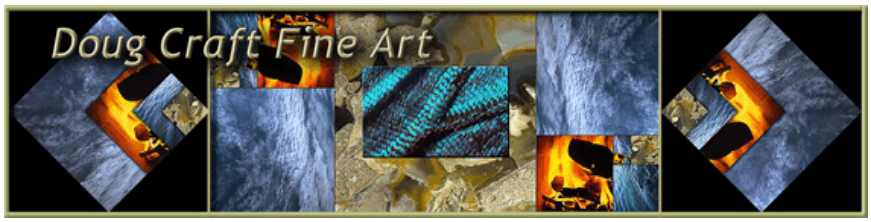

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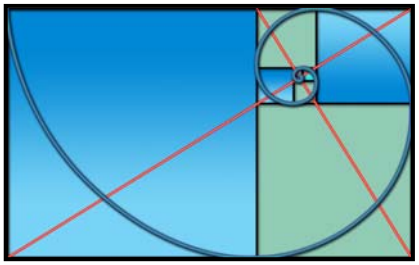
Artist Statement

There is a perfection and unity of form in nature that I believe represents fundamental aesthetic beauty. Nature is sublimely organized from the subatomic to the cosmic scale following the mathematics of fractional symmetry (fractals), self similarity, and the Golden Ratio. For example, adjacent bones in your fingers, adjacent chambers in the shell of a chambered nautilus, and the positions of the features on your face are all scaled according to the Golden Ratio. Golden Ratio proportioned branching is seen in microscopic crystals, bird feathers, and trees. The same forms also appear at vastly different size scales in nature: the structural model of the atom is repeated at the solar system and galactic scale, and many microscopic and satellite images are very similar in appearance.

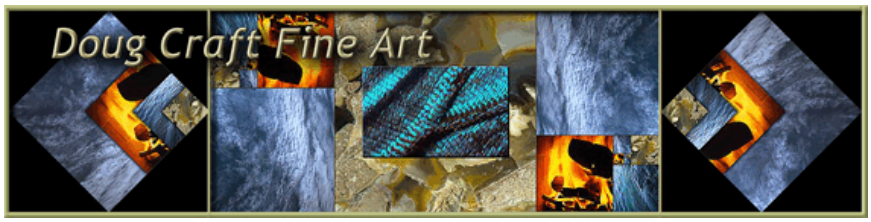
In addition to appearing as a proportion throughout nature, the Golden Ratio has been recognized and used as a formal element by artists throughout the ages. My collage, photography, and painting continues the ancient tradition of appreciation for this universal geometry with forms based on the Golden Rectangle (aspect ratio of 1: 1.618, seen in the diagram to the right with a superimposed logarithmic spiral), overlapping Golden Rectangles (square root of 5 rectangles, aspect ratio 1: 2.236), and other combinations of proportional squares and Golden Rectangles.



My work juxtaposes Golden Proportional images of nature from several levels of magnification, from the microscopic to the cosmic, applying the concept of a "collage of backgrounds." These abstract natural images are actually representational and obey the same geometric and mathematical laws of form that are similar at all scales of enlargement. This combination of micro, macro, landscape, and planetary scaled images in Golden Ratios dramatically underscores the unity of fractal forms in nature. Further, my work suggests that formal beauty in art is based on a recognition and emulation of universal structure, and that abstraction and realism are part of the same underlying process.

During the past 10 years, I have been consistently productive, creating a large body of work that is posted on my website, http://www.DougCraftFineArt.com. My most recent work has included a series of 84 collages, *The Elements in Golden Ratio*, based on the classical elements earth, air, fire and water; 185 new *macrophotos*; 68 new *experimental photographs*; a large number of *microphotographs* (>1,500) of chemical crystals, geological thin sections, butterfly wings, and other biological specimens; a series of 20 framed *photomontages* constructed using microphotographs, experimental photographs, macrophotographs, and landscapes; as well as a new series of Golden Ratio *panorama landscape photographs*. I have participated in several recent art exhibitions, and organized an exhibition of collaborative paintings, *Sacred Geometry 2003*, that involved the creation of five collaged Golden Rectangle paintings with four other Denver artists.

The photos below from previous exhibitions show how my work can be displayed in dramatic assemblages arranged using the Golden Ratio:



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Artist Resume

Education

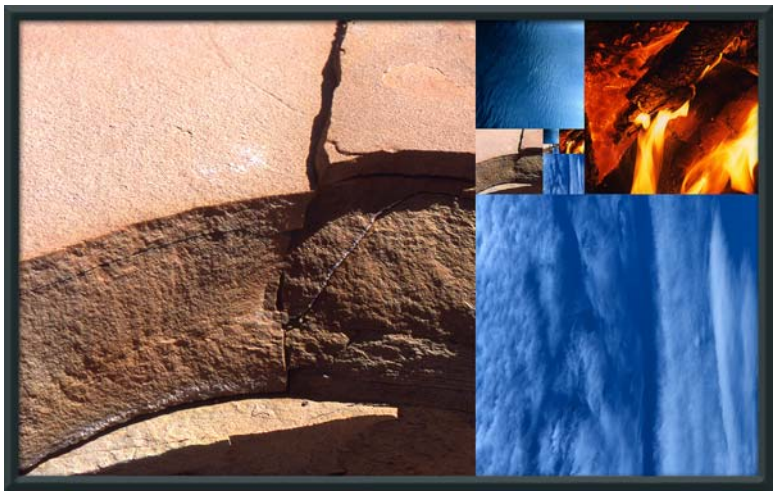
BS Chemistry, BS Interdisciplinary Sciences, University of West Florida, 1975
Studied art with Duncan Stewart, University of West Florida, and Ralph Hunt, Pensacola Junior College, 1971-1975

Creative Activity

Visual Artist: 1971-present. Collage, photography, and painting. Member CORE New Art Space, 2000-2002.
Musician: 1969-present. Guitar, bass, keyboards, percussion. *Severely Bomba,* with Mike Vargas and Ted Altenritter, 1978-1981. Rock video, Catfish Killers, with *Steel Alligator Boy,* broadcast on KBDI, 1982-1983.
Research Chemist: 1976-2008, U.S. Bureau of Reclamation, Denver, Colorado. Environmental chemistry, trace metal speciation and bioavailability, toxicological chemistry, and geochemistry. Numerous scientific reports and journal papers. Who's Who in America, 2001, 2005. *Who's Who in Science and Engineering*, 2007.

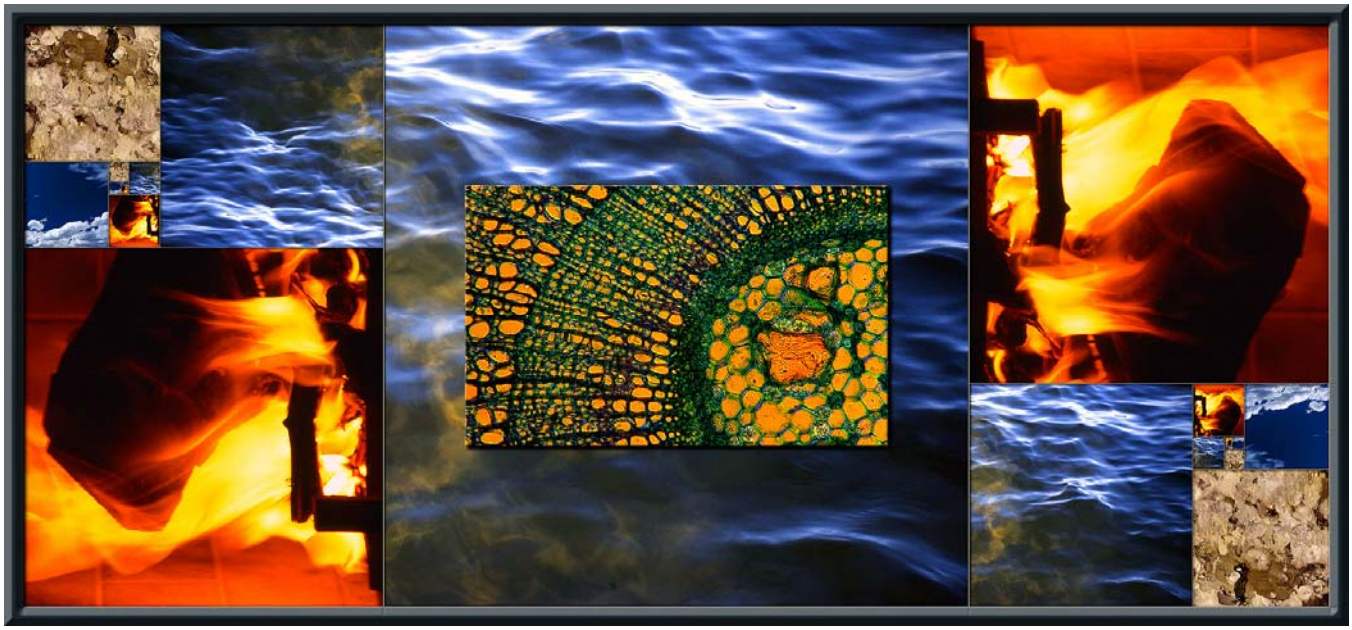
Art Exhibitions

- *Wide Open Whatever,* Juried Exhibition, January, 2000, CORE New Art Space, Denver Colorado
- Winter Salon, Juried Exhibition, December, 2000 - January, 2001, Aperture Gallery, Denver, Colorado
- *Doug Craft: Golden Rectangles,* annual member show, August 2001, CORE New Art Space, Denver, Colorado
- *Doug Craft: Collage and Montage in Golden Ratios,* annual member show, February, 2002, CORE New Art Space, Denver, Colorado
- *Doug Craft: Golden Horizons,* one man show, June, 2002, The Elephant Bean Coffee Company, Lakewood, Colorado
- Annual Associate Members Show, October, 2002, CORE New Art Space, Denver, Colorado
- *Sacred Geometry 2003: A Collaboration of Artists,* May-June, 2003, V-Gallery, Denver, Colorado
- *Doug Craft: Golden Ratios,* one man show, April 1-30, 2004, Barnes and Noble Bookstore, Golden, Colorado
- *A Beautiful World: Art and Mathematics,* Juried Exhibition, September 7 - October 4, 2004, Arapahoe Community College, Denver, Colorado
- *Two in One - One in Two: Mathematics in the Arts*, February 2005, Article in **Math Horizons** magazine, by Carla Farsi and Doug Craft, includes artwork images.
- *Patterns in Nature,* April 2005, Juried Digital Web Exhibition, University of Colorado's Special Year in Mathematics, Boulder, Colorado.
- Winship Cancer Institute, Emory University, September 2005, Permanent Display of 9 Collage Prints, through Novus, Inc., art brokers, Atlanta, Georgia
- *25th Anniversary Show*, CORE New Art Space, September 2006, Denver, Colorado
- *Human Organics*, Colorado Sustainable Living Association, February 2007, Lincoln Center, Fort Collins, Colorado
- *City of Aurora Art in Public Places Program*, January – May 2008, 12 framed photomontages displayed in Aurora Justice Center



The Collage of Backgrounds and the Golden Ratio

Supplemental Information about Sacred Geometry and the Art of Doug Craft



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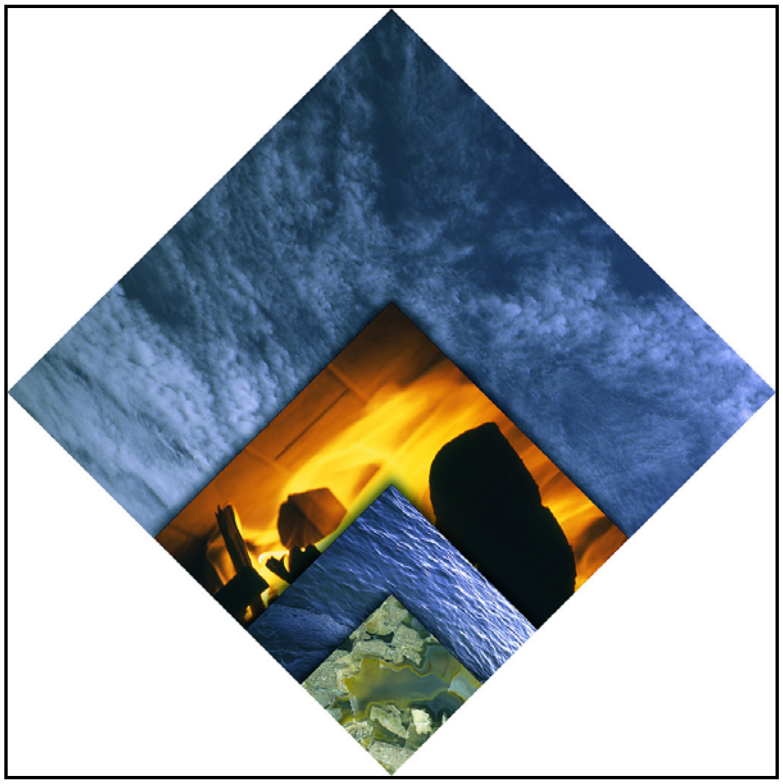
Introduction

While my earlier collages were figurative with a clear visual distinction between foreground objects and background, my work since 1997 has been exploring a new concept that I call *The Collage of Backgrounds*. This technique basically arranges natural abstract images - what would be considered backgrounds in my figurative collages - according to simple geometric rules based on *Sacred Geometry and the Golden Ratio*. This idea can be seen in the collage to the ***right**, AIR Elements Proportional Offset Square 2004-003*.



The following is an explanation and visual guide to the Golden Ratio and the shapes and geometric forms that I use in my collages, montages, and artwork in other media.

Sacred Geometry and The Golden Ratio, Φ

When I refer to Sacred Geometry, I am talking about geometry that is derived from or directly related to the structure of nature. Our universe is structured in a highly complex yet sublimely ordered manner. This is a truth that is readily felt by sensitive people, and has also been demonstrated by science and mathematics. Structural forms seen at the microscopic level are repeated at other scales, and the laws of fractional symmetry appear to apply throughout. So, geometry that refers to the structural unity of nature is a powerful metaphor for the mystery of life, and thus sacred. One of the best examples of Sacred Geometry are forms based on the Golden Ratio.

Knowledge of the Golden Section, ratio, or proportion has been known for a very long time. The Egyptians knew about it and the Greeks learned about it from them. It is called *phi, Φ*, in honor of Phideas, the architect of the Parthenon, and is approximated by the irrational fraction 0.6180339... Shamans, priests, and artists throughout the world and across history have understood and applied *Φ* to ritual, architecture, art, and the crafting of musical instruments and everyday objects.

Φ shows up throughout nature and represents one of the most fundamental numerical constants of the universe. For example, the finger bones are in approximate *Φ* ratio to each other, and the position of features on the human body is related to *Φ*. Recall *Vitruvian Man*, the drawing by Leonardo showing man within the circle and the Golden Ratios in the human body. More recently, Le Corbusier's *Le Modulor* represented another formal study of the Golden Ratio in the human form and architecture.

While the Golden Ratio can be derived mathematically, it is probably easiest to understand and calculate using the numbers that nature uses to calculate *Φ* - the *Fibonacci Numbers*.

Fibonacci Numbers: Nature's Approximation of Φ

Fibonacci was the pen name of Leonardo of Pisa, a 13th century mathematician and merchant whose book, *Liber Abaci*, introduced western civilization to Arabic numerals (replacing Roman numerals), and a special sequence of numbers named after him. Fibonacci raised rabbits and observed their population numbers over successive generations. They increased in a peculiar "additive" way, and from this he surmised the more abstract number sequence. Starting with 0 and 1 as the first two numbers in the sequence (or 1 and 1), each successive number is determined by adding the previous two numbers. Starting with 0 and 1, the series goes like this:

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377...

It turns out that this sequence of integers is much more than a simple additive rule number sequence. These numbers appear *everywhere* in nature, and are observed in the dimensions and branching of all plants, animals, as well as crystals. This happens because when things grow, they often grow on top of a previous structure, so that the new growth is "added to" the existing structure (like new offspring are added to the existing population). Plants exhibit Fibonacci numbers in branching and in spiral structures like the arrangement of rows of bracts on pinecones, petals on an artichoke, and scales on a pineapple.

This curious additive property of nature reveals an interesting outcome when we calculate the ratio between adjacent Fibonacci numbers. Table 1 shows how these ratio calculations begin to approximate *Φ.*

Table 1 - Ratios between adjacent numbers in the Fibonacci series start to approximate the Golden Ratio, *Φ*.

	Fibonacci number	Ratio Calculation	*Φ* Estimate		Fibonacci number	Ratio Calculation	*Φ* Estimate
	1	0 ÷ 1	0	**9**	55	34 ÷ 55	0.618181
1	1	1 ÷ 1	1.000000	**10**	89	55 ÷ 89	0.617977
2	2	1 ÷ 2	0.500000	**11**	144	89 ÷ 144	0.618055
3	3	2 ÷ 3	0.666666	**12**	233	144 ÷ 233	0.618025
4	5	3 ÷ 5	0.600000	**13**	377	233 ÷ 377	0.618037
5	8	5 ÷ 8	0.625000	**14**	610	377 ÷ 610	0.618032
6	13	8 ÷ 13	0.615384	**15**	987	610 ÷ 987	0.618034
7	21	13 ÷ 21	0.619047	**16**	1,597	987 ÷ 1,597	0.618033
8	34	21 ÷ 34	0.617647	**17**	2,584	1,597 ÷ 2,584	0.618034

After the fifth Fibonacci number ratio, the ratios of adjacent numbers begins to get very close to the algebraic solution for *Φ* = 0.6180339... If you figure that two decimal places are as much as even the most careful craftsman can measure and cut, then the 6th Fibonacci ratio, 8 ÷ 13, will do as an approximation of 0.62 for *Φ*. After the 16th Fibonacci number, the ratio approximates *Φ* to 6 decimal places. Higher Fibonacci number ratios yield changes in only in the 7th decimal place and beyond.

As a practical matter, I use Fibonacci numbers to set dimensions for both digital images and picture frames. For example, the basic Golden Rectangle (GR) for my digital images is 34 cm by 21 cm at

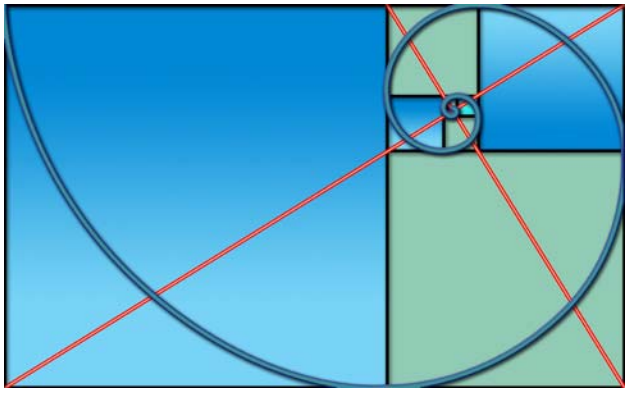
254-300 dpi (dots per inch). A small GR picture frame might be 21" by 13", while the GR collaborative painting collages from the *Sacred Geometry 2003* exhibition were sized at 55" by 34". Using Fibonacci numbers is an easy way to measure and size artwork and frames based on Φ.

The Fundamental Forms: The Square and The Golden Rectangle

The GR and squares in Golden Ratio to the GR are the basic forms that I use for all of my artwork. The GR is a rectangle with an aspect ratio of 1 to 1.618, or 1 to (1+Φ).

Golden Rectangle Coils

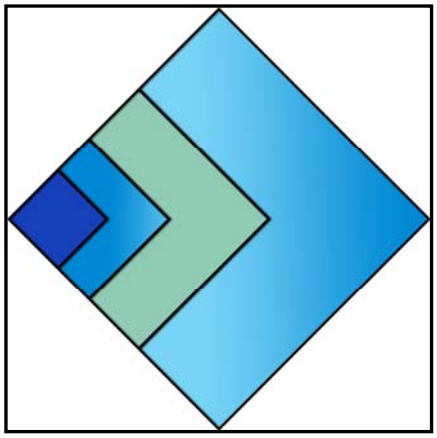
An interesting property of GR's is that cutting out a square starting from one of the short sides of the GR (the gray square to the ***right***), you will be left with another GR at a 90° angle (the vertical white GR to the right). You can continue to cut out short side squares for each successively smaller GR and another smaller GR will remain.



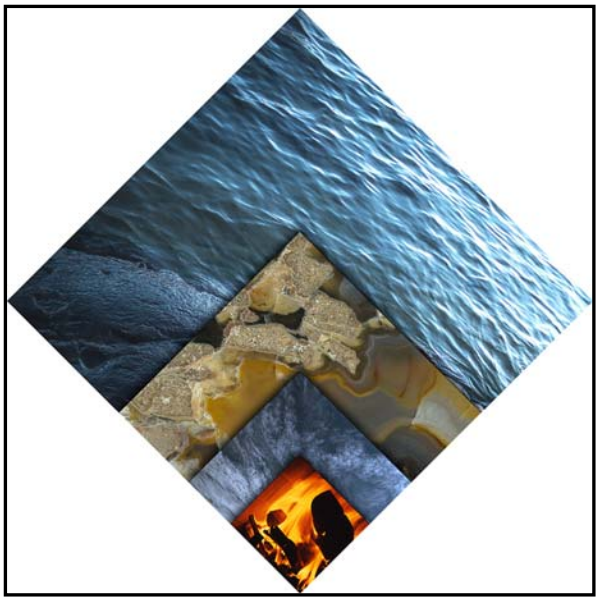
The dimensions of each successively smaller square and remaining subordinate GR will be in Φ ratio to the larger dimensions. To the ***left*** is a GR subdivided by Golden-proportional squares that converges on a point called the *Eye of God*. A superimposed logarithmic spiral also converges on this point, as does the intersection of diagonals (red lines, called radicals) from the primary GR, and the 1st subordinate GR.

I explore the Φ-ratio "coiling" property of GR's in a collage form called a *Golden Rectangle Coil*. To the ***right*** is *EARTH: Golden Rectangle Coil 2004-002*, a collage from the *Elements in Golden Ratio* series. This series of 84 collages explores the classical elements of earth, air, fire, water, and life (the 5th element that combines all 4 basic elements). The GR's coils from this series are also used as collage elements in the square root of five and mandala forms.

Square Forms: The Offset Proportional Square and Mandala



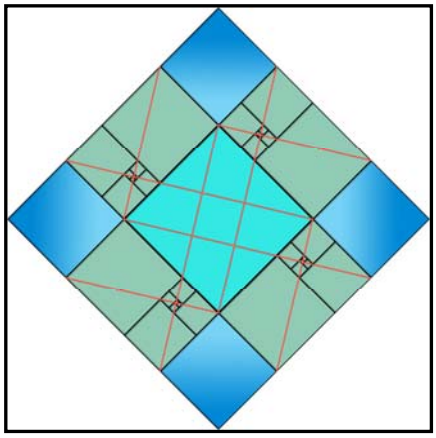
The square is the fundamental geometric form used in my work, and squares combined with GR's in Golden Ratio proportion can create a wide range of possible rectangles and image aspect ratios. To the ***right*** is a form diagram showing a square with three proportionally smaller squares called an *Offset Proportional Square*. Each smaller square is in Golden Ratio to the next larger square. Many other forms using proportionally smaller squares are also possible.

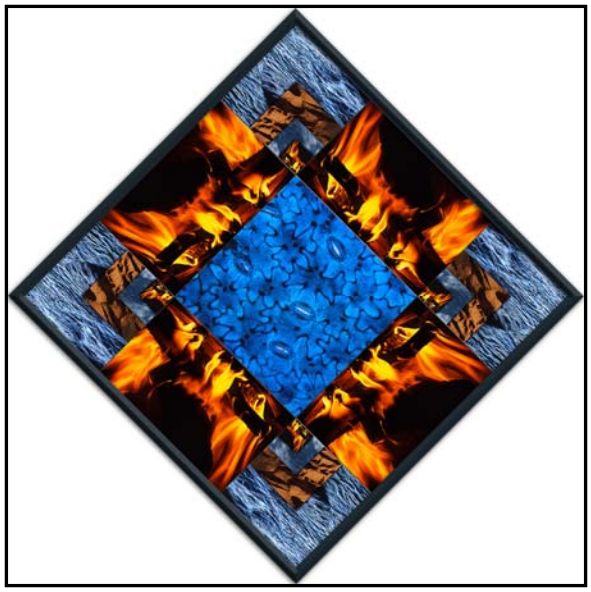


To the ***left*** *is WATER: Elements Offset Proportional Square 2004-003,* a collage of backgrounds combining images of earth, air, fire, and water. I used this particular idea as an organizing form and as a collaged element for other work in the *Elements in Golden Ratio* series - as well as a collage element in the assemblage seen on the cover (bottom image).

The *mandala* is another of my square forms that uses a central square surrounded by proportional GR's. Mandalas are round or square designs that focus the viewer's attention on the center. As such they are often used as visual meditation objects.

Below is the mandala form diagram showing how each of the peripheral GR's shares the same central square, forming four larger overlapping Golden Rectangles. The double square, a form thought sacred by the Egyptians, may also be found in the mandala form diagram.

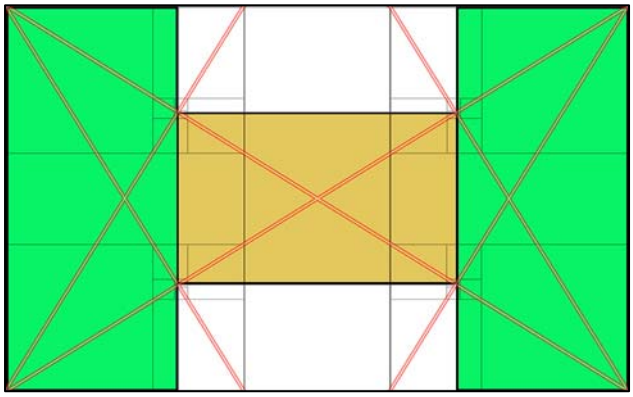




Above right is an example mandala collage, *FIRE: Elements Mandala 2004-002*. Note the use of offset proportional squares in the corner positions, and the microphotograph in the center square position surrounded by four fiery GR's.

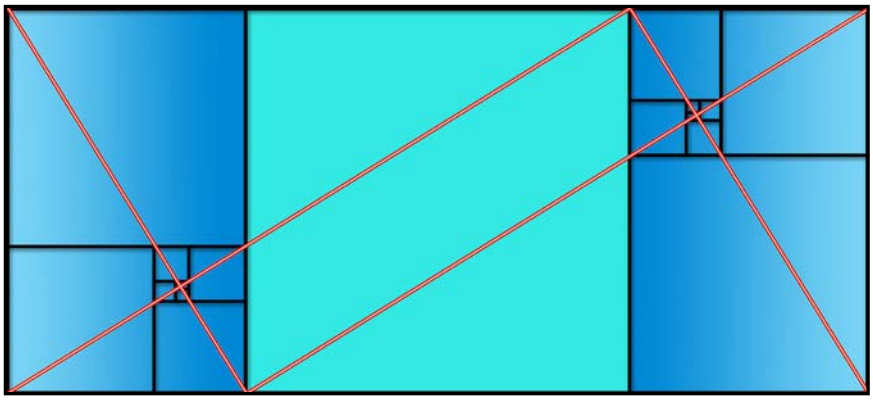
The Square Root of 5 Ratio and Rectangle

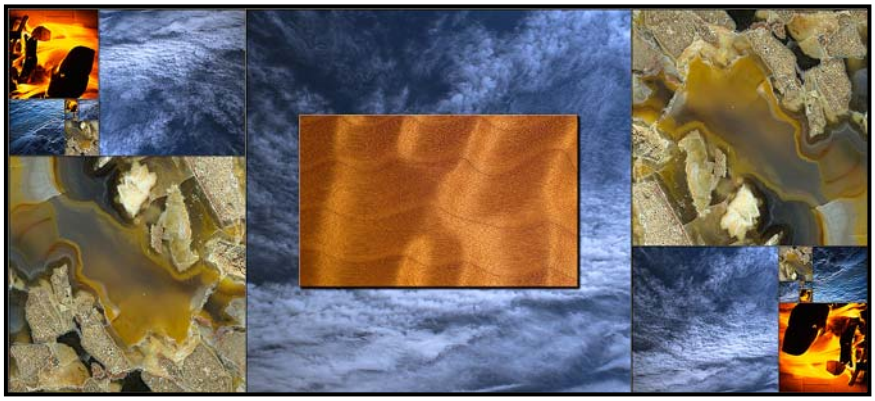
The square root of 5 (2.23606798...) is found in the algebraic computation of *Φ* and appears often as a significant "inner" ratio within GR's. We can see how the square root of 5 appears because of the inherent 4-way symmetry of Golden Rectangles: every GR can coil in 4 different ways, and so 4 possible *Eyes of God* are implied in every GR.



The 2 primary and 4 secondary radicals that arise from symmetry properties trace out the pattern seen in the GR to the ***left***. Note that the 4 *Eyes of God* form the corners of another GR (yellow, center) with sides that are in square root of 5 ratio (1 to 2.2360...) to the outer GR dimensions. The center GR also cuts off two green vertical rectangles that are in the ratio of 1 to 2.236 - the square root of 5.

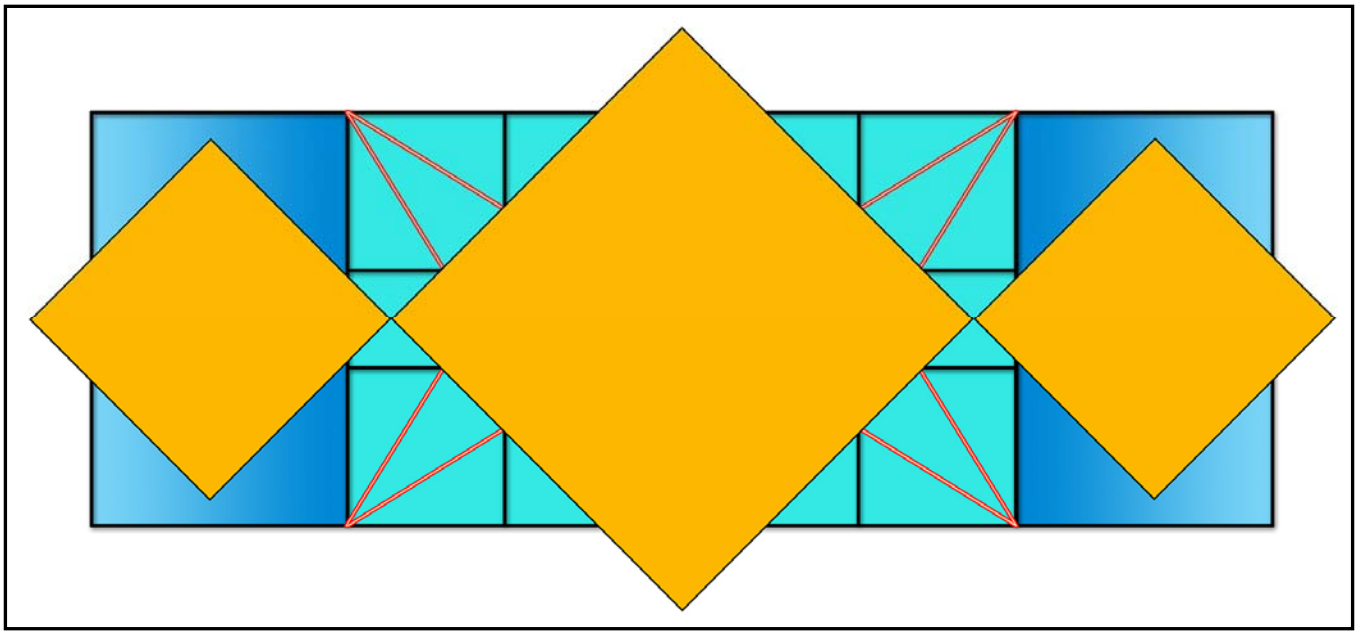
Another way to create a square root of 5 rectangle is to simply add another smaller proportional GR to a Golden Rectangle as seen in the form diagram (aspect ratio = 1 to 2.236) to the ***right***. You can also think of this form as two overlapping GR's that share a central square.



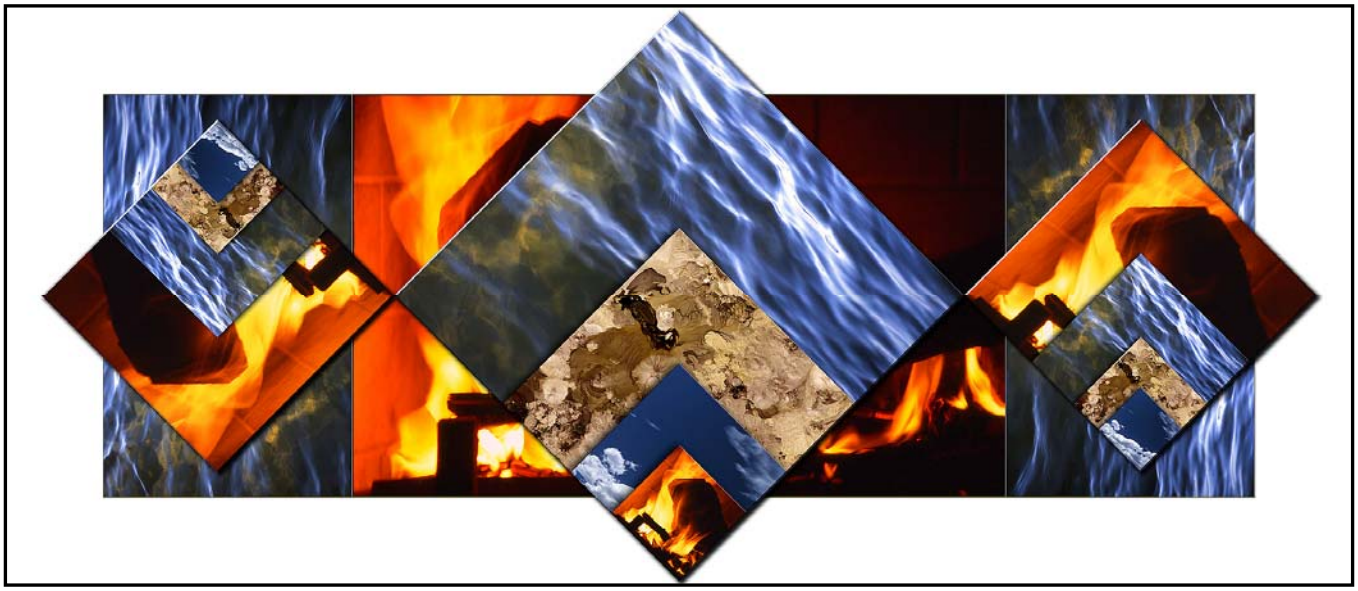


Left *- AIR: Elements Square Root of Five 2004-003*. Note the use of coiled Golden Rectangles on the sides as collage elements. The center GR image is a macrophoto of quilted maple and is in square root of 5 ratio to the perpendicular side (like the yellow GR in the top diagram).

One Plus 3(Φ) Forms

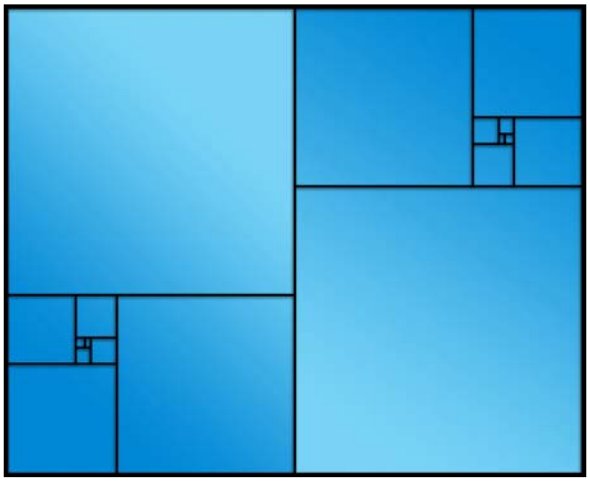


The form diagram for these collages is seen ***above*** These forms are based on a horizontal Golden Rectangle with two proportionally smaller vertical GR's on the ends, or a square with 3 vertical GR's joined together. Proportional diamonds (orange squares rotated 45°) are centered and overlaid on the background rectangle. The aspect ratio of rectangle is 1 to (1 + 3*Φ*), or 1 to 2.854. The overlaid diamonds create a bold angular break with the rectangular background. I have called these forms *Seals* (as in emblems or logos) and created an exploratory series of collages called *Seals of the Great Kings* using this format. ***Below*** is an example collage, *WATER: Elements 1 + 3Φ 2004-001,* from the *Elements in Golden Ratio Series*.



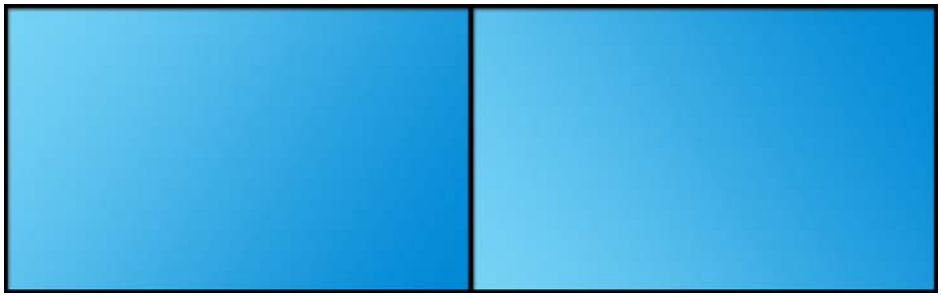
Tandem Golden Rectangles

A Golden Ratio form used - unknowingly - in my earliest collages was the joining of two vertical GR's in tandem. My collages actually used the 8" x 10" format popular in photographic printing. Only later did I realize this size contained the Golden Ratio by combining two 5" x 8" Fibonacci number GR's. Below right, *Masculine and Feminine Number 5,* collage, 1980.



Double and Triple Golden Rectangles

These wide aspect ratio forms are primarily used when I create panorama images, either traditional landscape panoramas, or triple Golden Rectangle photomontages:

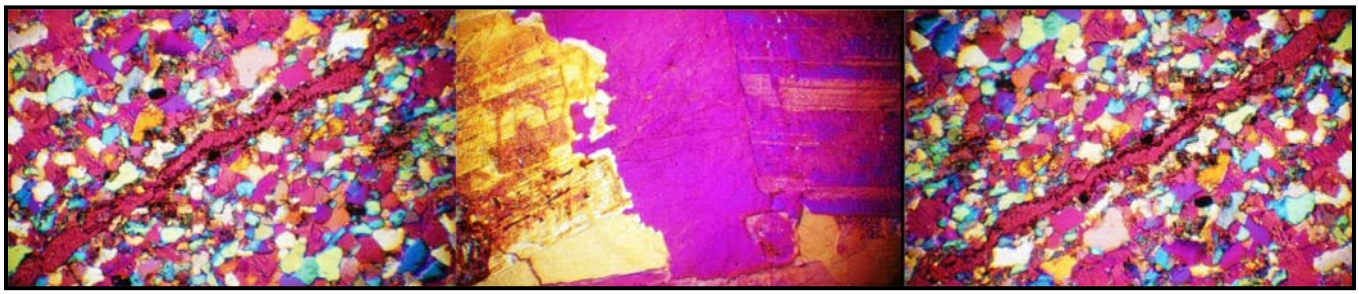


Aspect ratio = 1 to (2 + 2Φ), or 1 to 3.236. Oddly, this aspect ratio can also be described as 1 to (1 + square root of 5)! ***Below*** *- Mount Evans Panorama 2003-024.*

Left- the triple Golden Rectangle form diagram with an aspect ratio of 1 to (3 + 3*Φ*), or 1 to 4.854. Below are artwork examples of this aspect ratio.

Here are two triple GR landscape panoramas. The upper 2003 image is the pass over the Snowy Range in Wyoming, and the lower 2006 panorama is an image of a crystal of phenol (carbolic acid), photographed using a Nikon polarizing microscope:

The following two images are from my 2002 series of photomontages (this series of 22 pieces are framed at 42" by 13"). *Sky Wide Number 2*, (upper) and *Microcosmos Number 1* (lower):



Further Reading and References

These books have been helpful in my study of the Golden Proportion and form in nature and art. I recommend Garland's *Fascinating Fibonaccis* to anyone who would like a general overview. It's easy to understand and gives a lot of good visual examples. John Martineau's 2001 *A Little Book of Coincidence,* is a short and concise summary of mind-blowing Golden Ratio coincidences. Teachers may want to consider Garland as an introduction and Runion's *The Golden Section* for a more math-oriented approach with problems in each chapter. Garland is suitable for middle school kids while Runion is high school algebra level.

Bak, Per, 1996. *How Nature Works - The Science of Self-Organized Criticality*, Springer-Verlag, New York.

Ball, Phillip, 1999. *The Self-Made Tapestry - Pattern Formation in Nature*, Oxford University Press, Oxford.

Barrow, John, 1995. *The Artful Universe - The Cosmic Source of Human Creativity*, Oxford University Press, Oxford.

Boles, M. and R. Newman, 1987. *The Golden Relationship - Art, Math, Nature*, Second Edition, Pythagorean Press, Bradford, MA.

Briggs, John, 1992. *Fractals - The Patterns of Chaos - Discovering a New Aesthetic of Art, Science, and Nature*, Simon & Schuster, New York.

Cook, Theodore Andrea, 1979. *The Curves of Life*, Dover Publications, Mineola, NY.

Doczi, György, 1994. The *Power of Limits: Proportional Harmonies in Nature, Art, and Architecture*, Shambhala, Boston.

Eco, Umberto, and Hugh Bredin (translator), 1988. *The Aesthetics of Thomas Aquinas*, Harvard University Press, Cambridge, Massachusetts.

Elam, Kimberly, 2001. *Geometry of Design - Studies in Proportion and Composition*, Princeton Architectural Press, New York.

Emmer, Michelle, (editor) 1993. *The Visual Mind - Art and Mathematics*, MIT Press, Cambridge, MA.

Firth, Florence (ed), 1996. *The Golden Verses of Pythagoras and other Pythagorean Fragments*, Sun Publishing, Santa Fe, New Mexico.

Gardner, Martin, 1989. *Penrose Tiles to Trapdoor Ciphers*, The Mathematical Association of America, Washington, DC.

Garland, Trudy H., 1987. *Fascinating Fibonaccis: Mystery and Magic in Numbers*, Dale Seymour Publications, Palo Alto, California.

Gazalé, Midhat, 1999. *Gnomon: From Pharaohs to Fractals*, Princeton University Press, Princeton, New Jersey.

Ghyka, Matila, 1946. *The Geometry of Art and Life*, Dover Publications, Mineola, New York.

Godwin, Joscelyn, 1987. *Harmonies of Heaven and Earth: Mysticism in Music from Antiquity to the Avant-Garde*, Inner Traditions International, Rochester, Vermont.

Hambidge, Jay, 1919. *The Elements of Dynamic Symmetry*, Dover Publications, Mineola, New York.

Heath, Robin, 1999. *Sun, Moon, and Earth*, Wooden Books, Walker and Company, New York.

Herz-Fischler, Roger, 1987. *A Mathematical History of the Golden Number*, Dover Publications, Mineola, New York.

Holden, Alan, 1971. *Shapes, Space, and Symmetry*,Dover Publications, New York.

Huntley, H.E., 1970. *The Divine Proportion: A Study in Mathematical Beauty*, Dover Publications, Mineola, New York.

Jung, Carl, 1959. *Mandala Symbolism*, Bollingen - Princeton University Press, Princeton, New Jersey.

Kandinsky, Wassily, 1977. *Concerning the Spiritual in Art*, Dover Publications, Mineola, New York.

Kaku, Michio, 1994. *Hyperspace*, Anchor Books-Doubleday, New York.

Lauwerier, Hans, 1991. *Fractals: Endlessly Repeating Geometrical Figures*, Princeton University Press, Princeton, New Jersey.

Lawlor, Robert, 1982. *Sacred Geometry: Philosophy and Practice*, Thames and Hudson, London.

Livio, Mario, 2002. *The Golden Ratio - The Story of Phi, the World's most Astonishing Number*, Broadway Books, New York.

Mandlebrot, Benoit, 1977. *The Fractal Geometry of Nature*, Revised Edition, W.H. Freeman and Company, New York.

Martineau, John, 2001. *A Little Book of Coincidence*, Wooden Books, Walker and Company, New York.

Mitchell, John, 2001. *The Dimensions of Paradise - The Proportions and Symbolic Numbers of Ancient Cosmology*, Adventures Unlimited Press, Kempton, IL.

Pedoe, Dan, 1976. *Geometry and the Visual Arts*, Dover Publications, Mineola, NY.

Peitgen, H., and D. Saupe (editors), 1988. *The Science of Fractal Images*, Springer-Verlag, New York.

Pennick, Nigel, 1982. *Sacred Geometry*, Harper and Row Publishers, San Francisco, California.

Pennick, Nigel, 1995. *The Oracle of Geomancy*, Capall Bann Publishing, Chieveley, England.

Pickover, Clifford, 1997. *The Loom of God - Mathematical Tapestries at the Edge of Time*, Perseus Books, New York.

Runion, Garth E., 1990. *The Golden Section*, Dale Seymour Publications, Palo Alto, California.

Schneider, Michael, 1995. *A Beginner's Guide to Constructing the Universe - The Mathematical Archetypes of Nature, Art, and Science*, HarperCollins Publishers, New York.

Schroedinger, Erwin, 1969. *What is Life - Mind and Matter*, Cambridge University Press, London (out of print).

Sheldrake, Rupert, 1981. *A New Science of Life: The Hypothesis of Morphic Resonance*, Park Street Press, Rochester, Vermont.

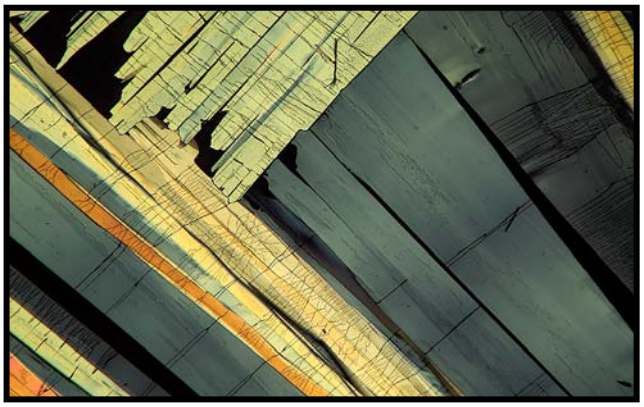
Talbot, Michael, 1991. *The Holographic Universe*, Harper Perennial, New York.

Thompson, Sir D'Arcy W., 1946. *On Growth and Form*, The University Press, Cambridge, England.

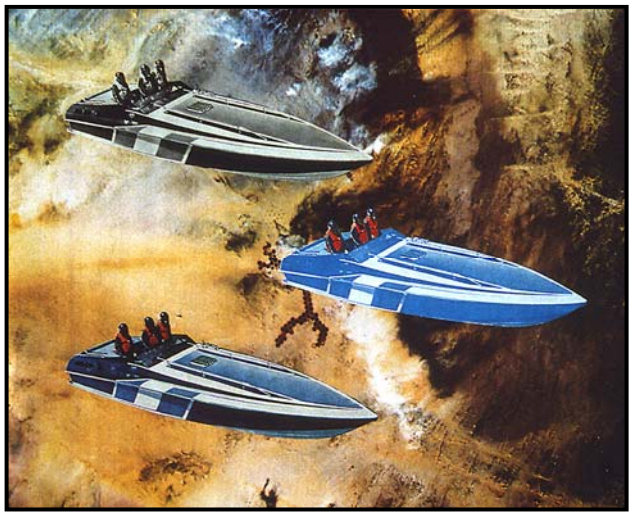
Wilbur, Ken, 1992. *A Brief History of Everything*, Shambhala, Boston.

Wilbur, Ken, (editor) 1982. *The Holographic Paradigm and Other Paradoxes*, Shambhala, Boston.

Phenol Crystal 2006-120, microphotograph



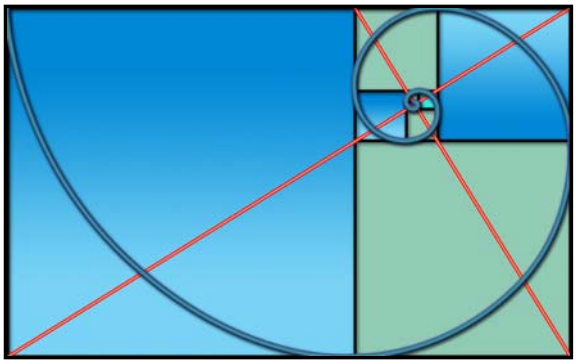
Benzoic Acid Crystal 2006-042, microphotograph



Speedboats, collage, 1978

Infrequently Asked Questions

An Interview with Artist Doug Craft



Doug Craft is a Colorado artist who works with collage, photography, and painting. Born in Pensacola, Florida in 1953, he has created art since the early 1970s. He worked as a research scientist for over 34 years and considers science "another art form – with a different media." His work is inspired by Sacred Geometry, the fractal structure of nature, and the Golden Ratio. His website, *http://www.DougCraftFineArt.com*, shows his collages, photographs, and other art images, along with a wealth of information about the Golden Ratio and Sacred Geometry. In this interview, Doug talks about his influences, and his aesthetic theory.

Who influenced your development as an artist?

I came to art through my studies in philosophy, spirituality, and science, rather than being formally trained as an artist. ***Ralph Hunt***, my philosophy of art professor at Pensacola Junior College, initially opened my mind to what creativity and aesthetics really were — and what art could be on a deeper level. Another wonderful philosophy professor, ***Robert Kleinman***, who also had a degree a physics, was very influential. Kleinman introduced me to the Upanishads, the Bhagavad Gita, along with quantum mechanics and General Relativity (which I was studying in more detail in my chemistry and physics classes). That wasn't all, he pointed out the similarities between modern physics and Hindu cosmology and mythology. I was inspired to start painting after taking these two teachers' classes.

Duncan Stewart, an art professor and working artist at the University of West Florida in Pensacola, was my artist mentor and he introduced me to his principal medium, collage, as well as a love for film and cinema. Duncan gave my early work its first critique and he introduced me to the pedagogical ideas of the Bauhaus — Albers, Itten, Klee, and Kandinsky. I was chemistry major, so I took several independent studies with him as electives. We talked about spiritual aesthetics, and he first introduced me to Kandinsky's *Concerning the Spiritual in Art* — a profound influence on my current ideas. He continues to teach and create collages and paintings — a wonderful example of the artistic life, and a great man.

Homage to the First Woman Astronaut*,* Mixed Media, 1976

I believe it is very important to acknowledge teachers and mentors who provided guidance and inspiration.

Which artists and scholars have influenced your aesthetics and style?

Early on, I was most influenced by Kandinsky for his ideas on the spiritual dimension of art and aesthetics. My aesthetics have matured over the years, primarily through readings of Joseph Campbell's wonderful work on mythology and creativity and his cited references. His work really pulled a lot of concepts together for me, especially his idea that artists are playing the role

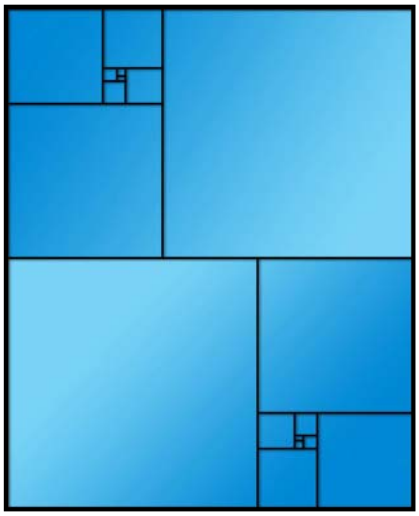
in modern culture that shamans performed in hunter gatherer cultures. He also introduced me to James Joyce's aesthetics as detailed in *Portrait of the Artist as a Young Man*, and referentially, Nietzsche's and Aquinas' writings on beauty and art.

My initial paintings visually derived a lot from Japanese *ukiyo e* wood block prints — Hokusai and Hirosige — and were mostly landscapes. I was crazy about Zen and eastern philosophy, and read a lot in that area and eastern philosophy in general. Then I started experimenting with abstract painting — and coincidentally, improvisation with my music. Since I mostly played music during the 80's, I did not work on painting (or art in general) until the mid 90's.

***Santa Claus Mask*,** Collage, 1978

My early collage were visually influenced by Terry Gilliam's animations on Monty Python, and were really just jokes — too visually busy to be any good. They looked like typical novice explorations. In the late 70's, I started finding much more interesting raw materials — I scored a stack of WW-II Life magazines for only $0.25 to $0.50 each — and my collages became simpler with only one or two foreground images and more abstract backgrounds. This was the start of my fascination with the abstract qualities of landscape and nature. My current collages are visually influenced by what are usually considered technical images: micro- and macrophotography, satellite images and computer "false color" techniques like tomography. I encountered these images while working on environmental studies and reading scientific periodicals, and very early on realized that despite looking abstract, they were at the same time representational of a smaller or larger scale reality.

A deeper influence on my current work is philosophical, primarily my ongoing study of form in nature, sacred and fractal geometry, physics, and complexity. Ideas that have been influential include those from the theoretical biologist Rupert Sheldrake (*A New Science of Life: the Hypothesis of Morphic Resonance*), writer Michael Talbot (*The Holographic Universe, Beyond the Quantum*), physicists David Bohm (*Wholeness and the Implicate Order*), Erwin Schrödinger (*What is Life, Mind and Matter*), and Michio Kaku (*Hyperspace*), mathematicians Rene Thom and Benoit Mandelbrot (*The Fractal Geometry of Nature*), Naropa teacher and psychologist Ken Wilbur, (*A Brief History of Everything*, *The Holographic Paradigm*), the classic work of Theodore Andrea Cook (*The Curves of Life*), plus all the other authors whose work I cited in my supplemental material bibliography. My all time favorite artists include Kandinsky, Klee, Mondrian, Ernst, Vermeer, Blake, Francisco de Goya, Nicolas Roerich, Pollock, Gaudi, Hopper, O'Keefe, Richter, and Hundertwasser. I also like the eye-candy of the Pre-Rafaelites and the luminists — mainly because of their dreamlike depiction of mythopoetic subjects. I have to admit I am fairly ignorant of



who's who in the current art scene. In Denver, I am fairly ignorant too, but I like the work of Phil Bender, Dave Griffin, Rolf Helland, Kent Rucker, Susan Vaho, and Roger Rapp.

Why do you create art?

At the risk of sounding pompous, I will say that my artistic activities are a personal spiritual practice. At least, that's my intention and aspiration. It's a complex issue, because personal vanity and being the center of attention certainly has its charms. I started playing guitar to impress women, and a certain amount of all male showing off is mating display. Also, being paid a lot for my artwork would be nice. So there are several motivations, but I would hope to stay grounded in a deeper purpose and intention.

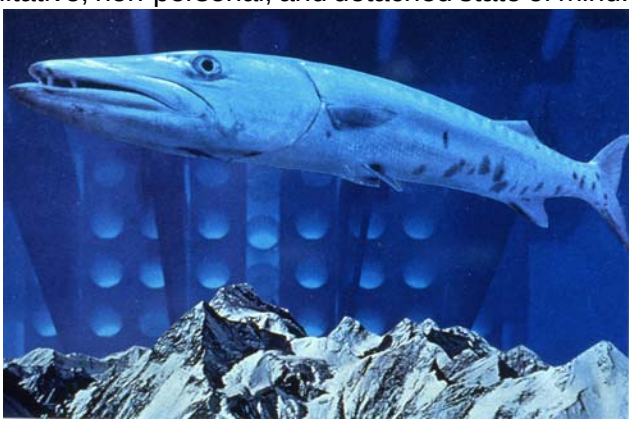
How is your art a spiritual practice?

While I have always felt that art and music were essentially spiritual activities, the idea that making art and music could actually be a "practice" — a regularly performed activity that constitutes a conscious spiritual discipline — evolved slowly for me. Certainly, it is not a new idea, as the Yoga systems have taught for many centuries. Any activity consciously performed can be the core for a spiritual practice or yoga, for example: exercise (Hatha Yoga), work (Karma Yoga), philosophical reflection (Jnana Yoga), or devotion to a personal god or goddess (Bakhti Yoga).

In the late 80s, I began taking music lessons with John Thornburg, a Denver jazz bassist, and started practicing bass and guitar on a daily basis. One day, after playing scales and arpeggios for about 30 minutes — I realized I was meditating — I was in the "zone". That was when the idea hit me that art and music could actually constitute a meditative practice, and one grounded in my own direct experience, drawn directly from the culture I grew up in. Since I am a fairly skeptical person, and do not generally trust what most people say about spirituality, this self-inferential and testing approach really suits me. This realization was significant, and really was the internal reason I became inspired to re-start making art and to practice it publically with more conscious intention.

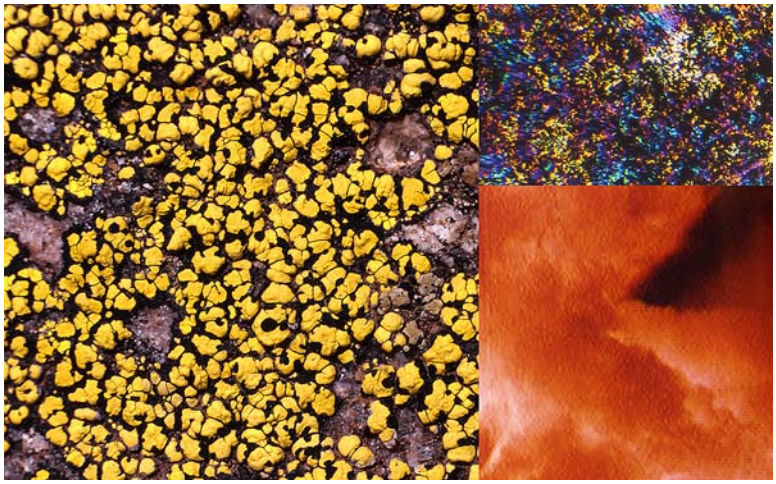
So, if art is a spiritual activity for you, how does that translate into a process for creating your collage or other images?

Kandinsky said that spiritualized art should be created from a detached and egoless state of mind that allows *internal necessity* to express itself. At the core of my art making process is the simple fact that artistic activities end up producing a meditative, non-personal, and detached state of mind. The repetitive nature of preparative art activities — like stretching and prepping canvas, or cutting collage images — allows you to enter a meditative, delta wave state of mind. The Zen call this *Beginner's Mind.* Someone exercising would call it an endorphin high. Regardless of how you get there, the important point is that you are not thinking, judging, or analyzing. You are in a *receptive* state.



Barracuda, Collage, 1980

Another important element for this process is the practice of improvisation, which I define as spontaneously creating forms while in a

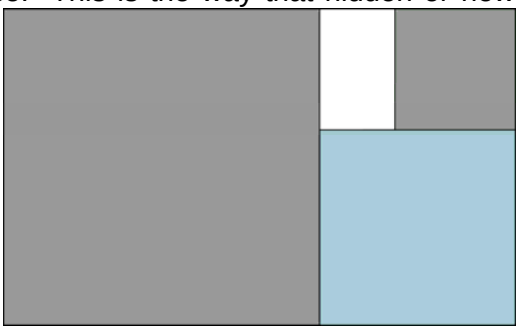


Golden Rectangle Coil 2008-004, collage, 2008

non-personal or meditative state. Musicians are usually more familiar with improvisation, but the process can be applied during any creative activity — and to all areas of life. Here, though, the idea of skill and experience must be mentioned. While artwork should assume a form dictated by internal necessity, the expression of the idea can be limited by the quality of my conscious state (which imposes distortion on the idea being manifested), and the maturity of my skills with the particular medium. The artist's skill is definitely a part of the quality or success of an artwork you certainly are not going to create something like a Coltrane solo if you can barely play *House of the Rising Sun*.

This model of creativity suggests that the artist is more of a *conduit* or *transceiver* of aesthetic energy, rather than an individual (in the Western sense) making something up. I think this process is similar to shamanism. The shaman, by experience with ascetic practices, meditation, or ingestion of psychoactive plants, attains the ability to enter non-personal trance states. During trance, the shaman directly experiences the hidden world of the spirits that sustains the universe we sense. Upon return, the shaman may teach the tribe a song or ritual inspired by the knowledge or wisdom he received during trance.

The song or ritual represents a formal structure — that allows the rest of the cultural group to enter a trance and re-enact the shaman's personal experience. This is the way that hidden or new mythopoetic knowledge is made manifest to culture — through shamanistic ritual and myth creation. The shaman is the designated intermediary.



Well, the artist, if he or she is doing their job right, can also function as a shaman. A skilled artist with mind properly attuned can receive aesthetic ideas dictated by internal necessity, and then create art forms able to transmit the idea to others similarly attuned.

That sounds pretty extreme. You aren't telling me that you paint your face, eat peyote, and meditate in a cave until creative inspiration comes, are you?

Oh yes, face paint is essential (laughter) ...of course not. Jesus, in the Gospel of Thomas, the non-canonical gnostic scripture found in the Dead Sea Scrolls, says, "The kingdom of heaven is arrayed before men but they do not see it." Aesthetic consciousness, logos, thought, creative intelligence, David Bohm's quantum implicate order, formative ideation, the mind of god — whatever term you use — surrounds and interpenetrates all of us. All that needs to occur for Kandinsky's internal necessity to speak through the artist is for the mind to be in a receptive and

quiet state. That receptive state of mind is fairly easy to attain with a little practice. Most artists, musicians, and scientists, will tell you that their best work is created during such detached and nonpersonal states.

Why is form and geometry so important in your work?

This question goes directly to the way I experience the structure within structure of the universe — which is based as much on my understanding of modern physics as metaphysics. I will address this question after explaining a few basic ideas.

A basic concept is that the structure of the universe is holographic and fractal. This is not an easy idea to explain except by analogy — and it will take some digression. The term "holographic" refers to the photographic laser hologram — which is a baffling phenomenon that nonetheless illustrates a profound truth about the structure of reality. In a hologram, an object is illuminated with a laser light, a focused and coherent light of a single wavelength, and the light that is reflected off the object's complex surface is captured on a photographic plate. When the plate is developed, the original object is not visible — and the hologram image is observed to be a complex matrix of finely detailed whorls and patterns that were created when laser light bouncing off the object at many different angles (and with varying reflectances) created a complex interference pattern.

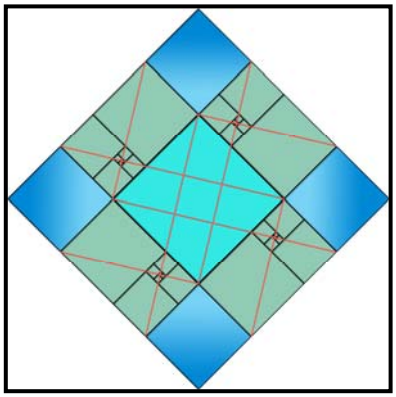
Whoa, wait a minute...What is an interference pattern?

Imagine a perfectly flat pond of water and that it is starting to rain. An interference pattern is like the waves on a pond from many different sized raindrops hitting the surface. As the circular water waves propagate outward from each impact point, the waves collide with each other, sometimes in a constructive (additive) way, creating larger waves, and sometimes in a destructive (subtractive) way, creating smaller waves or even flat surfaces. The sum total of all the waves and their interference patterns is analogous to the hologram plate, and it looks something like the whorling overlapping patterns you would see on a pond in a rain shower from above.

FIRE – Elements in Golden Ratio 2004-003, Square Root of 5 collage, 2004

But holograms are 3-D, right? Where does that come from?

The strangeness of the hologram begins when the laser is shined back through the interference pattern on the photographic plate. The original object then appears some distance beyond the plate, not as a flat 2-dimensional object like a photograph, but a complete 3-dimensional representation. Why this occurs is something of a mystery — at least to my primitive understanding of physics and optics — but it does. You can walk around the projected hologram and the details of the object are visible much like the original object would have been seen. So, the interference pattern on the photographic plate contains *all the information* associated with the object originally under laser illumination.



How does a hologram — or the interference pattern — relate to the "structure within structure" you keep mentioning?

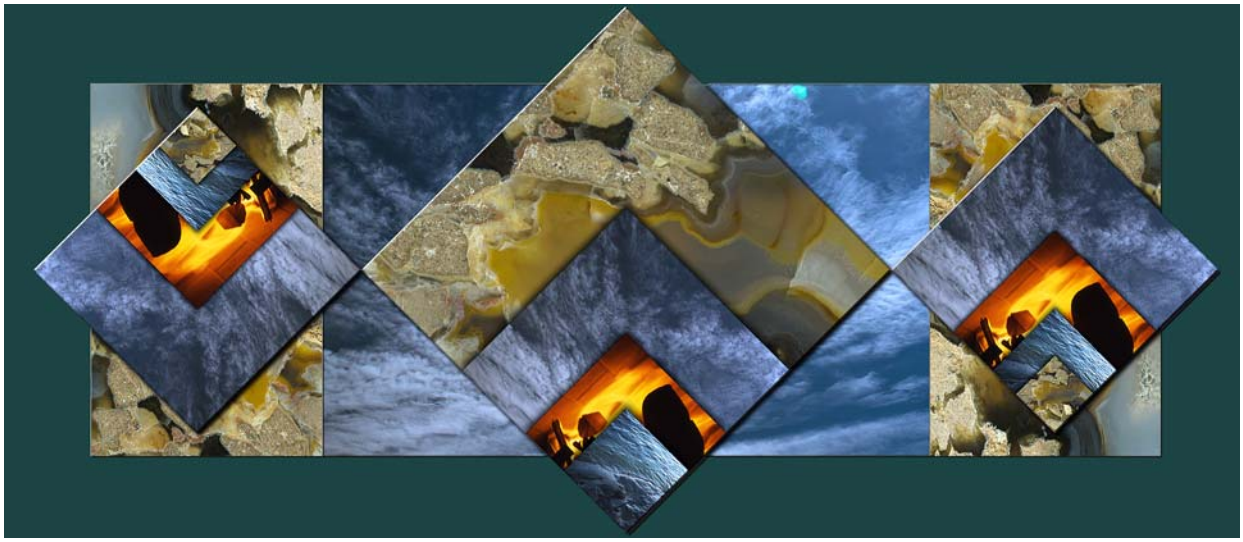
The hologram is a powerful metaphor for universal structure because of a really weird feature of the interference pattern. If the photographic plate is cut into 4 equal sections, and the laser is then shined back though one of the plate quarters, the original object once again appears — complete — in the projected hologram! In fact, all 4 quarters will display the original object projected as a hologram. The sectioning process could be repeated — into 16th- or 64th-sized sections of the plate — and the result would be the same. Actually, the resolution of the projected hologram will get fuzzier as the sections becomes smaller and smaller, but the smaller pieces of the hologram still contain *most* of the information (shape, texture, etc.) needed to recognize the object.

What does this mysterious result mean? That the dimensional and reflectance information about the object is imbedded throughout the interference pattern — practically down to the atomic scale! Each minute part contains the information about the whole. This is the basis for the analogy with the structure of the universe, where the structure of the galaxy is implied in the atom — the part contains the seed of the whole.

EARTH – Elements in Golden Ratio Mandala 2004-004, Collage. 2004

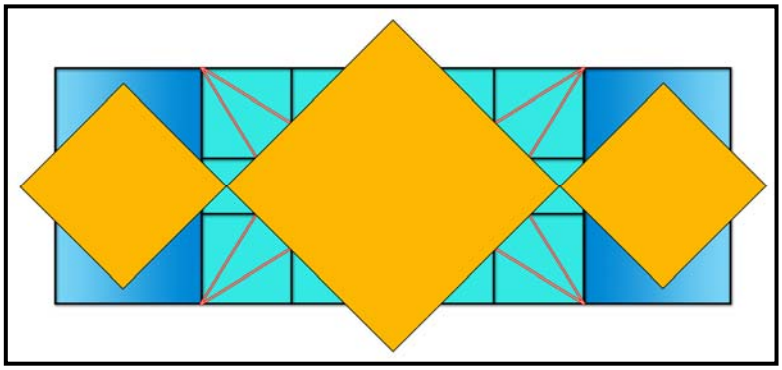
So, how else does the hologram analogy relate to the structure of the universe?

First, similar mathematical laws can be applied to many natural phenomena at many size scales.



AIR – Elements in Golden Ratio 2004-004, One + 3(Phi) Collage, 2004

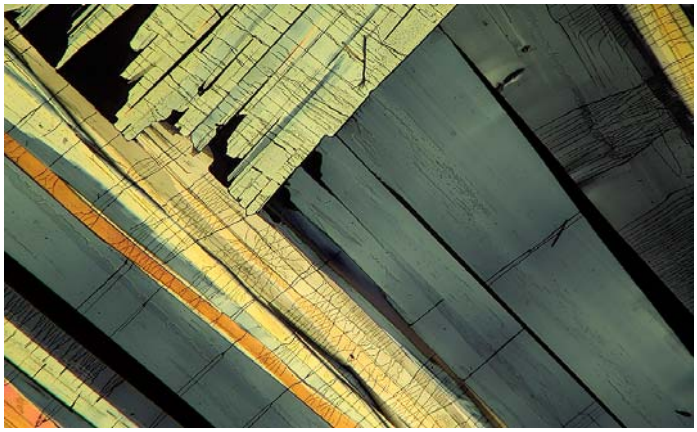
Consider the vibration of strings and musical intervals, which were studied by the Pythagoreans, and the correspondence with electrons in an atom. A vibrating string will have a fundamental pitch associated with the entire string moving back and forth in one motion. But the string will also vibrate in a more complex manner, with waves and nodes associated with integer divisions of the string length (one-half, one-third, one-fourth, etc). These integer division nodes create the higher harmonic frequencies which are not as loud as the fundamental pitch, but contribute to how the string sounds — the timbre. The electrons in an atom also have a "harmonic" structure with discrete levels associated with the energies of the electrons in orbitals surrounding the nucleus – usually electromagnetic energies in the visible and ultraviolet. Schrödinger used the analogy of a vibrating string to develop the wave equation for describing the electron in the hydrogen atom. This is the basis for quantum mechanics — that the electron behaves in some ways like a vibrating string on a guitar. *That* is what I call a holographic analogy or correspondence.



Another good example is the Fibonacci sequence of numbers, named after the pen name of Leonardo of Pisa, a 12th century merchant mathematician who also, by the way, introduced Arabic numerals to ignoramus western civilization. This number sequence is determined by adding the previous two numbers to get the next number in the sequence. If you start with 0

and 1, the next number is 1, the next is 2, then 3, 5, 8, 13, 21, 34, 55, 89, 144, and so on. It turns out that the ratio of adjacent Fibonacci numbers approximate the Golden Ratio.

Well, microscopic crystals and cells, many plants and animals, and even the *solar system* exhibit Fibonacci number sequences and the Golden Ratio in their growth or structural patterns. Cook's or Thompson's classic studies show dozens of great examples from human scale nature, and Matrineau's book, *The Little Book of Coincidences*, details the celestial presence of the Golden Ratio and Fibonacci numbers.

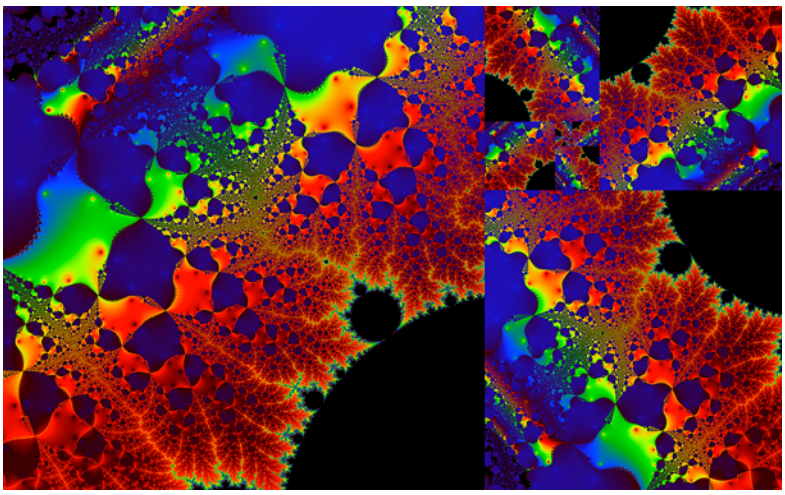


Benzoic Acid Crystal 2006-036, Microphoto, 2006

They are *everywhere* you look at all size scales — metaphors of the "kingdom of God arrayed before men." You can also calculate the Golden Ratio by dividing adjacent Fibonacci numbers — which ties this discussion to my use of Golden Ratios in my work.

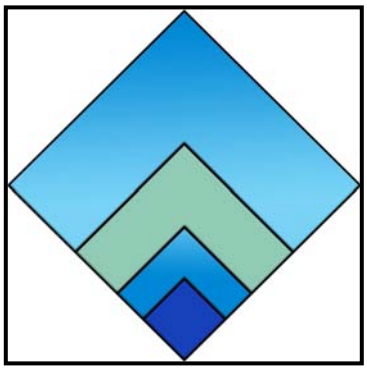
Fractals are another phenomenon that illustrates the holographic structure of the universe. A fractal is a geometric form that looks the same (that is, it is self-similar) no matter how much it is enlarged or reduced. You have probably seen colorful pictures of fractals generated by computers. Well, fractals are not just compelling computer images. It turns out that many of the simple and complex structural features in nature are fractal: crystals, bee hives, surfaces of cells, lightning, cracks in rocks, coastlines, landscapes, the melodic structure of music and language — the list goes on and on. So a fractal is a holographic/geometric metaphor for the way the universe really organizes itself, especially any process involving additive growth or random processes. The Golden Rectangle, the form I have been exploring, is also a basic fractal, where the square is the repeating self-similar form unit.

Second, and this is similar to the first point, the structural organizing forms of the universe repeat themselves. Structures at higher (or more complex) levels contain structural elements and patterns associated with simpler patterns. These more complex structures are themselves part of larger scale structures, in a nested hierarchy of organization. Ken Wilbur calls these nested and similar organizational structures *holons*.



Fractal Coil 2008-005, Golden Rectangle Coil Collage, 2008

The solar system shows structural similarities to the atom, which is also suggested in the galactic organizing structure. An organism repeats the functions of individual cells, which are also repeated at the social level



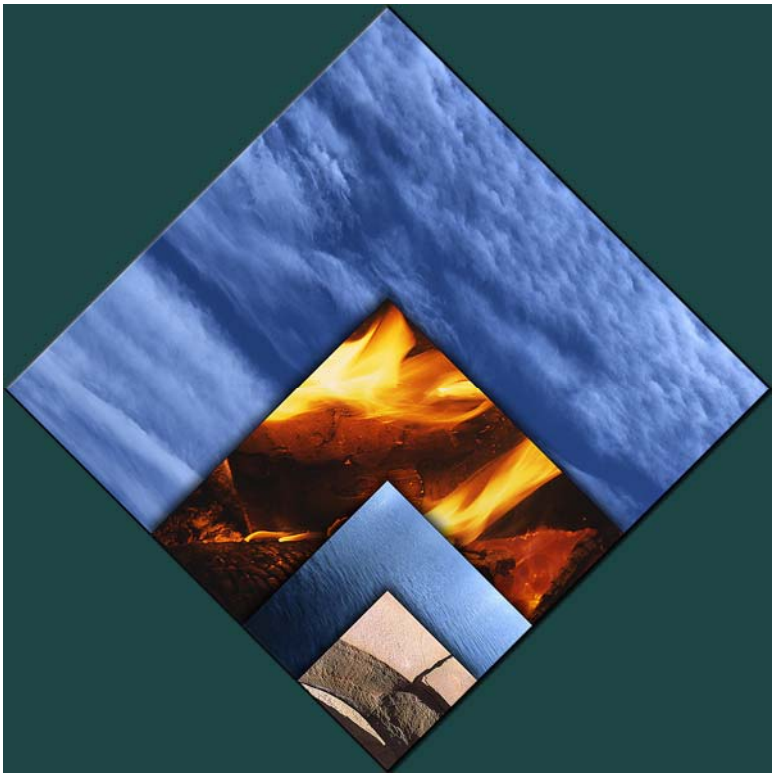
of organization. Our country responded to the September 11 tragedy much like a organism responding to an injury or a cell to an invading virus. Energy was allocated to rebuild, defend, and reproduce (witness the baby boom of WW II and increased marriages and pregnancies since 9-11). Empires re-enact predator feeding by "devouring" and "absorbing" other nations and cultures. The intermarriage following conquest is a form of genetic assimilation, or "digestion."

The alchemical axiom, "As above, so below." is stating the same correspondence from an occult frame of reference. Plato's realm of the archetypes, where ideal forms in heaven are seen in a distorted form in the physical plane, is a metaphysical way of saying that the universe is holographic. Michael Talbot even suggests that the whole universe is actually a giant hologram, a huge complex interference pattern that we only perceive as physical reality, and where the structure of the whole is found in every minute bit.

I can see that structural forms are repeated at different size scales, and geometry is a metaphor for universal structure, but I still don't see why you think form is so essential to art and why you use geometry in art.

OK. Now we can get to the model of art creation I endorse and explain why form is central to art for me. I need to bring up several additional axioms concerning the wave nature of the universe and the important role of resonance.

First, the physical universe we can sense and all energy are vibratory and have wave properties of wavelength and frequency. Einstein showed us that matter and energy are equivalent, so both have wave properties. Light is vibratory electromagnetic energy — sound is vibratory mechanical pressure energy. Solid objects have wave properties because they are composed of atoms that contain particles having wave properties.



AIR – Elements Offset Square 2004-004, Collage, 2004

I will stick my neck out and say I believe that consciousness and thought are also vibratory. I don't know what kind of medium thought waves propagate through — it probably has an electromagnetic component associated with neurochemistry and electrical activity of the nerves involved — but we don't yet understand the physical mechanisms of thought or consciousness — so the idea is untested. But it seems reasonable.

Second, all information in the universe is exchanged by way of resonance. Resonance is the sympathetic vibration of an object exposed to oscillating energy waves. Everyday objects have an acoustic resonant frequency associated with their shape, size, and physical properties. Everyone has observed buzzing vibration of certain objects when the stereo is loud — the sympathetic buzz usually occurs only when specific pitches sound — the resonant frequency of the buzzing object. The energy of sound waves at a particular frequency cause physical vibration in the object that has the same resonant frequency.

Microwave ovens cook by making the chemical bonds in water molecules resonate with the microwaves and vibrate, generating heat in the process. To properly receive radio signals, antennas have to have lengths that are related to the wavelength of the broadcast signal — FM waves are around a meter in length, and so is the wire antenna you hook to the stereo.

Lake Powell Inflow, Utah, Double Golden Rectangle Panorama, 2003

If thought, the conscious aesthetic logos, is vibratory and has wave properties, then the form of an artwork, referring to the analogy of the radio antenna, assumes a central role. Just like a radio antenna having to be a specific length to receive radio waves of a given wavelength, the form of the artwork needs to have certain properties that enable *resonance* with the thought waves of internal necessity. If the artist is being a proper shaman and creates a form harmonious with the idea, then the artwork will resonate with the aesthetic logos, and can thus *transmit* the idea. If a person views the artwork in a suitably receptive mind state; attuned, so to speak, to the resonant frequency of the artwork, then art can function as a *transceiver* of aesthetic energy. In this model, the artwork literally becomes the medium that bridges the invisible and visible world, but it also places a large responsibility on the viewer's state of mind. This idea of artwork as "aesthetic antennae" and the central importance of form is not new. Both Kandinsky and Klee kicked the idea around.

So, using the Golden Proportion as a formal organizing element in your work is a way of making sure the "aesthetic antennae" is tuned properly?

Exactly! What better formal organizing element could an artist find than a form that embodies the fractal structure of nature? Artists have known about the Golden Proportion for a long time, and it has been used extensively throughout history. We do not think about it, but what we consider musical is related to whether or not the melodic note content has a fractal structure. When people are played computer generated sound pitches that are random, it is rarely

considered music. When the computer selects pitches using a fractal selection algorithm, the notes are then perceived as "music."

What about other formal elements in art – color, texture, or content?

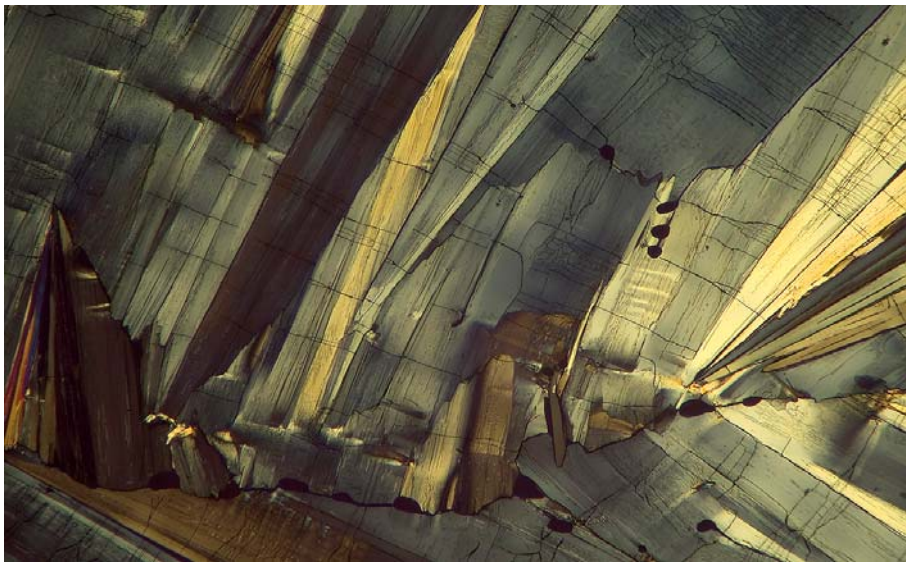
These elements are important, because they go directly to the issue of what idea is being expressed and how well it is being expressed. However, to me, they are subordinate to form and composition. These elements definitely contribute to form, because unskillful application of color or texture may obscure the form. The analogy I like is someone playing out of rhythm at a jam session. That oaf is "stepping on the groove."

Also, skillful application of color, texture and content can enhance the composition. I think that this is what Aquinas was referring to when he identified harmony (*constantia*) as an important aesthetic criterium. I would define harmony as the synergistic combination of skill and message with form. I would say that beauty is the subjective perception of harmony, and it is definitely a part of any great art work — or scientific theory.

Content is also important, because what appears in the frame says something as well. If it is a representational object, there are emotional associations each viewer will bring to the experience. An image of a horse means something different to a horse lover than to someone who is afraid of horses. An abstract may make one person uncomfortable while another may be entranced.

What other criteria do you apply to judge art?

This is a difficult question, because so much of artistic appreciation is subjective and dependent on your familiarity with art and aesthetic criteria like composition and appreciation for skills. And my own personal criteria are similarly subjective and limited by my own ignorance. That disclaimer aside, I do have some guidelines that I follow when I look at a piece.



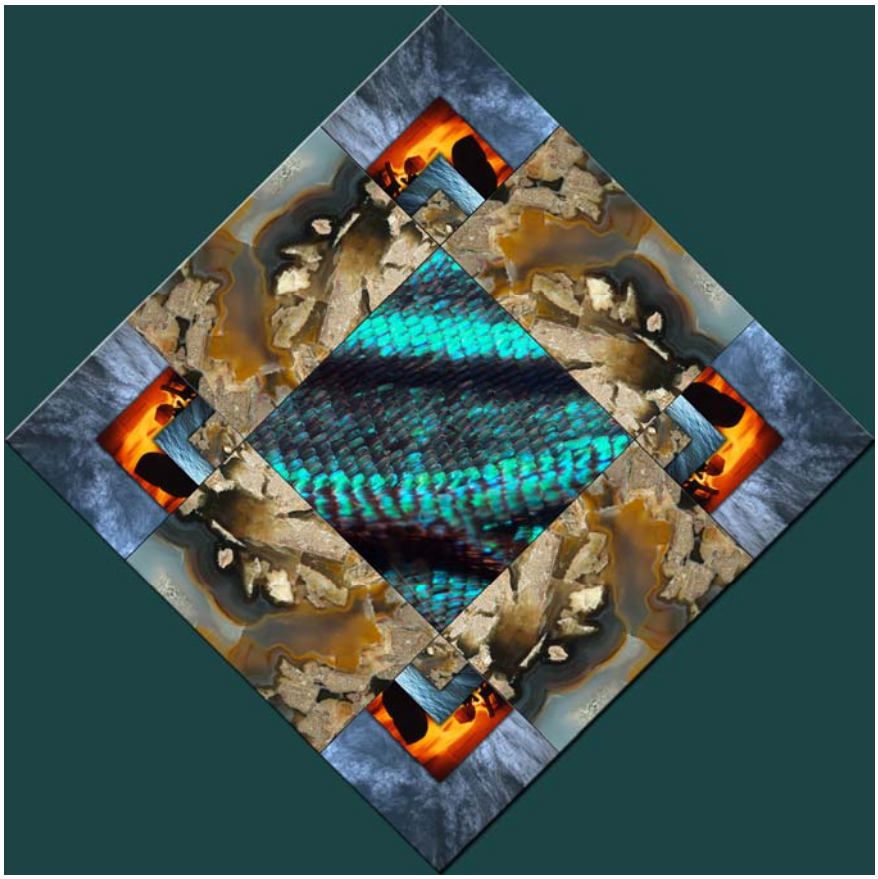
Benzoic Acid Crystal 2006-016, Microphotograph, 2006

First, if you want to appreciate good art, you have to do a little work as the viewer. The ideal would be to be in the same alert meditative state the artist shaman used to create the work. At the very least, you should approach art viewing in a calm and attentive state in a calm environment.

Next I ask if I am captivated by the image. Does it speak to me on any level? Does it "work"? This is the idea James Joyce described as *aesthetic arrest*, and it is a personal impression of "impassive capture" determined by the viewer's aesthetic and life experience, and how well the art antenna is broadcasting aesthetic energy. The greater the art, the more readily it should transmit. The good stuff should call you — and hold you entranced. *Post hoc*, I can rationalize why I was drawn to the piece based on aesthetic analysis (a more analytical and reductionist process), but fundamentally, the work either speaks to me or it doesn't.

Second, does the work have legs? This is a longer term criterium that asks, "Do you keep coming back to the work?" Do you continue to appreciate new nuances and meaning over time? Much like great music, great art should have some depth and complexity that engenders the desire to see it again and again. This criterium serves to separate the great from the good.

Finally, for representational art, I think that the degree of archetypal material is important. I believe that the Logos or internal necessity best manifests itself when the art antenna has mythopoetic and symbolic attributes. Good art should function as good mythology, and good mythology has many meaning layers that are accessible to many levels of viewer experience. Good mythology is also usually outwardly directed, universal, and nonpersonal, as opposed to self-referentially indulgent, neurotic, or political.



EARTH – Elements in Golden Ratio Mandala, Collage, 2004

Aren't you using the formal structure in your work, the Golden Proportion, as the mythopoetic content as well?

Yes. That is true. It is a big deal about my current work — and a difficulty at the same time. The use of Golden Rectangles for the formal image structure, fractal images in the artwork, and Golden Rectangles (or derivatives) for frames is really beating the drum on the "form as metaphor" idea. Partly, I am doing this to reinforce the symbolic message that definitely requires more work from viewers to appreciate — at least on the mathematical or scientific level. Very few artists and art lovers are also well versed in math (by the way, very few scientists are well versed in math!). I imagine I will be more relaxed about explaining the details in future work, but right now the spark is strong and I am still very excited about these ideas.

At the same time, the difficulty of understanding the reasons why Golden Rectangles are structural metaphors should not interfere with someone who is not educated enjoying the images. If the images work and speak to people, then it should not matter if you understand the hunga bunga behind the Golden Proportion, or my smarty pants theory of art and creativity. I think my recent work is visually strong and does work on the basic levels. If someone is drawn to them because they are "pretty" or have nice colors, then that's fine with me. In fact, that's great!

But isn't art ultimately an elite expression intended for an elite audience?

Great art is created by shamans, and yes, shamans are elites. And art is usually bought by the rich, who are economic elites. Despite the gallery system, it still seems to me that a rich patron must buy an artist's work for them to become successful — or at least to earn a decent living. How many artists made it after Peggy Guggenheim endorsed their work? Only after the rich buy your art does it interest the national and international art media. So until Gertrude Stein patronized Picasso, he was just another struggling artist. So, the current system is not much different from the feudal model, where the church or local royalty supported artists. And yes, it is true that the more you know about art and aesthetics, the better you will appreciate art - which implies educated and cultured elites. But the creation of art by elites should not necessarily imply that art is *intended* only for elites. The converse of the elite argument is that anything enjoyed by the masses is not artistic, but I disagree with that assumption, too.

Feed Forward Optimization, Photomontage, 42” x 13” Framed, 2001

Long live the Back Street Boys!

Just because something is out of the mainstream and esoteric does not make it good art. I have heard a lot of crappy and uninteresting atonal music and looked at a lot of ugly and mean-spirited art. At the same time there is no reason why something that is popular cannot have aesthetic merit. The Back Street Boys are bubblegum, but long live Hoagy Carmichael and the Beatles!

I have what I call the 10-Percent Rule — that 10% of all creative expression is good, in whatever medium or genre you choose, at whatever level of popular acceptance it exists. The 10% good contains the 1% that is great. The remaining 90% varies from not bad, to mediocre, to bad, then incompetent (which can sometimes have smartass entertainment value). Frankly, most of what you run across sucks, whether it is "cutting edge" or pop.

What is the state of artistic activity in our culture?

Like all activities, there is a continuum of intentions and purposes surrounding art. Our global culture produces both kitsch and the most sublime artistic expression. Because we are

currently experiencing a materialistic zenith — we are after all, the richest of rich countries in the world — the lion's share clearly goes to materialistic applications, such as advertising, propaganda, and meaningless ironic crap — the ennui of a wealthy materialistic culture.

However, I believe that the consciously intentional artist should approach art as a spiritual activity and as a shaman. That is the higher calling of artistic expression, and the role of "proper art," as James Joyce defined it. We are due for a change, and whenever a condition is in an exaggerated extreme, as it is now, the stage is set for the pendulum to swing back. It's a self organizing aspect of nature.

Double Arch, Arches National Park, Utah, Square Root of 5 Panorama, 2003