of the *mandala principle*. (Jung, 1968, 357).

¹⁴ This has been shared with me by a former supervisor of mine, May Tung.

Here Trungpa discusses the mandala principle and its relation to orderly chaos. The mandala principle states that orderly chaos is: "orderly, because it comes in a pattern; it is chaos, because it is confusing to work with that order." (Trungpa, 1991, p 3). So it seems, that the concept of wholeness and implicate order are common place in the cosmology of Asian people.

Egyptian Civilization

In contrast to the Asian cosmology, Egyptian cosmology elucidates a different and still somewhat similar use of the concept of chaos in its creation myth. Chaos is discovered in the Pyramid Texts written by Heliopolitan priests in roughly 2500 B.C. (Guirand, 1965; Ions, 1968, 1982). The first creative process was the result of the "chaotic waste" from the flood waters of the ocean called Nun (Guirand, 1965). According to Guirand (1965) chaos and creation may have come from the Egyptians having: "witnessed the apparently miraculous way in which as the floodwaters subside the pools they leave behind soon swarm with animal life." In his account, it is not clear why creation happened at that particular moment in time. Nevertheless, out of the "chaotic wastes" Atum, the complete one, later identified with the sun god Ra, emerged on the primeval hill to bring: "light and disperse the chaotic darkness of Nun." (Guirand, 1965).¹⁵

¹⁵ Guirand (1965) also makes reference to some different interpretations, as I am sure there must be. My almost exclusive reference to Guirand is due to the fact that among the readings of Egyptian mythology available to me his description seemed the clearest. Another point to be mentioned here is that Briggs & Peat (1989) likewise mention Ra's birth (p 19), but state that he was born out of a formless abyss called "Nut?" I believe this must be a typographical error, or it is possible that they simply got it wrong.

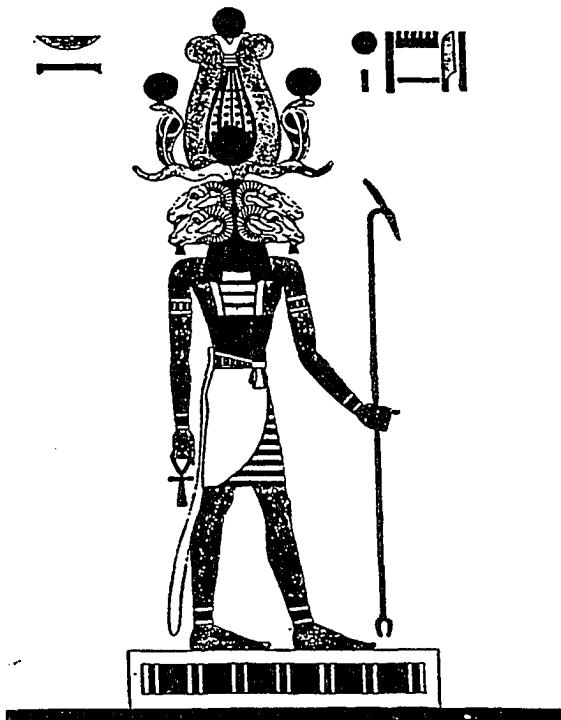


Figure 2-III

This is one picture of Ammon-Ra, who is a later version of Atum who later was identified as Ra in Egyptian mythology (Jung, 1968, 135).

It is interesting to note that Ra also was symbolized as the Phoenix bird. According to one account given by Guirand (1965) Atum had to return to the chaotic waters of Nun to create his son and daughter, while other tales tell of him being the "Great he-She," able to produce his children alone. Though different from the Asian perspective, chaos is similar in Egyptian lore in that it is the wellspring of creation. Where the Tao "brings about all things so chaotically," the chaotic wastes of Nun create Atum. Also similar is the fluidic manner in which chaos is discussed, and as we will see later, it is frequently affiliated with water. Historically we have placed chaos in Asian

and Egyptian cosmologic reference at roughly the same time 2500 B.C.. Now we will move on to Babylonian cosmology.

Babylonian Civilization.

The Babylonian creation myth is found in the library of Assurbanipal, which dates back to the time of Hammurabi 2000 B.C. (Pritchard, 1950, pp 62-67; Jung, 1967, pp 251-254). In the account Jung gives via the translations of Gressman (1909) and Speiser (1950), we initially have three figures: Tiamat, mother of the gods who "created everything, Apsu, the progenitor of the gods, and Ea, son of the watery depth of wisdom that has conquered Apsu. Well, Tiamat is angry that Ea conquered Apsu, and plots revenge against Ea by conjuring up giant snakes and dragons to destroy him. Ea, disconcerted about the possibilities that lay ahead, shares his concern with his creator Ansar. Ansar gets the other gods together, and Marduk is given the job of battling Tiamat. Marduk's chief weapons against Tiamat are various forms of evil or harmful wind, and with the "Imhullu" he kills Tiamat. After slaying Tiamat he went about creating the world again, this time with Tiamat's slain body: "one half he set up and with it he covered the sky." In Briggs and Peat (1989), Tiamat is equated to the concept of chaos, and they point out that with her destruction a new order is created by Marduk.¹⁶

¹⁶ What I find strange in their account are two things. First, they point to Tiamat's actions here as a result of realizing that her "wonderfully unkempt" (p 20) world is shrinking. This seems incongruent with the story I have just related through the interpretations I have read. Secondly, the connection between the Babylonian creation myth's veiled emergence in the Bible as the story of crushing Leviathan (Psalm 74:13ff) that Briggs and Peat (1989, pp 20) make reference to is also stated in Jung's work in as many pages (1967, pp 253-255). This connection seems uncanny, and Briggs and Peat do not reference Jung at all in this section of their book.



Figure 2-IV
This is a depiction of Marduk fighting Tiamat (Jung, 1967, pp 416).

And so, we again have the concept of chaos existing in yet another ancient culture that predates Hesiod's chaos by approximately thirteen hundred years. The question is, where do we go from here?

A Question of Record

Generally, one would lean toward moving onto Greek cosmology, but what about the cosmology of the Native Americans? Since records of their history are difficult to come by, it is hard to know when to place them historically. Many of the Native American peoples here on this continent have an equally nonlinear/chaotic understanding of the world in a philosophy that is similar to the three cosmologies we have discussed above (Bütz, Duran, Tong, Tung, 1991d). It is difficult though to indicate this in a scholarly fashion, since the Native American people by necessity

have translated their history and belief systems in an oral fashion:

"much of what had been recorded by Native Americans was systematically destroyed by the Europeans shortly after their arrival is testament to the fact of Eurocentrism. Another effect of the destruction of the written material encountered by the colonization process is that more reliance has had to be placed on oral traditions in order to make sense of history and of the life-world previous to 1492." (Duran in Bütz, et al, 1991d)

Consequently, the existence of chaos as a philosophical concept is difficult to demonstrate prior to 1492. What is available are the texts written since that time that were called for by the conquering nations, which describe a philosophical history of beliefs that by a conservative estimate have existed for a thousand years prior to 1492.¹⁷ So it is difficult to truly know when Native American people created a concept that is equivalent to chaos. And so, to deviate from previous precedents, and question the idea of who discussed chaos first, I will discuss the philosophical position of the Native American culture before moving onto Greek cosmology.

Native American Civilization

The Popol Vuh, the sacred book of the Quiché Indians (Recinos, Coetz, Morley, 1950) is generally regarded as the oldest book of the Americans.¹⁸ It was translated into Latin from the existing oral traditions of the Quiché Indians in the mid sixteenth century, roughly 1550, by an unknown individual of Quiché Indian decent. This manuscript was copied by Father Ximénez at the end of the seventeenth century. The Popol Vuh tells the story of the ancient Mayan race of the Quiché, tracing their history through mythology and tradition. Examining the introductory statements in the Popol Vuh, it seems that one may be reading a Native American version of the book of Genesis found in the Bible. In fact, many authors have made reference to the idea that the Quiché had already come under the influence of the

¹⁷ Personal communication with Eduardo Duran (1992). Also, significant inscriptions relating to the Mayan calendar have been dated to as early as 320 A.D., as well as some arguing the development of the calender may have taken a millennia before that (Thompson, 1960, p 5-10). In either case, it is probably safe to speculate that the cosmology discussed below of ancient Native Americans existed prior to Christian times.

¹⁸ The manuscript of Chichicastenango more accurately stated (Recinos, Coetz, Morley, 1950).

Christian missionaries in that time, possibly borrowing directly from the book of Genesis (Recinos, Coetz, Morley, 1950, p 18-19). Still, others argue that the text reflects the cosmology of the Quiché Indian culture at that period in time. Examining the unique aspects of the creation myth of the Quiché Indian culture, it appears that the idea of chaos does precede the creation of forms. Tenuous though this interpretation may be, in the creation myth there is a figure called Huracán. This Huracán figure is also addressed synonymously as the "Heart of Heaven." Huracán was told in the darkness by the co-creators of the world, Tepeu and Cucumatz, to arrange for the creation of man. What followed was something close to chaos, which was followed by order with an emptiness being filled and mountains appearing from the water (Recinos, Coetz, Morley, 1950, p 82-83; Mc Clear, 1973, p 37-41). Mc Clear (1973) notes that this initial nothingness into chaos into order sequence is followed by successive regimes of chaos and order, since the first creation of man was unsuccessful. As a result, the gods kept trying to make a better version of man. It seems that each time Tepeu and Cucumatz attempt to make man they must call in Huracán (Recinos, Coetz, Morley, 1950, p 82, 85, 87). After man is made Huracán simply disappears from reference. It is also well known that the Mayan's would destroy or abandon their cities and then rebuild them in time.¹⁹ This type of tradition seems to be a continuation of this chaos-order sequence, and may be rephrased even as a death-rebirth sequence. In current Native American artistry the Huracán is symbolized by what in modern culture has been associated with a swastika.²⁰ However, the modern symbol dated to 1841 (Webster's, 1989) is predicated by Native American

¹⁹ Chichén Itzá is just one example.

²⁰ Personal communication with Eduardo Duran (1992).

artistry found in the southwest. What is important in this is the centrality, or lack of centrality that Native American's give the concept of chaos. As Duran (in Bütz, et al, 1991d) put it, the idea of chaos is not so central an idea for Native Americans because they are not as attached to order as those of European decent. Also, according to Duran (in Bütz, et al, 1991d) Europeans like Jung have been told by Native Americans such as Mountain Lake²¹ (Jung, 1970a, Vol 10, ¶ 183-186) that chaos would not be so mystical and terrifying if they were simply accepting of it. So the concept of chaos as a creative force does seem to exist in the culture of Native American people, but how far it goes back historically is difficult to say.

Greek Civilization

Verily first of all did Chaos come into being, and then broad-bosomed Gaia, a first seat of all things for ever....Out of Chaos, Erebos and black Night came into being...

(Kirk & Raven, 1957, p 24 & 27)

Hesiod's description of chaos above from Theogony, is probably the most familiar description given thus far, and for good reason, since Greek cosmology is supposedly the seat from which modern Western civilization took its roots. The description of creation Hesiod proposes was written in seventh century B.C. (Kirk & Raven, 1957; Morford, Lenardon, 1985). Obviously, this is the standard citation in European influenced scholarship, but chaos theorists seem to be pointing a finger also to another figure in Greek history, Heraclitus of Ephesus. Heraclitus lived around the time 500 B.C.,²² during which he was known as both an "obscure propounder of

²¹ A Pueblo Indian Chieftain that Jung became friends with.

²² I might also mention that this was roughly the same time that Buddha and Mohammed lived.

riddles" and a philosopher with a following (Kirk & Raven, 1957; Kahn, 1979). He is now primarily known for his idea concerning the underlying unity of opposites and the essential tension between them,²³ "strife:"

An unapparent connexion is stronger than an apparent one.
They do not apprehend how being at variance it agrees with itself:
there is a back-stretched connexion, as in the bow and the lyre.
It is necessary to know that war is common and right is strife and that
all things happen by strife and necessity.

(Kirk & Raven, 1957, p 193-194)

It seems that it is for this reason chaos theorists, most notably Abraham (1989, 1990, 1991) and Sabelli and Carlson-Sabelli (1990) have called attention to this ancient riddler and philosopher. The whole "trick" of chaos theory is that one is able to observe both "strife" between opposites as well as an underlying unity, and consequently it is easy to see why these theorists are excited about Heraclitus. The Grecian influence in contemporary theory is readily obvious for all to examine, and so it does not require a great deal of further elaboration here. Like Greek cosmology, Christian cosmology has also had a considerable influence on modern thought, and in fact, its influence has possibly been the reason it has been so difficult to value or even to see chaos in any positive sense at all.

Christian Cosmology and the Split

Christianity arose during the same time when Greek cosmology was in full bloom. In the Bible the book of Genesis depicts the creation of the world in this manner:

²³ Exact interpretation of how "things" maintain stability in this unity, and are also in flux has been a point of considerable debate in some works (Kahn, 1979, p 148-150). What scholars have noted is that Heraclitus had visited Egypt, while others have noted the influence of Egyptian cosmology upon the Greeks (Kirk & Raven, 1957).

"When God set about to create heaven and earth-the world being then a formless waste, with darkness over the seas and only an awesome wind sweeping over the water-God said, 'Let there be light.' And there was light. God was pleased with the light that he saw, and he separated the light from the darkness."

(Speiser, 1964, pp 3)

Many scholars point to the likelihood that the Christian creation myth was adapted from the Babylonian creation myth that we have discussed above (Speiser, 1964, pp 9-10). Speiser presents the Christian myth line for line along side the Babylonian myth (*Enuma elish*) in this manner:

Enuma elish	Genesis
Divine spirit and cosmic matter are coexistent and coeternal	Divine spirit creates cosmic matter and exists independently of it
Primeval chaos; Ti'ammat enveloped in darkness	The earth a desolate waste, with darkness covering the deep (tehom)
Light emanating from the gods	Light created
The creation of the firmament	The creation of the firmament
The creation of dry land	The creation of dry land
The creation of luminaries	The creation of luminaries
The creation of man	The creation of man
The gods rest and celebrate	God rests and sanctifies the seventh day

(Speiser, 1964, pp 10)

Whereas the Babylonian myth originated in roughly 2000 B.C., the Christian myth found in Genesis was compiled around 500 B.C., and generally credited to a priestly source (Speiser, 1964, pp LXIV). And, as for dating Christianities beginings, well this is fairly obvious, i.e. B.C. & A.D..

The spread of Christianity in Europe and elsewhere seems to be largely responsible for the pervasive rationalistic attitude of the West in contemporary society where chaos is bad, and order is good. Where the rational-linear things of the world have been equated to "good" and the irrational-nonlinear world has been equated to "bad" in every sense of the word. It does not seem we can separate this split out of our Western culture or science any more than we are able to tell time in a different fashion: B.C. & A.D.. Briggs and Peat (1989, p 21) cite René Girard's observation that: "we humans have a great need to interpret the disorder in myths from the point of view of order." I would qualify that statement by stating instead of "we humans," we Europeans. In addition, Briggs and Peat (1989, pp 21) point to the idea that the Greeks: "'improved' on the mythical idea of disorder by injecting it with a scientific attitude," by describing it as a fluctuation in air or water. While I find this

to be a valid idea, I do not think it would have persisted without the added support of Christianity which would follow later. Duran proposes (Bütz, et al, 1991d) that Descartes was responsible for splitting the Western psyche. While I agree to a certain extent, I believe Christianity is the fundamental philosophy that allowed Descartes to "finish the job." Since Christianity emerged, the world has become a place intolerant of aberrations to the idea of "good," unless one is able to find a rationalistic explanation. Chaos theory seems to offer this type of promise for the Western mind, where the Western psyche will be able to comprehend chaos, something sort of bad, as something necessary for growth. Consequently, the Western world may now be able to take back the concept of chaos not only in a scientific context, but also in a philosophical context no longer confusing and fearing chaos as a literal form.

Aberrations Since Christianity

In the centuries that followed Christianity, there have been those who have attempted to explain chaos and nonlinear forms in a philosophical scientific context. Since these ideas are most likely somewhat familiar, I will only briefly mention them here. The Alchemists (1500-1700 A.D.) that Jung has made frequent reference to (Jung, General Index, 1979, pp 15-40) gave chaos²⁴ central importance as a concept of creation and transformation (Jung, 1970a, Vol 14, ¶252-253; Jung, 1966b, Vol 16, ¶402-404). Another example is Kant's (1724-1804) observance of the objective world: "The order and regularity in objects, which we entitle *nature*, we ourselves introduce. The understanding is itself the lawgiver of nature." (Flew, 1979, p 190). Kant's questioning of the "objective world" broke with inherent linear ideas of his day stating one would

²⁴ Massa confusa or nigredo (Jung, 1968c, Vol 9ii, ¶ 230)

fall into error if they simply applied concepts beyond and without any sense experience of that which they are studying. Hegel (1770-1831) is another who parted with his contemporaries in deriving his idea of the dialectic, calling into question what was considered knowledge. Through a dialectic Hegel felt one could arrive at a synthesized point of view attacking the traditional doctrine: "nature makes no leaps." (Flew, 1979, p 141). The Alchemists, Kant and Hegel are but a few examples of those who have parted ways with the separation that proceeded from Christianity. All had ideas that are now encapsulated in one shape or another, philosophically or scientifically, in the new science of chaos theory, and it is there we may find that nature does indeed make leaps.

Cosmological Convergence

What is clear after examining the above creation myth cosmologies from that of the Asian to the Christian is that a certain pattern has taken form. Examining table 1, we have a chronology as well as the events common in creation myths.

<u>Time in History</u>	<u>Table 2-1 Creation Myth Sequence</u>			
2500 B.C.				
Asian	Tao	Yin	Yang	
	Hun-t'un	Dragon	4 Dragons of the N, S, E,	
	W			
Egyptian	Nun	Atum (Ra)	Shu, Tefnut, Geb, Nut	
2000 B.C.				
Babylonian	Tiamat	Marduk		
700 B.C.				

Greek	Chaos	Gaia	Tartaros, Eros, Erebus,
Night			
•Time Unknown•			
Mayan	Huracán	Man	
Christian	Chaos	God	Adam and Eve

In each cosmologic view it appears that chaos is followed by the creation of a new form, usually a central godhead, which is followed by four main godheads. This central godhead is of symbolic importance, if it indeed is not man himself. Following the arrival of this symbolic figure, the creation of a tenuous order is established. In order to add greater balance to this order more beings are created often in pairs or in fours. Therefore, order has been brought into the primeval scene. There are certain symbolic implications in this type of sequence for psychological development. These implications will be addressed in full later in chapter nine, but for now we will move onto Poincaré who is often given credit as the Grandfather of the modern science of chaos theory.

Poincaré, Beyond the Renaissance Man (1854-1912)

"A very small cause which escapes our notice determines a considerable effect that we cannot fail to see,...Prediction becomes impossible, and we have the fortuitous phenomenon."
 (Poincaré in Crutchfield, et al, 1986, pp 48)

It appears that in chaos circles Poincaré, the father of dynamical systems theory, is known largely for two ideas. First, he is known for solving the three body problem, or not solving it actually, and elaborating its complexity to a point which could have actually driven him to madness. After nearly one hundred years his findings have ultimately caused people to wonder how stable the universe may be.

Secondly, Poincaré has become known through his address to the Society de Psychologie (Koestler, 1964) in which he discussed his creative act of Fuchsian problems and how the solution arose out of "nowhere." What is not so well known or at least to my knowledge discussed in the writings or presentations I have been exposed to is that Poincaré was part of the intuitionist movement in France viewing science as an artistic effort.

Poincaré viewed the world through lenses that were in search of "special beauty, the sense of harmony in the cosmos" (Slosson, 1914, p 104). However, his solution to the three body problem threw what was seen as harmony into dismay where he disproved the Newtonian laws on planetary orbits. Newton's laws on planetary motion held well for two body problems, two planet problems, but when it was applied to three body problems it was not accurate. As Poincaré found, the three body problem can only be approximated, solving the problem with probabilities that estimate a planet's position. Consequently, in "modern" science the importance of nonlinearity had been demonstrated through Poincaré's work in the early nineteen hundreds.

Poincaré has also become known through Koestler's work (1964) entitled: The Act of Creation, in which Koestler describes in detail the creative process that Poincaré went through in order to solve Fuchsian problems. In this account Koestler directs attention to the power of unconscious processes, in that Poincaré's idea simply "popped" into his conscious mind. He also mentions the chaotic sleepless night that preceded Poincaré's discovery. I bring this up to point out that Poincaré not only demonstrated the strength of nonlinearity in his mathematical work, but also in his own personal experience in creating ideas. This creative tension is an idea I have

previously touched upon in an earlier work (Bütz, 1990b), when discussing the chaotic experience of creation in holding or containing (Bütz, 1991b) as many ambiguities as possible. This mental act of containing ambiguities seems to allow for the process of creating a new idea or psychological structure. Poincaré's account is beautifully illustrative of this type of process:

For fifteen days I strove to prove that there could not be any functions like those I have since called Fuchsian functions. I was the very ignorant; every day I seated myself at my work table, stayed an hour or two, tried a great number of combinations, and reached no results. One evening, contrary to my custom, I drank black coffee and could not sleep. Ideas arose in crowds; I felt them collide until pairs interlocked, so to speak, making a stable combination. By the next morning I had established the existence of a class of Fuchsian functions,....The changes of travel made me forget my mathematical work. Having reached Coutances, we entered an omnibus to go some place or other. At the moment when I put my foot on the step the idea came to me, without any former thoughts seeming to have paved the way for it, that the transformations I had used to define the Fuchsian functions were identical with those of non-Euclidean geometry. (Koestler, 1964, p 115)

With Poincaré we have our European link to the chaos of the past in the science of modernity. Poincaré's ability to seek both artistic beauty in his work and peer into nonlinearity brings us closer to Lorenz' discovery of the *butterfly effect*. Poincaré was able to corral the tensions between artistry and science as did the ancient civilizations discussed above. This leaves us to discuss why this balance disappeared for so long, and what type of thought was responsible for its disappearance.

The Chaos Necessary for Balance, and The Chance to Return Home

There is a prevalent split in Western civilization between chaos and order. As we found, the value of chaos seems to be only "news" to the European tradition. I have indicated that this split has been caused by the spread of Christianity, and that Descartes' separatists ideas were only possible under its influence. Christianity has

been a tool, a motto, by which the Euro-Christian's have colonized a large part of the globe via the misguided and arrogant missionary movement. The Christian ethic of doing away with the chaos, the evil, or the dark forces has been a ready tool for witch hunts throughout our world, whereby missionaries label indigenous peoples as "primitive sinners" and worse. The Christian projection of the chaos and evil upon the world outside themselves, and in the people, who until colonization resided in their native lands, has caused the exploitation and genocide of millions. The Christian desire to rid the world of chaos has been a self-endorsed licence to colonize the world in order to "enlighten the savages." This Euro-Christian tradition has been largely responsible for the loss of the cultural heritages of a great many peoples in this world, notably the Native Americans here in the United States. Fanon describes the above phenomenon especially well in his book: The wretched of the earth.

"When we consider the efforts made to carry out the cultural estrangement so characteristic of the colonial epoch, we realize that nothing has been left to chance and that the total result looked for by colonial domination was indeed to convince the natives that colonialism came to lighten their darkness. The effect consciously sought by colonialism was to drive into the natives' heads the idea that if the settlers were to leave, they would at once fall back into barbarism, degradation, and bestiality. (Fanon, 1963, pp 210-211)

As a consequence, I am unable to offer a satisfactory lineage to the idea of chaos, but I am able to point out first of all why it is so difficult, and secondly, why the idea of chaos has not been central in our world culture for so long.²⁵ First, it is a common

²⁵ I am also painfully aware that what I have attempted to do in this chapter, by boiling down the ideas from various civilizations toward the word "chaos" may be called "lactation" (Fanon, 1963) of another culture's heritage to that of the European. But, weighing the consequences against these stories simply not being told, I have chosen to tell the story and indicate the historical-political ramifications. As a result, I am willing to deal with the "flak" I will take from either side for writing this chapter.

statement that conquering cultures write their own version of history in their image. This is indeed what impelled me to write this chapter, since almost constant reference is made to the Greek idea of chaos. Secondly, Christians disdain chaos, it is a thing of the devil, and as such, to discuss disorderly ideas or "to turn away from the light" would surely be of the devil. After all, witch hunts were not simply imagined, and I would contend that scientifically they have also transpired by those who do not go along with the current paradigm. Such scientists lose funding, cannot get published or lose their positions, and if they are practitioners they may lose their licence to practice. It has not been safe to study, or even consider, certain ideas because of the Euro-Christian ethic. It has been a powerful political influence pushing along the idea of order, linearity and other similar ideas that equate to "good" at all costs. Even scientists like Stephen Hawking avoid its inquiry (Hawking, 1988, pp 116). Now with Yorke's fortunate use of the term chaos to describe what scientists perceive with nonlinear phenomenon, we must now deal with the philosophical consequences. Philosophically, if chaos precedes growth to a more complex form of order then we must contend with it. Fortunately, for the Euro-Christian mind chaos now comes neatly wrapped in a nice rational scientific package, but philosophically if considered fully these ideas may well bring about another cultural revolution, and chaos. If this transpires, as Europeans we may be able to in some sense stop projecting our evil onto other races and cultures, taking it back into our own culture where it is necessary for growth-not a literalization of the devil.

This type of split appears to run through our religions, our work places and even into our *Being*. Indeed, it may well go back to Descartes' Cartesian split between mind and body as Duran has pointed out. In short, one of the main powers of chaos

theory is that it may *offer our culture one of the greatest opportunities it has had to heal this fundamental split between the dark and the light, chaos and order.*

Of the theoreticians currently writing on the topic whom I have referenced frequently, Briggs and Peat (1989) seem to be aware of the wisdom of older non-western cultures, addressing many concerns efficaciously with their well chosen quotations from heritages older than our own. One example is the quote given below from their work: *The Turbulent Mirror*.

The Yellow Emperor said...
"If we want to return again to the root,
I'm afraid we'll have a hard time of it!"
Chuang Tzu

Likewise, this journey into chaos theory may lead many of us far from our own civilization and the comfort of linearity, as we bifurcate toward our own form of chaos in order to understand how it is we are to integrate this theory in a creative way into science and psychology joining a larger cultural context.

Chaos Theory

Chapter 3

Segment I: Chaos, and Chaos Theory

Chaos Theory and its History

Edward N. Lorenz has generally been given credit as one of the parents of chaos theory. What seems important is how he discovered this phenomenon. He had replicated weather patterns through a digitized program on one of the early computers he had access to in 1961. This weather seemed to match patterns that existed in nature. Each pattern started with an initial set of conditions, a six decimal place code, e.g. .506127. One day in 1961, Lorenz took a shortcut by putting in only a three decimal place code, e.g. .506. He assumed that this would not affect the weather pattern in any deleterious manner. However, what he found when he returned to the room was a weather pattern *nothing like* the previous weather patterns created before by the simple six digit code above. What Lorenz discovered is jokingly called: *the butterfly effect*. Technically, the butterfly effect is called sensitive dependence upon initial conditions, and this means that the initial conditions, inputs, or variables are terribly important and sensitive. In the case above, Lorenz changed the initial conditions by losing information from the set, e.g. the digits .000127. Without this information the initial conditions were entirely different, and as a result the weather patterns were also. It is called the butterfly effect because a variable metaphorically as tiny as a butterfly flapping its wings in a weather pattern can change it drastically. From Lorenzes work, one may surmise that a tiny difference in initial conditions, input or variables are able to destabilize a system and begin a sequence that moves toward, and can cause, chaos.

Chaos theory was the term introduced by Yorke to describe Lorenzes' findings to a wider audience. The word *chaos* is a misnomer though, because chaos typically inspires imagery consistent with: "a state of things in which chance is supreme; esp:

the confused unorganized state of primordial matter before the creation of distinct forms." (Webster's dictionary, 1989). In fact, "chaos" in the hard sciences perspective is applied to describe systems whose complexity and dynamics at the *local* level appear to be chaotic as in popular vernacular. But, when these same dynamics are observed at the *global* level they reveal an underlying order.

Some Basic Principles of Chaos Theory

Under the rubric of chaos theory, a number of different fields and specialties are encompassed. The three major distinctions are between *dynamical systems theory*,²⁶ *dissipative structure* and *fractal geometry*.²⁷ These three fields have consequently been housed under the one term, chaos theory. Chaos is actually only part of a process in dynamical systems, dissipative structures and fractal geometry, where simple equations can produce complex results that appear random.

Chaos and Dynamical Systems Theory

The chaos one finds in dynamical systems may be illustrated most simply by discussing a *period doubling system*. The period doubling system was originally discovered by Van der Pol in 1927, while he was working with oscillators (Gleick, 1987, p 49-50; Briggs & Peat, 1989, p 84-85). A period doubling system is roughly the description of the time it takes a system to return back to its original state of stability

²⁶ Dynamical system theory is essentially concerned with a system that is derived from two main constituents: a phase space that provides a picture of the evolution of the system and a evolution equation that calculates change over time. "In far-from-equilibrium conditions we may have transformation from disorder, from thermal chaos, into order. New dynamic states of matter may originate, states that reflect the interaction of a given system with its surroundings." (Prigogine & Stengers, 1984, p12).

²⁷ Fractal geometry was created by Benoit Mandelbrot and is: "The geometry used to describe irregular patterns. Fractals display the characteristic feature of self-similarity - an unending series of motifs within motifs repeated at all length scales." (Coveney & Highfield, 1991).

description of the time it takes a system to return back to its original state of stability once it has been stressed by a force causing the system to destabilize. Simply, it takes the system twice the amount of time to return to its previous state.²⁸ Since Van der Pol's time, May (1976) has made the most effective use of the period doubling system, in explaining a dynamical system's *period doubling route to chaos* (Gleick, 1987, p 69-80; Briggs & Peat, 1989, p 58-62). May's work originated in 1976, and focused upon population growth in biological organisms. As pointed out before, chaos herein is "constrained randomness," and in this case the period doubling route to chaos described below is equivalent to a strangely complex stability.

The time it took for the system to oscillate back to its starting point doubled at certain critical values of the equation. Then after several period doubling cycles, the insect population in his model varied randomly, just like real insect populations, showing no predictable period for return to its original state. (Briggs & Peat, 1989, p60)

This state with "no predictable period for return" is what hard scientists have described as chaos. "Predictable," is the key word because given enough time the system will demonstrate its *own form of order*. The period doubling route to chaos will be further illustrated below in the discussion of dynamical systems.

The Concept of Stability

It has generally been accepted that theories that are able to describe stable systems do not describe unstable systems very well, and visa versa. Chaos theory is an exception to this notion, in that it is able to describe both stable and unstable systems

²⁸ More technically: the motion of a particle under the influence of a force may settle down to a regular orbit with a definite period. If the force acts nonlinearly on the particle, and is increased, then the orbit period (the time taken to return to a previous position) may suddenly double when the motion changes to a more complex pattern. This doubling from a single motion(called a one-cycle) to the more complex form (a two cycle) is period doubling (Davies, 1989).

equally well. In a rather oversimplified statement, one may assert that chaos theory describes systems as being both inherently stable and inherently unstable. Meaning, that stability and instability are both states and/or aspects of systems inherent dynamics. The stability or instability one witnesses is entirely dependent upon when one observes the system. In either case, the observer must monitor the system long enough to understand its complex dynamics in this dance between stable and unstable states. Therefore, in chaos theory *systems are both inherently stable and unstable.*

Dynamical Systems

These systems that are inherently stable and unstable may be described by the period doubling route to chaos that a system moves through over time. Dynamical systems evolve through three basic states: stable, bifurcation and chaos. Between stable periods and chaos are bifurcation points or period doubling points denoted by horizontal forking points presented below.

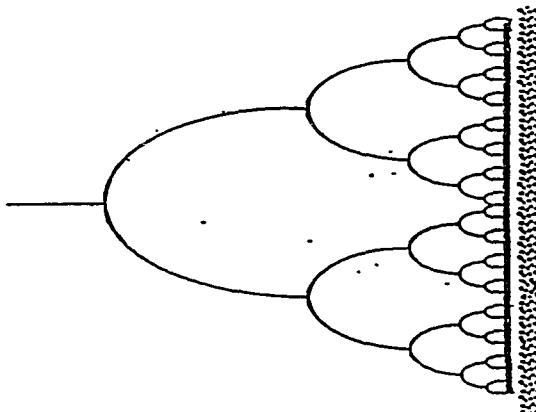


Figure 3-I

Examining the figure left to right, on the far left hand side is a straight horizontal line prior to the forking points that are bifurcations. This represents the systems stable state. On the far right hand side of the figure there is a speckled area which follows several bifurcation points. This represents a systems chaotic state.

A bifurcation is:

A point at which there are two distinct choices open to a system; similar to a fork at which a path divides into two. Beyond this critical point the properties of a system can change abruptly.

(Coveney & Highfield, 1990, p360)

The bifurcation indicates that a system has grown less stable as the result of an internal or an external stressful influence. As the system moves from a less stable or ordered state, it has greater difficulty returning to its previous balance of stability as it confronts more and more bifurcation and/or critical points.²⁹ At a critical point of instability, the ordered system bifurcates further becoming substantially unstable, thus the period "doubles" in the amount of time required for the system to return to what it's previous order once was, as described above in the discussion of May and oscillators. Hence, the term bifurcate. Eventually, as this process continues the system moves further away from order into chaos. In the end, the system is no longer able to maintain its previous form of stability and chaos ensues. As many experts in the field have shown (Bohm, 1980; Prigogine & Stengers, 1984; Nicolis, G, Ford, J: Davies, 1989) this "chaos" is constrained, and is reflective of a system's "own brand" of stability. As Gleick states:

A chaotic system could be stable if its particular brand of irregularity persisted in the face of small disturbances...Real dynamical systems played by a more complicated set of rules than anyone had imagined. (Gleick, 1987, p48)

What this simply means is that what may look chaotic, may in fact actually be a systems own brand of stability. One must observe the system long enough within the context of sufficiently complex variables to determine if it is "random behavior" or strangely stable behavior. If, for instance, one observes a system's behavior without accounting for sufficient time and space it could be dismissed as only "random,"

²⁹ Bifurcation and critical point may be used interchangeably.

when in fact it contains a highly complex order. Consequently, in chaos theory *dynamical systems are a powerful descriptive tool for illustrating the phases of stability and instability a system manifests over time.*

Attractors and Chaos

These chaotic or "irregularly noisy" periods as Van der Pol so named them in 1927, were sandwiched between ordered frequencies in his work with oscillators. As the tone would jump from one frequency to the next, as if climbing a staircase, Van der Pol would encounter this "noise." What this noise reflected was the chaos that resulted from the conflicting pulls between higher and lower frequency *attractors*. An attractor simply is what it sounds like, something that attracts this or that, but a technical definition of an attractor is: a system's asymptotic behavior: "they gravitate to a single state or set of states and remain there." (Masters, 1990). One attractor that is familiar to all is the Sun. It attracts objects in terms of gravity.

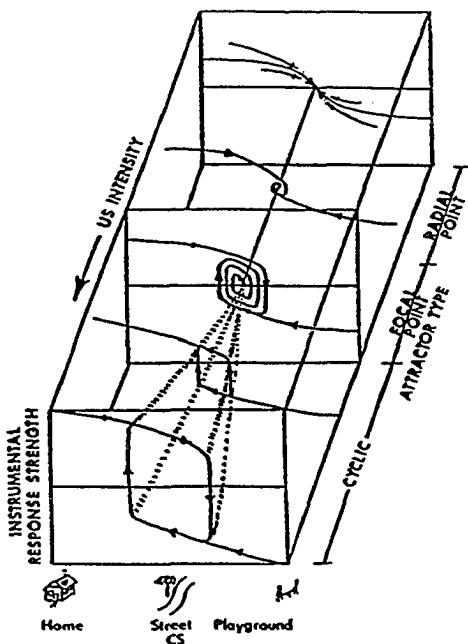


Figure 3-II

(Abraham, et al, 1991, pg III-67)

There are two attractors in the above example of an approach-avoidance situation. One is home and the other is the playground. In this case, the child vacillates between the two attractors and finds themselves in the middle of the street. Upon a micro examination of the situation, this vacillation in the middle of the street is chaos, and like the chaos described herein, it will resolve itself eventually moving toward one of the attractors.

Likewise, these attractors or pulls, may also be viewed as basins that a marble on a flat plane could roll into. The chaos a system moves through happens as a result of the tension and/or stress a system experiences as it moves from one attractor towards another attractor. An attractor that has received a great deal of attention in chaos theory is a *strange attractor*. The strange attractor is an attractor that is fractal in nature, being different from a fixed point attractor or a limit cycle attractor in the manner in which it "attracts" an object. A fixed point attractor would be one that pulls a marble toward the bottom of a bowl. A limit cycle attractor is an attractor that pulls a marble around the edges of a bowl. Both attractors reach a steady state and

repeat themselves, while strange attractors do not. A strange attractor would pull the marble all over the bowl in a complicated non-periodic pattern.

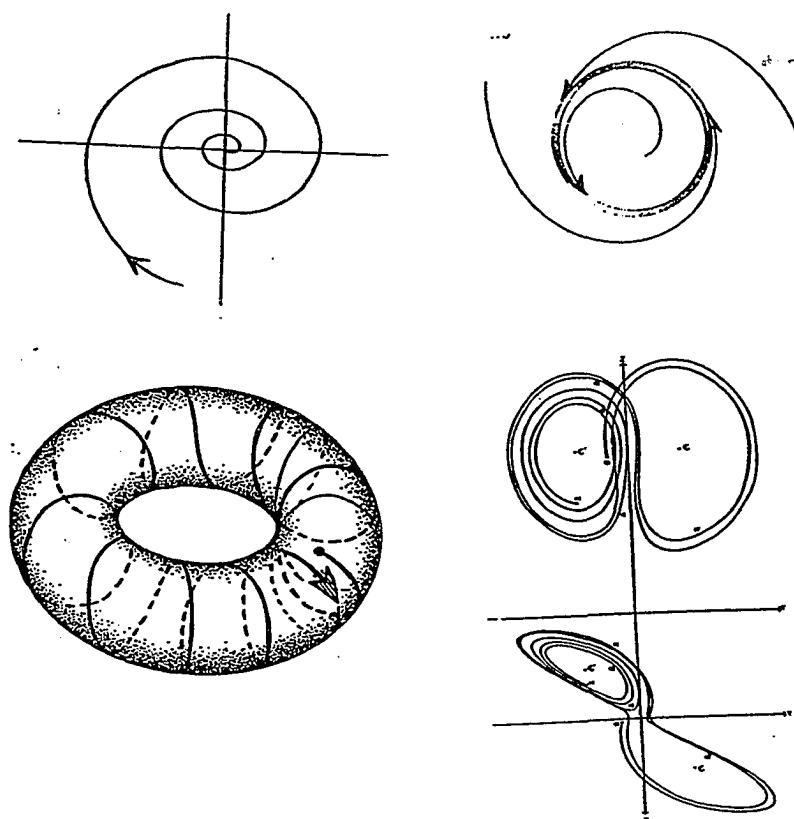


Figure 3-III

This sequence of figures depict different attractors, top-left: focal, top-right: cyclic, bottom-left: torus, bottom-left: strange.

What is so important about a strange attractor is that it is nonlinear in nature with a more complicated set of rules for its behavior being more similar to patterns of behavior one finds in nature.

Self-Similarity

It is no coincidence that chaos theory was discovered approximately thirty years ago by giving a computer incomplete information for a system's set of initial conditions. In fact, in large part chaos theory owes its discovery and life to the capabilities of computer technology. Only with the advances that computer technology has been able to offer, have scientists been able to account for, and model, the complexity that dynamical systems and fractal geometry require. It was also due to computer technology that the father of *fractal geometry*, Benoit Mandelbrot, was able to discover, what he termed the *fractal*³⁰ in 1975 during his work with IBM. Mandelbrot's fractals also represent a readily visual tool for understanding the dimensional consequences of chaos theory in one of the more important aspects of this theory, *self-similarity*. Self-similar is just as the term implies. Mandelbrot found that objects grow in a self-similar scheme. Self-similarity has seemingly been rescued from the scientific "wastebasket," after its inappropriate use to describe human sperm as a miniature human as well as the homunculus analogy. The fractal self-similarity that Mandelbrot described deals with the self-similar geometric structure of trees, lungs, and vascular systems in the human body with their branching and bifurcating shapes.

³⁰ "The name comes from the Latin *fractua*, which means irregular (Briggs & Peat, 1989, p90).

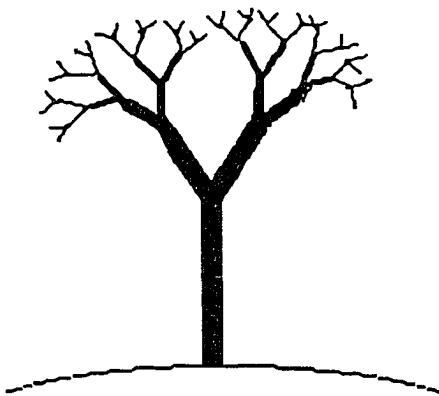


Figure 3-IV

Note how this fractal tree-like structure is very similar in shape to the period doubling plot above.

These distinctly tree like fractal shapes run throughout nature, and represent the notion from fractal geometry that many adaptations are self-similarly based upon previous structures. Like the above examples, the branching that occurs in a "tree structure" is a bifurcation that results from the structures instability. The bifurcation of both the branches and the roots arise out of the chaos of instability to offer the tree greater stability, but again it is the tree's own unique stability unlike any other tree. Among the many things Mandelbrot has stated about the fractal is that a fractal will: "have a constant degree of irregularity over different scales" (Gleick, 1987). What this means, is that no matter what dimension of scale you examine a fractal at, its degree of irregularity will remain constant. You can blow it up, shrink it, cut it up and it will still demonstrate a constant degree of irregularity. This can been seen in the successive pictures of the Mandlebrot set given in both.

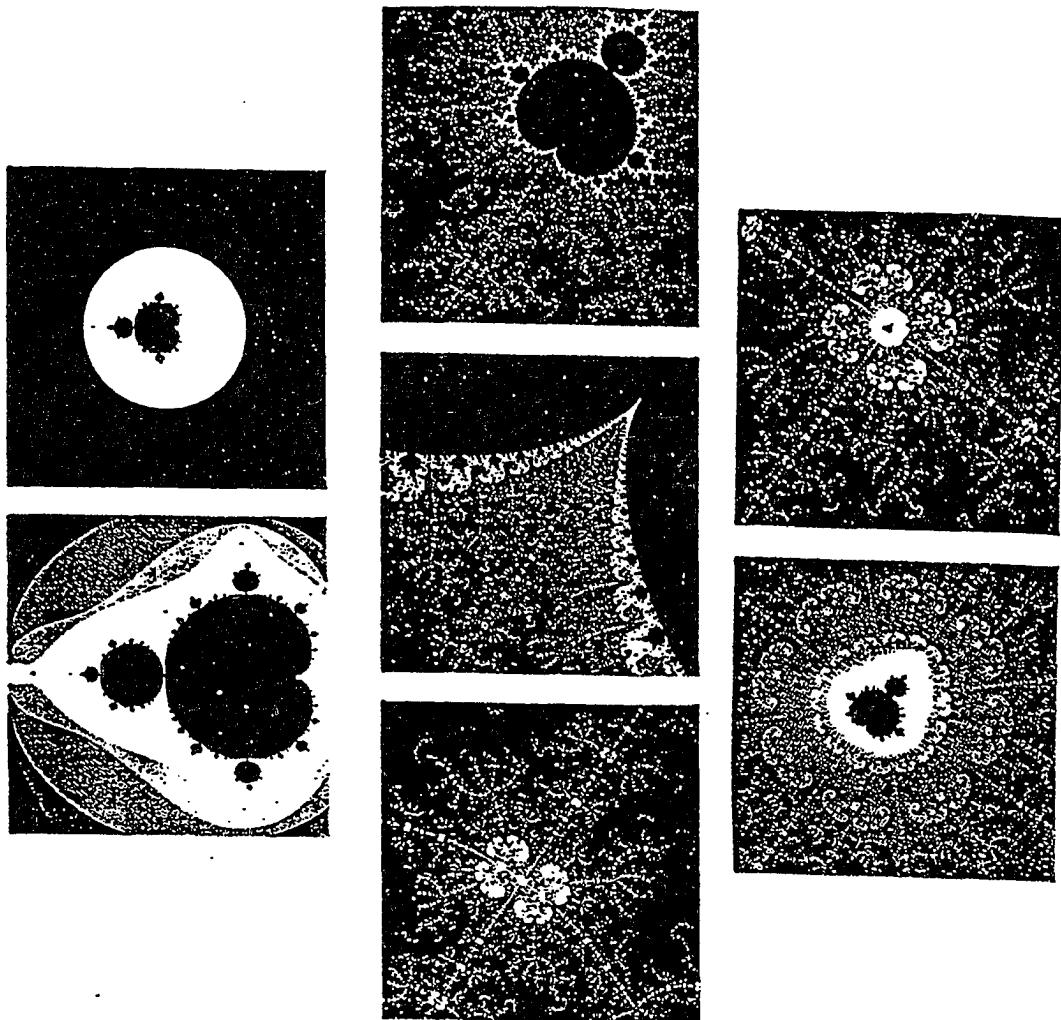


Figure 3-V
(Briggs & Peat, 1989, p98-100)

The black object in the upper left box inside the white circle is called a Mandelbrot set. It reoccurs at various scales of examination in these pictures. Moving top to bottom and left to right, the first frame is given at actual size. Then moving along this path the second frame is a magnification of one of the buds in the first by 2,500 times. The next frame is a magnification of the base of the above design by 50,000 times. It then moves to a magnification of one of the small light pearls that extend in string-like fashion from the base of the above design in a magnification of 833,333 times the original size. The final frame is a magnification of 83,333,333.

Similar to the sequence in Prigogine's dissipative structures presented in figure 3-VI below, fractals, and the Mandelbrot set most notably, these systems move through a sequence of roughly order, chaos, order. In Prigogine's work ,the chemical structures moved through what were termed oscillations, while with fractal equations one moves through iterations:

On the boundary of the set, the fate of iterated numbers is wild and uncanny.

We can think of the boundary areas as a terrain that lies between the finite solid world of the black inside of the set and the unstable limitlessness of the white and gray areas. This boundary is fractal.

(Briggs & Peat, 1989, p 97)

The gray in the illustrations listed above indicate: "how far the numbers in this area are from the set and how long it takes for the computer to decide if the number is in the set" (Briggs & Peat, 1989, p 97). Although infinitely small, this gray, is the iterative boundary between sets, chaos.

Universality

Feigenbaum's concept of universality took shape in 1975 when he discovered simply that a self referential system will exhibit change at precisely universal points along a scale (Briggs & Peat, 1989, p 64). He found this while calculating geometric convergences in period doubling patterns, and his result was 4.669.. What this odd number meant was that in a period doubling route to chaos there was scaling, meaning that: "some quality was being persevered while everything else changed." (Gleick, 1987, p 172). This seems to mean that even though a system may be moving through a period doubling route to chaos that its index of change may hold somewhat constant. In fact, Feigenbaum's equations have been worked out with a number of

systems involved in change, and all with the same results; that across systems, across change, there is a universal amount of change at scaled points. Still, it is important to remember that if this system is pushed beyond a certain limit that: "each system suffers its own nonlinear conditions where iterations³¹ will begin to flail out of control." (Briggs & Peat, 1989, p 71).

Dissipative Structures

In 1977 Ilya Prigogine won the Nobel Prize in Chemistry for creating theories that bridged the gap between various sciences and levels of reality in nature. In his discussion of *dissipative structures*, he illuminated a model that gave shape to both space and time in an unusual form of order. Irregular stability that has an underlying order was demonstrated by Prigogine & Stengers (1984) through the example of a chemical clock described below :

Suppose we have two kinds of molecules, "red" and "blue." Because of the chaotic motion of the molecules, we would expect that at a given moment we would have more red molecules, say, in the left part of a vessel. Then a bit later more blue molecules would appear, and so on. The vessel would appear to us as "violet," with occasional irregular flashes of red or blue. However, this is not what happens with a chemical clock; here the system is all blue, then it abruptly changes its color to red, then again to blue. Because all these changes occur at regular intervals, we have a coherent process.

Such a degree of order stemming from the activity of billions of molecules seems incredible, and indeed, if chemical clocks had not been observed, no one would believe that such is possible. To change color all at once, molecules must have a way to "communicate."

(Prigogine & Stengers, 1984, p147-148)

This sequence represents a rather strange form of order, that if one was to only examine it at a limited interval of time, one may incorrectly assume random or even

³¹ It is multiplying a factor by itself which produces feedback or an iteration that is nonlinear in nature (Briggs & Peat, 1989, p 57).

unchanging behavior. Prigogine and Stengers also graphically represent the unique stability of this sequence in the figure below, in which they simulate chemical waves on a computer through successive steps.

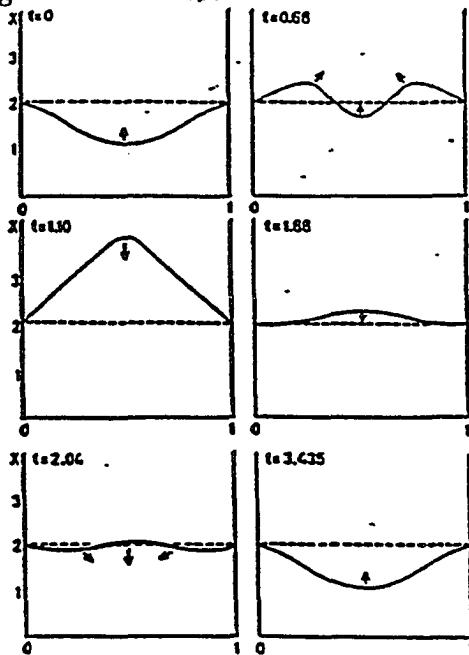


Figure 3-VI
(Prigogine & Stengers, 1984, p149, Fig 6)

Moving left to right and top to bottom, one observes a chemical wave moving from its ordered state, to a destabilized chaotic state with order returning in the final frame. The significance of this sequence is that in a dissipative system the chaotic period is reached by a cascade of bifurcations and/or critical points. After the chaotic period there is a new order, an order that: "is flowing yet stable for it can only change if the system is subjected to very intense further fluctuation." (Briggs & Peat, 1984). Therefore, subsequent to a chaotic period a: "new and "higher," more complex order evolves." (Briggs & Peat, 1984). Prigogine's dissipative structure is illustrative of a systems sequence when it moves from order, to chaos, to a more complex form of

order. This type of sequence was first overlooked in 1927 as order, noise, order by Van der Pol working with oscillations in electrical feedback loops. Smale and May later re-evaluated Van der Pol's work to describe an order, chaos, order sequence for period doubling systems. Prigogine also appears to view the movement of a dissipative structure similar to oscillations that occur in electrical feedback loops when he describes the Belousov-Zhabotinsky reaction.³²

In chemistry the relation between order and chaos appears highly complex: successive regimes of ordered (oscillatory) situations follow regimes of chaotic behavior.

(Prigogine & Stengers, 1984, p168)

These oscillations send a dissipative system toward becoming a more complex system based upon the previously existing forms of order. What makes the dissipative structure particularly unusual is that as an open system it is a far-from -equilibrium form whose structure must dissipate entropy so it: "won't build up inside the entity and "kill" it with equilibrium." (Briggs & Peat, 1984, p 169). As this discussion of chaos theory unfolds, the sequence of order to chaos to order will be revealed across disciplines in this field. The effect of this seemingly irregular sequence, as stated above, is that *a system moves from a previous order to a new and more complex order by virtue of a chaotic transitory period.*

Each theorist and principle described have one common emphasis: nonlinearity. In the next segment of this work this question will be examined as we reconsider the paradigm. For now, we will focus upon how the models described above apply to psychology.

³² Also note Figure 16 on the same page.

Chaos Theory and Psychology

Chapter 4

Segment I: Chaos, and Chaos Theory

Current Applications of Chaos Theory in Psychology

In the physical sciences Lorenz' "butterfly effect," Prigogine's dissipative structure and Mandelbrot's fractal geometry have become monumental influences in the advancement of the new science of chaos theory (Gleick, 1987; Briggs & Peat, 1989; Coveney & Highfield, 1990). Similar advances are now being attempted in psychology.

Walter Freeman

Freeman and his associates have developed models of learning, information processing and brain physiology in their work on olfaction and perception in animals. In this work, they monitored the brain activity of animals across hemispheres with an EEG while presenting both novel and familiar stimuli. What would transpire in the experiment is that neural activity manifested different forms of what are termed *phase portraits* dependent upon the novelty of the stimulus. A phase portrait is a three dimensional representation of the activity of a system, in this case, the activity of the electrical impulses of a brain. Given a familiar stimulus, the phase portrait would be a smooth orderly picture usually comprised of many rather concentric circles. On the other hand, an animal presented with a novel stimulus would produce a phase portrait that looked jagged and disjointed. The smooth and orderly phase portrait of the familiar stimulus represented an ordered and/or stable pattern of neural activity, whereas the jagged and disjointed phase portrait of the novel stimulus represented a chaotic and/or unstable pattern of neural activity.



Figure 4-I

On the left is an approximation to what the familiar phase portraits appeared as, while on the right is an approximation of the type of phase portrait a novel stimulus would produce.

From this research, Freeman and his associates proposed that: "chaotic behavior serves as the essential ground state for the neural perceptual apparatus, and we propose a mechanism for acquiring new forms of patterned activity corresponding to new learned odors." (Skarda & Freeman, 1987). Freeman (1991) submits that in working with the physiology of perception that: "chaos underlies the ability of the brain to respond flexibly to the outside world and to generate novel activity patterns, including those that are experienced as fresh ideas."

Larry Vandervert

Like Freeman and his associates, Vandervert (1988) is also primarily concerned with brain physiology, but focused on the brain-mind relationship. Vandervert advances his highly complex theory of *Neurological Positivism*, by describing the concept as a homological projection from the algorithmic organization of the individual's neurological structures upon world, brain and mind.³³ Basic to his premise is that neurological positivism describes human knowing as operating according to transformational rules that connect world, brain and mind through the "interplay between fractal self-similarity and fractal dynamics" of how objects in the "world" are represented in the "brain and mind" (Vandervert,

³³ Paraphrased from (Vandervert, 1990, p 2).

1990, p 2). This means that there is an interaction between the fractal shapes found in the world and the mental representations that occur naturally in our mind. What his work seems to state clearly, is that our world, brain and mind are projected from our physiology directing our development and perception towards some type of symbolic attractor that is consistent with chaos theory.

Fred Abraham

Abraham and his colleagues (1990) also have attempted to describe models of behavior and learning through the dynamics of chaos theory in their instructive work: *A Visual Introduction to Dynamical Systems Theory for Psychology*. More valuable still is their attempt to explain the dynamics of many types of therapeutic interactions through visual models of chaos theory. Their attempt to make intuitive sense of theory in a visual form seems quite similar to Mandelbrot's intuitive understanding of chaotic systems³⁴ (Gleick, 1987; Briggs & Peat, 1989). Likewise, these visual models encourage psychologists to make initial attempts to apply chaos theory with full use of operationally defined variables and formulas for therapeutic dynamics. Work such as this, is equivalent metaphorically to: "getting a foot in the door," for making use of chaos theory. Abraham does more than simply introduce chaos theory in his work though, he describes several models of learning (Abraham, et al, 1990). One model he emphasizes is Dollard and Miller's (1950) work on the approach-avoidance conflict through the use of both phase portrait and analogy. Abraham describes Dollard and Miller's work as "linear, but dynamical" (p III-56) as well as illustrating the dynamic that was previously given above in figure 2. The

³⁴ Mandelbrot was a genius mathematician, but he had great difficulty producing mathematical formulas without representing them in a graphically visual form.

model's linear aspects occur at *radial point*, while the dynamical aspects unfold in the evolution of the system as it moves from a *focal point* attractor to a *cyclic attractor*. Although Abraham's work does not seem to move beyond explaining how these theory's fit into mathematical equations and phase portraits, and does not extend these theories substantially. Still, his work is very useful in providing initial translations, and may be descriptive of the stage in which psychology appears to be at in working with these new concepts.

Hector Sabelli and Linnea Carlson-Sabelli

The work of Sabelli and Carlson-Sabelli (1989) propose an integrative framework of psychic dynamics they derive from *process theory*. Process theory is: " a comprehensive theory of natural and human processes that explains creative evolution as the result of the union and bifurcation of opposites," giving biological and social dynamics priority (Sabelli & Carlson-Sabelli, 1990). Utilizing phase portraits, they describe the evolution of the treatment of depression via the application of a conflict model in which:

"conflict can be the cause or consequence of depression. According to the conflict hypothesis, the opposing emotions of anger, fear and discouragement occur together: it is the mutually exclusive behaviors of fighting, escaping, or surrendering which are bifurcated."

(Sabelli & Carlson-Sabelli, 1990)

This means that anger, fear and discouragement are the stable elements of an individual's behavior under the previously existing conditions, and when stressed the individual's instability leads to the bifurcated behaviors of: fighting, escaping or surrendering. This means giving way to some of the sudden and erratic behaviors found in depression. The butterfly effect seems quite similar metaphorically to this

process since as the conditions change the behavior of the system may change radically. They give an example of the phase portrait of a mildly depressed woman describing her condition with the axes of anger (vertical), anxiety (right horizontal), and depression (left horizontal) over a time dimension in each of the two portraits.

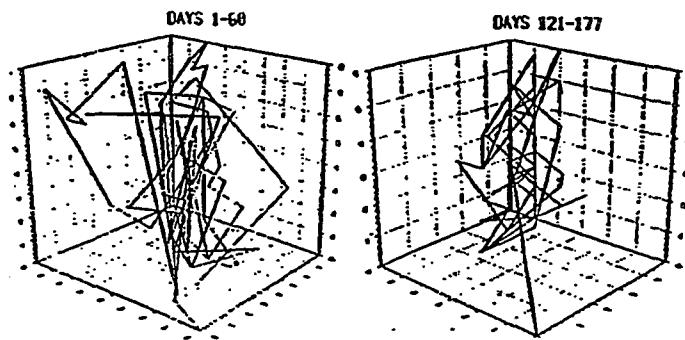


Figure 4-II
Phase Portraits Before and After Therapy

With therapy, the portrait changes from erratic and chaotic dimensions toward a more organized and stable portrait. Like much of the new theory emerging from the integration of chaos theory into the social sciences, Sabelli and Carlson-Sabelli propose that this method of theoretical inquiry and practical application leads to a "new integrative paradigm," enabling therapists to incorporate biological, social and psychological determinants of behavior into their formulations.

Basic Principles of Chaos Theory as Psychological Concepts

Here some examples of the basic principles of chaos theory will be simply demonstrated as psychological concepts through the use of analogy. At this point,

these examples are not intended to stand up as literal models, but rather as initial illustrations of similar concepts in chaos theory and psychology.

Concept of Stability: State (vs) Trait

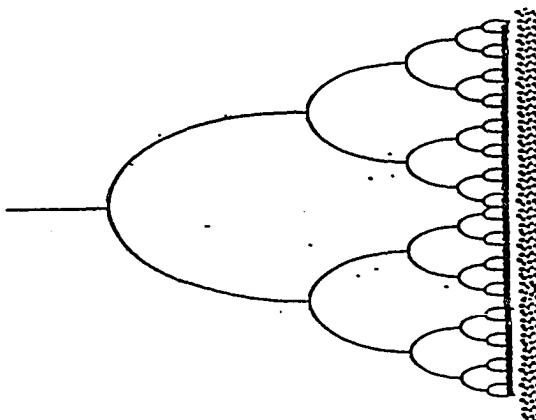
As discussed above, the concept of stability in chaos theory means that systems are composed of inherently stable and inherently unstable dimensions. In psychology, an example of this type of phenomenon can be found in the literature on anxiety and personality theory, and the argument of "state (vs) trait" (Spielberger, 1966, 1972). The argument is stated something like this: "state:" a person's personality characteristics are flexibly defined as function of the particular state that they are in at the moment; while "trait:" a person's personality characteristics are an enduring trait that rigidly defines the individual's behavior. It has generally been accepted that personality is a combination of these factors, rather than simply being defined as either a state or a trait. Like the discussion of stability, an individual's personality can be said to be inherently stable and inherently unstable being subject to the personality system's own parameters of behavior, traits, as well as the initial conditions, or state, they are currently experiencing. Middleton, Fireman and Di Bello (1991), assert that "chaos theory may provide a new light in which to examine the argument between situationists, personologists, and interactionists over behavioral continuity." Chaos theory does appear to offer a model that may allow personality theorists to incorporate state and trait under one theory in a similar fashion to how it has enabled hard scientists to integrate linear and nonlinear theories under one theory.

Dynamical Systems: Piaget's Theory of Cognitive Development

Recalling the above discussion, dynamical systems move through three basic states: stable, bifurcation and chaos. In Piaget's work on cognition (1950, 1952), he also makes use of three basic concepts: schemas, assimilation and accommodation. It appears that Piaget's system for cognition is a dynamical one, and that by analogy a dynamical system for psychology may be described.

By definition, a schema is a way of looking at the world that organizes past experience and provides a framework for understanding future experiences. It is a "stable" mental set about how the world operates. Assimilation is a process by which an individual incorporates new experiences into a schema, and accommodation is the process that adjusts an individual's schema in order to suit a new experience when it conflicts with the previous schema. Examining Piaget's model as a dynamical system, it appears that the following terms could be analogous: stable and schema, bifurcation and assimilation, chaos and accommodation. The schema seems to be stable until challenged in some form, eliciting the psychic events of either assimilation or accommodation. Assimilation appears similar to a bifurcation, in that it requires the schema to incorporate new material, and deviate somewhat from its stable pattern of operation. The time it would require mentally to assimilate information in this fashion would most likely at least double the period of time it would normally require for the schema to process previously "known" information. So, as described above, a bifurcation results when the system, or schema in this case, is sufficiently destabilized to require greater, double, the amount of time to return to its stable pattern of behavior. Assimilation seems close to this idea. Chaos would imply that the previous stability of the schema is temporarily or even permanently lost, as the system moves beyond its accustomed parameters of behavior towards what appears to

be random behavior. The event of accommodations seems strangely similar because the schema must be considerably revised in order to address new information that runs counter to the tenets of the current schema. There is a good chance that this new information would appear random or even incorrect at the time, making processing it decidedly difficult for the cognitive schema. Having no tools to do so, the schema itself would have to be revised. Once this accommodation takes place there would conceivably exist a new stable schema from which the system is able to operate until it is destabilized again and the sequence of events repeats. Examining Piaget's work in this manner, it brings to mind the work of Freeman, and his theories on the acquisition of new perceptual information. One could well imagine the differences in phase portraits that would occur in this process moving from a smooth-orderly portrait toward a jagged-chaotic portrait as the system moved along the period doubling route to chaos.



A Stable
B Schema Bifurcation
C Familiar Perception <-----> Novel Perception
 Assimilation Chaos
 Accommodation

Figure 4-III

Movement A depicts a dynamical system's movement through a period doubling route to chaos, while B & C describe the theoretical movement of Piaget's cognitive theory and Freeman's perceptual theory from a dynamical system's viewpoint.

Bifurcation: Erikson's Crises

The Chinese word for crisis roughly translated means two things simultaneously, crisis (as the translation is noted), but also opportunity.³⁵ In its best aspects Erikson's work can be seen in this way. He notes continually (Erikson, 1980, p 51-57) that each stage is a crisis due to the radical changes that transpire in the individual. These crises could be seen as chaos, and another formulation may lead to this type of exposition. However, here these crises will be described as analogous to bifurcations for two primary reasons: first, Erikson's emphasis on each stage as a crisis point, and second, the bi-directional developmental patterns he describes. The crisis comes from the radical change that transpires in the individual psychosocially through acquisition of new skills and social abilities. In these changes the crisis is whether or not the individual will be able to negotiate it in a "healthy" manner or an "unhealthy"³⁶ manner. At the end of each stage one is left with two choices for movement: healthy or unhealthy. In each of his eight stages, Erikson describes the choices that lay before the individual. For instance once an individual emerges from the latency stage they are faced with the choices of identity (vs) role confusion. Clearly, identity is the healthy choice, but it is a choice point for the individual. This is the essence of a bifurcation, a choice point for the system when it has become

³⁵ (Benjamin Tong, personal communication, September 16, 1990)

³⁶ Erikson's words not mine.

destabilized. Examining the period doubling chart above, a bifurcation is literally a fork in the road, and in psychosocial development this is how Erikson portrays the resolution of each crisis in his model. The crisis and the resultant two choices give a fairly sound, if not somewhat oversimplified, example of a bifurcation in psychological literature.

Attractors and Chaos: The Neurotic's Dilemma

In clinical work, therapists often face the opposing forces of what are casually termed a "healthy agenda" and a "unhealthy agenda" along with their clients. It has frequently been argued in this same manner that a "neurotic's dilemma" is one of being "aware" that they continue to function according to their "unhealthy agenda," and consequently feel frustrated with themselves for doing so. Stated another way, it is said that a neurotic's dilemma is knowingly making the same mistake over and over again. It is as though these individuals are "stuck in a rut." In the neurotic's dilemma, the client is caught between the attractors of their healthy agenda and their unhealthy agenda. On one side, there is the familiarity of the unhealthy agenda. The individual knows what to expect. While, on the other side there is the healthy agenda that the client is frequently unable to visualize clearly. Between these two states and/or attractors is the struggle the client must work-through in order to transcend their current level of existence. I have articulated a much longer discussion of this topic elsewhere in which this middle area between attractors is described as chaos in the human condition (Bütz, 1990a, 1990b). For the purposes of this work, let it be said simply that in psychology, clinical psychology more exactly, that an attractor can be roughly equivalent to a healthy or an unhealthy agenda that pulls an individual in one way or another. Furthermore, that an individual in the neurotic's

dilemma may have a difficult time moving away from the attractor of their unhealthy agenda, much the same way a marble would find it difficult to roll out of a basin.

Self-Similarity: Generational Patterns

In family therapy literature there is a great deal of discussion regarding the generational patterns that exist throughout familial psychological interactions on many levels (Thornton, 1991; Simons, et al, 1991; Kaufman & Zigler, 1987). While it is obvious that genetic self-similarity would occur generationally in a family, the psychological patterns are frequently less obvious. These patterns are manifested in the self-similar patterns that exist in family dynamics. Below is the circumplex model (Olson, et al, 1979; Russell, 1979). Examining it in a cursory manner, one will find that there are essentially eight elements with four elements on the adaptability scale: chaotic, flexible, structured, and rigid.

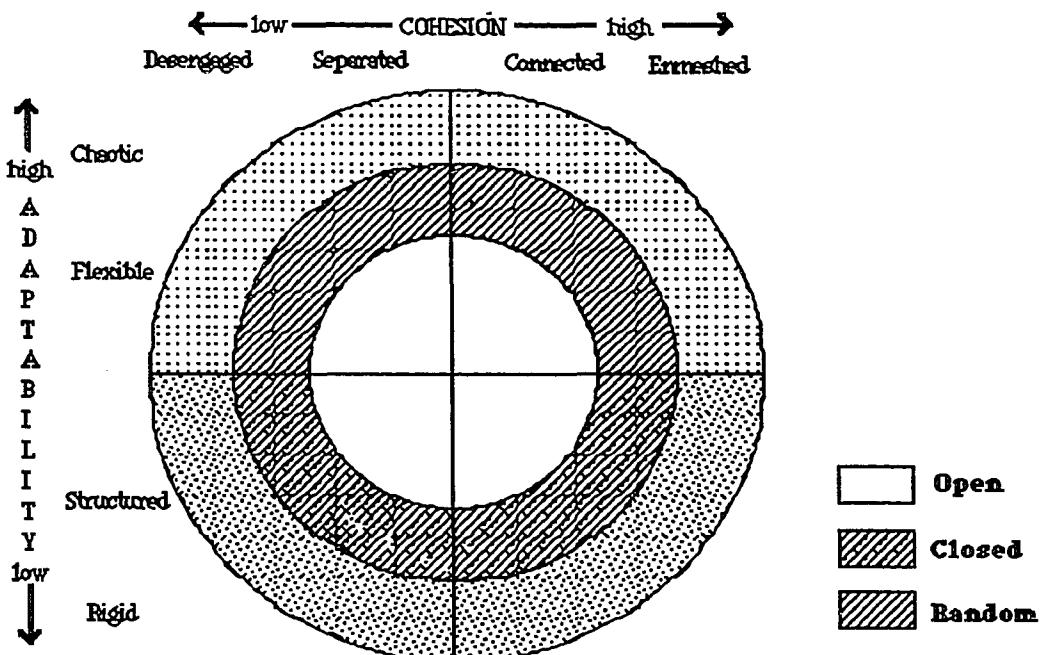


Figure 4-IV
Circumplex Model

There are also four elements on the cohesion scale: disengaged, separated, connected and enmeshed. An individual raised as a child in a rigid/separated family dynamic is likely to create in their own generational family as an adult a rigid/separated dynamic. In the individual's generation as an adult the dynamic will not be exactly the same as the family dynamic they were raised in, but it will be self-similar , i.e. based upon the essential components of the family dynamic they were raised with. The analogy of the family tree is familiar to all, and yet, also quite symbolic of the self-similar familial dynamics that take place across generations. In the example given, a rigid/separated familial dynamic may be perpetuated over several generations starting with the trunk of the tree and moving into its branches and twigs.

The reader may at this time have noted the apparent omission of an analogical discussion of the dissipative structure and the concept of universality. There is reason for this. Later in this discourse both the concept of universality and the dissipative structure will be discussed as important ideas in subsequent chapters. So, if the reader will be tolerant, I will ask their forbearance until these later chapters. Universality will be discussed as a symbolic constant in chapter nine, while the dissipative structure will be discussed as a unifying concept in chapter ten.

Paradigms from a Dimensional Perspective

Chapter 5

Section II: Reconsidering the Paradigm³⁷

37 None of the following work on paradigms would have been possible if the chairperson of my dissertation had not directed me to some seminal works in this area. Stephen Pittel has largely influenced this discussion on the paradigm, and I wish to thank him here for his influence and guidance in this area.

Thomas Kuhn's work on the concept of the *paradigm*³⁸ has generally been considered no less than a landmark by which scientists have been able to plot the course of their work. Since the publication of *The Structure of Scientific Revolutions*, his work has generated a great deal of discourse throughout the scientific community (Wilber, 1982; Moolten, 1987; Singleton, 1987; Evans, et al, 1989; Miller & Young, 1989; Sadler, 1991). It appears that the psychological community and the newly established Society for Chaos Theory in Psychology has been similarly stimulated by his work (Mey, 1982; Holmes, 1987; Mashal, Feldman, Sigal, 1989; Brown-Standridge, 1989; Frank, 1990; Holahan & Moos, 1990; Skurky, 1990; Slife, 1991; Sabelli & Carlson-Sabelli, 1989; Vandervert, 1990; Abraham, 1991 Bütz, 1991c, 1992c). In fact, in a keynote address to the society, Abraham was even so bold as to suggest that chaos theory would be the new paradigm that will overtake psychological theory in as little as five years (Abraham, 1991). Indeed, the concept of the paradigm offers chaos theoreticians a unique reference point from which to build the framework of their argument. After examining Kuhn's work in greater detail, it appears that chaos theory may be able to offer something in return through the concept of *dimensionality*.(Bütz, 1990a).³⁹

³⁸ I fear I may insult many readers if I define paradigm in the text, since it is so well known. Briefly, a paradigm is: "what the members of a scientific community, and they alone, share. Conversely, it is their possession of a common paradigm that constitutes a scientific community of a group of otherwise disparate men" (Kuhn, 1977, p 294). It also appears after reading Kuhn at some length, that a paradigm is a set of shared assumptions that guide research by influencing what and how a science studies phenomenon. Lastly, in his work *The Essential Tension*, Kuhn replaces paradigm with the phrase: *disciplinary matrix* (Kuhn, 1977, p 297). As a result, while the two terms will be utilized interchangeably, an effort will be made to reference them in a historically accurate manner.

³⁹ This chapter is a revised version of the paper: Fractal Dimensionality and Paradigms, that originally appeared in the Social Dynamicist: Bütz, M.R. (1991d). Fractal dimensionality and paradigms. *The Social Dynamicist*, 2(4), p 4-7.

In his essays, Kuhn is rather specific in describing the requirements for a paradigmatic shift to occur. It appears important in this essay to not only address the requirements of this type of shift, but how it transpires. Kuhn lists the requirements for the: "transition from a paradigm in crisis to a new one from which a new tradition...can emerge" (Kuhn, 1970, p 84).

a reconstruction that changes some of the field's most elementary theoretical generalizations as well as many of its paradigm methods and applications. During the transition period there will be...overlap between the problems...solved by the old and by the new paradigm...and...decisive difference in the modes of solution.
(Kuhn, 1970, p 86)

He also describes how it is these shifts transpire, in that scientists at the edge of the shift are often confused when at one time they felt a certain comfort with their science (Kuhn, 1970, p 83-84). He emphasizes that paradigm shifts are more than the result of anomalous findings, and that to reject one paradigm is to accept another (Kuhn, 1970, p 82 &77).

Kuhn seemed to feel misinterpreted by his critics even after he took such great pains to give ample examples, and in fact, he stated that could give examples: "multiplied *ad nauseam*" (Kuhn, 1970, p 136). Consequently, he aptly wrote on the misinterpretation and misuse of his concept in two essays: Postscript, 1970 and Second Thoughts on Paradigms, 1977. In both of these essays Kuhn emphasizes the point that the use of paradigm as a concept exists on two levels simultaneously. Here it is most appropriate to quote him directly:

Whatever their number, the usages of "paradigm" in the book divide into two sets which require both different names and separate discussion. One sense of "paradigm" is global, embracing all the shared commitments of a scientific group; the other isolates a

particularly important sort of commitment and is thus a subset of the first.

(Kuhn, 1977, p 294)

It appears Kuhn is discussing both the global and the local aspects of a science, in that at the global level one is able to discuss social science, while at the local level one is discussing psychology. Or, could it be that they are discussing psychology at the macro level and clinical psychology at the micro level? Examples such as this seem to go on endlessly, e.g. psychology and empiricists, clinical psychology and psychodynamicists, etc.. In some earlier writing on the topic of chaos theory and psychotherapy I developed the concept of *dimensionality* (Bütz, 1990a, p 65). This concept even expressed in its primary form seems to address the confusion expressed above over the distinctions between global and local.

Dimensionality was primarily devised to describe levels of consciousness in an Analytical topological reference. To the point, dimensionality expands upon an aspect of the main thesis in a previous work⁴⁰ in which chaos theory's application in one sense was described as: locally there are periods of order followed by periods of disorder that are globally stable. The global and local reference extended from the primary thesis of the work⁴¹ onto the genesis of the concept of dimensionality.

Inspired by the Mandlebrot set, and the concept of self-similarity,⁴² dimensionality

⁴⁰ Bütz, M.R. (1990). Chaos, An Omen of Transcendence in the Psychotherapy Process. In D. Paar (Coordinator), Chaos and Psychology, Conference conducted at Springfield College, Springfield, Massachusetts.

⁴¹ "The same words can be reasonably used to describe the human emotional condition; as a whole, periods of low anxiety are followed periods of high anxiety that over the life time are relatively stable in most cases. Utilizing, the above principles as a base, "chaos" will be defined in human terms, as a state of *overwhelming anxiety* that is an indication of potential psychic growth." (Bütz, 1990b, p 1)

⁴² Self-similar is as it appears, structures grow in a self-referential form, i.e. trees and lungs.

states: under the rubric of self-similar structures what describes a structure or a system as global at one level is local at another, and conversely, what is local at one level is global at another.⁴³ These dimensional structures have self-similar criterion that they are able to be defined by, in that what defines social science at a global level also defines psychology at a local level. One example would be of a scientific community whose common bond is the paradigm they share. According to Kuhn, a scientific community is defined by:

common elements in their education and apprenticeship; the pursuit of a set of shared goals, including the training of their successors; fullness of communication within the group; relative unanimity of the group's judgement on professional matters; and being absorbed in the same literature drawing similar lessons from it.

(Kuhn, 1977, p 296)

In addition, a paradigm or disciplinary matrix⁴⁴ is defined by three constituents: symbolic generalizations, models, and exemplars. As a person who is part of the therapeutic community, I, as well as other therapists, share a common understanding of what a "P.D." is (otherwise stated as a personality disorder), while at the same time as part of the psychological community I understand the meaning of a behavioral observation, and as part of the scientific community I share an understanding of the symbol "*ho*" or hypothesis as concept. Consequently, what defines a scientific community or a disciplinary matrix holds at any dimension of inquiry: general science, social science or psychological science. For example, psychodynamic psychologists share a scientific community among one another at the local level, but

⁴³ Singer (1990) also comments upon a similar process in her descriptive work: *Seeing Through the Visible World: Jung, Gnosis and Chaos*.

⁴⁴ See the first footnote in this chapter.

they also share the more global communities such as the psychological community, the community of social science and the scientific community. It seems important to mention that as the dimensional scope of a paradigm is expanded, e.g. psychology to social science, or social science to science, that communication becomes "more arduous, misunderstood, and may isolate significant disagreement" (Kuhn, 1977, p 296). The concept of dimensionality appears to address the quandary one would find themselves in if they were to attempt to define where the paradigm or paradigmatic shift occurs. Paradigms are self-similar in what defines them, and so by designating the dimension of inquiry, and the current trends of a science one is better able to define the paradigm they are observing or are a participant within. For the purposes of this work paradigmatic change will be illustrated at four dimensions: general science, social science, psychological, and therapeutic as is represented by the graph below. Also, for purposes of illustration, and to advance some of the theoretical notions discussed in the next chapter, an exterior vertical dimensional perspective is offered regarding the current state of paradigmatic change within several dimensions

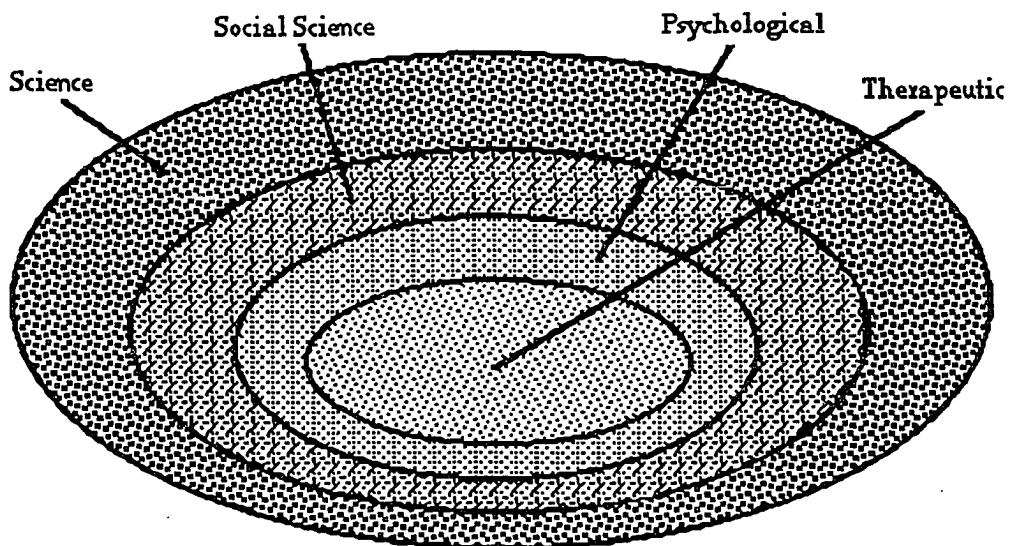


Figure 5-I
Horizontal Nested Dimensional Perspective

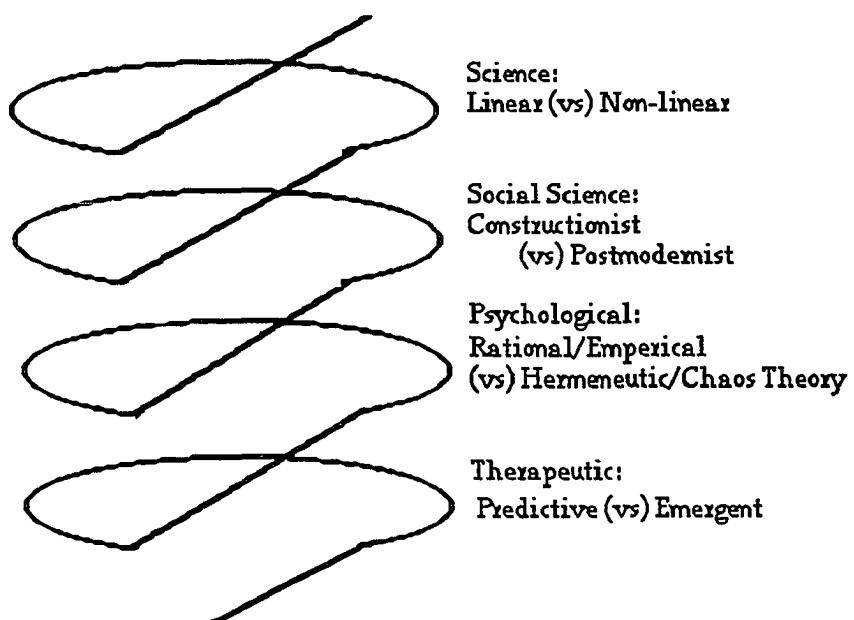


Figure 5-II
Exterior Vertical Dimensional Perspective
The graph above may be deceiving though, since it is depicted in a linear fashion. This is only for the readers benefit, since an

appropriate graph would entail much more detail, the cycles depicted above would not be flat, but would flow in an upward spiral radiating in many different directions, and these stages would be nested within one another as depicted below.

Like the Mandelbrot set, paradigms may exist ad infinitum characterized by finer and finer local distinctions such as a twig or a leaf of a tree. These finer distinctions between paradigms similar to a twig or a leaf of a tree should not be dismissed, since as a global paradigm has explanatory power at one level, a local paradigm may have explanatory power onto the global level of inquiry. In figure 3 below, it makes intuitive sense that science as a body of knowledge, acting as the trunk of the tree, has a conservative nature. Conversely, the limbs, twigs, and leaves of the tree are likewise defined by the same structure, but if these areas of science are less conservative it would not have a tremendous effect upon the tree of science itself. Some fringe areas of science may even die and fall off the tree of science.

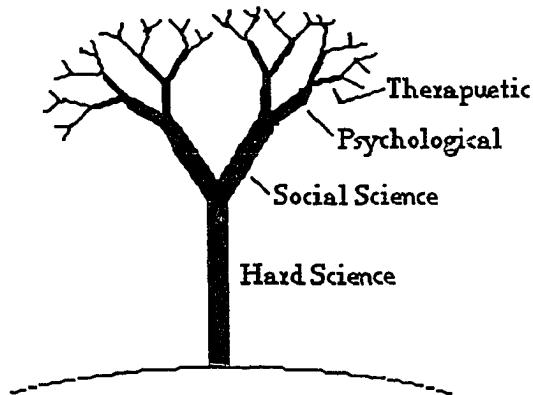


Figure 5-III
Tree of Science

As a result of the emergent properties inherent in the process, it also seems reasonable to posit that there may be non-symbolic forms of paradigms, in addition to the more powerful and profound symbolic forms. For non-symbolic paradigms to exist, it may simply mean that these paradigms are of a less profound nature or are in

a less articulated form: budding if you will. Kuhn would quite possibly disagree with this formulation of a non-symbolic paradigm, but this formulation is put forth to emphasize the transitional dimensional space that appears inherent in and between levels of scientific inquiry.

In conclusion, dimensionality's descriptive ability as a concept is like frequencies of sound or light, in that we may only participate in accurate description to the degree we can perceive their effects. As a scientist, Kuhn's concept of the paradigm is a fundamental building block, by which one measures the impact of their work. His work seems to imply simultaneous levels of self-similar descriptive criteria, that lend the paradigm to a fractal description in the concept of dimensionality presented herein. As a concept, dimensionality is offered in hopes of extending the explanatory power of the paradigm, thereby defining the complexity of transitional space as well as the level of description the scientist is addressing. Dimensionality also appears to add to the mounting ideas that the application of chaos theory brings to psychological theory, by emphasizing the multifaceted nature of science at many levels of description.

The Winds of Change I:

Science and Psychology

Chapter 6

Segment II: Reconsidering the Paradigm⁴⁵

⁴⁵ I have found in writing this essay that my influence goes back to the teachings of a former professor of mine: Susan Taylor at San Francisco State University. She had pointed out similar issues to me years ago, and suggested some similar solutions. I wish at this point to thank her and acknowledge her influence in this piece.

Having discussed Kuhn's idea of the paradigm as a concept with dimensional features thereby emphasizing the value of paradigms operating in more local areas of science, the task of this essay is to describe what paradigms have operated in psychology's hundred year history. While general science and social science will be discussed in broad terms, the focus will be upon the theoretical approaches that have dominated psychology.

Kuhn seemed to construct the paradigm to emphasize the transitory nature of science. Scientific revolutions move through four stages according to Kuhn: normal science, anomaly, crisis and revolution. This sequence of events could also be labelled in terms of a period doubling route to chaos as: order, bifurcation cascade, chaos and a new order.⁴⁶ This correlation seems obvious, but where does the anomaly that causes the bifurcation come from? Do anomalous findings typically arise from "normal science," or what I would call "hard" science? Furthermore, what is the difference between an anomaly and a science that is pre-paradigmatic? The "soft" sciences are full of what Kuhn labels as anomalies or counterinstances (1970, p 77). It seems that the "soft" sciences are full of anomalies whose time may have come, perhaps are even revolutionary, and consequently should influence the "hard" sciences in a way that would push them toward a cascade of bifurcations and eventual chaos. However, in the past, rather than integrate the anomalies of "soft" scientific disciplines such as psychology, scholars like Kuhn have dismissed these disciplines as "pre-paradigmatic."

⁴⁶ I could easily comment further, but the connection is so implicit , I will save commentary for another paper on the topic. Artigiani (1987) does point to these type of evolutionary revolutions in politics and history in a somewhat parallel manner by using Prigogine's model.

The Soft Sciences and Psychology, Nonlinear Science

It has been argued frequently that psychology is "pre-paradigmatic," and therefore not a science (Leahey, 1992).⁴⁷ However, several have formulated psychology in terms of possessing existent paradigms (Mey, 1982; Holmes, 1987; Mashal, Feldman, Sigal, 1989; Brown-Standridge, 1989; Frank, 1990; Holahan & Moos, 1990; Skurky, 1990; Slife, 1991; Sabelli & Carlson-Sabelli, 1989; Vandervert, 1990; Abraham, 1991). I have frequently wondered that if psychology is pre-paradigmatic and/or an anomalous science, could that just be another way to say it is nonlinear?

It seems that there are truly no consistent rules one may follow in psychology that agree with the classical, perhaps linear, view found in the "hard" sciences. Also, it has often been stated that psychologists seem to fight amongst themselves over the point of "what is psychology?" In fact, the "community" of psychology has recently split into the American Psychological Association (APA) and the American Psychological Society (APS). The split seems to be between those who adhere to principles of inquiry consistent with the "hard" sciences, APS, and those who align themselves with the views found primarily in the ambiguities affiliated with the "soft" sciences, APA.⁴⁸ Which association represents psychology? I contend that both do, in that, the struggle in psychology is consistent with the larger struggle within science.

⁴⁷ Leahey being the most recent example. I might add that in his discussion of the paradigm he confuses what Kuhn intends. Instead of the disciplinary matrix as a part of the paradigm as Leahey states, it is designated by Kuhn to replace the paradigm (1977, p 297).

⁴⁸ This may seem to be an oversimplification, and it is, since I think APA contains both views at this point. However, the nonlinear approach does not seem to be found in APS.

By analogy Bowen (1960, pp 347) stated that people from various disciplines who work with schizophrenia are like blind men viewing an elephant, where each believes they have an accurate experience of the elephant, and yet none of them can agree. One man states they perceived feeling a tree, while another believes they were feeling a fan. The problem the blind men have is that none of them have a global perspective of the elephant-they all have only a local perspective. Locally, they all have a limited amount of information. Each one's observation, although accurate, was entirely dependent upon how much information they had available to them. Accordingly, instead of realizing that each had only a limited experience of the object, the elephant, each man insisted that his experience was more valid than the others. What does this tell us about the self-similar differences we find between, and within, the "hard" and "soft" sciences in the general field of science as well as the APS and the APA in psychology? It illustrates that within each discipline there are more stable and/or linear fields of inquiry that are consistent with what Kuhn labels "normal science." Moreover, there are also unstable and/or nonlinear fields of inquiry that are commonly labelled as soft sciences. Realizing that one is looking at a nonlinear problem in their field of study enables one to realize that the "normal" modes of inquiry do not hold, and that it is inappropriate to apply them under the current circumstances. It would be similar to applying Newton's equation to a three body problem instead of Poincaré's approximation. Poincaré's equation is no less scientific than Newton's, it is simply a different tool for a different problem. As the old saying goes: "if your only tool is a hammer, then everything looks like a nail." What makes chaos theory unique as a body of knowledge is that it gives deference to both linear

and nonlinear problems, valuing each equally. Below in figure 6-1, we can see how our blind men of science find disagreement with each other.

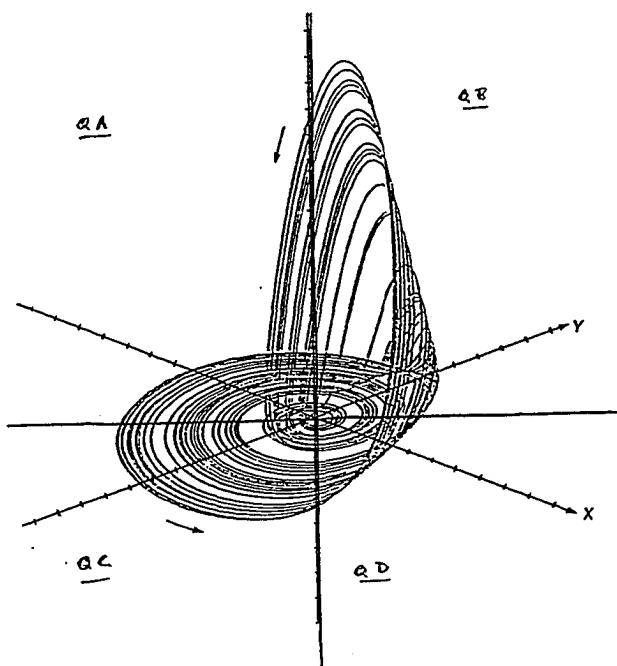


Figure 6-1
Strange attractor quartered.

If each had the information from one quadrant, and felt they had an entire picture it seems argument would be only natural. In nonlinear sciences such as psychology this seems to be the case. Each discipline within the disciplines of science and psychology has a different part of the picture. Their different perspectives become problematic when they overgeneralize from the limited local amount of information they have studied.

Modifying the Tree of Science

It appears that Kuhn's general definition for a paradigm is conservative like the trunk our tree in the previous chapter, made up of axioms that are absolute. If we are to view science in a holistic manner we must view the entire tree of science, and consider each aspect of the anatomy as a unique function. The anatomy of a tree is made up of three basic structures: roots, trunk and branches. Each structure has its function, and so for our analogous tree of science we must distinguish, and perhaps question what each structure is, and its function in terms of a scientific equal.

The stable strength of a tree is frequently three-fold; where the depth and development of the roots enables the tree to stand, the trunk holds strength in its mass and non-pliability, whereas the branches hold strength in their number and ability to be flexible. A tree cannot exist successfully without all three, and so, this may also be said of science and psychology. In addition, if science is to change it appears that all three components of the tree must also change in a paradigmatic manner. The tree of science must have roots, and now we must question what are its roots? I contend that in the minds of scientists there are two types of root systems that may ground science: the pursuit of "truth," or the pursuit of "understanding."

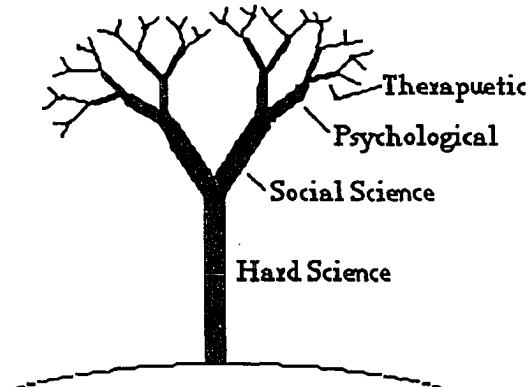


Figure 6-II
Tree of Science

The Roots

The idea of seeking the roots of science seems to be wrapped up in the old physics argument between an Aristotelian world view and a Galilean world view (Lewin, 1931). Truth has a distinctly Aristotelian value attached to it, whereas understanding has a distinctly Galileian approach to comprehending our world.

- Lewin discussed the conflict between the two modes of thought in psychology as early as nineteen thirty-one.⁴⁹ Lewin illustrated the Aristotelian view in this manner:

"On one side there are good or, so to speak, authorized forces of a body which come from its tendency toward perfection ($\tau\epsilon\lambda\omega\zeta$), and on the other side are the "disturbances" due to chance and to the opposing forces ($\beta\imath\alpha$) of other bodies." (Lewin, 1931, p 142)

The "empiricist" Aristotle insists that not only the regular but the frequent is lawful. (Lewin, 1931, p 145)

On the other hand, Lewin typifies the Galileian viewpoint as not so value laden, a more "what you see is what you get" type of approach. The Galileian view would seem to emphasize observing the world, and then attempting to understand it in an

⁴⁹ I suspect others preceded him as well as followed him in addressing this topic.

approach that strives to be value free. On the other hand, in an Aristotelian inquiry one is constantly attempting to place ideas, observations, etc. into a value system: perfect and disturbing.⁵⁰ I maintain that certain scientists aspire at the root of their discipline to seek truth or lawfulness, and as a result experience only brief moments of glory amid an almost constant background of despair. Why? Because truth has a value, and is always contingent upon the circumstances surrounding those who experience it. Consequently, if one does indeed find truth, the roots of the scientific tree do not develop enough to keep a very large tree standing. On the other hand, there are scientists who seek understanding keeping in mind that their understanding of an idea, a concept, or a behavior is entirely dependent in a Kantian way upon what we use to understand the phenomenon based upon the forces of society and technology. Understanding then, is never final, and always expanding in both complexity and depth, whereas what was once perceived as truth is only short lived, demonstrating ones ignorance at a later date. Therefore, as a scientist I have chosen understanding as a root system for my tree. In this essay we will not seek a final truth, but we will seek understanding of how and why paradigms have evolved in the aforementioned sciences.⁵¹

The Trunk

The trunk of our tree is rather obvious, hard science, but again, we must question what is at the core of hard science. General science has been guided by the

⁵⁰ Kuhn's split between scientific and non-scientific strikes me as Aristotelian in this way.

⁵¹ This also gets into the whole idea of what ideas are at the roots or foundation of science, and if we understand whether or not we have a grounded basis for a discipline . Obviously, this is topic enough for an entire book, and so I will only touch on few crucial aspects that seem to pertain to this exposition.

pursuit of a few basic ideas that can be summed up in what is called the scientific method. The goals of the scientific method may be described as a four step process: describe, explain, predict and control. To achieve these goals, the scientific method or what Kerlinger (1986) describes as the scientific approach is used: problem-obstacle-idea, hypothesis, reasoning-deduction, observation-test-experiment (p 11-14). So, according to this method a scientist has a problem followed by an idea of how to solve it (hypothesis), and he or she must then reason or deduce an experiment to test the accuracy of their solution to the idea. In following this approach the scientist: (1) describes his problem, (2) explains how he or she believes the problem came about-hypothesis, (3) predicts the behavior of the phenomenon-hypothesis; deduces an experiment, (4) via the experimental method he or she attempts to control the phenomenon. In essence, there is nothing wrong with this approach except for an underlying supposition that we are able to explain, predict and control phenomenon in a linear fashion, and the conclusion it aims to prove: objectivity. The goals of the scientific method enforce the classical idea of linearity that may be summed up nicely in an old joke. A man happens upon another man digging furiously in a manure pile, and the passerby asks the man why he is digging so furiously. The man in the manure pile looks at the other man with consternation in his face and says: "with all this manure here there must be a pony here somewhere." It seems that this may be the case with some aspects of hard science, in that they continue to look for linearity in a pile of maximum entropy matter that behaves in a nonlinear fashion. In such a condition, it appears that the best approach to take up is one of observation in a hermeneutic manner to understand the phenomenon. Thinking we might have objectivity may be comforting, but it does not seem realistic nor in congruence with

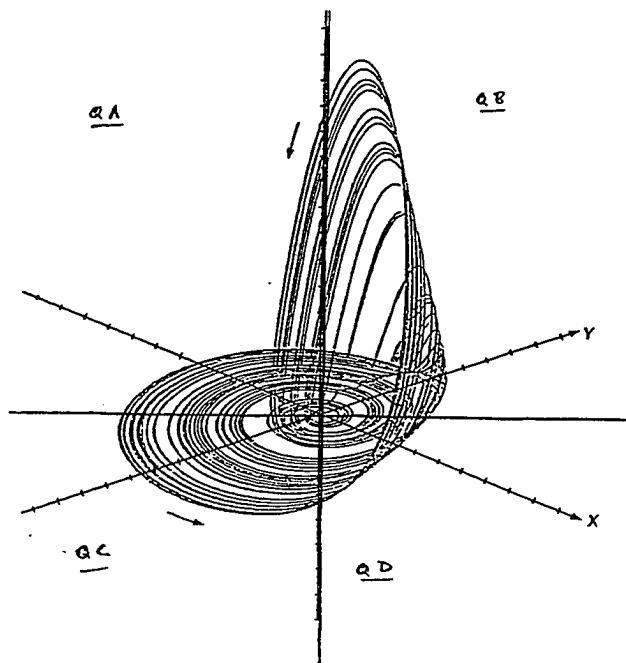
our experience of the world. It seems we may only attempt to be objective or value free in our approach to the study of phenomenon. It appears that if we want for objectivity, the best way we are able to do this is offer our biases first when we attempt to study or disseminate information on a particular phenomenon. In more recent years, scientists have been discussing the problem of separating the observer from that observed, and in this pursuit the propounderers of the scientific method are altering their goals toward a more realistic world view. I would simply add that the scientist, the observer, specify his or her biases on the topic of study, debate, or dissemination so all may be clear about the limitations of what understanding is offered.

The Branches

Branches, as well as twigs and leaves of a tree may be considered to be the nonlinear sciences, the "soft" sciences. What makes the soft sciences such as psychology nonlinear? As we have discussed, psychologists seem to act like blind men, and this is because each has limited information. Why does each have limited information? Because they are unable to track the movement or comprehend the global tendencies of what they are observing. According to different disciplines the very same phenomenon may have a number of different explanations. It seems that these psychologists, like our blind men, are talking about phenomena that sound completely different, while it is the same phenomenon! What chaos theorists have learned is that what one observes in a nonlinear system is entirely dependent upon when and under what circumstances one observes the system.⁵² Reason being that the system can look radically different from moment to moment. By simply the

⁵² And, if we think about what Kant had to say in chapter two, the condition of the observer.

amount of disagreement among psychologists it appears that nonlinearity is what they are observing. Therefore, if we are operating as scientists in a nonlinear field of study the watchwords it seems would be: caution and consultation.⁵³ Meaning, caution in interpreting findings, and consultation in order to find what piece of the puzzle you may have as opposed to which piece some one else has. In our example of the quartered strange attractor, scientist observing quadrant A would consult scientist in quadrant B to find they share the study of the same phenomenon at different periods in time, and that each has constructed different words to talk about it. I propose this is how psychology may be able to reduce its communal bickering.



⁵³ I do not feel I can lay claim to this idea, since it was part of my training by various professors of mine throughout my education. Although they taught these ideas, they were never so clearly labelled or made explicit in reference to the idea that they may be attempting to describe nonlinear behavior.

Figure 6-III
Strange attractor quartered.

In the description of the tree of science, four paradigm shifts have been discussed: truth>understanding, scientific method>hermenutic description, objective>personalized attempt at objectivity, generalizing>caution and consultation. Therefore, our tree in the old paradigm would look like the tree on the left side of figure 6-III, and our new tree would look like the tree on the right.

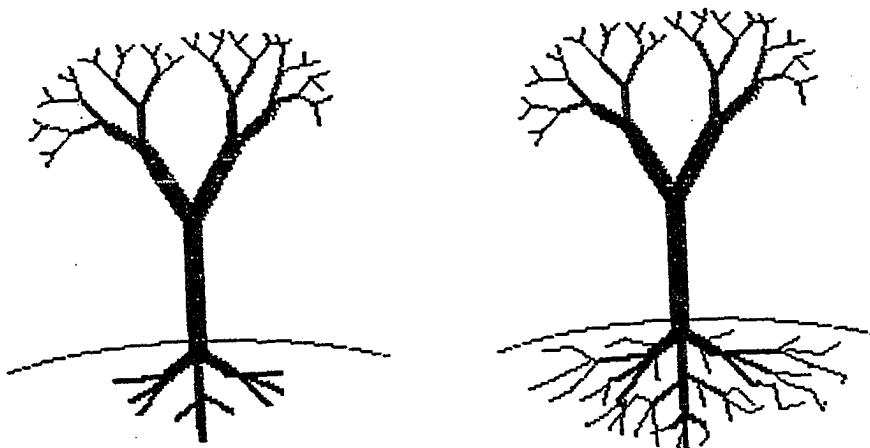


Figure 6-IV
Figure of Tree Changing

Paradigmatic change seems to be more difficult the closer one is to the root of science, since it seems that the struggle over value in the pursuit of the scientific dates back to at least Galileian times. On the other hand, in the branches of science change seems to come more easily where psychologists, rather than argue as intensely, are beginning to come to the view of caution and consultation. Now, to put the idea of the paradigm in perspective we need to look at science as a whole tree. Therefore, we see the paradigm as only a concept in science-not science itself. This seems to be

frequently forgotten, while scientists frantically aspire to come up to the values laid down by Kuhn for a paradigm. Kuhn's paradigm seems to be crafted in an Aristotelian linear form, but if we simply apply the concept to dimensional areas of science the paradigm has much greater explanatory power and flexibility.

Classical Order and Quantum Chaos

What passes for knowledge in science and psychology today, what is the ruling paradigm,⁵⁴ and what paradigms might be afoot? I have described some examples above illustrating the changes I see in the tree of science. From a global view it would appear that a paradigm shift is occurring in the realization that science and psychology are not simply linear sciences governed by ideas associated with a "classical" scientific view.⁵⁵ Science and psychology seem to be moving toward realizing that both linear and nonlinear, classical and quantum phenomenon exist and must be understood in different ways.

Hawking (1989) has made this type of distinction in his book A brief history of time.⁵⁶ I extend Hawking's discussion on classical and quantum mechanics here by adding to these areas the idea of globally linear and globally nonlinear sciences. I can sum this up in the concepts of linear, classical science and nonlinear, perhaps quantum science. In an earlier paper (Bütz, 1990a, 1990b) I made use of Gleick's (1987)

⁵⁴ I do not use this word lightly, since it appears to me that those who invoke the dominant paradigms often act as rulers. Peter Breggin's struggles are one such example (1991, pp 358-360).

⁵⁵ Classical in the sense of how Stephen Hawking uses classical in his description of physics in A brief history of time, (p 156).

⁵⁶ Physics seems appropriate to discuss here in tracing back the paradigms in psychology and science, since some have the opinion that psychology began with physics, specifically Fechner's psychophysics (Brunswick, 1956). There is also little doubt as to physic's leadership in the larger scientific community.

general description of chaos theory in that one has local periods of disorder followed by periods of order within a globally stable system. This may be a good description of classical linear science that has chaotic fluctuations, but for quantum nonlinear science this does not seem quite accurate. In a recent article Gutzwiller (1992) discussed the idea of "locally smooth, yet globally chaotic" (p 84) in reference to the idea of quantum chaos. It seems that this is a more appropriate description of the quantum or nonlinear world. As we have discussed, psychology seems to be a nonlinear discipline, where psychologists have a difficult time agreeing upon what they are observing as a field. However, within schools or smaller disciplines such, as say the psychodynamic school in psychology, there is often agreement upon certain basic concepts. These smaller disciplines have a smoothness or order about them within their membership, while psychology as a whole seems to be in chaotic disagreement. Therefore, psychology may be more aligned with the viewpoint in quantum science, than with the more classical scientific viewpoint. This may be globally true of psychology, but as I stated before, psychology as a science is self-similar to the larger field of general science itself thereby having a similar dichotomy between "classical" and "quantum" psychology. The division in psychology is apparently being drawn through associations currently, where some of the psychological community has left or never been a member of the American Psychological Association and moved to establish the American Psychological Society. It appears that the American Psychological Society wishes to define itself along the lines of classical linear science, where the American Psychological Association is trying to incorporate both the classical linear ideas of science and psychology as well as the quantum nonlinear ideas. What this recent split in the psychological community

seems to indicate is that a certain faction of psychology wishes to return to a more classical world view, while in the "hard" sciences there seems to be movement toward a quantum view of the world. This seems to be an indication that the classical and quantum worlds are coming together, slowly looking through the window of science at one another.

In Zeleny's book Autopoiesis, dissipative structures, and spontaneous social orders (1980), Jantsch puts forth the idea of "dissipative self-organization" as a unifying paradigm for the sciences. In this, he discusses co-evolving systems (p 85), and this seems to describe the interaction between science and psychology. However, for Jantsch there is a hierarchical type of organization, a niche for each system (p 83, 85), and it is here I must disagree with Jantsch's opinion. We must ask hierarchical in what form? In the same book, Maturana discusses "phylogenetic structural coupling," which is again a type of hierarchical self-referential unifying theme for growth(1980, p 68-69). Maturana states that it is "the essence of the phenomenon of evolution." (1980, p 69). Systems such as science and psychology are interdependent, and perhaps coupled as Maturana states, but I have difficulty with the idea of a hierarchical system. Inherent in a hierarchy is the idea again of value, a higher or lower form. From what I am able to understand about the world of science, sciences learn from one another; each offering its unique perspective to one another.⁵⁷ In Analytical Psychology, this would be the equivalent of putting masculine over feminine in terms of importance or superiority.⁵⁸ Each is interdependent upon the other, there is a give and take

⁵⁷ Kuhn discusses cross-fertilization in science similarly (1970, p 7).

⁵⁸ Tragically in a patriarchal system like several at work in the world today this is true. On this level the world is out of balance.

The Necessary Chaos of Development

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between the sciences where each offers a novel perspective for the other. As I have stated above, those in the "hard" sciences are moving toward more nonlinear ideas, and some in the "soft" sciences, i.e. APS, are moving toward back to more linear or classical forms of knowledge. It seems that both "hard" science and "soft" science can learn from one another, and it appears that this is beginning to be realized. This I believe is the ultimate new paradigm on the horizon: *co-operative science*. In co-operative science each discipline will realize that they are inseparably interdependent, and have something unique to offer one another.

The Winds of Change II:

Developmental Psychology and Clinical Psychology

Chapter 7

Segment II: Reconsidering the Paradigm

The concept of paradigmatic change has been thought to be one of cross-fertilization, and was described by Kuhn as a theoretical inevitability (Kuhn, 1970, pp 7; 1977, pp 340-351). Gurwitsch (1966, p 57) has discussed psychology as the "physics of the soul." He describes physics influence on psychology, and the difficulties psychology has in attempting to be realized as a "true" science. Still, it also appears that cross-fertilization does not solely flow from the hard sciences to the social sciences. Rather, the social sciences also inspire theory in the hard sciences (Singer, 1990, p 49-61; Van Erkelens, 1991). Below, the hard sciences' influence on previous psychological theory will be emphasized. In particular, these influences will be discussed as paradigmatic changes that occurred in psychological theory on developmental and therapeutic level. In contrast, more contemporary models of development have made us of a more hermenutic model where scientists observe and attempt to understand the experience of those they are studying (Levinson, 1978; Gilligan, 1982; Jordan, et al, 1991).⁵⁹

The Hard Science Basis of Psychological Theory

The Psychodynamic School

To begin, it would seem appropriate to examine the psychodynamic school of thought since it represents the so called mentalist movement early in psychology's history as well as arguably the first therapeutic paradigm in psychology.

Freud and the First Law of Thermodynamics

Freud gives psychology one of the first therapeutic paradigms in his concept of psychoanalytic theory. It is well documented that the dynamic aspects of Freud's

⁵⁹ Parts of this essay have appeared elsewhere in the work: *Fractal nature of the development of the Self* (Bütz, 1991a).

theories were inspired during his work as a medical student by two luminaries of his time: Hermann Von Helmholtz and Ernst Brücke (Ellenberger, 1970, p 431; Hall & Lindzey, 1978, p 35). Helmholtz was a physicist, and had further developed the first law of thermodynamics—the principle of conservation of energy, which basically stated: "that energy is a quantity just as mass is a quantity. It can be transformed but it cannot be destroyed. When energy disappears from one part of a system it has to appear elsewhere in the system." (Hall, 1954, p 12). Secondly, Brücke was a physiologist who had just published his book *Lectures on Physiology* which stated that living organisms were dynamic systems and subject to the laws of chemistry and physics. Freud transformed these principles analogically some twenty years later into his theory of dynamic psychology in which such principles were applied to his conceptions of the id, ego, superego, conscious and unconscious. The influence of physics in Freud's work is obvious here in his discussion of primary and secondary processes:

All that I insist upon is the idea that the activity of the first Ψ -system is directed towards securing the *free discharge* of the quantities of excitation, while the *second* system, by means of the cathexes emanating from it, succeeds in *inhibiting* this discharge and in transforming the cathexis into a quiescent one, no doubt with a simultaneous raising of its potential.

(Freud, 1965, p 638)

Therapeutically, in a rather simplistic analogy that flows from the first law, what this theory entails is simply the redistribution of conscious and unconscious contents toward a more evenly distributed state of affairs. Freud seemed to feel that conscious awareness was only the visible tip of the iceberg, and it follows that it would be great progress to expose to consciousness even one half of the unconscious contents

"brooding" within the psyche of the individual. This therapeutic paradigm seems to be given in some of his ideas on catharsis, whereby the therapeutic release of unconscious content is able to help the individual to function presumably better.

jung and the Second Law of Thermodynamics

Like Freud, Jung also incorporates the first law of thermodynamics in his discussion of the principle of constancy, but advances his theoretical conceptions by comparing the First Law of Thermodynamics with the principle of equivalence given by Busse:

Here we must follow Busse's suggestion and distinguish between the principle of equivalence and the principle of constancy. The principle of equivalence states that "for a given quantity of energy expended or consumed in bringing about a certain condition, an equal quantity of the same or another form of energy will appear elsewhere"; while the principle of constancy states the "the sum total of energy remains constant, and is susceptible neither of increase nor of decrease."

Hence the principle of constancy is a logically necessary but generalized conclusion from the principle of equivalence and is not so important in practice, since our experience is always concerned with partial systems only.

(Jung, Vol 8, 1968a, ¶ 34)

Jung was also heavily influenced by the physics of his day, as was demonstrated clearly in the development of what Jung termed the *energetic standpoint* (Jung, 1968a, p 16). The energetic standpoint was described by Jung in contrast to what he termed as Freud's "mechanistic view" of physical events, basically stated as:

The mechanistic view is purely causal; it conceives an event as the effect of a cause, in the sense that unchanging substances change their relations to one another according to fixed laws.

The energetic point of view on the other hand is in essence final; the event is traced back from effect to cause on the assumption that some kind of energy underlies the changes in phenomena, that it maintains itself as a constant throughout these changes and finally leads to entropy, a condition of general equilibrium. The flow of energy has a definite direction (goal) in that it follows the gradient of potential in a way that cannot be reversed. The idea of energy is not that of a substance moved in space; it is a concept abstracted from relations of movement. The concept, therefore, is founded not on the

substances themselves but on their relations, whereas the moving substance itself is the basis of the mechanistic view.

(Jung, Vol 8, 1968a, ¶ 2,3)

In this statement, Jung makes clear his difference with Freud's work by employing the second law of thermodynamics, entropy, thus incorporating and moving beyond the principles of constancy and equivalence:

So far as our experience goes, the principle of entropy is known to us only as a principle of partial processes which make up a relatively closed system. The psyche, too, can be regarded as such a relatively closed system, in which transformations of energy lead to an equalization of differences. According to Boltzmann's formulation, this levelling process corresponds to a transition from an improbable to a probable state, whereby the possibility of further change is increasingly limited. Psychologically, we can see this process at work in the development of a lasting and relatively unchanging attitude.

(Jung, Vol 8, 1968a, ¶ 49)

It appears important to note that the reactant contents of Jung's: "relatively closed system," are used up, and as such with no further reactants as in the case of attaining the Self, the conscious and unconscious contents have reacted fully together resulting in maximum entropy. As a result, the work in Jung's formulation of the therapeutic paradigm is to integrate or react all the "agents" analogically of the conscious and unconscious resulting in an "equalization of differences," a balance. Jung's theoretical advances did not rest in delving into the second law of thermodynamics and entropy, rather he continued his theoretical explorations seeking direction from some of the prominent physicists of his day, in particular W. Pauli.(Jung, Vol 8, 1968a, ¶ 437-440, 963 & Vol 9ii, 1959). His proposal of the energetic standpoint came early in his work, and being dissatisfied with the limitations of current physics, Jung continued to conceptualize new theoretical concepts without the aid of physics studying psychic energy through alchemy and mythology under the primordial concept of mana.

Early Developmental Paradigms

Piaget and Equilibrium

Piaget's work has had an important impact upon how the therapeutic community thinks about the cognitive developmental process. Piaget came to psychology via biology (Boden, 1979, p 1-6; Ginsburg & Opper, 1968c, p 1-3), and making use of the biological concept of equilibrium, described a theory of cognitive development. He viewed the individual and the environment as engaged in a continuing interaction, by which the individual adapted to the environment through two processes: assimilation and accommodation. By assimilating and accommodating new forms of information the individual is in the struggle of moving from states of equilibrium and disequilibrium. As Ginsburg and Opper (1969, p 14) note: "The definition also states that equilibrium is not immediately achieved: the cognitive structures only gradually 'tend' towards equilibrium." Piaget had this to say about the process: "intelligence is a particular instance of biological adaptation" (1952, p 3-4)-and again referring to intelligence—"is the form of equilibrium toward which all the structures...tend" (1968c, p 6). Piaget's basic model is comprised of three basic components: schemas, assimilation and accommodation. This tripartite system centers around the biological concept of equilibrium, and it is from this system Piaget goes on to elaborate his stage theory of cognitive development.

Erikson and Epigenesis

Erikson leaned toward biology basing his theory of development upon another hard science, embryology, in particular referencing C.H. Stockard's work (Erikson, 1963, p 65). Through his studies in this area, Erikson developed his concept of epigenesis which he described as follows:

In the epigenetic sequence of development each origin has its time of origin. If the eye, said Stockard, does not arise at the appointed time, "it will never be able to express itself fully, since the moment for rapid outgrowth of some other part will have arrived"...To us it is first all important to realize that in the sequence of significant experiences the healthy child, if properly guided, can be trusted to conform to the epigenetic laws of development as they now create a succession of potentialities for significant interaction with a growing number of individuals and with the mores that govern them. While such interaction varies widely from culture to culture, all cultures must guarantee some essential "proper rate" and "proper sequence".
(Erikson, 1982, p 27-28)

In Erikson's discussion he puts forth two seemingly contradictory notions, in that he makes clear the idea of "proper sequence" above providing the reader with a seemingly linear progression, while at the same time he makes allowances for variations in tempo and intensity of these stages elsewhere in his writings (Erikson, 1963, p 271-272). Erikson describes windows of opportunity in development through stages. What Erikson makes particularly clear in his use of the epigenetic principles is the notion of crisis. The crisis in epigenesis is whether or not the individual will attain all the potentialities inherent in that particular stage.

Systemic Movement and Family Therapy

At the time when Bateson's work on family therapy came to national attention (Bateson, et al, 1956), there was also the rise of what some have called the "third wave" of psychology, the Humanistic school. This school was given voice by rejecting the so called "mechanistic views" of psychoanalytic theory and behaviorism that had previously dominated psychology's global paradigm. What made the family therapy movement more "human" than the previous models was its emphasis upon systemic interactions, with a great deal of built in variability that could accompany therapeutic interventions. This variability came from two sources the Theory of

Logical Types (Whitehead & Russell, 1927, p 37-66), and Cybernetic theory (Wiener, 1961). Systemic thought based upon theory from the physical sciences bred a new way of viewing therapy from a familial perspective, rather than an individual perspective.

Bateson and Cybernetics

Bateson's work was a unique blend of a humanistic reference to the individual and utilization of modern scientific theory. Previous models focused upon the individual, and it seems that this was "part and parcel" to the theory's that were being used as a basis for understanding. In each case, the theory that dealt with the individual client was based upon a closed or partially closed system approach.

Bateson and his group: Jackson, Haley and Weakland,⁶⁰ focused upon two works from the hard sciences: *Principia Mathematica* (Whitehead & Russell, 1927, p 37-66) and *Cybernetics* (Wiener, 1961).⁶¹ He made use of the Theory of Logical Types (Whitehead & Russell, 1927, p 37-66) to address the logical linguistic binds a client finds themselves in with familial relations. Use of this work ultimately lead to his theory of the "double bind" (1956). He also made use of the cybernetic model "in passing" early on with no direct reference to Wiener (1961), when discussing the schizophrenic individual's use of unlabeled metaphors (1972, p 205). However, later he does devote an entire article to the topic (Bateson, 1967). Examining his work, the use of cybernetic theory seems clear, but its reference, at least in early works, appears to be sparse. Loosely, cybernetic theory discusses feedback in systems as being either open or closed, where the system has its own innate ability to self correct. Viewing

⁶⁰ I am referring to their seminal work: *Toward a Theory of Schizophrenia*, printed both in *Behavioral Science* (1956) and *Steps To An Ecology of Mind* (1972).

⁶¹ Please note that in each case these are not the publication dates Bateson refers to since they each have had additional editions printed.

families from this standpoint was especially useful in combination with the Logical Types, and the resultant double-bind to explain familial communication patterns that were pathological.

Contemporary Developmental Theory & Hermeneutic Psychology

It is here that one may note a fundamental shift in the ideas of how to derive a developmental theory. Is a psychologist guided by theory or the influence of the "hard" sciences, or does a psychologist determine an area of inquiry, analyze the results of their inquiry, and then describe the phenomenon observed through speculations arrived at once adequate study has been made. The later model, a hermeneutic approach, is what the clinicians and researchers involved with contemporary developmental theory have done. This movement most likely started before Levinson (1978), but I will choose him as a reference point for our discussion. The work of Gilligan (1982) and Jordan, et al, (1991) will then follow. These theorists describe a highly qualitative approach to their phenomenon with really no "hard" scientific theoretical underpinnings to their theoretical positions. This may well be due to the Humanistic movement in psychology that transpired at approximately the same time the family therapy movement originated. Still, these theorist's works also seem to reflect psychology fully discovering the validity of qualitative inquiry. These psychologies in many aspects seem quite different from one another. Where Levinson (1978) focuses upon men and the tasks of individuation and separation consistent with many of the aforementioned early theories of psychological

development, Gilligan (1982) and Jordan, et al (1991) describe a women's primary task in development as one of connection in relation to others.⁶²

Levinson's Transitions

Levinson advances his theory encapsulated in the Seasons of a man's life by describing and qualifying both the reasons for the study and how he went about studying the subject matter. His study was based upon a participant group of forty men from various walks of life. Levinson based his speculations upon a psychodynamic theoretical base, and from that he presented a number of ideas regarding male development. The main idea within his book is that of transitions. He points to four main transition points in the life cycle of men: early childhood, early adult, mid-life, late adult (1978, pp 20). Each transition has its unique characteristics, and of these transition periods the one that has received the most attention is the mid-life transition. During this transition the "foundations of a man's life are shaken" (pp 23). Levinson goes on to describe how earth shaking the mid-life transition, and/or crisis as it is frequently referred to, can actually be. This is the most noteworthy aspect of Levinson's attempt to describe the experience of men via the somewhat diverse group of forty men.

Gilligan: Defined Through Attachment

In contrast to the male psychology espoused by Levinson as well as most of the other psychological theorists above, Gilligan (1982, pp 8) defines women's development in terms of connection to others, as opposed to through separation.

⁶² This I believe is also a fundamental paradigmatic shift, in that Gilligan (1982) in redefining moral development along relational lines has boldly asserted a new type of developmental goal bringing the Western psyche of not only the female, but also that of the male back to itself from the hero's lonely separatist journey.

Gilligan's assertion I believe is no less than a paradigm shift in the way psychologists think about the issue of development. To define ones' self as developed in relation with another is *radically* different from the previous and pervasive separatist approaches that dominated psychology for so long. Gilligan wrote in a hermeneutic fashion on the issue of moral development in this vein, and in contrast to Kohlberg's (1981) overgeneralizations about moral development based upon a largely masculine point of view. Following Gilligan some ten years later, other women such as Jordan, Kaplan, Baker, Stiver and Surrey (1991) have in kind written on the topic of womens' development in connection. Baker (pp 11-26) elaborates most clearly on development in relation through her treatment of childhood and adolescence. It appears clear how radically different, and at the same time plainly obvious, development would be through attachment as opposed to through separation. Yet, psychology truly had to wait until the early eighties for this issue to be addressed.

In conclusion, the paradigms found in science and psychology seem to be changing in important ways. In this chapter there is not a more clear example than psychological theory's early dependence upon model found in the hard sciences for inspiration. With hermeneutic psychology, psychology entered into a new era, not so much in autonomy, but in terms of modesty. These more contemporary theorists have used caution in their speculations, and it seems psychology is beginning to use consultation to address our nonlinear science. I believe psychology has a "ways to go" in this respect. We see psychology as a science that yearns for unification, and yet discusses our science in a chaotic-bickering fashion with only local disciplinary agreement. What does this mean for development and therapy? It means we must put into practice what has been advanced here. Applying ideas from other disciplines

is not incorrect in itself, it is the overgeneralization that occurs with the sheer vail of "true objective science that purports control" that is incorrect. Therefore, we will attempt to understand the chaos of development in full view of the paradigms on the horizon.

The Chaos of Development

Chapter 8

Segment III: Development, Therapy and Unification

To this point we have discussed the idea of chaos as a creative process, including the scientific aspects of chaos theory, and their possible applications to psychology. We have also examined the trends in science and psychology closely to redefine the paradigm with dimensional aspects. In the last chapter, a number of paradigms in developmental and clinical psychology were addressed. Given our journey to this point, it appears only natural to explore the issues of development, therapy and unification in psychology . Reflecting on our journey into chaos and chaos theory, it has become apparent that there is a "necessary chaos" for the creation of new forms. It has also been demonstrated that the period doubling route to chaos is part of the activity of self-organization, and that a system may be radically influenced by something as small as a butterfly. In this vein, Poincaré has informed us that in dealing with such nonlinear phenomenon approximation is the best we can do. Therefore, we should use caution in our dealings with nonlinear systems.

Looking through dimensional lenses the paradigm has been moved out of its rigidly classical stance to apply to each scientific discipline, thereby respecting the ideas of each discipline as paradigmatic in their own right. The illusion of seeking truth has been confronted and replaced with understanding. We have found that classical science is only "part of the picture," and that its opposite lies in the chaos found in quantum science. Under this new view of science, psychology has been located as a nonlinear quantum science that has global disorder across the discipline, and local order within its many schools of thought. The disorder is a result of overgeneralization, and lack of interdisciplinary consultation about the aspect of the "elephant" each school has come to know. So, as with considering the nonlinear phenomenon Poincaré found, we too must be cautious and only approximate its

meaning. It is here where we will begin the discussion of an outlook for development, therapy and unification of psychology. With caution the chaos of development will be considered, focusing on the complexity and ambiguity found in that chaos.

Development: a dynamical struggle between attractors

Development: dynamical but linear

In chapter four, it was noted that conflict theory (Dollard & Miller, 1950; Miller, 1959)⁶³ has been recently described as : "Dynamical but Linear," by Abraham (1990) in a reformulation of the theory as a simple dynamical system. At first blush, conflict theory gives one the impression of an inherently linear model derived from S-R literature. However, Abraham illustrates this theories dynamical properties when he interprets the conflict between approach and avoidance as vacillating between a focal point attractor and a cyclic attractor. Roughly, these attractors are equivalent to the first and second bifurcation sequences discussed in chapter three in the illustration of a dynamical systems period doubling route to chaos. Abraham's description is consistent with the material Dollard and Miller used to describe such a conflict in avoiding one object and approaching another. As well as Abraham accounts for this system, and as powerful a descriptive model conflict theory has proven itself to be, each statement lends itself to greater elaboration by making use of other aspects of both psychological theory and chaos theory.

In conflict theory the focus is upon two objects, and the conflicting or combined tendencies of approach and avoidance. The individual experiences one of

⁶³ Abraham's references for his discussion on the topic.

three responses toward the two objects: approach-approach, avoidance-avoidance, approach-avoidance, with a differing likelihood for success in each case toward attaining a specific goal. Below, the familiar graphic representations of conflict theory (Miller, 1959) are given to provide the reader with a ready reminder of the tendencies inherent in the model.

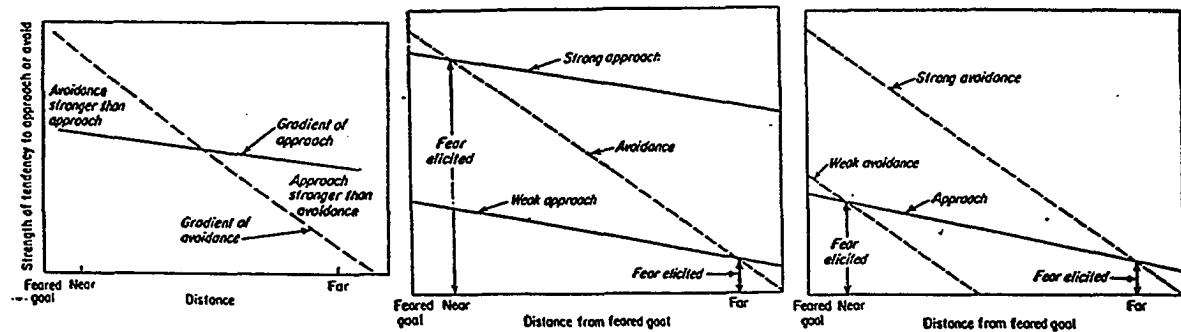


Figure 8-I
(Miller, 1959, p 206-208)

The graph at the left depicts the approach-avoidance conflict, while the center graph depicts a situation in which conflict is affected by increasing the strength of approach and the graph on the right depicts the situation in which the strength of avoidance is increased.

Note that this model is typically used to illustrate situations with just two objects and three conditions such as in Abraham's example above. Now image the models used to characterize the conflict an individual experiences between developmental stages, i.e. Piaget (accommodation) and Erikson (crisis). In each developmental theorist's model a period of conflict has been described in which opposing forces contend within the individual as they address a *novel experience*. These contending forces

have been described as attractors in the discussion on healthy and unhealthy agendas found in chapter four. Accordingly, each developmental stage and/or milestone may be considered an attractor psychologically.

The Known and the Unknown

The conflict between developmental stages may also be described in a more simplified fashion through utilizing the analogy of flavors of ice cream. Often, an individual prefers one flavor of ice cream over others at a given time. One can say this flavor of ice cream is familiar attractor. But, how is an individual attracted to a new flavor of ice cream? Of course, using the analogy of ice cream one would not have a "feared goal" as in Miller's work above, rather one would have an unfamiliar goal similar to the struggle in development. As in development, one makes use of other senses than, as in this analogy, simply taste. An individual may be attracted to a new flavor of ice cream through visual or olfactory cues given the person's ability to generalize from previous experiences with other similar sensations. Still, this person does not truly know what this new flavor tastes like because they can only generalize from previous experience. For instance, an individual may already "know" how the flavor vanilla tastes, but another flavor, such as rocky road, is an "unknown" taste to the individual's experience. While the individual knows how vanilla tastes and typically likes it, they may have become bored with it as a flavor of ice cream. Making use of their other senses, this person knows what rocky road looks like, and perhaps smells like, and yet, they have not tasted it. They are curious, but they vacillate between choosing vanilla the "known" flavor, and choosing rocky road the "unknown" flavor. According to Dollard and Miller's model, the closer an individual moves toward the attractor and/or approach goal of the flavor rocky road

the stronger its attraction would be, while the closer an individual is to the attractor and/or avoidant flavor, vanilla, the behavior of avoidance would increase more rapidly than the approach behavior. Consequently, in this conflictual situation the attractor, vanilla, is less powerful than the attractor, rocky road, given the same proximity.

Freeman's work, described in chapter four, gives one explanation for what may transpire after an individual has tasted the novel ice cream flavor, but his model does not describe what happens prior to the actual sensory experience. How does the choice to encounter new phenomenon transpire, and at what scale do we examine this question?

Metaphorically, the struggle in development is similar to our ice cream analogy, in that one knows how to deal with the so called vanilla stage they are currently living in, but having never seen the rocky road stage they are unsure of what it may entail. The individual knows that the attractor of vanilla ice cream has one smooth texture, and one primary taste, while they do not know what type of taste or texture the attractor of rocky road has. The individual can generalize a guess or a hunch, but they do not have precise knowledge of the experience. One may or may not find the next stage pleasurable, and so what is important in this discussion of development is the "known," and the "unknown" qualities of the attractor and/or attractors involved with each stage of growth. It would appear this is where the conflict occurs in development, where the individual vacillates between a psychologically known level of experience and a psychologically unknown level of experience. Developmental crises often arise once an individual has mastered one developmental stage to some extent, and is somehow, ineffably able to perceive the

next stage either consciously or unconsciously. The crisis is whether or not to approach the stage or avoid it.⁶⁴ Conflict theory seems to address the crises in development as a simple dynamical model.

Simple Systems Breed Complexity

To describe this model with sufficient complexity, Abraham's dynamical illustration will be re-examined. Abraham discusses the global aspects of conflict theory as an oscillating dynamical system.

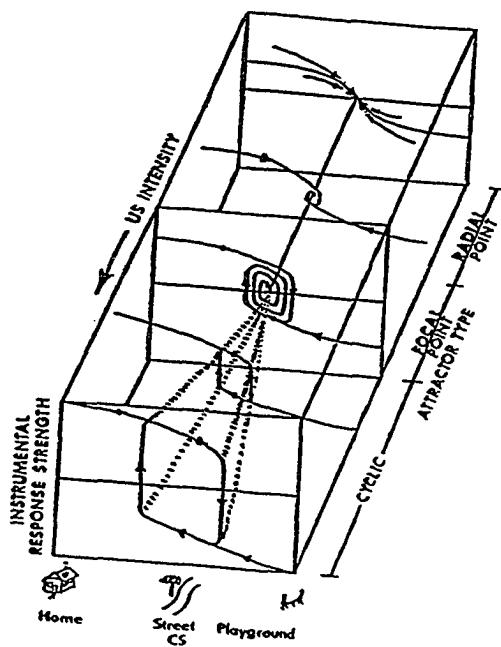


Figure 8-II

One chooses between approach and avoidance in a somewhat similar way to how one chooses a station and/or frequency on a radio. Oscillations occur in frequency that produces the "noisy" periods between the stations as one turns the dial searching for a

⁶⁴ I have commented upon this crisis at length in my description of the transcendent cycle (Bütz, 1990a, 1990b).

particular station. However, in this model there are only two stations and one area where noise and/or conflict occurs. Like the analogy of ice cream flavors, with two radio stations there are only two attractors contending for the radio dial position or desired flavor of ice cream. In terms of human behavior it seems to be stress that impels one towards choosing between a known or an unknown situation. This known or unknown situation may also represent the choice between order and chaos. What appears important to mention is that unlike inanimate or non-conscious entities, human beings have free will. A person may fully realize the choices before them between the known and the unknown, or chaos.⁶⁵ Choosing one or the other requires mental attention, either consciously or unconsciously. But, it is free will that provides a choice for the individual.⁶⁶ Another way of stating this dilemma is to describe it as fear or courage. If someone is afraid they will most likely remain in a known situation, because it appears to be more orderly to them. While, someone with courage may venture into the unknown. Any manner in which this dilemma is stated, the underlying human factor is free will or choice. As such, this has significance at a number of dimensions of experience. It seems that one can slice the choice point or bifurcation in infinitely thin layers. Consequently, a dimensional consideration begs the question of where the actual choice is made, "where was the straw that broke the camel's back?"

Notwithstanding the importance of the type of global model discussed above, what is the process that transpires at the finite point in an oscillation where conflict

⁶⁵ I have discussed this dilemma in the second stage of the transcendent cycle in a previous article (Bütz, 1990b).

⁶⁶ My thanks to Fred Abraham for a stimulating discussion of this topic, and a refresher course in human choice.

and/or the period of "noise" occurs? Moreover, what happens specifically during developmental crises as the individual stammers between developmental stages?

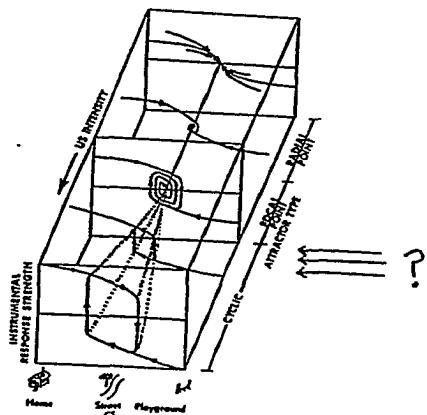


Figure 8-III

Examining the figure above what happens at each of these more minute periods of the system's behavior. In development what happens during the developmental crisis, say, hour to hour?

Fractal geometry describes portraits where iterations⁶⁷ occur *ad infinitum* at different dimensions. These iterations are like slices of cheese when one is preparing for a party. At the global level they would be thick, like large pieces of cheese served on a platter, while at the local level they would be quite thin, like a piece of cheese served in a sandwich. In addition, since each piece of cheese is cut from the same brick of cheese, each could be referred to as self-similar. The Mandlebrot set presented below demonstrates the iterated self-similar characteristics of fractal geometry.

⁶⁷ An iteration is: "multiplying a number by itself" (Briggs & Peat, 1989)

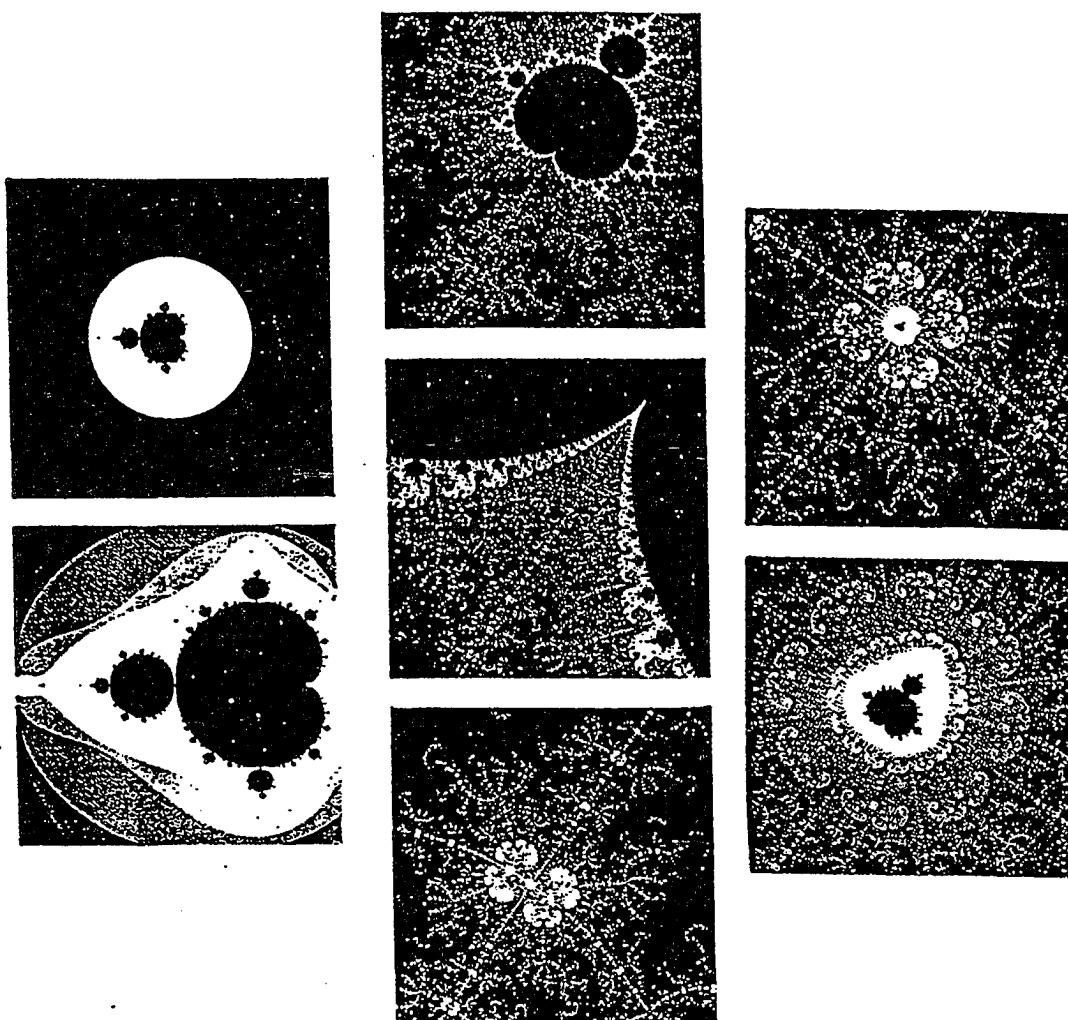


Figure 8-IV
(Briggs & Peat, 1989, p98-100)

The black object in the upper left box inside the white circle is called a Mandelbrot set. It reoccurs at various scales of examination in these pictures. Moving top to bottom and left to right, the first frame is given at actual size. Then moving along this path the second frame is a magnification of one of the buds in the first by 2,500 times. The next frame is a magnification of the base of the above design by 50,000 times. It then moves to a magnification of one of the small light pearls that extend in string-like fashion from the base of the above design in a magnification of 833,333 times the original size. The final frame is a magnification of 83,333,333.

In a similar fashion the period doubling route to chaos occurs on differing global and local scales. Remember the dynamical system model in chapter three with its simple

bifurcation design? Now examine a full plot below with period doubling routes to chaos occurring on a number of dimensions.

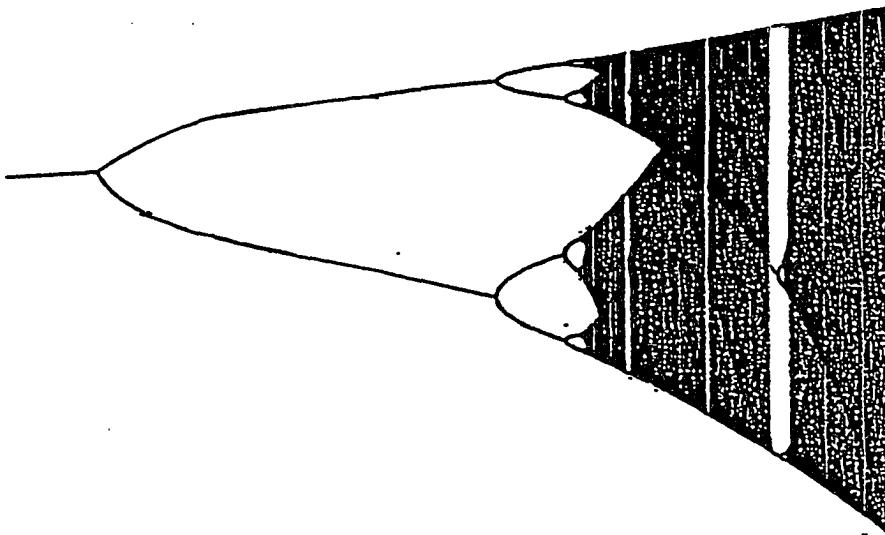


Figure 8-V
Noting the dimensional characteristics in this plot one can see a number of stability points amongst the period doubling routes to chaos.

It is not much of a jump to assume that at the local and/or finite level, that a more minute version of a period-doubling route to chaos occurs between the focal point attractor and the cyclic point attractor. As the developmental evolution of it occurs, it may occur in a self-similar fashion on a finer, more complex level simultaneously with the global oscillations one is able to readily observe. Goldberger (1987a,1987b, 1990) has also commented upon this dimensional self-similar phenomenon in reference to the patterns one finds in cardiac rhythms. What was once thought of as a "normal heartbeat," is now recognized as a constrained random heartbeat upon a closer fractal examination of the seemingly smooth waves. In summary, what Goldberger's work shows is that at the global level, one will see a "normal heartbeat," but upon closer examination of the fractal self-similar characteristics of the beat on a

finer, more local level, one will see a seemingly chaotic beat, i.e. constrained random beat. Therefore, this means that we need to examine system dynamics, such as those found in development, in a more detailed manner in order to ascertain the unique characteristics of each individual pattern.

The Map is not the Territory

Given chaos theory's global and local dimensional emphasis, it is able to describe both relatively stable periods in development and unstable and/or chaotic periods of development. It is simply dependent upon what dimension the system is examined upon. Korzybski's work (1958, p 58) is particularly helpful here in making a distinction between "map" and "territory." Where Piaget, Erikson, Abraham, Dollard and Miller give a "map" of the unfolding conflict within an individual's psychological experience, it is not necessarily the actual "territory." In point of fact, each theory offers an incomplete map, or what may be termed simply an insufficient map of the territory they attempted to describe. The territory may be different than the map, or a particular individual's psychological territory could be quite different from the map that describes most people. For example, the map may be drawn to describe the psychological universe, but only describes a galaxy in the psychological universe in a crude or gross manner. The galaxy actually consists of ten planets, but since only four are large planets, they are the only ones depicted on the universal map. Likewise, as Piaget, Erikson, Abraham, Miller and Dollard describe conflict on a universal level, they do not describe specifically what happens in each galaxy of the psychological universe during conflict. The maps are too global, and lack enough detail to describe conflict in development in a useful local fashion. It is helpful to state that a person is in a developmental crisis, but what part of a developmental

crisis? Metaphorically, are they at a peak or a valley in this crisis? Furthermore, where is this peak or valley within the peaks and valleys of the individual's life time? How has the person dealt with similar situations before? Is this current conflictual behavior the person's usual and unique type of stability, or is this behavior outside of this person's range of usual behavior? These queries ask the more important question: can one assume the current maps of conflict apply to all individuals, and is the territory represented correctly? Would a map of one mountain describe all mountains? The answer is: of course not. Moreover, would a mountaineer use this one map of a mountain to plan for climbing all mountains? Simply, no, that would be ridiculous. Psychologists have global maps of conflict in the models provided by Piaget, Erikson, Abraham, Miller and Dollard, but these maps do not describe the local territory of the individual's conflict. The models found in chaos theory do offer the potential for more descriptive maps of each persons psychological territory, based upon each individual's own unique patterns of behavior in dealing with chaos. Thus, chaos theory seems to provide a more precise map of the territory of conflict, enabling psychologists to explore regions of behavior they have previously been unable to describe.

Under this model it seems important to examine dimensions, or moments, of behavior that allow us to view an individuals own form of stability. In general, we would need to assess each case individually in terms of how he or she behaves when they are in chaos globally, and then under "x" circumstances how they behave from moment to moment, hour to hour, day to day and so on, delving into their historical pattern of behavioral stability. A good example of such a model is the suicide protocol that describes a global sequence for suicidal behavior. However, at a more local level

clinicians at a clinic may be more familiar with client x's own stability and able to estimate according to the aforementioned model, and their prior knowledge of the client, what period of developmental chaos the client may be feeling at that particular moment. This idea is not new, it is what is commonly called clinical judgement. What is different in this orientation is an emphasis upon more careful attention to the idea that this "judgement" is an approximation based on a certain amount of experience with the client; and the full idea of entertaining a number of possibilities⁶⁸ based upon this approximation. It is a speculation rather than a prediction. Prediction implies control, while speculation does not. We simply do not know all the factors affecting the clients stability, and therefore we can only generate approximations based upon past behavior. The difference seems subtle, but it is an important one due to sensitive dependence on initial conditions.

Unique Stability and the Ability to Self-Organize

While chaos theory offers a more precise map, this map is indeed difficult to draw,⁶⁹ since developmental and therapeutic processes do not often lend themselves to mathematical formulas with any idea close to voracious abandon. But, one may discuss models of biological growth in chaos theory through Prigogine's (1984) work on "self-organizing dissipative structures." What is unique to his work is that systems called "far-from equilibrium," under stress, move from order to chaos and then self-organize toward a more complex form of order. What this means for psychology is that the developmental process inside and outside therapy seems to be

⁶⁸ This is usually called a hypothesis, but hypothesis implies the scientific method. The end to the scientific method is prediction, not approximation.

⁶⁹ In a future sense, impossible to draw actually.

governed by the same types of laws found in this biological growth model. Each individual seems to have their own unique patterns of behavior and growth as was discussed above, and it at least makes intuitive sense that some individuals "self-organize" under stress faster than others. This would be similar to stating that some people make decisions faster than others, they have their own unique characteristics. What seems important about all this, is that there is an underlying order in the chaos, and this order is gestating toward a more complex form of order. Psychologically speaking, the individual's psychological capacities are transforming in a manner difficult to perceive. As therapists it may be apparent that an individual is in conflict, but often it does not look like anything more than conflict. The underlying order in the chaos is not apparent. Like what seems to be random data generated in a mathematical formula, as a therapist, one often does not know what to do with this conflicted client. As in our crisis example above, if we are unfamiliar with client x what do we do? Therapists are supposedly disposed to end an individual's suffering, and so it would make sense to call an end to this agony one finds client x in. However, if a therapist knows that there is a self-organizing end to this suffering on the part of the client, which will result in the client attaining a deeper, more complex, facility for psychological capacity-wouldn't that encourage both therapist and client to stay with this process? Meaning, that rather than immediately attempting to quell the anxiety the client is experiencing, and that we may be experiencing with the client, one should observe client x for a time with no intervention. Since, if we make a haphazard intervention instead we may interfere with the client's own ability to self-organize.

What I am saying here is nothing particularly new, psychodynamic therapists, among others, have conceptualized therapy in this way for many decades. But, what chaos theory can add to this picture beyond validation is the possibility of a mathematical understanding of how tenuous psychological states may be. The butterfly effect described in chapter three reveals that even small stresses in a weather system can result in dramatically different behavior within the system. It would seem that an individual's psychological state may be likewise affected by what some call "the straw that broke the camel's back." Thus, given what has been said above about stability and self-similarity, it also appears that people behave in a manner self-similar to their previous behavior unless they become psychologically unstable. At that point, although there are parameters (like a person cannot become a chair) one is no longer able to predict future behavior based upon past self-similar *stable* behavior. This unstable or chaotic behavior is often termed a "crisis." The term crisis literally means: a turning point for better or for worse... (or) an unstable or crucial time...(Webster, 1989). The experience of crisis seems to be marked by a high level of anxiety, which seems analogous chaos in the human condition (Bütz, 1990a, 1990b). Evaluating this crisis or unstable behavior we must compare it to previous periods of instability that the client has experienced. How long have crises like this lasted in the past, how unstable does the client become, and what does it look like when our client begins to self-organize? Prigogine's dissipative structures require this type of condition, i.e. far-from-equilibrium, to move from a chaotic period towards a more complex form of order. Being aware that there is this necessary chaos that an individual will need to move through, it seems that this knowledge would direct developmentalists to consider development in a different fashion. In broad terms,

developmental theory has been criticized for stage dependent theories which emphasize windows for a particular type of growth. Also, early theory has been criticized by feminists for their separationist emphasis. These are just a few concerns in developmental theory. It appears a more hermeneutic method of developmental theory is called for, whereby attention is turned away from prediction. The method would simply describe how development unfolds in a number of cases. Describing both stable and chaotic behavior in men and women from many different cultural heratiges may be the most appropriate manner to avert the stumbling blocks of overgeneralization that have existed before in developmental psychology. With this type of multicultural hermeneutic approach developmental psychology may land closer to the approximations that may reasonably be called for by cautious scientists.

Respecting the System: Watch, Look and Listen.

Given what we do know about the models under chaos theory, one may be able to recognize potential developmental problems an individual may encounter in the course of moving from equilibrium to semi-far-from-equilibrium to far-from-equilibrium chaos. Such problems as strange attractors that trap the growth of a system in a semi-endless repetitive loop may be encountered, or too great a build up of high energy entropy in the system may kill it as in the second law of thermodynamics, or even other phenomena not previously mentioned may occur. Under these circumstances one may feel the need to intervene. But, and secondly, it also seems that *chaos theory directs a therapist's attention toward less invasive techniques of intervention that focus a great deal of attention upon previous patterns of behavior: self-similar patterns, with attention to what is stable and what is unstable behavior for the particular client one is addressing.* This is so especially if a

therapist considers sensitive dependence upon initial conditions, and the radical changes that may happen in a system's behavior in a very short time. Therapists often use generically called for invasive techniques to solve the presenting problem(s) at hand. Without a requisite careful history, and focus upon non-invasive techniques, one might find that the client is in greater distress than they were prior to their entrance into therapy. Depending upon the stability of the persons psyche, or in psychodynamics "ego strength," invasive techniques could "wipe out" the persons "rhythms" that previous gave them the ability to self-organize toward a more complex psychological state of being. It would be like adding a chemical to a chemistry experiment without being sure of what effect it might have on the mixture. Simply playing with a chemical intervention until it does something is a rather crude way to treat such a complex and self-organizing essence as a human being. Yet, this seems to be largely what psychopharmacological intervention is reduced to a great deal of the time (Morgan, Wilson, 1982; Breggin, 1991). As we are beginning to learn after nearly forty years the results of this type of intervention can be devastating. To truly understand patterns like these, a phase portrait of an individual's psychological progress would be a useful tool. If the reader will recall, in chapter four we discussed Sabelli and Carlson-Sabelli (1990) having already begun to use this tool to describe a depressed woman's sequence in therapy. With a phase portrait of a client's behavior we may be able to plot her stability with even greater accuracy than we are able to now. Thus, giving the clinician a better approximation of what phase of developmental growth a client is currently in, while we are attempting to estimate the effects an intervention may have. Consequently, if we see the persons psychological capacities as self-organizing, this directs therapists toward specific types

of therapeutic activities. Such activities might include monitoring the client's own form of stable behavior, and utilizing less invasive interventions that are designed to allow the client's own psychological system to "run its course" in order to self-organize.

Models of Developmental Transformation:

Process, Perspective and Symöbia

Chapter 9

Segment III: Development, Therapy and Unification

The models found in the creation myths of many cultures point to chaos as a specific stage of creation, the beginning (Bütz, 1992g). From this beginning a new form arises, and with it a new type of order. According to scientific models like Prigogine's (1984), this new order is a more complex and adaptive form of order. Thus, in this scenario of creation the *necessity of chaos* becomes apparent. What both chaos and order mean for the *process* of development may be discussed through the concepts of the *Transcendent Cycle* (Bütz, 1990a, 1990b) and the *Transitory Self* (Bütz, 1991b). Each concept emphasizes the necessity of chaos as a developmental task in which an individual moves through successive dimensions of growth. The symbol is emphasized in both of these models as the psychological representation of the transformative process. Dimensionality (Bütz, 1990a, 1991c) is another concept that comments upon development, but instead of describing process, dimensionality adds a perspective to our picture of development.

While I have emphasized both process and perspective in the earlier models, I have not commented upon the essence of what it is we are. What are we? To be a human being is roughly translated as a creature who is: one and the same (*homo*) as the progenitor (*manu*) having the state or quality of existing (*being*). There seems to be more to us than this, and Maturana & Varela (Maturana & Varela, 1973; Zeleny, 1980; Maturana & Varela, 1992) describe a recursive creature they call *autopoietic*. Autopoietic is defined by Maturana and Varela (1992, p 43) as: "living beings are characterized in that, literally, they are continually self-producing." Linguistically, autopoietic means: "self...to produce" (Maturana in Zeleny, 1980, pp 52). In Maturana and Varela's work the emphasis is steered toward an autopoietic unity's autonomy and away from a being's symbiotic interaction with the environment (Maturana &

Varela, 1992, pp 88). There is no mention of a symbolic process.⁷⁰ Our symbiotic relation to our environment and our symbolic abilities seem to be the essence of what makes "us" distinctive, and yet, Maturana and Varela neglect to address their importance as distinctly human characteristics. Consequently, I offer the term *symöbia* instead, in order to describe what makes us unique in our existence and development. The concept is designed to describe the symbiotic interdependence that exists between the environment, and a symbolic self-referential being who develops through self-organization (Prigogine, 1984). Symöbia is the constant of the persons essence through the process of development, a more descriptive term than "human being."

The Primeval Sequence of Creation

The creation myths depict chaos as an essential ground state for the development of new forms (Bütz, 1992g). In the Asian cosmology the Tao and Hün-t'un represent the chaos, and from them all things are born. Specifically in the Asian cosmology the mythical dragon is born as a sentient and intelligent being. With the dragon we have consciousness, similar to the consciousness created in the Egyptian creation myth with Atum, or with man that emerges with the assistance of the Huracán in Mayan mythology. Roughly, there is a sequence to the creation of new forms: chaos, symbolic sentient being or man, a form of order, creation of balancing beings. The necessity of chaos is central for the creation of new forms, but out of

⁷⁰ Environment does not seem to be included as an interdependent type of idea. The autopoietic being simply couples and uncouples with the environment in their view. Secondly, there is no mention of symbolic forms, and it is no wonder, since Maturana is a biologist and Varela a cognitive neuroscientist with an entrenched anti-representationist stance.

chaos there emerges either a symbolic sentient being or man. What this new form holds either literally as a symbolic creature, or figuratively as man, who has the power to create symbolic representations himself, is the power of the symbol. The symbolic creature or man, and the symbol he produces takes precedence in an important way. The symbol in either case becomes the focal point for an ordering concept.⁷¹ In Dollard and Miller's work (1950), it may even be phrased as the approach object, and yes, in this set of attractors there is one that is feared, chaos. So, cosmologically and psychologically the symbolic being or man carries the hope of order in this primeval scene. Marduk, Atum, and man are each examples of this. Once the symbolic being or man has been established, and to some extent order is assured, other beings may be created. These beings typically add balance to the scene, often representing polar opposites as in Yin and Yang or Adam and Eve, or representing the four directions as in the four dragons. Therefore, in our primeval world balance and order is achieved. This does not last for long because now man must encounter something novel that he or she is unable to comprehend. The serenity of the scene then begins to disappear, and soon chaos will follow in a new form. So, we see a cycle from the very start of creation where there are successive regimes of chaos and order. Broken down into simple parts it seems to look something like this: chaos, symbolic being or man, tenuous order, balancing beings, disruption of the order—"novel phenomenon," chaos.

In the scientific models discussed we also see a similar pattern. For example, in Kuhn's paradigm (1970) we see this cycle in slightly different terms. The hard

⁷¹ Jung (1979, p 651-655) and Trungpa (1991) have frequently stated this in various places, both emphasizing the mandala.

scientific models in chaos theory also exhibit this cycle, but without the symbolic content, i.e. period doubling route to chaos, dissipative structures, etc.. There is a curious phenomenon though among chaos scientists and others who often seem to use anthropomorphic terminology to describe how a system organizes itself. They often seem to emphasize a type of collective communication transpiring across the system even in discussing chemical reactions, biological structures, soliton waves in rivers and oceans, physics and even astrophysics (Prigogine, 1984; Maturana & Varela, 1992; Gleick, 1987; Tonge, D. G., 1974; Barrow & Tipler, 1986; Barrow, 1988). If I did not know better, I might even think they may be ascribing a type of intelligence to these systems. They may be, and my mind is open to this type of possibility although it seems that they may be harkening back to vitalism in philosophy.⁷² However, at this point in time we are unable to know if this is so, at least to my knowledge. What we do know is that symbolic activity is possible with certain life forms other than simply human beings,⁷³ and the psychological models I have developed give symbolic content priority in the development of new psychological forms.

Transcendent Cycle, Transitory Self and Dimensionality

In all modesty, the first model was developed as a class assignment back in the Winter quarter of 1989-1990 while I was working on my Ph.D in Northern California. I was studying the possible relationship between chaos theory and psychosis from the viewpoint of Analytical Psychology. The paper required was to be a twenty-five page

⁷² I am indebted here to Robin Robertson for some of the above sources, as well as his frequent counsel on matters that are sometimes outside my training. In addition, other ideas earlier in the text relates to and are extended by some of his work (Robertson, 1989a, 1989b, 1990, 1992)

⁷³ Meaning to my knowledge, primates and dolphins.

scholarly work. After three months of intensive study I produced a paper that was eighty pages in length (Bütz, 1990a).⁷⁴ At that time I began to realize what the integration of chaos theory could mean for the field of psychology. The primary model I developed in that paper was the *transcendent cycle*. The transcendent cycle is firmly rooted in Analytical Psychology, and based upon some general descriptions of the process and character of models found in chaos theory. Four main ideas run through the model: first, the perspective that locally during change there is disorder, while on a global level there is stability; second, chaos in the human condition is defined as overwhelming anxiety; third, chaos is an essential state to create new forms often represented psychologically by symbolic forms; and fourth, that development is cyclic in nature with periods of chaos and order. The transcendent cycle has two sets of overlapping stages in the process:

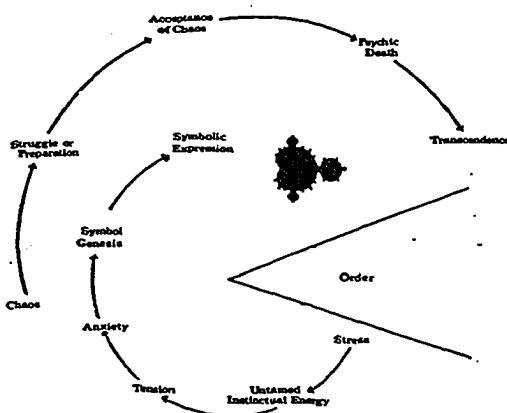


Figure 9-I
Transcendent Cycle

⁷⁴ This was under the instruction of Eduardo Duran, who with my classmates in Archetypal Psychology taught me a great deal about Analytical Psychology and life.

The second model I developed dovetails with the transcendent cycle, and it is called the *transitory self*. The transitory self represents the briefly ordered periods of the individual's life when they are fairly balanced. This self follows the transcendence in the previous model, and precedes the encounter with the novel stimulus that would produce anxiety within the individual's psyche. The individual in this model is a partially open system (Bütz, 1991a, pp 22-23).

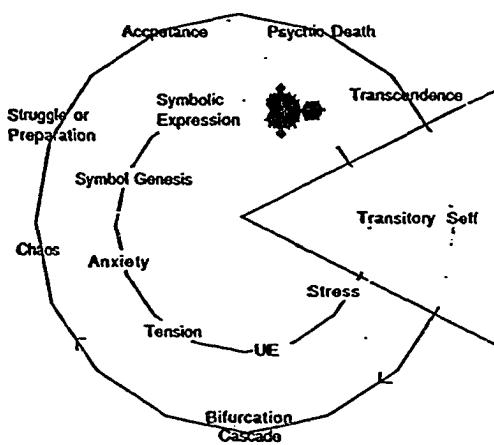


Figure 9-II
Transcendent Cycle and Transitory self

In another context the earlier lengthy version of Chaos, an omen of transcendence in the psychotherapy process (1990a), the concept of *dimensionality* was inspired by the Mandlebrot set, and the concept of self-similarity.⁷⁵ Dimensionality states: under the rubric of self-similar structures what is global at one level is local at another, and conversely, what is local at one level is global at

⁷⁵ Self-similar is as it appears, structures grow in a self-referential form, i.e. trees and lungs.

another.⁷⁶ Dimensional structures have self-similar criterion that they are able to be defined by, in that what defines change at a global level also defines change at a local level. The concept was applied to an Analytical framework in this way.

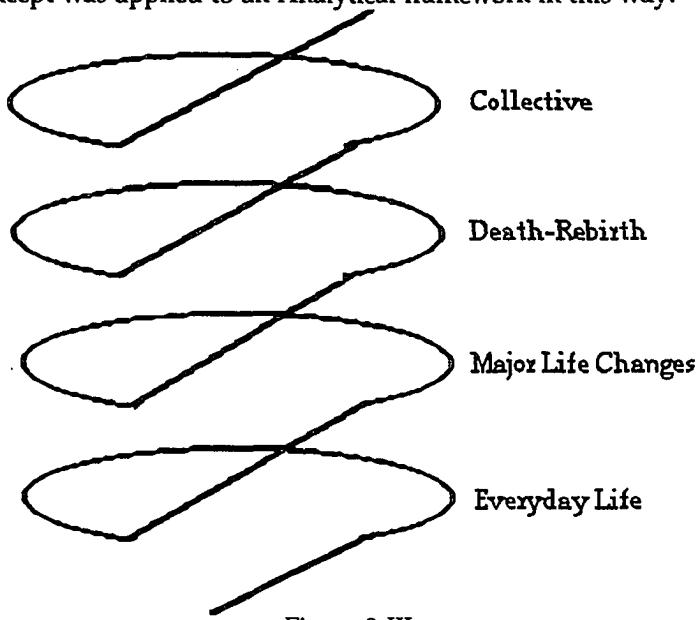


Figure 9-III
Collective, meaning collective unconscious, and Death-Rebirth
meaning literally death and rebirth in a reincarnation sense from the Buddhist
standpoint.

⁷⁶ Singer (1990) also comments upon a similar process in her descriptive work: *Seeing Through the Visible World: Jung, Gnosis and Chaos*.

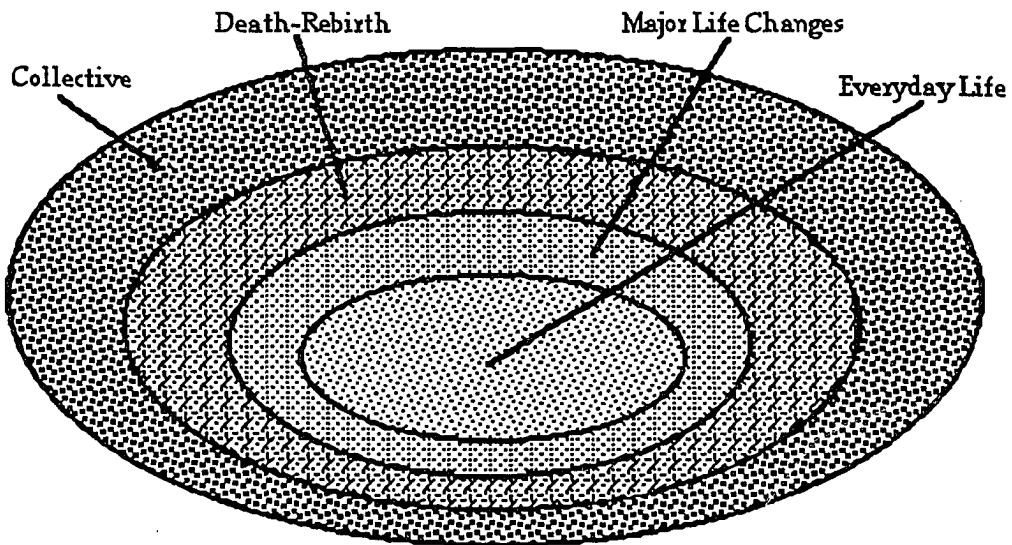


Figure 9-IV
Nested Dimensional Graph

The graphs above may be deceiving though, since they are depicted in a linear fashion. This is only for the readers benefit, since an appropriate graph would entail much more detail, the cycles depicted above would not be flat, but would flow in an upward spiral radiating in many different directions, and these stages would be nested within one another as depicted below.

Each of the three concepts described provide a different aspect of the process and perspective for change. In this context, the three models are combined to demonstrate a creative developmental sequence. With dimensionality, the global and local levels of growth are apparent as well as the transcendent cycles and the transitory selves. The growth experiences one moves through are not simply on the grand scale of the so called mid-life crisis (Levinson, 1978) or an existential crisis. Rather, these chaotic experiences can happen several times a day in more minute, but equally relevant ways. Creation myth sequences have also been described in terms of chaotic and orderly periods (Bütz, 1992g). The facility that makes all this possible, and what it's

essential character is has been overlooked so far in our discussion of the process of change.

More than Autopoietic: Symöbian

What do we call ourselves, or those other creatures that share the world with us? We often call those other creatures "lower animals," and ourselves, as well as a chosen few other animals we designate as "higher animals." The term "man" is slowly fading from usage to describe both men and women, while the above designation still remains, a more "politically correct" term would seem to be simply human beings.⁷⁷ As we have discussed, this is translated as: one and the same as the progenitor who exists. So, are we the progenitor who exists? Does this mean in a sort of Euro-Christian zeitgeist that God created man in his image? This term seems somewhat arrogant, and gives our form of existence no great description.

In Maturana and Varela's work (1992) on living systems they describe these systems as *autopoietic*. Again, autopoietic is defined as: "living beings are characterized in that, literally, they are continually self-producing." What seems important in this idea is the focus upon living beings being self-producing, and recursive in their growth patterns. Because of this recursiveness living beings do not change much. Obviously, there are mutants, genetically speaking, that do exist, but because of recursiveness the basic creature does not change all that much. Recursiveness seems to be the nature of growth patterns in our world, and in this I agree wholeheartedly with the description of living beings that Maturana and Varela

⁷⁷ Politically correct, simply means acceptable in a sensitive fashion, and because of the current admittedly fashionable movement to be politically correct it is difficult to know what term is acceptable. Much of a terms acceptance may simply have to do with what group one is addressing at a certain time.

offer.⁷⁸ But, in this essay we are not simply examining living beings, we are examining human beings, and in this the symbiotic relationship with the environment and the symbol is absent.

In 1983 Fedanzo (pp 173-176) wrote a book review that is very helpful in describing problems with Maturana and Varela's work. Fedanzo compares the somewhat recent publications: Autopoiesis, dissipative structures and spontaneous social order by Zeleny (1980), and On a systems view of man by La Violette (1981). Where Zeleny describes the work of Maturana and Varela, La Violette describes Von Bertalanffy's work. Fedanzo points out the strength of Maturana and Varela's concept in this way: "the living systems are *self-producing, self-creative, or self-renewing* - they are *autopoietic*." He also points out that such a living being would "by definitions have to encompass an understanding of its identity." Fedanzo points to problems with this idea in basically stating that it is an old philosophic problem dressed up in new clothes: "the problem of material object identity across time." He then points to La Violette's book on Von Bertalanffy's work. The main distinction Fedanzo makes here is that Von Bertalanffy's work is superior because of the inclusion of the symbol as part of the living being (pp 175).⁷⁹ I fundamentally agree with the point Fedanzo makes here, but I do not find Von Bertalanffy's work an improvement Jung's more in depth studies on symbolism. The point here is that

⁷⁸ The main problem I have with their work in this area is that they seem to take up the ancient position that "nature does not proceed by leaps" (Carl Von Linné, 1707-1778).

⁷⁹ As one who is familiar with Jung's work, I find La Violette's naive statement that the symbolism Von Bertalanffy proposes is different from either Freud or Jung (pp xvi). In fact, his symbolism is very similar to Jung's, if not the same, with different words. It seems he should have examined the matter more closely.

human beings are more than simply their biology, self-producing. They are indeed recursive, as Maturana and Varela point out, but they are *recursive after they encounter a novel experience.* What represents this novel experience is the symbol.

Symöbia

As human beings, we must run up against a problem that is difficult to answer in order to be self-referential; otherwise we are frequently on "autopilot" (Baars, 1988, pp 195-196). We already have structures that can deal with known experiences in our environment (Baars, 1988; Skarda & Freeman, 1988; Freeman, 1991). What drives us into chaos is constructing a new structure to deal with a novel experience (Bütz, 1990a, 1990b, 1991a). Consequently, I am dissatisfied with using autopoiesis to describe the process of development in human beings. I offer a new term to describe our existence: *symöbia*. Symöbia is taken from the Greek word symbolon, and the concept of the Möbius strip. The power of symbolic expression has been emphasized since time immemorial, as described in chapter 2. What is important to understand here is how confusing we are to describe as a being.



Figure 9-V
Möbius strip (Websters, 1989, pp 762)

The Möbius strip provides a wonderful metaphor to describe the paradoxical simplicity and complexity that makes us unique.⁸⁰ The Möbius strip is:

"a one sided surface that is constructed from a rectangle by holding one end fixed, rotating the opposite end through 180 degrees, and applying it to the first end." (Webster, 1989, pp 762).

What this means for us⁸¹ is that in one moment the Möbius strip can look one dimensional, but with a twist it can look three dimensional. Still, both dimensions are represented in the same object. It's complexity only manifests itself through a manipulation. The same is true for beings such as ourselves. If one were only to look at our biology, as complex as it is, they may only view us in terms of certain capacities. On the other hand, if we examine the creations and capacities of our mind in concert with our bodies, there is a complexity that transcends biological description. This transcending agent is our symbolic capacity. The symbiotic being's capacity for transcending previous levels of existence lies in its ability to be self-referentially symbolic. This makes us unique in spite of our biology, and at the same time we are not terribly autonomous. Our capacity for growth psychologically and biologically is symbiotically tied to our relationship with the environment. Meaning, that in order to enact the self-referential process of producing a symbol we must encounter novelty. In this experience we find the uncertain feeling of chaos,⁸² which, seems to be a precursor to growth (Bütz, 1990a, 1990b).

⁸⁰ Here, thanks goes to my friends Robert Morgan and Rebeccas Owl, who while I was struggling with what to name this concept directed me to the Möbius strip.

⁸¹ I use "us" since I am caught in the dilemma of redefining what it is we are in a novel manner. Consequently, I do not wish to use old conventions to describe my topic, and it seems it would be arrogant to use the term I am introducing as a constant.

⁸² As I have previously stated, Grotstein (1990) has commented similarly upon the perception of chaos.

So, in this interpretation of human existence it seems that our relationship to the world is symbiotic in nature. Rather than being unities that couple and uncouple as Maturana and Varela describe (1980, pp 69; 1992, pp 75-88). As symöbia we seem to have an interdependent relationship with the environment, where we encounter novelty in our environment, and then return to ourselves in a self-referential way for experience that may enable us to adapt to the situation. We flower in the construction of the symbol as a focal point for our organization of previous knowledge. In making sense of a novel experience the symbolic process may not *feel* orderly, in fact it will most likely feel chaotic since we are no longer on "autopilot." The symbol seems to be there as a representation of the problem we have encountered, it is both a "liferaft" and a piece of clay we are molding into form. Freeman's model (1991) is particularly helpful here.



Figure 9-VI
Approximated Freeman phase portrait

When we are on so called autopilot, we have an orderly phase portrait like the one presented above on the left. If we have run into a novel situation we are "switched to manual control," and must draw from previous experiences in order to construct a method of adapting to the situation by barrowing from our previous experiences. I posit that this is why the phase portrait on the right looks so jagged and chaotic, it is because the brain is looking for previous mental representations that will assist in

understanding the novel stimulus. In this type of construction, symöbia has built a new and more complex form of order for itself. Like Prigogine's dissipative structure (1984) it has the ability to self-organize, and it achieves this by an interdependent relationship with the environment. In the process of change from order to chaos to a more complex form of order symöbia is the constant through the process, and it may be something akin to Feigenbaum's universal numbers (1978, 1979). Universal numbers seemed to simply appear out of the chaos as constants in a numerical sequence, and as Gleick put it: "Feigenbaum knew what he had....scaling meant some quality was being preserved while everything else changed." (1987, pp 172). Some underlying order seemed to exist in the chaos; in development it may be the symöbia and/or ourselves. As a result, the process of development seems to incorporate the aspects depicted below in figure 9-VII.

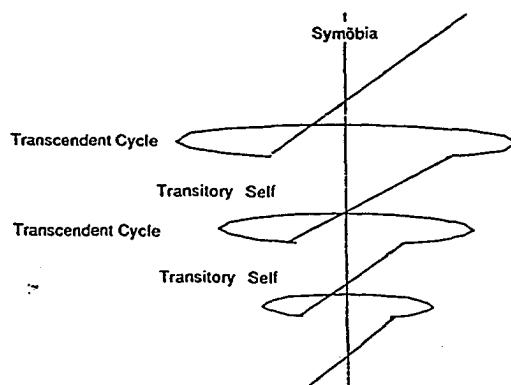


Figure 9-VII
Symöbia, Transcendent Cycle & Transitory self

Both the transcendent cycle and the transitory self comment upon the process of development, while symöbia comments upon the constant object that is the essential mechanism for growth in ourselves. Dimensionality provides a vantage point from which we can view the process of growth in what could be termed an interdependent self-similar manner.

Family as symöbian system

At this point, an example seems necessary to describe the potential problems and benefits a therapist may encounter in their work with clients. One example is a Russian family I worked with some time ago.⁸³ This family had immigrated to the United States thirteen years prior to my work with them in family therapy. Shortly after their immigration, they had a daughter who began to be a great source of trouble to them around her eighth birthday. I was referred the case after they had been through roughly four years of therapy in various clinics, and told that this was a difficult case- "we don't know what to do with them." By now the girl was twelve, and she was acting out both at school and home, cursing parents and teachers alike. The parents and teachers all felt helpless to understand what dynamics were at work to cause the girl to behave in this manner. Investigating prior treatment, it seemed that previous therapists had spent a great deal of time trying to empower the father to act as the head of the family, and were baffled by his inability to be an "effective parent." From a chaos theory standpoint, I wondered what was impeding this family "system's" ability to self-organize. I began to wonder what their stable behavior

⁸³ I have altered certain relevant aspects of the identity of these clients to ensure their anonymity. The relevant issue I have held constant so that this vignette is not a fictitious account.

looked like prior to this difficult period which started when the child was eight years old. Furthermore, what was stability in a Russian family? Honestly, I had no idea. So I began to study Russian culture by way of consultation and information gathering with the family. What I came to find out were two simple, but important factors in the family's initial conditions. The first, was that Russian families are typically matriarchal, not patriarchal as previous therapists had endeavored to encourage. The second was that, in Russia, control over the children at a certain age turns to the community, and not to the family. Here in the United States the family unit, not the community, is ultimately responsible for control and/or management of their children. Families here in the United States are by and large patriarchal in the largely EuroAmerican middle-class culture. In turn, once the mother was empowered as head of the home, and it was explained to the family that management of their child fell upon the parents as a family unit here in the United States, the family moved from what could be labelled as a chaotic state toward an ordered state in a rather short amount of time. Admittedly, this demonstrates several generally sound clinical practices, but this vignette also demonstrates many useful ideas from chaos theory. The vignette shows how chaos theory may be used effectively in a developmental and therapeutic context through: the appropriate utilization of history in knowing the family system's particular stability; self-similar patterns and initial conditions for a Russian family; relatively non-invasive interventions that may allow the family to move from a chaotic state towards a more ordered, and possibly more complex state of being. How did these basic ideas from what one might term a philosophical chaos theory viewpoint have an impact upon the therapeutic approach I used with this family? First of all, I venture to say the family became more complex, in that, the

family had to accommodate the added burden of managing their child as well as acquisition of several new cultural norms. Clinically speaking, this seems to be the precipitating event, where the family, like an individual, encountered a novel experience: no communal support in raising their child. As a result, the family returned to a self-referential mechanism, and found itself unable to make sense of the novel experience. Developmentally, the family may have been said to be in chaos for four years, stalled by cultural conditions they were ill-prepared to accommodate. One must then ask on a crude global scale what is "normal" for a Russian family, since our family in this case carries a self-similar pattern of Russian cultural behavior with them. Essentially, what is the families initial cultural conditions, and what has changed as in Lorenz' experiment? The next aspect of consideration seems to be the question of how to be non-invasive in both our collection of history, and our intervention strategy. The issue becomes how do clinicians take what the individual or system provides, try to make sense of it, and then return to the client(s) with a response to the dilemma. The observer, or the clinician cannot be considered out of the loop in this type of clinical work (Gibney, 1987). In this case, the family was "organized" by several small, but essential pieces of information. This leads us to the idea of what was the symbol? Symöbia, as well as the other models that have been presented in this chapter are rudimentary translations of chaos theory into a developmental and therapeutic context. Accordingly, what was this symöbian system (Bütz, 1992f) communicating in terms of its symbolic content. The daughter, or the "identified patient," was the symbol of this families difficulties. The identified patient is almost without exception symbolic of familial problems. Still, this is not a new idea in family therapy, in fact it has been around for years. Contextually, it is different in

the application posited here. Symōbia is also the enduring essence of the family unit's characteristic operation. The child has become symbolic of the dilemma. The family, unable to interpret their own symbol then attempts to reference help outside of themselves, and present their symbolic being to a larger system. The system, through various therapists, recommended an alien form of order, patriarchal, and so the system became more chaotic because the symbol has not been interpreted correctly. While the family is unable to interpret their own symbol, they also know when it has been interpreted correctly. There is perhaps a resonance they feel with the interpretation. Until the symbol is addressed what clinicians may well call pathology increases, consequently the symbol grows stronger. This went on for four years until the system was oriented toward their familiar rhythms (Russian culture) so they were able to self-organize again. Consequently, the child no longer needed to be the symbol of the family's felt sense of chaos. In this example, the family unit is not merely an entity, it is an essence defined in terms of a symōbian structure. It has its own unique type of stability, as well as the ability to self-organize. The symbol is the reference point, or the representation of the degree of chaos or order that exists within the system-be it an individual or a family.

Unification of Chaos

Chapter 10

Segment III: Development, Therapy and Unification

The last leg of our journey brings us full circle towards unification. In looking to unification, it seems important to look back at the path traveled so far in this essay. Unity has been discussed in terms of a cultural balance, chapter two pointing towards both the value and the cost for its absence in a cosmological sense. Unity also reflects upon the discussion of paradigms in segment II. Each dimension of science has its own form of unity, the paradigm, while in larger contexts this is also true. However, psychology, like quantum physics, has had a difficult time realizing this unity. Here, there seems to be global chaos and misunderstanding, with local agreement. Locally, within smaller disciplines there seem to be unity, but at a global level unity is elusive. I have commented that this problem seems to be due to local disciplines overgeneralization into larger contexts than are appropriate. This is not to argue that once we have information from each discipline collated with others we will have a complete science or the "answer." Rather, I am stating that we will possibly have a better picture, and clearly our *understanding* will never be complete. Understanding will merely have a more complete context. Currently, psychology is suffering from decontextualization,⁸⁴ or overcontextualization-overgeneralization. Context within a dimensional reference will greatly add to our ability to communicate as a science. Like an individual or a family, psychology also seems to be a symbiotic system.

Symbol, sign and the paradigm

As I have commented upon earlier, Kuhn's (1962-1970) ideas on revolutions and the paradigm roughly approximate the transformative process of chaos and order.

⁸⁴ This term came out of a discussion I had with Fred Abraham, and it provides a wonderfully lucid description of the problems I am observing.

His idea of revolution appears close to the transcendent cycle, and the paradigm seems close to the transitory self. He comments upon symbolic content, but does not address it as significantly as I have treated it herein. This may be due to the fact that with so many members in the system the symbol may not be as clear as one would prefer. In this case, it seems closer to looking like an anthropic system (strong sense) where there appears to be intelligence, and yet there is no readily apparent symbol. In this case, we know there is intelligence, but again the symbol is illusive. The symbol seems to present itself as contemporarily important theories, but this may also be an illusion if the theory has already become a dominant paradigm. Again, the symbol is important so long as it is pregnant with meaning. Otherwise, it is simply a sign of a previous paradigm that is now dead.⁸⁵

Unity of science and the Brunswicks

Striving for unity is not a new idea, although recently it has been given more attention (Cahan & White, 1992; Hornstein, 1992; Leahey, 1992; Bütz, 1992h). One of the earlier attempts came from the *unity of science* moment in the nineteen fifties. One of the key figures in this movement was Egon Brunswick (1903-1955). Brunswick's major contribution was his theory of probabilistic functionalism (Hammond, 1956). His other passion was the unity of science movement. He shared this passion with his wife Else Frenkel-Brunswick (1954). Together they made an argument for psychology's unification justifiably based upon the similar difficulties found in other sciences. In part, their arguments dealt with the idea that more

⁸⁵ Often, scientist do not know that their paradigm is dead, since as Kuhn also notes, they have a difficult time recognizing the new one. Also, credit for these ideas truly belong to Jung (Bütz, 1990b).

fundamentalist social scientists have appeared to have the view that the proof for hypotheses and resultant theory must be clearly observable in every instance. These scientists often cite the conduct of physical science as the basis for its acceptable application to the social sciences. As far back as 1954, Else Frenkle-Brunswik illuminated this issue in her address to the Academy of Arts and Sciences entitled: *Psychoanalysis and the Unity of Science.*

As operationism is an offshoot of some considerations in physics, many critics of psychoanalysis explicitly point to the physical sciences as providing an ideal model for the formulation of theory, psychoanalytic or otherwise. However, this is in most cases done without full realization of the extent of certain changes in the conception of theoretical structure which have taken place in the field of physics itself. These developments in physics made it necessary to modify the requirements stated in the older forms of empiricism and positivism. Thus Einstein does not demand that all abstract terms of science should be interpreted in terms of sense observation, and he designates as "structural" those elements of a theory which deal only with the relationship between the symbols.

In order that thinking might not degenerate into metaphysics or into empty talk, it is only necessary that enough propositions of the conceptual system be firmly enough connected with sensory experiences.

Modern physics and psychoanalysis have in common a turning away from the "natural" to a "fictitious" language. And the common result of this policy is that a wider and simpler network of interrelationships within observable data is ultimately being achieved.

(Frenkle-Brunswick, 1954, pp 274 & 276)

As a result, one cannot observe the "Big Bang," of the Big Bang theory in physics anymore than one can observe an Ego. But, one is able to speculate on its existence based upon other observations that lead us to certain notions. Again, Frenkle-Brunswik's words are useful:

There is increasing realization of the fact that scientific theories are the product of our imagination even though the system must have a rooting in observable fact and experience remains the ultimate and sole criterion of its adequacy. Different levels of description and theory can be defined by the closeness of the concept to, or their remoteness from, observable facts. Hempel gives a vivid description

of the relationship between a scientific theory and the observational data.

The whole system floats, as it were, above the plane of observation and is anchored to it by rules of interpretation. These might be viewed as strings which are not part of the network but link certain points of the latter with specific places in the plane of observation.

(Frenkle-Brunswik, 1954, p 275-276)

Not only does this type of dilemma that certain social scientists present seem to be a misinterpretation of science, but a bias that could easily be labelled as a misguided effort to push for psychology's acceptance as a "hard" science. Frenkle-Brunswick made clear that the position of "hard" science was no more valid, or based in fact, than what is considered "soft" science, and specifically psychology. On the other hand, Brunswick was tracing psychology's history. The concept of the paradigm had not yet been advanced (Kuhn, 1962), but paradigms seemed implicit in Brunswick's description. Brunswick demonstrated psychology's multiply influenced history in his essay "Historical and thematic relations of psychology to other sciences" (Brunswick, 1956). The main ideas that seemed to come and go through this history were the ideas of rationalism, typified by Freud's psychoanalysis, and empiricism, typified by Watson and Skinner's behaviorism.

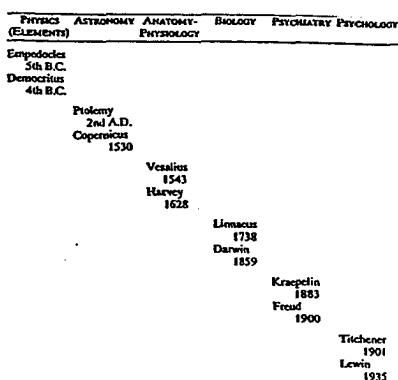


Figure 10-I

Brunswick's chart (Hammond, 1956, pp 502)

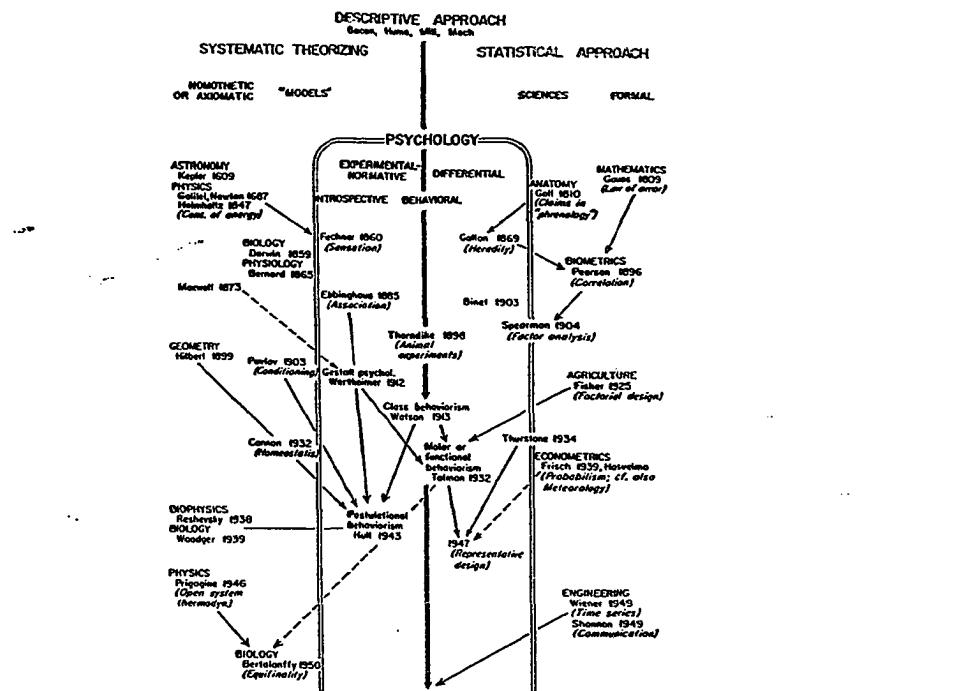


Figure 10-II
Brunswicks chart (Hammond, 1956, pp 505)

Considering the radically different views these two schools hold, unity does not seem possible even today. Still, Brunswick offered the idea of *ecological validity*. In ecological validity Brunswick calls into question the "major failures that result from the fallibility of perceptual cues or behavioral means while at the same time fully recognizing the favorable cases also." (Hammond, 1956, pp 511). What he seems to be stating is the problematic issue of dealing with nonlinear and linear phenomenon, and that one must use caution in interpreting either.

Different ecologies

Apparently, wrapped up in this dilemma are the concepts of empiricism and rationalism. For phenomenon of linear origin empiricism seems appropriate, while

for nonlinear phenomenon rationalism seems to be an appropriate descriptive device. As stated before, we must understand what type of phenomenon we are studying so that we are able to make appropriate decisions in analyzing the data these phenomena present. Unity seems to flow if we consider the idea that we are dealing with different ecologies, and the study of each is *equally valid* in their own right. I have argued earlier that hermeneutic description seems to be the best first step to approach either ecology, and in this, I find myself aligned to some extent with the views of Giorgi (1984, 1989).⁸⁶ Also, chaos theory has been advanced as a better model under which scientists may unify. An example seems to be called for here. One that seems to comment upon divergent viewpoints with similar phenomenon is the study of successful aging.

Unity in aging⁸⁷

"If you don't use it, you'll lose it." This is a fairly common saying in our society today, and it may also be followed by the quip: "no pain, no gain." Both of these statements demand activity on the part of the individual to maintain or improve themselves. A model quite similar to this was advanced many years ago in the studies on successful aging, and it may be no great surprise that it was called activity theory (Havinghurst & Albrecht, 1953). Currently, activity theory is one of three dominant theories in the study of successful aging with the other two being: disengagement theory (Cumming and Henry, 1961) and continuity theory

⁸⁶ My initial ideas on this topic were kindled while I was a student in Giorgi's class during my graduate work, and here I want to thank him for such a stimulating class that, in part, lead to this paper.

⁸⁷ This section of this chapter has been published previously under the title: "Chaos theory, and theories of successful aging: Prigogine's dissipative structures." (Bütz, Morgan, 1992). Socal Dynamicist, 3(2), p 1-3.

(Neugarten, et al, 1968). In chaos theory,⁶ Prigogine's approach appears to be the one most often linked to developmental issues in the social sciences (Prigogine, 1982).⁷ His work on self-organization in dissipative structures also seems to lend greater description and explanation to these theories that describe successful aging.

Prigogine's Dissipative Structures

Prigogine's concept of dissipative structures in open thermodynamic systems has much to do with the concept of entropy. And, on a purely metaphorical level *at this point in time*, entropy also seems to have a great deal to do with successful aging as measured biologically, psychologically or sociologically (Morgan, Wilson, 1982). Entropy, a concept largely associated with the second law of thermodynamics is the quantity that indexes the amount of disorder in a system at any given point in time. It seems to have a paradoxical nature in the way Prigogine (1971, p1-2) describes it, where in thermodynamics it is associated with "the law of progressive disorganization." In biology, psychology and sociology it is aligned with the idea of evolution (evolution=*entopion*, Greek: entropy)⁸ where it is associated with an "increase in organization" and the creation of more complex structures. Brent (1978) describes these "two conditions of entropy" as positive and negative entropy, where positive entropy is a source that dumps disorder into its surrounding environment and negative entropy drains order from its surrounding environment to maintain or increase its own internal order and complexity. As a result, a local region develops a

⁶ Housed under this term are several theories that are considered in the realm of the "hard" sciences. These include: Fractal Geometry, Dynamical Systems Theory, and Dissipative and/or Self-Organizing Structures.

⁷ This is but one example where Prigogine himself discussed the topic.

⁸ (Brent, 1978, p374)

"self- organizing system, a dissipative structure" that grows more orderly and complex only at the expense of neighboring regions within the surrounding global region. These dissipative structures assimilate low entropy, orderly, matter and dissipate high entropy, disorderly matter to evolve toward a more and more complex structure. On each level of our existence: biological, psychological and sociological, we, as human beings, seem to operate in a very similar fashion to Prigogine's idea of the dissipative structure in our assimilation and expense of entropy.

Theories Of Aging

The three theories that describe successful aging mentioned above, can be discussed from Prigogine's model of dissipative structures in a manner which does not negate any one of them.

Activity Theory

The first contemporary theory of successful aging was activity theory which was advanced by Havinghurst and Albrecht (1953). Activity theory plainly states that the maintenance of a high level of activity inhibits the negative effects of aging, and therefore improves life satisfaction. It appears that under this theory elderly individuals have the same psychological and social needs as those of the middle aged except for the inevitable biological changes (Burbank, 1986). The reductions in activity that occur are usually the result of societies withholding opportunities from the elderly, whereby they lose contact with peer activities and similar roles. This reduction in both activities and roles seem, at least metaphorically, analogous to a dissipative structure being "cut off" from low entropy/orderly energy resources. As a consequence, the self-organizing effect that maintains or increases the structures internal order and complexity is stifled or severely hampered. Thus, the reduction in

activity through the individuals own choice, or their isolation from former activities and roles they previously held would lead to an increase in high entropy energy, that eventually kills a system.

Disengagement Theory

On the other hand, disengagement theory paints quite a different picture of aging, according to disengagement theory:

aging is an inevitable, mutual withdrawal or disengagement, resulting in decreased interaction between the aging person and others in the social system he belongs to.

(Cumming & Henry, 1961, p14).

While this theory describes a "mutual withdrawal," it would seem to only make sense if an individual has withdrawn from or has been inhibited by society from low entropy structures that seem to breed life or "negentropy" into the individual. Furthermore, it seems that disengagement would be the result of the "flip side" of activity theory. It is said that once disengagement begins, the process is "irreversible" (Burbank, 1986). This may be due to the possibility that the person as a "dissipative structure" has recalibrated their low entropy use to the point, where like an object in orbit around a planet, the individual no longer is able to maintain their previous condition/orbit, and thereby beginning the slow, perhaps gradual decay of orbital activity toward death.

Continuity Theory

Lastly, continuity theory seems to indicate that personality is the main ingredient that determines successful aging, in that one who has had a fulfilling life in early and middle age will continue to find activities and roles that they find fulfilling in later life. Continuity theory lends itself to the idea that individuals have

established a constant rate for assimilation and excretion of entropy as one would find in a dissipative structure which is "far-from-equilibrium." Briggs and Peat (1984) describe a dissipative structure in this way:

In its high generation of entropy and continued openness to fluctuating energy input, the dissipative structure literally transcends closed-system thermodynamics. This also makes the dissipative structure a paradox. It can survive only by remaining open to a flowing matter and energy exchange with the environment. In fact, matter and energy literally flow through it and form it, like the river water through a vortex. On the other hand, this very openness somehow makes the structure resistant to change.

Consequently, in continuity theory is the idea that the individual remains open to change and able to adapt to the changing resources around them, i.e., variation in initial conditions, while both activity theory and disengagement theory account for situations in which the initial conditions change somehow in a way that is more or less adaptive. These changes in initial conditions seem to apply to many levels of existence such as biological, psychological and sociological as well as to other domains in life.

Each of these theories on successful aging may be seen in a unified sense through the use of Prigogine's dissipative structure as a metaphor for human existence. Distributions of entropy and alterations in initial conditions seem to be the key elements of "change" in the individual, applying to biological, psychological and sociological realms of existence. This model is but one example of how models in chaos theory may bring unity to the field of psychology.

References

- Abraham, F. D. (1989). Toward a dynamical theory of the psyche, archetypal patterns of self-reflection and self-organization. Psychological Perspectives, 20(1), p 156-167.
- Abraham, F.D., Abraham, R.H., & Shaw, C.D. (1990). A visual introduction to dynamical systems theory for psychology. Santa Cruz, CA: Aerial Press.
- Abraham, F.D. (1991). De Arte Combinatoria Psychologia. In L. Vandervert (Coordinator) Establishing Dynamical Systems Theory in Psychology. Keynote panel conducted at Inaugural Conference for a Society for Chaos Theory in Psychology 1991, San Francisco, CA.
- Artigiani, R. (1987). Revolution and evolution: applying Prigogine's dissipative structures model. Journal of Social and Biological Structures, 10(3), p 249-264.
- Baars, B. J. (1988). A cognitive theory of consciousness. New York: Cambridge.
- Bateson, G. (1972). Steps to an ecology of mind. New York: Ballantine.
- Bateson, G. , Jackson, D. D. , Haley, J., Weakland, J. H. (1956). Toward a theory of schizophrenia. Behavioral Science, 1 (4), p 251-264.
- Bateson, G. (1967). Cybernetic explanation. American Behavioral Scientist, 10 (8), p 29-32.
- Barrow, G. M. (1986). Aging, the individual, and society(3rd Ed). San Francisco: West Publishing.
- Barrow, J. D. & Tipler (1986). Anthropic cosmological principle. New York: Oxford
- Barrow, J. D. (1988). The world within the world. New York: Oxford
- Briggs, J. & Peat, F.D. (1984). Looking glass universe, the emerging science of wholeness. New York: Simon and Schuster.

- Briggs, J. & Peat, F.D. (1989). Turbulent mirror. New York: Harper & Row.
- Boden, M. A. (1979). Jean Piaget. New York: Penguin Books
- Bohm, D. (1980). Wholeness and the implicate order. New York: Ark.
- Bowen, M. (1960). A family concept of schizophrenia. In Jackson, D. D., The etiology of schizophrenia. New York: Basic Books.
- Breggin, P. (1991). Toxic psychiatry: why therapy, empathy, and love must replace the drugs, electroshock, and biochemical theories of the "new psychiatry.. New York: St. Martin.
- Brent, S. B. (1978). Prigogine's model for self-organization in nonequilibrium systems: its relevance for developmental psychology. Human Development, Vol 21(5-6), p 374-387.
- Brown, Standridge, M.D. (1989). A paradigm for construction of family therapy tasks. Family Process, Dec, 28(4), 471-89.
- Brunswick, E. (1956). Historical and thematic relations of psychology to other sciences. In Hammond, K. R., The psychology of Egon Brunswik. New York: Holt, Rinehart & Winston.
- Busse, L. (1903). Geist und Körper, Seele und leib. Leipzig, 1903.
- Burbank, P. M. (1986). Psychosocial theories of aging: a critical evaluation. Advances in Nursing Science, Vol 9(1), p 73-86.
- Bütz, M.R. (1990a). Chaos, an omen of transcendence in the psychotherapy process (long version). Paper presented at the Chaos and Psychology Conference conducted at Springfield College, Springfield, Massachusetts.
- Bütz, M.R. (1990b). Chaos, an omen of transcendence in the psychotherapy process. Psychological Reports (in print) & In L. Vandervert (Chair), A

Chaotic/Fractal Dynamical Unification Model for Psychology,

Symposium conducted at the American Psychological Association

National Convention 1990, Boston, MA.

Bütz, M.R. (1991a). The fractal nature of the development of the Self.

Psychological Reports (in print) & Paper presented at Inaugural

Conference of Society for Chaos Theory in Psychology 1991, San

Francisco, California.

Bütz, M.R. (1991 b). Practical applications of chaos theory to the psychotherapy

process. Paper presented at Inaugural Conference of Society for Chaos Theory

in Psychology 1991, San Francisco, California.

Bütz, M.R. (1991c). Fractal dimensionality and paradigms. The Social

Dynamicist, Vol 2(4), p 4-7.

Bütz, M.R. (1991d). Older civilizations and chaos theory: concern about horses, tigers

and their relation to Heraclitus. The Social Dynamicist, 2(4), commentary

section.

Bütz, M.R., Morgan, R. F. (1992a). Chaos theory, and theories of successful aging:

Prigogine's dissipative structures. Socal Dynamicist, 3(2), p 1-3.

Bütz, M.R. (1992b). Models of development and psychotherapeutic growth that chaos

theory inspires. Paper presented at the XXV International Congress of

Psychology, Brussels, Belgium.

Bütz, M.R. (1992c). Paradigms afoot in science and psychology: beyond

explication of fractal dimensionality. Paper presented at the Society for

Chaos Theory in Psychology Annual Conference, Washington, D. C..

Bütz, M.R. (1992d). Family therapy and symbolic chaos. In T. Levine (Chair), Chaos Theory as a Key to Creativity in Psychotherapy, symposium conducted at the Society for Chaos Theory in Psychology Annual Conference, Washington, D.C.

Bütz, M.R. (1992e). Chaos theory's implications for psychological transformation: Process, Perspective and Symöbia. In L. Vandervert (Chair), Chaos Theory in a Historical and Philosophical Perspective: Initial Translations, Symposium conducted at the American Psychological Association Conference 1992, Washington, D.C..

Bütz, M.R. (1992f). Family therapy and symbolic chaos. In W. Mc Cown (Chair), Chaos Theory and Family Therapy-A New Unifying Paradigm?, Symposium conducted at the American Psychological Association Conference 1992, Washington, D.C..

Bütz, M.R. (1992g). Chaos theory, philosophically old, scientifically new. In M.R. Bütz (Chair), Chaos Theory's Implications for a Cross-Cultural Perspective, Symposium conducted at the American Psychological Association Conference 1992, Washington, D.C..

Bütz, M.R. (1992h). Looking for unification? Remeber chaos theory? Commentary submitted for publication.

Cahan, E. D. & White, S. H. (1992). Proposals for a second psychology. American Psychologist, 47(2), p 224-235.

Chamberlain, L. (1990). Chaos and the butterfly effect in family systems. Network, Vol 8(3), p 11-12.

- Coveney, P. & Highfield, R. (1990). The arrow of time, a voyage through science to solve time's greatest mystery. New York: Fawcett Columbine.
- Crutchfield, J. P., Farmer, J. D., Packard, N. H., Shaw, R. S. (1986). Chaos. Scientific American, December, p 46-57.
- Cumming, E. & Henry, W. E. (1961). Growing old: the process of disengagement. New York: Basic Books.
- Davies, P. (1989). The new physics. New York: Cambridge University Press.
- Dollard, J & Miller, N.E. (1950). Personality and psychotherapy: an analysis in terms of learning, thinking and culture. New York: Mc Graw-Hill.
- Ellenberger, H.F. (1970). The discovery of the unconscious, the history and evolution of dynamic psychiatry. New York: Basic Books.
- Erikson, E.H. (1963). Childhood and society. New York: Norton.
- Erikson, E.H. (1980). Identity and the life cycle. New York: Norton.
- Erikson, E.H. (1982). The life cycle completed. New York: Norton.
- Evans, W.E.; Relling, M.V.; Rodman, J.H.; Crom , W.R. (1989). Anticancer therapy as a pediatric pharmacodynamic paradigm. Developmental Pharmacology and Therapeutics, 13(2-4), 85-95
- Fanon, F. (1963). The wretched of the earth. New York: Grove Weidenfeld.
- Fedanzo, A. J. (1983). Autopoiesis, dissipative structures and spontaneous social orders and a systems view of man[Review of Autopoiesis, dissipative structures and spontaneous social orders and a systems view of man. Journal of Social and Biological Structures, 6(2), p173-175.
- Feigenbaum, M. (1978). Quantitative universality for a class of nonlinear transformations. Journal of Statistical Physics, 19, p25-52.

- Feigenbaum, M. (1979). The universal metric properties of nonlinear transformations. Journal of Statistical Physics, 21, p 669-706.
- Flew, A. (1979). A dictionary of philosophy (2nd Edition). New York: St. Martin.
- Frank, G. (1990). Beyond the psychiatric principle: a proposal for a psychological paradigm for the description and classification of psychopathology. Psychological Reports, Aug, 67(1), 131-6.
- Freeman, W.J. (1991). The physiology of perception. Scientific American, 264 (2), p 78-87.
- Frenkel-Brunswik, E. (1954). Psychoanalysis and the unity of science. Proceedings of the American Academy of Arts and Sciences, Vol 80, 271-350.
- Freud, S. (1949). An outline of psycho-analysis. New York: W.W. Norton.
- Freud, S. (1965). The interpretation of dreams. New York: Avon.
- Gibney, P. (1987). Co-evolving with anorectic families, difference is a singular moment. Australian and New Zealand Journal of Family Therapy, 8(2), p 71-80.
- Gilligan, C. (1982). In a different voice, psychological theory and women's development. Cambridge, Mass: Harvard.
- Ginsburg, H. & Opper, S. (1969). Piaget's theory of intellectual development, and introduction. New Jersey: Prentice-Hall.
- Giorgi, A. (1984). Toward a phenomenologically based unified paradigm for psychology. In D. Kruger (Ed.) The changing reality of modern man: Essays in honour of J. H. Van den Berg. Capetown, S. A.: Juta & Company.
- Giorgi, A. (1989). An example of harmony between descriptive reports and behavior. Journal of Phenomenological Psychology, 20 (1), p 60-88.

- Gleick, J. (1987). Chaos making a new science. New York: Viking Penguin.
- Goldberger, A. L. & West, B.J. (1987a). Fractals in physiology and medicine. Yale Journal of Biology and Medicine, 60(5), p421-35.
- Goldberger, A. L. & West, B.J. (1987b). Applications of nonlinear dynamics to clinical cardiology. Annals of the New York Academy of Science, 504, 195-213.
- Goldberger, A. L. (1990). The fractal dynamical model of impulse regulation in living systems. In L. Vandervert (Chair), A Chaotic/Fractal Dynamical Unification Model for Psychology, Symposium conducted at the American Psychological Association National Convention 1990, Boston, MA.
- Graham, A. C. (1981). Chuang-Tzu, the seven inner chapters and other writings from the book Chuang-Tzu. Boston: George Allen & Unwin.
- Gressman, H. (1909). Altorientalische texte und bilder zum alten testamente. 2 volume set: Tübingen
- Grotstein, J. S. (1990). Nothingness, meaninglessness, chaos, and the "black hole" I: the importance of nothingness, meaninglessness and chaos in psychoanalysis. Contemporary Psychoanalysis, 26(2), 257-290.
- Guirand, F. (1965). Egyptian mythology. New York: Tudor.
- Gurwitsch, A. (1966). The place of psychology in the system of sciences. In Studies in phenomenology and psychology. Evanston, Ill: Northwestern Press.
- Gutzwiller, M. C. (1992). Quantum chaos. Scientific American, 266(1), p 78-84.
- Hall, C.S. (1954). A primer of Freudin psychology. New York: Mentor.
- Hall, C.S. & Lindzey, G. (1978). Theories of personality. New York: John Wiley & Sons.

- Hammond, K. R. (1956). The psychology of Egon Brunswik. New York: Holt, Rinehart & Winston.
- Havinghurst, R. J. & Albrecht, R. (1953). Older people. New York: Longmans, Green.
- Hawking, S. W. (1988). A brief history of time, from the big band to black holes. New York: Bantam.
- Hawkins, R. C. (1990). Dynamics of substance abuse: nonlinearities in individual trajectories. In L. Vandervert (Chair), A Chaotic/Fractal Dynamical Unification Model for Psychology, Symposium conducted at the American Psychological Association National Convention 1990, Boston, MA.
- Heiby, E. M. (1991). Multidimensional behavioral assessment advances from chaos theory and unified positivism. Symposium conducted at the American Psychological Association National Convention 1991, San Francisco, CA.
- Holahan, C.J. (1990). Life stressors, resistance factors, and improved psychological functioning: an extension of the stress resistance paradigm. Journal of Personality and Social Psychology, May, 58(5), 909-17.
- Holmes, C.S. (1987). Cognitive functioning and diabetes: broadening the paradigm for behavioral and health psychology? Diabetes Care, 10(1): 135-137.
- Hornstein, G. A. (1992). The return of the repressed: psychology's problematic relations with psychoanalysis. American Psychologist, 47(2), p254-263.
- Ions, V. (1968, 1982). Egyptian mythology. New York: Bedrick.

Jordan, J. V. , Kaplan, A. G. , Miller, J., Stiver, I. P., Surrey, J. L. (1991).

Women's growth in connection, writings from the stone center. New York:
Guilford.

Jung, C.G. (1961). Memories, dreams, reflections. New York: Vintage Books.

Jung, C.G. (1967). Symbols of transformation (Coll Works 5, 2nd Ed). Princeton, NJ:
Princeton University Press.

Jung, C.G. (1966a). Two essays on analytical psychology (Coll Works 7, 2nd Ed)
Princeton, NJ: Princeton University Press.

Jung, C.G. (1966b). The practice of psychotherapy (Coll Works 16, 2nd Ed).
Princeton, NJ: Princeton University Press.

Jung, C.G. (1968a). The structure and dynamics of the psyche (Coll Works 8, 2nd Ed).
Princeton, NJ: Princeton University Press.

Jung, C.G. (1968b). The archetypes and the collective unconscious (Coll Works
9i, 2nd Ed). Princeton, NJ: Princeton University Press.

Jung, C.G. (1968c). Aion: researches into the phenomenology of the Self (Coll Works
9ii, 2nd Ed). Princeton, NJ: Princeton University Press.

Jung, C.G. (1968d). Psychology and alchemy (Coll Works 12, 2nd Ed). Princeton, NJ:
Princeton University Press.

Jung, C.G. (1970a). Civilization in transition (Coll Works 10, 2nd Ed) Princeton, NJ:
Princeton University Press.

Jung, C.G. (1970b). Mysterium coniunctionis (Coll Works 14, 2nd Ed). Princeton, NJ:
Princeton University Press.

Jung, C.G. (1971). Psychological types (Coll Works 6). Princeton, NJ: Princeton
University Press.

- Jung, C.G. (1979). General index (Coll Works 20). Princeton, NJ: Princeton University Press.
- Kahn, C. H. (1979). The art and thought of Heraclitus, an edition of the fragments with translation and commentary. New York: Cambridge.
- Kaufman, J. & Zigler, E.F. (1987). Do abused children become abusive parents? Annual Progress in Child Psychiatry and Child Development, Vol 57(2), p 186-192.
- Kauffman, S.A. (1991). Antichaos and adaptation. Scientific American, Vol 265 (2), p78-84.
- Kerlinger, F. (1986). Foundations of behavioral research (3rd Ed). New York: Holt, Rinehart and Winston.
- Kiel, L. D. (1991). Lessons from the nonlinear paradigm: applications of the theory of dissipative structures in the social sciences. Social Science Quarterly, 72(3), p431-442.
- Kirk, G. S. & Raven, J. E. (1957). The presocratic philosophers, a critical history with a selection of texts. New York: Cambridge.
- Koestler, A. (1964). The act of creation. London: Arkana.
- Kohlberg, L. (1981). The philosophy of moral development. San Francisco: Harper & Row.
- Korzybski, A. (1948). On structure. In Korzybski, A, Science and sanity. Lakeville, Connecticut: International Non-Aristotelian Library Publishing Company.
- Krippner, S. (1991). Chaos theory: a window on opportunity. In L. Vandervert (Coordinator) Establishing Dynamical Systems Theory in Psychology.

Keynote panel conducted at Inaugural Conference for a Society for Chaos Theory in Psychology 1991, San Francisco, CA.

Krippner, S. (1992). Chaos theory and humanistic psychology. Social Dynamicist, 3(1), p 1-5.

Kuhn, T. S. (1970). The structure of scientific revolutions (2nd Ed). Chicago: University of Chicago Press.

Kuhn, T.S. (1977). The essential tension, selected studies in scientific tradition and change. Chicago: University of Chicago Press.

Langs, R, & Badalamenti, A. (1991) Toward a science of mind. The Social Dynamicist Vol 2 (3) 1-3.

La Violette, P. A. (1981). A systems view of man: Ludwig von Bertalanffy. Boulder: Westview.

Leahy, T. H. (1992). The mythical revolutions of American psychology. American Psychologist, 47(2), p 308-318.

Levinson, D. J. (1978). The season's of a man's life. New York: Knopf.

Lewin, K. (1931). The conflict between Aristotelian and Galileian modes of thought in contemporary psychology. Journal of General Psychology, Vol 5, 141-177.

Lonie, I. (1991). Chaos theory: a new paradigm for psychotherapy? Australian and New Zealand Journal of Psychiatry, 25(4), p548-560.

Lorenz, E. N. (1962). Deterministic nonperiodic flow. Journal of the Atmospheric Sciences (20), p130-141.

- Loye, D. & Eisler, R. (1987). Chaos and transformation: implications of nonequilibrium theory for social science and society. Behavioral Science, 32, p53-65.
- Mandelbrot, B. B. (1977). Fractals: form, chance, and dimension. San Francisco: W. H. Freeman.
- Marks, T. (1991, August). The fractal geometry of human nature. Paper presented at Inaugural Conference of Society for Chaos Theory in Psychology 1991, San Francisco, California.
- Masters, T. (1990). Computable chaos. Network. Vol 8 (3), p 4-8.
- Mashal, M.; Feldman, R.B.; Sigal, J.J. (1989). The unraveling of a treatment paradigm: a followup study of the Milan approach to family therapy. Family Process, Dec, 28(4), 457-70.
- Maturana, H. R. & Varela, F. J. (1973). De maquinas y seres vivos. Santiago, Chile: Edit Universitaria.
- Maturana, H. R. & Varela, F. J. (1992). The tree of knowledge, biological roots of human understanding (Revised). Boston: Shambhala.
- May, R. M. (1976). Simple mathematical models with very complicated dynamics. Nature, 261, p 459-462.
- Mc Clear, M. (1973). Popul Vuh, structure and meaning. Madrid: Plaza Maya.
- Meehan, E.J. (1970). Explanation in social science: a system paradigm. Homewood, Ill., Dorsey Press.
- Mey, M. (1982). The cognitive paradigm: cognitive science, a newly explored approach to the study of cognition applied in an analysis of science and scientific knowledge. Hingham, MA: Kluwer Boston.

- Middleton, C., Fireman, G., Di Bello, R. (1991). Personality traits as strange attractors. Paper presented at Inaugural Conference of Society for Chaos Theory in Psychology 1991, San Francisco, California.
- Miller, H.I. & Young, F.E. (1989). The drug approval process at the Food and Drug Administration. New biotechnology as a paradigm of a science-based activist approach. Archives of Internal Medicine, Mar, 149 (3), 655-7.
- Miller, N. E. (1959). Liberalization of basic s-r concepts: extensions to conflict behavior, motivation, and social learning. In Kock, S. (Ed) Psychology: a study of a science, Vol 2. New York: Mc Graw-Hill.
- Moolten, F.L. (1987). An alternative to the magic bullet paradigm for specific cancer therapy. Medical Hypotheses, Sep, 24(1), 43-51.
- Moran, M. G. (1991). Chaos theory and psychoanalysis: the fluidic nature of the mind. International Review of Psychoanalysis, 18, 211-221.
- Morford, M. P. O., Lenardon, R. J. (1985). Classical mythology 3rd Ed. New York: Longman.
- Morgan, R. F., Wilson, J. (1982). Growing younger: adding years to your life by measuring and controlling your body age. New York: Stein & Day.
- Neugarten, B. L., Havinghurst, R. J., Tobin, S. S. (1968). Personality and patterns of aging. In Neugarten, B. L. (eds), Middle age and aging: a reader in social psychology. Chicago, Ill: University of Chicago Press.
- Olson, D. H., Sprenkle, D. H., Russell, C. S., (1979), Circumplex model of marital and family systems: I. cohesion and adaptability dimensions, family types, and clinical applications, Family Process, 18, p. 3-28.

Piaget, J. (1950). The psychology of intelligence. New York: Harcourt, Brace and Jovanovitch.

Piaget, J. (1952). The origins of intelligence. New York: International Universities Press.

Pribram, K. (1991). Brain quantum field and chaotic processes. Invited Address, conducted at Inaugural Conference for a Society for Chaos Theory in Psychology 1991, San Francisco, CA.

Prigogine, I. (1971). Interpretations of life and mind. In Greene, Essays around the problem of reduction. New York: Humanities Press.

Prigogine, I. (1982). Dialogue with Piaget concerning the irreversible. Archives de Psychologie, Vol 50(192), p 7-16.

Prigogine, I. & Stengers, I. (1984). Order out of chaos. New York: Bantam.

Pritchard, J. B. (1950). Ancient near eastern texts relating to the old testament. Princeton: Princeton.

Recinos, A., Goetz, D, Morley, S. G. (1950). Popol Vuh, the sacred book of the ancient Quiché Maya. Norman, OK: University of Oklahoma.

Robertson, R. (1989a). The evolution of number. Psychological Perspectives, 20(1), p 128-141.

Robertson, R. (1989b). Stairway to heaven: Jung & Neoplatonism. Paper presented at the conference on Numinous and the New, Los Angeles, California.

Robertson, R. (1990). After the end of time, revelation and the growth of consciousness. Virginia Beach, VA: Inner Vision.

Robertson, R. (1992). Gödel, Jung and the continuum hypothesis. Unpublished manuscript.

Rosarium philosophorum. Secunda pars alchimiae de lapide philosophico vero modo praeparando....Cum figuris rei perfectionem ostendentibus. (Vol. 2 of De alchimia.) Frankfort on the Main, 1550.

Rossi, E. L. (1989). Chaos, determinism, and free will. Psychological Perspectives, 20(1), p 110-127.

Russell, C. S., (1979), Circumplex model of marital and family systems III. empirical evaluation with families, Family Process, 18, p. 29-45.

Sabelli, H.C. & Carlson-Sabelli, L. (1989). Biological priority and psychological supremacy: a new integrative paradigm derived from process theory. American Journal of Psychiatry, 146(12), 1541-1551.

Sabelli, H.C. & Carlson-Sabelli, L. (1990a). Psychogeometry: the dynamics of behavior. Toward a Just Society for Future Generations. Paper presentation conducted at Annual Meeting of the International Society for the Systems Sciences 1990, Portland, Oregon.

Sabelli, H.C. & Carlson-Sabelli, L. (1990b). Process theory as a framework for comprehensive psychodynamic formulations. Genetic, Social and General Psychology Monographs, 117(1), 5-27.

Sadler, L.L. (1991). A paradigm for the next millennium: health information science. Journal of biocommunication, 18(2), 6-13.

Schwalbe, M.L. (1990). The autogenesis of the self. Invited Address. Presented at Annual Meeting of the Southern Sociological Society.

- Simons, R.L. , Whitbeck, L.B., Conger, R.D., Wu, C. I. (1991). Intergenerational transmission of harsh parenting. Developmental Psychology, Vol 27(1), p 159-171.
- Singer, J. (1990). Seeing through the visible world: Jung, Gnosis and Chaos. New York: Harper & Row.
- Singleton, R. Jr. (1987). Creationists versus evolution: a paradigm of science and society interaction. Perspectives in Biology and Medicine, Spring, 30(3), 324-44.
- Skarda, A. & Freeman, W.J. (1987). How brains make chaos into order to make sense of the world. Behavioral and Brain Sciences, Vol 10 (2), p161-195.
- Skurky, T.A. (1990). The levels of analysis paradigm: a model for individual and systemic therapy. New York: Praeger.
- Slife, B.D. (1991). Psychology's paradigm: linear time. In J.F. Rychlak (Chair) Invited Address conducted at the American Psychological Association National Conference 1991, San Francisco, CA.
- Slosson, E. E. (1914). Major prophets of to-day. Freeport, N.Y.: BFL.
- Speiser, E. A. (1964). Genesis. New York: Doubleday.
- Spielberger, C. D. (1966). Anxiety and behavior. New York: Academic Press.
- Spielberger, C. D. (1972). Anxiety: current trends in theory and research. New York: Academic Press.
- Staats, A. W. (1991). Unified positivism and unification psychology: fad or new field? American Psychology, 46(9), p899-912.
- Thompson, J. (1960). Maya hieroglyphic writing, and introduction. Norman, OK: University of Oklahoma.

Thornton, A. (1991). Influence of the marital history of parents on the marital and cohabitational experiences of children. American Journal of Sociology, Vol 96(4), p 868-894.

Tonge, D. G. (1974). Logical properties of the perceived behavior patterns of a dynamical system. International Journal of Man-Machine Studies, 6, p 715-728.

Trungpa, C. (1991). Orderly chaos, the mandala principle. Boston: Shambhala

Vanderveert, L. (1988). Systems thinking and a proposal for a Neurological Positivism. Systems Research, Vol 5 (4), p 313-321.

Vanderveert, L. (1990). From the Editor's desk. Network, Vol 8(3), p 11-12.

Vanderveert, L. (1990a). (Chair), A Chaotic/Fractal Dynamical Unification Model for Psychology, Symposium conducted at the American Psychological Association Conference 1990, Boston, MA.

Vanderveert, L. (1990b). Systems thinking and Neurological Positivism: further Elucidations and implications. Systems Research, Vol 7 (1), p 1-17.

Vanderveert, L. (1991a). The emergence of brain and mind amid chaos through maximum-power evolution. World Futures: The Journal of General Evolution, in press.

Vanderveert, L. (1991b). (Coordinator) Establishing Dynamical Systems Theory in Psychology. Keynote panel conducted at Inaugural Conference for a Society for Chaos Theory in Psychology 1991, San Francisco, CA.

Van Erkelens, H. (1991). Pauli's dialogue with the spirit of matter. Psychological Perspectives, Vol 24, Spring-Summer, 34-53.

Veith, I. (1972). The Yellow Emperor's classic of internal medicine. Berkeley:
U.C. Press.

Webster's ninth new collegiate dictionary. (1989). Springfield, MA: Merriam-
Webster.

Whitehead, A. N. & Russell, B. (1927). Principia mathematica (2nd ed.). New
York: Cambridge University Press.

Wiener, N. (1961). Cybernetics, or control and communication in the animal and the
machine (2nd ed.). New York: Wiley & Sons, Inc.

Wiener, N. (1967). The human use of human beings, cybernetics and society (3rd ed.).
New York: Avon.

Wilber, K. (1982). The holographic paradigm and other paradoxes: exploring
the leading edge of science. Boulder: Shambhala.

Zeleny, M. (1980). Autopoiesis, dissipative structures, and spontaneous social orders.
Boulder: Westview.