

Movements and Metaphors: The Biophilia Hypothesis, *Feng-Shui* and
Restorative Landscape Design

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Dedication

In loving memory of two inspiring women:
my mother the mathematical genius, Margaret Alice,
and my first spiritual mentor, Regi Boehme.

Abstract

This study creates a modern, adapted conceptual definition of the *qi* theory that is common to both *feng-shui* and Chinese medicine for comparison with restorative landscape theoretic frameworks. These two systems of knowledge are rooted in ancient *qi* theory. The roots of this theory are developed in the Chinese classic canon *Yi Jing (Book of Changes)*. This conceptual definition of *qi* theory is used to understand classical Chinese *feng-shui* references as design informants for restorative landscapes. A comparison of the two central theoretic frameworks used for research concerning evidence-based design's study of nature-based restoration is made: the conceptual definition and design informants for Stephen and Rachel Kaplan's "Attention Restoration Theory (ART)" and the conceptual definition and design informants Roger Ulrich's "Stress Reduction Theory (SRT)" are the restoration theory frameworks. The "sweet spot," of intersection of these theoretic frameworks informs an overall synthesis of the most universal aspects of theories. The result is a set of design informants for restorative landscape design.

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PREFACE

The following explanation embodies my efforts to incorporate personal and professional experience within an academic theoretic knowledge base to build a better understanding of restorative landscape. My journey began shortly after starting graduate work when I sustained whiplash injuries from a car accident. I discovered the effectiveness of the niche manual therapies modality, myofascial release, for whiplash and similar soft tissue sprain and strain.

Prior mentorship in holistic practices. My original exposure to myofascial release happened when I had returned to home to Milwaukee after college. There, I was employed for a time as a clinical and administrative assistant for the Occupational Therapy practice and continuing education workshop business spear-headed by Regi Boehme, O.T.R. Regi had exposed me to an overall personal philosophy regarding “healing practices.”

At the time of my employment with Ms. Boehme, she joked humbly about being “really famous” in a “rather tiny field.”ⁱⁱ What made Ms. Boehme so famous were breakthroughs that fell outside of what was expected or accepted as the “normal” prognosis for many of her cases. She consistently produced what, without a detailed understanding of the mechanics of myofascial release, might be considered “miracles” at most, and at the very least, unexpected or unpredicted breakthroughs.

Growing research on multiple paradigm threads. More than two decades later, it turned out that many of the differences between prognosis and the results of these neuro-developmental treatment therapists can be understood through two main areas of recent research breakthroughs. The first is medical understanding of connective tissue system changed and the second is the role of mind-body connections in health and well-being is no longer discounted.

Personal health decline informing understanding of theory. My initial coursework in restorative landscapes was shortly after a residential move. This move coincided with a sudden decline in health. This included an increase in chronic pain and tissue inflammation symptoms.

Since this residence, I have found that many of the restoration benefits of nature as well as risk factors addressed in the main theories of restorative landscapes were associated with changes in my chronic health situation. The main theories of restorative landscapes, Stress Reduction Theory (SRT), the work of Roger Ulrich (1999, 2008), and Attention Restoration Theory (ART), the work of Stephen and Rachel Kaplan (1981, 1989; Kaplan, Kaplan and Ryan, 1998), helped confirm many of my general impressions of my personal experiences. Experiences of immediate improvements and downward spirals I had noted personally correlate with these theoretic frameworks and emerging empirical evidence (Berto, 2014; Bowler et al., 2010; Ulrich, 2008). My self-management strategies now include a conscious effort to engage with nature as a routine.

Qi theory unfolding in relationship to environments. Parallel to my personal experience with soft tissue injury and chronic fatigue, I was learning the system of Chinese medicine and how its circular logic was a part of my own healing metaphor. That is, Chinese medicine's paradigm and concepts are different from western traditions. A circular set of information exists that is difficult to initially grasp. The process typically requires an initial effort of brute force memorization. A large portion of this memorization can seem illogical as the metaphors are initially too cryptic to make sense. My instructor was calm but firm about the value of this arduous work. He encouraged us to be thorough about memorizing the metaphors, stating, "Understanding will come in time." Understanding in this context develops in relation to the Chinese concept of *qi* (Eisenberg, 1995).

Qi theory as a culturally unique concept. Chinese medical theory is one of many cultural developments that explicitly develop the Chinese theory of *qi*. *Qi* is

often translated as “the breath of life (Stark, 2005)”. This definition refers to its broadest meaning as the animating force behind the observable pattern of changes in the universe. This definition appeals both to the intuitive nature of the concept, and to its strictest applications in modern, systematized Chinese medicine (Maciocia, 2015; Paton, 1995; Stark, 2005). *Qi* theory’s origins are generally attributed to a vastly influential Chinese canon, the *Yi Jing*, (*Book of Changes*). *Qi* theory as developed in this canon is the common roots between Chinese medicine and the Chinese design traditions classical known as *feng-shui*.

I eventually investigated what *feng-shui* might have to say in relation to intuitions about my initial health decline related to my residence. This concerned one aspect of my personal impressions that are not well addressed in western restorative landscape theory, the water flow of the site. I found references that correlated tangible features with my intuitions (Xu, 1990). However, the metaphors defied a full rational understanding even more than my initial experiences with Chinese medicine.

Goethian science and fluid phenomena. A breakthrough concerning *qi* arrived as part of a design precedence exploration, exploring water channel designs for a treatment space such as my office occurred when a professor suggested I look at the architectural work of Erik Asmussen at Järna, Sweden. At this site the use of A. John Wilkes’ sculptural water channel inventions, *Flowforms* are used. I felt I might be on to something with Wilkes’ (2003) story on his creative process which lead me to the work of Theodor Schwenk’s *Sensitive Chaos* (2001).

The work *Sensitive Chaos* explores the world of fluid phenomena: the ways that wind and water move in identifiable archetypes. I began to piece together a new understanding of *qi* in relation to the body, that perhaps also worked for landscape design. In scouring Chinese medicine literature, I confirmed that *qi* in the body can always be understood at some level in relation

to fluid flow, tied to concrete physical phenomena (Maciocia, 1989; 2015). This distinction is easy to lose among many more qualitative associations of *qi* theory. **A key a-ha moment: how knowledge builds to understanding.** Schwenk's work followed the qualitative science tradition of Goethe, science that by some is categorized of complex systems theory, as theory that addresses multiple interrelationships between the parts and the whole, as opposed to single variable causalities (Meadows, 2008; Skybrook, 2011). Goethe was in the syllabus of a course I took called "Whole Systems Healing". During this course, I became familiar with the basic tenets of a concrete, approachable version of complex systems theory, which provided an "a-ha moment". This was the insight that complex systems theory is the true essence of the Chinese *Yi Jing (Book of Changes)* model.

Consequently, the following study represents my efforts to incorporate my personal and professional experience with an exploration of academic theoretic knowledges bases to build a better understanding of restorative landscape design.

CHAPTER ONE – INTRODUCTION

The Biophilia Hypothesis

Biophilia. Author E.O. Wilson popularized use of the term *biophilia* or the *biophilia hypothesis*, a phrase often referred to in western evidence-based design literature, Wilson defined biophilia as, “the innate tendency to focus on life and lifelike processes” (Wilson, 1984, 1). Wilson argues that to “explore and affiliate” with life is integral to our emotional and mental development, but is still relatively undervalued in our philosophy and religion. Wilson’s statements have in part inspired the work of conceptual theorists in nature-based restoration design.

Wilson created a manifesto for the interdisciplinary work of nature-based therapies: “to the degree which we can come to understand other organisms, we will place a greater value on them, and on ourselves” (Wilson, 1984, 2). Much work is being pursued from the viewpoints of medical science, environmental psychology and neuroscience to understand biophilia and the importance of nature on health and human efficacy.

The biophilia hypothesis has influenced theorists in adaptive-evolutionary perspective: the hypothesis that our responses to nature are “innate” as part of an evolutionary pattern based on our needs for habitat. One such researcher, Roger Ulrich, made the statement, “The intuitive belief that contact with nature promotes psychological well-being and physical health dates back at least two thousand years and has appeared widely in Western and Asian cultures (2008, 89).

Western Traditions in Considering the Value of Biophilia

Twentieth century trends exclude nature from healthcare facilities. Ulrich's statement about an intuitive belief connecting nature with psychological and physical well-being in western cultures is historically well-evidenced. European traditions have valued special little places as beneficial for retreat and reflection—a beautiful rock formation, a shaded spring in a forest, a secret cave. Cloister gardens were part of the healing environments in Middle Age monastic infirmaries (Cooper Marcus and Sachs, 2014). Convalescing by connecting with natural ventilation, sunlight and nature has been prevalent over the centuries in a wide variety of different European cultures (Ulrich 1999).

In the middle of the 20th century, inherent and intuitive connection with nature was de-emphasized, however, in medical environments alongside changing trends in medicine. One key influence was germ theory: the theory that diseases are sometimes cause by microorganisms as pathological infectious agents. Specialization and technical approaches to medicine became more common. Healing gardens became generally rare within the context of medical settings (Cooper Marcus and Barnes, 1999). Ulrich attributes this shift as a product of pressing costs and well-meaning emphasis on new technology and sterilization techniques. These new processes overshadowed traditional beliefs about elements such as gardens (Ulrich, 1999). Ulrich, an environmental psychologist, describes the resulting stark environments made in a trade-off for efficient and sterility as “stressful” and “otherwise unsuited to the emotional or psychological needs of patients, visitors, and staff” (Ulrich, 1999, 27). Evidence-based design has been quite successful in re-shaping healthcare facilities' architectural characteristics (Ulrich, 2006), but is now also successfully arguing for nature content (Sullivan and Kaplan, 2016; Ulrich, 2008).

Biophilic evidence re-negotiates nature inclusion. Evidence-based research trends have been critical in negotiating the reintroduction of nature in healthcare

facilities. Stark, nature-deprived urban areas are also being addressed for improvement. A growing research base on general urban population uses concepts tied to “restoration” to argue for nature as a needed, cost-effective benefit to human health and effectiveness (Berto, 2005, 2014; Bowler, et al., 2010; Kaplan and Kaplan, 1982; 1989; Ulrich, 2008).

Two key concepts of “restoration” have emerged in relation to restorative nature spaces. One ties nature content to stress reduction, *Stress Reduction Theory (SRT)* developed by Roger Ulrich (1999, 2008). *Attention Restoration Theory (ART)*, developed by the Kaplans (1989), ties nature content to improved cognitive recovery. Each theory has been validated empirically with both general populations and specific treatment populations (Berto, 2014; Sachs, 2014). Each theory has included focus on Wilson’s concept of *biophilia* and its ramifications as a key part of their conceptual foundations.

Adaptive-evolutionary content and organizational patterns. Kaplan and Kaplan (1989) frame the key questions about “the effects the natural environment has on people” as:

1. Is it real? Is the effect of nature on people as powerful as it intuitively seems to be?
2. How does it work? What lies behind the power of environments that not only attract and are appreciated by people, but are apparently able to restore challenged individuals to healthy and effective functioning?
3. Are some natural patterns better than others? Is there a way to design, manage, and interpret natural environments to enhance these beneficial influences?

(Kaplan and Kaplan, 1989, ix.)

In terms of their work with nature and preference in relation to beneficial influences on “healthy and effective functioning”, the Kaplans note two key areas: one deals with content, the elements of an environment, and the other deals with the organization of this content, the *spatial patterns* of information in a landscape (1989, 3).

For example, in discussing water, the Kaplans present evidence linking real estate value to proximity to water. As a “highly prized” landscape element, “water provides an excellent example of the natural environment that is highly preferred” (Kaplan and Kaplan, 1989, 9). However, the Kaplans note that the *relationship* of water with surrounding elements is also important to preference. **Site elements and organizational patterns of landscape:** Water provides an example of the basic ways that *adaptive-evolutionary theory* informs biophilic design. The main hypothesis is that both our responses and preferences to natural environments are based on evolutionary needs from landscape, as our habitat. A component of adaptive-evolutionary theory argues there are optimal site elements in relation to the primary resources required for life, such as a source of water. The elements identified as most important in restorative landscape theory are also recognized in *feng-shui*: water is perhaps the most central; vegetation, particularly trees, are another example. However, the Kaplans also theorize that relationships between elements, or optimal patterns of organization in landscape, are also critical in evoking our innate biophilic response.

Eastern Traditions in Considering the Value of Biophilia

The phenomenological science aspects of the Chinese *Book of Changes*.

The broad influence of the *Book of Changes (Yi Jing)* shaped Asia’s own intuitive notion about nature as well as its rich garden traditions (Mak, 2009; Zou, 2008).

The canon’s introduction and exposure to western cultures has largely emphasized its philosophical and aesthetic interpretations (Lu, 2013). The book’s

true origins are less well known. The symbols developed in the book were developed as a system of recording cyclical patterns of nature (Lu, 2013; White, 2006). Scholarly interest in the *Book of Changes* origins in natural sciences surfaced due to modern interest in Chinese medicine. This occurred both in China and elsewhere as complementary and alternative health approaches were examined (Lee, 1986; Lu, 2013; Maciocia, 2015;; Porkert, 1974; White, 2006). Connections applicable to *feng-shui* ecology and design methods are being uncovered.

Qi theory concepts: yin-yang and five elements originating from cycles. *Yin* and *yang* describe the components of *qi* as an animating force, or breath, in action. *Yin* and *yang* can be understood from their original roots related to observations of the simple cycle of night and day (Maciocia, 2015) and resulting relative proportions of sun and shade (White, 2006). These concepts are inherently relational and interdependent (Maciocia, 2015). Just as inhalation and exhalation are components of the two-phase cycle of breathing, *yin* and *yang* are the two key phases of any cycle of *qi*. The concepts are essentially “meta-variables” that are applied to specific situations.

The five element concept describes more complex cyclical patterns of *qi*. The metaphoric names for the five elements are derived from nature: water, wood, fire, earth, and metal. However, in terms of their original conceptual development and their use, the five elements are *not* the basic constituents of nature (as in elements in chemistry) but rather five basic processes, qualities, or phases of a cycle. Simply put, these are inherent capabilities of change in phenomena (Maciocia, 2015). Alternate translations for elements include “phase” (Paton, 1995) and “agent” (Hwangbo, 2002). For clarity, this study adopts the use of a combined term, “elemental phase” when the usage is specific to the earliest meaning as phases of a cycle, and uses “element” for the more general concept.

Biophilia in qi theory from a Goethian science perspective. A biophilic exploration of the *Book of Changes* concepts is particularly intriguing in view of

compelling parallels with those identified by the modern qualitative work of artist-scientist Johann Wolfgang von Goethe (1749-1832). Goethe's work with nature is a type of phenomenology, or pure descriptive research, that incorporates "in-depth study of the phenomenon. This must be seen and described as clearly as possible" to identify the phenomena's deeper, more generalizable patterns, structures, and meanings" (Seamon, 1998, 2). Goethe's work provided a foundation for the development of qualitative science (Seamon, 1998).

Steiner viewed one of Goethe's discoveries as fundamental: "the discovery of *the nature of the organism itself*" (Steiner, 2000, 1). He stated "natural science before Goethe was unaware of the essential nature of living phenomena" (Steiner, 2000, 2). Goethe (1978) identified archetypal patterns of organization found in plants as well as increasingly complex living systems. Goethe's key insights include witnessing an underlying principle of *polarity*, or contrasts of opposites, in the metamorphosis of biological life forms.

Goethian-based science's identification of key formative principles of organisms and life-sustaining functions (Seamon, 1998) are paralleled in the primitive but elegant Asian *qi* theory. Examining the roots of *qi* theory demonstrates that the concepts originate from observation of nature (White, 2006). Polarity and *yin-yang* reveal themselves to be intrinsically equivalent concepts. Theodor Schwenk's (2001) phenomenological research in fluid flow archetypes furthers insights. The patterns Goethe observed in life forms originate in the archetypal movements of fluids expressed by water. This additional knowledge suggests that the *qi* concept is understandable from the perspective of fluid flow archetypal movements.

The Ideal Site and the Integration of Western and Eastern Traditions of Biophilia

Feng-shui is understood as many things, including: natural science, superstition, divination, and philosophy (Yoon, 2006; 2009). *Feng-shui*, which translates to wind-water in English, denotes an abbreviation of “*tseng-feng*” and “*te-shui*” translating to “calming the wind” and “acquiring the water” respectively. **Form school theories.** *Feng-shui*’s traditional knowledge system assesses content and organizational patterns in landscape in relation to site analysis and design. The branch of *feng-shui*’s development relevant to restorative landscape is typically referred to as Form School. Site selection used in *feng-shui*’s Form School is a blend of analytic and the intuitive applications (Bennett, 1978; Mak, 2009; Xu, 1990). The organizational pattern typology described in Form School is generally referred to as the “ideal site” (Mak, 2009).

Form School is the older of the two classical branches of *feng-shui*. The other is Compass School. Compass school has a highly analytic, complex approach to astrological influences and orientation (Xu, 1990). Form School is currently more strongly validated and discussed in scientific research approaches. In ancient China, scholars and intellectuals from upper society engaged in its practices (Mak and So, 2009). However, aspects of its theory are still not well understood from a modern perspective (Mak and So, 2009). Form School *feng-shui* theories are based originally on *qi* theory from the *Book of Changes* (Bennet, 1978). Bennet argues one must acquire insights into the nature of *qi* theory to assess “theoretic integrity” (Bennet, 1978, 451).

***Qi* theory conundrums for scientific approaches.** A key question in the investigation of *feng-shui* relates to the nature and definition of *qi*. *qi* has been characterized by scholars as a uniquely cultural concept (Yoon, 2009). Mak and So (2009) identify three key problems in its acceptance in the academic world: “the inconsistencies or even conflicts between different schools, the arbitrary or

subjective interpretations by masters, and the lack of empirical models for prediction with estimated accuracy (xlili)”. These authors concluded that a “key to scientific research in *Feng Shui* is the quantification of “*qi*” (Mak and So, 2009, xlii¹i). However, Choy (2009) clarifies that *qi* is an intrinsically relational concept. Quantification of *qi*, therefore, must also characterize how the concept functions within a holistic perspective. Perhaps empirical quantification is only possible in relation to specifically defined locations and functions of *qi*, as in Chinese medicine (Maciocia, 1989; 2015).

Possible approaches to scientific *feng-shui* research. The definition of *feng-shui* can be approached from two perspectives in scientific research (Lee, 1986). One approach examines “all metaphysical and cosmological contents and characteristics about nature and man’s place within it” (27). This examines the conceptual history informing *feng-shui* from its own cultural viewpoint. A second approach is more pragmatic and objective. Western scientific theories are applied to interpret the *feng-shui* ideal site’s tangible features rather than attempting to address the unique nature of the cultural concept of *qi* itself.

Key findings from each approach. Both approaches have advanced the scientific understanding of *feng-shui*. Clarifications of the *Book of Changes* ideation systems (Lee, 1986) inform *feng-shui* as design theory have emerged from the first perspective (Hwangbo, 2002; Lee, 1986). These studies clarify the connection between *feng-shui* traditions and a primitive, culturally specific theory of the universe’s evolution (Hwangbo, 2002; Lee, 1986). Interpretations and comparison from western scientific perspectives, as relevant to this study, include an identification of *feng-shui*’s ability to identify and create fertile, biodiverse landscapes (Bixia et al., 2009; Paton, 2009; Xu, 1990) modulate climate (Fang, 2000, Yoon, 2006) and meet qualitative environmental psychology values such as an experience of safety and comfort (Lynch, 2003).

A synthesized approach to interpreting *Qi* theory. This study attempts to synthesize the two approaches Lee (1986) describes. It explores cultural ideation systems in the context of modern scientific theory. By choosing a scientific approach that offers a complex systems theory perspective, a more appropriate and potentially adequate comparison to *qi* conceptual theory may emerge.

The ideal site as an analogy. In presenting cultural origins of the system of order behind the ideal site's configuration, Lee (1986) discusses its derivations from diagrams related to the *Book of Changes*. He classifies the essence of *feng-shui's* ideal site typology as an analogy of nature (1986). Lee argues this analogy intrinsically encompasses ecological, functional and behavioral aspects modeled on nature when applied to analyzing site location and design (Lee, 1986).

The viewpoint of the human body developed in Chinese medicine is also informed by this analogy (Maciocia, 1989; 2015). In Form School's development, there appear to be lost books (Skinner, 1982; White, 2006). *Feng-shui's* assumptions are not all obvious looking at existing poetic code. Some of the noted inconsistencies in the theories (Mak & So, 2009) may be due to a modern confusion due to gaps in the theoretic paths of development, while others may be based on interpretations that meet different purposes. Systematized definitions of *qi* in Chinese medicine theory (Maciocia, 1989; 2015) help clarify assumptions about the relationship between the body and environment applied in *feng shui*. These definitions also allow a perspective of Goethian science. This perspective can be used to understand the ideal site analogy in relation to the *qi* concept's development from biophilic observations. This specific interpretation provides a tangible theoretic framework for comparison with nature-based restoration theories.

East-West Theoretic Commonalities in Relation to The Biophilia Hypothesis

How might a comparison of qi theory to the main tenets of adaptive-evolutionary theory inform biophilic design?

Interdisciplinary approaches. When the theoretic roots of *qi* theory are examined from a biophilic perspective, including the more systematized developments of modern Chinese medicine, an interesting interdisciplinary parallel with evidence-based design emerges. This parallel is diagrammed in Figure 1 below.

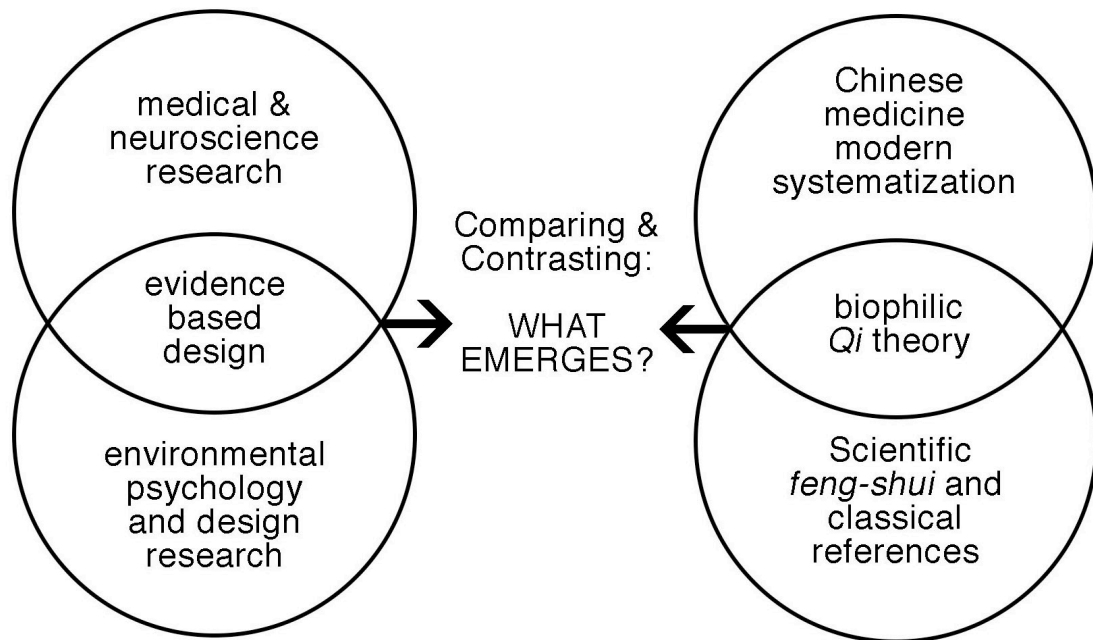


Figure 1. Interdisciplinary parallels.

Chinese medicine's analysis of *qi* in relation to the body's fluid flows encompasses a theory that describes both concrete physical phenomena and qualitative phenomena (Maciocia, 1989; 2015). The theory of concrete physical phenomena can be compared to findings of contemporary western medicine and neuroscience disciplines. Medicine and neuroscience have also helped to inform environmental psychology restoration theory frameworks and empirical

developments (Kaplan, 1995; Ulrich, 1999; 2008). Qualitative aspects of *qi* theory offer a strong comparison to the qualitative topics in these environmental psychology research frameworks.

The organizational features of the ideal site. The features of the ideal site have many points of comparison with the content and organizational patterns of adaptive-evolutionary landscape theory (Han, 2001).

The characteristic features of the ideal site typologies were developed for the mountainous regions of China (Fang, 2000; Han, 2000; Hwangbo, 2002; Xu, 1990). Figure 2 shows a summary of these features. These are identifiable as an inner and outer structure and a central open space called the *ming tang* or “bright court.” Land forms are organized by a principle of centrality around this bright court (Hwangbo, 2002).

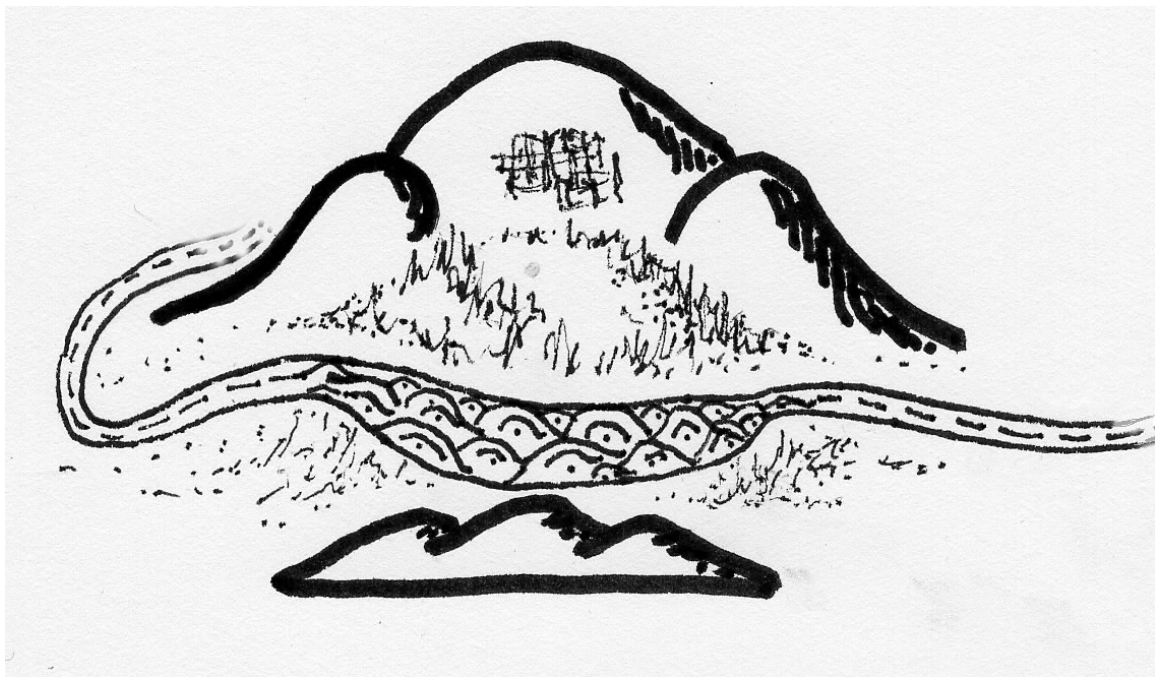


Figure 2. The *feng-shui* ideal site arrangement (adapted from Choy, 2009; Yoon, 2009).

Land forms may be present in each of the four directions. The largest of these land forms is oriented towards the north to protect from harsh winds. Sometimes only three landforms are present, depending on the conditions of the regional landscape context (Fang, 2000). The landforms are conceptualized as metaphoric emblems representing the animals of the Chinese cardinal constellations. What is called a “cave,” “node,” or sometimes, “dragon’s nest” is the location of the site itself. This is typically partway up the slope of the black turtle mountain and looks out over the central open space of the bright court.

A reference overview of additional ideal site *qi* analysis features and analysis methods are outlined in Appendix A. Specific features and methods will be referred to in the context of the arguments made in the literature review.

Problem Statement

Goal. The goal of this study is to examine the intersection of conceptual definitions and design informants between ART, SRT and the *feng-shui* ideal site as interpreted from a Goethian sciences perspective. This is shown in the “sweet spot” illustrated below in Figure 3. The aim is to increase the understanding of the most universal aspects of the biophilia response by comparing theories that represent interdisciplinary approaches from different cultural perspectives and historic periods. Intersecting commonalities suggest the most universally applicable design informants. The hope is to gain further nuances and clarifications for how these theories inform the design of restorative landscapes.

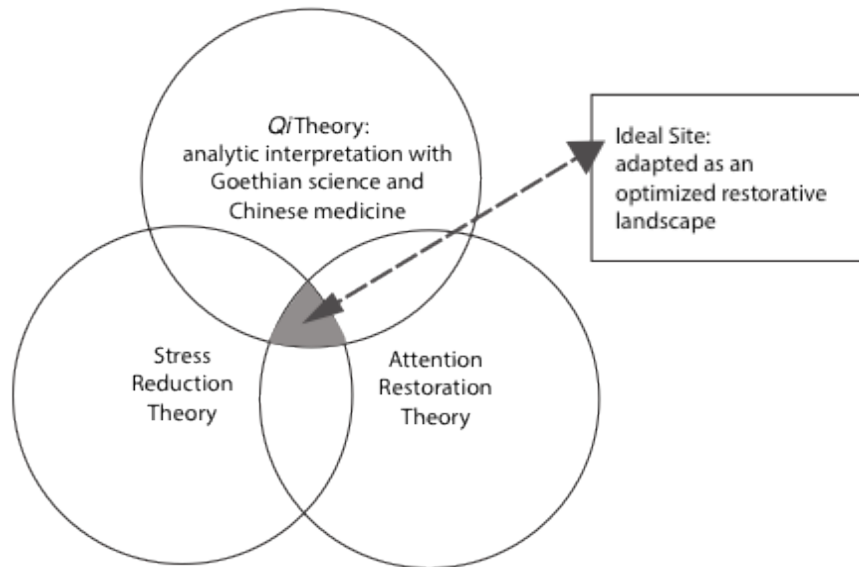


Figure 3: Locating a “sweet spot” of conceptual definitions as design informants.

Objectives. Achievement of this goal is executed by two main objectives:

1. Create a synthesized set of design informants for optimal restorative landscapes. To do this, two specific steps are needed:
 - a. Develop a specific *interpretation* for a conceptual definition of *qi* theory from literature review. This definition should be inclusive of modern Chinese medicine theory with its increasingly evolved and systematized development of *qi* concepts. This interpretation is made from the perspective of Goethian science and in relation to *qi* as observable in fluidic media.
 - b. Develop the conceptual definitions and relationships to design informants for the nature-based restoration theories Attention Restoration Theory and Stress Reduction Theory through literature review.

2. Discuss a design process summary.

CHAPTER TWO – REVIEW OF LITERATURE

EASTERN CONCEPTS OF RESTORATION THEORIES

Introductory Background on *Qi* Theory

The unity of man, heaven, and environment. A key difference noted in *feng-shui* theory and western ecological or built environmental theories is its environmental determinism (Yoon, 2006). The relationship between human and ecological health of the biological environment is considered critically influential in determining outcomes such as health, wealth and personal development. In contrast, the Western conception views the environment as exterior, unaffiliated and alien to humankind (Chen and Nakima, 2004).

This Eastern spiritual unity stems from *qi* theory's unique assumption of two key principles: the principle of correlation, and the principle of resonance. These two principles can be understood in relation to how *qi* operates. Fixed, unchanging principles dictate *qi*'s expression of ever evolving change (Lu, 2013; Maciocia, 1989, 2015; White, 2006).

The principle of correlation. The principle of correlation assumes a correlative relationship among the design of the cosmos, the earth, the landscape, man and other living organisms. This correlative assumption is summarized by the Chinese adage, “the unity of heaven and mankind” (White, 2006, 16). This adage infers a premise about the overall structure of *qi* of the universe. *Qi* is thought to have relative consistencies at all scales. This ranges from the micro—such as the basic nature of atoms as the building blocks of physical matter—to the macro—for example, the galaxy and larger (Lu, 2013; Xu, 1990).

The principle of resonance. The principle of resonance provides an overall umbrella of the preceding key concepts of *qi* theory in terms of a basic

interrelationship between the parts of any whole. The principle of resonance provides a primary contextual assumption of *qi* theory: it is the idea that “like activates like” (Bennet, 1976), as with strings of a guitar (Maciocia, 1989; 2015).

In *qi* theory, resonance between environment and man happens along “like” elemental categories (Maciocia, 1989; 2015). Properly understood, the *yin* and *yang* and five element concepts are systems of categorization (Hwangbo, 2002). However, these concepts must be understood within a relational model as having intertwined functions (Maciocia, 1989; 2015). This adds a dimension to the principle of resonance from a standpoint not just of categories, but of *relational* categories, exhibiting time-space rhythmic and structural patterns.

Patterns of birth, growth and death cycles. The first principle of *feng-shui*, is that it is an integrated and holistic system (Choy, 2009). It is used to identify the patterns of organization and entropy in nature:

Because everything is inter-related, Feng Shui enables us to use such ideas as the theory of Yin and Yang, Wuxing (Five Elements) and the concept of Qi to observe and to describe the relationship between the parts and the whole. When there is synergy between these, the Chinese say it has Sheng Qi, and when the synergy is missing or out of balance, it has Sha Qi or Blocked Qi (Choy, 2009, 91).

Choy’s (2009, 91) ‘first principle of *feng-shui*’ describes one pattern of *qi* in relation to the cycle of birth and death. From the lens of *feng-shui* practices, *qi* is categorized as either harmonious (*sheng qi*) and beneficial to life, or as disharmonious (*sha qi*), in relation to death and decay (Xu, 1990; Lee, 1986; Mak and So, 2009). A translation of the categories of *qi* in terms of landscape analysis is “living *qi*” which “infuses life with energy,” and, its contrast, “dead” or “killing *qi*,” which is “cold and still, making life end” (Xu, 1990, 24).

These forces are also viewed as part of a cycle: the processes of entropy, breaking down parts back to the building blocks of life and, in turn, providing the possibility for continued emergence and growth (Zhang, 2007).

Cycles as described by *yin* and *yang*. *Yin* and *yang* are noted as concepts that can describe “the polar quality of all effects” (Porkert’s, 1974). Complex systems theorist Meadows (2008) clarifies a point about complex systems theory by citing the following traditional Sufi teaching: “You think that because you understand “one” that you must therefore understand “two” because one and one make two. But you forget that you must also understand “and” (Meadows, 2008, 17). The explicitly relational characteristic of the *yin-yang* concept speaks to the meaning of this adage. Visual models can capture the essential time-space patterns more discretely and accurately than verbal language. Visual language can represent relational aspects that “happen all at once” (Meadows, 2008, 4-5).

In their early history, *yin* and *yang* were first represented with simple symbols: *yin* as a filled in dot and *yang* as a hollow dot (Lu, 2013) and later evolving to *yin* as a dashed line and *yang* as a full line (Lu, 2013; Maciocia, 1989; 2015), as shown in Figure 4. Numerological values are also incorporated into what these symbols represent: *yang* is assigned odd numbers starting with 1, and *yin* the even numbers starting with 2 (Rutt, 1996; White, 2006).



Figure 4. *Yin* and *yang* symbolic representations.

Symbolic language of hexagrams and trigrams. *Yin* and *yang* as a dashed line and a solid line develop to create “four images”, proportions of *yin* and *yang* represented by two lines. A set of eight trigrams representing proportions with three lines are further derived. This sequence of development is often represented as first *yin* and *yang*, then the four images, and then the eight

trigrams emanating from the Chinese *Tai Qi* symbol. (Maciocia, 1989, 2015; White, 2006; Xu, 1990). The progression of symbols and relative ratios, from pure *yin* and pure *yang*, to the four images, and then the eight trigrams are shown in Figure 5. The trigrams generally need to be considered as pairs of polarity and have metaphoric names that represent function: Heaven-Earth; Fire-Water; Lake-Mountain, and Wind-Thunder.

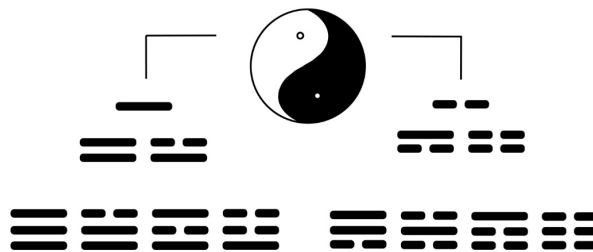


Figure 5. The *Tai Qi* symbol generating a progression of *yin-yang* ratios.

The trigrams are further developed as a total of 64 pairs of *hexagrams*, symbols of six lines each, by combining all possible relationships of two basic trigrams. The trigrams can be conceptualized as the compositional “notes” of hexagram system (Son Su Myer, 2016). The father of calculus, Leibniz, identified the hexagram system of 64 symbols as exactly the number needed to represent all things in binary math, if zero is used for pure *yang* (Lu, 2013; Rutt, 1996; White, 2006). While many scholars raise doubt that this binary elegance was of conscious design by the ancients (Rutt, 1996), the mathematical nature of the trigram and hexagram system is inarguable. It is notably elegant (Rutt, 1996). The trigrams and hexagrams abstract the basic patterns of transformational cycles witnessed in nature.

The key five elemental phase sequences. The five elemental phase model uses the theory of balance between generating cycles and limiting cycles. In the generating cycle of elemental phases, each element plays a role as *parent* in relation to the next element as its *child*. This is indicated by the outer arrows in

the left sequence in Figure 6: water generates wood; wood generates fire; fire generates metal, and metal generates water to close this cycle as a circular pattern of changes. The controlling cycle demonstrates how each elemental phase exerts a limit on the generation of the child of the parent it generates: water limits fire; wood limits earth; fire limits metal; earth limits water, and metal limits wood, as indicated inner arrows in the right sequence of Figure 6.

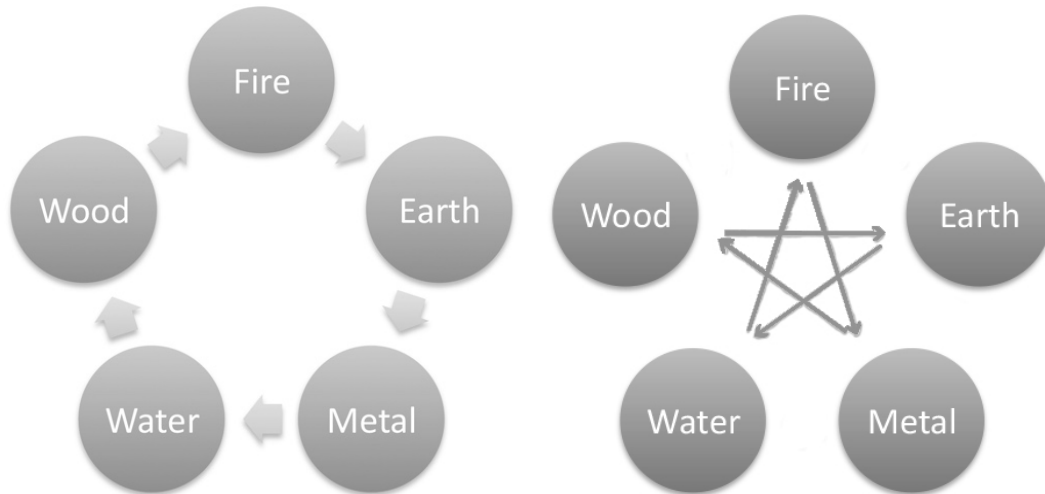


Figure 6. Generating and controlling five elemental phase sequences (after Maciocia, 2015).

In *feng-shui* theory, the interpretation of these cycles is more simplistic than in Chinese medicine. In *feng-shui*, the generating cycle refers to general patterns of birth, emergence, and growth (Xu, 1990) and the evolution of the “myriad of things” (White, 2006; Yoon, 2006, 58).

Further development in medicine. On the most “meta” metaphoric level in relationship to the landscape scale of complex systems levels, the generating cycle is considered tied to *sheng qi* and is therefore considered auspicious; the controlling cycle is tied to *sha qi* and is therefore considered inauspicious (Lee, 1986).

In Chinese medicine, the two cycles are considered as a rhythmic combination, as a system of “check and balance” (Lu, 2013, 108). This model of

interaction in these two five elemental phase sequences is used as an inductive and deductive analysis tool for organ relationships (Maciocia, 2015).

The cosmological cycle. A third but less referenced five elemental phase sequence is also applied to both *feng-shui* theory and Chinese medical theory. This is the cosmological cycle, pictured in Figure 7. The sequence allows for an understanding of the most literal of the five elemental phase correlations: this includes the directions, stars, constellations, movements, and emerging metaphors of emergence, growth, and decline (Maciocia, 2015; Zhang, 2007).

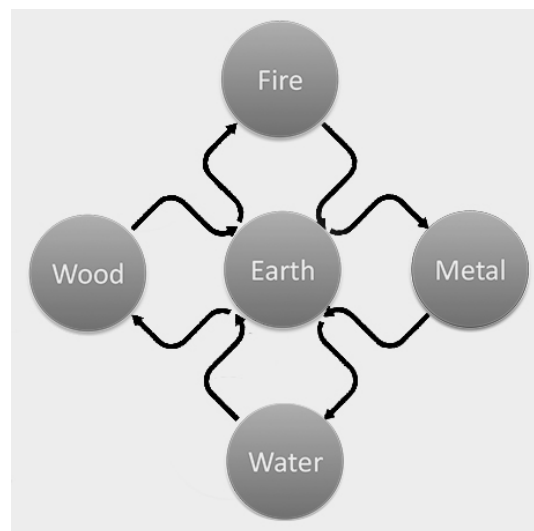


Figure 7. Cosmological sequence of the five elemental phases (after Maciocia, 1989; 2015).

The cosmological cycle demonstrates key seasonal relationships to the elements in relation to the four directions (Maciocia, 1989; 2015); it relates to the *structural* aspects of organized forms. In *feng-shui*, it is the simplest model of the inner structure of the ideal site. In Chinese medicine, it models the structure of the organs' physical relationships in the body. In Chinese medicine theoretic applications, it serves as a better model for particular organ relationships than the more commonly used controlling-balancing sequences (Maciocia, 1989; 2015).

Roots of the derivations. Lee’s (1986) exploration of the ideation systems that underlie Chinese *feng-shui* and its architectural applications identifies and discusses these two key diagrams. These two maps (Figure 8) are the heart of ideation systems that dictate the basic configuration of the *feng-shui* ideal site, informing what Lee identifies as an analogy of nature (Lee, 1986).

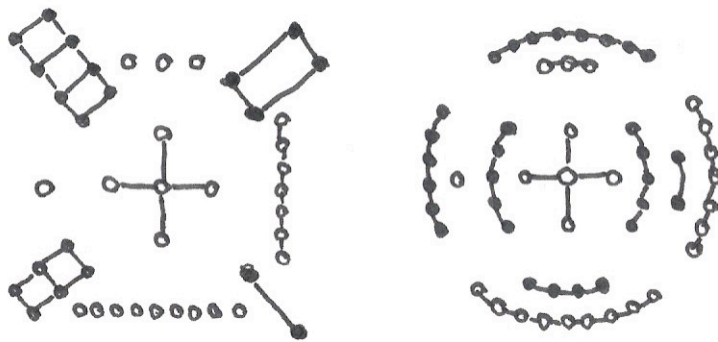


Figure 8. *Ho Tu* (right) and *Luo Tu* (left) time-space maps (after Hwangbo, 2002; White, 2006).

Derivations for the five element sequences are based on geometric calculations evolving from these trigram sequences. The two maps are first converted to eight phase sequences using the trigram symbols as an intermediate step.

The geometric calculations are combined with qualitative transformations based on the metaphoric meanings of the trigram symbols. The *Ho Tu* diagram supplies the information for the early trigram sequence and the “generating rule” of the five elemental phases. The *Luo Tu* supplies the information for the later sequence and the “controlling rule” of the five elemental phases. White (2006) describes the progression of sequences as prototype models. These models capture “the central mechanism of the universe that is both plain and elegant” (White, 2006, 10) in a manner that makes the models applicable to generalized problems.

Legendary Chinese emperors. Fuxi is believed to have been an influential emperor and sage in approximately 2850 BCE (Lu, 2013). Fuxi is generally

credited with the authorship of the trigram and hexagram system of symbols (Lee, 1986; Lu, 2013; White, 2006), as well as the earlier time-space map. Fuxi's development of the *Ho Tu* was followed approximately 800 years later with the development of the *Luo Tu*, by another emperor, Yu the Great (White, 2006). This diagram is associated a moment of insight at a time of devastating flooding of the Luo river. The controlling rule of the five elements was indicated as central to Yu's insight (White, 2006). Yu is known in history for creating channel systems to provide control for flooding associated with the Luo river (Fang, 2000).

These sequences are considered patterns that operate on nested levels.

The generating and controlling sequences summarizes a rhythmic cycle of birth and death on the highest conceptual level. These two sequences can also be interpreted as a basic rhythmic pattern of interwoven balances in context more specific to the heavens, the earth, a landscape, or a living organism (Maciocia, 2015). Together, these three sequences are the key models of simplified patterns used in *qi* theory. The principle of correlation dictates that the basic patterns of *qi* theory operate in nested hierarchies (Lee, 1896), as diagrammed in Figure 9.

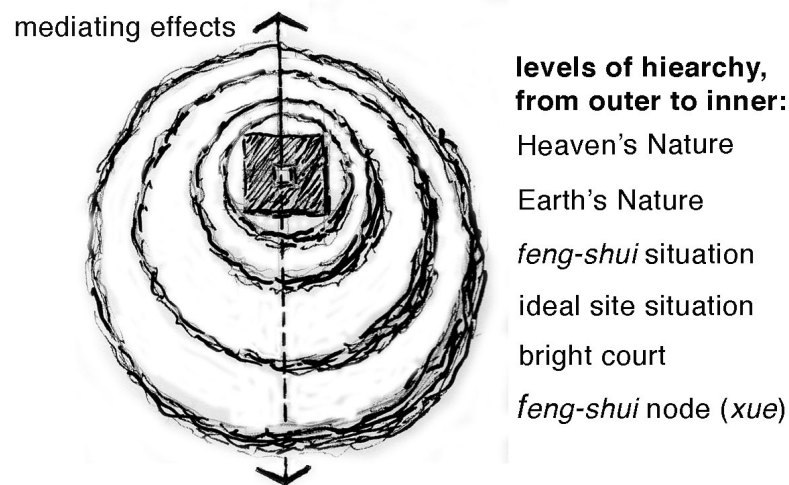


Figure 9. Centrality, nested hierarchy, and mediation (adapted from Lee, 1986).

At each level of Lee's (1986) diagram, the optimal location is a central location within the next level up. Lee calls the site within a larger organized pattern of landscape the "*feng-shui* situation." This indicates a place where ideal balances are coming together at each level of hierarchy within nature. The forces between earth and man, and sky and heaven, are mediated here. Located centrally inside this *feng-shui* situation and its nested ideal site is the bright court (*ming tang*). This is a wide, open grassland area. The node (*xue*) is the specific location where *yin* and *yang* balance as an appropriate placement for man. The node is considered an ideal point of placement for the human as a grave or building in Lee's diagram. At a larger scale the node might also refer to the placement of a town or a city within the landscape (Bhatt, 2013). Various translations of *xue* include "cave," (Yoon, 2009) "node," (Paton, 1995) "spot" (Lee, 1986) and "dragon's lair" (Bhatt, 2013; Stark, 2005).

Figure 10 shows how a *feng-shui* ideal site is nestled within a context that creates another layer of interior and exterior.

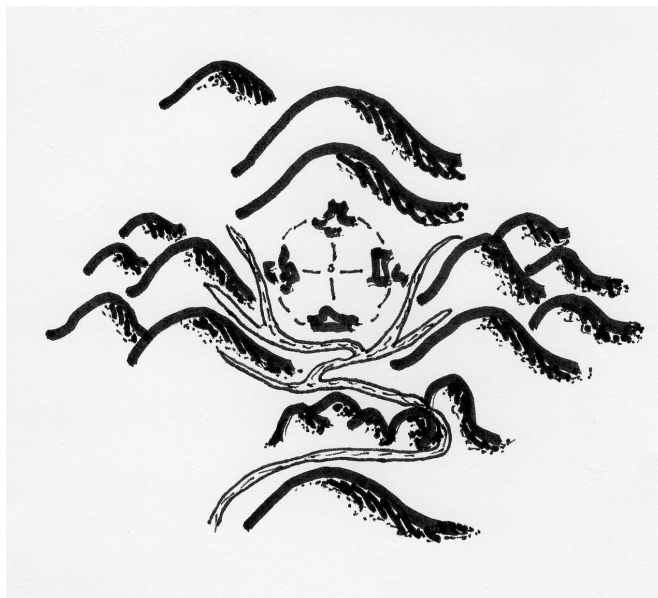


Figure 10. The ideal site nested within its landscape context (adapted from Choy, 2009).

This landscape meets similar requirements for organizational patterns as the ideal site itself (Choy, 2009). In the interior is the ideal site with a land form in each direction, with metaphoric animal associations. In China, the black turtle emblem is typically oriented toward the back of the site to protect winds from the north. Lower land forms that metaphorically represent an azure dragon and a white tiger embrace the site in the east and west, respectively. These landforms are typically connected, creating a characteristic curve referred to as the armchair formation (Fang, 2000; Lee, 1986; Mak, 2004). A red vermilion bird may lie south of site, across from a river or lake. This landform has a lower rise. It assists in containing the site without blocking access to sunlight from the south (Fang, 2000; Han, 2001; Lee, 1986; Xu; 1990).

The Biophilic Roots of *Feng-Shui* from the Perspective of Goethian Science

Polarity and metamorphosis in botany. Goethe first observed a principle he called polarity in relation to the metamorphosis of form, by examining the formal aspects of botanical and animal life. The expansion and contraction demonstrated by a leaf and a stem of a plant is a fundamental example of polarity. Observation shows alternating sequences in the forms. Note the maple leaf in Figure 11. There is a polar alternation between contraction and expansion between the leaf and the stem. Another such polar metamorphosis can be seen in the expansion and contraction of the lobes of the leaf itself.

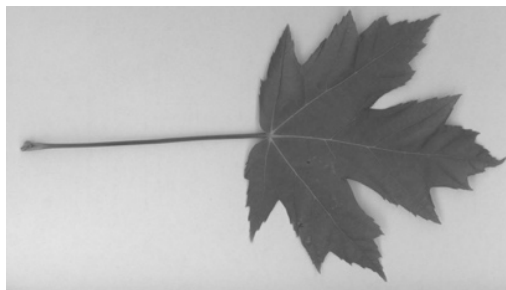


Figure 11. Maple leaf (photograph by the author, 2016.)

The principle of polarity discussed by Goethe is not entirely newly discovered phenomena, however. In fact, the principle is clearly demonstrated in the ancient Chinese *qi* theory concept of *yin* and *yang*. Examining the origins of these concepts reveals polarity in movement. The concepts of *yin* and *yang* originate from the observation of nature's patterns relative to daily and seasonal cycles of the sun and moon (White, 2006).

The *Book of Changes*' symbols originating from astrological observations.

The *Book of Changes* is typically dated in *feng-shui* literature to circa 800 BC (Mak and So, 2009). However, some scholars date the original portion back to emperor Fuxi (circa 2850 BC). This refers to the core of symbolic language found in the *Book of Changes*. (Lu 2013; White, 2006.) Per this viewpoint, just a system of simple symbols for *yin* and *yang* were originally passed down, in a form used to record important calendrical concepts (Lu, 2013; White, 2006). This happened prior to the full development of the Chinese character system and printing methods (Lu, 2013).

The character etymology reinforces this viewpoint of the symbols origins: the words *yin* and *yang* refer to the sunny and shady sides of a hill. The etymology of "*Yi Jing*" has a concrete meaning tied to the sun and the moon (White, 2006). The pattern of solar gain and loss is therefore the original polarity observable in nature that the concept of *yin-yang* developed from.

Image and shape. The *Book of Changes* has an adage: "By knowing the image you get the shape, and by following the rule you will get the state" (White, 2006, 50). This adage can be understood in relation to natural sciences phenomena. Goethe's work with botanical and animal life identifies the principles of polarity and metamorphosis in the formal characteristics of living organisms. The essential relationship between "image" and "shape" described in the Chinese adage's poetry is perhaps the heart of the "simultaneity" relationships that is unique to the *qi* concept.

The principle of polarity can seemingly be seen in all living systems (Schwenk, 2001; Wilkes, 2003). It is the part of the nature of living organisms (Steiner, 2000). The details of water flow archetypes provide further clarity. It is well known that water is instrumental in the formation of biological life. However, it is less well known how intrinsically the specific archetypal movement patterns of water influence these forms.

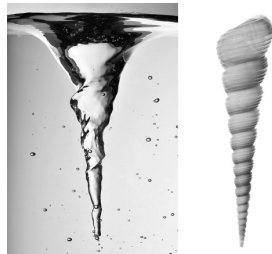


Figure 12. Water's movements: "the image creates the shape"
(after Schwenk, 2001, with Adobe stock images.)

Water movement archetypes. Key archetypal movements are dictated by water's characteristic tendency to spiral; this spiraling nature is evidenced in the braided vortex pictured in Figure 12. This spiraling movement is the result of two polar forces: water's tendency to form a sphere due to surface tension, and gravity. The meander, wave forms, both standing waves in a body of water, and travelling waves in a current are key movement archetypes in water. These different archetypes might produce interference patterns when coming together in the same place (Schwenk, 2001), defining the rich textures observable in bodies of water. There exists a key relationship between movement, as a prototype for form, and the fluidic processes and forms of living systems (Schwenk, 2001). All forms of living organisms pass through a watery phase that leaves its trace even after becoming less or more solid within the embryonic phase of life (Schwenk, 2001). A key relationship between water's archetypal movement patterns and all living forms is therefore observable.

Movement archetypes as prototypes. The cosmological sequence analogy describes the ideal site's key features. However, per *qi* theory's principle of correlation outlined above, this analogy also informs the common thread between the universe, planet, landscape, and man. In examining details of fluid movement archetypes, this correlating principle is understandable in relation to the vortex movement archetype. The vortex is the most uniquely specialized of the movement archetypes in relation to life and the many expressions of living organisms (Schwenk, 2001).

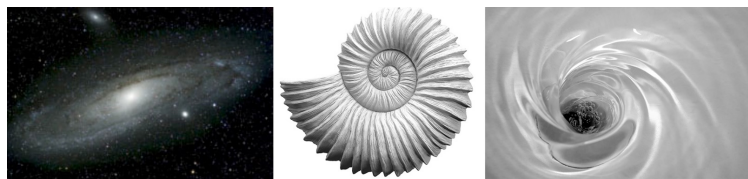


Figure 13. Galaxy, seashell, and water draining (Adobe stock images).

Pictured in Figure 13 are examples of how the vortex archetype manifests in many familiar forms at a wide range of scales: galaxies, seashells, and the swirling movement of water draining from a bathtub are all specific expressions of the vortex archetype. This archetype can be seen in both movement and form.

Generalization to all fluidic media. Schwenk (2001, 11) notes “certain archetypal forms of movement may be found in all flowing media, regardless of their chemical composition.” Movements observable in water parallel many properties of the fluidic flows of gaseous stars. For example, Schwenk (2001) observes how a stick floating in a whirling vortex in Figure 14 maintains a constant pointer, hinting of the tilt of the earth in orbit around the sun.



Figure 14. Phenomena in water hints at gaseous phenomena in the heavens (adapted from Schwenk, 2001, and Adobe stock image).

The roots of the Book of Changes' symbolic system developed in relation to a system of measuring and calculating daily and seasonal cycles of solar loss and gain using a sun dial, the four directions, and a central location (White, 2006). White (2006) interpolates the specific methods of calculation believed described in two original lost sections of the Book of Changes from later developments. This work demonstrates that the origins of the *Ho Tu*, as well as the ancient *Tai Qi* symbol, can be understood in the context of a calendrical mapping of the polar effects of sun and shade patterns, as pictured in Figure 15.

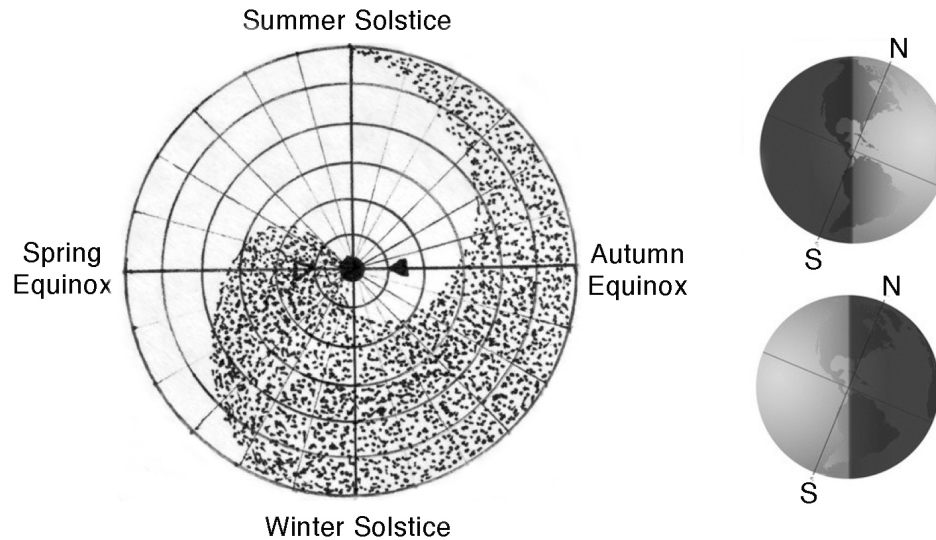


Figure 15. The ancient Tai Qi symbol as solar gain and loss (adapted from White, 2006).

The pattern captured is therefore identifiable as an effect from movements in our solar system, from the angle of tilt of the earth axis in combination with earth's orbit (White, 2006).

The myths of origins of the *Ho Tu* and *Luo Tu* diagrams poetically suggest that the ancient Chinese sages made a conceptual connection between fluidic movements of the galaxies. Both legends connect the pattern the diagram to markings on animals, with the animals emerging from the associated rivers

during a moment of intuitive insight. The first legend states that a dragon-like horse sprang out of the Yellow River. The legendary Chinese emperor Fuxi witnessed the dragon-horse. In a spiritual shock, Fuxi wrote down the pattern written on the horse's back as the *Ho Tu* (Lee, 1986; White, 2006). This poetic metaphor is pictured in Figure 16.

Circa 2100 BC (White, 2006), as waters of the Luo River were flooding, a turtle emerging from this river inspired Yu. The pattern on the turtle's back provided Yu with his insight for controlling floods (Lee, 1986; White, 2006).



Figure 16. A dragon horse appears from the river with the *Ho Tu* pattern (after White, 2006).

These myths also symbolically infer an awareness and emphasis on the relationship between water's movement patterns and biological forms. Review of Chinese medicine reinforces this premise. Chinese medical references confirm that *qi* in the body must *always* be understood in relation to the concrete phenomena of various types of fluid flow. Qualitative phenomena described in this system are considered to arise as effects of this flow (Lu, 2013; Maciocia, 1989; 2015), just as a shadow appears when the sun shines.

Conclusions. The *biophilic* roots of the system have often not been well understood as the *concrete* phenomenological roots of the later philosophical development of the *Book of Changes*. The system of symbols is accompanied by verbal commentaries as poetry and metaphor; these commentaries have multiple

historical layers. Like the Christian bible, various layers of commentary originated from various authors (Lu, 2013).

Properly understood, these commentaries represent perspectives and application of *qi* theory concepts, from different points in Chinese history, as complex systems theory applicable not only to living organisms but also family, government, and social organization as complex systems (Briggs and Peat, 1999). Lu (2013) and White's (2006) work clearly demonstrates that *qi* theory's origins are concretely related to specific observations of natural phenomena. Key principles of fluidic media were extracted from these observations; these principles are also identified by Goethian science. This knowledge informs a purely *biophilic* interpretation of *qi* theory specifically to fluid flow.

From this viewpoint, the *Book of Changes*' symbols provide the scientific rational behind the key concepts from Chinese medicine. The development of these concepts in Chinese medicine offer a theoretic bridge to clarifying *feng-shui*'s central assumptions from a standpoint of the Book of Changes as complex systems theory: its general approach as a salutogenic health paradigm, and its related assumptions regarding climatic and emotional influences on the body's general state of resilience.

Application of *Qi* Theory to a Salutogenic Health Paradigm

Modern pragmatism initiates systematization. Some refer to the modern Chinese medical perspective as the "Chinese clinical gaze" (Wiseman, et al., 1985, xviii). Its distinct viewpoint stems in part *qi* theory and its assumptions about the unity of man and heaven (White, 2006). Even with many disagreements about specific aspects of Chinese medicine (Kaptchuk, 2000), scholars and practitioners in modern China have continued working on the systematization of its theoretical concepts. This trend happened in part as an effort by the current Chinese government to find Chinese-based methods of medical practice and treatment (Kaptchuk, 2000; Maciocia, 2015; Wiseman, et

al., 1985) at a time when a large population could not be well served by the available Western trained physicians alone (Taylor, 2005; Maciocia, 2015).

Adaptation. Chinese medicine scholar Maciocia (1989) remarks that one of the reasons the system has become popular across cultures in modern times is its simplicity. It assesses the causes of pathology in terms applicable to any society at any point in history. However, on adapting the system, Maciocia emphasizes the study of its foundational concepts, “adaptation can only take place on the solid foundation on the theory of Traditional Chinese medicine,” arguing, “one cannot adapt something if it is not mastered first (Maciocia, 1989, vii-viii.)

Therefore, Chinese medicine theorists are motivated to address and clarify concepts stemming from the *Book of Changes (Yi Jing)* in relation to its roots in observations of natural phenomena.

Non-static viewpoint. The system emphasizes fluidic movements and processes over structure. Chinese medicine emphasizes the nature of a human being as a set of patterned time-space interactions. Aspects of these interactions are considered from an integrated view of the physical and non-physical aspects of these interactions as phenomena that manifest in what can be named a principle of *simultaneity* (Bhatt, 2013; Maciocia, 1989; 2015). Simultaneity relates unseen, qualitative aspects—thought and emotions are examples—to more tangible physical phenomena. These are viewed as interwoven reactions and responses of the body’s biochemistry (Lu, 2013; Maciocia, 1989; 2015)

This relational perspective contrasts with a more static viewpoint of the body as a solid “thing” as suggested by Western medicine (Lu, 2013; Maciocia, 1989; 2015). Chinese medical United Kingdom scholar Maciocia clarifies this conceptual difference as, “The body and mind are not seen as a mechanism (however complex) but as a vortex of energy and vital substances interacting with each other to form an organism (Maciocia, 1989, 35).” Definitions of clinical *qi*, in relationship to the human body, relate to two general categories. First, clinical *qi* definitions may describe either the types and movement patterns of

fluid, and simultaneously generated unseen and qualitative phenomena in relation to these flows, as a *yin-yang* pair. Second, clinical *qi* definitions may define function of the organ systems and other processes that are related to the five main organ system categories. The second type is often named by the organ pair most related to the function or process cluster being referred to, for example, *liver qi*.

Classification of systems. The Chinese medicine model classifies the systems of the body in a unique way (Fletcher, 2016). All systems are categorized in a hierarchy that stems from the adoption of the five element system, with the five key organ pairs exerting dominance over each complex of processes and functions (Maciocia, 2015). When approaching these concepts, it is advised to let go of the limited “material-anatomical aspect,” as emphasized western medical perspective, and give in to a conception of the organs as “a complex system encompassing its anatomical entity and its corresponding emotion, tissue, sense organ, mental faculty, colour, climate, and more” (Maciocia, 1989, 67).

Perspective from a young western medical student’s initiation. Chinese medicine’s paradigm and concepts are different from western traditions and are difficult to initially grasp. As described in the *Preface* of this study, an aspiring practitioner learns the system by first memorizing the system’s concepts and key metaphors. The understanding of the underlying conceptual linages comes through time spent applying these metaphors to specific observations and case studies.

Many of the underlying *qi* theory concepts as applied in Chinese medicine are explained below through a recounting of the experiences of David Eisenberg, M.D. in describing his early training in in the field. As a Harvard medical student, he had the opportunity to go to China and study its medicine under the instruction of Dr. Fang (Eisenberg, 1995).

Eisenberg’s (1995) account of his experiences provides an appropriate initiation to the nature of *qi* theory in relation to the body for a layperson to the

system. One key theme of the experience is that within the constructs of *qi* theory, human existence *does not exist* conceptually without its relationship to its overall context, as the universe or cosmos. There is therefore *no* conceptually abstract division of a complex system's parts from the overall hierarchy of larger systems: the *qi* of the universe and the environment inherently influences the clinical *qi* of the body. The concept is ever-inclusive of greater unity. This suggestion of nested systems operates alongside the assumption of the principle of resonance. This combination provides a key philosophical distinction that is vastly different from the positivistic viewpoints possible in a western Aristotle-based worldview.

Eisenberg recounts Fang's early words explaining this philosophical difference: "Chinese medicine appreciates the relationship between man and nature. Man does not exist in a vacuum" (Eisenberg, 1995, 40). In Eisenberg's story, his teachers' explanation continues to explain influence in terms of *yin-yang* relationships: "The human body is subject to changes in Yin and Yang. This includes weather, geographic location, seasons, temperatures, colors, taste of foods, and emotions. In short, our bodies are influenced by every aspect of nature" (Eisenberg, 1995, 40).

By way of illustration of *yin-yang* concepts applied to the human physiology, Eisenberg's story sheds understanding on the initial confusion of diving into another culture's conceptual constructs, with an appropriate dose of reassurance and humor:

"Can the human biological processes also be thought of in terms of Yin and Yang?" I asked.

"The solid organs are said to be Yin, and the hollow organs are Yang. Female is Yin, male is Yang. Chronic diseases are Yin, while acute diseases are Yang."

When viewed in these terms, the body, like the universe, is a complex system of Yin and Yang. Yin and Yang ebb and flow, changing through constant motion. One can give rise to or be diminished by the other. According to Chinese medicine, a balance of Yin and Yang results in health; an imbalance leads to disease.

“What about a piece of chalk?” I asked. “Is it Yin or Yang?”

“It has characteristics of both Yin and Yang,” Fang said.

“Because it is dry, it is Yang. Because it is [solid], it is Yin. Its surface is Yang because its exterior is Yang, but its interior aspect is Yin. This piece of chalk, like all the universe, is a mixture of Yin and Yang.”

“This system is confusing to the Western mind.”

“Be patient, in time you will understand” (Eisenberg, 1995, 37-39).

While Eisenberg wants to label a “thing”, the chalk, his teacher only responds in terms of aspects that can be conceived on a spectrum between two adjectives: wet-dry; solid-rarified, interior-exterior. Fang only speaks in *pairs of yin and yang*.

Eisenberg also describes the relationship between Fang’s explanation and that of “Old Chang”, his first *Tai Qi* instructor. Old Chang lectures Eisenberg on the importance of a balanced life-style: “the mind, the body and the external environment are constantly influencing one another. By neglecting one, you neglect all” (Eisenberg, 1995, 42). (*Tai Qi* is a type of Chinese slow-moving martial art exercise form that aids circulation, strengthens the fascia of the tendon-ligament structures that provide postural support for the musculoskeletal system. This exercise builds a strong relationship to gravity in the form of a sense of balance.)

Pattern recognition. Eisenberg characterizes his Western training as focused on “causal relations, structure, and quantitative changes” with his Eastern training concentrating on recognizing patterns. This difference in perspective results in training and practices that are “worlds apart” (Eisenberg, 1995, 34). The method is individualistic, based on an overall assessment of a body’s specific patterns at a point in time, as opposed to the classification of pathologies as distinct diseases with common characteristics across all individuals; the same “disease” in the western medical model might be attached to any number of different specific patterns in relation to a specific individual’s functioning under the Chinese model (Kaptchuk, 2000).

“Patterns” are described within the analysis methods with the same root concepts described in Form School *feng-shui*, describing *qi* in terms of *yin-yang* balances:

...for thousands of years the Chinese have observed life processes and relationships between man and his environment. From this observation, the art of Chinese medicine has developed vocabulary to describe [a] myriad [of] subtle body patterns, [and] a method of description not available to Western medicine because of its emphasis on disease states. The Chinese approach is a more holistic consideration of health and disease and the delicate interplay between these opposing forces” (Caudill, 2000, xiv-xv).

Intuiting Pathology: Patterns, Man and Environment

Relationship to the environment more emphasized in the pattern approach.

Qi theory lends itself to a more pronounced perspective of the relationship between environmental factors and behavior. It is particularly relevant to

healthcare in terms of self-efficacy. It speaks to Ulrich's argument that environmental design for healthcare is critical to interwoven health outcomes (Ulrich, 1999). It also reinforces the general philosophy of a "salutogenic" well-being, or resiliency-oriented approach to health. The system therefore has wisdom that speaks well to the developing notions of nature-based restoration as a therapeutic intervention:

- for treatment populations, and
- as a "maintenance of well-being" *buffer*, an influence that supports overall system resilience for either treatment populations or for lowering health-related risks for general populations.

Pathogenic factors. In Chinese medicine, the conception of the classic pathogenic factors addresses the need for mid-range balances in all things.

Pathogenic factors are conceived in terms of several factors, including:

- the six climatic excesses (defined as wind, cold, heat, dampness, dryness, and fire);
- an extreme experience or repeated occurrence of unbalanced or negative emotions;
- lifestyle habits, such as too much or too little sexual activity, work, or exercise; and
- improper diet or intemperance in habits such as alcohol (Maciocia, 2015; Kaptchuk, 2000).

Congenital factors, relating to the specific characteristics of an individual's inherited constitution, are also considered in addition to these factors (Li-Jing, 2003; Maciocia, 2015).

Qi flow and resiliency. Historically, treatment emphasis was placed on prevention in terms of maintaining the smooth flow of "nutritive *qi*" and "defensive *qi*". These terms pertain to the Chinese theory of circulation systems in the body. Nutritive *qi* nourishes and constantly reconstructs the body. Its conception includes the densest form of clinically defined *qi* in the body: blood. Defensive *qi*

regulates and protects the body. This concept also centers on concrete fluidic phenomena. Lu (2013) translates this specifically as lymphatic fluid, but the concept also has other dimensions in the Chinese medicine framework, such as the fluids that produce sweat (Maciocia, 2015). Maciocia's 3rd edition Chinese medicine textbook (2015) is updated with a specific analysis of classical references regarding the defensive *qi*. Material new to this edition clarifies just where the physically concrete fluidic aspect of this *qi* travels, in the *cou li* just under the skin. *Cou li* refers to the connective tissue. There is a thin, contiguous layer of connective tissue just under the skin referred to in medical terminology as the subcutaneous fascia. The fascia is quite hydrated when in healthy condition (Meyers, 2013).

A treatment emphasis on resilience is intrinsically tied to the theoretic constructs of Chinese medicine (Maciocia, 2015). Chinese medicine scholars generally laud the Chinese tradition for this knowledge base's strengths in prevention, and an ability to address chronic stages of many conditions and illnesses at the initial onset of pathology (Eisenberg, 2001; Lu, 2013; Maciocia, 2015; Wiseman, et al., 1985; Zhang, 2007). Western medicines and surgery are suggested for treating acute stages of illness such as organ degeneration (Lu, 2013). However, organ degeneration is considered by Chinese medicine to be an end result of a long-term disruption of the basic rhythms that continually renew and rebuild the body's physical aspects. That is, the acute results of a longstanding condition that starts as relatively chronic. All conditions are seen to stem from an original disruption in the true *qi*, as "disharmonious" patterns of these processes (Lu, 2013).

***Qi* and our relationship to the environment.** *Qi* theory emphasis of the relationship between environmental factors and behavior. It is therefore particularly relevant to nature-based restorative landscape design. *Qi* theory speaks to the general philosophy of a salutogenic approach to health, and

suggests reinforcements and clarifications to the developing notion of restorative or therapeutic landscapes in two general categories:

- The direct biophilia-related restoration effects of the landscape itself. In the general categories of pathogenic factors, effects of landscape are most specifically addressed by theory of climatic and emotional influences.
- The promotion of good habit and lifestyle change through the landscape's ability to supply support for an individual's opportunities and motivation to initiate and maintain habit change. Theory of emotions and self-cultivation needs are included as part of the classic Chinese medicine theory. *Qi* theory has informed a value on gardens and nature as environments to nurture self-cultivation practices (Slawson, 1987; Zou, 2008).

Unified *Qi* Theory: Bridging Medicine with Design

Overview. Chinese medicine as a system of inductive and deductive reasoning (Maciocio, 1989; 2015). Maciocio argues that the application five element theory as applied to medicine marked an important historic shift in Chinese medicine's paradigm. This shift was from operating in a *purely* qualitative, or shamanic perspective, to a scientific perspective.

Qi theory's principle of resonance suggests an underlying mechanism of nature-based restoration in response to specific types of landscape. An understanding of how this theoretic assumption is developed in Chinese medicine clarifies and provided interpretive nuances of classical *feng-shui* poetry. Interpolating from Chinese medicine, a key design goal of *feng-shui* is the microclimate modulation of a site. A second design goal inferred by Chinese medicine is to nurture a potential shift in emotional states by way of the beauty of an environment. In the Asian garden tradition, there is thought to be a resonant qualitative response to beauty in a natural landscape (Zou, 2008). Beautiful

gardens have therefore provided an appropriate setting for a long tradition of self-cultivation practices (Slawson, 1987; Zou, 2008).

Lee (1986) argues the ideal site analogy intrinsically encompasses ecological, functional and behavioral aspects modeled on nature when applied to site location analysis and design process. The vortex archetype clarification of this analogy reinforces Lee's argument from a scientific rationale. Lee's claim is essentially that proper use of the analogy in design guarantees a synergy of simultaneous design goals. The key principle at play is biomimicry. However, the essence of what is to be mimicked to achieve proper results is important to be understood. The underlying *feng-shui* assumption seems to indicated the biomimicry of the vortex as a prototype for biodiverse complexity. As the vortex archetype as a key pattern nature employs for organizing complex systems, it reveals several of the mechanisms of nature's wisdom (Schwenk, 2001). Modulation of environments is one (Fang, 2000). The formation and the the function of sense organs is another (Schwenk, 2001). The general hypothesis is that this principle of biomimicry, properly executed, should indeed function well in terms of resource efficiency and biological diversity. Resulting designs should then also function well qualitatively, for human aesthetic preferences.

The categories of *sheng qi*, (nurturing *qi*), and *sha qi*, (killing *qi*) can therefore be understood in terms of self-organization of complex systems versus entropy. The principle of resonance dictates a principle assumption: the underlying rhythmic influences of the *feng-shui* support dynamic equilibrium in living organisms. Killing *qi*, as entropic informational patterns, disrupts self-organizing dynamics of life forms into turbulence. This provides an over-arching *feng-shui* principle as an informant for restorative landscape design.

Sheng qi can be increased through design, by mimicking the self-organizing movement patterns of fluid media. This can be done in both image—fluidic flows of the air and water circulation within the site and in relation to its regional landscape—and form—the underlying force relationships and

informational patterns of the spatial forms of the site. This principle appears to apply simultaneously to two main categories. The first is climate modulation. The second is aesthetic preferences that relate to more qualitative emotional phenomena.

Climate: design to create a *feng-shui* situation of ideal microclimate. A

Goethian science *qi* theory interpretation in combination with the basic tenets of Chinese medicine clarifies the importance the theory places on climate modulation. Extremes of climate are thought to have influence on critical fluid flows of the body. This concept applies, for example, to blood flow and the flow of hydration in the fascial system.

This is conceived in terms of how thermal dynamics change the mechanics of water currents. The theory of periodicity of fluid flows in the body and how these are believed to be influenced by seasonal climatic changes is referred to by the classical Chinese medicine adage “midnight-noon ebb-flow” per White (2006, 268). These changes in flow with temperature variances are phenomena observable in water currents in the landscape that are discussed in Schwenk’s work as well (2001). This theory reinforces that a primary design goal informing classical Form School *feng-shui* was the identification or creation of an ideal microclimate location within the conditions of the regional landscape.

The work of Zitao Fang (2000) confirms this suggestion. Fang compared the ideal site typology features to modern bioclimatic studies, as “the science of small-scale weather” (Fang, 2000, 22). Fang’s work provides a starting point for understanding how the features of typical ideal site typologies do mitigate temperature extremes.

Several scientific *feng-shui* scholars clarify that “inauspicious” directions in classic *feng-shui* have a rational basis. These are directions climatic extremes arrive from relative to a central location (Fang, 2000; Lee, 1986; White, 2006). The trigram system is identified as originating from the middle and lower reaches of the Yellow River (White, 2006, 8). This area has monsoon climatic conditions

(White, 2006, 8). Winter winds bring cold from the north and northwest (Fang, 2000; Han, 2000) as well as dusty, polluted winds from the Mongolian border (Gage, 1989). Summer heat gain is an issue in the more southern parts of the region (Fang, 2000).

In relation to adapting *feng-shui* for other regions of the planet, Fang (2000) provides an important clarification. The “inauspicious” directions are not fixed. A designer must perform an analysis of the larger regional landscape to determine its unique “inauspicious” directions in relation to the contextual regional landscape. This understanding is also found in classical writings as auspicious and inauspicious directions are identified differently for different locations (Yoon, 2006).

Emotions and self-cultivation: transcendent environments. Bhatt discusses the metaphysical aspects of *feng-shui* design goals in relation to a principle of simultaneity (Bhatt, 2013). Bhatt’s analysis, an overall goal of *feng-shui* create a “transcendent” environment for fostering self-cultivation. Self-cultivation is part of a larger theoretic model of emotion used in Chinese medicine (Kaptchuk, 2000; Maciocia, 1989; 2015; Zhang, 2007).

Per Bhatt, the successful design of a *feng-shui* environment simultaneously layers physical needs with more qualitative needs (Bhatt, 2013). Bhatt (2013) makes a strong comparison between architectural theorist Christopher Alexander’s (1977) use of patterns and the metaphors used in *feng-shui*: “when different patterns are joined together, qualitative aspects of space, such as encouraging socialization and providing lighting, accrue cumulatively and influence well-being” (Bhatt, 2013, 189). Bhatt’s (2013) argument addresses the direct, positive emotional impact of *feng-shui* landscape. In practical design terms, *feng-shui* places an emphasis on copying clear organizational patterns seen in nature (Stark, 2005).

This can be thought of in relation to the development of beauty, as *sheng qi* (Paton, 1995), that invites a transcendent state of being. This shift in

consciousness can nurture personal growth and discipline: beauty in the landscapes can provide a supportive context for lifestyle and habit changes recommended by Chinese medicine. Self-cultivation practices are part of the recommendations of classical Chinese medicine to mitigate the effects of prolonged negative emotions. Classifications of the pathological emotional challenges are made in relation to each five element category and the related organ system that is most directly affected through resonance. Virtues are also specified for each five element category of resonant correlation. These virtues can be cultivated to create resiliency in the face of these challenges (Kaptchuk, 2000; Maciocia, 2015; Zhang, 2007).

Phenomenology reinforces transcendence theme. Zou (2008) reinforces an understanding of Bhatt's (2013) theme of transcendence in relation to the specific notion of *jing* in the landscape. Zou's discussion is from a perspective of the phenomenology of the human experience. Per Zou, Chinese landscape concept of *jing* relates to beauty in a landscape scene that creates an experience of unity between mind and environment (Zou, 2008, 353). Zou develops a description of the term *jing* through translated citation from classical Chinese literature. For example, Zou (2008) examines passages from fourth century poetry. A general theme is the effects of *jing* in the landscape, as its happiness and emotion, interweaving with the heart of the participant. Zou comments: "the poetical expression clearly conveys that the *jing* acted as an agent for both human emotion and perception" (Zou, 2008, 355). Zou also analyzes several examples of landscape themed poetry by poets from the Tang dynasty (from seventh to ninth centuries). Zou characterizes the experiences conveyed as the *jing* of the landscape enhancing the consciousness of the poet in a dynamic tension between the *jing* of the environment and that of the poet (2008, 356).

Conclusions. The emotional and climatic effects of landscape from the Chinese viewpoint dictate some specific design goals in relation to themes of bioclimatic modulation, and transcendence. In the next section, these themes will be used to

clarify classical *feng-shui* references as design informants for restorative landscapes.

Biomimicry of self-organizing movement archetype patterns is certainly the overarching design principle indicated by the conceptual definition of *qi* interpreted here. Chinese medicine develops *qi* theory in relation to specific effects on fluidic flows in the body in relation to both climatic and emotional influences. Environmental factors can present pathological influences as well as influences that nurture a shift to a more resilient state of being (Maciocia, 1889; 2015). However, these can all be understood in relation to *sheng qi* as organized rhythms in the landscape.

Design Informants from Unified *Qi* Theory: Creating Optimal Resonance

Overview. The *feng-shui* ideal type model served both for site analysis moderation: “Traditionally, the Chinese have altered landscape, when it is not perfect according to the ideal *feng-shui* model. They have also brought the model into their design when they needed to create a man-made landscape” (Xu, 1990, 9). Form School analysis methods can be applied to site selection as well as modification and design. This section clarifies classical references to form school assessment of *qi* and methods as key design informants for restorative landscapes.

Content: the five “geographical secrets”. The five geographical secrets are methods largely addressing site content, the elements of a site greater regional context of the site. These existence or lack of these elements are considered in assessing the quality of *qi* in a landscape: mountains, hills, water, specific site location, and orientation (Mak, 2004; Xu, 1990). Orientation can be understood in relation to content: orientation largely addresses access to optimal sunlight. In *feng-shui* sites, these elements indicate an accumulation of *sheng qi*. Each element is considered important, if one is missing it must be created (Xu, 1990).

As a design informant for restorative landscape, the five geographical sequences represent necessary site element content to be included. These elements in combination can be viewed as producing a more biodiverse landscape system.

Organizational principles of the ideal site. The preceding biophilic interpretation of *Qi* theory clarifies basic features in relation to a biomimicry of the vortex pattern. This is a further clarification of Lee's observation of the ideal site as based on an analogy of nature. The references to organs in relation to the ideal site and landscape are perhaps not meant to indicate a living organism in a literal manner. However, these references contain an insight, the understanding of vortex patterns as prototypes for self-organization. The key features of the ideal site, identified in the literature as having an inner and outer structure and a central location (Hwangbo, 2002) capture the basic essence of the vortex pattern.

A vortex in water responds as a likeness to a *sense organ* to differences in its surroundings and surrounding flows, functioning as a mediator between differences of any kind (Schwenk, 2001). It also functions as a prototype for form (Schwenk, 2001) and is vital in the formation of the sense organs of living organisms.

The information contained in the movement as image becomes the basis for the formation of the myriad of things. Observational study of these organizational patterns can provide precedence for design inspiration and deepen an understanding of how to design with *feng-shui* principles to optimize *sheng qi*. *Feng-shui* methods take on additional meaning as a more comprehensive understanding of the phenomena unfolds. With attention to underlying forces of movement in a site's design, a site can be encouraged to "breathe," in likeness with the key self-organizing principles observable in nature. These forces work together in a landscape to create an optimally modulated climate (Schwenk, 2001).

Inner and outer structure: form and force. In the vortex, multiple layers of fluid move at different speeds: slower on the outside, and faster toward the center. This is true in water, but also in the gaseous fluids of the stars, for example our own planetary system's sun. A downward funnel of suction results from lowered pressure at the center. This funnel has a characteristic pulse, with an expansion and contraction with a simultaneous rising and falling. This pulse repeats as the fluid media flows (Schwenk, 2001). It is necessary to consider the vortex archetype from a three-dimensional perspective to understand its rhythmic movement cycle, as illustrated in Figure 17.



Figure 17. Three-dimensional viewpoint of a vortex pattern.

The pulse and its underlying forces provide a distinct identity as a continually renewing self-organized form. The most abstracted universal and essential relationships of inner and outer structure of a self-organized complex system are symbolized in the hexagram system of the *Book of Changes* by the hexagram *Tai*, pictured in Figure 18.

Tai symbolizes a balance between in inner force acting outwards and outer force acting inwards (Lu, 2013); this basic polarity is necessary in maintaining the body, for instance. The opposite situation would signal the entropy of a system.

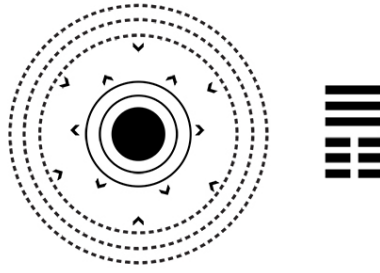


Figure 18. The forces of a system (left) as indicated by the Tai hexagram (right) (after Lu, 2013).

A key site feature is identified as having an inner and outer structure (Hwangbo, 2002). The rhythmic suction of a vortex archetype pattern meets the condition of polar force relationships described by this hexagram; this can be considered first in relation to the overall pressure differences in air flows within the site as opposed to its surroundings. The distinct identity of the site created by landforms is reinforced by the unseen informational patterns in a site the landforms and other features of the site influence.

Biomimicry of underlying forces in relation to form. Many classic design concepts such as contrast, balance between form and void, and rhythmic repetition are used by nature in relationship to an interpretation of *yin* and *yang* and the shape correlations among the five elements. These shapes include fire as triangles and pyramids, earth as squares and cube, metal as circles and spheres, water as the curving lines of water's characteristic meander, and wood as rectangular forms (Bhatt, 2013; Xu, 1990). Goethe's principles of polarity, an understanding of the vortex in movement as a prototype for complex forms in living organisms clarify the role that movements and forces play in relation to forms and their functions in nature. A definition of *qi* in relation to fluid flow reveals how force and movement relationships are an underlying aspect of biomimicry. The designer can consider these force and movement aspects to achieve a richer expression of biomimicry in the design process.

Architect Erik Asmussen's work provides a Goethian example in relation to architectural forms. Asmussen's process is guided by precedents put forth by

Goethe's botanical work. Polar metamorphosis is a key source of guidance and inspiration for Asmussen (Coates, n.d.). A sketch of Asmussen's Culture House at Järna is below in Figure 19.



Figure 19. Asmussen's Culture House (based on photograph by Coates, n.d.).

Coates (n.d.) diagrams a polar interplay between vertical and horizontal forces in Asmussen's work, as in Figure 20. The results are a playful and visible interplay between these polarities. This demonstrates an example understanding of the relationship between image and form, unseen and seen that is a key principle in *feng-shui* design. The interplay again creates a distinct identity of the building, as indicated by the concept of the Tai hexagram. For restorative landscape design, this awareness can be applied to structures such as windowed gates, infrastructure for seating or rest, and shade structures such as gazebos.

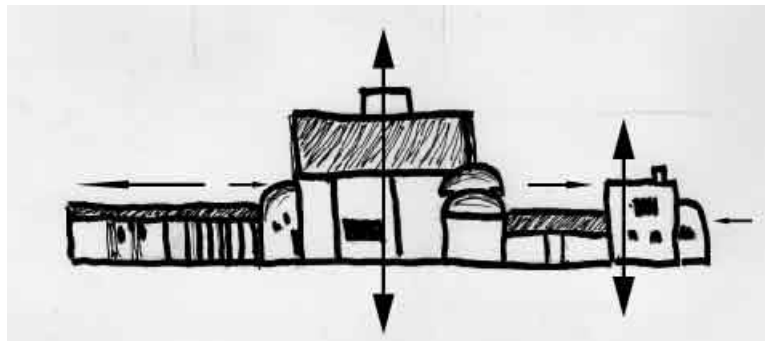


Figure 20. Diagram of an interplay of forces in Asmussen's Culture House.

(adapted from Coates, n.d.).

Functions of emblematic forms in the ideal site. The specific arrangement of emblematic landforms in the ideal site create an analogy of the structure of a vortex. The most essential understanding here is in relation to a landscape as a place where landscape resources (sun, water, and landforms) come together with self-organizing pattern in relation to acting as a complex system.

From a design standpoint, emblematic landforms must be understood in relationship to function. Emblems have several functions in a site. Mechanically, emblems provide a site identity and structure as described above. They should be arranged to consider modulating effects of the site's microclimate (Fang, 2000). This is referred to as accumulation (Fang, 2000; Xu, 1990). The arrangement of multiple emblems provides a way to create a distinct inner and outer structure of the site. Qualitatively, the containment created by the arrangement provides a sense of comfort and safety (Lynch, 2003). Finally, the forms can also provide images that please; classical *feng-shui* shows a preference for landforms that emulate biophilic animals, for example (Xu, 1990).

Containment. In classical *feng-shui*, the arrangement of landforms is used to simultaneously protect a site from directions of climatic extremes in the regional landscape. Containment of a central location of the site with landform or vegetative forms create a zone of protection from winds. Gently curving forms can also be used to influence air flows. The additional element of water complements with further benefits of modulation.

Fang's (2000, 21-28) analysis of the ideal site in relation to bioclimatic studies clarifies the site typology as a distinct watershed within this contained area. This explains a rational understanding of the use of the term "accumulate" in relation to water and the accumulation of *sheng qi*. The location of a *xue*, translated as "cave," "dragon lair, or "node" is positioned in the upland portion of the watershed. Upland zone, but close to the edge separating the upland zone and the collection zone. Edge within the upland zone are concave, with a

tendency toward dryness along the zone's axes. The edges of the collection zone are primarily convex, with tendency to be wet along the zone's axes. The ideal *xue* is in the upland zone, but near the zone of collection. The zone of collection provides the climatic modulation of water on the site. Fang's (2000) analysis provides an example of a more generalized classical *feng-shui* method, finding the opposition.

In design, trees and buildings can also function as emblematic forms. In relation to containment and microclimate modulation function of emblem organizational pattern, groupings of trees (Chen, et al., 2009; Gage, 1989) and/or buildings (Fang, 2000; Hwangbo, 2002; Lee, 1986) can also be used to achieve the protection and containment of a centralized open area, or bright court. This minimally requires that the emblematic form provide a substantial solid that deflects wind. Other functions may also be considered and incorporated in relation to trees.

For example, classical *feng-shui* practices included planting groupings of deciduous trees as a north-oriented emblematic form to absorb dust riding on seasonal winds from the northwest Mongolian border (Gage, 1989). Deciduous tree groupings might be planted as a south-oriented emblematic form to shade a southern orientation that invites an excess heat gain in the summer. This choice still allows the benefit of solar heat gain in the winter season (Fang, 2000).

A more complex example of this strategy is the case of the Ryukyu islands in the southernmost part of the Japanese Archipelago (Chen, et al., 2009). These islands are vulnerable to chilling winter winds and fierce summer typhoons and are generally lacking the protective hills of the ideal site formation. On one of these, Tamara Island, a curving forest belt was planted in 1742, in the north, to connect hills in the east and west, to complete the ideal site's armchair formation. Two species of trees were originally planted; over time, the belt developed into a more richly biodiverse forest. A case study concludes these trees have provided

protection for the village on the island and play a significant role in the island's biotope (Chen et al., 2009).

Finding the opposition. Xu (1990) identifies several historic *feng-shui* methods summarized as brief poetic adages, translating and verifying the methods of Yang Junsong' *Han Long Jing*, (c. 850 AD). One of the metaphoric references involves "finding the opposition" (Xu, 1990, 32). This is any point of relative contrast in the landscape related directly to the phenomena of vortices. Figure 21 provides an example of water meeting a landform. Vortex patterns arise in water wherever contrasts meet, and acts as a moderating force between extremes (Schwenk, 2001).



Figure 21. Water and land meet to create a point of opposition.

The same principle applies to the contrasts of air and water meeting in a landscape. In landscape, air and water act together in relation to temperature differences of distinct regions of landform and vegetation, as in Figure 22 (Schwenk, 2001).

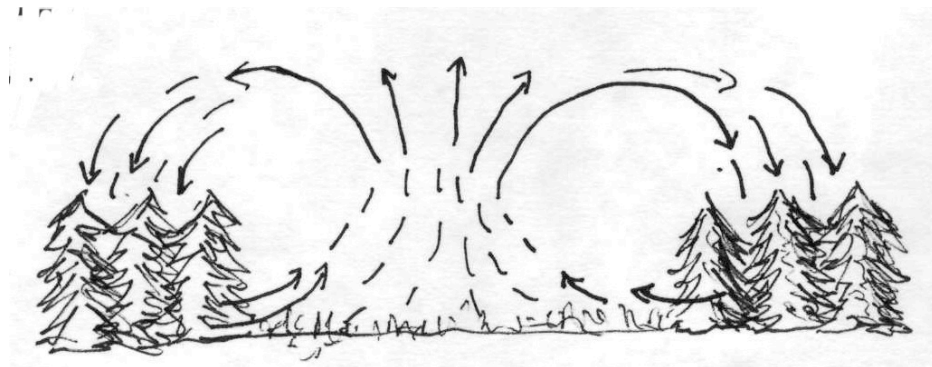


Figure 22. Air flow interpretation of the "moving and mating" poetry (after Schwenk, 2001).

The example in Figure 22 shows a grassland region bordered on each side by regions of conifers. The greater heat gain in the open grassland rises in summer, carrying evaporating moisture. In winter, the effect is reversed. This moisture is drawn by the cooler region of contrast created by the forest vegetation, and a modulating around-the-axis flow is created. To generalize, “the air space above a piece of land forms a totality with it, and the air moves accordingly” (Schwenk, 2001, 105).

The effect creates a type of “breathing” in the landscape. This “breathing” effect provides another nuanced understanding of another of the classical *feng-shui* methods, “moving and mating” (Xu, 1990).

Moving and mating. Another of the poetic metaphors in Junsong’s classical methods is to “find the place where the Yin and Yang dragons are mating and moving” Xu (1990, 34). Xu notes the interpretation of this metaphor in relation to the balance between void and form, but more specifically in relation to a widening or opening in a river valley in a mountainous landscape, as in Figure 23. Xu’s interpretation of a widening valley in plan and section is shown at the top. A reinterpretation is pictured below, in section, showing the landscape metaphorically breathing, as described by Schwenk (2001). This circulation pattern arises due to thermal gradient differences between regions of landscape and/or land and water bodies.

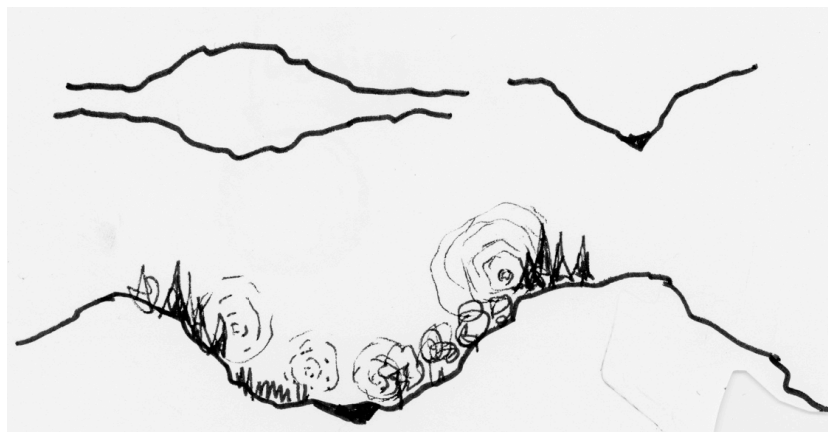


Figure 23. Moving and mating in the landscape (adapted from Xu, 1990).

Considering Schwenk's (2001) "breathing effect" for this configuration adds an understanding of the additional microclimate effects at play in this organizational pattern. In relation to two contrasts, the angle of the landform and differences in types of vegetative regions, and water bodies, landforms generate multiple "breath" modulations between regions with thermal gradient differences. The landscape has a rhythmic resonance that effectively enhances its microclimate. Such a microclimate is known to produce more biodiversity (Fang, 2000). The metaphor "moving and mating" therefore also conveys the additional movements a biodiverse wildlife as another rhythmic pattern. One can visualize patterns of birds flying on these air currents, making the patterns of this air and water "breathing" in the landscape visible (Schwenk, 2001).

The true dragon. Emphasis is also placed on the outer layer of the site. In mountainous areas, this outer layer is created by mountain forms. Another of Junsong's (c. 850 AD) classic methods (Xu, 1990, 45) uses the poetic metaphor of finding "the true dragon." This is a mountain range that has a sinuous, wavy form in plan and profile. Contemporary *feng-shui* master Stark (2005) clarifies this as a range with a complete, as in unbroken, fractal organization. Figure 24 provides a specific visual example of such an organized form, the island of Corsica. The valued fractal organization may be produced in the formative creation of the landform, or as effects of meandering water, or both.



Figure 24. The island of Corsica (photo courtesy Xavier Bilan).

Another aspect of the true dragon method is the metaphoric progression of the landforms. The auspicious configuration is that the outer lying landforms of the greater region follow a progression of shapes that correlates with the shape correlations of the generating cycle of the five elemental phase metaphors. This is represented in Figure 25 with exemplary landforms from left to right: a triangular fire form, a table-shaped earth form, a dome-shaped metal form, curving water forms, ending with a rectangular wood form.



Figure 25. Morphological sequences of mountain forms in classical *feng-shui*.

Yoon (2009) notes that this method does suggest an early awareness and attention to the morphology of landforms. It is unclear whether there is a relationship with rational effects of this arrangement or if it is simply symbolic. The general conclusion informed by a Goethian interpretation alongside classic references (Yoon, 2006) is if there is a scientifically based rational, it would lie in either effects on wind relationships to the site, erosion of soils, or effects on water currents. The practice may be purely symbolic. If so, it would still be thought to have benefit to those culturally native to the system from a perspective of environmental psychology. Note that the sequence provides a system of progression useful to orientation. This provides a tool for navigation and rapid conceptual mapping for those culturally familiar with the five element system.

Goethian science provides a viewpoint from the formative perspective of the origins of the mountain range. Schwenk offers a discussion from the perspective of the formative period of mountains. Processes similar to the

archetypal flows in water take place. Therefore, the organized fractal formations of some mountains bear a direct relationship to self-organizing states of flow phenomena (Schwenk, 2001). Whether due to formative flows, water erosion, or both, a highly organized landform such as the island of Corsica is valued.

Assessing the water. Presence of water is a necessary component of the ideal site. There is an obvious evolutionary need for water as a resource. *Feng-shui* also suggests the designer consider water's important function in the creation of an ideal microclimate situation in a local site (Fang, 2000). Per *feng-shui*, water should be curving, and flowing at a medium speed (Xu, 1990). Some of these conditions, such as avoiding swampy or stagnant, low-lying water (Xu, 1990), have obvious rationale in terms of the growth of bacteria. However, a medium speed and confluences (Xu, 1990) are both the best conditions for the generation of vortex movement. What is most clearly suggested by the overall indicators for *sheng qi* in water is that these are all conditions where more vortex movement patterns arise. The qualitative effect is rhythms that create rich textures. These textures are as but as renewing and repeating organized forms (Schwenk, 2001).

Wilkes' water channeling systems. An example from Goethian science biomimicry of this *feng-shui* situation in water is the work of A. John Wilkes. Wilkes (2003) experimented with the principles of polar and sequential metamorphosis movements in water to develop his sculptural water channel systems. He stated an intention of wanting to develop an organ-like system that involved symmetry, as in some organ examples in living systems. These systems are now patented with the name "Flowforms." The systems develops a metamorphic sequence of symmetrical vertical movements that exhibit a rhythmic pulse. These systems can be interpreted in several ways, as fountains, or alternatively, conveyance routes such as the design pictured in Figure 26.



Figure 26. A *Flowforms* sculptural water channel system example (author sketch, 2011).

Landscape architect Herbert Dreiseitl is certified in the Flowform method uses Wilke's specific concepts in some of his more sculptural expressions with water design on sites (Wilkes, 2003). However, study of Dreiseitl's work also provides precedence that the beauty of vortex patterns can be highlighted by very simple means. Highlighting key movement archetypes of water speaks to biophilia in relationships to these as part of the formative principles of life. An understanding of these principles offers many opportunities for inspiration in relation to the design of water on a site.

Jagged rocks. Generally, jagged rocks might indicate an area where interaction with water has not yet produced rich local soil and is therefore not able to produce fertile biodiverse vegetation (Yoon, 2009). This does not indicate a negative *qi* as much as, "unrefined" or "raw," indicating an area that is not at a point of evolution to be ideal as human habitat. Therefore, use of river rock or otherwise "softer," more eroded rock would be preferable. Softening areas where hardscapes are needed in restorative landscapes can be done by providing a contrasting site element nearby, such as water, per the classical *feng-shui* method of opposition.

General Conclusions - Eastern Concepts of Restoration Theories

Beauty in a landscape should aim to provide a qualitative experience of transcendence that nurtures a shift in consciousness. Transcendence in a restorative landscape can provide support for additional salutogenic self-management practices. Classical *feng-shui* methods can be understood in relation to an overarching design goal to create positive rhythmic resonance. This offers a design opportunity to increase the resonance of *Sheng qi* on the site through biomimicry. More complex patterns of movement in the landscape can be encouraged to arise through strategic placement of forms. Through a conscious application of classical *feng-shui* methods to the design of a restorative landscape, simultaneous *feng-shui* design goals can be achieved. Examples are creating a distinct site identity, optimizing the climate modulation of the site, and creating an aesthetic sense of resonant *jing* in the landscape that awakens the heart and the senses.

WESTERN CONCEPTS OF RESTORATION THEORIES

Overview

The following material outlines the basic conceptual definitions of the theoretic constructs used for empirical research in restorative landscapes. These conceptual definitions are then discussed as design informants.

Conceptually, understanding the restorative effects of contact with nature on human behavior falls into two theoretical frameworks: Attention Restoration Theory (ART) (Kaplan and Kaplan, 1989), and Stress Reduction Theory (SRT) (Ulrich, 1999, 2008). These frameworks address the mechanisms of nature-based restoration through physiological responses and their relationships to qualitatively described human experience.

Conceptual Definition of Attention Restoration Theory

Attention Restoration Theory (ART) Overview. Stephen and Rachel Kaplan, developers of Attention Restoration Theory, relate the restorative effects of contact with nature to conceptual and spatial organizational patterns in the landscape. They argue that landscape preference is defined by human adaption to these organizational patterns (Kaplan and Kaplan, 1982; 1989). This approach is now generally known as the *adaptive-evolutionary perspective*. A key precedent influence informing their framework is the work of geographer Jay Appleton, “prospect and refuge” theory (Kaplan and Kaplan, 1982; Appleton, 1975).

The Kaplans’ framework is based on the proposition that positive response to nature is facilitated by optimal patterns of spatial organization of appropriate nature content. They argue that it is not simply the *elements* of a site

that elicit a positive response, but its *patterns*. The Kaplans work is based on the concept of cognitive mapping, the relationship between perception of an environment and its representation in thought.

Their application of cognitive mapping speaks to adaptive-evolutionary theory, with the argument: “information processing must be adaptive, that is, it must play a central role in survival” (Kaplan & Kaplan, 1981, 117). Unique to the Kaplans’ approach at the time was looking at preference in terms of this approach to an adaptive-evolutionary theory framework: “Our discussion of preference has led us to a conception of humans as spatial animals constantly assessing the possibilities presented to them by the environment, and making their choice accordingly. This is not a traditional conception.” (Kaplan and Kaplan, 1981, 89.)

The Kaplans cite two precedents as informing the development of their reliance on landscape content and spatial organization as predictors of environmental preference. One part comes from the ecological psychology theory of John J. Gibson relating to the importance of environmental “affordances” (Gibson, 1979). Environmental affordances address the assessment of such questions as, “what can be done with this object” as applied to the content and spatial organization of landscape.

Jay Appleton’s “prospect and refuge” framework (Appleton, 1975) facilitates the application of the concept of “affordance” specifically to landscape perception (Kaplan and Kaplan, 1981). Appleton argues that much of our notion of environmental aesthetic is a visceral reaction to environment in relation to habitat, “that is to say as a place which affords the opportunity for achieving our simple biological needs,” noting that “habitat theory, in short, is about the ability of a place to satisfy all our biological needs” (Appleton, 1975, 70). However, it is the satisfying of biological needs incumbent during Hominid evolution in the savannahs of East Africa that drives environmental preference. Appleton posits that preferred landscapes reflect habituated responses to the structure of the

environment in which humans spent the last phases of their evolution as *Homo sapiens*. Evolutionary success evolved in an environment which offered prospect (or the ability to see) the hazards that threatened evolutionary progress and provided refuge from the perils associated with these hazards.

The Kaplans build on the notions of environmental affordance and habitat theory in the creation of a conceptual framework for explaining landscape preference. In applying these perspectives to the explanation of environmental preference, the Kaplans suggest that “the concern to make sense out of the environment is one of the most pervasive of human needs” (Kaplan & Kaplan, 1981, 77).

The preference framework. The Kaplans’ preference framework is summarized in Table 1 below.

Table 1. The Kaplans’ ART Preference Framework (after after Kaplan & Kaplan, 1982).

	MAKING SENSE	INVOLVEMENT
PRESENT OR IMMEDIATE	Coherence	Complexity
FUTURE OR PROMISED	Legibility	Mystery

The preference framework makes use of a distinction between two temporal conditions as perceived in an initial combined cognitive assessment of an environment. This framework argues for basic relationships to preference as related to critical *balances* between adaptive needs: the immediate need to make *sense* of an environment, and a subsequent state of *involvement and interest* related to an inferred future of exploring this environment.

Preference related to meeting the range of aspects. The first temporal aspect of the preference “deals with the rapid assessment of,” what’s right there” in an immediate environment. There is a concern to grasp the main elements and relationships of the scene, of “the picture plane” (Kaplan & Kaplan, 1982, 82). Ideal landscapes therefore meet the requirements of balance by between offering

at least minimal “coherence”, appealing to a cognitive map, while also providing an approachable amount of “complexity”.

The latter concept relates to the diversity of visual elements in the picture plane as a basis for becoming interested and involved with the environment. Increased complexity of visual content invokes exploration of the scene. At least, if the diverse content has an organized visual framework. For example, a balance between vertical elements such as trees, and horizontal elements, such as a smooth ground plane, provides coherent complexity. In Figure 27 below, trees are balanced by the horizontal textures of the path, the low ground cover vegetation, and the expanse provided by the observable part of the lake. There is a general balance between openness of the site and regions of information. The site pictured is somewhat dense but still relatively balanced. However, imagine the site with additional trees, and vegetation. This version would be too complex on the spectrum. A site that is open but entirely horizontal ground plain, with no vertical elements to provide differentiation would be too far on the other end of the spectrum. Such a site is relatively incoherent (Kaplan and Kaplan, 1989; Kaplan, Kaplan and Ryan, 1998).



Figure 27. Coherence and complexity inform a balanced preferred landscape.

The preference framework’s second temporal aspect addresses a balance between ‘legibility’ as the landscape offering landmarks and other features allowing an inference that it could be navigated without cognitive confusion, and “mystery,” presenting the implication that there are interesting things to be

discovered upon further involvement with the environment. The continued engagement while moving into the landscape is therefore appealing (Kaplan and Kaplan, 1982; 1989); this notion clearly relates to Appleton's (1975) notion of prospect and refuge. For example, a site that has a structure that is partly obscured by trees, landforms, constructed gateways, or other elements that frame but partially hide and a view with some extant offer mystery. Here again balance between the extremes of the preference matrix is critical. It is important that the visible features of the space indicate a continued legible organization of the landscape. This organization should promise interesting new views that invite further investigation, but also appear approachable to navigate.

Distinct regions of terrain or vegetation, especially if some provide vertical elements and some provide a somewhat smoothly uniform and visually available ground plane, meet the needs of the mystery-legibility balance. Such a balance invites a navigable further exploration of the site: depth cues and landmarks are available to assist creating a cognitive map of the area in relatively quick order. (Kaplan, Kaplan, and Ryan, 1998). In the example provided in Figure 28, the layered regions of the landscape offer a sense of depth. The rich patterned textures of the tree lines in the foreground also contribute to this sense of depth. High peaks act as distinct landmark features for orientation. However, there remains a sense of mystery and opportunity to engage with the landscape further.



Figure 28. Mystery and legibility inform a balanced preferred landscape.

Cognitive chaos and rapid neural inference relating to landscape content.

Despite the discussion of two distinct temporal aspects of the cognitive appraisal in terms of the *affordance* of the environment, both of these temporal aspects are hypothesized to take place with neural reflexive immediacy. In examining landscape preferences in relation to spatial organization using the preference framework, the Kaplans (1989) specifically argue that informational patterns in the landscape yields to rapid cognitive mapping. This synergizes with: “an ancient neural structure that processes visual information with great speed and little need for inference” (Kaplan and Kaplan, 1989, 84). This verbiage references their earlier theoretic work of cognitive perception: “the pattern that such observations suggest is that preference calls for at least a modicum of the qualities that permit immediate processing” (Kaplan and Kaplan, 1989, 58).

The Kaplans follow the development of preference related to adaptive needs with an observation about the continuum of cognitive chaos. This includes an assertion that an individuals’ state is subject to many influences from patterns of attention and fascination: *if* the need for legibility is both sufficiently met, as well as balanced with the promise of inherently intriguing, yet coherent stimuli, another cognitive shift important to restoration *may* take place. Features that capture attention, such the rich textures of plants, gentle movement patterns of water or leaves (Kaplan, S., 1995), or wildlife such as birds in flight invite a shift to fascination (Kaplan, Kaplan, and Ryan, 1998).

Fascination. The shift to fascination involves a distinction between two types of cognitive attention. The first type of attention is willful or voluntary attention that requires effort, and this effort over time leads to mental fatigue, with the most obvious effect being, “a decline in the capacity to force oneself to attend” (Kaplan & Kaplan, 1982, 106). The second type of cognitive attention is “soft attention,” or attention related to interest and involvement with the surrounds, contrasting with work-related needs demanding voluntary attention.

Soft attention evolves in relation to the preferred landscape's ability to offer immediate interest and the promise of additional interest in terms of mystery associated with further engagement with the environment. In terms of restoring cognitive drain, or cognitive fatigue, the mechanism at the heart of ART is the shift from voluntary to involuntary attention. Engaging with a nature-based environment while in a state of soft attention—as being intrigued and stimulated in a nurturing way by the environment generates a state of “fascination” (Kaplan and Kaplan, 1982; 1989), which is characterized by a shift to the use of more intuitive and creative cognitive process. Fascination is a central concept in ART that informs design. Perhaps the primary design goal for participant experience from ART is to create a landscape that increases the likelihood that a participant might quickly let go of the concerns related to cognitive tasks and shift to a state of cognitive fascination, or soft attention.

Design informants from ART

Preference study data analysis. From preference study data, the Kaplans found that landscapes that are on either end of middle ranges – such as an open but undifferentiated space, or a space that is thick with vegetation cover, receive consistently low preference ratings. Landscape that is at least a mid-range between “coherence” and “complexity” such as spaced trees with smooth ground is consistently high in preference. These landscapes offer a high contrast between the patterns of light and dark. One way that a scene might offer a high degree of both coherence and complexity is to have a moderate number of distinct regions but with each region having rich texture. (Kaplan, Kaplan, and Ryan, 1998).

The Kaplans (1982, 1989) relate legibility with distinctive features, but mention that these may change with familiarity and that patterns of organization may become increasingly discernable with repeated experience of a particular

landscape. Mystery depends on being able to infer there is more to see. Having the indication of such partly revealed by a partially but not fully obstructed view, for instance, helps mystery. If the obstruction offers spatial organization, such as a windowed fence or gateway, it offers both mystery and a coherent legibility.

Design characteristics for restorative settings. The Kaplans (1989) define four concept categories as important to design specific to restoration of mental fatigue: being away, fascination, extent, and compatibility. Being away means basically that the environment allows one to have a sense of being somewhere separate and different from one's usual setting. However, this need not even be more than being able to look out of a window at a natural scene. Extent means that the environment provides either the actuality or sense of being large enough to have its own properties and rules, and further speaks to "being away"; this extent can also be conceptual as well as physical, such as historic references that evoke a sense of the place over time. Fascination might be offered by multi-sensory stimuli such as the sound of the wind, movement patterns or the play of light, and watching wildlife. Compatibility relates desired activity or inclination with the circumstances of the environment. The Kaplans (1989) note it is perhaps easiest to understand when it is missing, such as being distracted in a walk by mosquitoes.

Pattern language. Kaplan, Kaplan, and Ryan (1998) translate the ART into a simple and practical design handbook. The work employs an example established by architect Christopher Alexander (1977) called "pattern language". This work is appealing to the Kaplans as one can describe overall informational pattern "design solutions" without presenting site-specific limitations. These are organized into themes that often overlap.

Important elements are and trees and water. A particularly important preference patterns include having a distinct number of coherent areas or regions. These regions work best for preference when they are spatially organized in patterns connoting mystery through partially but not fully obscured

views. A sense of depth can be created by the layering of regions and a making balance between vertical and horizontal regions. If the regions are distinct from one another, they also act as specific and unique landmarks. Another important pattern is openings that offer an expanse or extant such as smooth ground or a lake or river.

Maps, paths, and signs can offer cues for way-finding, along with distinct regions. Gateways and partitions can help provide orientation, directing a view, a sense of “inside” and “outside,” and offering a sense of mystery with partially observable and partially hidden features in the site. Providing a balance of small spaces and extensive views can provide a sense of being away; contained spaces can provided contained enclosure, while still opening towards expanses to provide extant. Curving trails are preferred, and offer mystery, but should follow the lay of the land. Water preferences show that curved, naturalistic water edges are preferred; vegetation near water is also preferred if it also meets the conditions of both coherence and complexity by being organized as distinct regions.

Conceptual Definition of Stress Reduction Theory

Ulrich’s “Window Study” breakthrough. The initiation of a wave of research in the area of the inclusion of nature having scientifically measurable impacts on health outcomes in relation to healthcare environments is generally credited to Ulrich’s (1984) now famous window study in 1984 (Sachs, 2014; Sternberg, 2010). Ulrich compared statistics for gall bladder surgery patients recovering in a hospital room with a view of trees as compared with similar patients having a view of a wall. The study showed patients in a room having a view of trees exhibiting shorter postoperative stays, reduced complications, reduced use of pain relief narcotic drugs, and more positive nurse evaluations (Ulrich, 1984) for those patients having a view of a wall. The group with the wall view had more

negative nurse evaluations (e.g. notes on patients being upset or needing a lot of encouragement). The original study has been validated repeatedly since Ulrich's original study (Marberry, 2010; Ulrich, 2008).

Ulrich's empirical focus aimed to win over two highly critical audiences: doubters within the empirical science oriented medical community, and administrators with the strong need to assess impacts affecting bottom line care facility costs (Sachs, 2014). The window study made an impact in the medical community for two reasons (Sachs, 2014). First, the study showed significant outcome differences using the strict scientific empirical methods accepted by this audience. Ulrich's (1984) pairings of patients carefully controlled for other variables that could affect recovery: age, sex, whether they smoked, hospitalization history, year of the surgery, floor the room was on, and being treated by the same nurses (Sternberg, 2010). Secondly, all the improved health outcomes demonstrated in the study translated directly into potential for cost savings for care facilities—duration of hospital stay, amount of medication, degree of strain on staff, and patient satisfaction levels (Cooper Marcus and Sachs, 2014).

The window study, however, did not address theoretic mechanisms explaining how the view works; the study simply demonstrated results. Ulrich went on to develop a mechanism theory that could directly relate to impact on health outcomes within an emerging medical understanding about the negative impacts of chronic and acute stress. While Ulrich has recognized the Kaplans' notion of cognitive restoration and the mechanism of fascination, he apparently did not view this mechanism as primarily causal to the health outcomes demonstrated in the window study. He later argued that fascination could not be the only mechanism at play (Ulrich et al., 1991). Ulrich developed the hypothesis of an affective, or rapid and pre-cognitive emotional response to nature based on similar patterns of landscape as tied to adaptive evolutionary theory (1983; 1991). Without making direct reference to the Kaplans' immediacy in neural

processing (Kaplan and Kaplan, 1989, 84) here Ulrich seems to translate this aspect of the Kaplans' theory to physiological concepts beyond the limitations of the cognitive psychology focus of the Kaplans. Ulrich argues, "feeling and thought are linked in different parts of the brain," continuing, "the limbic system, which appeared early in evolution, has a central role in emotions, whereas cognition takes place in the neocortex" (Ulrich, 1983, 90).

Ulrich's career was highly involved with evidence-based design specific to healthcare facilities and the specific needs of related populations, and also inclusive of work with architectural environments. His research reviews in relation to specific aspects of architectural environments informed a mechanism hypothesis relating an immediate response to the content and organizational patterns of adaptive-evolutionary theory to the physiological stress response (Ulrich, 1983; 1991).

Stress Restoration Theory overview. Ulrich first developed Stress Reduction Theory (SRT) in relation to influencing healthcare facility architectural environments as opposed to inclusion of nature (Ulrich, 1999). This conceptual framework leveraged literature review evidence for stress responses and reduction in relation to aspects of architectural environments. Ulrich argued for a paradigm shift: the viewpoint that environmental aspects influence health outcomes in a meaningful way. His argument was first built with the more easily approached subjects of single-variable control blind studies such as sound and sunlight (Ulrich, 1999).

Ulrich's first iteration of SRT as an argument specific to the inclusion of therapeutic nature content in healthcare facilities occurred at a time when empirical evidence of a relationship between nature and stress reduction was beginning to emerge (Ulrich, 1999). He, therefore, focused more on a substantial body of empirical outcome and survey research which already provided strong empirical connections between categories of movement and exercise, social

support, and control as offering stress reduction for patients, their families, and staff (Ulrich, 1999).

The general argument for how coping resources offered by therapeutic gardens influence health outcomes can be outlined in the Figure 29 (adapted from Ulrich, 1999). This argument obviously promotes restoration gardens as more than passive views, although Ulrich also make a strong healthcare facility recommendation to providing passive nature views in patient rooms (Ulrich, 2008).

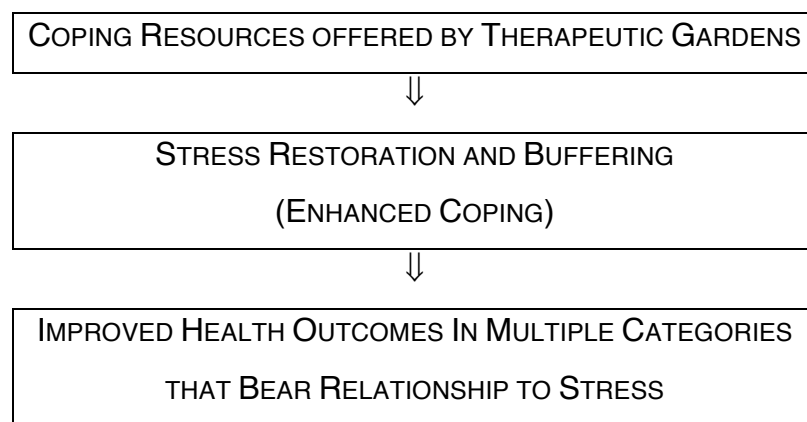


Figure 29. The coping resource argument for therapeutic gardens.

Ulrich relied heavily on the concept of *health outcomes* in the arguments presented for SRT. He defines these as “an indicator or measure of healthcare quality” and further developing a categorical list of types:

- *Observable signs and symptoms* relating to patients’ conditions (examples: intake of pain medication, blood pressure, length of hospital stay);
- *Satisfaction* and other reported outcomes (examples: patient satisfaction, health-related quality of life, staff satisfaction);
- *Safety outcomes* (examples: infection rate, medical errors, falls);
and

- *Economic outcomes* (examples: cost of patient care, recruitment or hiring costs due to staff turnover, revenue from patients choosing a facility)” (Ulrich, 2008, 88.)

When experienced chronically or acutely, stress has been shown to influence negative physiological results. It is therefore significant to the multiple categories of outcomes listed above, interwoven between the stress reduction needs for patients, staff, and families (Ulrich, 1999; 2008).

Types of stress: “good stress” versus “bad stress”. In developing his conceptual framework of stress reduction, Ulrich (1999; 2008) identified stress as including numerous psychological/emotional, physiological, biochemical, and behavioral changes. The physiological changes associated with physical stress response relate to the rapid shift between the parasympathetic and autonomic nervous system activation popularly earmarked by the phrases “rest and digest” and “fright or flight,” respectively. A set of physiological responses prepares the body for action: heart rate increase, muscle tension, skin conductance, an increase in systolic blood pressure and hormone changes all rapidly take place. (Ulrich, 1991; McEwen, 2007).

Physiological stress is by nature adaptive, and important, in the face of life’s dangers. In this sense stress has a protective role: it helps a person mobilize in response to predators (or in modern urban terms, street threats), an accident, or a natural disaster. A *balance* of stress is important to health. Stress at appropriate levels provides exhilaration to meet a challenge leading to a sense of accomplishment. The medical term used for an adaptively appropriate ratio of stress is “*allostasis*”, as related to maintaining stability. This term stems from the broader medical term “*homeostasis*” referring, in physiological usage, to the body’s maintenance of stable function and condition. Its literal meaning is, “achieving stability through change” (McEwen, 2007, 880).

Negative impacts of acute or extended stress. Medical science is concluding that the many time-space mediators of the stress responses can cause depleted

or excessive responses in relation to prolonged elevated stress. Biochemical balances are lost. This condition is termed “alleostatic load” or “alleostatic overload.” Alleostatic load can have immediate effects such as fatigue from the overstimulation of a mediator, sleeplessness, depression, increased anxiety, and increased inflammation. (McEwen, 2007). Chronic stress creates changes in the hormonal system that relate directly with lowered immunity (Ulrich, 1999; Sternberg, 2010; Ewen, 2007). Chronic or acute stress also impacts on negatively toned emotions and self-defeating behaviors as manifesting when coping needs are not adequately met (Ulrich, 1999).

The brain is the master control center for most of the interrelated hormonal mediators related to the stress response. Alleostatic load affects the higher cognitive areas of the brain as associated with critical processing functions such as memory, anxiety, and decision-making. The amyglia, related to fear assessment and generation, and the prefrontal cortex can be affected: the amyglia can become hyperactive, throwing an individual into a chronic state of anxiety. This occurs with a period of chronic stress lasting just 21 days. The frontal neocortex, involved with negatively toned emotions, has an intimate connection with the amyglia and is also negatively impacted by prolonged stress. (McEwen, 2007).

Interventions and nature-based stress restoration. Recommended brain interventions for stress include moderate and consistent exercise, social support, embracing a positive outlook, and making necessary lifestyle changes such as cessation of habits, for example smoking (McEwen, 2007). Growing evidence supports Ulrich’s hypothesis that interacting with nature provides an immediate—as 90 seconds to several minutes—shift to the parasympathetic or “rest and digest” response (Berto, 2014; Ulrich, 1991; 2008;). Ulrich refers specifically to this response to nature as, “biophilic distraction,” important to lowering alleostatic stress conditions, as well as having measurable benefits in relation to a lowered perception of pain (Ulrich, 2008).

Design informants from SRT

SRT focus on design for stress restoration coping resources and content.

Ulrich's initial coping resource argument has had great influence in terms of the development of philosophy around gardens for treatment populations, staff, and families for healthcare centers (Cooper Marcus and Barnes, 1999; Cooper Marcus and Sachs, 2014). The coping resource argument is important to understanding accepted contextual and programmatic goals for garden space design for therapeutic effects. It is important to provide: opportunities for social interaction; movable seating; the choice to take private moments of solitude; easy access and clear way-finding; as well as safety, comfort, and opportunities for movement and exercise (Cooper Marcus and Barnes, 1999; Cooper Marcus and Sachs, 2014; Ulrich, 1999). Additionally, the needs and strengths of the intended users must be considered, and participant-process oriented design is therefore encouraged. This is especially so for gardens intended for therapeutic activities for specific treatment populations, commonly referred to as *enabling gardens* (Cooper Marcus and Sachs, 2014).

As empirical research for nature-based restoration grew, Ulrich shifted his argument to more specific design guidelines regarding these spaces (2008). His focus was still highly geared towards the most empirically based end of the spectrum. Therefore, more easily measurable, content-related categories dominate Ulrich's design guidelines for nature inclusion in healthcare (2008). Access to daylight is one of the primary ones, but this must be considered with avoiding glare patches. Verdant vegetation, water and trees are all considered important stress reduction content. Also emphasized is using content to attract very specific forms of wildlife that engender a biophilic response, such as birds and butterflies.

Ulrich also places an emphasis, given the needs of vulnerable populations, on risk factors: over-enclosed and shadowy spaces, dominant hardscapes, scale-like or snake-like forms, loud or fast running water, and loud or confronting urban noise are all risks for stress responses in relation to environment. Art is also mentioned, as it has been shown that abstract or chaotic art may be more likely to be interpreted negatively by vulnerable populations. (Ulrich, 2008).

SRT and organizational patterns. As for organizational patterns, Ulrich summarizes using savannah-like landscape or park-like landscape patterns and refers to adaptive-evolutionary theorists such as Appleton and the Kaplans. Ulrich presents an argument for the adaptive-evolutionary theoretic perspective for three main reasons grounded in research data (Ulrich, 2008).

First, the stress reduction response is universal: research indicates a high agreement across diverse cultures and socioeconomic groups, suggesting a “hard wiring” nature of this response from survival-related adaptation. Second, the evolutionary argument predicts a rapid response. Stress reduction or increase would be predicted to happen within minutes, or even seconds in the case of some bodily systems. A third prediction of evolutionary theory concerns favorable and unfavorable responses to specific elements in the physical environment that can be related to the functional-evolutionary genetic conditioning argument. Humans have a disposition towards vegetation and water, and relatively none for built environment materials such as concrete, glass, metal and plastic. Preferred scenes tend to have spatial openness that provides prospect, sunshine or good light, and qualities linked to favorable habitat resources (Ulrich, 2008).

CHAPTER THREE – GROUNDED THEORY METHODOLOGY AND STUDY DESIGN

Grounded Theory Overview

Grounded theory methodology was used as the method of qualitative analysis for this study as an exploratory project. The end goal is creating a hypothesis grounded in the theory base of existing research. The specific problem statement itself initiated from a combination of personal and professional experience. This unique situation fits described methods for defining problems in grounded theory (Strauss & Corbin, 2008).

In grounded theory, concepts emerging from data build the foundation of a hypothesis that moves from the descriptive to the conceptual (Glaser, 2001). Conceptual categories and theories emerge from iterative processes between data collection, data coding, and analytic memo writing (Charmaz, 2014). The term ‘grounded theory’ itself refers to both process and its product, as theory that represents process and product alike (Charmaz, 2014). A distinctive feature of a grounded theory approach is a potential to focus on actions and processes rather than themes and structure (Charmaz, 2014). It therefore addresses the exploration of *feng-shui* in relation to a complex systems theory conceptual framework. It also addresses the more general problem statement to compare and adapt *feng-shui* knowledge for use in relation to the biophilia hypothesis.

Coding Techniques

‘First Cycle’ coding techniques used were a combination of InVivo coding to the cultural knowledge base of *qi* theory, gerund coding relative to processes and actions, and provisional coding in relation to nature-based therapies “restoration”

concepts. *In Vivo coding* is defined as codes defined from actual words or phrases from the actual language of the qualitative data. The root meaning of the term “in vivo” as refers to the state of being alive (Saldaña, 2013). *Process coding*, also referred to in some literature as action coding, uses gerunds or “-ing words”, connotes action in the data.

A second cycle of coding identified themes and eventually emerging theory. *Focused coding* was used to develop emerging categories from coded data based on conceptual similarities (Saldaña, 2013). The themes emerging around the sub-problem statement of *qi* theory were organized into groups into second cycle coding. Clusters of meaning emerged in relation to the gerund codes specific to processes as a process of focused coding.

Table 2. Coding themes summary.

Why	Theoretic mechanisms of the restorative response	The interrelated effects of stress on emotion, behavior, and cognition as common to all three theoretic frameworks. The Chinese medicine model emerged provides a comprehensive framework that encompasses much of ART and SRT frameworks and empirical testing results. However, it has an alternate view of the body and understanding of mechanisms specific to <i>qi</i> theory and fluidic flows in the body.
What	Content—site elements to include, or avoid/mitigate	Themes in content emerged around a correlation between the indicators of <i>sheng qi</i> and <i>sha qi</i> and reduction and risk factors for stress.
How	Organizational patterns of restorative landscapes	Themes in organizational patterns emerged around mid-range balances, habitat cues in relation to landscape patterns that modulate a local microclimate, and a correlation between these cues, preference, and emotional mechanisms.

The movement correlations and specifically the theme of the vortex emerged as central to the problem in a process of theoretical coding progressing toward a central theme for a conceptual definition interpretation of *qi* theory.

The same iterative process was applied to identify themes across the three theoretic frameworks in relation to the main problem statement. Coding was organized around the mechanisms, content and organizational patterns of restorative landscapes. Emerging theme clusters are summarized in Table 2. The general model provided by *qi* theory emerged as a key organizing principle for these emerging themes.

Grounded theory suggests a process of reflective analytic memo writing to generate codes and categories (Saldaña, 2013). The nature of this study's specific material also dictated additional visual processes. These processes might be described as analytic sketching. Certain theme and code relationships were only first realized through engaging in processes of visual expression beyond diagrams as conceptual sketches. At times, the visual aspect of the coding process also included purely intuitive sketching. Intuitive sketching produced a map for whole systems interrelationship. Sketching was at times instrumental in synthesizing complex systems "a-ha" moments, making insights more available for eventual verbal communication.

Conceptual Framework

A key source is the work of Donella Meadows (2008). Meadows compiled a summary of basic operational systems vocabulary and principles from interactions between interdisciplinary researchers as part of the MIT Systems Dynamics Group founded by Jay Forrester. Meadows presented this vocabulary and these principles in the work *Thinking in Systems* (2008), as a guide to useful, conceptually non-abstract systems theory. While these non-abstract complex systems theory terms will be familiar to many readers, definitions key to their

specific use in either the background literature review or key arguments presented will be either included in the body of the text.

An Appendix glossary, as well as a list of key complex systems theory principles, is provided for further reference for the interested reader in relation to the applications of systems theories in relation to salutogenic approach to health in relation to leverage points.

Scope

Chinese medicine concepts used in this study are limited to those taught for modern adaptation in western use. The Chinese medicine examination is limited to a moderate number of sources available to the modern Western practitioner. A commonly referenced classic cited in these references, the *Huang Ti Nei Ching Su Wên (The Yellow Emperor's Classic of Internal Medicine)* (Veith, Ilza, transl. 1966, no original publ. date) was also referred to.

The Goethian approach to scientific phenomenology has a vast amount of associated literature with many applications. This study focuses on a few selections relevant to biophilic design principles.

Relevance

The preliminary problem of this study addresses advancing the understanding of *qi* theory to provide a more in-depth interpretation of the biophilic metaphors of *feng-shui* knowledge. This provides a perspective on the theory in specific relation to restorative landscape design. The hope is to provide a small step in the conversation of scientific understanding of the conceptual theory of Form School *feng-shui*. An identified need is systematization of concepts and measures for non-arbitrary interpretation of *qi* theory. This step launches from Lee's (1986) conceptual definition of the Ideal Site as an analogy of nature.

Evidence-based design is an interdisciplinary field with many gaps of knowledge (Cooper Marcus & Sachs, 2014). The main goal of this study to develop an optimal set of design informants for restorative landscapes. This exploration hopes to reinforce the current understanding to the adaptive-evolutionary theory of preferred restorative natural landscape. It may contribute some nuances to the current understanding in relation to the identified commonalities between the *feng-shui* ideal site and adaptive-evolutionary landscape design informants (Han, 2001).

Limitations

In examining the concepts and methods of *feng-shui*, this study limits its scope to that of Form School as understood through contemporary high quality scientific *feng-shui* articles. Form School is currently the most systematically understood branch of *feng-shui* in contemporary academic scientific approaches (Mak and So, 2009).

The original historic texts were recorded in poetic language, open to multiple interpretations that were guarded as secrets (Mak and So, 2009; Xu, 1990) within a context of being passed from master to apprentice. Interpretation of these works is therefore a matter of ongoing debate and discussion. The *interpretation* of poetry and metaphor used in this study are therefore developed and declared explicitly as a modern, adapted conceptual definition of *qi* theory.

This study has recognized limitations regarding cultural understandings of a historical knowledge system, especially on the part of a researcher from outside of the specific culture that originated *feng-shui*. Recognized linguistic problems also present themselves for Western researchers of *feng-shui*: issues of terminology, translation and transliteration (Mak and So, 2009). It is noted by translators of Chinese that a brief character set might translate as a short phrase, or alternatively several sentences, depending on interpretation and nuances

chosen by the translator (Paton, 1995; Xu, 1990).

Cultural concepts therefore present obvious problems in terms of the critical assessment of validity of interpretation of traditional principles. This study does not attempt to maintain exact adherence to the cultural specifics of *feng-shui*. It hopes to employ the elegance and wisdom inherent in modern Chinese medicine's development of *qi* theory for an interpretation that is adaptive, as useful to contemporary and universal issues of human efficacy and health in relation to the biophilia hypothesis.

Terminology Convention

For the sake of more fluid prose, the interpretive *qi* theory conceptual definition and related *feng-shui* practices developed in this study will be referred to in the upcoming discussion chapters as *biophilic qi theory* and *biophilic feng-shui*, respectively. This terms are used in the discussion chapters to indicate the modern adaptation of *qi* theory from a Goethian science perspective.

CHAPTER FOUR – *QI* THEORY'S UNIQUE CONCEPTS IN RELATION TO RESTORATIVE LANDSCAPE DESIGN

Overview. This chapter briefly discusses the aspects of *qi* theory adapted for restorative landscape that lie outside of an intersection with ART and SRT.

These differences can be summarized as:

- the paradigm of Chinese medicine, including its view of the “body-mind” as opposed to mind-body;
- conceptual aspects of the design process itself; and
- the design informants of *feng-shui* concerning biomagnetic forces.

The aspects of these topics relevant to restorative landscape design exploration of this study are discussed first. A second section of this chapter summarizes findings in the *qi* theory literature review suggesting future research areas.

Mind Body Relationships in Chinese Medicine

Applying the model to restoration theory. *Qi* theory as used in Chinese medicine lends itself to a more pronounced perspective of the relationship between environmental factors and behavior due to its assumption of unity between man, heaven and environment. It is particularly relevant to healthcare in terms of self-efficacy. It speaks to Ulrich's SRT argument that environmental design for healthcare is critical to interwoven health outcomes (Ulrich, 1999). It reinforces the ART cognitive-related theory of the Kaplans (1982; 1989) but adds theoretic nuances. It also reinforces the general philosophy of a salutogenic approach to health and the developing notion of nature-based therapies beyond simple restoration.

The body-mind concept in Chinese medicine. Chinese medicine's theory in relation to emotion may be relevant to an understanding of the emerging synthesis between ART and SRT theory constructs. Like ART and

SRT, the theoretic framework has a recognition of important ability of landscape to affect emotions, and to provide an intervention for pathological emotional states associated with physiological pathologies. Chronic stress and chronic cognitive fatigue are both recognized in Chinese medicine as pathological influences that can lead to a pathological emotional condition. However, the Chinese viewpoint of causality within the body is a contrasting theory to the construct of western medicine (Eisenberg, 1995; Kaptchuk, 2000; Maciocia, 1989, 2015). Rather than the mind-body viewpoint of western medicine (Sternberg, 2001; 2010), one might say the Chinese view is of a *body-mind*. Sternberg's (2001, 15-38) discussion of neurological structures in the brain and understandings from more recent findings of neuroscience in relation to the phenomena of emotions lends a small suggestion of validity of this viewpoint from emerging western understanding of biochemistry.

The viewpoint could be summarized as emotions having a simultaneous effect of the processes of the visceral organs. The theory validates Ulrich's viewpoint of interwoven relationships between stress, physiological impacts, emotions and behavior (Ulrich, 1999; 2008). However, it provides different and more comprehensive set of causal relationships in relationship to which emotions affect what internal organ, and how behaviors will manifest. These are two-way relationships. Organ dysfunction gives rise to challenging emotions, and vice versa (Kaptchuk, 2000; Maciocia, 2015; Zhang, 2007), as shown in Figure 30.

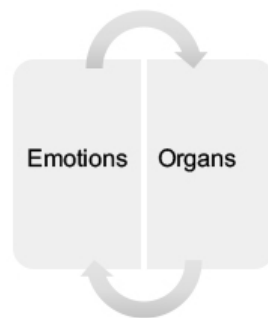


Figure 30. Emotions and organs in two-way reflexive relationship (after Maciocia, 2015).

In the Chinese viewpoint of the mind-body connection the visceral organs are what drive the cognitive phenomena of the cortex. The psyche, as conceived in the western paradigm, is seen as arising simultaneous effect from the functioning of the viscera in the Chinese medicine viewpoint. This is quite different than the western conception of the psyche in relation to the brain. (Maciocia, 2015). Chinese medicine’s overall classification of the body’s systems is quite a different view of functional categories. Figure 31 illustrates an overview.

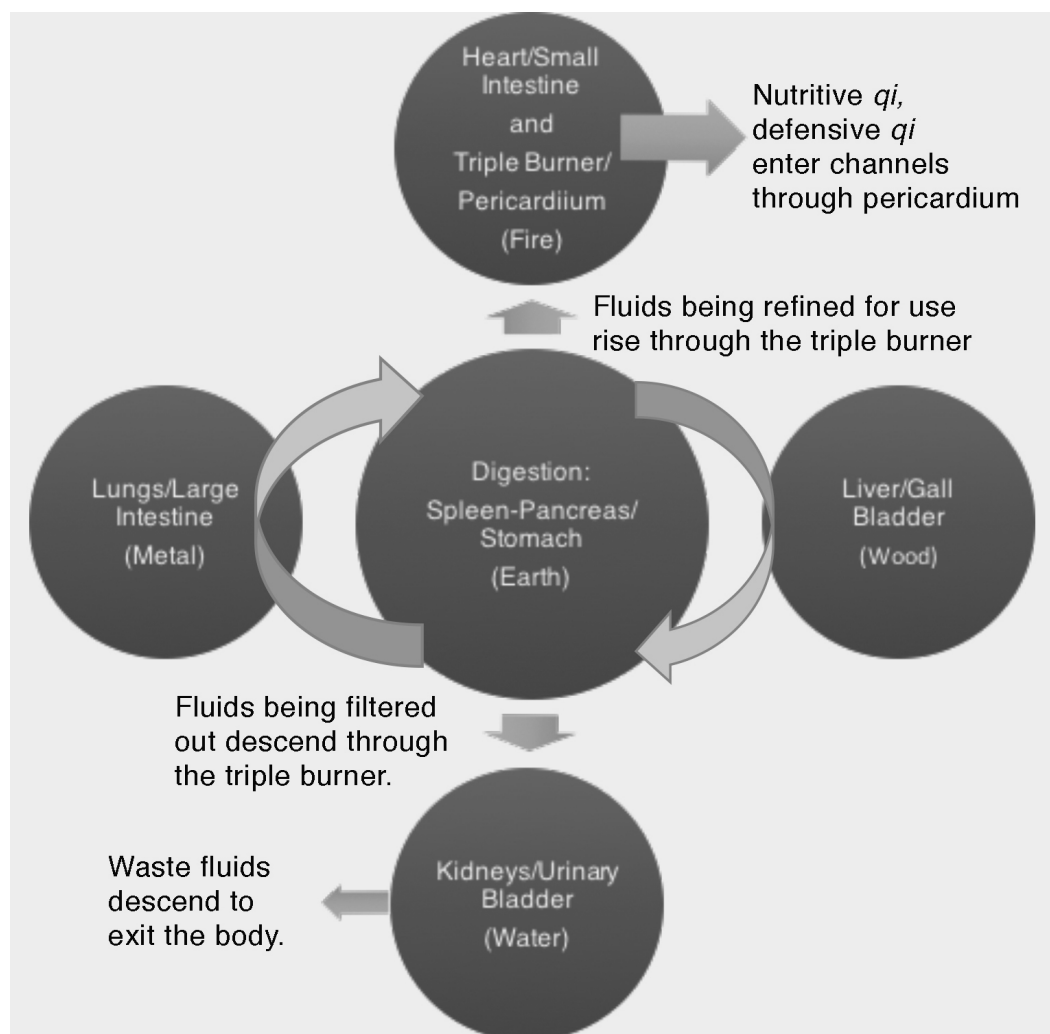


Figure 31. Qi flows, the organ complex, and the triple-burner’s role (after Maciocia, 1989; 2015).

Organs are categorized in pairs. *Yin* organs have transforming functions while *yang* organs have storage functions. Organs and interrelated categories of all the body's other systems are categorized in relation to five element metaphors of function, largely in relation to the movement correlations. The analysis of function centers around fluidic activity, referred to as the *qi* mechanism (Maciocia, 2015). This is modeled in relation to five element metaphors and their movement correlations. Fluids ascend and descend in relation to the heart and the kidneys as polarity of fire and water, with the related movement correlations of rising and falling. The lungs and liver together provide the "wheel" of contraction bringing in air with an expansion of circulative forces. This wheel is viewed a metaphoric wood-metal polarity. The five *yin-yang* organ pairs transform incoming food, air and water into the nutritive *qi* and the defensive *qi*. As each organ executes its function, fluids being refined for use in the body rise and fluids being discard descend. The transport center for these exchanges is a concept unique to Chinese medicine, the triple burner (Maciocia, 2015).

The triple burner governs the transformation and transportation of fluid. (Maciocia, 1989; 2015; Kaptchuk, 2000). The refined nutritive *qi* and defensive *qi* then enter the circulating vessels and meridians of the body through the heart and the pericardium, a system of tissue that protects the heart (Maciocia, 2015).

New material in Maciocia's most recent Chinese medicine textbook clarifies the structural aspect in relation to fascia in the abdomen. Maciocia has interpreted this from a classical reference to the *cou*, or connective tissue. A legend exists that the name of the triple burner originated from a burned appearance of these tissues witnessed in cadavers (Putra, 2016). The work of fascial anatomy theorist Thomas Meyers (2015) helps clarify the structure of this tissue, as illustrated in Figure 32. Fascia layering is interwoven in between three muscles of the superficial portion of the abdomen, the tranversus abdominus, internal oblique, and the external oblique. The pericardium encasing the heart is also part of the connective tissue system, or fascia (Myers, 2015). As the fascial

system is still the least understood system of the body in western medicine, attributable to its relatively ephemeral nature upon death, (Myers, 2015) more understanding is needed. However, these new insights help clarify some of the more intangible concepts of Chinese medicine's theory of *qi* flows in the body in a way that can be directly related to a theory of a mechanism of responses to the immediate environment.

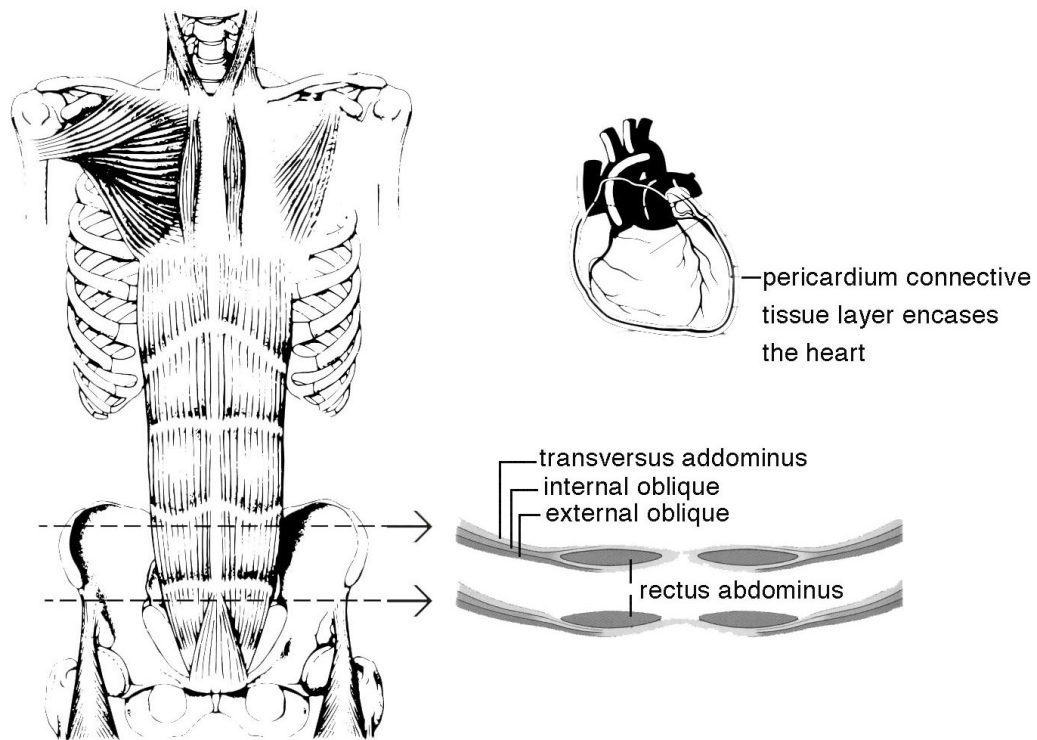


Figure 32. The triple burner and pericardium as connective tissue (fascia). (Scales are not relative to one another to show detail.) (Adapted from Maciocia, 2015; Meyers, 2015).

Self-cultivation interventions: the theory of the virtues. The theory of emotional pathology is also accompanied by wisdom regarding self-cultivation practices and virtues: each ruminating emotion can be eased by practicing the related virtue. The shift to more creative thinking is considered the virtuous state correlated to the earth element, a parallel to the shift the notion of entering a

state of fascination. Joy in the heart is relevant to restorative landscape theory of mechanisms. In the Chinese clinical gaze, a balanced state of joy has a positive physiological effect on the heart. The heart is viewed as the General of the other organs. The impact of joy in the heart is viewed to shift the heart towards harmonious function. This initiates a shift toward resiliency. The effects of joy are viewed as regulating for the system gestalt. Benefit to the heart is beneficial to the smooth operation of the *qi* mechanism in the triple burner. This further validates the Asian emphasis on the *jing* landscape discussed by Zou (2008).

The understanding of rhythmic influence developed in biophilic *qi* theory and the relationships of the extra “organ pair,” the triple burner and pericardium increasingly clarify the theory’s concepts in relation to climate of the environment and diurnal flows in the body. This relationship, known as the “midnight-noon ebb flow” (White, 2006, 226), provides the root of the theory of how changes in temperature might influence changes in blood and other circulation flow that stems from its meridian passageway concepts. Emotions are also thought to impact these flows (Maciocia, 2015). However, both influences would affect the very same mechanism. The fluid processes are considered causal of more qualitative effects, such as thought and emotion.

Biophilic *Feng-Shui* Design Process: Climates and Contexts

Adapting the design process. *Feng-shui* is believed to have developed in the central and lower reaches of the Yellow River basin, a regional landscape with mountains and climatic extremes. Ideal site organizational patterns are more specific than adaptive-evolutionary theory. However, (Fang, 2000, 43-59), clarifies a process for adapting regional specifics to other landscapes. This process needs to include the daily and seasonal patterns of solar and wind conditions in relation to the directions. *Feng-shui* land form and other placement

strategies need to be adjusted accordingly, as key function of the emblematic forms is to shield a site from these extremes.

For instance, even in China, southern regions adjust the facing of the ideal site slightly toward the east, due to the higher extreme of summer heat gain from the sun in the south (Fang, 2000). Deciduous trees that filter the sun in the summer but allow it to pass in the winter might also be used for this type of climatic-seasonal relationship. Gage (1989) notes a similar strategy used in the more northern areas of China, *feng-shui* practices plant trees are planted in the north to filter polluted dusty winds.

The process Fang (2000) recommends performing wind and solar pattern analysis in relation to seasons and directions. Fang also suggests a calendrical humidity index analysis. The directions and seasonal cycles of climatic influences can then direct a strategic placement of the ideal site's emblematic forms. These might be landforms or other structures, or masses of vegetation.

Habitat cues. A conceptual exploration of adaptive-evolutionary by theorists Heerwagen and Orians (1993) suggests that there may be a human evolutionary mechanism of preference in landscape that bears relationship with habitat cues. These authors discuss an interesting science observation regarding birds and habitat instincts. Certain species of birds instinctively respond to vertical and horizontal branching patterns to identify habitat outside of the reproductive season of food-bearing plants.

Considering this premise in relation to the strong emphasis on climate factors in biophilic *feng-shui* may suggest a mechanism for the evolution of preference. This relates to the specific organizational patterns favored by biophilic *feng-shui* for their effects in optimizing a site's local microclimate. Temperature changes as well as rhythmic flows of the environment would be thought to have resonant effects on the defensive *qi* circulating just under the skin, and in the fluid flows of the triple burner. If the environmental conditions for its optimal rhythmic regulation are met, per Chinese medicine these cues would

also have a beneficial regulating effect on the heart, accompanied by a consequent increase in joy. The triple burner might therefore be viewed as “sixth sense” that responds to climate conditions favoring the general health of its function.

Future Research: Chinese Medicine’s Paradigm And Biomagnetic Influence

Paradigm of the body explained by *yin-yang* pairs of fluidic flows. Chinese medicine uses a radically different viewpoint and categorization of the human body’s system as briefly explained in the literature review. It is clear from drawings in classics that the ancients were observing the same anatomical structures from dissection as known western medicine (Maciocia, 2015). However, a detail of fluid phenomena provides an insight to the rationale behind its viewpoint of the human body. All systems and processes of the body are described as belonging to one of the five element categories. An understanding of these categories in relation to pairs of vortex rhythms increasingly clarifies the perspective informing the Chinese medicine paradigm.

Note that in the chains of vortices that arise in a current behind an object or as water exits an opening. These chains manifest as *yin-yang* pairs, as the rotations in the metamorphic sequence alternate directions as they manifest, as in Figure 33 below (Schwenk, 2001).



Figure 33. Paired, alternating vortex rotations in flowing media.

A chain of vortexes induced when water exits from an *opening* initiates in a clockwise direction, as pictured on the top of the Figure 33. A chain of vortexes

induced as water passes around an object initiates in a counterclockwise direction, as demonstrated in the bottom of Figure 33. Schwenk notes, “In the paired arrangement of the vortices in a vortex train we have a principle of construction which occurs in the formation of paired organs throughout the animal and human kingdom (Schwenk, 2001, 53).

This suggests a principle of formation informing the classification of the Chinese organ pairs and the interconnected theory of meridian flows. As explained above, the system categorizes the body in relation to six *yin-yang* pairs of functional correspondences. Systems recognized by western medicine are at times non-existent in the Chinese model, in a sense, and vice-versa, due to the difference in paradigms of categorization (Fletcher, 2016). For instance, the twelve cranial nerve passageways in the brain, with their connections to sensory organs (Sternberg, 2001, 34), would each be classified under *different* element correspondences as associated with the organ classification systems. In the *qi* theory system, each of these nerves might be associated with each of the twelve *yin-yang* meridian classes and their related functions.

Without an understanding of fluid phenomena, the entire classification of Chinese medicine stems from seems almost inexplicable from a western viewpoint. This suggests an avenue for future research in the *paradigm* of Chinese medicine itself that might be helpful in correlating western empirical research and the *qi* theory model.

Water, Geomagnetic Forces, Biomagnetism, and the Body. The topic of water from the viewpoint of *qi* theory may be a rich area for future research as relevant to health outcomes, restorative landscapes and preference.

Direct rhythmic resonance in relation to water as a potential future research area topic of water preference and restoration response research. This could be through a mechanism of direct rhythmic resonance between water in the environment and the functional rhythms of the abdomen. A noted pragmatic side of the example of *Flowform* water channel designs is their ability to optimally

oxygenate water using the mechanics of nature (Wilkins et al., 2005; Wilkes, 2003). The oxygenation effects have been shown in research to result in more reproductive growth in plants (Wilkes, 2003). From the point of view of biophilic *feng-shui*, it may be reasonable to believe there are simultaneous physical or qualitative restorative effects on the body from situations with enhanced rhythmic pulsing of water, such as with the *Flowform* conveyance systems. Extrapolating from research with plants, Schwenk himself theorizes water exerts rhythmic influences of on the landscape participant in writings with his son (Schwenk and Schwenk, 1989), however subtle, are nonetheless important.

Qi theory also additionally suggests that biomagnetic fields arise from fluidic flow. In *feng-shui* practice, assessing both biomagnetic energies and water flow are important principles (Choy, 2009). There are suggestions in classical references that these forces may interact, and perhaps influence one another. *Qi* theory provides a suggestion would suggest that there might be a subtle effect on the fluids in the body and/or the biomagnetic field of the body as a resonant effect of biomagnetic fields in flowing water. The Chinese were recognized to have an early awareness of magnetism (Skinner, 1982) as well as tidal flows (Needham, 1981), there may be some worth to this theory. The hypothesis suggested by *qi* theory might also be informative in theory for preference related to the design of water in the landscape and water features.

Conclusions. The overall mechanism of restoration indicated in Chinese clinical gaze is tied to its theory of resonance between rhythmic organization in the landscape and in the body's fluid flows. A primary mechanism of restoration is the shift in the heart toward joy that may take place in response to beauty in the landscape. While its primary theoretic assumptions are very different from western medicine, its theoretic model views emotions, cognition and the response to landscape as intertwined, in commonality with ART and SRT theory. An understanding of *qi* theory places an emphasis on organizational patterns in the landscape that modulate climate. The designer of restorative landscapes can

benefit from an adaptive application of *feng-shui* strategies but must perform location specific analysis of daily and seasonal patterns in relation to the directions.

CHAPTER FIVE – DISCUSSION AND CONCLUSIONS: INTERSECTION OF *QI* THEORY, ATTENTION RESTORATION THEORY, AND STRESS REDUCTION THEORY FOR RESTORATIVE LANDSCAPE DESIGN

Chapter Overview

The synthesis of conceptual definitions will be discussed in relation to empirical research using the ART and SRT models. This overall synthesis acts as a design informant for optimal restorative landscapes. The *qi* theory five element model does in some ways model the frameworks of SRT and ART. However, its own framework is more comprehensive (Maciocia, 1989; 2015). The Chinese medicine model correlates with current empirical findings that have used ART and SRT constructs (Berto, 2014; Bowler, 2010). The synthesis of conceptual definitions will be discussed in relation to the comprehensive aspects of Chinese medicine's theoretic framework.

Exploring a Synthesis of Conceptual Definitions

Chinese medicine's five elemental phase model as an umbrella. Chinese medicine's five elemental phase model provides an overall model that assumes a rhythmic resonance at the foundation of the relationship between man and environment (Maciocia, 2015). All resilience and pathology is ultimately understood relative to the harmony of rhythmic cycles of fluidic processes and their diurnal and seasonal cycles (Maciocia, 1989; 2015; White, 2006).

The interrelationships of water and earth. The five element model provides a simple tool for understanding many interrelated variables in a holistic way. Cognitive functions are supported by digestive system. This is conveyed by the metaphor, "the spleen houses thought" (Fletcher, 2016; Tanning, 2015).

The understanding of the relationship between earth and water elements in the Chinese model reinforces the empirical research findings of the ART and SRT constructs. It reinforces and even theoretically extends a synthesis of the ART and SRT that has emerged. The system of “check and balance” in the five-element model can be related in modern terms to the myriad of “on-off” time-space biochemical processes western medicine is beginning to understand (Maciocia, 2008).

Two Restoration Mechanisms: Causal or Non-Causal Relationships?

Highlights of studies using restoration theory frameworks. Accepted measures for ART and SRT empirical studies generally include a combination of physiological indicators and self-reported emotional indicators.

Stress reduction was shown early to be evidenced physiologically in response to nature by one of Ulrich’s earlier studies (1991). The evidence for this has continued to build since (Ulrich et al, 2008). In a general literature review of over one hundred sources, restoration effects associated with both SRT and ART are adequately evidenced (Berto, 2014; Bowler, 2010). Findings showed preference related to restorative effects. Preferred natural views provide positive changes in emotional, physiological stress using self-reporting assessments. These views also test well for stress restoration using measurable physiological indicators. Similarly, restorative landscapes correlating to preference show empirical results in relation to cognitive restoration measures. Effects include improved performance of cognitively challenging tasks after exposure to a restorative landscape. For example, a test sandwiched mentally fatiguing attention tests around a viewing of restorative environments, non-restorative environments, or geometrical patterns. The results indicated salutogenic effects only for the subjects viewing the restorative environment prior to completion of the attention fatigue testing. This performance improvement happened both for a

standardized restoration exposure time and a self-paced condition of exposure (Berto, 2005).

Feedback loop relationships. A question that has risen, then, is whether the two mechanisms, stress reduction and cognitive restoration, are causally related. In other words, is stress reduction an initial response required to pave the way for cognitive restoration? Is cognitive restoration a later effect of a time-prolonged exposure to a landscape that elicits a stress reduction response?

In the Chinese elemental model, these questions would be addressed in a non-pathological individual by the balanced cycles of generation and control, as a system of interwoven feedback loops. The viewpoint is there is no direct causal relationship between systems that pertain to different elemental phase correlations. Systems that belong to the same elemental phase category, however, have reflexive, two-way causality. If a flow in an organ's correlating meridian pathway is disrupted, it will have a negative effect on the organ, and vice-versa. If an organ's function is pathological, an adverse condition of the meridian flow may result. A prolonged exposure to the *negative* condition of an emotion will have a causal effect on the correlating element's corresponding body systems.

Independent mechanisms suggested by study with school children. Recent findings suggest a relationship between cognition (examined in ART) and stress (examined in SRT). Assessing school children as a test population, both stress reduction and attention restoration were enhanced with a visible window view of green vegetation, as compared to a barren window or lack of window:

1. Students with the green views experienced a significant change in functional attention tests than those with no view or a barren view.
2. This group also experienced significantly faster recovery from a stress initiating experience than peers of the other groups.

When the data were analyzed for causal relationships, the effects of the green views on stress reduction and attention restoration appear as two separate and independent benefits (Sullivan and Li, 2015). Both stress restoration and cognitive restoration were tested, with positive results for both. However, when data was analyzed specific to a causal link, a causal relationship did not appear. This recent data suggests that the two mechanisms are not causally related.

Feedback loop relationships in pathological situations. However, this does not rule out a potential interplay of the two mechanisms for vulnerable populations experiencing alleostatic overload. A synthesis of the two theories has developed in the literature, suggesting a relation of the impacts of chronic stress on cognition.

In the Chinese model, the stress response can be interpreted in relation to the water element and kidney function (Fletcher, 2016; Maciocia, 2008; 2015; Tanning, 2015). Analytic cognition is a function related to the digestive system, metaphorically represented by the earth element. The two are viewed as separate systems. In other words, they are not directly linked by resonance; they are two different notes on the guitar (Maciocia, 2015). In both western and Chinese medicine, functions of the immune system are tied to the digestive system due to its association with the lymph system (Sternberg, 2001).

The situation changes in a pathological situation when relationships between feedback loops in the two systems are out of balance. A small, repeated change in a feedback loop can yield a large change in systems' behaviors, initiating a downward spiraling or an upward positive resiliency response (Meadows, 2008). In the five element model, overwork in relation to highly analytic cognitive work, pensive thought, or worry are all considered directly causal pathological influences on the digestive *qi*. The metaphor "spleen houses thought" suggests this. The interrelationships are modeled as interwoven checks and balances by the combination of the generating and controlling five elemental

phase cycles (Maciocia, 2015; Lu, 2013). This can be interpreted as a system of negative and positive feedback relationships between the five element metaphors for organ function.

In Chinese medicine, such pathological relationships are modeled by *different* set of sequences of the five elemental phase cycles. The controlling cycle might become “over-controlling,” rather than balanced. This might initiate an “insulting response,” where the controlled organ system responds by “insulting” the over-controlling organ system (Maciocia, 1989; 2008; 2015). This over-controlling and insulting combined sequence provides a simple model of the complex relationships between chronic stress and a lower immune function noted in western medicine research (Sternberg, 2001, 93-132), as pictured in Figure 34, depicted by the larger black arrows. Per this model, the pathological pattern continues, other generating and controlling relationships will be influenced. Pathological patterns might manifest along any number of specific relationships between element function categories shown in the model. The image is the regulated rhythms shown in the balanced generating-controlling sequence becoming like a misfiring piston in a car engine. Eventually, other parts of the engine will be affected. (Maciocia, 1989, 2008; 2015).

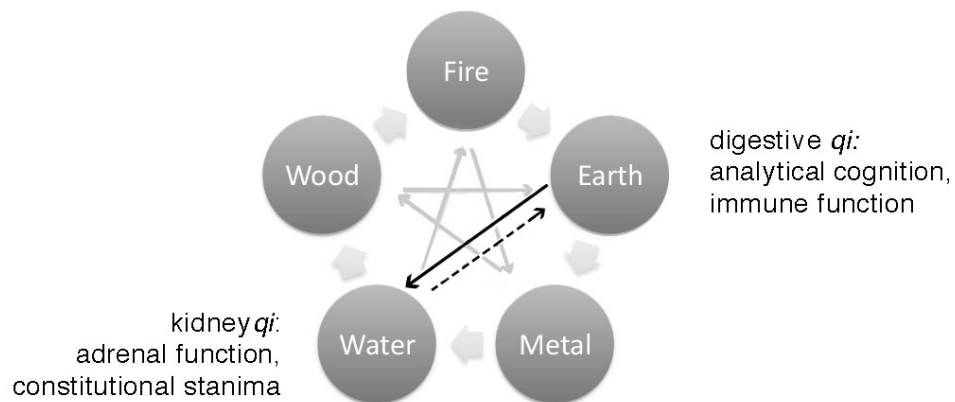


Figure 34. Pathological model: earth “overcontrols” water; water “insults” in response (Maciocia, 1989; 2008; 2015).

Western microbiology demonstrates the earth and water feedback loop.

Neuroscience has now evidence for the existence of communicating cells between the immune system and the brain. Sternberg (2001) summarizes these recent discoveries in microbiology for a popular audience. Sternberg's research lead to a ground-breaking experimental study that defined the role cytokines, cells originating from the immune system, plays in the body's stress response. Sternberg (2001) identifies a two-way communication: cytokines, generated by immune system cells, travel through the bloodstream or send signals through the central nervous system to the hypothalamus. This initiates the hormonal responses associated with physiological stress. The end of this hormonal response chain is cortisol, the "off" switch for the immune response. The details of this fundamental mechanism of this system are as follows. The hypothalamus secretes CRH hormone to the pituitary gland (2001, 79-91). The pituitary gland secretes another hormone, adrenocorticotrop hormone, or ACTH. This hormone secretes to the adrenals, glands that are located just above the kidneys. The adrenals secrete cortisol, which turns off inflammation responses produced by the immune system. Sternberg (2001) describes this as a feedback loop keeping the immune system in check. Sternberg describes this as a two-way street feedback loop; changes in the immune system affect the stress response, and vice-versa. The systems work together to keep the overall balance maintained, similar to the simplified concept of a thermostat (Meadows, 2008).

Sternberg's feedback loop between the adrenal-hypothalamus-pituitary axis is critical in developing a full understanding of lowered immunity in response to chronic stress. When thrown out of balance, the result produces inflammatory conditions that remain unchecked (Sternberg, 2001, 109-132). This partially explains the empirically identified relationship between chronic stress and lowered immunity that forms part of Ulrich's arguments concerning the relationship between environment and health outcomes (1999; 2008). Additionally, an imbalance in this feedback loop of the endocrine system, the

system of hormonal responses in the body, is now thought to be the cause of conditions such as fibromyalgia where the stress response is thought to be stuck in the “on” position (Starlanyl and Copeland, 1999; Sternberg, 2001). What might this mean for restorative landscapes in relation to this population?

Support for Chronic Stress Related Situation and Health Conditions

Arguing specifics. Kaplan and Kaplan argue that confusion and uncertainty of cognitive chaos “is a cumulative concept” (Kaplan and Kaplan, 1982, 114). The idea of cumulative impacts of cognition on an existing state of chronic stress provides a foundation for synthesis between ART and SRT.

Fascination in relation to reflection. Steve Kaplan (1995) addresses a possible synthesis of ART and SRT in two ways. The first is to construct a relationship between fascination and a new term, “reflection.” The second is to hypothesize the role that the cognitive assessment of resources available from the immediate environment plays for person with chronic stress.

Kaplan (1995) distinguishes between “soft” or involuntary fascination (e.g. enjoying a view of a verdant forest) and “hard” or directed fascination (e.g. watching sports). Attention recovery from both soft and hard fascination leads to the evolution of a state of cognition, offering recovery benefits. However, only the evolution of soft fascination emanating from response to involuntary stimuli leads to reflection. Reflection allows the individual to come to resolution with problems or troubling emotions. While hard attention associated with spectator sports offers restoration benefits, it does not afford the full benefits of reflection (Herzog et al., 1997).

Neocortex studies, rumination, and ART as important to health efficacy.

Recent studies examined responses in the neocortex and a relationship to

“rumination” as “a prolonged and often maladaptive attentional focus on the causes and consequences of emotions—most often, negative, self-relational emotions” (McErwen 2007, 884). Rumination occurs in relation to activation of the prefrontal neocortex (McErwen, 2007; Bratman, et al., 2015). In contrast to walks in an urban environment, nature walks appear to reduce neocortical activity that leads to rumination (Bratman, et al., 2015). Increases of up to 50% in creative problem solving efficacy in young adult women were associated with a four-day immersion in natural settings (Atchley and Strayer, 2012). These findings support Kaplan’s argument for the cumulative assessment of coping resources (1995). They suggest contact with nature has a positive impact on attention restoration and creativity, and may have a consequent stress reduction affect in relation to a more *chronic* condition of stress.

Chinese medicine’s viewpoint. All extremes of emotions are believed to have reflexive effects on fluid flows per the Chinese medicine model. This in turn is believed to impact organ function.

This viewpoint validates Ulrich’s viewpoint of interwoven relationships between stress, physiological impacts, emotions and behavior. However, it provides a much more detailed theory regarding these. The system viewpoint is of many two-way relationships. Organ dysfunction can also give rise to challenging emotions (Kaptchuk, 2000; Maciocia, 1989; 2015; Zhang, 2006.)

The five element theory of emotional pathology is also accompanied by wisdom regarding self-cultivation practices and virtues: each ruminating emotion can be eased by practicing the related virtue. Creativity is the virtue for the earth element, (Kaptchuk, 2000; Maciocia, 1989; 2015; Zhang, 2006), paralleling Kaplan’s (1989) “fascination.”

ART, SRT, and Chinese medicine all suggest a significant role for cognitive restoration as a leverage point for impacts of chronic stress. In five element theory, worry and analytic thinking are believed to increase demand on

the digestive system. Chinese medicine would also inform the following intervention hypothesis: time spent in nature to decrease rumination might be increasingly effective as a “dosage” after eating to support digestive function (Macioia, 1989; 2015). All three theories dictate creating *habits* around biophilia-related interactions for treatment populations with chronic stress and related rumination. While changes in the body’s stress response are rapid, changes in the pathological condition of the immune system happen over longer periods of time (Sternberg, 2001).

Evidence relevant to a chronic stress treatment population was explored for newly diagnosed cancer patients. A minimum of two hours of exposure to natural environment a week proved to be an effective intervention for increasing attentional capacity (Cimprich and Ronis, 2003). These findings are thought to have an impact on self-efficacy in relation to starting treatment.

The impacts of joy modeled by Chinese medicine. *Qi* theory suggests that pleasure in response to preferred views would have a beneficial effect primarily on the heart. Improvements to the function of the *qi* in the heart are thought to have additional benefit to the regulation of the system as a totality: the metaphor for the heart is as an emperor, inferring its dominant position in the hierarchy of the visceral organs (Maciocia, 2015, 86). If the heart’s rhythmic function is strengthened through balanced, positive emotional responses to the environment, the entire system’s resilience is also considered to be strengthened as result in the Chinese medicine paradigm.

A neuroscience study using preferred and restorative landscape constructs based on ART themes that suggests some validity to this viewpoint. This study also validates the SRT claim of a rapid, reflexive response to landscape as a restoration mechanism that is almost immediately reflected in shifts from the sympathetic to parasympathetic nervous system. The study shows the increase in μ -opioid receptors in a region of the brain, as a reflexive rather

than a cognitive response, to preferred landscapes. This response is associated with cognitive/perceptual pleasure (Yue et al., 2006).

Pattern language comparisons as a bridging commonality. The role of joy is typically discussed in a more qualitative than scientific manner in *feng-shui*, but still viewed as intrinsic to well-being. Bhatt (2013) discusses the goal of *feng-shui* to create a “transcendent” environment for fostering self-cultivation. This type of environment simultaneously layers physical needs with more qualitative needs (Bhatt, 2013). This idea bears a commonality with the goals of engaging in a state of fascination, and a prolonged interaction with ideal environments offering an additional benefit in the way of reflection, the opportunity to shift from a state of rumination to creative problem solving and resolution. Ulrich (1999, 2008) incorporates a synthesis of this restorative benefit of nature into SRT with the need for a positive cognitive assessment of resources.

Bhatt (2013) makes a strong comparison between architectural theorist Christopher Alexander’s (1977) use of patterns and the metaphors used in *feng-shui*: “when different patterns are joined together, qualitative aspects of space, such as encouraging socialization and providing lighting, accrue cumulatively and influence well-being (Bhatt, 2013, 189). The salutogenic bridge between ART, SRT, and Chinese medicine with pattern language suggests that the metaphoric approach of *feng-shui* offers some intrinsic foundational commonality with these three theories as they might be applied to design.

Synthesizing Design Informants

Providing stress coping resources. Design for stress reduction includes providing opportunities for social interaction, movable seating, the choice to take private moments of solitude, easy access and clear way-finding, as well as safety, comfort, and opportunities for movement and exercise (Ulrich, 1999;

Cooper Marcus and Barnes, 1999; Cooper Marcus and Sachs, 2014). Inclusion of the Chinese model encourages consideration of balances along spectrums. These include interactions with family and friends to provide social support. They also include, in contrast, private rest or private meditation time for reflection. Areas for exercise optimally would provide areas to rest nearby, including seating interspersed along paths and trails.

Biophilic content. In comparing Stress Reduction Theory content recommendations, which are relatively more specific and empirically derived than Attention Restoration Theory, the following commonalities emerge: verdant vegetation, trees; a peaceful or moderate current water element in the landscape; and planning orientation to maximize available sunlight without risking glare. Table 3 summarizes. One difference is *qi* theory specifies rich soils, which is not an element specifically addressed by Ulrich or the Kaplans, however it is a resource content are that is suggested by the presence of verdant vegetation.

Table 3. Restoration factors compared with nurturing *qi* indicators.

	SRT Stress Restoration Factors (Ulrich, 1999, 2008); SRT areas of content agreement (Kaplan, Kaplan, and Ryan, 1998) indicated by a star*				
<i>Feng-shui sheng qi</i> indicators	Water*	Verdant Vegetation*	Trees*	Orientation for sunlight	Biophilic wildlife (birds and butterflies)*
Water	X				
Verdant Vegetation		X			
Trees			X		
Soil					
Orientation for sunlight				X	
“Moving and mating” metaphor as biophilic wildlife					x

[Legend: **X**- strong correlation; **x** – moderate correlation; shading – no correlation.]

Ulrich (2008) also highlights encouraging bird and butterfly interactions; *qi* theory makes no specific mention but the notion of biodiverse wildlife is implied by “moving and mating.” Water is described in more detail and with poetic metaphor in *qi* theory. Water on the site is ideally “happy and dancing” (Yoon, 2009), denoting a medium speed in its rhythmic movements.

ART is more focused on organizational patterns than details of content. The explicit intersection of all three perspectives validates the inclusion of verdant vegetation, especially tress, and water either meandering or having curved edges, and trees. This agreement of content is indicated by an asterisk on the content categoris from SRT in Table 3. ART does not mention sunlight in relation to site content (perhaps assumed). ART implies consideration of biophilic wildlife in relation to the topic of fascination (Kaplan and Kaplan, 1982, 1989; Kaplan, Kaplan and Ryan, 1998) and develops this topic further in relation to movement patterns (Kaplan, S., 1995).

Risk factors and killing *qi*. Ulrich (1999, 2008) emphasizes the ‘don’ts’ as much as the ‘do’s’ of restorative landscape design. These are summarized in Table 4.

Table 4. Risk factors in relation to *feng-shui sha qi* indicators.

<i>Feng-shui sha qi</i> indicators (Xu, 1990; Mak, 2004)	SRT Stress Response Risk Factors (Ulrich, 2008)						
	Fast running water	Glare (NE)	Points, scles	Snake-like forms	High % hardscape	Abstract Images	Urban noise (NE)
Straight course water	x						
Very fast very slow (stagnant) moving water	x						
Falling water	x						
Smelly, swampy or cloudy water							
Points, poison arrows			X				
Negative images in forms				X		X	
Disorganized or broken forms						X	
Jaggy rock			X		X		
Rock with no vegetation					X		
Strong biomagnetic force							

[Legend: X- strong correlation; x – moderate correlation; shading – no correlation.]

Consideration of risk is particularly necessary in relation to designing for treatment-related populations with specific vulnerabilities. A comparison of Ulrich’s empirically-derived stress triggers in the environment with *feng-shui’s* indicators of killing *qi* shows high agreement. Both warn against: sharp points (Ulrich specifically includes scale patterns); abstract images (*qi* theory includes chaotic forms); loud noise; concrete or dominant hardscapes (*qi* theory specifies

an abundance of rough, non-eroded rock as a distinction); and loud or fast-running water. An overall correlation patterns suggests some equivalence between the concept of “killing” or “unrefined” *qi* indicators and the actuality of stress restoration or risk for stress response.

The two main indicators of killing *qi* not discussed in the literature are biomagnetic factors and certain configurations of water, such as water flowing in straight lines. These are topics of interest for future research within a restoration-based framework, as briefly discussed in the previous discussion chapter specific to the unique points of *qi* theory.

Optimal organizational patterns in ART, SRT, and biophilic *feng-shui*. In a qualitative comparison of the ideal site typology from the assessment parameters of adaptive-evolutionary preferred landscape theory, Han (2001) finds that the ideal site meets the conditions of adaptive-evolutionary theory. His analysis particularly focuses on organizational patterns. Developed for the central China landscape with mountains, the ideal site organizational patterns are more specific than adaptive-evolutionary theory. Han compares themes developed from review of adaptive-evolutionary theorists reviewed also by this study (Appleton, 1975; Ulrich, 1983; Kaplan and Kaplan, 1989) as supplemented by later adaptive-evolutionary qualitative theorists who reinforce these themes. Han’s themes are summarized in Table 5, below, alongside comparison points from the features of the classic *feng-shui* landscape that match the features identified here in this study also.

Han (2001) also points out general advantages in relation to themes of military advantages. The protected node or *xue* of the specific location to build in the ideal site offers a vantage point to spot oncoming enemies. The configuration of waterways in relation to the ideal site allows for an escape route that quickly hides the exiting parties from visible perception for parties upstream. Han’s themes were assessed in relation to the more updated version of adaptive-evolutionary landscape from Ulrich’s (2008) work reviewed in this study, with

correlation confirmed by an asterisk on Table 5, on the following page. Han's description of the features of the ideal site were assessed in relation to sources used in this study's review of literature Agreement of Han's development of classic ideal site features with this study's own development of the ideal site features as indicated in Appendix A (Choy, 2009; Fang, 2000; Hwangbo, 2002; Junsong, c. 850, AD; Mak, 2004; Pu, c. 300, trans., 2004; Xu, 1990; Yoon, 2006; 2009).

Table 5. Adaptive evolutionary landscape themes and ideal site features.
(Developed from Han, 2000).

Han's (2001) evolutionary themes as basis for comparison with <i>feng-shui</i> ideal site features.	<i>Feng-shui</i> intersections
Spatial configuration and depth cues*	Refuge provided by emblem curving around a central space meet spatial configurations well: extant is provided by wide open space of the bright court, refuge is providing by protective emblematic landforms that enclose the site on 3 or 4 sides.
Focal Points*/also a depth cue	High back mountain and mid-level side mountain (emblematic land forms) act as focal points.
Ground Texture*/also a depth cue	Ground texture of bright court, as a wide, open horizontal region, provides accessibility. It meets conditions for a smooth, uniform, texture surface that is visually even. It also provides depth cues to understand more vertical features of the site.
Water and Vegetation*	Resources included as necessary in the ideal site as indicators of the <i>sheng qi</i> of a biodiverse habitat. Diverse flora and fauna are present.
Information Gathering and Cognitive Appraisal*	Deflected, curving vistas of overlapping ideal site surrounding mountains promise more information as available beyond the current vantage point.

[Legend: * indicates thematic commonality with Ulrich's (2008) adaptive-evolutionary landscape summary used as a primary source in this study. ** indicates themes that match both Ulrich (2008) Kaplan and Kaplan, and Ryan, 1998.]

Han's (2001) summary alongside the additional analysis of literature review themes shown in Table 5 provide a clear indication of strong common organizational pattern themes between ART, SRT and Form School *feng-shui* theoretic frameworks.

Design Informant Conclusions. ART, SRT and biophilic *feng-shui* suggest vastly similar site content and organizational patterns as theory-based design informants for restorative landscape design. The commonality reinforces the overall emphasis on these content and organizational pattern informants for restorative landscape design applications. ART and SRT develop in relation to empirical variable research and preference studies respectively. *Feng-shui* appears to have developed in relation to locating biodiverse areas in the mountainous landscape of China (Fang, 2000). The specific biophilic *feng-shui* interpretation made in this study reinforces a notion that the *feng-shui* knowledge base can be useful in designing biodiverse landscapes.

Biophilic *feng-shui* cross-informs preference theory from the perspective of identifying patterns of landscape that favor biodiverse evolution, a perspective presented by the Kaplans in relation to their theoretic framework's development but not explicitly explored with study data (Kaplan and Kaplan, 1982, 1989). The approach and evidenced efficacy of biophilic *feng-shui* to identify fertile landscape (Xu, 1990; Paton, 2009) may suggest a mechanism of evolution through habitat cues, as theorized by Heerwagen and Orians (1993). This is a central emerging hypothesis of the study in relation to biophilic *feng-shui* as cross-informing ART and SRT in a *specific* manner related to organizational patterns and microclimates.

Climate cues, preference, and simultaneity through pattern applications.

SRT, ART and biophilic *feng-shui* theory frameworks examine nature-based restorative landscapes from different theoretic constructs and approaches. SRT focuses on chronic stress vulnerability as a generalized treatment population

trait, opportunities for stress restoration, and risks for stress responses in the environment and review of empirical research. ART focuses on cognition, with cognitive fatigue as a general population trait as an effect of increased demand in relation to society conventions for longer periods of cognitive directed attention. *Feng-shui* was developed in relation to ancient biophilic observations and provides general site location and design insights for health and well-being for a general population. All three conceptual theories merge in relation to an overall design goal to provide fascination-reflection, or alternatively, mental-emotional transcendence, for a better cognitive assessment of resources.

There is a high degree of agreement in the SRT theory literature details site elements to include and avoid based largely on empirical single-variable findings. SRT, area and *feng-shui* all inform the following site content as valuable and necessary for restorative landscape designs: vegetation and water, preferably including trees, that provides an access to biophilic wildlife. There is a high degree of agreement in relation to organizational patterns that best meet conditions to meet the design goal of fascination-reflection, or alternatively, transcendence.

The synthesis of the intersections has further informed a design process relative to restorative landscape largely as a reinforcement that content and organizational patterns outlined in the ART and SRT theories. *Feng-shui* adds some specific nuances when thinking about the organizational patterns. The underlying movement forces and interactions of the landscape are valuable to consider. In considering these aspects of the organizational patterns of ART, a designer can simultaneously address creating microclimate conditions biodiverse habitat and preference theory. A last conclusion is about using patterns observable in water, particularly the vortex, as prototype in relation to biomimicry. The simplicity of the vortex in relation to the complexity of its many manifestations of specific living organisms, or their parts, such as sense organs, is a rich territory for design inspiration.

CHAPTER SIX – CONCLUSIONS

Summary of General Conclusions

At the onset of this exploration, some commonalities between the theoretic frameworks of ART, SRT and biophilic *feng-shui* were anticipated. However, their emerging intersection has some surprisingly strong specific themes. The Chinese medicine model is a system based on a very different theory of the body's systems, in relation to the functions of fluid flows. Nonetheless, this simple model encompasses and reinforces knowledge indicated by many of the empirical findings of research using the ART and SRT frameworks.

Together, the three theories synthesize a picture of interwoven health and wellness outcomes in situations of chronic stress contributing to a state of cognitive rumination. A particularly strong theme emerges around nature-based restoration as a leverage point to promote a positive cognitive assessment of available resources. The three theoretic frameworks therefore each reinforce the value of the role nature plays as both a buffer and an intervention. This supports designing green spaces for optimal therapeutic effects as a strategy to either mitigate or prevent a state of cognitive rumination. This specific design goal is relevant to healthcare treatment facilities, but also relevant to meeting a growing public policy concern with public wellness (Sachs, 2014). The appropriate evidence-based design of public greenspaces and wildlife recreational resources is suggested.

Relevance to the Design Process for Restorative Landscapes

The interwoven synthesis of why, what and how nature-based restorative responses work has several implications specific to their design.

Content as an interwoven set of functions for optimal biodiversity. In

relation to landscape content, the strong intersection between *qi* theory's

categorical indicators and SRT's empirically developed risk and reduction factors reinforces the overall premise of biomimicry that is central to *feng-shui*. This general premise favors content that exhibits a high degree of complex organization, and the avoidance of contrasting entropic elements. This principle provides the designer with additional criteria for the necessary resource content areas of the restorative landscape. These are identified as water, verdant vegetation, particularly trees, and biophilic wildlife such as birds and butterflies.

Specific content elements must be considered in relation to their interrelated *functions* in the landscape. The *feng-shui* principle of *sheng qi* reminds the designer that *each* of ART and SRT's list of content resources is needed for the restorative landscape to *function* as an optimally biodiverse landscape. A missing resource in the content area of the site might diminish the effects of other resource elements. Theoretically, this optimal biodiversity increases the optimal restorative impacts for the participant interacting with the landscape. Additionally, specific choices for content, such as plant species and groupings, must be considered in relationship to this interwoven function. The resources must come together as a unified, rhythmic whole to be inviting habitat for biophilic wildlife and to optimally invite a state of fascination-reflection-transcendence.

The *yin-yang* of organizational patterns. This principle, considering the site content resources function as a unified whole, also informs an opportunity to further enhance the design guideline work of the Kaplans (1998) as presented in *With People in Mind* by implementing *feng-shui* "simultaneity." *With People in Mind* was written as an effort by the Kaplans (1998) to make the theoretic framework and the parameters outlined by their preference framework construct more accessible: it is a pragmatic design manual that primarily addresses the organizational patterns of landscape dictated by the preference matrix of ART. The Kaplans use of pattern language (Alexander, 1977) enables the theory to be translated to specific design concepts without imposing the type of site-specific

limitations that might otherwise diminish the value of this book. The strategy of a design process related to pattern language has key commonality with both classical and biophilic *feng-shui* approaches.

This study's intersection suggests *With People in Mind* as fundamental required reading for the restorative landscape designer. However, the synthesis with *feng-shui* explored in this study suggests it is possible to implement the patterns described by the Kaplans (1998) with attention to how these patterns also created microclimate effects on the site, as simultaneous effects of the mid-range balances that are inherent to the preference matrix. While this may at first seem like a lot of information to process, the concept of pattern language and the simple five-element and *yin-yang* concepts of the *feng-shui* model provide simple prototypes for synthesizing complex interweaving sets of design goals during the conceptual stage of the design process.

The parameters of the preference matrix can be viewed from the lens of overall *yin-yang* midrange balances of polar contrasts. These balances might also speak to microclimate effects. Coherence and complexity are satisfied by a balance between vertical elements on the site which assist depth perception and uniformly smooth regions of more horizontal, open ground space; this balance also provides visual access to the site (Kaplan and Kaplan, 1998). The Kaplans (1998) translate the coherence-complexity range to the specific pattern concepts of areas, regions, depth perception, landmarks and focal points. Areas and regions should be clearly defined for coherence, but offer richly patterned textures for complexity.

The five element method of organizing emblematic forms around a central opening is an elegant way to meet these parameters. Proper execution of this method requires site analysis for specific "inauspicious" factors in the regional climate, including seasonal solar, humidity and wind analysis in relation to specific directions (Fang, 2000). The emblematic landform strategies can then be adapted to achieve moderating effects through proper attention to the orientation

of these forms in relation to the regional climatic influences. Emblematic landforms can be planted with attention to rich textures and an overall identity for each form to achieve additional “complexity” and assist with depth cues. Schwenk’s (2001) work shows us that these regions and areas will have thermal gradient interactions that can be enhanced through specific design choices. The *feng-shui* method of “finding the opposition” can be apply to create favorable thermal contrasts between areas and regions. The relationship to these areas and regions to water bodies and circulating currents on the site should be considered in relation to orienting activity areas close to but above watershed collection zones (Fang, 2000). These strategies will optimize coherence-complexity balance as well as climate moderation simultaneously.

Achieving a mid-range balance of mystery-legibility is addressed by the Kaplans through the patterns of layering areas and regions to partially obscure view. The use of layers is a specific pattern discussed by the Kaplans (1998). These patterns can be generated by incorporating the *feng-shui* method of creating inner and outer structures of the site in a way that layers regions but also assists in accumulating moderate temperature within the site (Hwangbo, 2002; Han, 2001). Framed views, gateways or other partitions are other patterns the Kaplans (1998) mention to meet these requirements; these patterns can be incorporated, again, with attention to maintaining and inner and outer site structure. Curving paths and curving water features also address the mystery-legibility balance by keeping what is ahead only partly visible (Kaplans, 1998) and meeting *feng-shui* guidelines for biomimicry of healthy water conditions (Han, 2001; Xu, 1990).

The three frameworks are also in agreement on the importance of specific support services greenspaces provide, such as social interaction and a venue for exercise. This suggests a need for attention to some additional specific design goals for these environments. An overall *yin-yang* balance of the typology of areas and regions is required. Activity areas should include a balance of large

and small, for group-oriented interactions or private solitude. A balance of areas as appropriate for exercise and appropriate for more restful activities is also optimal. Such as strategy will ensure that the support services resources offered by a restorative landscape meet a range of participants' needs and desires for use. This speaks to the the Kaplans' (1989) affordance concept, Ulrich's (1999, 2008) stress reduction resources, and *feng-shui's* overall emphasis on self-cultivation (Bhatt, 2013; Slawson, 1987; Zou, 2008). The need is to meet a general variety of participants' self-efficacy goals to create positive habits in conjunction with how they might use the restorative landscape.

Going Forward: Possible Future Research Avenues

This study suggests a possible mechanism of evolutionary preference for landscape from the perspective of Chinese medicine. This evolutionary mechanism can be thought of in relation to *qi* theory's premise of rhythmic resonance. This premise suggests that mid-range rhythmic flows of air and water and thermal gradients are optimal for the biodiverse functions of a landscape. The Chinese medicine perspective further suggests that there is a resonant response between the fluid flows of the body and the fluidic rhythms and resulting moderation of temperature range in the environment. Habitat cues in relation to conditions of landscape that favor ideal microclimates are thereby a possible part of the evolution of preference. These habitat cues appear to fit the conditions for optimal organizational patterns in relation to preference theory.

An overall restorative response to an ideal landscape in the Chinese model includes an increase in joy, believed to positively influence the heart. Connections between the Chinese model and emerging evidence of increased μ -opioid activation in the brain, suggesting cognitive perceptual pleasure in response to preferred landscapes, indicate a potential future research area (Yue et al., 2006) requiring further exploration. To fully understand what aspects of the Chinese medicine model that might be correct from the standpoint of western

empiricism, interdisciplinary efforts relating new knowledge of the body's fascia, the embryonic development of the body, and correlations with the five element categorical hierarchies might be required. This research avenue addresses the overall *paradigm* of *qi* theory.

This study's exploration also brought to light possible empirical approaches for future research in an area of content considered vitally important to restorative landscape, water. While water is accepted as a critical site element, there is relatively little research that has approached the topic of optimal design guidelines in relation to preference and restoration constructs in a systematized way (White, et al., 2010). Given the central importance of water's relationship to life and biodiversity (Schwenk, 2001), a design premise for increasing self-organizing conditions of water emerges. These conditions might also be optimal for preference and restorative responses. This premise fits well with the basic assumptions of adaptive-evolutionary theory. The guidelines offered by *feng-shui* may offer an approach to systematizing features of water flow in the landscape for empirically based preference-related studies. The Chinese *qi* theory provides an overall premise regarding *sheng qi* that is specifically applicable to water and its context in the landscape: *sheng qi* versus *sha qi* qualities of water flow in landscape might be organized with a Likert (1932) scale method, for empirical preference or restoration response studies.

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APPENDIX A – FENG-SHUI IDEAL SITE METHODS AND FEATURES

Developed from review of several sources (Choy, 2009; Fang, 2000; Hwangbo, 2002; Junsong, c. 850, AD, trans., 1990; Mak, 2004; Pu, c. 300, trans., 2004; Xu, 1990; Yoon, 2006; 2009).

Configuration of the Ideal Site

Four landforms as “emblems” of mythic animals relating to the constellations are arranged around a wide open grassy area, typically referred to as the *ming tang*, or bright court. The *xue*, “cave” or “node” or site overlooks this wide area. The *xue* indicates the position of a specific building site, garden, or grave in relation to the overall site formation.

Three key principles of the typology organization are identified as (Hwangbo, 2002):

1. Having an inner and an outer structure.
2. Using a principle of centrality.
3. The inner structure’s arrangement correlates with the Five Element Cosmological sequence (Lee, 1986). The relationships of the inner and outer structure bear a relationship to two classic *Book of Changes* diagrams, the *Ho Tu* and *Luo Tu*.

The inner structure of the site is often called either the “dragon lair” (Bhatt, 2013; Stark, 2005) or the “aimchair formation (Lee, 1986; Mark, 1995; Fang, 2000). Four landforms contain the site, in a configuration correlating to the layout of the cosmological sequence with corresponding relationships to the directions, seasons, and representational animals associated with correlating constellations. A site with just three land forms, the “half horseshoe (Fang, 2000)”, is also

acceptable if the orientation still protects from the north and west in relation to the climate of the area the system originated from. Water is a necessary site element (Lee, 1986; Mak, 2009).

Emblems have symbolic five elemental phase metaphoric associations with animals that are valued in Chinese culture. These are the red phoenix in the south (fire), azure dragon in the east (wood), white tiger in the west (metal) and black turtle in the north (water). They are associated with the five elemental phase stars and their celestial constellations. Here emblems are arranged in the five elemental phase cosmological sequence of the inner ideal site typology, around a central location or bright court (*ming tang*).

The Five Geographical Secrets

The “Five Geographical Secrets” (Mak, 2004, Xu, 1990; Fang, 2000; Paton, 2009):

1. The dragon: background is a mountain range with a sinewy profile.
2. Sands: this refers to both looking for an area of rich soils and foothill forms. Green, thriving vegetation needs to be present. Jagged rock, steep slopes are to be avoided, as “unrefined” or “killing” *Qi* indicators.
3. Water: No site is valued without the presence of a curving watercourse and preferably, a peaceful lake in addition.
4. “*Xue*” translated as “cave” or “node” and “*ming tang*” or “bright court: The site location is situated nestled into the mid-height of a landform, at a high point on the watershed, with a view out over a “bright court” or flat, open area.
5. Orientation: The site is oriented for optimal sunlight, facing a lower hill or no hill to the South or East. Orientation is considered in the design of buildings on the site in a similar manner. Courtyards allowing additional

access to sunlight are included in many of the house configurations based on the ideal site.

The following references are methods from the Song dynasty, primarily attributed to Yang Junsong, c. 850 AD. Xu (1990) translates poetic phrases from Junsong's work *Han Long Jing*, verifying his methods as common from many other *feng-shui* references in Chinese. This represents a later development from the earliest existing classic, *the Book of Burial (Zang Shu)* written by Guo Pu c. 300 AD (Yoon, 2006).

1. The first method is “finding the opposition (Xu, 1990, 32)”; this can mean mountains and water, referred to as “yin and yang dragons, or other places where contrasts meet. In a flat plain area, it would be a place of a rise; in a mountainous area, a place of a flat opening: a point of contrast.
2. “Find the place where the Yin and Yang dragons are mating and moving (Xu, 1990, 34”): Xu explains this as solid and void balance, but interprets specifically as the place where a valley widens into an opening.
3. “Find the true dragon (Xu, 1990, 45).” The true dragon has these characteristics: the dragon starts with a peak; the dragon follows a morphological transformation of shapes in mountains according to the 5 element sequence's shapes; the dragon has a sinuous, wavy form that is complete; water flows with the vital *qi* (interpreted as biomagnetic energy). This vital *qi* flows in the dragon vein, similar to the water.
4. Containment: the site is contained of site with surrounding hills of smooth, regular forms which curves inward without “shooting” sharply.
5. Most generally, water should be curving, and flowing a medium speed. Additional specifics are outlined under Table 6, “Assessing the water”. Choy (2009, 100) also discusses analyzing water quality in relation to *qi* as the seventh of his sixteen *feng-shui* principles.

Table 6. Assessing the water (developed by Xu's (1990, 63-69) translation from Yang Junsong's *Han Long Jing* (c. 850 AD.)

Nurturing <i>qi</i> (<i>sheng qi</i>)	Killing <i>qi</i> (<i>sha qi</i>)
"A curved and tortuous watercourse is one of the best signs of <i>Qi</i> accumulation"	Straight course
A medium speed river or peaceful lake	Flowing over jagged rock, steep slopes
Converging waters	Falling water ("roar of the dragon") "the water cries sadness and children die early" (Xu, 65)
Inside of a bend; on an island	Outside of a bend; shoots 'poison arrows'
Orientation of flow – from auspicious to inauspicious directions	Rapid speed/noisy flow
At a point of contrast; as a lake or river alongside a hill or rising landform	Smelly or cloudy; at low or swampy area of the landscape, stagnant water

APPENDIX B – COMPLEX SYSTEMS GLOSSARY OF TERMS

(Source: Meadows, 2008, 187-188.)

Archetypes: Common system structures that produce characteristic patterns of behavior.

Balancing feedback loop: A stabilizing, goal-seeking, regulating feedback loop, also know[n] as a “negative feedback loop” because it opposes, or reverses, whatever direction of change is imposed on the system.

Bounded rationality: The logic that leads to decisions or actions that make sense within one part of a system but are not reasonable within a broader context or when seen as part of the wider system.

Dynamic equilibrium: The condition in which the state of a stock (its level or its size) is steady and unchanging, despite inflows and outflows. This is possible only when all inflows equal all outflows.

Dynamics: The behavior over time of a system or any of its components.

Feedback loop: The mechanism (rule or information or signal) that allows a change in a stock to affect a flow into or out of that same stock. A closed chain of causal connections from a stock, through a set of decisions and actions dependent on the level of the stock, and back again through a flow to change a stock.

Flow: Material or information that enters or leaves a stock over a period of time.

Hierarchy: Systems organized in such a way as to create a larger system. Subsystems within systems.

Limiting factor: A necessary system input that is the one limiting the activity of the system at a particular moment.

Linear relationship: A relationship between two elements in a system that has constant proportion between cause and effect and so can be drawn with a straight line on a graph. The effect is additive.

Nonlinear relationship: A relationship between two elements in a system where the cause does not produce a proportional (straight-line) effect.

Reinforcing feedback loop: An amplifying or enhancing feedback loop, also known as “positive feedback loop” because it reinforces the direction of change. These are vicious cycles and virtuous circles.

Resilience: The ability of a system to recover from perturbation; the ability to restore or repair or bounce back after change due to an outside force.

Self-organization: The ability of a system to structure itself, to create new structure, to learn, or diversify.

Shifting dominance: The change over time of the relative strengths of competing feedback loops.

Stock: An accumulation of material or information that has built up in a system over time.

Suboptimization: The behavior resulting from a subsystem's goals dominating at the expense of the total system's goals.

System: A set of elements or parts that is coherently organized and interconnected in a pattern or structure that produces a characteristic set of behaviors, often classified as its "function" or "purpose".

APPENDIX C – COMPLEX SYSTEMS PRINCIPLES

Complex System Principles: A Summarizing Overview for Understanding and Transforming Systems

(Source: Meadows, 2008, 190-192.)

The following summary of key systems principles and leverage points provide an understanding for applying non-abstract complex systems theory to integrative healing practices that aim to provide one or multiple habit-based interventions to effect system resilience and/or maintain salutogenic “well-being” in relation to human health.

The following summary is direct citation from the book *Thinking in Systems*:

Summary of Systems Principles

Systems

- A system is more than the sum of its parts.
- Many of the interconnections in systems operate through the flow of information.
- The least obvious part of the system, its function or purpose, is often the most crucial determinant of the system’s behavior.
- System structure is the source of system behavior. System behavior reveals itself as a series of events over time.

Stocks, Flows, and Dynamic Equilibrium

- A stock is the memory of the history of changing flows within the system.
- If the sum of inflows exceeds the sum of outflows, the stock level will rise.
- If the sum of outflows exceeds the sum of inflows, the stock level will fall.

- If the sum of outflows equals the sum of inflows, the stock level will not change—it will be held in dynamic equilibrium.
- A stock can be increased by decreasing its outflow rate as well as by increasing its inflow rate.
- Stocks act as delays or buffers or shock absorbers in systems.
- Stocks allow inflows and outflows to be de-coupled and independent.

Feedback Loops

- A feedback loop is a closed chain of causal connections from a stock, through a set of decisions or rules or physical laws or actions that are dependent on the level of the stock, and back again through a flow of change to a stock.
- Balancing feedback loops are equilibrating or goal-seeking structures in systems and are both sources of stability and sources of resistance to change.
- Reinforcing feedback loops are self-enhancing, leading to exponential growth or to runaway collapses over time.
- The information delivered by a feedback loop—even nonphysical feedback—can effect only future behavior; it can't deliver a signal fast enough to correct behavior that drove the current feedback.
- A stock-maintaining balancing feedback loop must have its goal set appropriately to compensate for draining or inflowing processes that affect that stock. Otherwise, the feedback process will fall short of or exceed the target for the stock.
- Systems with similar feedback structures produced similar dynamic behaviors.

Shifting Dominance, Delays, and Oscillations

- Complex behaviors of systems often arise as the relative strengths of feedback loops shift, causing first one loop and then another to dominate behavior.
- A delay in a balancing feedback loop makes a systems likely to oscillate.
- Changing the length of a delay may make a large change in the behavior of a system.

Scenarios and Testing Models

- System of dynamics models explore possible futures and ask “what if” questions.
- Model utility depends not on whether its driving scenarios are realistic (since no one can know for sure), but on whether it responds with a realistic pattern of behavior.

Constraints on Systems

- In physical, exponentially growing systems, there must be at least one reinforcing loop driving the growth and at least one balancing loop constraining the growth, because no system can grow forever in a finite environment.
- Renewable resources are flow-limited.

Resilience, Self-Organization, and Hierarchy

- There are always limits to resilience.
- Systems need to be managed not only for productivity or stability, they also need to be managed for resilience.
- Systems often have the property of self-organization—the ability to structure themselves, to create new structure, to learn, diversify, and complexify.

- Hierarchical systems evolve from the bottom up. The purpose of the upper layers of the hierarchy is to serve the purposes of the lower layers.

Source of Systems Surprises

- Many relationships in systems are nonlinear.
- There are no separate systems. The world is a continuum. Where to draw a boundary around a system depends on the purpose of the discussion.
- At any given time, the input that is most important to a system is the one that is most limiting.
- Any physical entity with multiple inputs and outputs is surrounded by layers of limits.
- There always will be limits to growth.
- A quantity growing exponentially toward a limit reaches that limit in a surprisingly short time.
- Where there are long delays in feedback loops, some sort of foresight is essential.
- The bounded rationality of each actor in a system may not lead to decisions that further the welfare of the system as a whole.

Mindsets and Models

- Everything we think we know about the world is a model.
- Our models do have a strong congruence with the world.
- Our models fall far short of representing the real world fully.

Places to Intervene in a System - in increasing order of effectiveness.

12. Numbers: Constants and parameters such as subsidies, taxes, and standards
11. Buffers: The sizes of stabilizing stocks relative to their flows
10. Stock-and-Flow Structures: Physical systems and their nodes of intersection
9. Delays: The lengths of rime relative to the rate of system changes
8. Balancing Feedback Loops: The strength of the feedbacks relative to the impacts they are trying to correct
7. Reinforcing Feedback Loops: The strength of the gain of driving loops
6. Information Flows: The structure of who does and does not have access to information
5. Rules: Incentives, punishments, constraints
4. Self-Organization: The power to add, change, or evolve system structure
3. Goals: The purpose of a system
2. Paradigms: The mind-set out of which the system—its goals, structure, rules, delays, parameters—arises
1. Transcending Paradigms

APPENDIX D – QI THEORY ENVIRONMENTAL REFERENCES

Table 7. Four image correlations informing the development of the five element correlations.
(Adapted from Maciocia, 2015.)

Utmost Yin	Yang within yin	Utmost yang	Yin within yang
North	East	South	West
Midnight	Sunrise	Noon	Sunset
Winter	Spring	Summer	Fall
Cold	Warm	Hot	Cool

Table 8. Five element correspondences (Adapted from Zhang, 2007; Maciocia, 2015).

Element	Water	Wood	Fire	Earth	Metal
Direction	West	North	East	Central location	South
Daily cycle	Sunset	Midnight	Sunrise	<i>As diurnal cycle effects on earth</i>	Noon
Season	Fall	Winter	Spring	18 day end of each cycle	Summer
Temperature	Cold	Warm	Hot	<i>Change</i>	Cool
Function	Dormancy, death	Emergent growth	Peak growth or development	Intermittency	Decline
Movement	Downward, falling movement.	Movement in all directions, contraction.	Upward, rising movement.	Neutral state and/or motion around the axis	Condensing movement, contraction.

Five elements system of resonant correspondences. The five elements are said to have been developed in relation to the directional and seasonal correspondences: Fire and heat come from the southern sun in summer. Water is attributed to ice and snow, and as cold wind blowing from the north. Wood, as seeds and plants, begin to grow in the spring, with the sun rising in the east. Metal is attributed to the west and autumn, due to the setting sun, bleak time of year, the astringent nature and rough and hard appearance of metal (Hwangbo, 2002; White, 2006). Earth, assigned to the center, represents a totality (Hwangbo, 2002; White, 2006), as well as a period of intermittency, assigned to the last 18 days of each seasonal cycle (White, 2006). Somewhere along the line, movement correlations were also added, and metaphoric meanings relating to the season's functions also developed.

***Qi* theory and weather.**

The development of the “six *qi*” was in relation to climate extremes and a six-phase calendrical cycle (White, 2006). These weather concepts seem to be among the earliest conceptions associated with the *qi* concept, aside from sun and shade patterns (Paton, 1995). They can also be understood in relation to *qi* as water in the hydrological cycle (Xu, 1990).

APPENDIX E – CHINESE MEDICINE REFERENCE

Table 9. Relationships between Resiliency, Chronic Pathology and Acute Pathology

←spectrum of bi-directional potential for change→			
← Increasing resilience, recovery of homeostasis over time -versus- Increasing pathology over time →			
<p><i>Optimal</i> physiological health given one’s inherited constitutional characteristics: “homeostasis” understood through the lens of the harmonious <i>qi</i> production & circulation of <i>qi</i>.</p>	<p><i>Initial</i> instance(s) of disruption of the <i>qi</i> mechanism conceivable in <i>yin-yang</i> relationships of relative balances</p>	<p><i>Perpetuating repetition</i> disruption as disharmony of <i>qi</i> (over time): manifesting as pathological, ongoing patterns. These patterns describe situations of dysfunction in the production of bodily fluids, circulation, and time-space microbiological mechanism ratios.</p>	
Resilience: homeostasis restored	Struggle between pathology and resilience	Chronic illness or condition	Pathological structural changes: organs or tissues: acute illness or condition

Table 10. Emotional organ correspondences and effects on the *qi* mechanism.

Elemental Phase	Yin Organ	Emotional correlation	Immediate effects on <i>qi</i>
Water	Kidney	Fear/Fright, Shock	Fear descends <i>qi</i> ; Fright (shock) scatters <i>qi</i> , induces chaotic <i>qi</i>
Wood	Liver	Anger	Induces the <i>qi</i> to ascend
Fire	Heart	Elation, Joy (interpreted as excessive excitement, craving, “overstimulation”)	Stagnates and scatters <i>qi</i>
Earth	Spleen	Worry, excessive pondering, excessive mental work	Generates “knottedness” or “stuckness”; descending <i>qi</i>
Metal	Lungs	Sadness/Grief	Weakens or dissolves <i>qi</i>

ENDNOTES

ⁱ Regi Boehme authored several books and taught continuing education workshops in the occupational therapy field. One focuses on the application of myofascial release in this field.