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A NEW AESTHETIC FOR ENVIRONMENTAL AWARENESS: CHAOS THEORY, THE BEAUTY OF NATURE, AND OUR BROADER HUMANISTIC IDENTITY

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INTRODUCTION

I left the ITC Conference, International Theosophy Conference, in Julian CA, August 2011, on a high. Lovely people joined (across related organizations) by a greater truth and a need to help catalyze new consciousness in the world, for the benefit of all beings. Time to work together - time for the ties that bind. I was reminded of a piece I wrote earlier for a special issue on Ecopsychology of the *Journal of Humanistic Psychology*. In this issue, I and various others were looking at our profound interconnection with all of life, indeed all the cosmos, and the depth and complexity of our awareness and who we really are. We were broadening the traditional purview of humanistic psychology. I shared with Jan Kind, whom I was privileged to meet at the ITC gathering, and I am honored he is presenting it here, and in such a stunning way.

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October 28, 2011

A NEW AESTHETIC FOR ENVIRONMENTAL AWARENESS: CHAOS THEORY, THE BEAUTY OF NATURE, AND OUR BROADER HUMANISTIC IDENTITY

by Ruth Richards

Summary

Can beauty help us adapt, evolve, and cope with environmental crisis? This article challenges the longstanding Kantian view that beauty is "disinterested," while linking Kant's view of the sublime with chaos theory and the fractal forms of nature. We humans participate in beauty as open systems in ongoing process, coevolving with all of existence. Beauty offers us conscious awareness and resonance with deeper life patterns. We sense our interconnection and the "bounded infinities" of potentialities related to chaotic "strange attractors." A study of aesthetic preference not only supports preference for the fractal forms of nature but suggests, tentatively, that creative persons prefer forms of even higher "dimensionality." Beauty can open up our vision in an endangered world - while yielding intimacy and delight, not isolation and fear. Caring can become natural for the greater whole we all cocreate. As humanistic psychologists, we can be concerned with no less than this totality.

Can aesthetic appreciation be good for us? Can it be good for our world? Might it advance an awareness that can aid us in an endangered age? These are the questions addressed in this article. Their implications may be important for the health of our environment and for all of us.

The article looks at (a) the possibility that beauty has adaptive aspects, including roles in the evolution of information and ourselves. It then addresses (b) the powerful aesthetic appeal of many fractal forms of nature, including homologous forms found broadly across inorganic and organic life forms, with the possibility that we humans are also included in such morphogenetic families. Next, the article considers (c) aspects of our selective and limited sensing of our surrounds, followed by (d) new research findings on patterns of aesthetic appreciation that may work to broaden our awareness, including "creative" profiles of appreciation. Finally, in view of the above, and considering how we humans are open systems in resonant interaction with our world, this article presents (e) six perspectives to help increase ecological awareness in our era of environmental degradation and threat. Their adaptive value for us as a culture is further underscored by their direct benefits for us as individuals - for both our physical and psychological health.

ADAPTIVE VALUE FOR BEAUTY?

An adaptive value for Beauty? Some may strongly resist such a position. Yet, why do people respond so quickly and intensely to certain images of nature or to the patterns that evoke these? So many of the natural forms around us - be they jagged mountains, forests, clouds, hillsides of flowers, swaying trees, falling water, or the sound of thunder - can evoke attention, appreciation, and awe (Richards, 1999b; Wilson, 1992). Let us consider this phenomenon and new insights it affords us into our intimacy with our environment.

Kant's Time-Honored View: Beauty Is "Disinterested"

In the widely accepted view of Immanuel Kant (1790/1964), there is no further function to our appreciation of beauty than our appreciation itself. Beauty is disinterested. Kant's *judgment of taste* occurs without any agenda or further purpose. People notice beauty (or elegance, or fitness) because of its intrinsic appeal. That reason for noticing is sufficient in itself; there is nothing else we want to get out of it. We look because we look - and it pleases us intrinsically to do so.

What, actually, do we call aesthetic? What is involved in *beauty*? Santayana (1896/1955) suggested that *beauty* is "value, positive, intrinsic, and objectified. ... Beauty is pleasure regarded as a quality of thing" (p. 31). We don't have a good word in English for the broad category of aesthetic qualities we may recognize. There are beautiful landscapes, to be sure, but also fine wines, handsome people, and elegant mathematical proofs. All of these have a special quality - and one that appeals to us, one that will draw us in (Sheppard, 1987).

RolloMay (1985) expanded on the personal experience of beauty. He said,

> Beauty is the experience that gives us a sense of joy and a sense of peace simultaneously. ... Beauty gives us not only a feeling of wonder; it imparts to us at this same moment a timelessness, a repose - which is why we speak of beauty as being eternal. (p. 20)

Might Beauty Do Even More for Us - and to Us?

What if our gazing at beauty - whether we intended this or Not - does do something to us and for us? This seems to be so. First of all, we are brought to conscious awareness! "Wow!" we may say, seeing a beautiful dusk from our summer cabin porch, the light fading over the lake, the faint puff of air on our cheek. We may even nudge our companion to get her or him to look as well. Now we have brought our companion into the picture and into this conscious awareness.

As if this weren't enough, our noticing activity has permanently changed us, physically and biologically, and potentially psychologically. Our neurons, our dendrites, our electrical patterns, and our dynamic web of experience have been altered - they have registered this moment and will never again be the same (Richards, 1999b, in press-a).We are now different persons than we were the moment before. We all are open systems in ongoing interaction with everything around us.

Each time we notice something, our brains - which are very rarely quiet anyway - work to process this new information. In addition, when a person notices consciously, rather than unconsciously, the information may be shared across a broader range of brain subsystems (e.g., Combs, 1995, 1996). Thus, in our contact with a summer lake, deepening dusk and gentle breeze, an individual is changed. In however a big or small way, she or he has evolved. It is therefore worth asking about some possible drivers of this "evolution" - and whether it might apply to us as a species.

Can Beauty Show Us Greater Possibility?

Poet Robert Burns wrote,

> The voice of nature loudly cries,
> And many a message from the skies,
> That something in us never dies.
>
> Burns, 1790

Many have spoken of broader and indeed transcendent experiences of beauty - of experiences involving a realm or agency of existence that may transcend the ordinary, may defy description, and one that can transform lives in ways that are beneficial. Hillman (1989) said, for instance, that "beauty is the way in which the gods touch our senses, reach the heart and attract us into life" (p. 302).

From an environmental perspective, some scientists and writers have posited an intrinsic need to be present with nature, to gaze at certain scenes, as in Wilson's "biophilia hypothesis" (Roberts, 1998;Wilson, 1992;Winter, 2000); they have noted a fundamental pleasure one experiences in doing so (see also Kant, 1790/1964; Richards, 1999b). This may involve a sense of unity that draws us beyond our isolated individual identities (Pilisuk, 2001 [this issue]; Winter, 2000) and a transcendent reaction of our deeply aware ecological self (Winter, 2000). This article considers whether beauty might advance such greater connection. If so, then we also need to ask how human beings manage to mute this appreciation and to manifest instead destructive behaviors (e.g., to consume an excess of goods or to shape the land to our short-term needs; e.g, Kanner, 1998; Laszlo, 2000; Oskamp, 2000; Riebel, 2001 [this issue]). Indeed, for someone sensing a broader interconnection (e.g., Macy, 1991; Pilisuk & Parks, 1986, Pilisuk, 2001), this destruction is also a way of neglecting and of hurting ourselves.

An Evolution of Information and a Creative Process

This ongoing dynamic, this metabolism of information in the world, and our role in it, may be seen as an *evolution of information*. Does beauty - and most certainly the beauty in nature - help alert us to what we would do well to notice? (We have not yet proposed why we should notice - just that we should do so.) Significantly, this hypothesis is not in conflict with Immanuel Kant's (1790/1964) still dominant and widely accepted perspective on beauty. To Kant, beauty is *disinterested*, and we notice simply because we have pleasure in doing so. Kant's aesthetic *judgment of taste*, therefore, stands alone; we look because we look - there is no ulterior motive, no other agenda.

Yet, one may note that *the judgment of taste may itself be the point* - the very means of heightening our conscious awareness and of furthering a transformation or change (Richards, 1999b). If one does not appreciate beauty for a particular purpose, a particular purpose has still been duly served. We have noticed - and we have remembered.

What undergoes transformation or evolution? One can speak metaphorically of *memes* (Dawkins, 1976; Richards, 1990, 1999b) or of "units of information" that affect the evolution of our personal and cultural understandings. These are comparable to the genes or units of genetic information that affect our biological evolution. In our individual work or social communication, these informational units might mix, match, and recombine to yield original information. This originality, this putting together of elements in new ways, this informational evolution, is the very definition of *creativity* (Albert, in press; Richards, 1999b; Runco & Richards, 1997).

What is a meme? Examples are an idea, a tune, an equation. One can also speak of a meme system, information that evolves more or less as a unit. Examples include the English language or the Beethoven piano concertos. Writ smaller, one might speak of various concepts or meaningful clusters of information that have evolved for particular reasons, such as the types of pasta or rivers in the Northwest. Our minds seem organized to create such clusters, to chunk and conceptualize much of our reality. Modern research suggests this may occur against a chaotic background of electrical brain activity (see Combs, 1995; Richards, 1997; Skarda & Freeman, 1987), which is poised to suddenly self-organize in face of new understandings. We look at a landscape and we see trees, clouds, mountains, and fields. Our perceptions seem to come already prepackaged in such conceptual units.

Such memes and meme complexes may be the paints on our informational palette. We combine them in new ways in our ongoing creative task of staying alive and of seeking meaning for our living. Our creativity is fundamental to our evolution.

One may note in this regard that from a human perspective, creativity is neither inherently good nor evil (e.g., Richards, 1993). As with a knife, which can be used to make a salad or to commit a robbery, our originality of daily life can be applied quite broadly across the works of humankind, whether benevolent or not. One may consider, as well, as one reads on in this article, whether our response in accordance with the beauties of the natural world may not put us more fully in harmony with a greater flow of life and point us in a more positive evolutionary direction. Such has indeed been suggested, for example, in our aesthetic appreciation of Taoist or Zen art (Chung-yuan, 1963; Ross, 1960).One might even ask if what we call "ugliness" might tend to fade, when viewed more universally, and without self-interest.

Memes and Chaos Theory

Indeed, using chaos theory, memes might be profitably compared with chaotic attractors of mind; some believe these attractors organize our thoughts and beliefs in complex hierarchies of mental operations (Combs, 1995; Goertzel, 1995a, 1995b; see Richards, in press-a). We can learn a bit more about creativity from chaos theory and vice versa.

To take a relatively uncreative example, we see a drinking glass in a department store and touch and reject it. We're just not interested in tableware today. The word *glass* may become the totality of what we remember, if anything, from this brief encounter, which we box and file away without a flicker of conscious awareness. Such mindless response can be useful as we go about our complex tasks; our demands are far too many to process them all consciously. Thus, goodbye glass.

Yet, one can overdo a good thing. We may then walk through the shoe department and then out the door - still on automatic pilot - use the drinking fountain, get in the car, drive to the office, eat our lunch, and even carry on a conversation, in a routine and mindless way. If automaticity can be helpful at times, such programmed living also brings the risk that we will miss our life entirely, and the richness it could have, as we continue along on automatic pilot. While our "drinking glass" is being filed away under tableware, in our mental files, we may meanwhile be overlooking its deep blue color, brilliant clarity, sparkle of cut crystal, and numerous other qualities. We may as well have been asleep. These qualities will stay incognito until something else arrests us and helps us to notice. Happily, without the need for immediate action, for fight or flight survival responses, fear or aggression, we can still be brought to awareness. Beauty can do this.

In the case of the glass, in the first and mindless instance, we have not significantly changed our mental organizing structure but have assimilated the information about the glass, even as Piaget said (see Richards, 1996a) into our already existing mental schemata. In this case, we have automatically added another card to our mental card file (or another glass to the shelf). Our conscious awareness has moved onto some seemingly more meaningful tasks.

Now enter *beauty*, which comes, interestingly, hand in hand with deeper holistic awareness and with our human creativity (Richards, 1999b). The sun strikes our glass. "Wow!" we gasp as the sun shows the depths of the blue and a hundred sparkling facets. We gasp with delight. This time, we are not just cataloging attributes - a form, a color, a reflection of light. We are there *with* the object, there in its totality, and our seeing and the object become one in a deeper and a holistic knowing. This experience is indeed quite well known to our children as well as to our sophisticated adult selves. As Puhakka (1997) put it:

> "Knowing" is a moment of awareness in which contact occurs between the knower and the known. This contact is nonconceptual, nonimaginal, nondiscursive, and extremely brief.

> "Having knowledge," on the other hand, consists of descriptive or interpretive claims to the effect that "such-and-such is the case" ... (with knowing) what is contacted are, to borrow Husserl's term, "things themselves." The act of contact breaks out of our solipsistic representational world of images and meanings, and also out of the collective solipsism of socially determined meanings, into genuine, empathic interconnectedness. (p. 9)

Now let's return to our glass in the store and another possible type of encounter. A curator of a California historical museum sees this object. She is struck - she just stops, she looks. This is a moment of pure appreciation. A smile comes forth on her face. She is finishing an exhibit on the people of the California gold rush, and now she imagines the sparkling blue glass in the hand of a smartly tailored California banker. He stands in an 1850s' Nob Hill parlor far above the San Francisco Bay; she pictures him hoisting hand and glass in the elegant manner of his native Boston toward a full-skirted lady. Behind him, through the bay window, is a San Francisco panorama, with hills and harbor, expanse of blue bay, the outlet the Golden Gate Bridge will later span, and the ocean beyond. Tiny in the distance, down near the docks, are gold prospectors in tones of brown and grey, raising dust as they enter town.

In the museum example above, the glass has been reframed as an art object, an elegant piece of craftsmanship that picks up the dominant blue color of a panoramic background. In using the glass this way, the curator became consciously aware and made conscious choices after initial direct awareness and appreciation of the glass. Here she escaped not only automaticity but also the usual conventional meanings and associations to a drinking glass.

Here one finds freedom for creativity! The curator reframed the glass's qualities, associations, and impact for the task at hand, and she perhaps adjusted the task itself in turn (e.g., highlighting blue more as a dominant color associated with means or ease). She was willing to *accommodate*, to use Piaget's companion term, to adapt actively to a situation that was evolving anew and requiring new visions of its parts and the whole.

This innovative instance places recollection of the blue crystal glass in a different mental region, or attractor of mind, serving this time as symbol of elegance, wealth, and leisure, as well of glassware. Simultaneously, in the mind of the creator, this use becomes linked creatively to many other possibilities, enriching the content - and also the potential process - for future creative associations.

Recombination and Replication of Information

What is evolving here? Is it not our very minds, our understanding, our information in memory and conscious awareness, plus the dynamic structure of our brains and the ongoing process we use individually and together to organize our material reality? Every second, we reframe our worlds (indeed, even when we are moving on autopilot).We are all processes in motion; we never stop. Each moment we change - and we truly see differently! We become different beings as varied neurons flicker on and off or link to each other through new chemical or anatomical connections. As with our genes, these memes - including our thoughts, ideas, wishes, and plans - will recombine and replicate always, as we blink, move, sit quietly, take a nap, or jump up to answer a ringing phone (Richards, 1996b).

One might think that this mental process could reach a new local maximum whenever creativity is involved. Our everyday creativity is precisely the bringing together of known elements in new and unusual ways for the generation of meaningful originality (see Barron, 1969; Richards, 1997).

Compared with biological creativity, one can ask how efficient this meme-making, or informational, process is. Unlike genes, wherein two biological parents join after perhaps a lengthy courtship and then wait 9 months for the offspring to emerge, the creation of new memes can happen instantaneously. Now compare our example of exhibit design. "That's it!" says the curator, the creator of the gold rush scenes, as she mentally hands the blue glass to the man by the lace curtain of the San Francisco Victorian home. The whole picture comes together. In the openness of discovery, the system has coevolved; separate memes have been joined - glass to residence to banker, against a backdrop of salt water and blue sky. In what was not a wisp of a thought a second before, new memes have been created.

The next day, perhaps, a local reporter writes up the exhibit for the morning paper, and a photographer snaps a picture. Already some memes have been replicated. Thousands may scan them in the newspaper the next day at the breakfast table.

Yet, how well will such memes actually survive? The salmon swims upstream and lays many eggs. Only certain offspring will live and propagate their DNA, their genes. So it may be as well for our creative memes, both individually and socially, even for our newest and most original ideas or compositions. For a variety of reasons, some of these will survive, but many others will languish and die.

Yet, if any one of these should appeal, if the idea or creative product should do something useful within the minds of others, it may achieve a different fate. The information will be stored - preserved, not lost - and will be replicated, as in the example above. Publication in the *Journal of Humanistic Psychology* is one worthy example of this. The information can be cloned and distributed at remarkable speeds in this age of the Internet, cable connections, networks, and systems of all sorts.

Returning to the museum illustration, aspects of the gold rush exhibit could also be captured with digital photography and sent electronically elsewhere. These memes could appear in museum Web sites, online journals, and on tourist souvenirs such as gold rush postcards, T-shirts, sunhats, calendars, and screensavers. Here is a mini population explosion - an explosion of information.

When might such an information explosion be most pronounced? Consider a cure for cancer. A vaccine for AIDS. The discovery of life on Mars. How fast this news would travel around the globe and into each living room! Here are memes exploding in all directions like brilliant fireworks.

Seeing Beauty, Evolving Along With It

Our ideas may fade, but the wonders of nature have so far persisted. Indeed, how often may people across cultures and countries be roused to awareness by the beauties of our natural world - including the fragile leaf and the tiny bud, along with more majestic mountains and valleys. How readily we may file such aesthetic experiences away for future appreciation and benefit. You have probably heard it said that we become the food we eat; no less do we become the sights we see, the ideas we

entertain - or the marvels we stand in front of in awe.
We could know more about why we process the things we do. Do we notice and integrate certain forms more preferentially? Certainly there are built-in predispositions to some visual characteristics even, as it occurs, in choosing a mate! (Pennisi, 1995). (Wouldn't it behoove us to be aware of such preferences?) Might particular memes even have their own agendas? Might some call more for calm appreciation and others for more immediate action, for instance, and/or does response also vary in relation to context and previous experience?

Such questions can orient our inquiry. The focus in this case is on beauty and, in the language of chaos theory, the fractal forms of nature - these self-similar forms, such as the ever more delicate branching of a tree, that can repeat at vastly different scales. These fractal forms are far from rare; they are everywhere outside your window and, indeed, are present as well when you look in the mirror! Are there lessons we can learn from these, even lessons that might keep us alive, aware, and evolving in a healthier harmony with our natural world?

KANT'S ***SUBLIME*** AND THE FRACTAL FORMS OF NATURE

In the last section, we looked at ways that beauty can affect us, including a pull to conscious awareness and to a direct knowing that puts us more intimately in touch with our world and our own creative options. Aesthetic appreciation also changes our brains, quite literally, and modifies the fabric of our past experiences and our future possibilities. In this section, this argument is extended to the fractal forms of nature and not only to the experience of beauty but of awe. Does our natural world carry some powerful messages with which we resonate?

Awe, Infinity, and the Sublime

There can be real aesthetic surprise and delight in pondering the fractal forms of nature - a tree, a mountain, a cloud - as will be described. Certainly, there are other aesthetic experiences of nature as well, but the fractal forms have a clear appeal. In addition, this can sometimes go beyond beauty to what Immanuel Kant (1790/1964) called the *sublime*.

To Kant, there was a distinct pleasure found in nature that was dependent neither on a sense nor on a particular understanding. "It is an object [of nature] the representation of which determines the mind to think of the unattainability of nature regarded as a presentation of Ideas" (Kant, quoted in Beardsley, 1966, p. 221).

A quotation from Gregory Bateson (1972) is provocative here: "'The primrose by the river's brim' is beautiful because we are aware that the combination of differences which constitutes its appearance could only be achieved by information processing, i.e., by *thought*. We recognize another mind within our own external mind" (p. 465).

What is the essence of this experience, Bateson (1972) asks, which is translated as beauty? What greater knowing may exist - and delight us - perhaps reaching beyond our own idiosyncratic viewpoints and resonating with something greater? Looking no further than the level of biological science, for instance, consider Sheldrake's (1984) theory of "morphic resonance," indeed a transpersonal biological explanation. Other metaphysical perspectives can be included as well. But we must leave this for now and move onto Kant's theory of the sublime.

Whereas beauty involved the bounded, the sublime involves the boundless. Kant (1790/1964) wrote of both the *mathematical* and *dynamical* sublime. Kant's mathematical sublime renders all else small by comparison. Consider the power of large numbers, of immensity beyond our ready comprehension. Here is a mountain range towering above, experienced directly, noncognitively, with awe. In a process of aesthetic estimation, the imagination reaches an upper limit in the ability to take this all in. Then comes the experience, the awesome quality. Yet, Kant saw in this very failure a triumph of reason, even one with moral overtones. The experience, he said, reminds us that we have "a faculty of the mind surpassing every standard of sense" (in Sheppard, 1987, p. 219).

Kant's dynamical sublime involves forces that appear to wield absolute power over one - consider hurricanes, earthquakes, volcanoes. Yet here, too, Kant (quoted in Sheppard, 1987) found a moral triumph, a superiority. In the face of such forces, Kant said, and in our human appreciation of its nature, "our person remains unhumiliated" (p. 220).

In each case, people are confronted with hints of infinity, conveyed in size, number, power, destructiveness, or in some other way. Here, then, is mystery in vastness and incomprehensibility. Kant (in Beardsley, 1966) said, "Nature is sublime in those of its phenomena whose intuition brings with it the Idea of their infinity" (p. 219).

As we confront the sublime with awe and respect, we may again be brought to awareness, often without the limiting - albeit grounding - framework of a finite self. This experience can sometimes be frightening. We may expand into that broader space, now knowing directly a towering cliff as we stand far below by the canyon wall, and a river that flows onward. The moment is intuitive, noncognitive, we crane our necks backward and feel the cliff's immensity with a gasp - a half mile of towering stone, the geological ages beyond human comprehension that so slowly and patiently sculpted it.

Zausner (1998) noted the similarity of such moments to transcendent religious states of awe, "an encounter with the infinite, structured by the familiar" (p. 4). Transcendent religious states often evoke ecstasy as well as fear. Yet, by contrast with panic, which brings the fear of obliteration, awe brings with it "an intimation of eternity" (p. 4). Such transcendent states are sought and valued across cultures and carry the potential for personal transformation (Zausner, 1998).

The Infinite Is Found in the Fractal Forms of Nature

How do we get from here to *fractals* - which may be characterized as forms that look self-similar whether seen at a greater or a smaller scale. Patterns of self-similarity are present right now, all about us, writ large on the same towering cliff in our example and writ small in the scrub brush beside the winding river at one's feet. (Picture the limbs of a bush, branching smaller into tiny limbs, smaller into twigs, and onward so long as the plant will grow. There's a fractal.)

These fractals' forms are born from infinity; by definition, they can look similar on infinitely receding or expanding scales. In chaos theory (or nonlinear dynamical systems theory - see Gleick, 1988, and Briggs & Peat, 1989, for readable and graphic introductions), fractals speak to a bounded infinity, often marking out some of the infinite possibilities inherent in the "strange attractors" of our world to which these fractal forms are typically tied. They reflect these possibilities in a condensed and powerful graphic form. Fractals are often related to points of growth and new development on the borders of change in our world. They can be related both to Dewey's (1934) aesthetic of everyday life and to the related construct of everyday creativity (Richards, 1999b; see also Marks-Tarlow, 1995; Schuldberg, 1999; Zausner 1996). To the extent that they appeal and draw us in, these fractal forms can aid in the evolution of information, in our ongoing global creativity. This evolution may occur in an instant and by definition. If we process an image, as has been stated, then we have changed, we have evolved into something original and new. In processing a fractal, we encompass, perhaps, a great deal more: an infinite series, a process in motion, an ongoing possibility.

How remarkable that such self-similar forms are also found in Asian art, including Asian sacred art. Consider, for instance, the swirling clouds or the fires of transformation (Lauf, 1995; for further information, see Richards, 1999b). Here is the art of transformation, and this has been joined, in some cases, with particular practices. It can offer one type of aid or another toward enlightenment (Lauf, 1995; Ross, 1960). We may contemplate such art to change, to grow, and to move toward realization. How significant that the wonders of nature can offer this benefit. Whether fractal forms carry aesthetic qualities that people find beautiful or awe inspiring are hypotheses to be tested. After further discussion of fractal characteristics, and how we might perceive our world, some research data are presented on this very question.

We Are More Familiar With Fractals Than We Might Think

In chaos theory, the term *fractal*, applied to a visual image, alerts us to infinite detail in an irregular pattern showing typical self-similarity, looking roughly the same on one scale as it does on another (Briggs & Peat, 1989; Mandelbrot, 1977). These fractals are more familiar than one might think. Consider a rocky coastline. It looks similar in its wandering and irregular profile of headlands and bays, whether seen in broad detail from a satellite, more closely from an airplane, or in minute detail during a walk along the shore. Consider a simple example of a Koch curve (e.g., Peitgen, Jurgens, &Saupe, 1992),which you can draw for yourself on a piece of paper, starting with a simple triangle and then putting smaller triangles in the middle portion of each triangle's edge ... and so on and so on. You are creating self-similar forms along this periphery, and they get smaller and smaller in scale. Doesn't the result look rather like a snowflake? This pattern has appeal to most people. Why is this?

Attractors and the Fingerprints of Chaos

Are we somehow reading a deeper implication in a fractal related to the operation of chaos theory (or nonlinear dynamical systems theory)? Fractal forms have been called the *fingerprints of chaos* (Richards, 1999b); here, a process of great importance is indicated - a generator of great complexity, indeed of infinite possibility. These fractals are typically linked to *strange attractors* in our world - the word *attractor* denoting the status that a dynamic system eventually "settles down to" - represented by a set of values in phase space (Richards, in press-b).

Look how quickly things can get complex in our world. There are three basic types of attractors. First, (a) a point attractor might be illustrated by a pendulum and its coming to rest. There's only one place it can be going, whatever its path. Death is one of the less pleasant examples of a point attractor. Then we have (b) a periodic attractor. Consider the same pendulum with continuous energy input so that it just keeps swinging back and forth in the same arc or going around and around in the same circle, or ellipse. (This is not necessarily an example of immortality!) The earth provides an example - were it not for an infinity of other planets and forces, the movement of the earth around the sun might be a familiar illustration of a periodic attractor - indeed, this simpler periodicity is what a beginning physics student learns. It reflects what we have often assumed; that we can fully predict our world. But not so. The third type is, finally, (c) a strange (or chaotic) attractor, and this situation of infinite complexity turns out to be the usual case. All it takes to make our pendulum "strange" like this, instead of predictable, is to link it to another pendulum. Two coupled pendulums will produce an infinity of possibilities (not to mention two people, two families, or nations).

The idealized orbit of the earth is, again, one of the more stable examples of such strange-attractor possibilities. There are dominant forces that give us a nice Newtonian certainty in predicting where the earth will be next month, and this pretty much works. We have been happy with Newtonian dynamics for a great many years.

Yet, chaos theory got its name for a reason. Chaotic systems (like the earth, like the weather, and like us!) tend to be "far from equilibrium" systems that seek new order as a matter of course and can evolve dramatic new possibilities. Recall that chaos theory can be called (or is a central example of) "nonlinear dynamical systems theory," and Newton would have to think again about situations that only seem to be linear but suddenly attain configurations of parameters that allow dramatic change (e.g., Briggs & Peat, 1989).

You have probably heard about the so-called Butterfly Effect (Gleick, 1988) whereby a butterfly flapping its wings over, let us say, Moscow suddenly causes a storm system to erupt over New York City. This particular butterfly was "the straw that broke the camel's back" or the last snowflake before the avalanche. A destabilization occurs, and a dramatic new equilibrium is reached. Such nonlinear dynamics have been applied to everything from the weather, to the stock market, to biological rhythms, and may even help solve the mystery of creative insight (e.g., Abraham, 1996; Iannaccone & Khokha, 1995; Richards, 1996a, 1996b, in press-b).

It turns out we largely studied the exceptions, and not the rule. This was true for our study of human beings as well as simple physical systems. Compare, for instance, the homeostatic Freudian model of personal development with the model of ongoing growth and self-actualization of humanistic psychology (Richards, 1981). In the first, the goal is stability and quiescence. In the second, instead, we have the potential for self-actualization and an ongoing human evolution, including possibilities of which we may yet be unaware (see also Krippner, 1994).

Such points are discussed in the fourth and last section of this article, along with some consequences of a new aesthetic for environmental awareness.
As such, the fractal forms of nature herald some of the infinite variants of our world's possibilities for growth and change as they reach out to involve us. Here are the branchings of a tree, each twig unique in itself yet overall of the same "family." Here, too, are the veins in each leaf - each leaf a study of uniqueness but also of community membership. A strange attractor never generates the same possibility twice, although it will by nature bound or enclose all possibilities. Here in each case is the signature of bounded infinity.

Chaos does not involve stasis or quiescence. It involves active energy seeking dynamic new order and patterns for greater complexity and more efficient energy flow. These are dynamic systems far from equilibrium - and not confined only to visual phenomena - found commonly in our world, for instance, in thunderstorms, waterfalls, evolving mountain ranges, in the patterns of trees and bushes, and the contours of clouds; all are processes in motion bursting with unlimited possibility (Iannaccone & Khokha, 1995; Mandelbrot, 1977). Here, as John Dewey (1934) said, we can find the creativity of the life force on the borders of change - of the aesthetic moment involving peak, transition, and indeed, opportunity (see Richards, 1999b, in press-a). How important to be conscious of such opportunities. Beauty indeed does makes us mindfully aware (Richards, 1999b). Don't you become conscious with a start when you see a sunset streaking the sky with brilliant colors and cloudscapes?

HOW WE SEE: SOME WELL-KEPT SECRETS?

So far, this article has considered how beauty and how the sublime can enhance our overall awareness, in general, our appreciation, and our freedom for creative originality. Here is considered a possible role for aesthetic appreciation in the actual selection of what we end up seeing and processing, toward our greater growth and evolution, against the backdrop of how much we habitually and experientially miss.

We See It Selectively

Bateson (1972) noted, regarding Kant's *Critique of Judgment*, that aesthetic judgment is selection of a fact. We create the sight, even as we become conscious of it. We do not merely have it. We have chosen, if you will, to see that sunset for a reason, even if we don't know what that is. Let us look first at what we rule in and then the vastly greater universe we rule out.

Sewall (1995, 1998) spoke of our need to see nature, to see certain patterns, and of a natural resonance this involves, or an affinity with certain types of experience. She suggests that this is one way we essentially "listen," doing our part in a broader and multisensory communication system linking all parts of Gaia. Roberts (1998) noted a *structural coupling* we all have with our environment, born of our interactions, that causes ongoing changes in each.

This is not a simple affinity that is broadcast (say, by a cloud at sunset or by a tree) and then received (by our human eyes). It is an affinity created between seer and seen. It is our metaphorical joining of hands with those aspects of the world that are calling to us and to which we instinctively respond.

Consider a tree, say a tall and stately redwood, trunk rising to a vanishing point high above us, branches silhouetted against the sky, as we stretch back our neck to look. It is quiet - so very quiet - in a deep forest glade - layer upon layer of needles and leaves and brush and earth. Our feet sink softly into this carpet. An invisible bird breaks the silence with a call. We listen, we watch, we feel very small yet protected and somehow at home in this scene that seems almost familiar.

Is this comfort because the scene actually is somehow familiar? Recall that the stately redwood is not really out there, with us back here, separate and isolated. The tree is not an invariant fact of nature, objectively perceived, an object that has nothing to do with us. Recall again what Bateson (1972) said: "Aesthetic judgment is selection of a fact." Going further (e.g., Nhat Hanh,1988, 2000), the object sensed, the process of sensing, and the sense organ itself (tree, seeing, eye) can be said to form an undivided whole. It is not merely out there, then, that tree. It is there because our perceptual process has selected it, framed it conceptually, and put it there. We, too, are part of this evolving process; we are cocreated as open systems in mutual interaction with our environment (e.g., Marks- Tarlow, 1995; Richards, 1996b). As students of the new physics are well aware, the observed and the observer cannot be separated (e.g., Combs, 1995; Laszlo, 2000).

Of the infinities of light rays streaming in from all directions, in seeing we have (and we have rather automatically) made our choice and our linked interpretation. The tree came prepackaged as a "tree" - just think about that one - it was already wrapped, labeled, and tied up with a ribbon before our glance had barely settled on it. It may indeed be important if our filtering mechanism brings us items central to our survival and ongoing evolution and if beauty in nature, let us say, provides one way to give us all a common, and a pleasing, vocabulary.

Yet So Much Is Missing

Then, there is the other side of this issue, not what we see but what we miss. When we organize our world, we leave out vastly more (Richards, 1993, 1999a). It is useful to draw a scene, any scene, because you'll surely discover many parts of the scene for the first time, as Franck (1973) noted in *The Zen of Seeing*; just take a look out of the window right now. Then, there is the additional issue that whatever we do see comes preprocessed; it has already been conceptualized and compartmentalized.

Actually, be a system small or large, a tree or a universe, chaotic systems have two paradoxically different properties. First, there is (a) an unpredictability, related to the infinity of possible manifestations, including a dynamic unpredictability related to sensitivity to initial conditions, as in the widely touted Butterfly Effect. Second, there is a (b) boundary, a general patterning of great clarity, bounding these infinite possibilities - related, for instance, to our conceptual labels (Richards, in press-b). City, tree, what have you, the overriding constructs can be clear and defined. Overall, these patterns are structurally predictable (Combs, 1995; Goertzel, 1995a, 1995b).

Think of the families of phenomena we come to name - coastlines; clouds; river deltas; trees; and the not-dissimilar branchings of our arteries, veins, and nerve cells. We recognize these broadly, and we know what to expect in general. Think of the "clouds" or "trees" we anticipate, even if we cannot predict specifically what a certain cloud, or budding branch, will do. Is there an even deeper belonging and intrinsic resonance? At a level of intuition and aesthetic appreciation, might we even sense a hint of a central life force? No longer will the family name be clouds or trees; instead, it will extend throughout our manifest reality. Is this why we go to the country on vacation - and why some may call it *recreation*?

On the other hand, having these categories available is like putting on blinders. How much gets sucked into the powerful vortex of our strange attractors? We are cutting down rainforests at the terrifying rate of 10 city blocks a minute (Richards, 1997). A common defense is, "We've always handled things before, so somebody must be doing something about this." Instead of creating a category of mind, "environmental devastation we need to do something about" (see Howard, 2000; McKenzie-Mohr, 2000; Riebel, 2001), we let our concern be sucked right down the drain of our self-reassuring "Somebody's doing something" (Richards, 1993, in press-a, in press-b). What else are we missing (Ornstein & Ehrlick, 1989)? This is a waste can of forgotten memories we do not inspect. At the bottom of this attractor hole lie a great many issues, foretelling, perhaps, of our human undoing.

Relevant to this is investigative reporter Richard Preston's (1994) largely truth-based novel, *The Hot Zone*. What if Ebola virus or another should escape from the African equatorial rain forest - a hot virus, highly contagious, rapidly acting - and jump the species barrier, begin to infect humans, and threaten us all? Preston's brilliant speculation: that at some point, the immune system of the earth, of Gaia itself, could react to the strange and self-centered creatures that are paving it over and send a disease, a new plague, to restore the balance and the earth's sustainability. The dinosaurs didn't make it, so who says that human beings will continue to exist, no matter what? While we overlook the dangers that seem remote, they may be just a hairsbreadth away - nonlinear dynamical phenomena that are difficult to predict.

Perhaps part of what is awe inspiring about the sublime in our world is just the opposite of heedless negligence above. Instead, one has an intuitive hyperawareness of the fractal forms of nature and all that they imply and might further be in the future - not only (a) the strange attractors of infinite possibility but (b) very much the infinitudes of the specific forms, with a cherishing of all these manifestations. Here lies the wonder of the yet unknown in its limitless promise of discovery. In this case, we are all too ready to uncover it. Plus, here, once again, we may not only discover the multitudes of trees, branches, flowers, petals, and ridges along a mountainside but we may discover ourselves.

What Raw Experience? - We Are Prepackaged and So Is Our World

Let us turn from the misuse of categories to the problem of categories in general. In making our many conceptualizations and discriminations, we lose a vast immensity (e.g., Nhat Hanh, 1988, 2000). How fortunate indeed that beauty is able to bring us a fresh and more direct experience.

But we still don't even know what we are missing. Sky, bird, pine needle, rotting log, buzzing bee. It doesn't seem at all fair! The hand of this concept maker is surely quicker than the eye. Even our own selves are prepackaged and assumed by us to be fixed, when they are evolving open systems, ongoing processes in connection with all else, of which we may only sense a wisp (Combs, 1995; Marks-Tarlow, 1995, Pilisuk, 2001; Richards, 1996b).

And what did we just hear? There was a singing bird in the tree, or so we thought, but did we even see the maker of that mysterious sound? What was it like - a cheerful chirp was sensed, and it was possibly dumped in the "bird in tree" category without a thought. Then there's the sky. How helpful, at times, to reduce all of the layered gases that swirl above, covering the planet earth, thinning out into the upper atmosphere, and reflecting sunlight that masks the planets, stars, and galaxies, into that three-letter word, "sky." We may see this cover, if we're not consciously trying, as a simple wash of blue. Yet, did anyone give us a choice? Not exactly.

Well, of course, you might say - aren't trees, birds, and sky overhead what one sees in a forest?

Not necessarily. Imagine instead that our conditioned senses fall on a more fluid gestalt - air movement, softness, flickering sunlight, spaciousness between giant forms, slowness of time, dampness and hush, creatures scurrying beneath. In this example, we are still using labels, if a little less obviously - the result is tied more to process, to ongoing change, and to direct sensory experiences (air movement on a cheek, subtle changing sounds, a dampness we inhale, and flickering light in a spacious soft enclosure), more than to the illusion that we can pin everything down with a name or a noun. It may also be that this experience is enacted more consciously, with even greater mindful awareness of all that is happening. It doesn't fall so readily into a template ("tree in forest") that can simply suck up the experience and file it away.

One might well consider what it could be like to encounter a panorama without any labels, names, exclusions, or chunking of sensations whatsoever. A goal of a great many meditative traditions is a truer seeing, a realization. This can lead not only to a transformed sense of reality and the interconnectedness of all things but to greater identification with the totality and a profound compassion for all beings (Goleman, 1977; Macy, 1991; Nhat Hanh, 2000). Here indeed is help for our endangered world and for us.

Yet, short of this, there are still many ways to learn to see a bit more - and to see more consciously. In some art classes, one valuable exercise involves portraying negative spaces, those spaces between displayed objects - between vase, cup, apple, or human model and modeling stand - objects that are more typically one's focus. Doing this can be illuminating and can open up vision to other exclusions, too. But when did those spaces get "negative," anyway? What exactly is wrong with them? What counts and what doesn't count in our selective perceptual and conceptual experience, and in our world?

Another way to open up our experience more - and perhaps it is even part of its purpose - is through awareness of beauty.

We Are Part of Something Bigger

How is it, if we are entities not separate from nature but an integral part of nature, that we sometimes congratulate our "selves" for our unique and personal accomplishments, as if nothing else was involved, not even our parents, our teachers, our education, and our lucky breaks. Plus we were not the designers of these selves to begin with!

When we look carefully, some part of a greater "family relationship" may be revealed. How telling that the rivers that traverse the mountains are not at all dissimilar to the branching of our own arteries and veins, which in turn resemble trees and tree branches, or the trees and neural branches of the neural structures in our heads. We didn't construct these rules of our very bodies any more than we crafted our own hands and feet. We came into these forms and we came into this place. We continue to seek and to wonder why we are here.

Our systems that perceive these forms and that feel, think, and act are reaching out into a greater reality and at each moment are reformulating the whole gestalt - of us and world, who we are, what we see in the looking glass, and see out there, and what we will next react to. It is all of a piece. Again, that chair is not out there, inert and separate from the rest of creation! Who even said it was "a chair"? If my view and yours are a bit alike, we do have the forces of culture between us. But for each of us, it is still an indivisible whole that unfolds in each moment. Plus, that panorama that appears - and appears to be "just like that" - exists only because of our mind. Again, as in modern physics (Richards, in press-b), you cannot separate the observed from the observer. It's our particular slice of the infinite pie.

Thus, it may be all the more significant when we observe these homologous structures repeatedly in body, mind, and world - and furthermore, when we are moved by them. We have chosen to notice this and to admire it. One may recall again what Bateson (1972) said: Aesthetic judgment is selection of a fact.

There are other patterns we are learning to see and to appreciate, which include the beating of our hearts, which is also, as it occurs, a fractal phenomenon (Sabelli, Carlson-Sabelli, Patel, Levy, & Diez-Martin, 1995). But compare the resonance to the cyclical music of the spheres, the lunar month, the woman's cycle, the tides, the healing qualities of a circle; here are others of our common bonds, the rules we may live by, whether we are mountains or streams or small children or dolphins (e.g., Borysenko, 1996; Cohen, 1999).

We stand in awe before the beauty of nature and the sublime. We have chosen to appreciate it - or could it be, chosen something that one can appreciate - out of an infinity of alternative perceptions. What, indeed, if some of the choices are based on a family resemblance, a deep and sensed familiarity as Bateson (1972) implied. How often do the mountains look familiar, or the seashore, or a distant cloud, even though we've never seen them before? As per Bateson (1972), we might ask if there is an underlying intelligence operating here that we can't really describe but that we can know in our bones. Is there a pull into life from more sacred realms as Hillman (1989) proposed?

Poets, artists, composers have sung to the glories of nature. There are unlimited possibilities for growth and transformation latent in the bounded infinity of strange attractors. Is this one reason we like to notice them, to enter more into the flow and the possibility? Are they just "pretty," or do we sense more, perhaps a potential for evolution, for an energy flow toward a new equilibrium? Consider Taoist and Zen art and the magnificence of an always evolving nature (Chung-yuan, 1963; Richards, 1996b; Ross, 1960). Do we - to be bold - even sense the life force in action?

Then, to what extent is some of the familiarity, and the intense aesthetic appeal, related to our own participation in the mystery? Could these phenomena alert us, subtly, yet powerfully, that there is something here we should take care to not miss? This time, we may turn the light around on ourselves and may, furthermore, look within.
Albert (1996) addresses potential evolutionary aspects of art going back as far as prehistoric times and the possibility, beyond other functions, that such art tells us how "the brain fascinates itself. What stimulates it, whatever and wherever the source ... [it] was compelled to pay attention to its own living processes" (p. 80). This was "in keeping with an evolutionary sequence ... and the transition from earlier human species to Cro-Magnon" (p. 80). Others have addressed the greater potential within the human brain, and our own opportunity now, if not our overwhelming obligation at this time of global crisis, to undergo a new and dramatic evolution of consciousness (Laszlo, 2000; Loye, 2000).

Yet, whatever the pull to a particular view of nature, it does seem at times that we can feel its resonance. And thus we might ask: Does that resonance have anything to do with beauty?

ARE WE DRAWN TO THE FRACTAL FORMS OF NATURE?

This article has considered the possibility that beauty and the sublime may draw us in and enhance our awareness, appreciation, creative originality, and the cocreation of our experience in concert with all that affects us from our environment. It has also looked at potential aesthetic appeal in the fractal forms of nature, in consideration of Kant's view of the sublime. Finally, here, it asks if people really prefer the fractal forms we have been discussing and if there are particular patterns to this preference or any individual differences.

Fractal Forms of Nature: We Humans Seem to Like Them - In Moderation

This study was born during a plane ride over Hong Kong when I was en route to Vietnam and in a later conversation with Long Island University Professor of Art Therapy Christine Kerr, my collaborator, who is also a doctoral student at Saybrook Graduate School. I was sketching in the plane as I looked out the window at the June monsoon clouds. They looked like marshmallows floating in a cup of hot chocolate, distinct yet touching, and melting just a little. I drew them like that, and they looked dreadful and not at all like clouds. Because I'd been studying fractals, I decided to try a fractal version of a cloud or at least a caricature of a fractal. It was easy - you can try it yourself: big arc, smaller arc, smaller, arc, into little squiggles. Whoa, I thought. There's something here. The drawing had come alive. In fact, there was more to the picture than what was on the page.

Back in the United States, Chris Kerr had the same reaction, both as an artist and researcher. In fact, we were both quite gleeful about it. I'd shown some rough picture pairs of nature subjects to graduate students in a seminar - the two types of clouds, plus two types of coastline, and two types of trees. These were paired sketches, one with many fractal features, the other with few. We asked students to rate their preferences. The fractals won hands down. Chris and I decided to study this more formally (Richards & Kerr, 1999), presenting drawing pairs to 74 people on both coasts, including both art therapy and psychology students. It didn't matter what coast or what interests; the more fractally rich drawings were definitely preferred and at high ratios ranging across picture pairs from 2:1 to 5:1 (Even the smallest chi-square significance value was high at $p < .001$.) We also asked people to say *why* they liked their picture choices. Reasons included peace, serenity, flow, and naturalness.

What was this phenomenon? Were people sensing the bounded infinity suggested by the fractal drawings - the infinite possibility encoded by suggestion (literally) of an infinite series? How interesting that findings were consistent with the aesthetic theory of Immanuel Kant (1790/1964), which has held sway for more than 200 years.

What follows are six possible implications, presented as hypotheses. Might we be drawn by intrinsic beauty to aspects of our world that offer

1. *Bounded infinity* - the awesomeness of our manifest world, yet in ways we can encompass. We at once have a profound humility, being only one tiny particle of this whole, yet we appreciate our unique and varied roles.
2. *The borders of change* - where growth is occurring, where sudden bifurcations may occur, and new possibilities open for us. Here may be points of balance and transition as John Dewey (1934) said. We live in a dynamic world of process, not a static world of names. This helps to remind us to take off our blinders and to be in the flow.
3. *Resonant structures* - these are not foreign apparitions out there but structures and processes that operate by the very same rules we do and speak the same language of creation. We may understand this intuitively; could this be why we are attracted to the familiar forest, mountain range, or sandy beach?
4. *Belongingness* - of each of us to a greater whole of which we are inevitably and of necessity a critical part, both in our vital uniqueness and in our overall "family resemblance."
5. *Doorways to the transcendent* - here, through beauty, through awe, through the promise it offers, we may see openings to realms that we humans have only suspected are there. Through the beauty of nature, we may sense their presence and also their beneficence.
6. *Greater awareness and self-realization* - we may also discover a potential they can awaken within us and a path and greater purpose - and even the possibility of an evolution of consciousness for humanity as a whole.

Next Steps - How Much of a Fractal Does It Take to Appeal? And Who Likes It?

To be fair, we offer at least one alternative hypothesis: Might the more prominent fractal drawings simply have been a little better done than the others and thus have won more votes?

In the next phase, we decided to eliminate this possibility and also to quantify things more, by using five computer-generated image pairs, of natural forms including mountains and islands. These nature-based pictures were taken from chaos theory textbooks and put on slides that were then shown to research participants. One picture in each pair was of higher fractal dimensionality than the other (this shows up as greater complexity, in the picture), although they did not differ as dramatically from each other as in the first study. There were also a couple of controls, with dimensionality held constant, whereas the number of steps in the series of constructions varied. Thirty participants gave both their preferences and their reasons.

We thought they would respond with, "The higher the fractal dimensionality, the better." But this was not the case. First, the island image pairs led to mixed opinions and were potentially confounding, being colored differently and shaped differently. Along with the two controls, the islands led to no significant pattern of preference, albeit with the slightest trend toward higher dimensionality. But with the mountains, there was an evident preference for a mid-dimensional complexity, not too jagged, irregular, and threatening, one might say, yet not too simplistically calm. Preference ratios ranged from 3:1 to 9:0 (yielding significant chi-square values, with p values from $p < .01$ to .001).

Among other things, the preferred dimensionality was near to or somewhat greater than that which Mandelbrot (1977), the father of fractal geometry, ascribed to our own natural world. Do we like things the way we see them or maybe just slightly wilder? Later, we found that Abraham (1996) had discussed other examples of a preference for mid-dimensional complexity in everyday life. Perhaps we are often searching for the middle way.

We became very curious about reasons why people chose either the nature-related, higher dimensionality pictures or the lower dimensionality ones. Could there be some interesting reasons and interesting people? We looked at explanations for aesthetic preference for mountains and islands and found a remarkable general pattern across all of these. People who preferred the higher dimensionality nature drawings gave reasons such as busier, open, wilder, scattered, jagged, individuality. Those who preferred the lower dimensionality ones mentioned things like condensed, calm, stable, softer, grounded, symmetrical, held together.

If the first group seemed more likely to take a hike up the hill after lunch and the second group a nap, there was more as well. We thought the first profile was particularly reminiscent of the experimental and risk-taking personality traits of highly creative people (see Barron, 1969). Consider also the creativity-related traits of preference for complexity and tolerance of ambiguity. One may bear in mind as well that the higher dimensionality situation, in general, can put one closer to the edge of chaos, to those sudden unpredictable, nonlinear shifts - to the Butterfly Effect. It's an overall different lifestyle, as Abraham (1996) has also said. We were reminded in addition of the Barron-Welsh Art Scale (Barron, 1969), in which more creative people preferred more asymmetrical and complex drawings over simpler and symmetrical ones. Did we perhaps end up with a personality test of sorts for creativity? (It will behoove us or others to give these two measures together with a more standard measure of creativity - and to replicate the present study with another sample and a more diverse group of image pairs.)

In any event, Chris Kerr and I not only found a general attraction to the fractal forms of nature but a possible augmentation of this, related to high creativity (Richards&Kerr, 1999).We humans do tend to find fractals aesthetic and appealing (Briggs, 1992; Mandelbrot, 1977). Could there also be a relationship between creativity and sensitivity to (or awareness of and responsiveness to) the beauty in nature? Think of all that this might imply at this critical time for our environment.

ENVIRONMENTAL CRISIS - AND THE "NONLINEAR REVOLUTION"

With fractals, it seems, we see them, we like them, we are drawn to them - be they natural forms or not. (In fact, applications in nature have already been found for many, including Julia sets and Mandelbrot sets (Iannaccone & Khokha, 1995; Mandelbrot, 1977). Their dimensionality, their complexity, can enhance the appeal. These chaotic systems are open, evolving, and may be inviting us in. By definition, each carries a far-from-equilibrium energizing potential promising new organization, complexity, change, and a chance for creativity. Indeed, they may even seem alive.

As Goerner (1995) said, "We stand at a turning point in human civilization, the magnitude of which we are only barely aware but whose importance cannot be doubted ... of how order evolves naturally, why change is inevitable, and what factors underlie transformations" (p. 17). We are moving, Goerner said, "from a controlled machine vision of the world to an evolving ecological vision" (p. 17). Goerner (1995) mentioned five "messages of chaos":

> 1. *Order is hidden in chaos* [italics added] ... Strange attractors show that intricately ordered flows can be hidden in what looks like completely erratic behavior.
> 2. *The order in chaos is holistic order* and results from mutual effects ... a result of interdependent variables.
> 3. *provides a mechanical explanation for "mysterious" hidden global ordering* (an "invisible hand") ... elements of a mutual effects system. ... Walking on the treadmill causes it to move but its motion creates a pressure to keep walking.
> 4. *Nonlinear interdependent dynamics have a penchant for creating wholes out of parts.* The classical example of entrainment is the phenomenon of self-synchronizing cuckoo clocks.
> 5. *may exhibit qualitative transformation of behavior* (bifurcations) ... may have multiple attractors ... each perhaps a hairsbreadth away ... classic examples here are horses' gaits: walking, trotting, galloping, and running. (pp. 23-24)

Likely, our grandchildren will never see the world the way we do. In fact they may laugh (as only the young can do) at how we could have been so foolish to believe that things were linear, simple, and predictable!

Below are suggested six themes for our environmental awareness that relate to this interconnected, nonlinear dynamical perspective. Each can be well illustrated by the fractal forms of nature, seen vividly in pictures such as that below, and particularly in ongoing dynamic videos of these as they change and evolve. Consider the Mandelbrot Set, illustrated in Figure 1 (Peitgen & Richter,1986) and the repeated forms seen at all scales, differing in various ways, but always belonging, and contributing to a breathtaking whole.

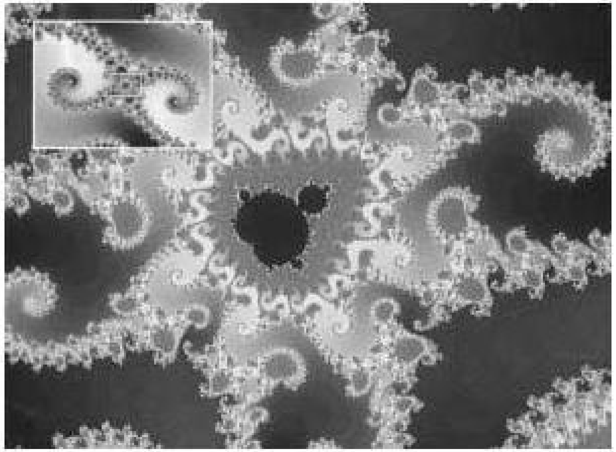

Figure 1: Fractal Image
SOURCE: Peitgen and Richter (1986). Reprinted by permission.
NOTE: Original image was in color.

Can one imagine here a new worldview, a sense of belonging and family with all of manifest nature that fosters a sense of responsibility and stewardship, and of caring and love? This is a vision and an intimate connection that can be intrinsically healing (e.g., Pilisuk, 2001; Pilisuk & Parks, 1986; Richards, 1996b, in press-a, in press-b; Riebel, 2001;Sewall, 1998, Stern 2000).The creativity that is involved - in becoming more whole, in evolving with, contributing to, and identifying with, a greater whole - leads in the direction of self-actualization and our fullest potentialities (Krippner, 1994; Rhodes, 1990; Richards, 1997; Runco, in

Runco & Pritzker, 1999; Zausner, 1996). Surely this should be a natural vision for humanistic psychology.

1. *Awareness* - We are not so on top of things now, and we have areas of blindness (Richards, 1993), but our potential is incredible! We can hold hands with the natural world, communicate intimately (e.g.,Sewall, 1995),and be mutually healing. We help save our environment and meanwhile learn more about ourselves (and greater self), and we develop a more expansive and interconnected picture of who were are, individually and together.
2. *Humility* - We are not in control, we are not the whole game, we are but a piece of the mosaic. How brutally we have trampled this world, but how much of our technological and scientific wisdom we can now bring, with humility, to its aid. However - once again - we cannot predict exactly what we can do; we cannot control. We can listen, look deeply, realize forces are acting of which we're not always aware, stay open-minded, willing to learn. We can contribute to the flow and the growth (not destruction) of the whole.
3. *In process, all together* - We are alive in this ongoing *process*, all of us together and at all times - we are not isolated images in a snapshot. We need new models of process and a fuller language reflecting process and interconnection to appreciate who we are in our world and what can be done. Nhat Hanh's (1988, 2000) suggestion of the word *interbeing* is one example. We also need new models of cooperation, for by our actions, we hurt all or we help all. Let's challenge the zero-sum game (I win, you lose) and turn down the competition (Richards, 1999a). Aren't there better ways to use human potential?
4. *Unique yet interdependent* - Although our unique role is only one part, it is essential, both yours and mine, as we bring our uniqueness to the evolving total picture. We need to identify both with our limited selves and this larger picture in motion with which we are greatly more than entwined. We cannot help the

environment sufficiently without a major transformation in our own lifestyles, values, and fundamental worldview (Laszlo, 2000; Loye, 2000).

5. *Open systems in interconnection* - As open systems, we reach out everywhere and to everything. Our mutual influence is widespread. Living this way can empower us and better inform our identity, choices, and behaviors (Macy, 1991; Nhat Hanh, 2000; Richards, 1996b). Indeed, a humanistic psychologist truly committed to the fullest realization of human potential should by necessity include environmental issues; we can look at no less than the totality of all existence.
6. *Sources of meaning and belonging* - One may look here for greater purpose in life and for spiritual meaning, joy, compassion, and love. Beauty in nature can draw us beyond conventional assumptions into a world that is alive and full of beauty - and it can draw us beyond our limited pictures of ourselves into whom we most fully can be.

Our problems include educative ones, not the least of which is a lack of awareness of all that we don't know. Some people show remarkable ignorance about environmental devastation or, if it has filtered in, an unwillingness to stay with the anxiety it induces (Richards, 1993, 1997). How happy indeed when a new opportunity arises to raise consciousness. As Goerner (1995) put it: "Chaos is the tip of the iceberg. The iceberg is the nonlinear revolution and the ecological transformation."

Ten Summary Points

Here then is the potential for a new aesthetic. One may summarize the argument in 10 points:

1. *Beauty can change us*, it can attract our attention, bring us into the moment, modify our minds and memories, and help us participate in a larger evolution of information; our appreciation of beauty can thereby potentially be adaptive for individuals and for cultures.
2. *The fractal forms of nature hold particular aesthetic appeal*, even an appeal consistent with what Kant (1790/1964) called the sublime; as such, they can bring us in astonishment to view the fingerprints of chaos, the bounded forms of infinity encoding the infinite life possibilities latent in the strange attractors of nature.
3. *These fractal forms can hold a curious familiarity,* even despite the wonder and awe they may evoke - consider the clouds, the trees, the mountains, all scenes that may be new to us - could these somehow resonate with homologous structures in our own minds and bodies?
4. *These fractal fingerprints are not static indicators* - consider the ever outreaching branches of a growing tree - but they reflect, rather, the dynamic and multiple forms of ongoing life processes through time and across space; perhaps at times they herald John Dewey's (1934) moments on the borders of change and our own chance to join in the flow.
5. *We have chosen our own aesthetic moments out of vastly more numerous possibilities*; our perceptions and conceptions of the world and of self, represent, in general, only an infinitesimal slice of the infinite pie. If, as Bateson (1972) put it, aesthetic judgment is selection of a fact, how significant that we have, universally and across cultures, chosen to appreciate so many of the same fractal forms of nature.
6. *Some find in nature a reverence, a path to greater possibility and spiritual meaning*; they can lose themselves in awareness of more expansive realms and the profound interbeing of all that exists.
7. *Yet, we humans can also avoid and ignore areas of danger and conflict* when we feel helpless and overwhelmed, and we may even collude in turning away from global threats and environmental destruction.

8. *Aesthetic appreciation can bring us new hope; it can entice and please us* while raising our awareness of our surrounds, our interconnection, our nature as open systems, and our coevolution with all that exists; out of this renewed sensitivity may be born both caring and responsibility.
9. *Preliminary data (Richards & Kerr, 1999) suggest, first, a general human preference for fractal forms and, second, a possible preference in creative persons for forms of higher dimensionality*, important findings that might accord with a preference for complexity, tolerance of dynamic change, and willingness to challenge the status quo; this merits further study because creativity and aesthetic awareness are qualities that can be enhanced in all of us.
10. *The future may hold a "nonlinear revolution" and an "evolving ecological vision"* (Goerner, 1995,p. 17) that will help us appreciate our integral role in an evolving system of immense complexity and, at times, of unpredictable sensitivity, as well as our need to care for the health of this greater whole. As humanistic psychologists seeking to develop our fullest possibility, we can be concerned with no less than this totality.

Is the time right for such a change in viewpoint? It is indeed! Recent issues of journals such as *ReVision* (spring 1998), *The Humanistic Psychologist* (autumn 1998), *American Psychologist* (May 2000), and now this issue of the *Journal of Humanistic Psychology* (2001) have been devoted to environmental and ecological issues. These show us that the alert is finally being heeded. Happily, the nonlinear revolution may now help awaken us; more important, perhaps, it may awaken us in new ways, furthering a different paradigm and worldview. In all of this, the beauty in nature - and the sublime - can draw us forward, hand in hand with our resonance to the natural forms that surround and, indeed, define us.

We can learn a different way of knowing; we can learn how to see, and then we can see what we really need to do.

Let us conclude, then, with a quotation from Nhat Hanh (1996), which is reminiscent of fractal wonders of infinite extension. It appears in a perhaps unusual source for nonlinear dynamic theory, a discussion of *The Avatamsaka Sutra*. Note that the lotus flower, rising in beauty from a muddy pond, has been used to symbolize the unfolding of our greatest potentialities.

> There are enormous lotus flowers - big enough for three or four people to sit on! Each of these lotus flowers has more than one thousand petals, and when we look deeply at one petal, we see that it, in itself, is another lotus flower with one thousand petals. And each of those petals is also a lotus of one thousand petals, and those lotuses are not smaller than the first lotus flower. It continues on like that forever. This may sound strange, but it is exactly what happens in the Avatamsaka realm ... we see the many in the one and the one in the many, the miracle of interbeing. (pp. 80-81)

The present article suggests that aesthetic appreciation can bring us to awareness, can delight us, and can entice us into new and profound understandings. This awareness is not one of isolation and fear; it is of caring and love. And it is an awareness that is present at birth (or possibly before). Nor is it just for a few; one needn't go to college to intuit its lessons. We can heighten this awareness with ease and enjoyment, raising our aesthetic sensitivity - in the schools, in the home, in our entertainment media, in the workplace. This is well within the vision and mission of humanistic psychology. Within the lessons of beauty and appreciation, then, we may find a powerful new aesthetic for environmental awareness.

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