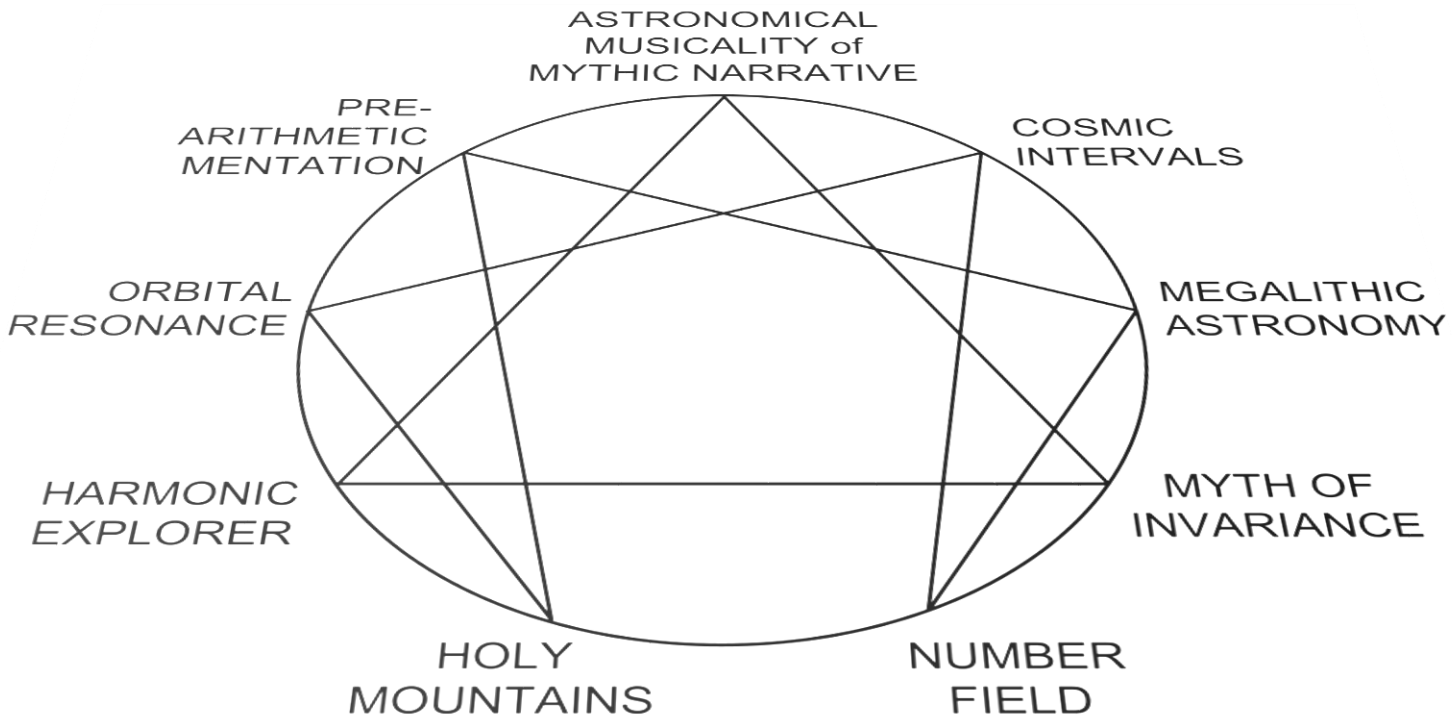


Transmission of Astronomical Musicality into Mythic Narrative

By Richard Heath
https://independent.academia.edu/HeathRichard
ICONEA 2013

Introduction to the Parts

1. The Planetary Gods of Myth have **Musical Ratios** with respect to each other's astronomical time periods
2. Before the gods were characterised, could Prehistory have discovered astronomical ratios using the ***pre-arithmetic*** form of Numeracy, found in the Upper Paleolithic and Megalithic monuments ?

3. …..

Parts 3 and 4

3. The numeric origin of **musical invariance** actually originates from the structure of the early number field (1-81).
4. Beyond these smaller numbers lies a world of rational tonal LIMITS, studied through balanced tuning, within an arithmetic Numeracy developing in the A.N.E. - this inherited by **Plato** and pioneered in our time by **Ernest G. McClain** (for whom I wrote the web application: **Harmonic Explorer**.)

5. ….

Part 5

5. The Nub of my work has been my use of Harmonic Explorer to locate the planetary ratios of “the gods”, in the numerical limit for 1440

Astronomical Musicality arises naturally out **planetary resonance**, which prefers to stabilise gravitational systems around such ratios, like the human ear, around products of 2, 3 and 5.

Part 6

6. **Numeracy:** The role of pre-arithmetic numeracy in prehistory is necessary for interpreting what the Upper Paleolithic and megalithic achieved before the A.N.E., through their study of numerical invariants.

1. Planetary Musical Ratios

These became clear to me in 2000 (CE)

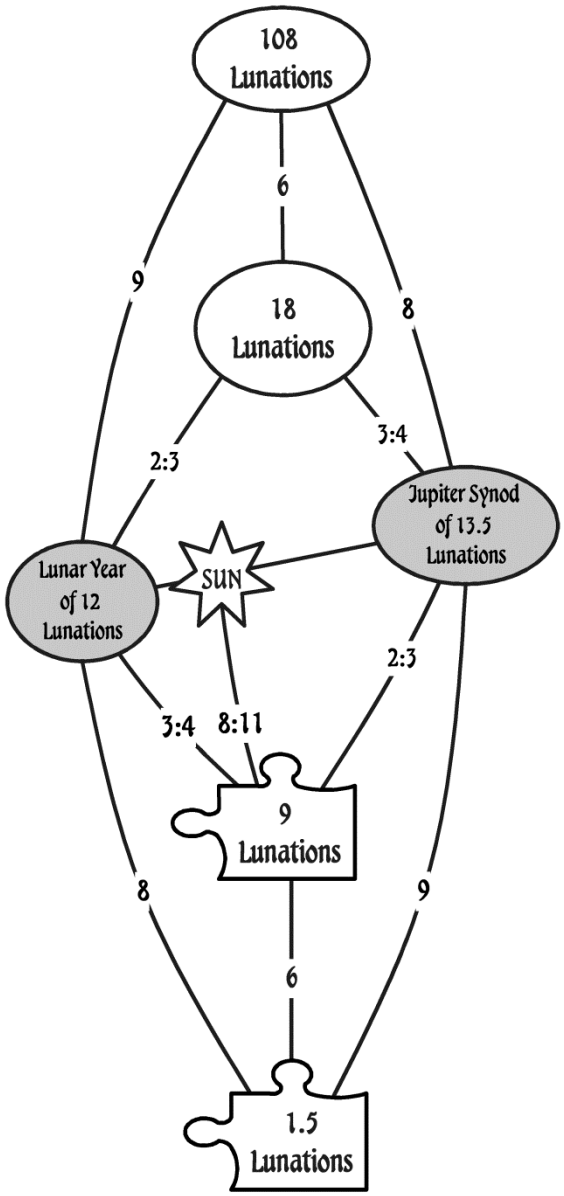
At that time I knew little about the structure of music

I published *Matrix of Creation* with my findings

My next two books, *Sacred Number* and *Precessional Time*,

saw further connections between cultural narratives about gods, built structures and numerical and musical ratios

1.1 Jupiter and the Moon

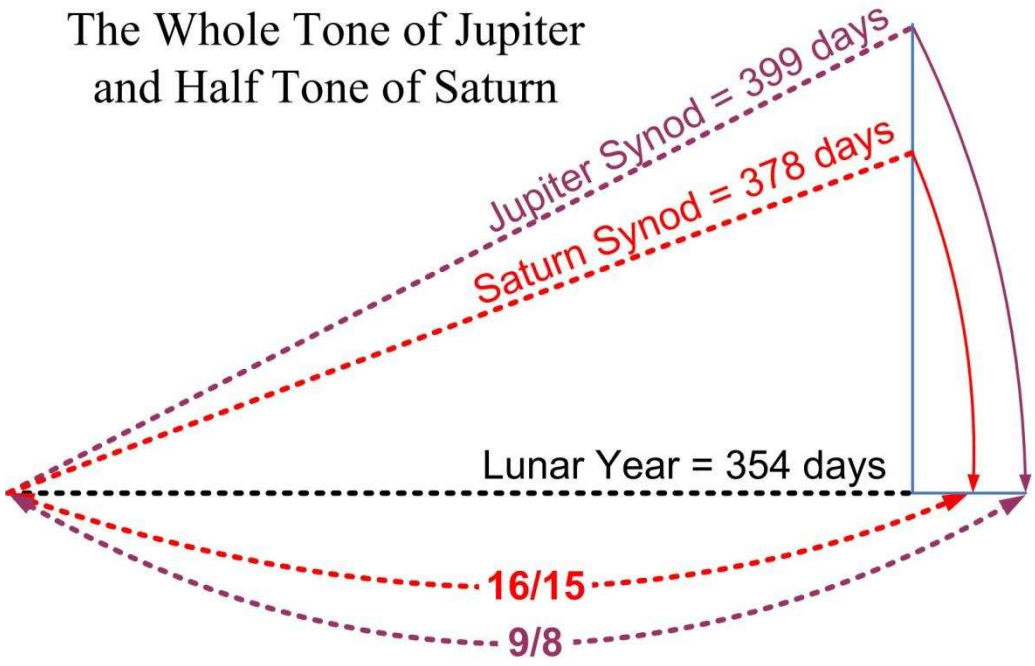


- Jupiter, the largest planet, appears to have brought the lunar year into the harmonic ratio of a Pythagorean wholetone, 9/8, relative to its synod.

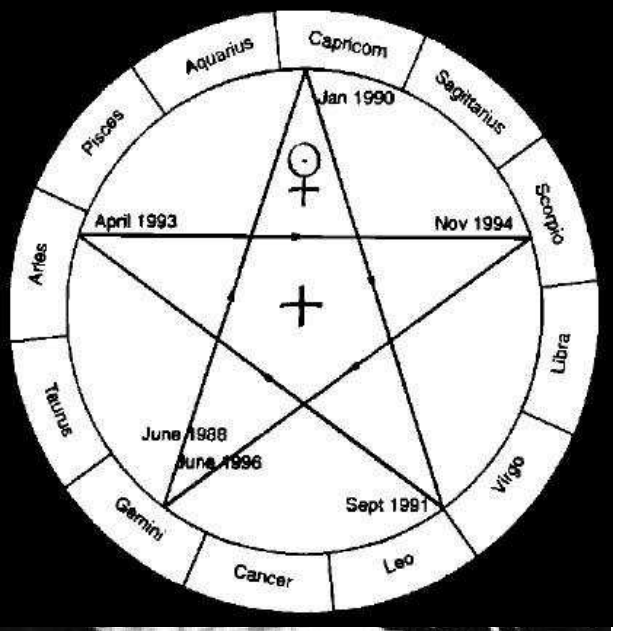
- *In Hesiod's Cosmogony, Jupiter deposes Saturn, father of the Titans, and forces the God of Time into retirement.*

Some Planetary Musical Ratios

1. 2. Saturn and the Moon



- Saturn, the second largest planet, appears to have brought the lunar year into a harmonic ratio of the **Just semitone**, 16/15, relative to its synod.
- *Saturn, God of Time would have a whole tone to the lunar year if the month was 28 days.. but, Saturn's synod has the semitone instead, having been "deposed"*
- Saturn's synod is exactly **52** 7-day weeks, 13 x **28** day "months", 27 to the "Saturnian year" of 364 days and 18 to 19 relative to the Jupiter synod



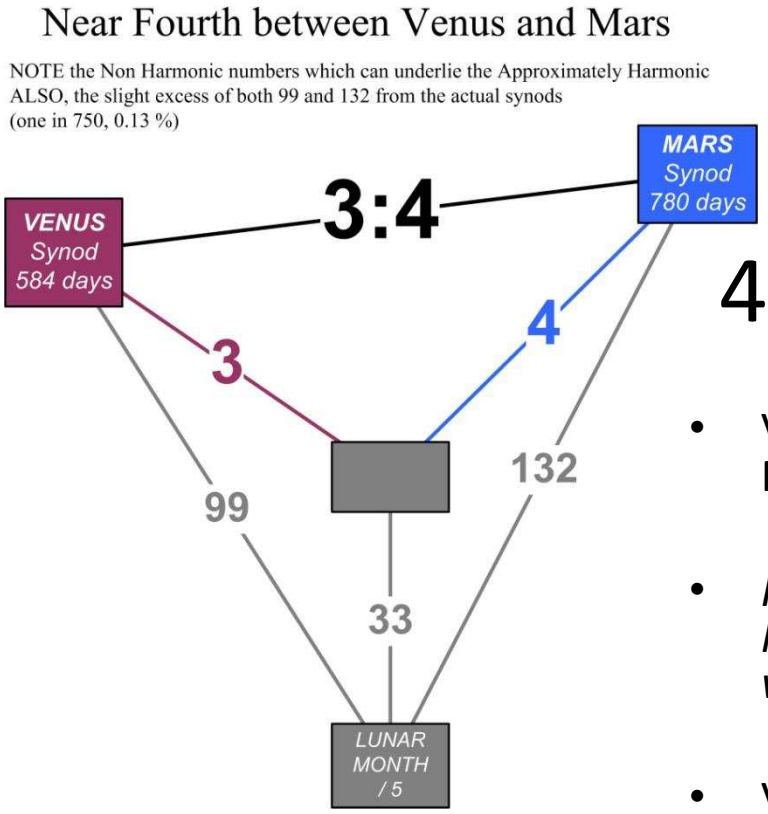
Some Planetary Musical Ratios

3. Venus
The Evening and Morning Star

- Venus, the largest **inner** planet, has a synod that is a Fibonacci of 8/5 earth years and an orbital period of 8/13, thus approaching the golden mean through a musical ratio.

- *Venus arose when Cronos Saturn cut the genitals of Okeanos/uranos, the sky god, creating LIMITS bounding the outer solar system*
- *Notice Venus stands on Saturn's shell sickle, used for the emasculation*

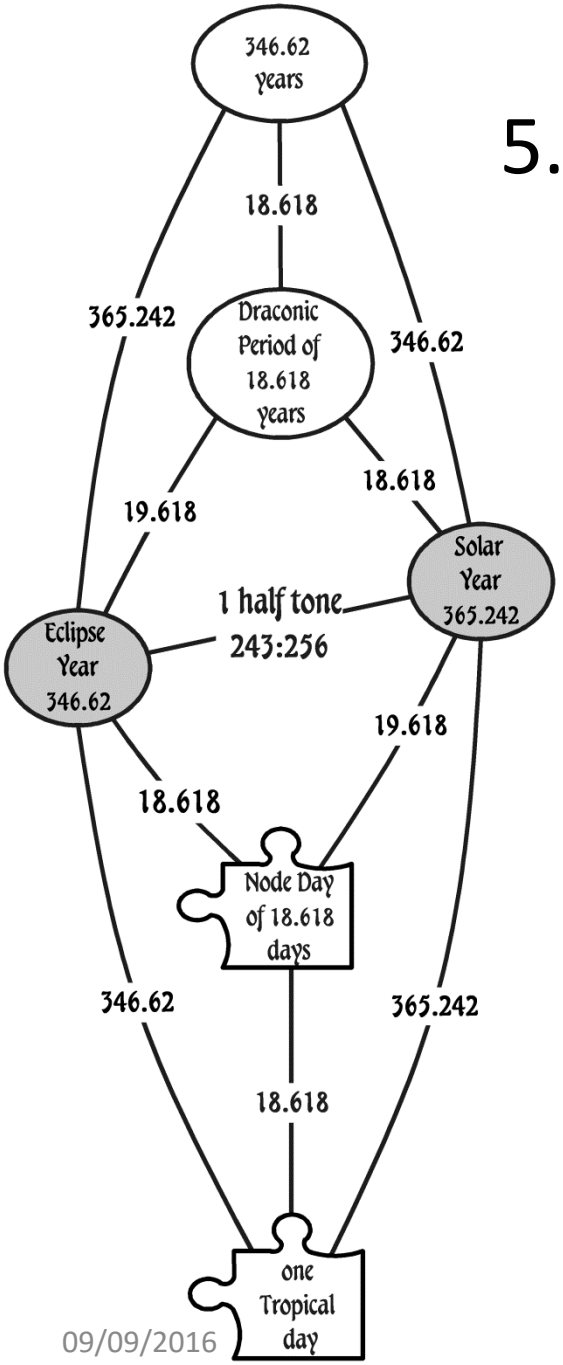
- FIVE has become symbolic of Life and Beauty along with Golden Mean



4. Venus and Mars 3:4

- Venus' 584 days also generates a musical fourth to Mars' synod of 780 days
- *In Homer's Odyssey: Venus-Aphrodite, lover of Mars, was caught by husband and smith Hephestos when he cast a "net" over the couple's love making*
- Venus and Mars link the two species of

1. Inner planets which only appear around the Sun
2. Outer planets which, like the Moon, traverse the sun's path of their own volition



Some Planetary Musical Ratios

5. Eclipse to Solar Year 256/243

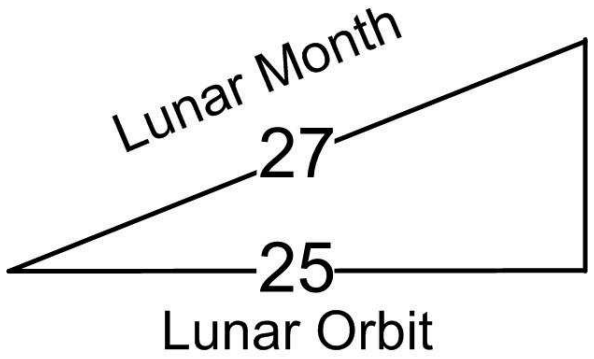
- The Eclipse Year* (346.62 days) defines a *Pythagorean Leimma* to the solar year (365.2422 days).

* *the time taken for the Sun to revisit one of the Moon's nodes*

- The Leimma is found in Pythagorean heptatonic tuning.

- *Megalithic chambered tombs often point to the maximum standstill of the lunar nodes every 18.6 years*

6. Lunar Month to Lunar Orbit 27/25



- The Lunar Month* (29.53 days) defines a semitone of 27/25 to the lunar orbit (27.322 days).

* the time taken for the same phase to be repeated

- *This ratio of 1.08 is 1/100th of the 108 associated with the Moon and Shiva*

2. Stone Age Astronomy

In 1992, my brother introduced me to a triangle he thought in use by the Megalithic in Britain, to compare solar and lunar years – he calls the Lunation Triangle.

This led to the utility of seeing relative astronomical periods as geometrical ratios (Musical Harmony also uses ratios usually normalised to N:N+1, as in 8:9)

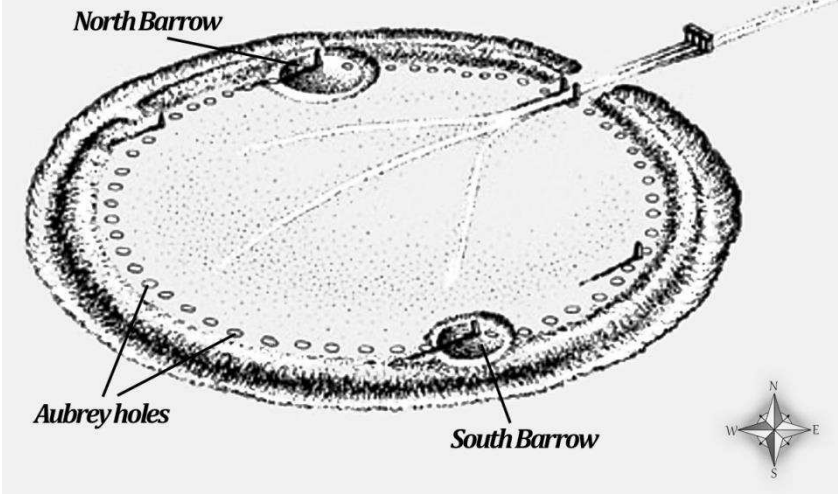
In 2009 we discovered a lunation triangle where the **megalithic yard** had been ***defined*** by a triangular comparison of two day-inch counts

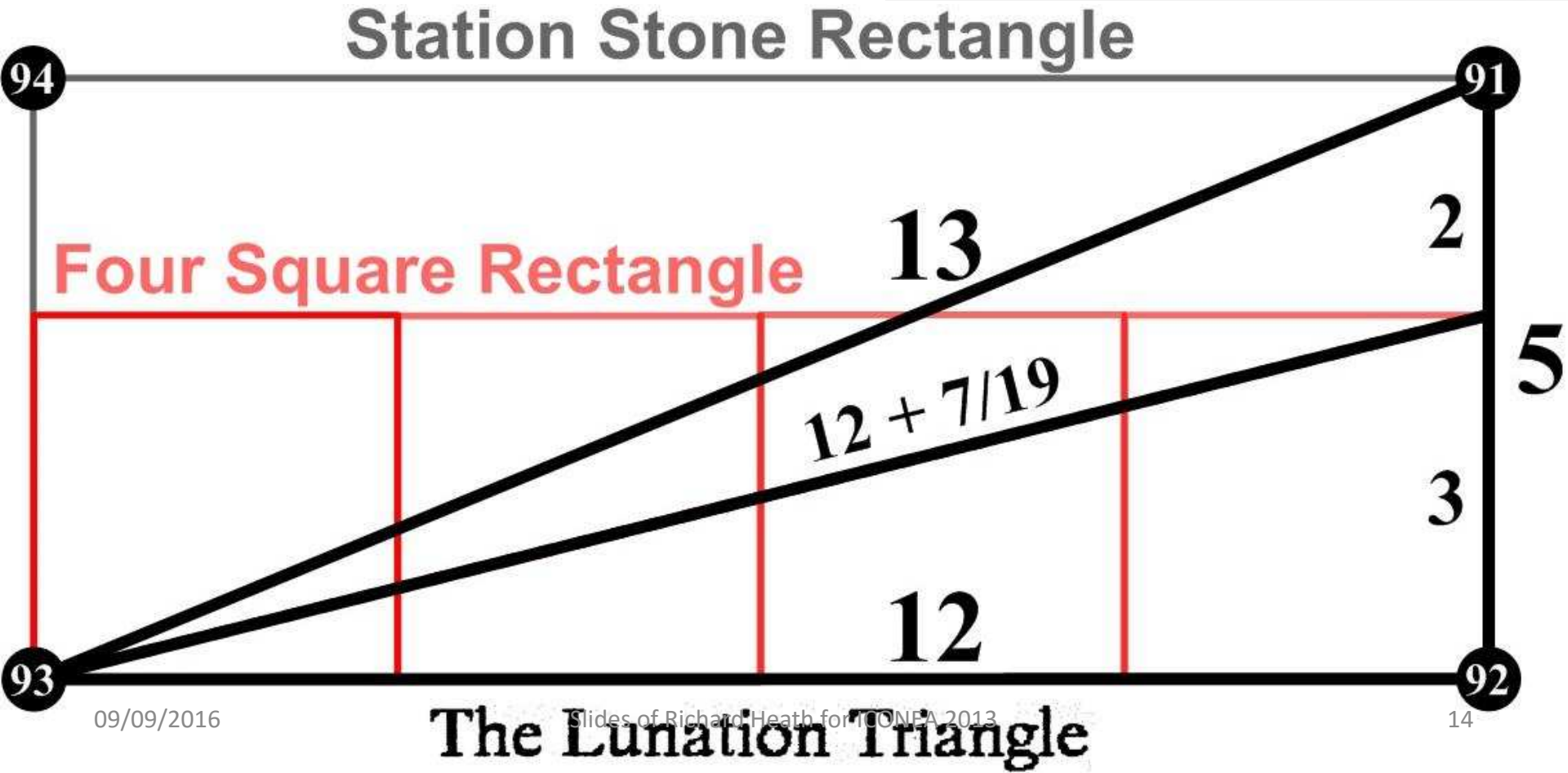
How could this happen without arithmetic?

Stone Age Astronomy:

Geometry and Lengths

The *Lunation Triangle* at STONEHENGE as proposed by Robin Heath in 1992, was only *found* in 2010 at Le Manio, near Carnac.





2 Stone Age Astronomy: Numeracy

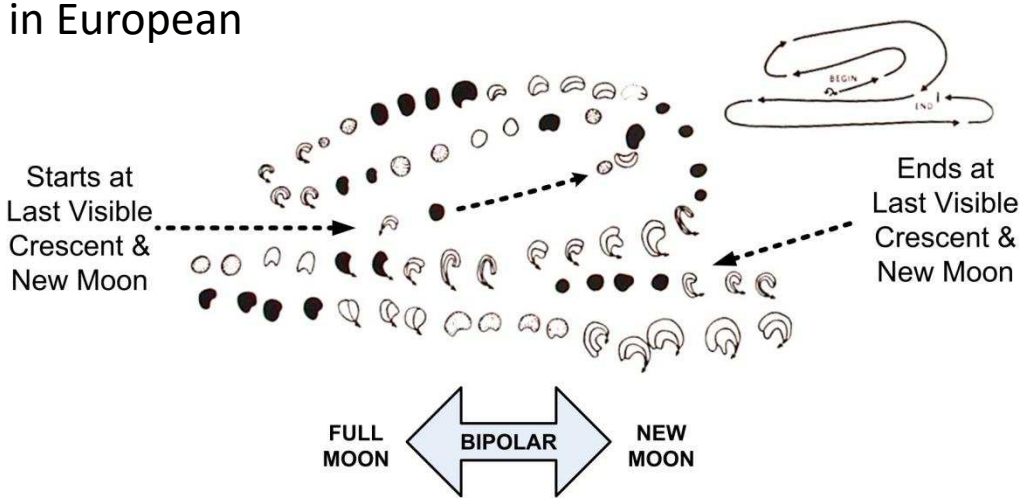
- Were there earlier forms of Numeracy? Such as Upper Paleolithic, on bones

The Ishango Bone, a bone tool dated to the Upper Paleolithic era and now believed to be more than 20,000 years old. It has been interpreted as a tally stick but also as a medium for a Stone Age awareness of prime numbers. It was found in 1960 by Jean de Heinzelin de Braucourt while exploring what was then the Belgian Congo. Image courtesy of Wikipedia.

2 Stone Age Astronomy: Counting

- In *Roots of Civilisation*, Alexander Marshack stayed upon a rich seam of apparently notated bones in European Museums

These marks appeared to focus on the possibilities of making a daily mark on the bone whilst the moon was visible and then counting invisibility according to some difference in marking a technique Marshack called *time-factoring*



2 Stone Age Astronomy: **Calendars** of Sun and Moon

Later, Marshack heard of a more extensive count.

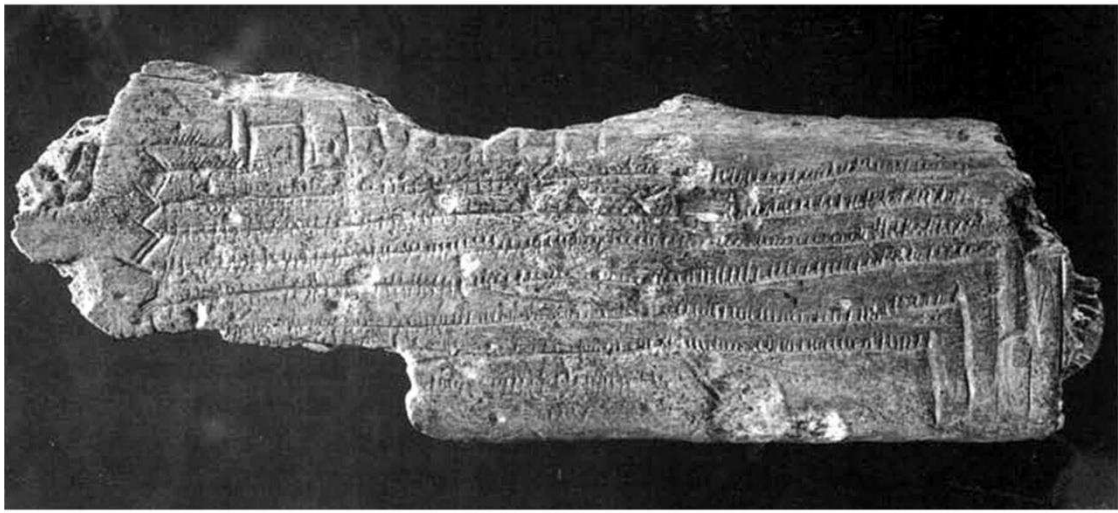
- After analysis; of days, lunar visibility and points of solar extreme at solstice.

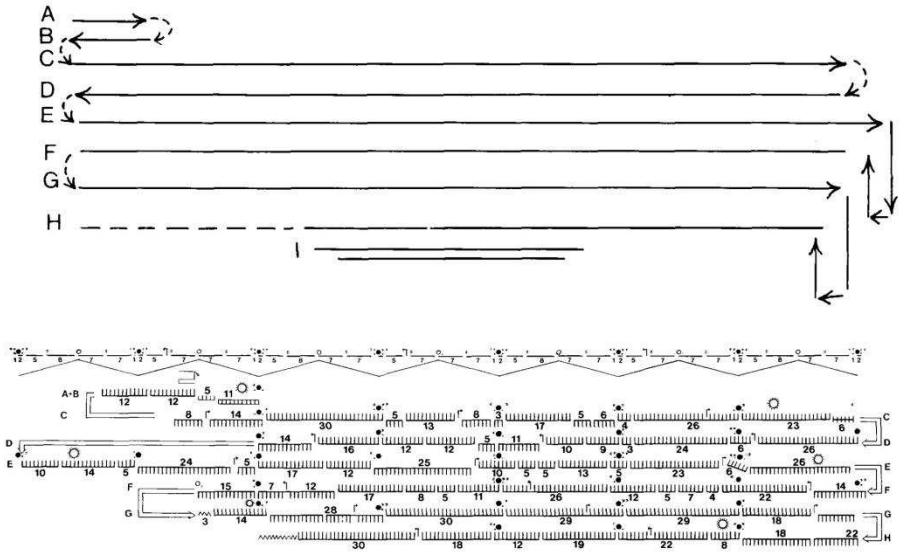
- The period of time counted seemed to be three years, the time within which the sun moon and stars first return to a reasonably similar configuration

Thais Plaque

NON-ARITHMETIC COUNTING of days, months and half years

Fashioned from a Midden Bone Dated to terminal Madgalenian or early Azilian c. 10,000 BC



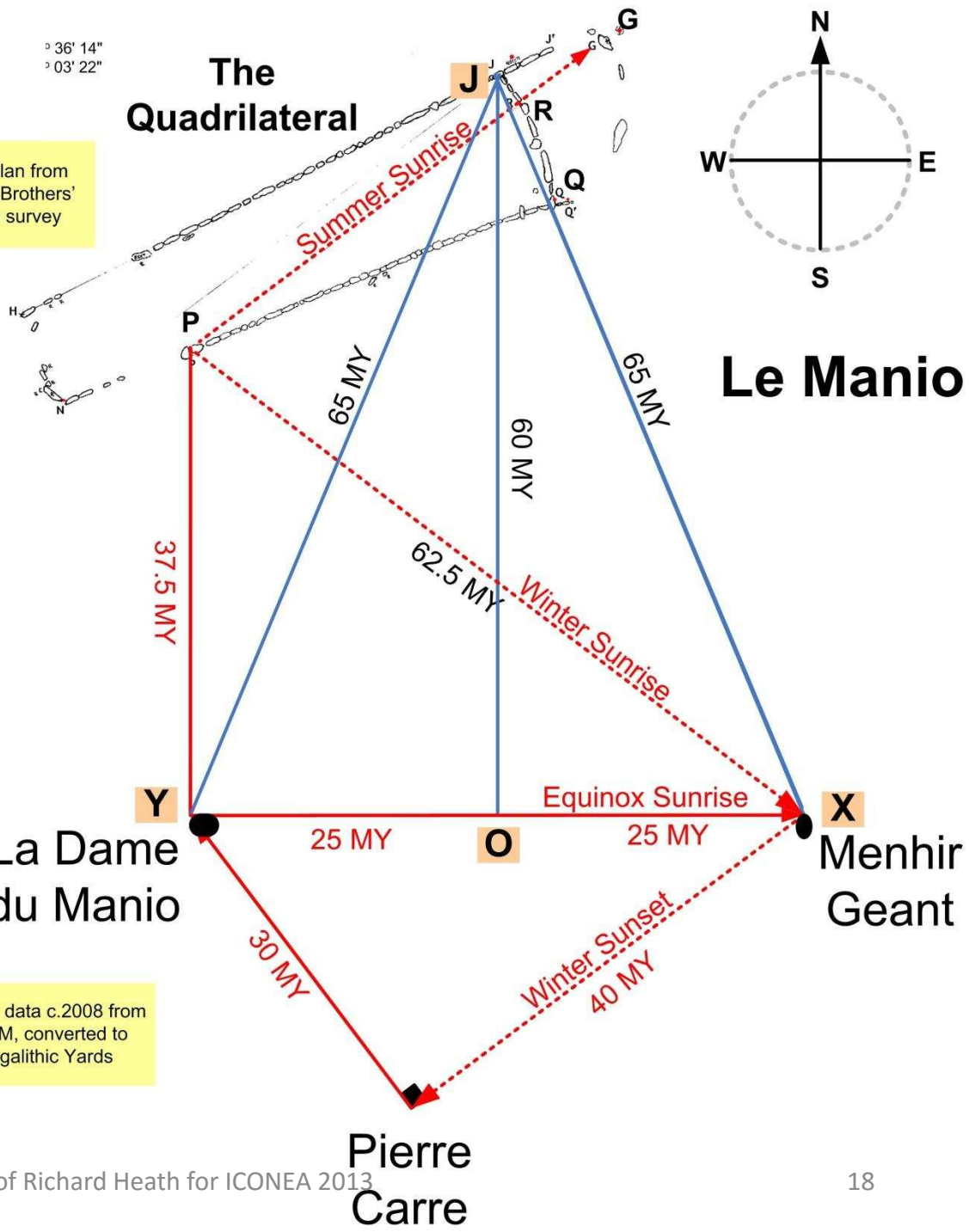


Alexander Marshack (1991). The Taï Plaque and Calendrical Notation in the Upper Palaeolithic. Cambridge Archaeological Journal, 1, pp 25-61 doi:10.1017/S095977430000024X

2 Stone Age Astronomy
day-inch counting

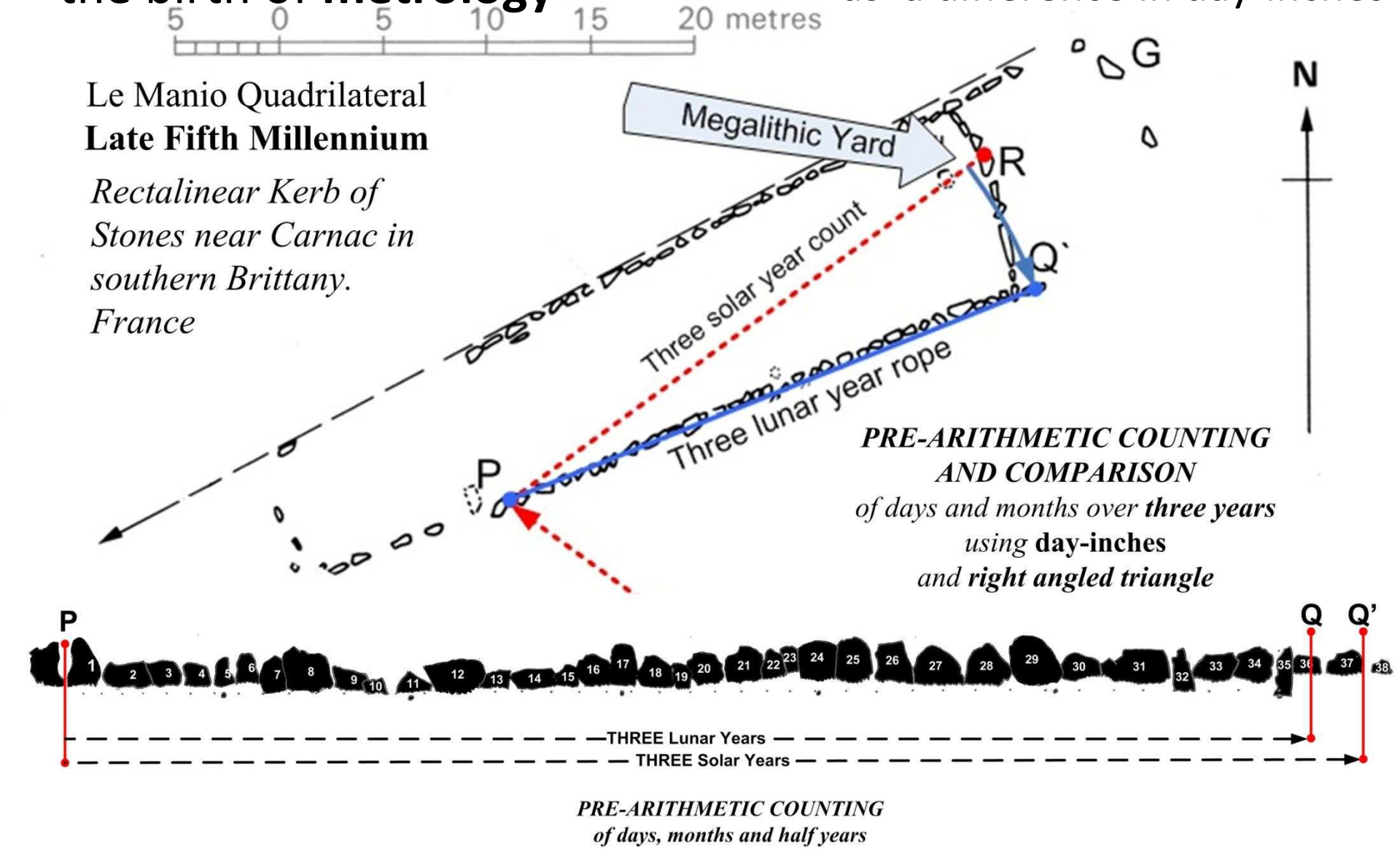
- Around 5,000 years after the Thais Plaque, megalithic were being constructed, again in France, this time in Southern Brittany near **Carnac**

- One unique site, called **Le Manio**, is carefully laid out with a stone kerb geometry, the **Quadrilateral**, north of a large **Menhir Geant** using 3-4-5 and 12-13-5 triangles in Megalithic Yards.



2.6 Stone Age Astronomy: the birth of **metrology**

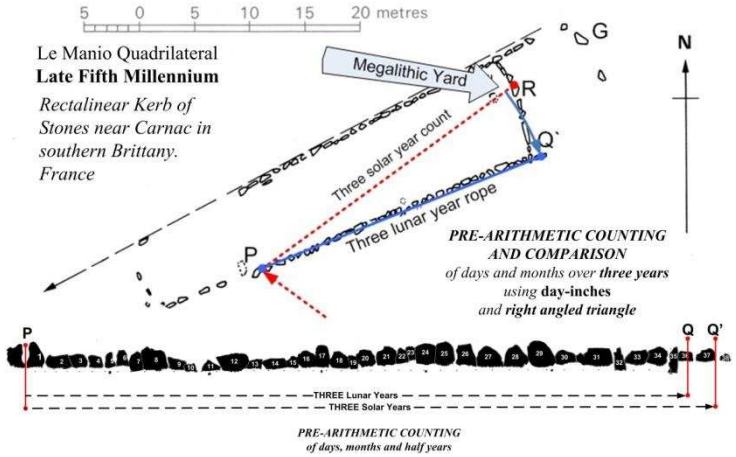
The Megalithic Yard appears defined as a difference in day-inches



- The silhouette of the Southern Kerb shows 36 to 37 stones marking lunar months

2 Stone Age Astronomy: The Inchometer

This enables the development and understanding of invariant ratios based upon whole number day counts or simple musical ratios of string length



Le Manio's Quadrilateral was an Inchometer

We can see that

- numbers-as-lengths and
- Angular comparison

Was a

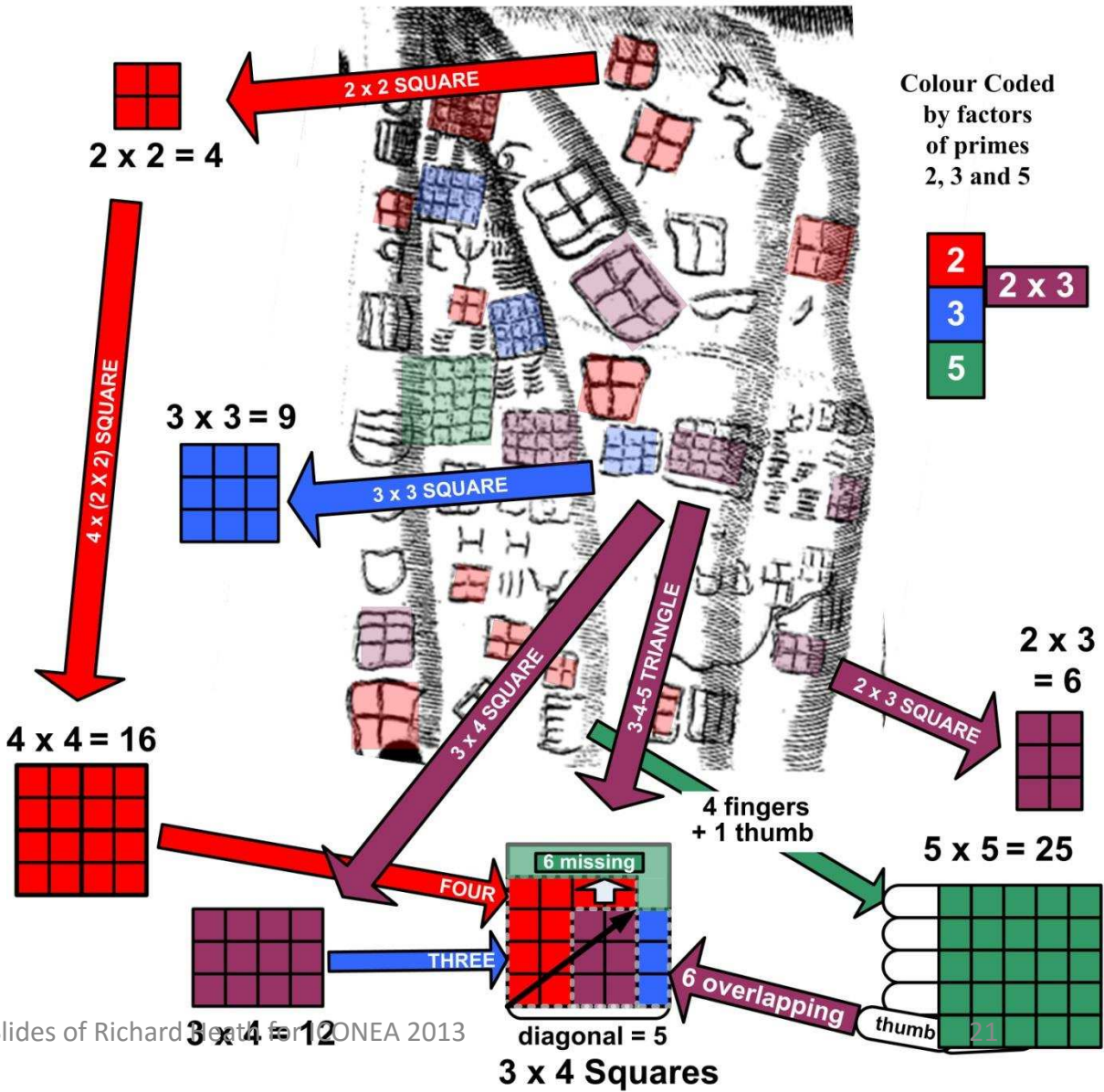
- Simple to access technology
- Proceeded from Stone Age time-factoring

2.8 Stone Age Astronomy
Geometrical Numeracy

This is my reading of a copper age painted rock shelter in Spain.

I came to a new proof that the 3-4-5 triangle could be understood as within the square of 5 in which the smallest **overlapping region** between the squares of 3 and 4 were the **uncovered squares** within the square of 5.

A proof of the theorum attributed to Pythagoras.



3. Musical Invariance

We have seen that astronomical periods provided an ongoing signal which the stone age appeared to receive, the sort of signal that was an external invariant rather than the signals left by evidence

To understand artifacts derived from an invariant signal requires that one study that invariance

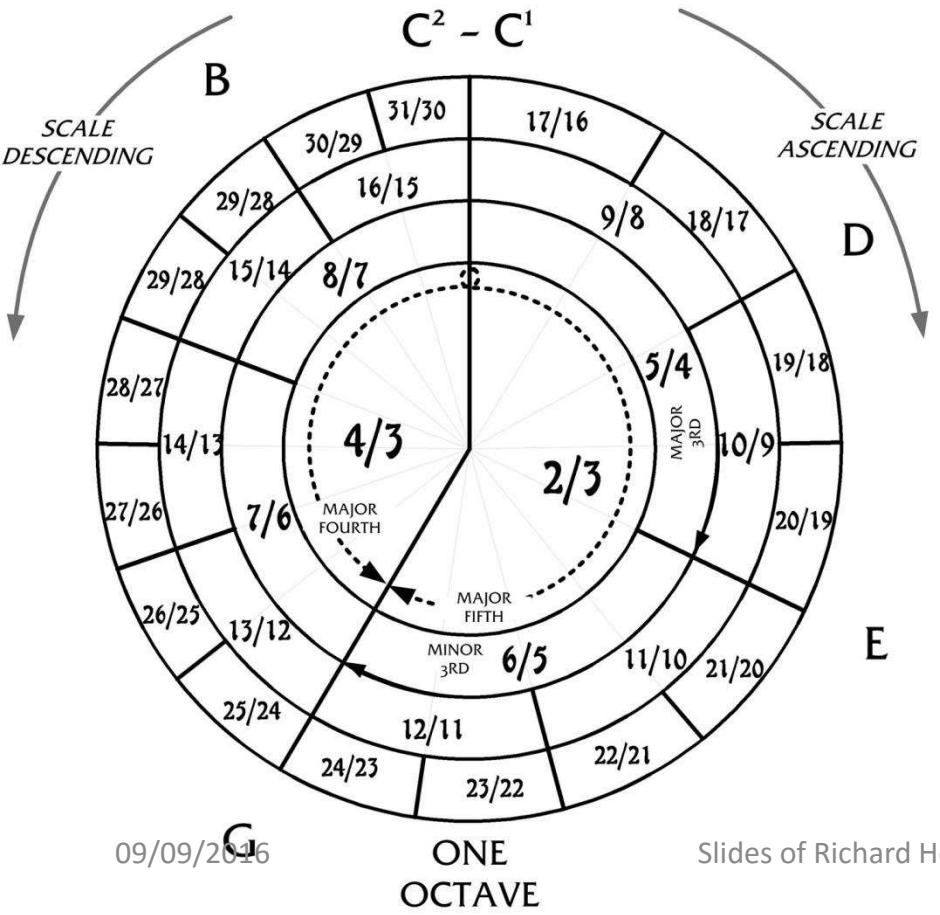
Some planetary periods relate according to the *additional* invariance we call musical harmony, and megalithic artifacts and techniques were naturally suited to studying the lengths of strings

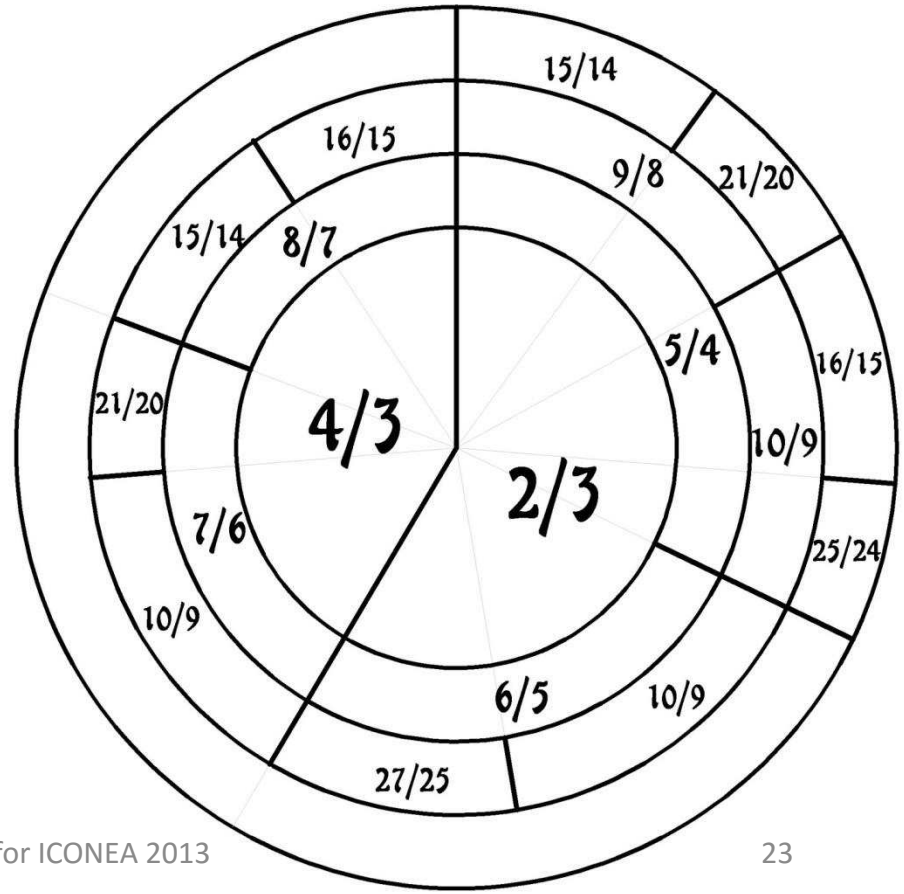
3.1 Musical Invariance The Number Field

How the Number System "packs" the Octave's Tone Circle

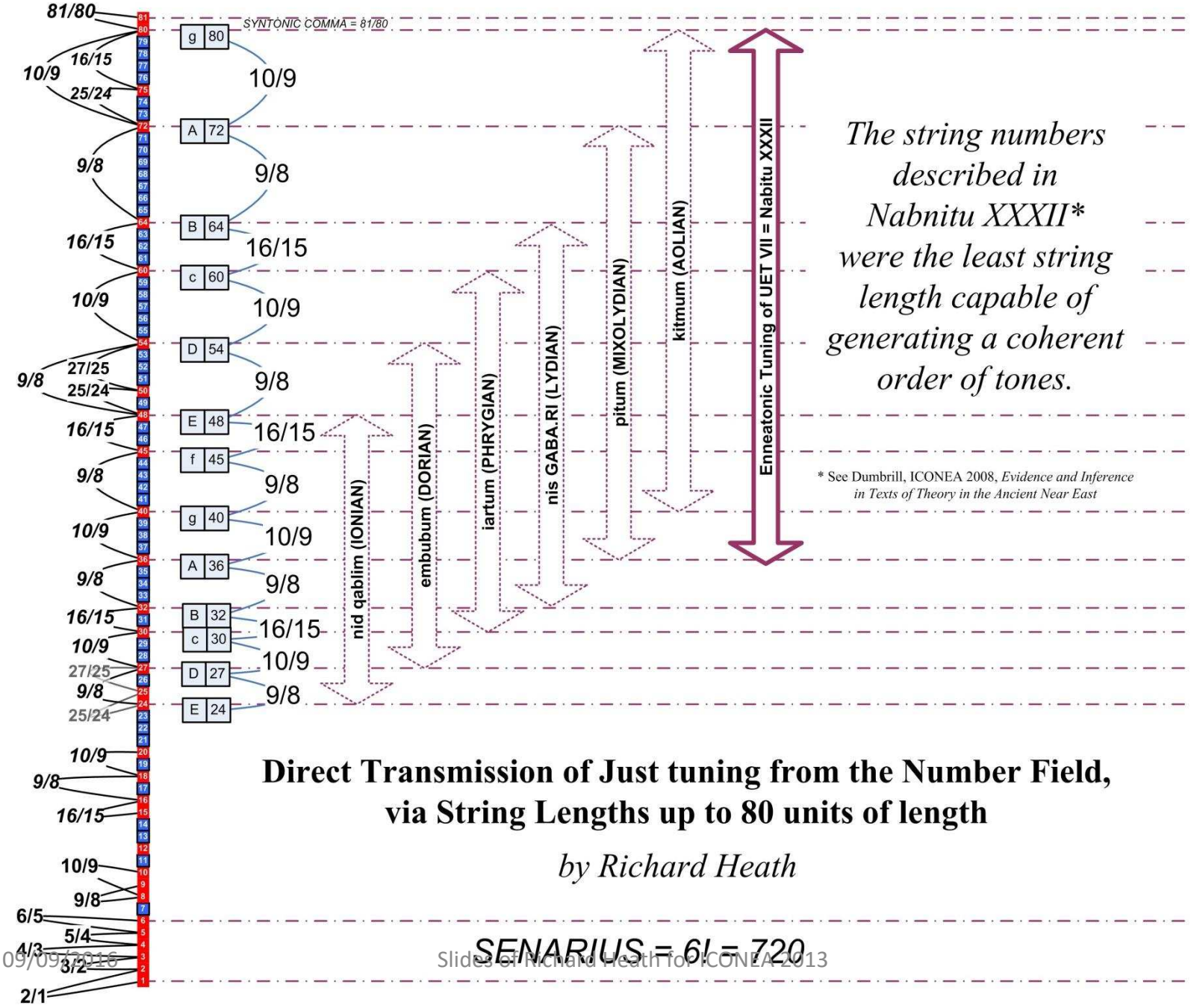
Successive numbers would divide up the "tone universe" without end

"Just" tuning applies "closure" on the tonal field for the Fifth and Fourth using only Harmonic Numbers
(4/3 is 5/4 times 16/15)





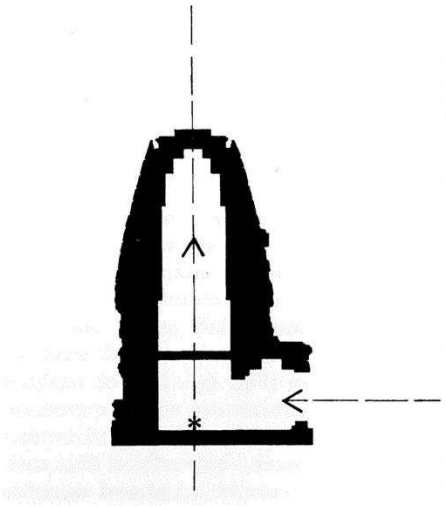
3.2 Musical Invariance from 1 to 81



3.3 Musical Invariance **in India**

The Hindu Temple Plan with "Just" God in the Centre

Extracted from George Michell's *The Hindu Temple* by Richard Heath, September 2013



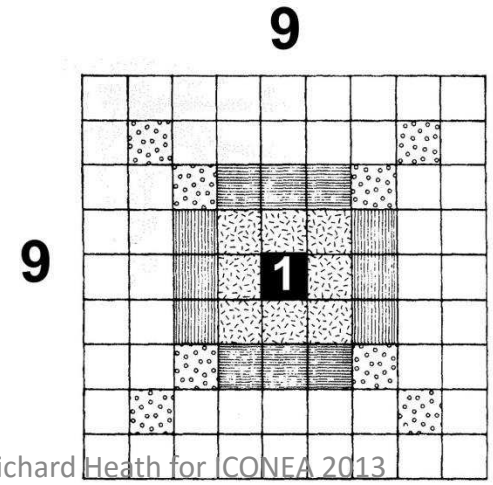
"Accompanying this penetration inwards towards the cave is the ascent upwards to the symbolic mountain peak, whose summit is positioned over the centre of the cave-sanctuary. This means that the highest point of the elevation of the temple is aligned with the most sacred part of the temple, the centre of the inner sanctuary which houses the image of the god.

"The temple becomes an architectural facsimile of the sacred places of the gods, providing for the worshipper the merit that would be his through an actual visit to the mountains. Meru is the centre or 'navel' of the universe, standing as a reference point for the surrounding and concentrically arranged continents, oceans and heavenly bodies.

"The *mandala* governing the temple plan, following the *Brihatsamhita,* a text dating from the Gupta period. Brahma occupies the central nine squares and is surrounded by various planetary divinities, including the Sun and Moon", *within 9 by 9 squares equalling 81.*

"The *mandala* governing the temple plan, following the *Brihatsamhita,* a text dating from the Gupta period."

"Brahma occupies the central nine squares " [and is surrounded by various planetary divinities, including the Sun and Moon, within 9 by 9 squares equalling 81.]



At the centre is ONE in 81

Surrounding it are 80 squares, giving the ratio of the Syntonic Comma of 81/80,

The building block of Just Intonation based on Indra Power FIVE

3.4 Musical Invariance within Chartres Cathedral

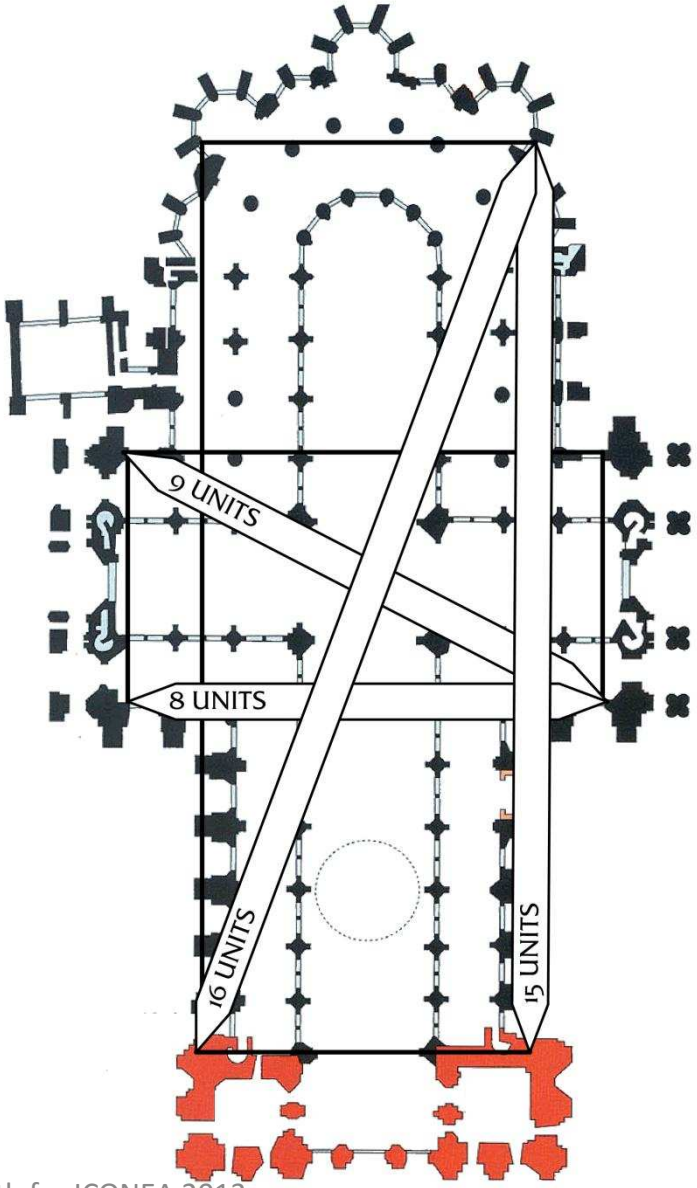
The primary view of the plan involves two rectangles at right angles.

Each of these is defined by a triangle between its diagonal and longest side.

In this case Chartres manifests the Pythagorean wholetone of 9/8 and the Just semitone of 16/15.

These are the two ratios corresponding to the synods of Jupiter and Saturn relative to the lunar year.

The building could be viewed as another type of Quadrilateral with an astronomical musicality at its heart



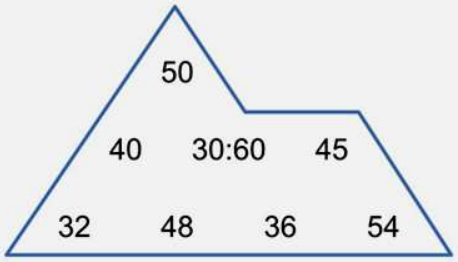
4. Invariance within LIMITS

In 1976 Ernest McClain published *The Myth of Invariance*.

He proposed that our greatest ancient literature had an undercurrent of numerical reference to the realities of musical invariance.

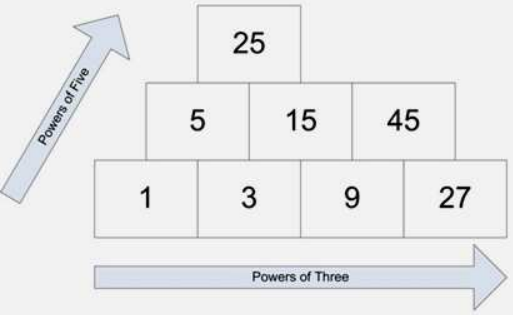
His work on reconstructing the underlying rules of numerical tuning theory lead to “holy mountains” generated by a single limiting number as D, our “note” signifying do on the axis of symmetry, within octave tone circles and on modern keyboards.

4.1 Invariance within LIMITS: Calculation



Result: Yantra for N < 30
"God on the Mountain"
The Diatonic Scale of
[30 32 36 40 45 48 (50) 54 60]

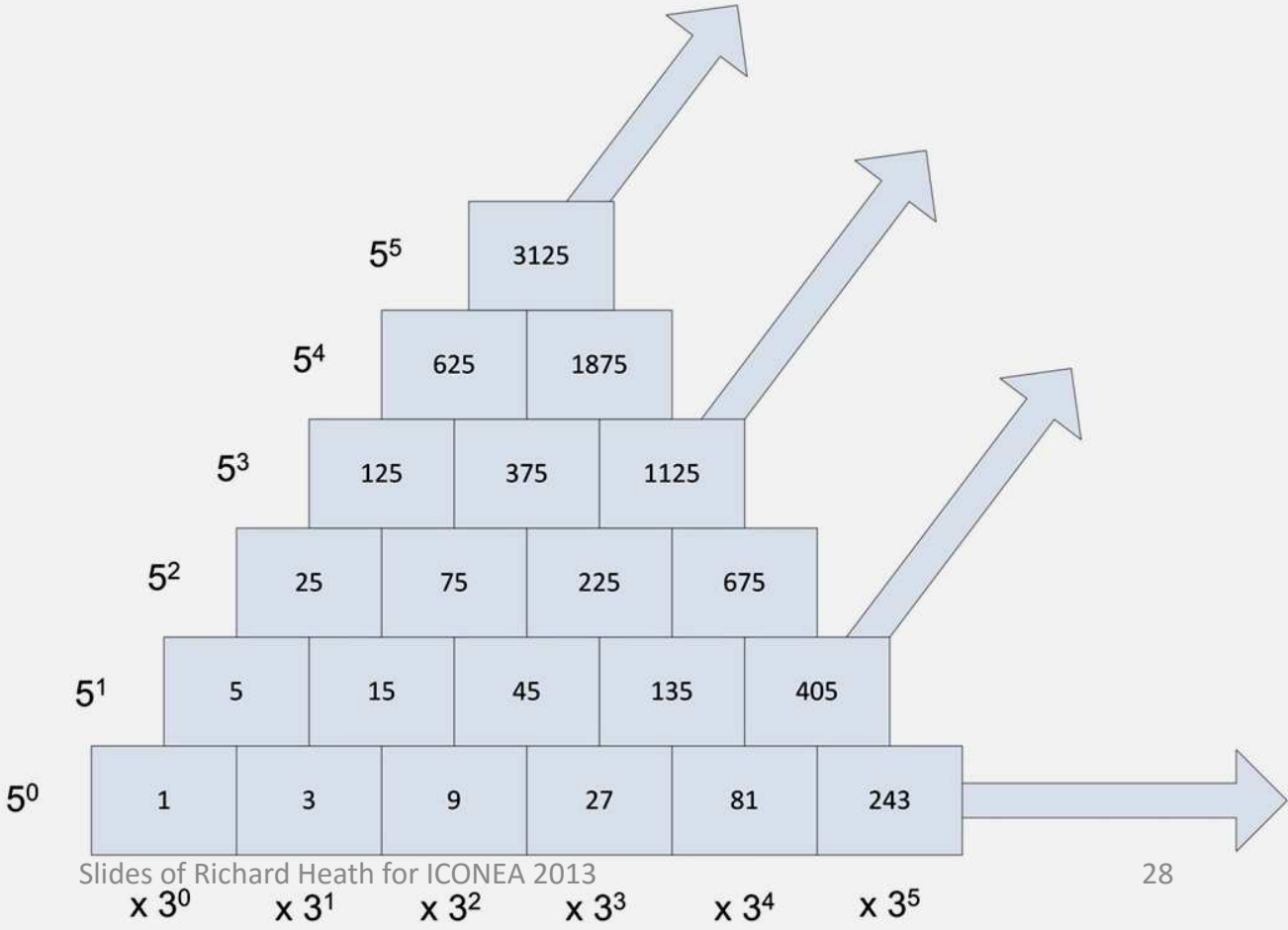
Step 2: Double to N > 30
(Powers of 2)



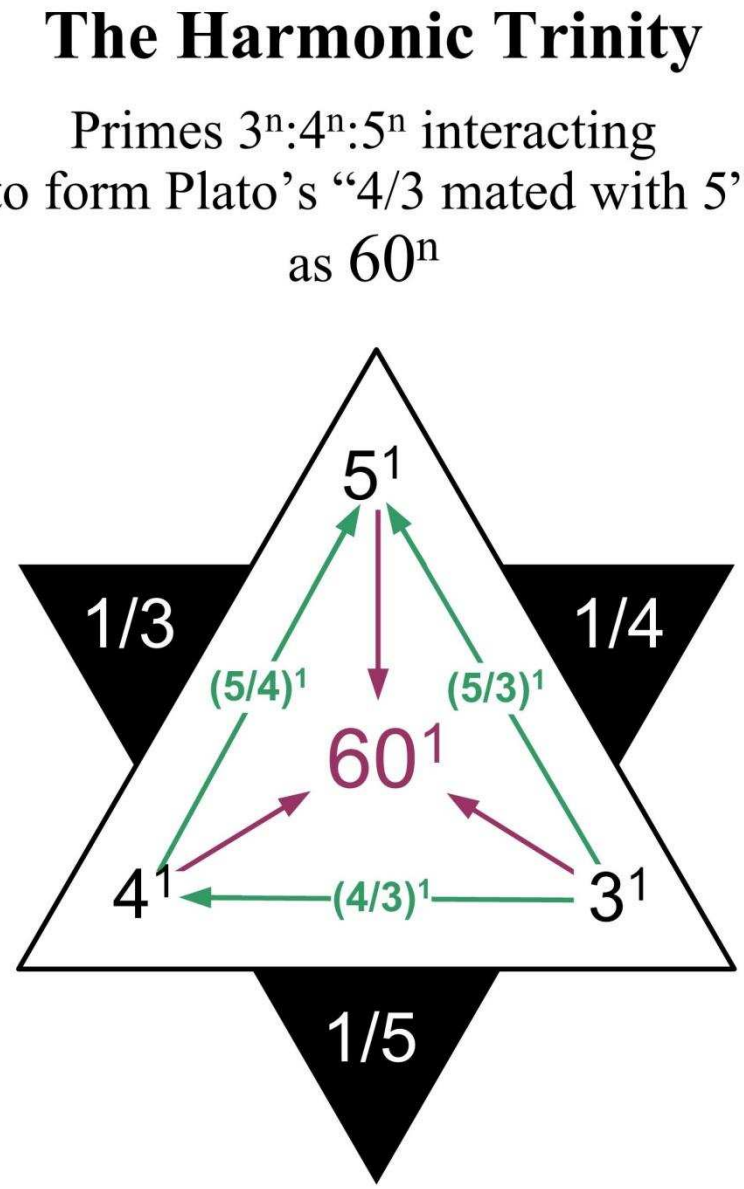
Step 1: Building Blocks for N < 60
(Powers of 3 and 5)

How Holy Mountains are Numerically Born,
First by products of 3 and 5
Then by 2 to reach Octave Limit = N/2:N

Using A.N.E. Arithmetic and obtaining large relative string lengths as numbers



4.2 Invariance within LIMITS: *"4:3 mated with 5"*



The white triangle represents the limiting numbers rational boundary, creating the mountain shape.

The black triangle is the white triangle pivoted about D, so that as reciprocals, only Plato's TWINS provide identical ascending and descending intervals relative to D

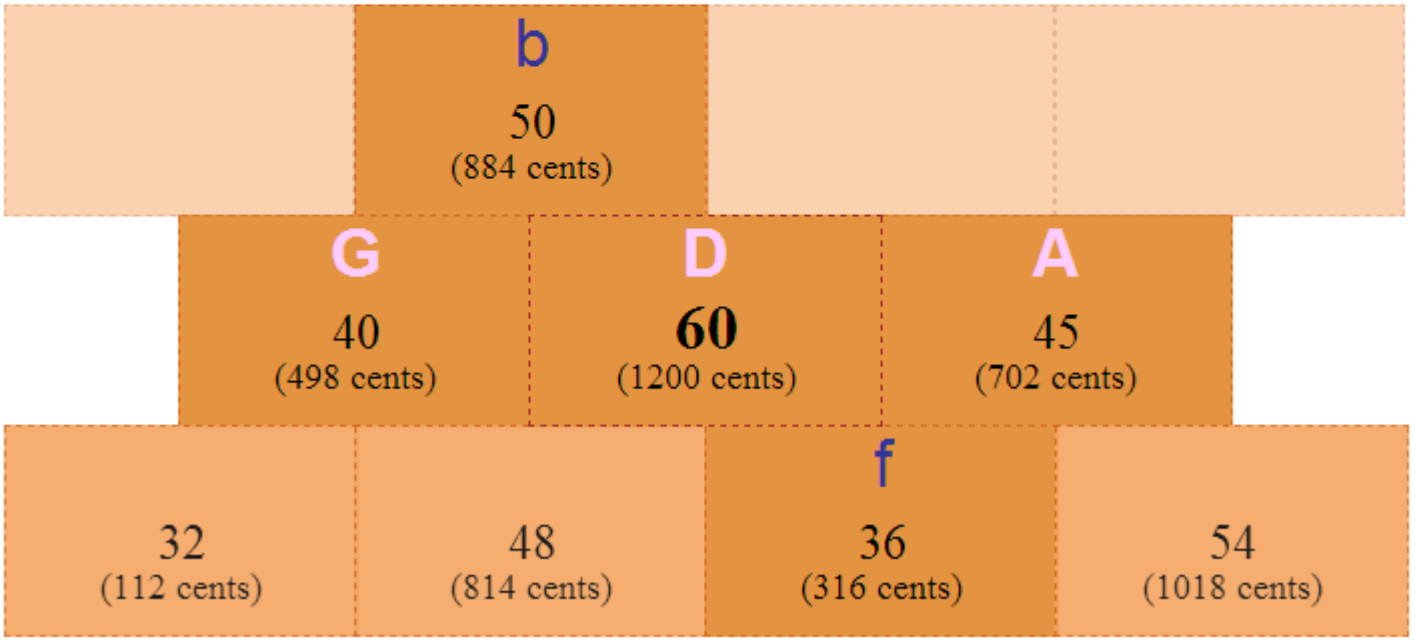
In practice, the PIVOT is achieved by using BALANCED TUNING around D

1. A bidirectional cycle of FIFTHS (3/2) and
2. A bidirectional cycle of THIRDS (5/4)

The 5/3 and other intervals within the mountain are pure consequences of just these intervals and rules.

4.3 Invariance within LIMITS: **60**

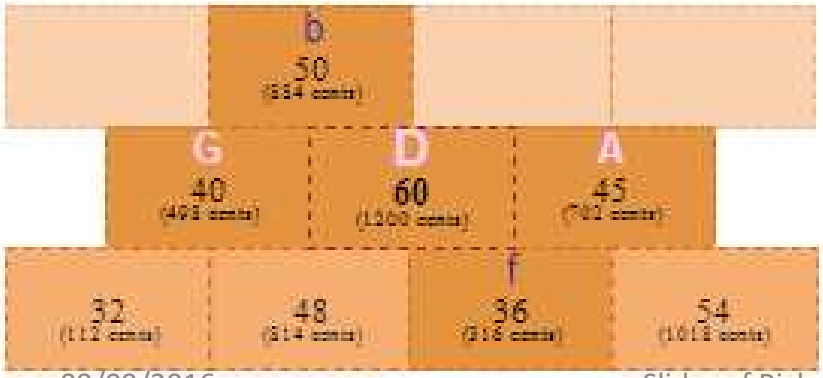
Limit: 60 { 2^2 3^1 5^1 }
with 5 reciprocals
among 8 bricks

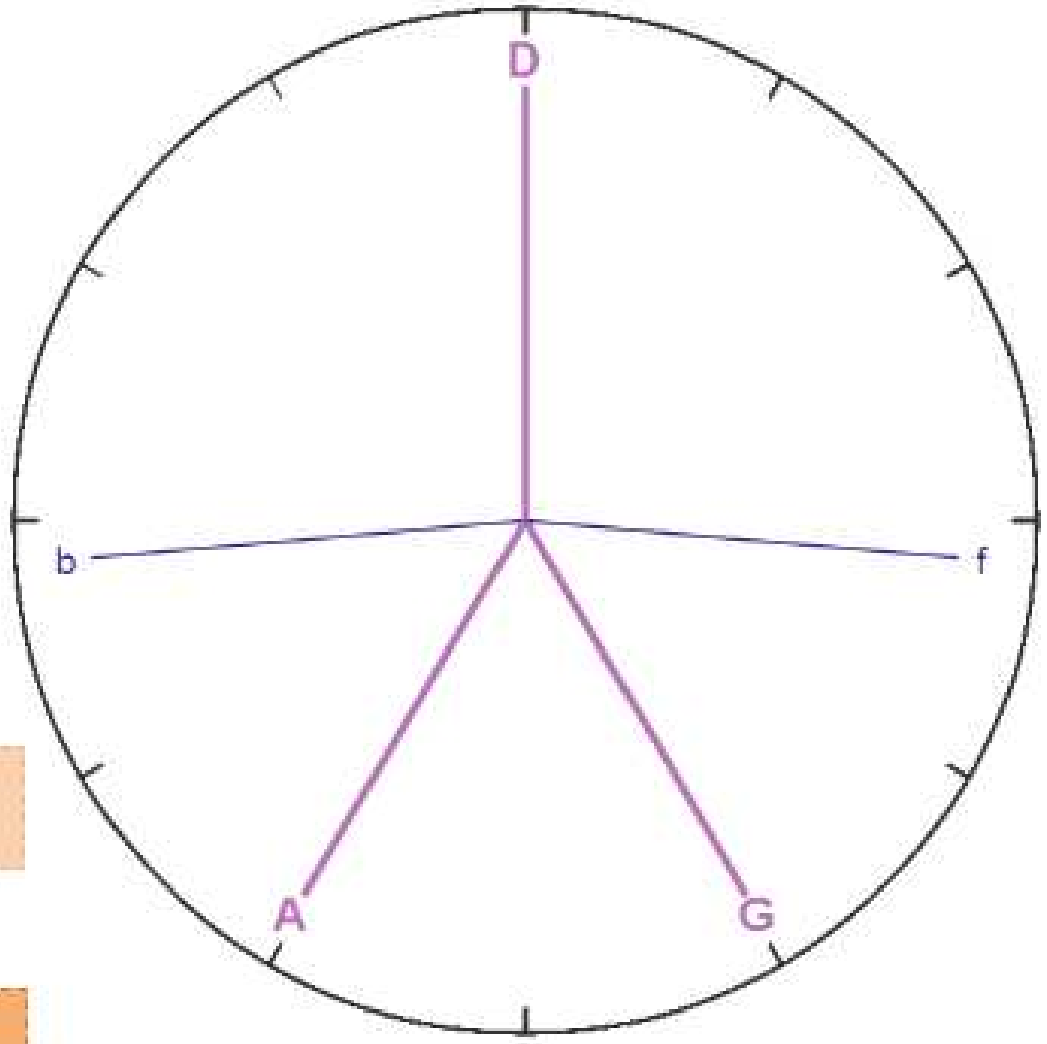


4.4 Invariance within LIMITS: The World of 60

Limit: 60 { 2^2 3^1 5^1 }
with 5 reciprocals
among 8 bricks

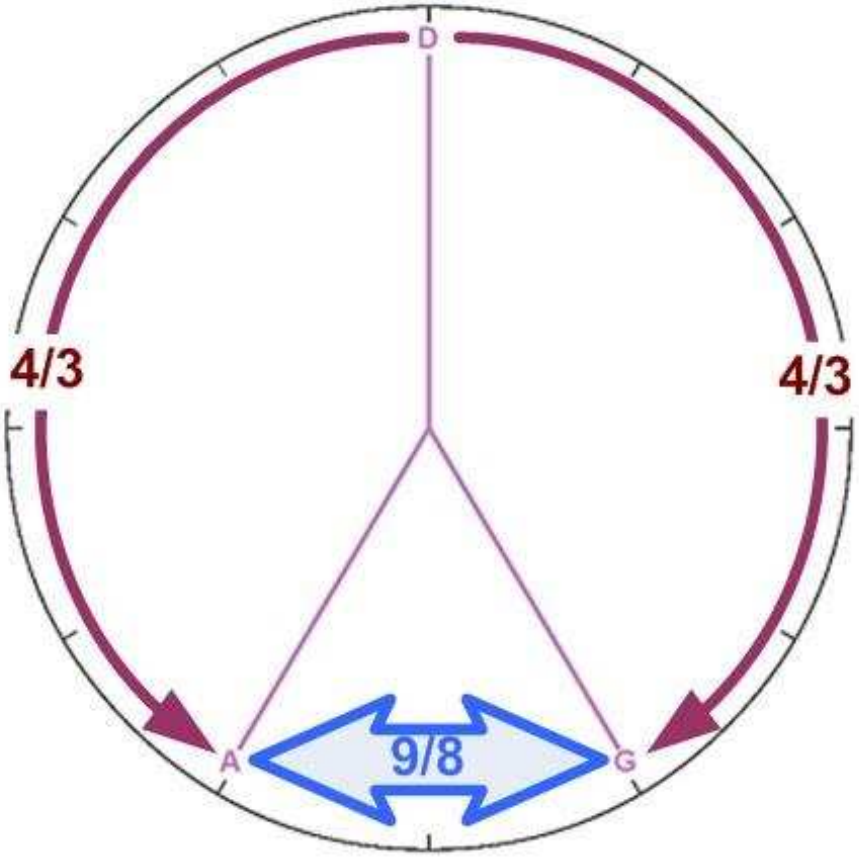
Plato's TWINS are symmetrical in ascending and descending and shown darkened

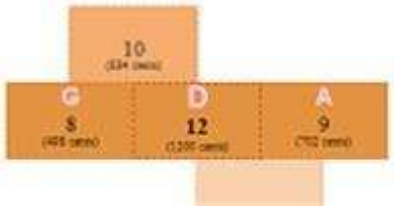




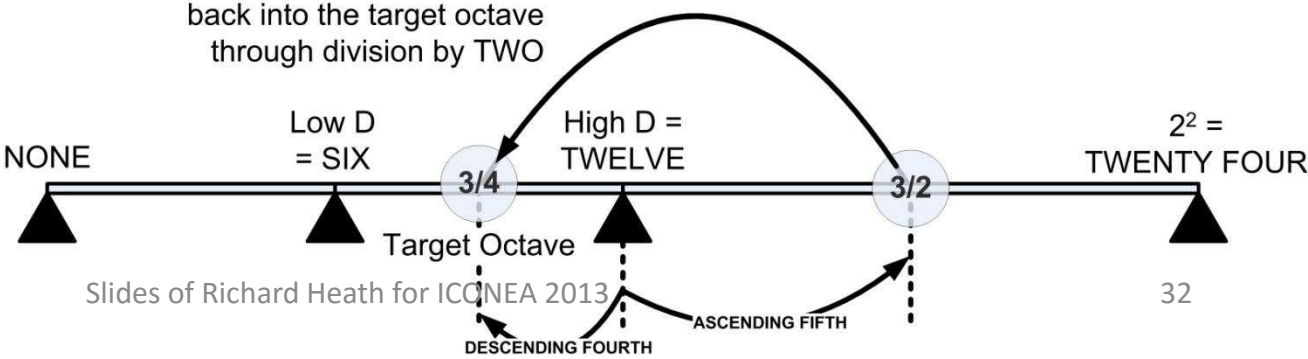
4.5 Invariance within LIMITS: 12 – Three Tones

Limit: 12 $\{2^2 3^1 5^0\}$
with 3 symmetries
among 4 bricks





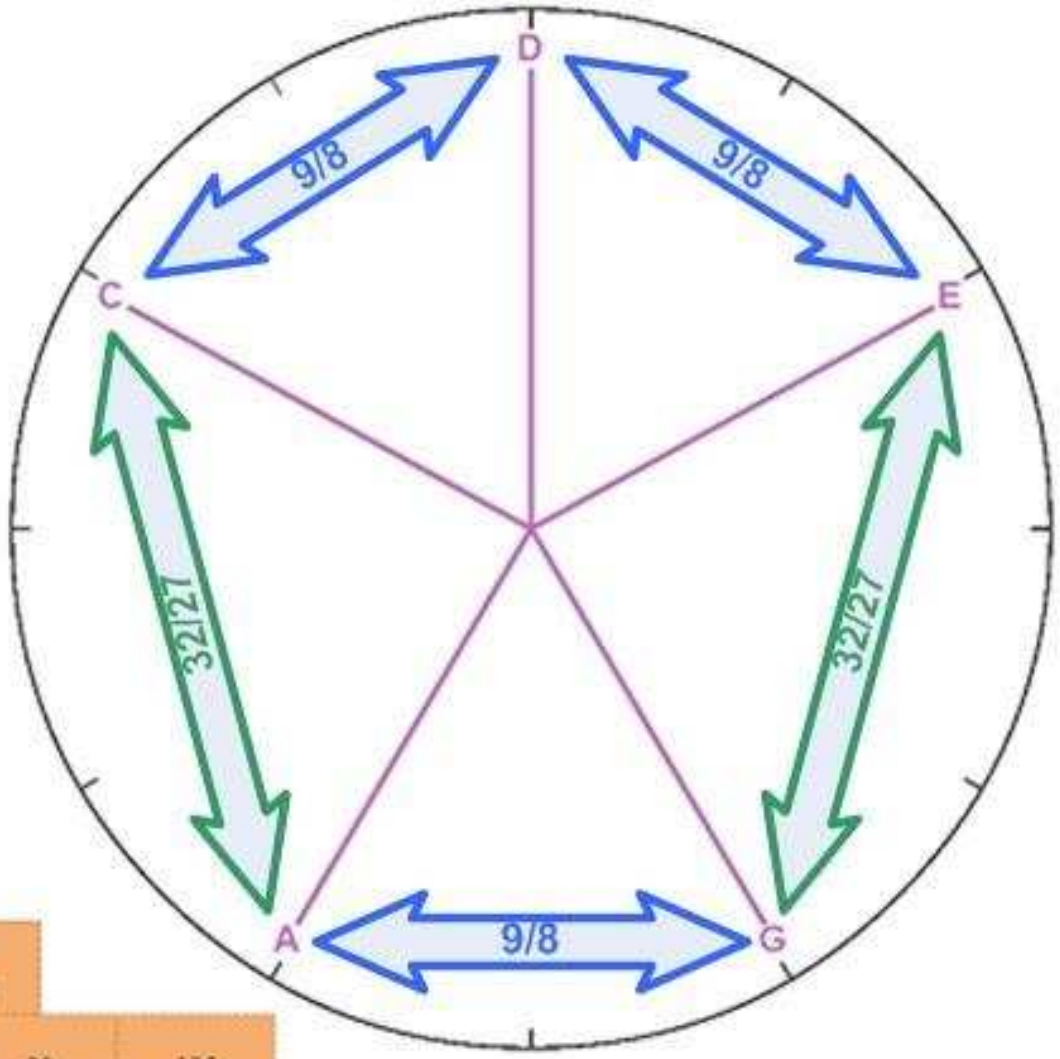
Bringing the ascending tone
back into the target octave
through division by TWO

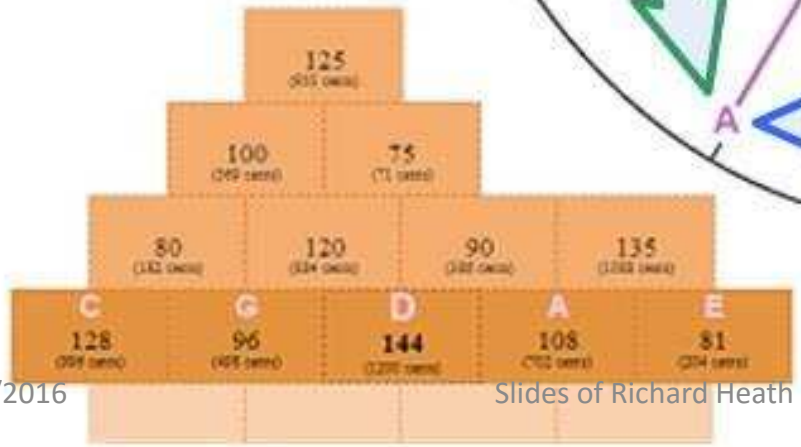


4.6 Invariance within LIMITS: 144 Pentatonic

Limit: 144 $\{2^4 3^2 5^0\}$
with 5 reciprocals
among 12 bricks

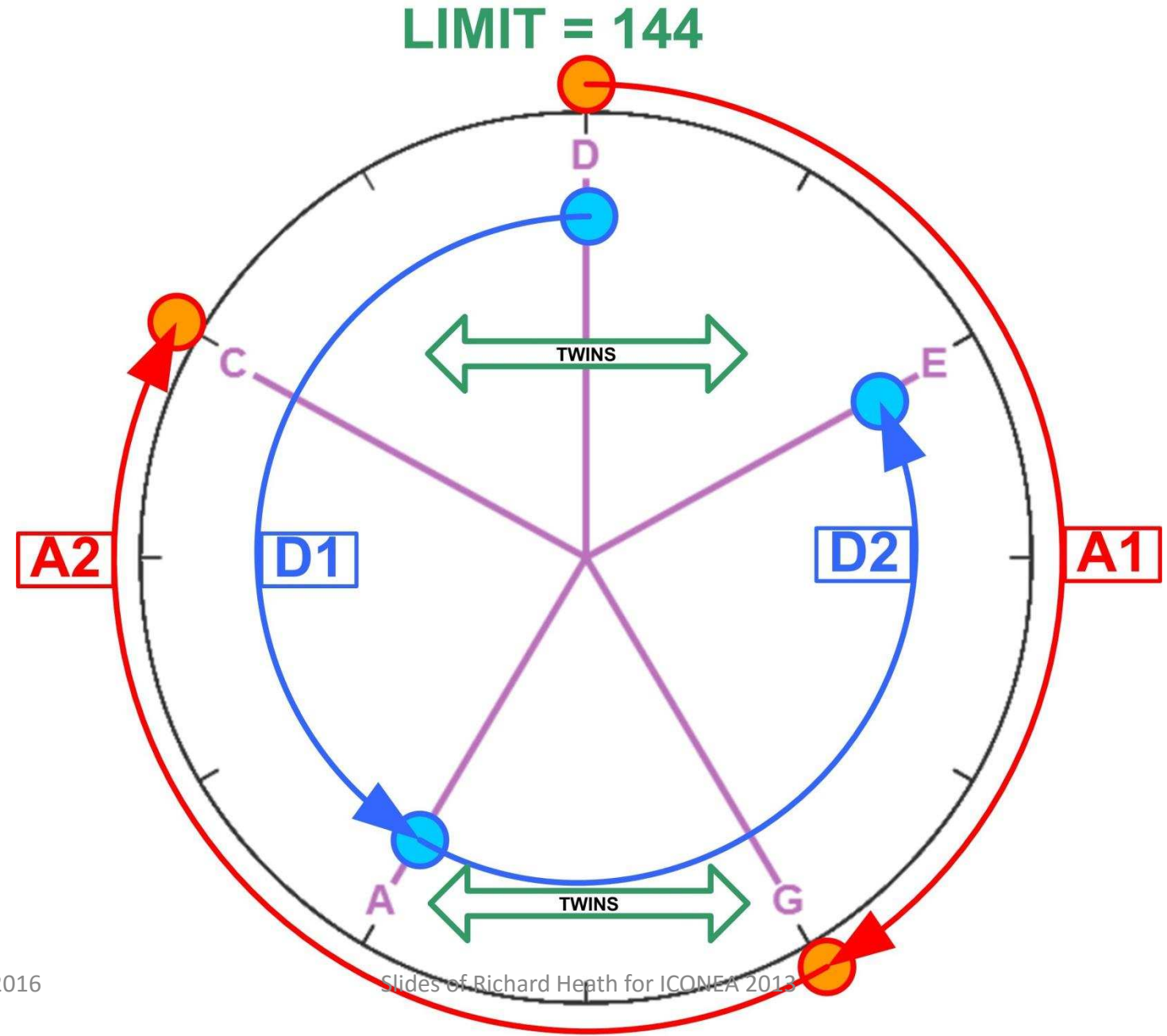
Diminished
Minor
Thirds





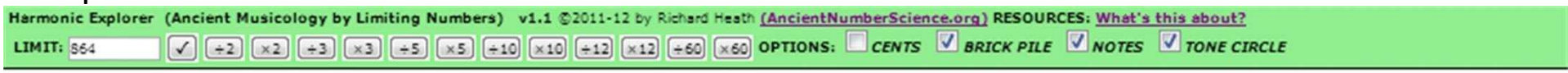
$$\frac{9}{8} \times \frac{32}{27} \times \frac{9}{8} \times \frac{32}{27} \times \frac{9}{8} = 2$$

4.7 Invariance within LIMITS: 144 Tuning Order



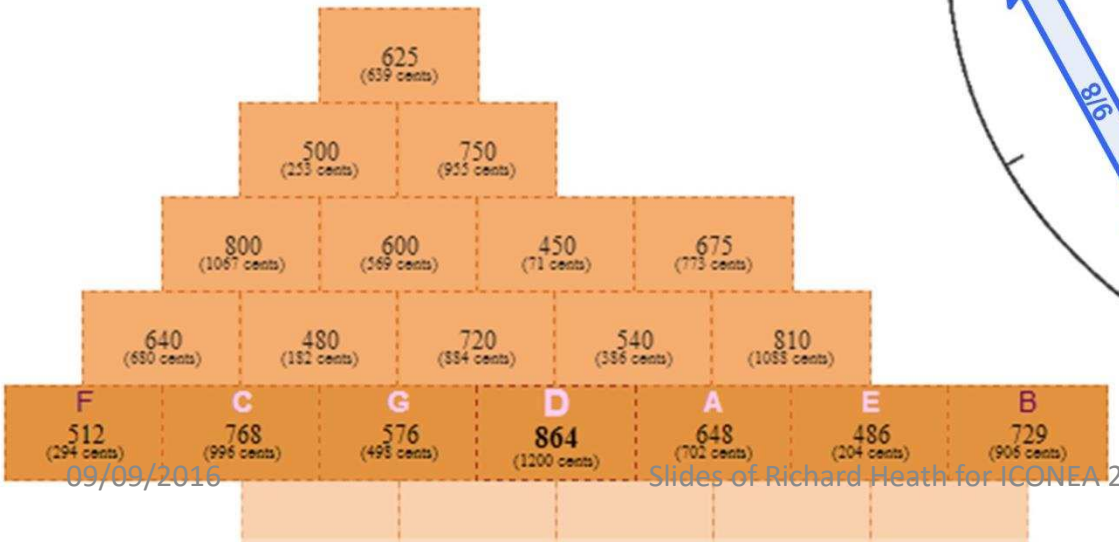
4.8 Invariance within LIMITS: 864 Heptatonic

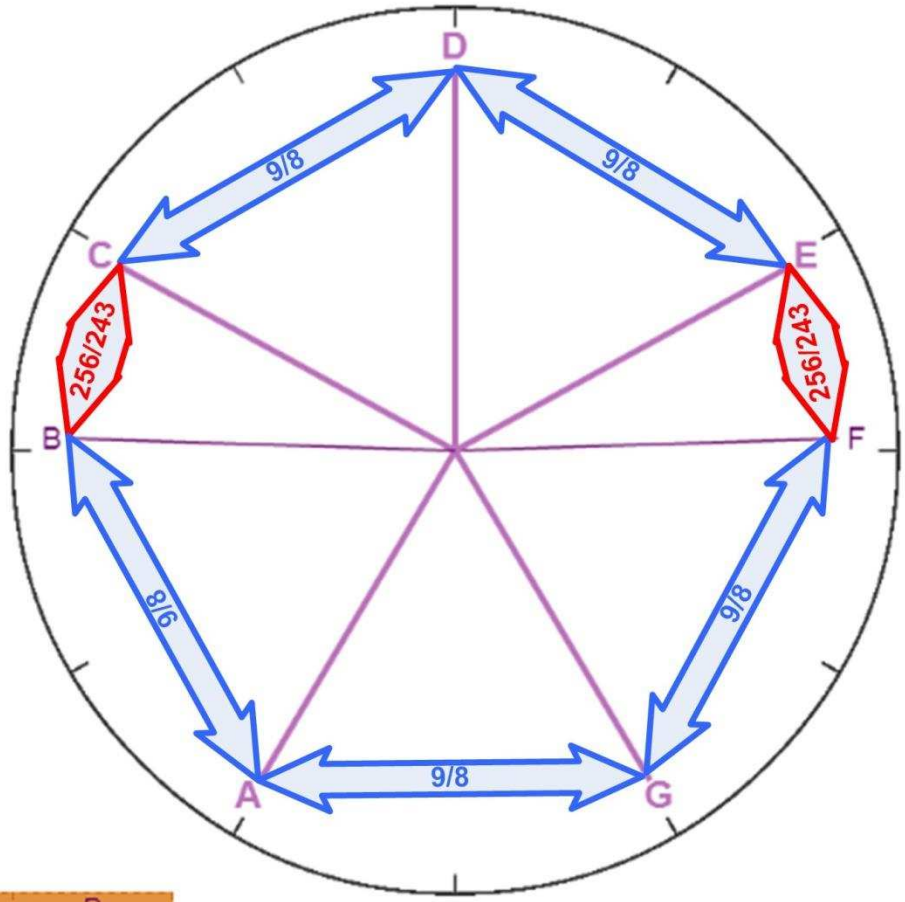
Note how THREEs are accumulating and two semitones 256/243 struggle to get rid of them to achieve doubling. These excesses or commas can be seen as deviations from Equal Temperament



Pythagorean Heptatonic

Limit: 864 { $2^5\ 3^3\ 5^0$ }
with 7 reciprocals
among 19 bricks

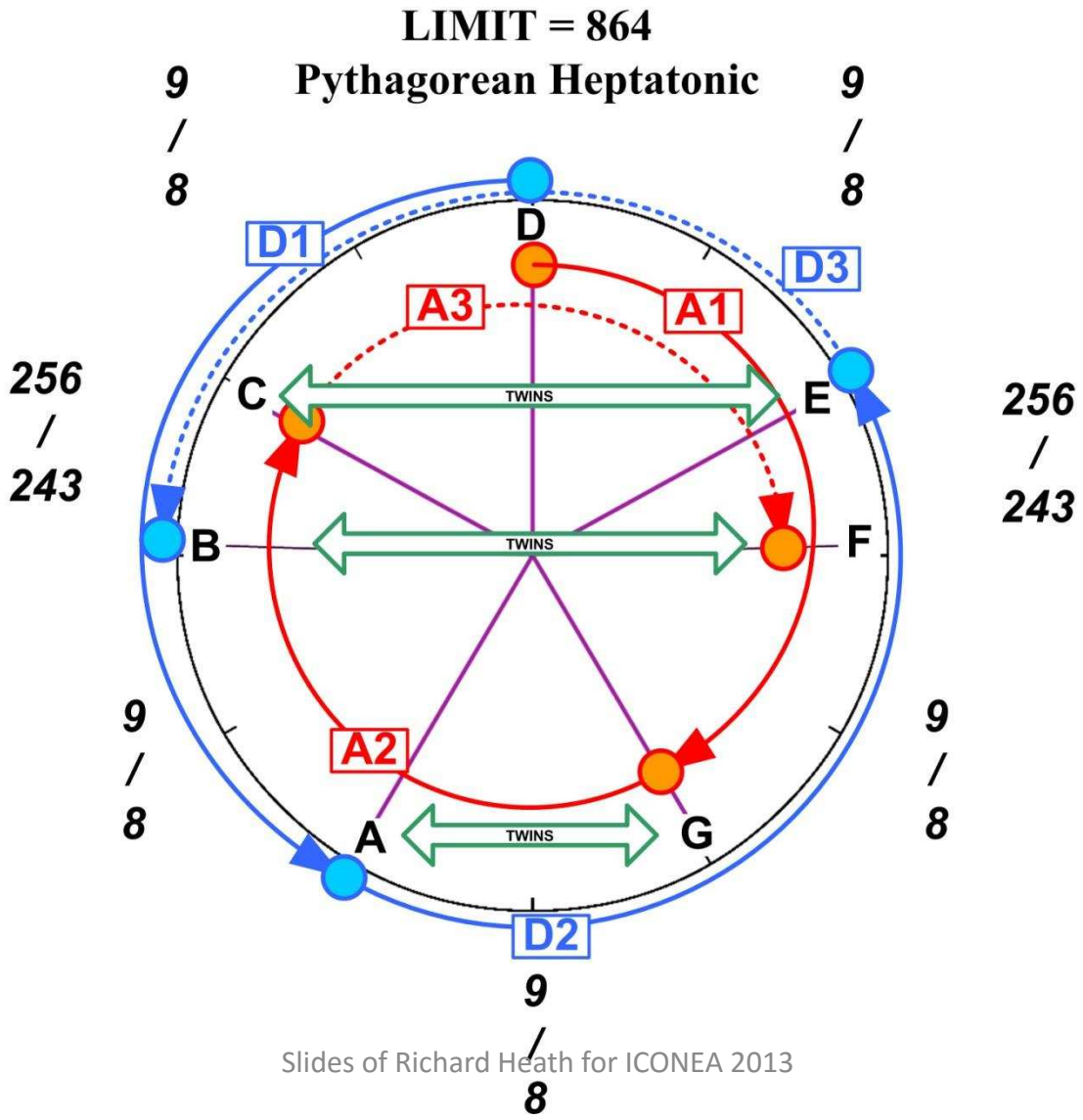




This bottom row for D came to be called a SERPENT Python or Vritra

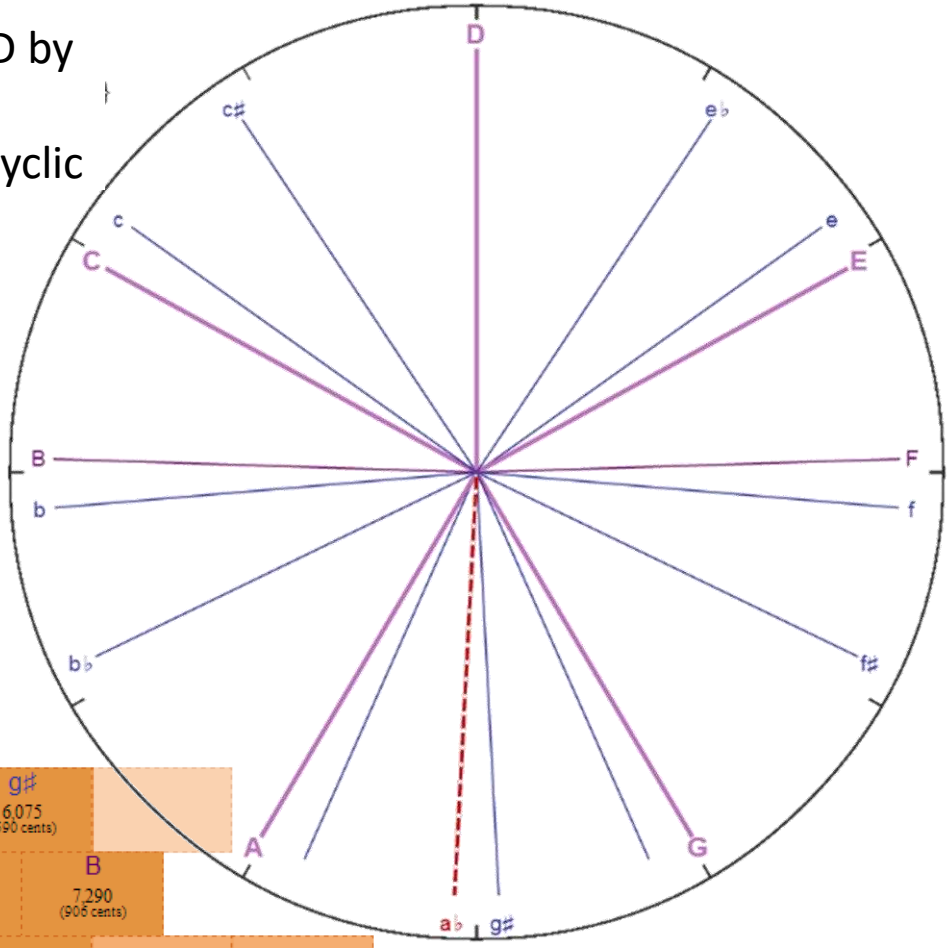
4.9 Invariance within LIMITS: 864 Tuning Order

The heptatonic semitone of 256/243 can be seen as the 3rd stage of balanced tuning around D

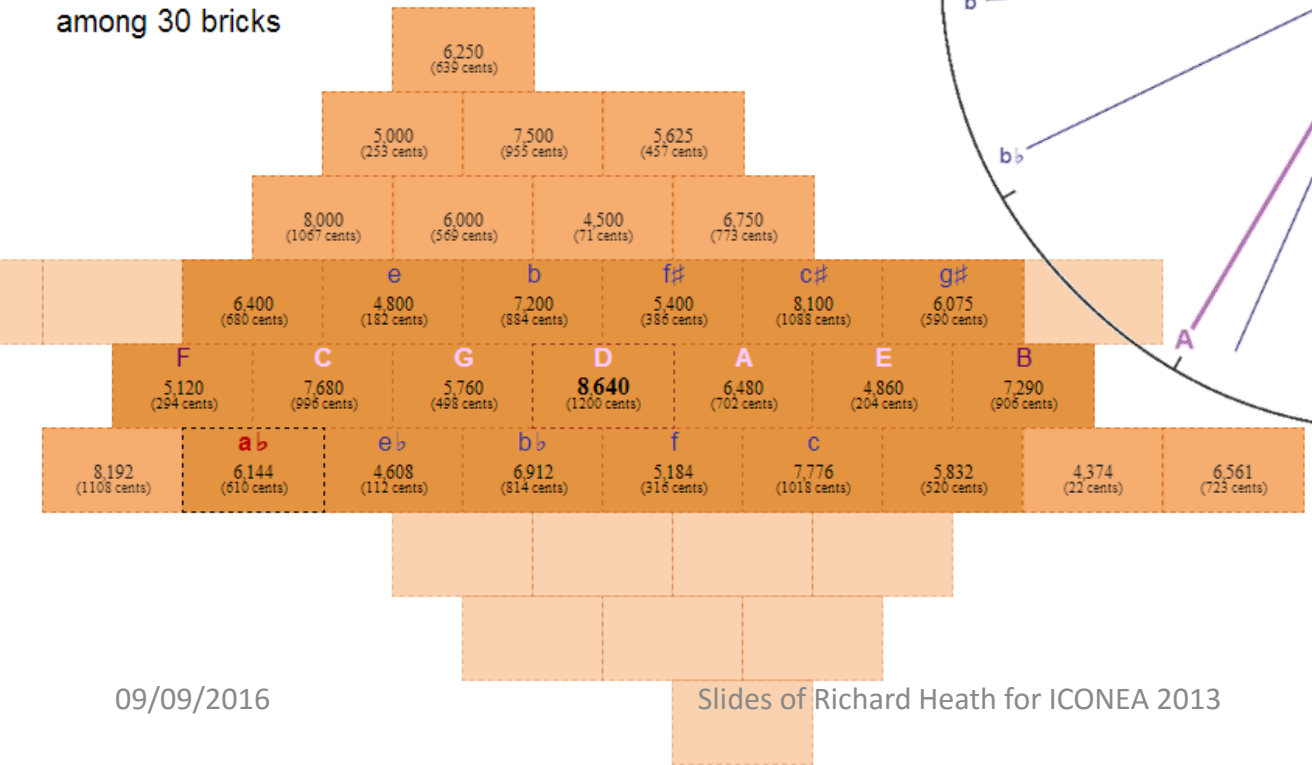


4.10 Invariance within LIMITS: 8640 Just Chromatism

The Cure for the serpent is to be raised as D by FIVE and become a “ten-borne one”, giving Just tuning alternatives to comma sticken cyclic fifths as was the case with 60 earlier.



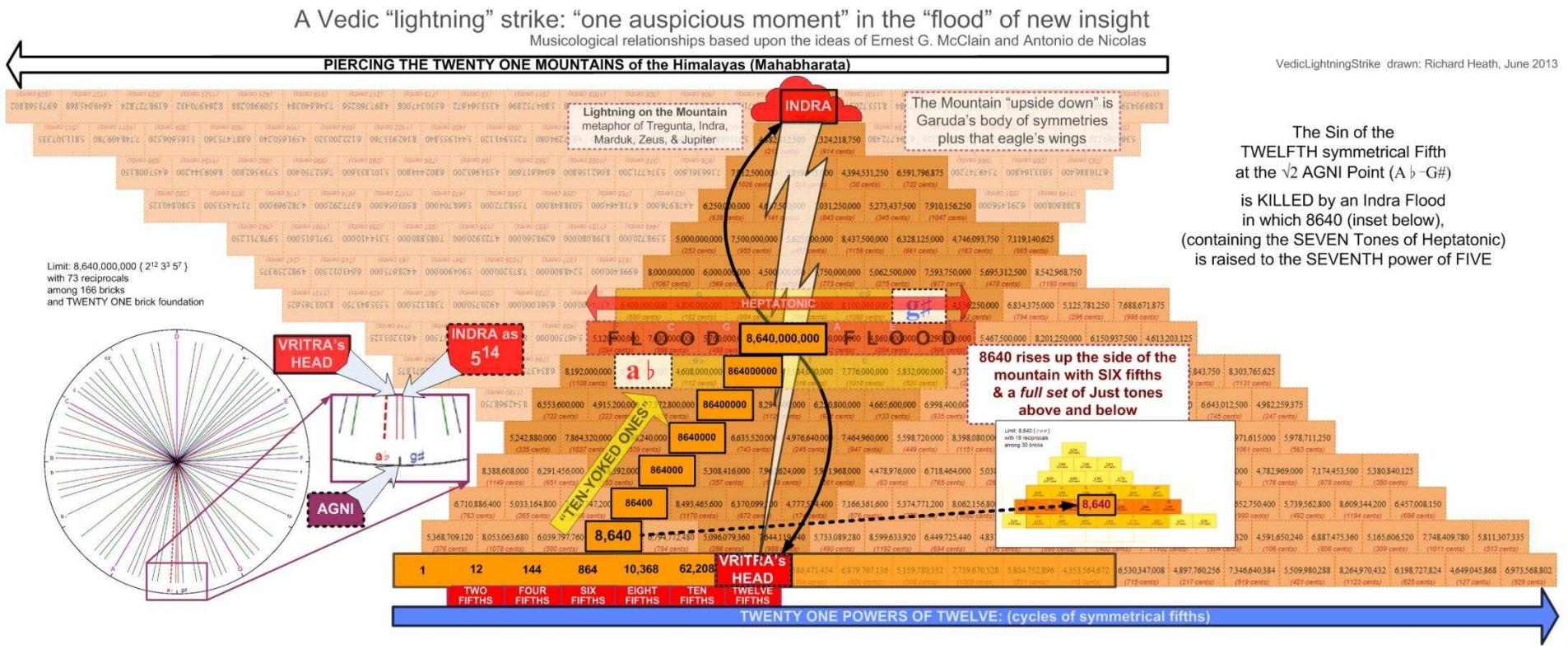
Limit: 8,640 { $2^6\ 3^3\ 5^1$ }
with 19 reciprocals
among 30 bricks



4.11 Invariance within LIMITS: 864 x 10^7 The Flood

In the numerical flood to water level 10^7, 864 can rise to generate G#/A flat only separated by 4 cents.

INDRA is on the top of the mountain as 14th power of 5



whilst VRITRA's "head", the TYRANT number 729, is defeated

5. Orbital Resonance

In celestial mechanics, an **orbital resonance** occurs when two orbiting bodies exert a regular, periodic gravitational influence on each other, usually due to their orbital periods being related by a ratio of two small integers.

In physics, the ***n*-body problem** is an ancient, classical problem[1] of predicting the individual motions, and forces on same, of a group of celestial objects interacting with each other gravitationally.

http://en.wikipedia.org

5.1 The Key to Jupiter and Saturn

- The 9/8 of Jupiter is a Pythagorean wholetone
- The 16/15 of Saturn is a Just Semitone
- This would imply in the world of LIMITS, a tuning system having $9 = 3^2$ and 5 in its limit which gives a ROOT of 45, the root of Plato's Calendar Octave

5.2 Orbital Resonance

The bare bones of McClain's balanced tuning mountains is the table of powers, of 3 and 5.

Powers of two can be ignored as contributing at all to the Invariance of the tones populating an octave doubling.

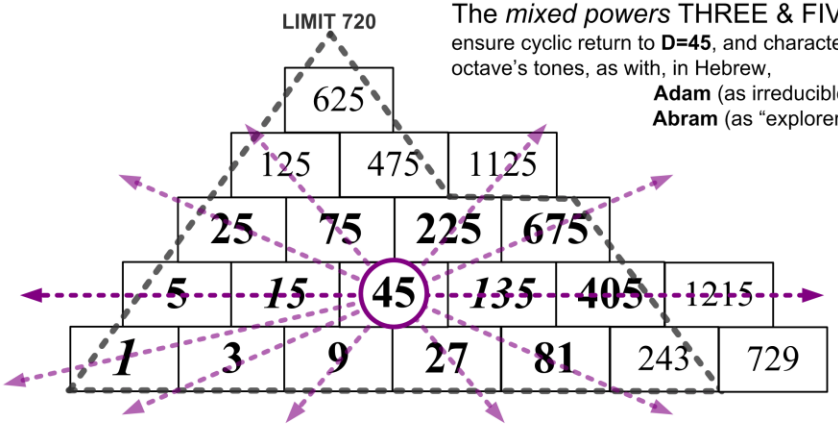
The only function of 2s being to raise each product of 3 and 5, to give just one tone within each octave.

The place to look for the lunar year, Jupiter and Saturn is Plato's Calendar Octave.

The Anatomy of Plato's Calendar Octave developed from **45**:90:180 to ***360*:720::720:*1440***

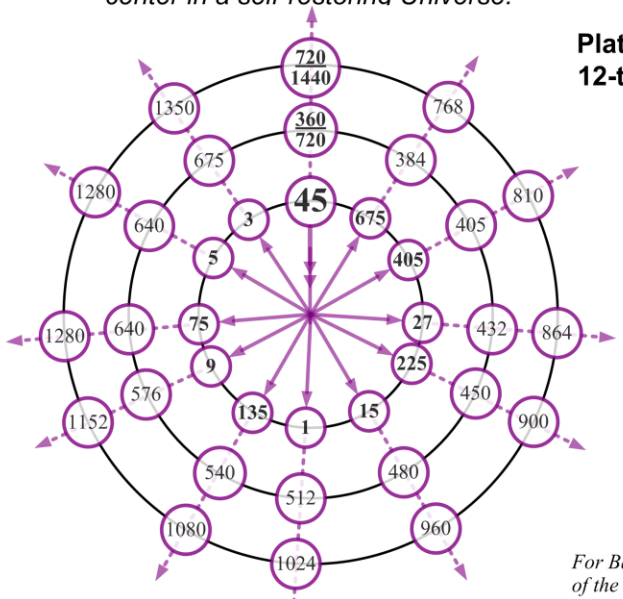
Where 18 Platonic male elements of 3x5<720 reduce to 12, 6 pairs through the uncounted center

Version. 1-2
drawn for Ernest McClain and Antonio de Nicolas
by Richard Heath, September 2013



The *mixed powers* THREE & FIVE ensure cyclic return to **D=45**, and characterize the octave's tones, as with, in Hebrew, **Adam** (as irreducible 45) and **Abram** (as "explorer" at 243).

Reciprocal powers of 3 and 5 ensure reflection to the center in a self-restoring Universe.



Plato's "Small and Great" 12-tone chromatic octave

360 is "no more than half" of 720, and 1440 is also "no more than double," but rather it is BOTH through the double octave,

1440:720::720:360,

a range of 4:2::2:1; Pythagorean Justice thus remaining "on 360."

For Plato this meant 2 years of preliminary training, reversing course the 2nd year.

For Babylon it meant only the 180 days of the half-year, taken twice.

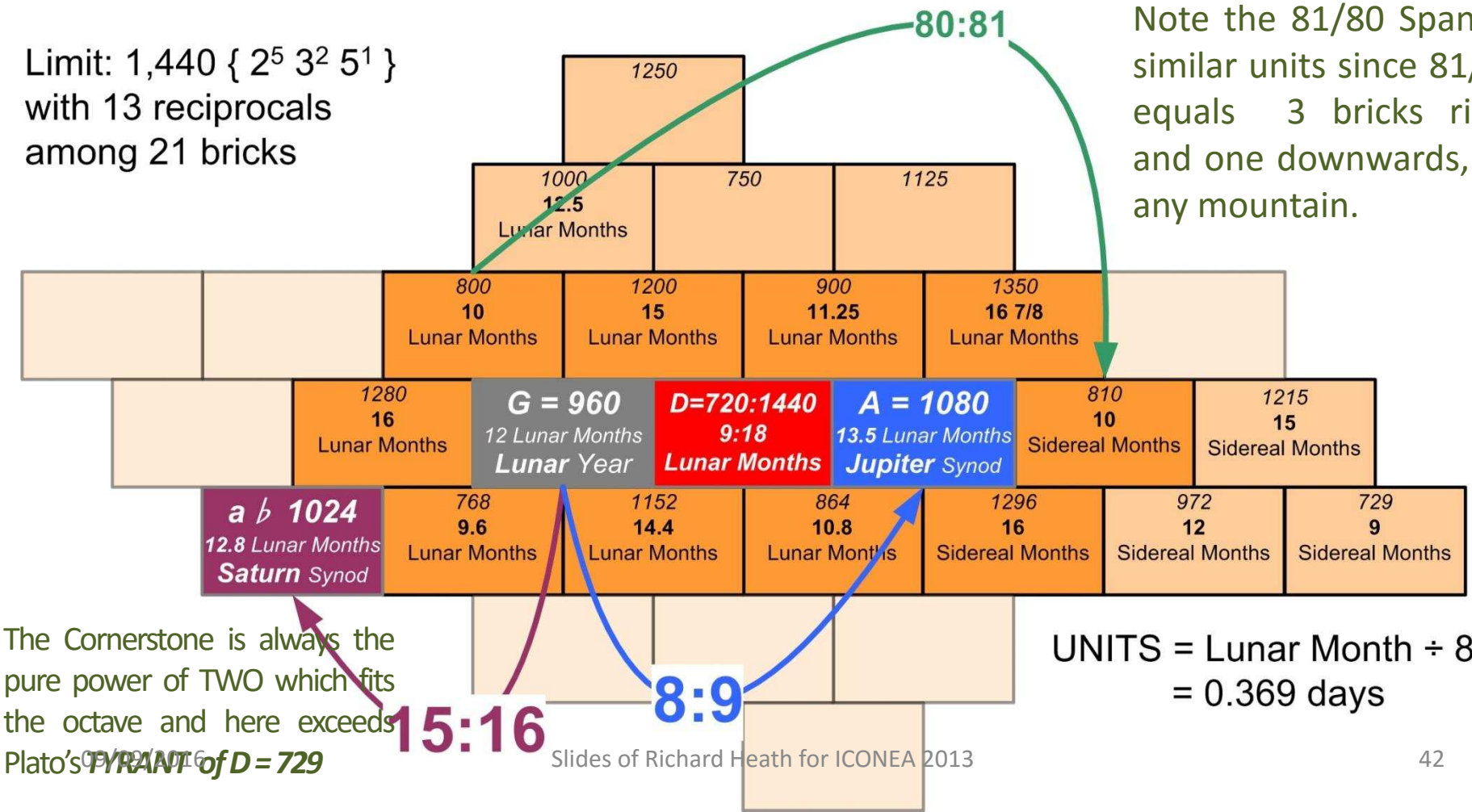
ONE stands opposite D = 45 as "cornerstone"

5.3 Orbital Resonance

In the octave 720:1440 the common factor is the lunar year which is TWELVE times 80 and 80 takes part in the Syntonic Comma of 81/80, the root interval of Just tuning

The Lunar Month multiplied by 81/80 gives THIRTY sidereal days (a sidereal "month"). 1440 is the earliest LIMIT which then enables Saturn to be revealed as CORNERSTONE

Limit: 1,440 { 2^5 3^2 5^1 }
with 13 reciprocals
among 21 bricks



Note the 81/80 Span of similar units since 81/80 equals 3 bricks right and one downwards, on any mountain.

The Cornerstone is always the pure power of TWO which fits the octave and here exceeds Plato's ***TYRANT of D = 729***

UNITS = Lunar Month ÷ 80
= 0.369 days

6. Prehistoric Numeracy

It seems quite clear that a lack of A.N.E. arithmetic need not have held back the Neolithic inheritors of a fruitful interest in the sky and the carving of time-factored bones.

Indeed, the megalithic of NW Europe has left evidence in the megalithic of a number science based upon numbers-as-lengths (and areas) and the utility of right angled triangles and circles.

Useful calculation was possible without arithmetic.

6.1 Prehistoric Numeracy: Numeracy and Invariance

The megalithic understanding of astronomy was of invariant ratios between synodic periods, some musical.

Unlike our own astronomy, this requires some familiarity with what monuments might have been seeking to achieve.

Numbers-as-lengths could give access to musical invariance through forming musical string lengths and studying interval ratios

The Value of Invariance to Ancient Studies

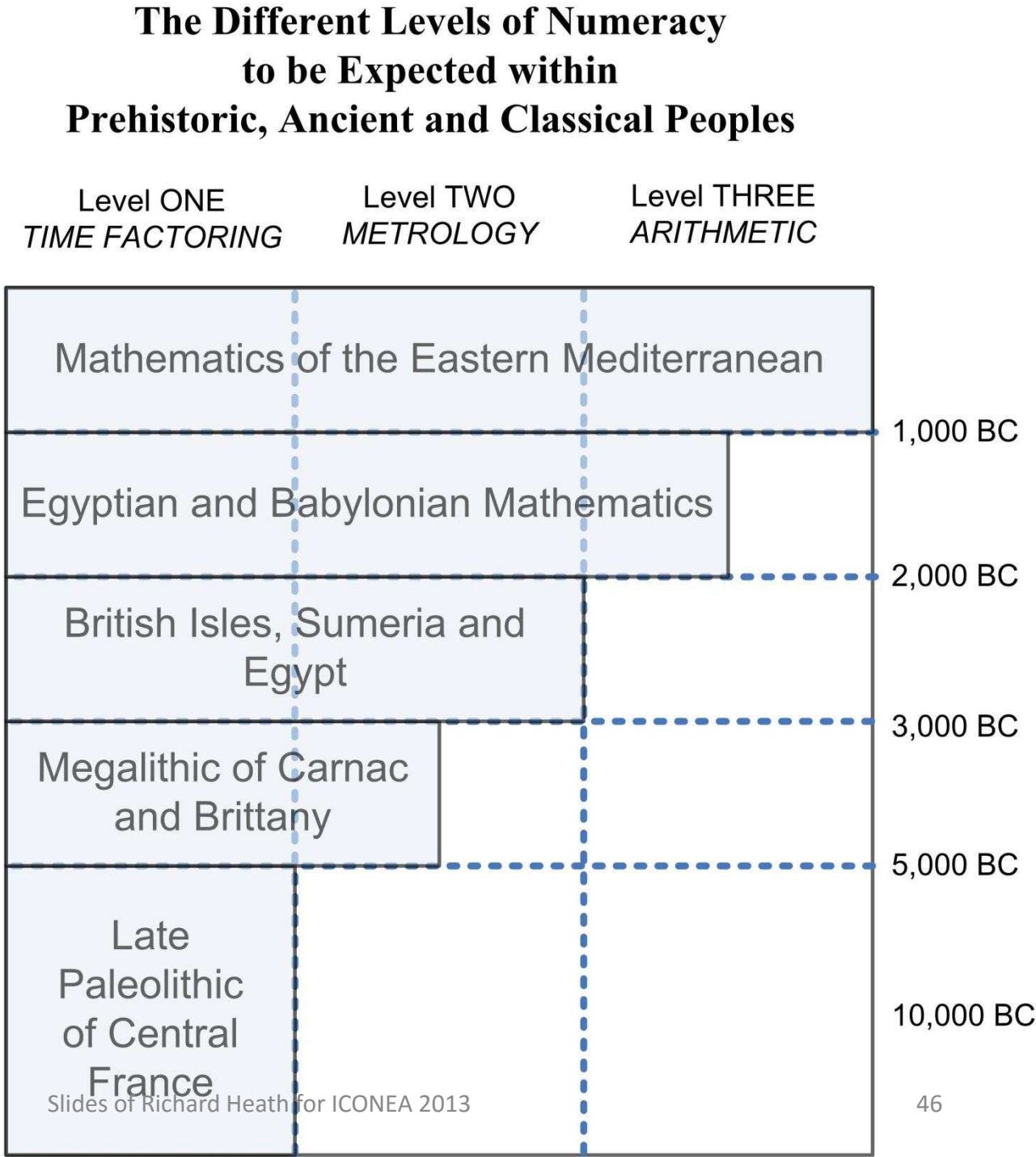
Invariance within evidence has been an unpopular "language" within ancient studies, perhaps because people believed it signified an unscientific and religious idea, of a Designer.

However, in the case of the musical ratios between planetary time periods, orbital resonance is known to be a stabilisation of planetary orbits into low number relationships.

Musical invariance involves low numbers and so it appears as dominant in the musicality of the Moon, Jupiter and Saturn.

Hence, our gods naturally obtained a myth of invariance involving their behaviour.

A New Timeline for Numeracy



Where Next?

- Do try out www.harmonicexplorer.org and on-page links to a related blog and late Ernest G. McClain webpage.
- A paper for this talk is soon to be published by ICONEA.org as *Conference Proceedings for ICONEA 2013*
- For megalithic: see slides for my Megalithomania 2015 talk at academia.org and look at www.numbersciences.org

- My author website is www.richardheath.info