

Phionics:
Golden Harmony of Organic and Synthetic Vibrational Expressions

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for Jennifer Berezan
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"the state of emergency, how beautiful to be"

—Bjork

The origin and generation of life is the great mystery. Human inspiration guides us into a continual exploration of the breadth and depth of this unknown. Our aim is to relate to the unfathomable through artistic, scientific, and spiritual modalities. We imagine and create masterpieces of expression through art, music, and poetry; we discover and describe concrete structures and processes in chemistry, astronomy, and physics; we attune and align ourselves to the ineffable by meditation, contemplation, and prayer. Engaging with the mystery of life, we become the generators of more life. Is there anything more fundamental to life than this miraculous process?

Granted, as we develop our comprehension and articulation within this mystery, an absolute realization of the fundamental nature of life continues to elude us. While we devise grand inquiries into the nature of the entire universe of matter, energy, and time—we are generally blind to the full spectrum of our timely evolution as a species. Even our abilities to apprehend, contemplate, and integrate our own wonderment remains a mystery enshrouded within our own being. The most distinguishing characteristics of being alive, including perception, awareness, and communication, appear to have emerged as concentric layers within the unfolding of consciousness—the blossom upon the mystery of life itself. In awe and wonder of the dance of patterns upon our senses—we must often abandon ourselves to revel in the sublime beauty of it all.

Numinous Design

If we are to recognize a fundamental quality of life and the universe, perhaps it is the presence of pattern, form, and an apparently intelligent design. Among all the diversity of material forms, the emergence of pattern is common to all. Be it the spiraling of a conch shell, spots upon a leopard, ripples through the cloud cover, or striations across the bark of a tree—design patterns are ubiquitous within all forms. And our inherent capacity to perceive and associate patterns appears to be among the most fundamental qualities of sentient awareness.

When we ponder the origin of such prevalent patterns in form, we are led directly into the heart of magnificent wonder. We don't need to look far. Just beside us, even upon us, are the objects of pattern and form. Much nearer than our speculations into the vast expanse of outer space, and more accessible than our deep probing into the fabric of material reality—is the mystery of design. Literally all around us—articulated by the contours and surfaces of our own limbs and skin—we are permeated by a *numinous design*.

The ancient Chinese designated the term *li* to describe an entire scope of specific surface patterns inherent in material manifestation. From the branching patterns in trees and plants, the netlike formations upon insect wings, the cracks in

stone and drying mud, the current patterns in sand and water, and the fracturing configurations of entire landmasses—*li* represents dynamic form in nature.

... *li* can be seen as a manifestation of the gestalt, the inherent pattern of things. In its earliest Chinese usage the term was applied to such phenomena as the markings in jade and the pattern of fibers in muscle, but it gradually acquired the more extended meaning of an innate principle.

What we are dealing with here then are graphic expressions of a great range of archetypal modes of action, the traces of which may be found throughout the natural world. They present, in a traditional Chinese view at least, an order that arises directly out of the nature of the universe. It is this somewhat Platonic notion of external and preexistent forms that thus accounts for the appearance of strikingly similar formations in widely different circumstances and in quite unrelated phenomena. [Wade, p1-2]

Can we speculate upon the origin of such complex and prevalent design? Can we consider a mysterious source of intelligent design beside or beyond a traditional fallback to religious dogma, or into a barren indulgence of scientific abstraction? And how does numinous design involve us? How does the numinous move through us—not just through the veins and limbs of our bodies—but through our cognition, imagination, virtuosity, and even subtler qualities of human potentiality? What principles or qualities of numinous design can we allow to guide and inspire human activity toward a harmonic contribution to the unfolding expression of the universe?

Evolution of the Primordial Expression

Within the ancient myths and religious texts of many world cultures, we find common references to a fundamental understanding that the universe began as a *sound*, a *light*, a *word*—a *vibrational expression* of inexplicable origin beyond space and time. The Christian, Hindu, Taoist, Zen, and Egyptian traditions are among those who hold the understanding of a primordial expression giving birth to the panoply of the cosmos.

"In the beginning was the word," says the English translation of the Bible. "En archen en ho logos" is the original Greek from the Gospel of John. For the Greeks, the term *logos* had a more encompassing meaning than our mere interpretation of "word." The Greeks understood *logos* as the primordial, archetypal expression that encompasses everything we recognize as a *word*, *sound*, *shape*, *proportion*, and even more:

The common Greek word for proportion is *logos*, but a study of the use of this word in Greek philosophy shows that "proportion" had for the Greeks a far wider range of meaning than it has for us. Heraclitus, for instance, used the word *logos* to refer to the underlying organizational principle in the universe—the ultimate whole experience—through which "all things are one" and according to which "all things come to pass" [Livio]

Logos, then, is understood to be not just *proportion*, but *holistic proportion*—or *right relationship*. In the beginning was *right relationship*.

Ancient, multicultural references also affirm that humans are made in the "image of God." We are created similar to the source of Creation itself, and are made to behave *like* the Divine. Along the span of human evolution, we have evolved to become significantly distinct from other organisms. Aside from our unique bipedal nature—human beings have developed augmented cognitive abilities, and have an unequivocal capacity to *make* things beyond ourselves—such as symbolic languages, four-lane highways, violin concertos, mausoleums, and cellular networks. Indeed, humans appear capable of activating both creative and destructive powers something *like* God. How significant, then, the question is: *what is the ideal way to express the divine intelligence moving through us? How do we guide ourselves into right relationship?*

Toward the Golden Ideal

Since the time of antiquity, philosophers, mystics, scientists, and musicians have come to recognize a most fundamental and common pattern embedded within the world. This pattern is represented as a certain number or geometric proportion that has come to be known as the "Golden Ratio," "Golden Number," "Golden Section," "Golden Mean," and "Divine Proportion." This *Golden Ratio* is a pattern of *relationship* between parts within nearly all observable forms and systems. It is found in the ordination of petals in a flower, the organization of the human body, the breeding patterns of rabbits, the frequency intervals of musical scales, in the arrangement of molecular compounds, and of planetary orbits within our solar system. The Golden Ratio is the most ubiquitous and universally observable pattern found in all that is naturally created by numinous design.

The first definition of the Golden Ratio was given around 300 B.C. by the founder of geometry, Euclid of Alexandria. Euclid defined a proportion derived from a simple division of a line into what he called its "extreme and mean ratio." In Euclid's words:

A straight line is said to have been cut in extreme and mean ratio when, as the whole line is to the greater segment, so is the greater to the lesser.

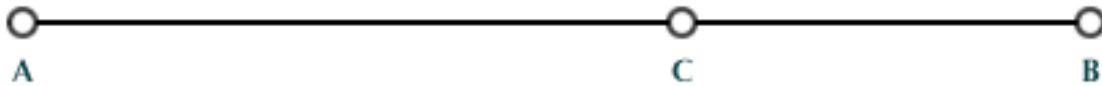


Figure 1

In other words, if we look to Figure 1, line *AB* is longer than segment *AC*; at the same time, the segment *AC* is longer than *CB*. If the ratio of the length of *AC* to that of *CB* is the same as the ratio of *AB* to *AC*, then the line has been divided in

extreme and mean ratio, or in a Golden Ratio. Likewise, all of these segments are in *Golden Proportion* to each other.

$$a:b = b:a + b$$

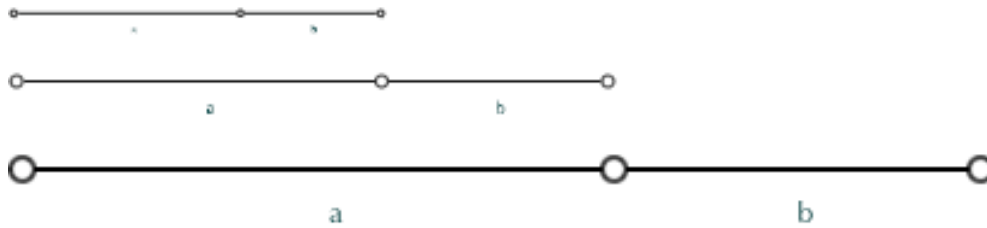


Figure 2

By such a perfect relationship of parts, we can see (Figure 2 & 3) how inter-related growth creates harmonious and integrated forms and structures.

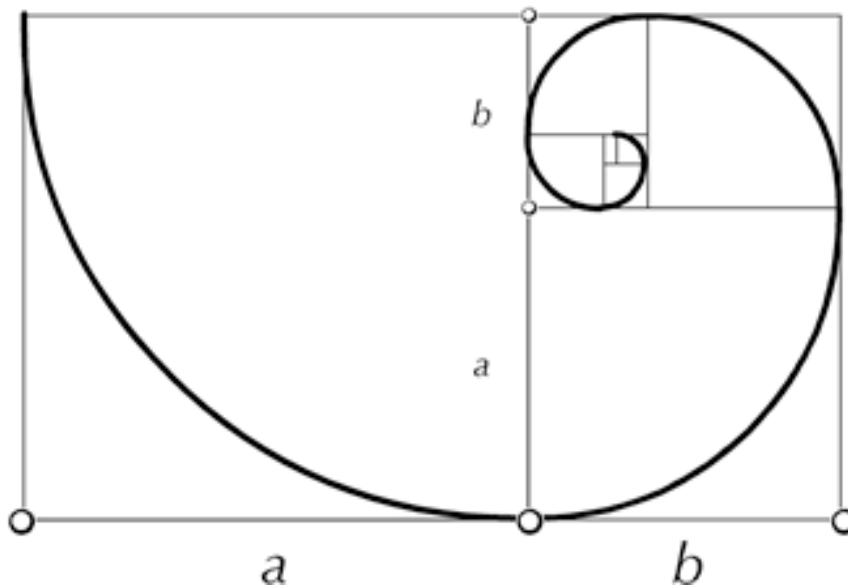


Figure 3

The precise value of the Golden Ratio is ultimately an incalculable number, and inscrutable ideal. Represented by the Greek symbol *phi* (Φ), the numeric expression (1.618 0339887...) is an irrational number that cannot be entirely known—but only approached. In essence, then, what we recognize as an isomorphic standard in all biological organisms, musical harmonies, molecular bonds, and astrological arrangements—is a *procession* toward an ideal balance and harmony between all things.

Proportion is both an idea and a reality. It is the significant relationship between things, and therefore it is inherent in natural law, as we live in a cosmos—a cosmos being a profound unity of balance between various forces, events, and elements. Proportion in the broadest sense is concerned with this balance, harmony and relatedness between things: between body and mind, nature and humanity, illusion and reality. [Critchlow, p.133]

In all arenas of phenomenological reality we find expressions that appear to reach toward this *Golden Ideal*. When looking to the realm of biology, we are blessed with a vast diversity of organisms that hold the Golden Proportion in their forms, and grow through time toward the Golden Ideal—as the plants of the forest reach for the light of the sky. It appears safe to say that across all the diversity of the biosphere—the Golden Proportion is a unifying principle—an isomorphic constant between all life forms and biogenetic processes. There is also evidence that Golden Proportion is found in the tissues within organisms. When we look deep enough, we also find Golden Proportion expressed in the microscopic components of minerals, in the molecular structure of organic matter, and even in the nearly infinitesimal dimensions of subatomic particles. When looking beyond planet Earth, we find Golden Proportion in the arrangements of planetary orbits in our solar system.

Symphony of the Spheres

As we find harmonic relationships throughout and between all levels and scales of our observable world—we commonly associate *harmony* to the more earthly realm of literal *music*. In all of its ethnic and personally influenced variations, music has emerged through cultural evolution as the quintessential human expression and contribution into the "world of sound." The very nature of music—bridging human reckoning and sensibility with the more subtle and transcendent realms of emotion, spirit, and soul—can literally *move* us by its sheer and simple power to *amuse*. And having become so integral to the human experience itself—we commonly come to understand and communicate about other spheres of reality through the metaphor of music itself.

Pythagoras, in approximately 500 B.C., discovered how musical harmony emerges through appropriate ratios of frequencies consisting of simple, whole numbers. Specifying such musical intervals as an *octave* (1:2), a *fifth* (2:3), and a *fourth* (3:4), for example, came about by him listening to how appealing these frequencies were to the human ear. Each of these fundamental musical intervals has an equivalent geometric correspondence of Golden Proportions (relating to sections of the pentagram, pentagon, and golden rectangle).¹ Recognizing this metaphysical connection between music and number, Pythagoras concluded that all of nature and the universe is a harmonic expression deriving from number. He distinguished three sorts of music in his philosophy: *musica instrumentalis*, the

¹ The Pythagoreans designated the *fifth* interval to be particularly harmonious. Of all the primary, whole number intervals—the *fifth* (2:3) is the closest approximation to a true Golden Proportion.

ordinary vibrations made by musical instruments such as the lyre, or flute; *musica humana*, the inaudible harmonics of human organisms, and in particular the resonance (or dissonance) between the body and soul; and *musica mundane*, the inaudible yet traceable harmonic proportions of the solar system—the "music of the spheres."

A modern day interpretation of Pythagoras's three realms of harmony can be extended to parallel the fields of audible *sound*, the electromagnetic spectrum of *light*, and the extraordinarily mysterious field of quantum reality—which captivates many of our modern scientific theories of *space and time*. Although we typically think of *harmony* as a quality of music and sound—harmonics can also be found and applied across more extraordinary realms of reality.

Since the Golden Proportion, and more literally phi, is an expression toward an ideal that is representative of the relationship between *measured* parts—we can find and apply Golden Harmonics to *anything* that can be measured or designed. Inspired by the wealth of beauty and harmony present in our studies of geometry, music, and astronomy—what other constituents of life and the universe are innately embedded, or can be created with Golden Harmonics?

We recognize, for example, that light travels at a constant speed (299,792,458 meters per second).² To this apparently constant measurement, we can easily calculate an array of corresponding Golden Numbers (299,792,458 x 1.618 = 485,064,197 meters per second, as one example). And with this calculation, we may then ask, *what travels at this speed in harmonic proportion to light?* As light is merely a narrow band upon the breadth of the electromagnetic spectrum—it is possible to specify Golden Proportional correspondences to vibrational frequencies within the spectrum of the rainbow, as well as extend to higher and lower harmonics of visible light itself. Similar experiments are theoretically possible with direct measurements of time. What in the world is left outside of the field of universal harmonic resonance?

Bios & Technos: the Born and the Made

All things in manifest are either *born* or *made*. Babies, flowers, and frogs are *born*. Computers, churches, and sailboats are *made*. What we typically recognize as "natural" becomes through *birthing*—coming into organized manifestation through a process that is ultimately unknowable by our capacity to trace the origins of the design. What we typically recognize as "unnatural" is *made* by something that has already been *born*—such as humans making new things (and many other biological species capable of building new forms—such as ants making ant hills).

The *born* is directly associated to the *bios*—the realm of biological form and process that gives a fundamental context to the human condition. The *made* is directly associated to the *technos*—the realm of what humans design and construct in the world. The realm of the *technos* applies to all the advents we commonly

² Although there is recent (2004) speculation that the constant speed of light may be accelerating.

recognize as modern technology: agriculture, plumbing, computers, radar, and cell phones—to name just a few. And the *technos* also encompasses all the *tools of technique*: the hammer, the pen, the paintbrush, the guitar—the technologies by which we create more technologies. Through the *technos* we evolve our capacity to *articulate*, creating artistic expressions—the essence of human culture.

Anything which is *born* will very commonly have the Golden Ratio embedded in the details of its morphic design, as well as in the patterns of its continual growth process. Anything that is *made*, however, will not necessarily have the Golden Ratio inherent in its design. Although there is ample evidence of Golden Ratios being implemented in the architecture and art of ancient and modern cultures—much of what we design and produce in industrial-consumer culture is far from a conscious modeling of natural design principles.

The idea of *biomimicry*—that is, mimicking or modeling human made design and manufacturing after biological forms and processes—has just begun to emerge as a more significant practice by human designers and engineers. Such products as Velcro and solar panels are examples of biomimetic design. Janine Benyus, a leading voice on this "new science of innovation inspired by nature," says the practice of biomimicry requires a fundamental change in human attitude:

Perhaps in the end, it will not be a change in technology that will bring us to the biomimetic future, but a change of heart, a humbling that allows us to be attentive to nature's lessons. ... our tools are always deployed in the service of some philosophy or ideology. If we are to use our tools in the service of fitting in on Earth, our basic relationship to nature—even the story we tell ourselves about who we are in the universe—has to change. [Benyus, p.8]

If human beings are understood as creations in the likeness of the primordial expression of divine intelligence, and if technology is understood as an extension of the human being (McLuhan)—then it follows that the impetus of human design, production, and engineering may benefit greatly in adhering to natural design principles—and the universal balancing principle of the Golden Proportion. Perhaps even the *relationship* between *bios* and *technos* itself—the essential field of all our creation process—can be intended toward an ideal, Golden Harmony.

In his book, *Out of Control: the New Biology of Machines, Social Systems, and the Economic World*, Kevin Kelly describes a trend toward an inevitable fusion of these two apparently disparate domains of manifest creation:

The overlap of the mechanical and the lifelike increases year by year. Part of this bionic convergence is a matter of words. The meanings of "mechanical" and "life" are both stretching until all complicated things can be perceived as machines, and all self-sustaining machines can be perceive as alive. Yet beyond semantics, two concrete trends are happening: (1) Human made things are behaving more lifelike, and (2) Life is becoming more engineered. The apparent veil between the organic and the manufactured has crumpled to reveal that the two really are, and always have been, of one being. [Kelly, p.3]

Can we consider that *technology* is also an emergence of numinous design? Are the advents of computers and distributed networks, for example, elaborate *tools of*

technique capable of contributing toward a greater, collective *articulation*? Is information technology—despite the residual detrimental effects during these "primitive" decades of development—a manifestation of *technos* nearing the "veil between the organic and the manufactured?"

Harmony of the Gears: toward a Transcendigital Language of Unity

Information technology and multimedia provide new ways of perceiving, organizing, delivering, presenting, and communicating complex information. Unprecedented to previous paradigms of communication and publication, the utility of computers, the medium of cyberspace, and an expanded threshold of interactivity offer information management within virtually unlimited dimensions (*n*-dimensionality). Science is harnessing the advents of rapid computation and high visual resolution to model complex data in physics, mathematics, cosmology, meteorology, chemistry, molecular biology, physiology, geology, engineering, and many other fields of study. Be it the diagramming of genetic molecules, the simulation of a bird in flight, or a demonstration of variable scenario dynamics involved in a hurricane—such representations directly communicate complex ideas, systems, and relationships through forms that are immediately comprehensible and accessible to the common senses.

Information technology may have something to offer into the universal evolution of the primordial expression. With advanced methods of accelerated computation, we are able to process and orchestrate any type of data very rapidly into virtually unlimited dimensions of organization (2d, 3d, 4d, ... *nd*), as well as translate information into multiple modalities of presentation (visual, audio, kinetic). We now have methods of perceiving deeper into both the microscopic (molecular, atomic, and quantum) and macroscopic (planetary, extraterrestrial, and cosmic) scopes of the universe. We now have methods of accumulating broader and more intricate types of information—allowing the perception of systemic processes previously incomprehensible to the human mind and senses. Coupling this trend toward capturing a holistic sense of the universe with the trend toward universal translation of multi-sensory presentations—we appear to be heading toward a method of articulating a *holoscopic* and *synaesthetic* style of communication.

In his essay, "Ancient Temple Architecture," Robert Lawlor describes how language is influencing natural evolution itself:

Language and symbolic processes have transformed learning and behavior into a biological instrument which, in humanity, challenges natural selection as the prime evolutionary mover and brings us to the threshold of a new potential in evolution—a survival mechanism based on the transmission of acquired knowledge, skills and experience, not through genetic inheritance, but through a structural system of essential symbols, and in which may well lie the key to the original function of Art, as well as of Science. [Lawlor, p.54]

Through information technology we are beginning to dabble upon a type of hybrid artistic-scientific palette—re-sculpting something *like* the primordial

expression from the inside out. If a primordial expression of divine intelligence set the universe in motion—what is our collective human response?

Evolution of Music

The evolution of music itself has an interesting trend toward complexification. If we trace the emergence of Western music since the beginning of the Christian Church,³ we find that the development of musical structures have transformed radically over this course of time. From the minimalistic notation style and *monodic* melodies of Gregorian Chant, to the more elaborated styles and *polyphonic* melodies of the fifteenth and sixteenth centuries, to the unbridled musical innovation of the twentieth century to modern day—the musical structures by which collective culture allows sound to be *amusing* to the human ear are continuously expanding and redefining bounds.

The 500 years of Western music between 1400 and 1900 can be viewed as an exploration of the circle of fifths, and exploration of the expressive possibilities of a system of music based on the special characteristics of the interval of the fifth. ... From this time until the early twentieth century, periods of music can be seen as the explorations of structures extending further and further around the circle of fifths. ... The explorations progressed further and further along the circle of fifths until, hearing a note, one could not determine to which set of notes it related. ... The harmonic structures that had been the basis of Western music for centuries collapsed. They were no longer used to build musical structures. [Holtzman, p. 27-29]

Yet new musical *styles* continued to emerge: modern classical, Jazz, Blues, Rock & Roll, etc. And with the advent of electronically generated and synthesized music in the 1970s, 1980s, and 1990s—we have new tools of musical technique, new *instruments* of producing and engineering sound. What may come across the next cusp of musical and computational evolution? How may information technology provide for the development of new musical structures? How may the fusion of the *bios* and the *technos* conceive of new musical styles? Can we imagine a genesis of novel harmonic expressions that will deliver human *amusement* across a greater threshold of inspiration, celebration, and *right relationship* to life?

Cymatics as a Way of Being: Frequency, Amplitude, and Duration

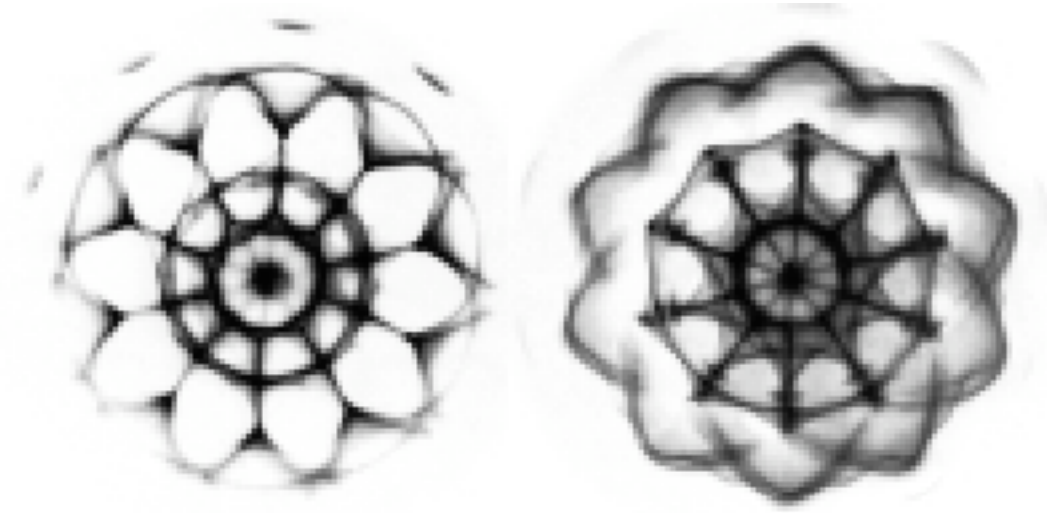
In the 1950s, Dr. Hans Jenny began pioneering the science of *cymatics*,⁴ the study of sound vibrations in interaction with physical matter.⁵ Jenny conducted

³ Most scholars agree that Western Music begins with the music of the Christian Church. Though, certainly, preliminary influences can be traced to early Greek and Egyptian music.

⁴ From the Greek *kyma*, "pertaining to waves".

⁵ Special mention can be made to E. F. P. Chladni (1756-1827) who discovered the sonorous figures named after him while he was investigating Lichtenberg figures with a violin bow on metallic plates sprinkled with powder.

several decades of experimentation with audio generation of form patterns in various palpable mediums—such as sand, powder, and water. When viewing the extensive visual documentation of the geometrically precise "sonorous figures," it is common to experience a visceral sense of the *numinous design* involved.



Cymatic forms emerge by vibration traveling through a material medium. Essentially, a cymatic form is a physical *expression* of the surrounding vibratory *environment*. Cymatic patterns conform the physical parts (literally, the particles) to the standing wave interference patterns of the source tone. The vibrational tone is a combination of both *frequency* and *amplitude*. When either the frequency or the amplitude changes, so does the form. These are the basic principles involved in the science of cymatics.

The more one realizes these things, the more one realizes that sound is the creative principle. It must be regarded as primordial. No single phenomenal category can be claimed as the original principle. We cannot say, in the beginning was number, or in the beginning was symmetry, etc. These are categorical properties which are implicit in what brings forth and what is brought forth. By using them in description we approach the heart of the matter. They are not themselves the creative power. This power is inherent in tone and sound. [Jenny]

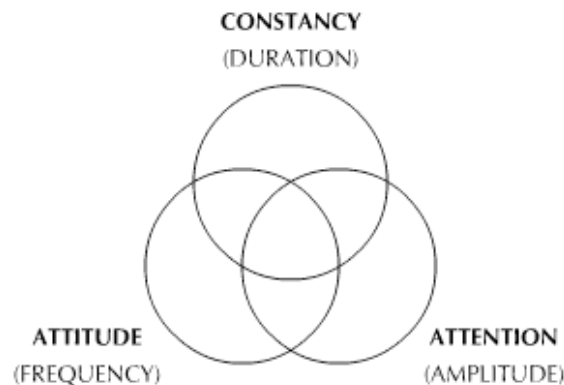
Indeed, the power is in *tone*. For *tone* encompasses the *quality* of *sound*—or any other vibrational expression—as a combination of *frequency*, *amplitude*, and *duration*. When these vibrational qualities are in pleasing, integral, harmonic arrangement together—we have good *tonality*.

Audible *sound*—as our human capacity for sensation recognizes it—is merely a narrow band of human perception along a greater spectrum of vibrations. *Sound* can only exist in a physical medium—such as air or water—that can transmit the source vibration. *Sound* cannot happen in a vacuum space (despite the great audio effects of science fiction movies we hear). How the *tone* of a *sound* emerges can depend much on the constituents of the medium.

Our experience of *light* is also based on vibrational interference patterns. When we see light, it is because the *tonal* property of light is diffusing across a spectrum of hues as interference patterns within or onto a physical medium—such as air, water, a window, or a flower. Although light travels through outer space (a nearly perfect vacuum)—we do not see it as *light traveling*—we see it as the resulting interference pattern of, say—the blue sky or the shape of the sun. Yet light does not have the same morphing capabilities to shape matter as sound does. For example, light will conform to the morphic patterns of water rather than water to light (whereas sound can shape water). Yet light may have a more subtle and powerful morphing power. When we experience a flower, we are seeing the result of sunlight absorbed, and then *transformed through time* into the complex geometries of a blossom. And we can *smell* light too. In essence, the fragrance of a flower is another complex arrangement of inter-related *tonalities* of absorbed light expressed through *time*.

So both *sound* and *light* are manifest results of *vibration*. And *vibration* is a result of cyclic motion or *periodicity*. Something must be in motion—in constant *change*—in order to generate vibration. And as *tone* encompasses the *qualities* of a vibrational expression—both the constituents of the expressive *medium* and the properties of its original *source*—*tone* signifies the *quality* of universal expression itself.

If we apply the principles of cymatics to the realm of human awareness—of consciousness—we derive a unique and applicable model of integral *beingness*. As a human being, bound to the medium of physical form (with all its limitations and potentials), we can literally change the form and perception of our environment, by adjusting our *attitude* (frequency), *attention* (amplitude), and *constancy* (duration) of the conscious *awareness* (source vibration) coming through.



It is nevertheless the case that to use one's mind with its incomparable analytic abilities is one sure way of realizing one's gift as a human being. Yet this is only half the truth. An appreciation or experiencing of the whole is the only way to give such analytic activities meaning, significance and ultimate usefulness to the person concerned. Parts lead to complexity; wholes to simplicity and unity.

Proportion is the ratio between these two poles, these two cerebral functions. It is the key to arriving at a transcendental unity from the polarity of existence. Thus proportion as it has been consciously employed in an architectural or structural sense is traditionally symbolic of the Gnostic function. Indeed, ultimately, the transcendental, proportional ratios ... are metaphysical principles which may be embodied in matter to give it significance and to enable the part to contribute to and relate to the whole. [Critchlow, p.135]

Just as we are able to derive and apply Golden Proportion in geometry, sound, and light—how can we measure and conduct the subtlest qualities of our human *beingness* into harmony of Golden Proportions—into Golden Tonality? How can we compose ourselves within the full range of our innate biological potentialities and techniques of articulation toward a symphonic awareness of universal totality? If in the beginning was the *logos*—the *sound, light, word*—perhaps in the end will be a type of *uni-vibrational, holomorphic, super-natural soul-expression*.

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