

The Power of Limits: Proportional Harmonies in Nature, Art & Architecture

By György Doczi

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The Limitless Emerges from Limits

- Epigram attributed to Pythagoras: “Limit gives form to the limitless.”
- This study combines science, art, philosophy and religion
- When we see the way that patterns emerge in the universe, something reveals itself to us that is infinitely greater than we are
- All patterns are defined by limits
- In nature, we frequently find a general pattern-forming process that involves the union of complementary opposites
- Doczi coins the term “Dinergy”
 - The creative energy of organic growth
 - Polarity and synergy refer to the pattern-forming process of the union of opposites but does not express the generative power of this process

Fibonacci, Pythagoras, and Beautiful Proportion

- The Fibonacci summation series is found frequently in nature (e.g., sunflowers)
- The point of a star shows the proportions of the golden mean
- The pentagonal star was a sacred emblem of the Pythagorean fellowship
- The 3-4-5 triangle (Pythagorean triangle or the “ropestretchers triangle”) is frequently found in plant patterns

Harmonies of Music and Growth

- Harmony is a dinergic relationship in which *different* and *contrasting* elements *complement* each other by joining in harmony
- Harmony comes from the Greek *harmos* – to join
- Harmonic proportions:
 - Octave – 1:2 – Diapason (through all) - (see proportions of a double square)
 - Fifth – 2:3 – Diapente (see Pentagram point proportions)
Please note, the fifth (.666) is very close to .618, golden mean
 - Fourth – 3:4 – Diatessaron (tessares = four) – (see Pythagorean triangle)
- Can find relations, for example, in the design of a leaf, that demonstrate harmonic relations of fourths and fifths
- The same dinergic relationships that delight our eyes in the shapes of leaves and flowers also enchant our ears in the chords and melodies of music
- In the ratios of the Tetraktys, the Pythagoreans sensed the secret power of a cosmic order – gave rise to the belief in the mystical power of numbers

Dinergy in Crafts

- Many folk arts and crafts demonstrate this innate sense of pattern and order and use of harmonic proportions
- The golden section is an important regulating principle in many forms of folk art
- This use of pattern and proportion creates an elemental feeling of oneness and unity.
- One senses a wholeness in which everything is related, just as the diversities of patterns are related
- Harmony and being human: We see harmony; we access it; we emulate it; we create it.

Unity and Oneness

- *Mana* – a direct experience of the sacred force that permeates existence – a strong feeling that life is unity and everything has a part.
- Many tribes and primitive peoples express this feeling of unity with spiral patterns
- St. Francis of Assisi, Canticle for the Sun, Moon, Wind, Water, Fire, Earth, Love, Death – all are brothers and the Earth is the mother – Laudate!
- William James – religion is the belief that there is an unseen order, that our supreme good lies in harmoniously adjusting thereto
- Abraham Maslow – peak experience is a clear perception that the sacred is in the ordinary.

Spirals in Ancient Cultures

- Snake figure with coiled body may have contributed to creation of archaic spiral patterns
- Great Mother figures of Crete are frequently represented holding snakes
- Hermes caduceus with two snakes winding around his magic wand is a tool of healing power
- New Grange, Ireland
- Double spirals of prehistoric ancestors

Sharing as Pattern-forming

- Sharing is not only a basic pattern-forming process but also a condition of life
- The mana of shared rhythms carries us in the waves of dance
- Dance and shared movements – rhythm – express shared religious emotions – en+thousiasmos – the god within
- The art of thinking originates in sharing through talk
 - In prehistoric times, simple geometric patterns were used to shared ideas
 - Early writing has a sacred character
 - The rhythms of writing are created by the same pattern-forming process of sharing that creates the rhythms of dance, music, and speech

Harmonious Proportions in Ancient Cultures

- Stonehenge
- Great Pyramid
- Ziggurat of Ur – relations of diatessaron and diapente are revealed

Rhythm and harmonious sharing

- Harmonious sharing is universally present in musical sound, color, light, weight, plant growth, ebbs tides, calendric rhythms, our own biorhythms – all demonstrate the role pattern forming process plays
 - Tides
 - Seasons
 - Breathing
 - Circular patterns
 - Cosmic rhythms
 - Clocks
 - Calendars

Correspondence between Musical Sounds and Colors

- Color Wheel and 3-4-5 triangle
 - Fifths created by the apothem = 5
- Colors associated with notes of a scale
- 3-4-5 triangle might indicate the Tonic Chord A min – indigo green orange
- Anything that uses a phi golden section is showing a harmonious fifth, c.f., sunflower
- Harmonic progression

Proportions in Nature

- Tetrakatys
 - 1:2 2:3 3:4 4:5 = .5 .666 .75 .80
 - Many things in nature are designed according to these proportions
- The proportions of the 3-4-5 triangle and the golden section
 - Fish proportions
 - Bones
 - Skeletons
 - Horses

The Mana of Sharing in Nature

- Doczi equates harmony with the concept of rhythmic sharing
- Animals communicate with other through the body language of dance and music
 - Bees
 - Whales
 - Dolphins
- Animal migrations – Such gigantic shared enterprises could not take place without superb cooperation and mutual assistance
- Shorelines - Shared shapes of waves, hills and rocks
- The “mana of sharing” in nature.
 - The basic pattern-forming process shapes harmonious relationships in animal and human life in the same way it shapes proportional harmonies in animal anatomy, in music, and in the other arts.

Order and Freedom in Nature

Paul Weis, Zoologist: “Life is order, but order with tolerances.”

- One of the oldest observations of mankind is that there exists a basic unity within the manifold diversities of this world.
- Uniformity is characteristic of all inorganic crystalline patterns
 - Snowflakes
 - Icosahedron structure
- Unity doesn't necessarily mean uniformity
- Unity and diversity are dinergically joined in all harmonies of nature and art

Gravity and Grace - Simone Weil

“Brute force is not sovereign in this world. What is sovereign is limit. Every visible and palpable force is subject to an invisible limit, which it shall never cross.”

- Gravity is weight. The lifting of weight by its dinergic sharing is grace.
- In Simone Weil’s book, Gravity and Grace, she shares observations about the many strange ways in which necessity and beauty, order and freedom, gravity and grace, unity and diversity are linked in nature as well as human destiny.

Harmonies in Human Proportions

Leonardo da Vinci: “Every part is disposed to unite with the whole, that it may thereby escape from its incompleteness.”

- Vitruvius man –
 - Leonardo da Vinci’s depiction
 - Square encompasses the whole body while hands and feet touch a circle centered upon the navel.
- See also Dürer’s studies of human proportions using harmonic scales
- Squaring the circle – the circle and the square are considered as perfect and sacred
 - Circle – Earth and the heavenly orbits
 - Square – the foursquare firmness of the earth
 - Combining circle and square in the human body suggests in the language of symbolic patterns that we unite within ourselves the diversities of heaven and earth, an idea shared by many mythologies and religions
- Adjacent parts of the body share proportions which fall within the range of the golden section

Musical Harmonies and Bodily Proportions

- Root harmonies in music correspond to proportions in the human body
- Revival of Pythagorean concepts
- Robert Fludd
 - Depicted man as microcosm united with the macrocosm of the universe
 - Combining dark earthly potentialities with light, heavenly ones
 - Attuned to musical harmonies like a monochord stretching from earth to heaven
- Plant and animal growth seems to unfold from a single center
 - The *os sacrum*, the center of the body, sacred bone
- Greek temples laid out according to human proportions

The Art of Living

- Wisdom and knowledge are essential to the art of living
- Wisdom is putting together and knowledge is taking apart
- Wisdom sees only with the eyes of the mind
- *Veda: Tat twam asi.* Thou art that.
- Teaches the relatedness of all things
- The unity of diversities
- *Satori:* flash of the unifying experience
- The “greatness of little things” – held up by the Tao Te ching – guide to the art of living
- I Ching – primal arrangement of 8 basic trigrams – where 2 meets 3
[illustrate?]
Vitruvius Nancy

Nature and Wholeness

- Live so that harmonious patterns unfold in our daily living
- May harmonious proportions unfold in our daily living.
- Geometry is the study of unity
- Proportion is exemplary of unity
- Unity amidst diversity
- Feeling of the whole – Latin *numen* means divinity or spirit – something that mankind commonly feels

Patterns of Wholeness

- Mandala
 - Aids to meditation and worship
- Dante's Divine Comedy – Circles of hell and purgatory
 - Dante: "I could feel my being turned by the love that moves the moon and stars."
 - When we fail to share ourselves in love, when we meet the frozen lake of lovelessness and scramble over craggy rocks of egoism, and yet we may still be fortunate enough to see the light of "love that moves the moon and stars."
- Song of the Cosmos – Hungarian poet Atilla Jozsef
 - 14 sonnets
 - Last line of each sonnet is the first line of the following one
 - Word mandala
 - Neighboring relations

Power of Limits

“Reciprocal sharing, nature’s own golden proportions, are built into our own nature, into our bodies and minds, which are, after all, a part of nature. The basic pattern-forming processes of nature which have shaped the human hand and mind can continue to guide whatever the hand and the mind are shaping, when the hand and mind are true to nature.”

- The golden relation of neighbors – when we share our own limitations with the limitations of others, thereby creating living harmony in life
- The power of limits is the force behind creation
- Drop 2 pebbles in water and watch the waves interact
 - Is this merely a pattern of pebbles, of vibration, or is it also a metaphor for love, for the power of shared limits, and for the creative act itself?

Peras and Apeiron –
Limit and Unlimited

From the Golden Chain

By Algis Uzdavinys

Peras and *Apeiron*:

The Main Principles of Manifested Being

- Basic principles of Pythagorean cosmology:
 - *Apeiron* – lacking of limit, unlimited - indefinite
 - *Peras* – A bound – limit or boundary
- The Pythagorean unlimited is indefinite and in need of Limit
 - Infinite in a negative sense, i.e., infinitely divisible
- Neoplatonism – *peras* and *apeiron* constitute the archetypal duality located at the position between the ineffable One and the noetic cosmos
- Limit and unlimited are discussed in Plato's *Philebus*
 - The monad and the dyad
 - Principles (*archai*) of mathematical reality (*ousia*)

Limit, Number and Proportion and Unity

- Principles of the *decad* lead us to understanding of the Unlimited
- Numbers are bounding wholes, the stuff of creation
- The *Decad* contains the principles and guides for all life – it insinuates itself everywhere
- Unity and Limit
 - Unity combines opposites
 - By limit, every series of things approaches unity
- Monad = Unity – The Cause before the Cause
 - By Limit, every series of things approaches Unity.
 - Through the Unlimited, the lower series is produced.
 - Before duality is the cause before the cause.
- There is no movement or manifestation without duality or polarity, which proceeds by proportion marching forward with its neighbors.
- Duality of Limit and Unlimited, Being and Becoming, Eidos and Physis

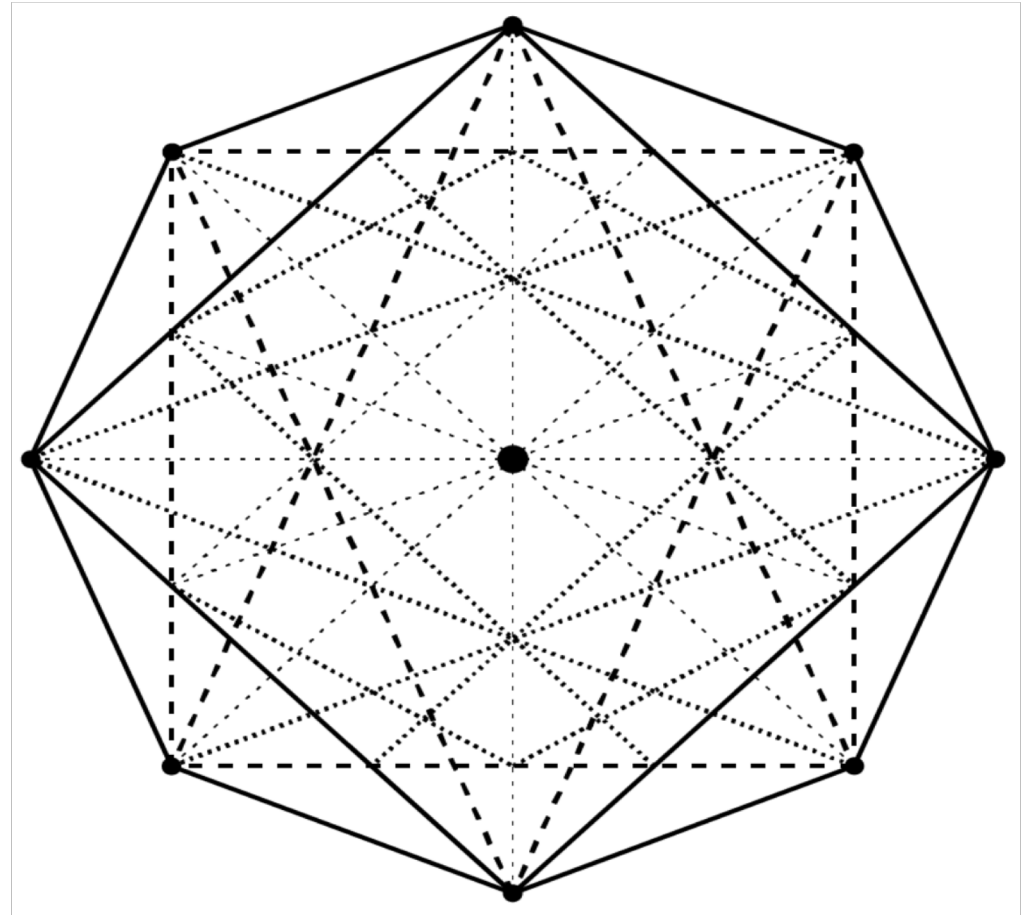
Aristotelian Table of Opposites * - συστοιχία - *sustoichia*

1. Limit	-	Unlimited
2. Odd	-	Even
3. One	-	Plurality
4. Right	-	Left
5. Male	-	Female
6. Rest	-	Moving
7. Straight	-	Crooked
8. Light	-	Darkness
9. Good	-	Bad
10. Square	-	Oblong

* From Aristotle's *Metaphysics*

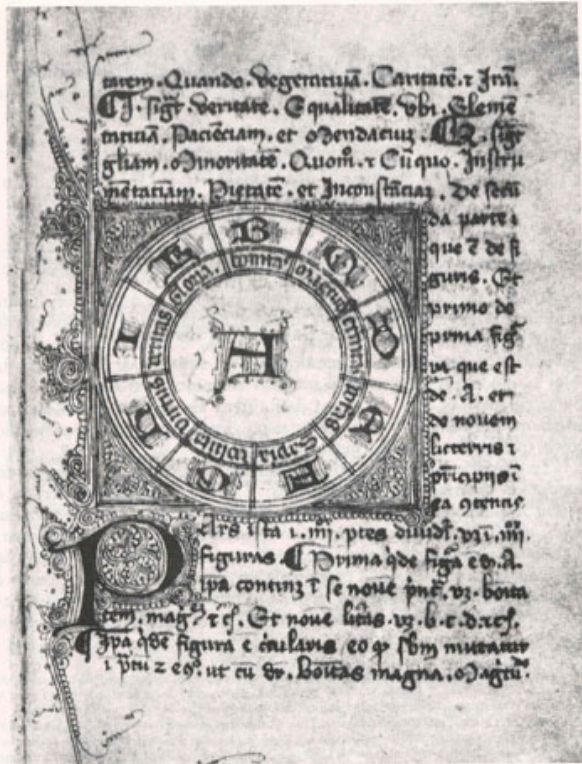
The Canticle of St. Francis

1. Sole
2. Luna
3. Vento
4. Acqua
5. Focu
6. Terra
7. Amore
8. Morte

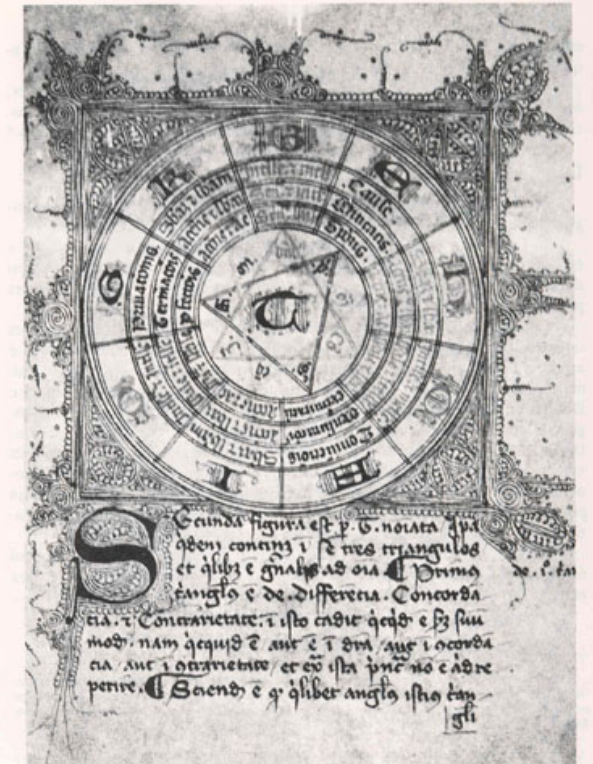


Ars Brevis - Raymond Llull

- Written at Pisa in 1308
- the most widely read and distributed version
- Simplified the *Ars Generalis Ultima* (1305).
- The *Ars brevis* was written to make The “Great Art” more accessible.
- The graphic devices which render the Art visible, both in the *Ars brevis* and in the ‘Great Art’, are the Figures and the Alphabet.



Làmina XV. *Art breu*, La Primera Figura. De El Escorial, Ms. f-IV-12, fol. 3.



Làmina XVI. *Art breu*, La Segona Figura. De El Escorial, Ms. f-IV-12, fol. 4.

Ars Brevis

Table 2: The alphabet of the Ars Brevis (adaptation based on [Bonner 2007b](#))

	PRINCIPIA ABSOLUTA (absolute principles)	PRINCIPIA RELATIVA (relative principles)	QUAESTIONES (questions)	SUBIECTA (subjects)	VIRTUTES (virtues)	VITIA (vices)
B	Bonitas (goodness)	Differentia (difference)	Utrum? (whether?)	Deus (god)	Iustitia (justice)	Avaritia (avarice)
C	Magnitudo (greatness)	Concordantia (concordance)	Quid? (what?)	Angelus (angel)	Prudentia (prudence)	Gula (gluttony)
D	Aeternitas (eternity)	Contrarietas (contrariety)	De quo? (of what?)	Coelum (heaven)	Fortitudo (fortitude)	Luxuria (lust)
E	Potestas (power)	Principium (beginning)	Quare? (why?)	Homo (man)	Temperantia (temperance)	Superbia (pride)
F	Sapientia (wisdom)	Medium (middle)	Quantum? (how much?)	Imaginatio (imaginative)	Fides (faith)	Acidia (bad temper)
G	Voluntas (will)	Finis (end)	Quale? (of what kind?)	Sensitiva (sensitive)	Spes (hope)	Invidia (envy)
H	Virtus (virtue)	Maioritas (majority)	Quando? (when?)	Vegetativa (vegetative)	Caritas (charity)	Ira (ire)
I	Veritas (truth)	Aequalitas (equality)	Ubi? (where?)	Elementativa (elementative)	Patientia (patience)	Mendacium (lying)
K	Gloria (glory)	Minoritas (minority)	Quomodo (how? And with what?)	Instrumenta (instrumentative)	Pietas (pity)	Inconstantia (inconsistency)

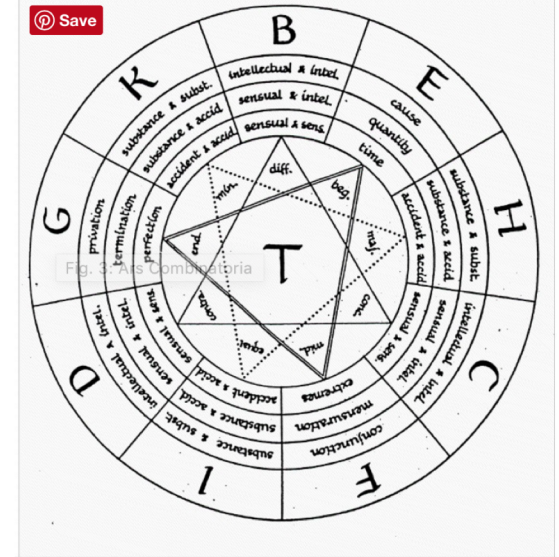


Figure 3: Ars Combinatoria ([Bonner 2007b](#))

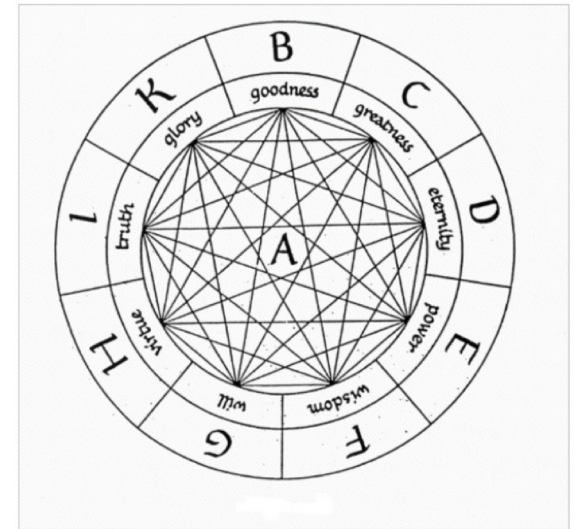


Figure 2: Ars Combinatoria, first column ([Bonner 2007b](#))

Limit in the Golden Chain by Uzdavinys

- Anagogic ascent to unity, proportion, and meaning
 - Vertical connection with first principles – participation in the first cause
 - Anagogos – to lead up
 - One truth leads to another
- Geometry as *epopteia*, direct vision of truth and unity
- Timaeus – the deity conjoins the elements by proportion
- Being and becoming
- Being as an image of eternity
- Geometry as temenos
- Number as bounding wholes - number and harmonic relations

Agalmata and Onomata

- *Agalma* - hieratic statue, cultic image, ornament
- *Onoma*
 - Word, name
 - Audible “icon”
- A name is like a cult statue of an idea or spirit
- A name is an *eikon* of a *paradeigma*, a copy of a model
- The world is made in the image of the eternal paradigms *paradeigmata*
- Onomata are *agalmata*, the audible “icons” or statues” of the higher divine realities
- Geometry as *agalma* (hieratic statue, cultic image, ornament)
- Demiurge makes the cosmos as an *agalma*