

The Harmonically Numerical Form of Creation (and why it used to matter) by Richard Heath

ABSTRACT

The Bible, Homer and other myths were largely written down long after their inception, from memorable oral narratives composed by a type of author who was not a writer. Plato saved the number science implicit in oral works from extinction through including it in his own literary output. A number science can develop without a formal arithmetic through using only geometric procedures and these are to be found in the terminal Stone Age, famous for its enduring megalithic monuments. This paper illustrates the structure of this harmonic science as it is found within historical texts and monuments, whilst suggesting that the harmonic ratios between astronomical periods would most simply explain how our oldest myths were orally composed and performed cosmographies, skilfully woven around the invariant structure of numerical harmony and the sky, these being taken as responsible for creating and maintaining the world.

The Rediscovery of an Ancient Science

When Ernest G McClain read *Plato's Mathematical Imagination* by Robert S. Brumbaugh (Brumbaugh, 1954), he was able to understand what was only obliquely referred to in Plato's allegories. McClain consequently wrote *The Pythagorean Plato* (McClain, 1978), which revealed a harmonic number science of surprising sophistication, presumably developed in the ancient near east. Around the same time McClain met Antonio de Nicolas, whose PhD research on the Vedas (de Nicolas, 1976) had pointed to a similar harmonic science but then within the mythic poetics of Vedic texts, as a structural "memory palace" alluding to the invariant world of harmony. McClain and de Nicolas' joint proposition, that ancient texts from many regions were at least partly based on harmonic tuning theory, became *The Myth of Invariance* (McClain, 1976), a popular esoteric book of the late 1970s.

If correct, tuning theory was being used in the ancient world as a doctrinal guide to the manifestations of the divine. A similar conflation of music and divinity is to be found in the mythic *Life of Pythagoras* where Pythagoras is named after the Delphic Python slain by Apollo, (a god of music and of the lyre). Pythagoras is presented as studying in the mystery centres throughout the eastern Mediterranean, Egypt, and Ancient Near East, some of these apparently dealing with musical mysteries. Pythagoras (circa 600 BC) lived between the Heroic age of Homer and Hesiod, and Plato; a world where oral traditions were dominant. Orality was soon to be challenged by a new type of general literacy, proposed in Plato's *Republic*, where Plato concluded that only by imposing widespread literacy at an early age could one free thought from being *shaped by spoken language to remember a mythic past* and instead, coming to **reason** about the world through sharable writings which externally remembered one's thoughts.

This new approach to literacy was crucial to the formation of the modern world though it has impaired our understanding of the oral world that went before

(Havelock, 1963), with perhaps one exception. Plato recorded the harmonic number science of which he was an initiate and this was, I believe, integral to the skills of the oral composers. More or less contemporaneous with the earlier world of Pythagoras were the compilers of the Bible, in Babylon circa 600 BC who, it seems, prefaced their Pentateuch with stories reworked from the Ancient Near East, which narratives appeared to follow the invariant forms found in McClain's reconstituted tuning theory.

The texts McClain found to be most clearly developed in their use of harmonic metaphors and allegory survived in Homer, the Bible, Plato and Rg Veda. I have found evidence that harmonic allegory was developed from the astronomical time periods, as sometimes found in megalithic monuments as day counts. For instance, there are familiar harmonic intervals between the synodic periods of the three nearest outer planets, with respect to the lunar year, and these intervals are prominent in the tuning matrices found by McClain within ancient texts.

I propose that harmonic allegory was based on the harmonic intervals found between the synodic periods of these three outer planets with respect to the lunar year, and that these god-like invariants came to be recorded in the monuments of different periods and regions alongside those early texts where McClain found references to numerical tuning. This should strengthen McClain's case as to why tuning theory was a strong influence on ancient storytelling.

Explaining How Music got Mixed-up with The Gods

My own interest in ancient number science developed through looking at astronomical invariance; in order to build a more compelling case for a *megalithic* number science. The main evidence for such a megalithic science is built into its monuments, their design and alignment to horizon events such as sunrise or moonset. Without an arithmetic, the megalithic deployed numbers as units of length which formed day counts which, as lengths, could be compared

geometrically (Heath, 2014). It is therefore highly likely that in due course megalithic exploration of astronomical intervals turned to the remarkable musical intervals between the planets and the moon.

Astronomical day counts are like strings (having numerical lengths) which can be compared to each other by forming a right angled triangle, this revealing the interval between two planetary periods as being just like the intervals between musical tones. I therefore question whether the arithmetic of the ancient near east was essential before a numerical tuning theory like McClain's could develop, since a well-established metrology existed which happily stored lengths as integers (Berriman, 1953). The megalithic precursor to the ancient near east could have employed a pre-arithmetical way of studying string lengths as numbers, and such a metrological approach is inherently compatible with McClain's matrices of string numbers of integer length. (Heath, 2013)

Musical harmony would have been of no human interest without the ears and brain which could discriminate tonal intervals as the same, independently of pitch, via an innate logarithmic perception of intervals. But, in addition to the human capacity to tune intervals by ear, astronomy provided a framework of important numerical intervals: the lunar year appears to have developed harmonic intervals to the synodic periods of three outer planets: Jupiter as 9/8 (the major whole tone), Saturn as 16/15 (the Just diatonic semitone) and Uranus as 25/24 (the Just chromatic semitone).

It therefore seems likely that a number science already existed, at the prearithmetic interface between the megalithic way (of using numbers as lengths) and the slow growth of near-eastern arithmetical methods (of using numbers as abstractions). Prehistoric number science was certainly capable of measuring outer planet harmonics to the lunar month and, to my knowledge, the ancient near east of the third to the first millennium left no direct textual record of these synodic cosmic intervals. However, ancient oral traditions such as those called

the Mysteries are thought to have transmitted their knowledge secretly, that is as part of an apprenticeship, and this could have included numerical tuning theory, as it related to both practical music and celestial intervals. Secrets could not be kept on cuneiform and not later become known to the uninitiated.

Therefore, instead of providing a technical description of planetary intervals or musical theory in the manner of Ptolemy, ancient stories only provided allusions to musical harmony which, in the manner documented in McClain's *Myth of Invariance*, need only infer that the gods lived above and that planets have harmonic inter-relationships. In other words, when the planetary intervals were mythically extrapolated into narratives methods resembling McClain's holy mountains revealed matrices of integer string lengths which could characterise important cosmic scenarios, as described later for Adam as embodying a harmonic story starting with 45 and ending with 1440 – different interpretations of his name.

Harmonic Cracks in the Cosmic Egg

Harmony in McClain's system is largely based upon division by the first three prime numbers, 2, 3 and 5. A **harmonic number** is an integer made up of only these three primes, as factors, and the number 1 as implicit in all whole numbers. It is the presence of 2, 3 and 5 within an integer number which makes it creative in the harmonic sense of being able to host, as the **limiting number** of an octave, a rich set of intervals between the limit and half limit.

The Number TWO

Any harmonic number can be multiplied by two to create an **octave**, the simplest and most harmonious interval. A second function of two is to develop the continuum of possible harmonic numbers, throughout the discrete harmonic continuum of *possible* octave ranges, as in figure 1.



Figure 1 The Myth of Adi Sesha fits the powers of two well, as these organise the harmonic numbers which are possible limiting numbers for octaves. In the centre lies Vishnu, resting between creations on Ananta-Shesha¹, together with His consort Lakshmi who is massaging his feet [V&A]

Plato's Greek script, like Hebrew, gave letters a numeric value enabling words to signify larger numbers and a name to therefore specify a harmonic number. In addition, mythic art and monuments (see last section) could develop a visual language within which harmonic numbers could be lengths or diagrammed symbolically. An example of harmonic art (where symbols function like a diagram) exists in a 6th century BC Olmec cave sculpture (Bernal, 1969, 1976) (figure two):

¹ King of all Nāgas (serpent deities), one of the primal beings of creation, and according to the Bhagavata Purana, an avatar of the Supreme God [Śrīmad Bhāgavatam 5.25.1] known as Narayana. He is also known as Balarama, Laxmana and Sankarshana. In the Puranas, Sheshanaga is said to hold all the planets of the Universe on his hoods and to constantly sing the glories of Vishnu from all his mouths. He is sometimes referred to as Ananta Shesha which translates as endless-Shesha or as Adishesha which means the first Shesha. It is said that when Adishesa uncoils, time moves forward and creation takes place. When he coils back, the universe ceases to exist. "Shesha" in Sanskrit texts, especially those relating to mathematical calculation, also implies the "remainder" – that which remains when all else ceases to exist. [Jarzombeck, Mark (2011). A Global History of Architecture. Hoboken: John Wiley and Sons. p. 393.]. Wikipedia



Figure 2 (above) A Sculptured Relief on the Wall of a Cave at Chalcatzingo [Monument 31 drawn by M. D. Coe, 1965] (below) How the Chalcatzingo monument no. 31 appears to signify the number TWO in its power to stretch out and define an octave.



OLMEC Number Two, the symbol is its power

= TWO

Two is One plus the power to EXTEND over an octave doubling or reset a tone into an adjacent octave

$$= 2^6 = 64$$

Two has the power of *development* based upon a *root harmonic number* which is doubled to fulfil its potential, as with 45-90-180-360-720-1440 But the number Two cannot furnish its octave with any intervals that reach into its octave. To be populated with tones, an octave must be "penetrated" by larger primes being present in the octave's limiting number, these becoming smaller than two when reciprocated within interval ratios.

The Number THREE

Three can divide the octave whilst using two as a "ballast" (of 2, 4 or 8, etc), to form intervals such as the fifth of 3/2 and the fourth of 4/3 and these, either ascending from low *do* or descending from high do^2 , define the perfect fifth and fourth separated by a major whole tone interval of 9/8, between them (figure 3). To use three in this way, three must be a factor in the composition of a given limiting number and a *Pythagorean* harmonic number would only have factors of 2 and 3.

It is crucial to understand that, in the ancient harmonic system, the limiting number as octave is a GOD in the sense that the whole creation proceeds only from the number itself. It is then true that such a god, of numerical *limitation*, is completely at the mercy of those prime number factors found within it because these intervals are not selected but are *all the intervals possible* when applied to that limiting number: The system can calculate the involuntary manifestations of any limiting number and the ancient harmonist can investigate the tonal worlds created by harmonic limiting numbers. These invariant creations are those which McClain has drawn our attention to, creations lying behind the references to harmonic numbers in ancient texts and monuments.

 $^{^{2}}$ *do* being called after our note D by McClain, because D is on the octave's **axis of symmetry**² since D is the geometric mean of its symmetrical tones, rising and falling from D which, in Plato's harmonic system, were seen as of particular importance and called "pairs of fighting men" by Plato.



Figure 3 Harmonic Explorer display (Heath, 2011), annotated to show that octave 6:12 has two symmetrical tones, G and A, based upon ascending and descending fourths, with 9/8 between. The brick valued 10 is asymmetrical and prefigures Just intonation, being 5/6 of D and 5/4 of G i.e. involving prime number Five equated to Hebrew Hey and Greek E.



Figure 4 To maintain symmetry, 12 must be squared to 144 to form the least possible limit having a pentatonic symmetry, creating two Pythagorean tones, in tuning order, either side of D.³

³ In octaval studies, i.e. when seeking a single octave populated using any tuning method: If any interval repeated goes beyond the range of the octave, one can use two so as to return a tone back to the single octave. Using numbers as string lengths this is a reliable calculation but when tuning real instruments, one requires an accurate aural faculty to achieve octaves despite overtones, etc.

Chalcatzingostela_Monument31

OLMEC Number Three



= THREE

Three is a prime number, denoted by a circle within a circle (=prime) with serpentine "hat" and a land bird with three tail feathers.

The resplendent quetzal

is an aptly named bird that many consider among the world's most beautiful. These vibrantly colored animals live in the mountainous, tropical forests of Central America where they eat fruit, insects, lizards, and other small creatures.

Figure 5 The Olmec appear to have signified each factor of three with a feathered bird shown with three feathers.

The map of figure 5 shows the quetzal or "feather" bird that was regionally specific to the Olmec, also deified it as *Quetzelcoatl*⁴, the compound feathered serpent who represented a cycle of fifths in serpentine tuning order. The triple feathers shown here signify the prime number three which generates successive fifths in ratio with the number two. Two such birds means three times three equal to nine.

The Number FIVE

Five can also be instrumental in splitting the octave into two large intervals, the major third of 5/4 and the minor third of 6/5, forming new notes within a

⁴ Attributed to Venus, the gods being *coatl* or serpents.

chosen octave's population. Again though, this requires the octave's limiting harmonic number to include at least one factor of five. In fact only one factor of five is required in numerical tuning to achieve practical Just intonation, exactly as is found in the Olmec monument where the "numerical figure" emerging from the harmonist's head has a single head equal to five since,

the harmonic number 2880 is equal to 2^6 times 3^2 times 5



TONE CIRCLE FOR 144 with Vitruvian Man overlay.

The "Human Fiver" are the FIVE tones where the fifth is D = HEAD with four Pythagorean limbs, two arms and two legs

Figure 6 The Symbolism of the Olmec for Five within harmonic number 2880.

Five appears as the head in what is now a human-like figure, in a garment showing the six powers of two, as a livery. It is the number three that, from D, creates what McClain called the "human fiver" of C G D A E, in tuning order about D (ascending or falling), shown in Figure 6 with da Vinci's Vitruvian Man, which expresses human fiveness, over the tone circle for limiting number 144. This fivefold structure is *always* present when the limiting number can *at least* "afford" to spread two fifths away from D, using exactly two threes and four twos i.e. 144.



Figure 7 Harmonic Explorer (Heath, 2011) for limit 16,000 illustrates how a cycle of thirds does not have the harmonic power of fifths because 5/4 does not divide the octave but creates the minor diesis of 125/128 = 125/64 = 1.953.

The actions of three and five within harmonic tuning theory lead to what is probably the first earliest known example of separating two variables after recognising their independent effect within a phenomenon. The two types of "tuning"⁵, by 3 and 5, when placed at right angles in McClain's reconstructed system, can be seen (in figure 8) to numerically compress the serpentine chromatism of twelve Pythagorean tones. The serpent's extremities, either side of D, are cut and reset, above and below D, thanks to realising the independent effect of five relative to three. When D's limit is a pentatonic harmonic number (containing 144), "raised" by a single factor of 5, the practical tuning system of Just intonation results. This triumph of numerical transformation over tuning by fifths was itself the stuff of legends whilst reducing the conceptual magnitude of the harmonic string lengths required to achieve it by a judicious blending of twos,

⁵ This perhaps should not be called tuning since the ear is not being used and the process is not essentially sequential as one might assume by using terms such as a "cycle of fifths", yet tones do appear in their tuning order and are organised from D as an apparent starting reference length. Perhaps the confusion arises because of the inherent duality between physical dimensionality and acoustic perception and this requires careful control over terms and what they imply.

threes and fives as factors within 144 times 5 equalling 720, half of Adam = 1440 and one quarter of 2880.



Figure 8 The serpent of fifths which achieved chromatism using prime three is elegantly cut in two places by adding the 'upward' prime Five dimension to D. The Just Chromatic semitone of 25/24 is produced between the displaced parts, which are then much closer to D. Therefore, say McClain and de Nicolas, mythic heroes cut up a serpent, alluding to such a mutilation in their legends, for example of Apollo and Python, and of Indra and Vritra.

Whilst harmonic facts can be elucidated aurally (when varying a string's sounding length to achieve such harmonic intervals by ear) the above facts could now be extrapolated in the abstract, so as to study harmonic populations of harmonic numbers not limited to practical performance or earthly instrumentality. Instead, a new firmament of possible numbers were applied to the characterisation of divinities as inhabiting now elevated worlds, of numerical mountains which, transposed into texts, allowed an exoteric scripture to maintain the link between esoteric harmonic details and a plot's necessary anthropomorphism within a culture.

Creating a Harmonic Firmament for Octaval Identities

Besides forming the octave interval and resetting tones between adjacent octaves, the number two gives a third gift. The number two divides the logarithmic world of the octave, as heard by the ear, into two symmetrical halves,

about an axis of symmetry where D is the re-entrant octave pair of D^6 , and "opposite" D is the square root of two, our notes Ab or G[#], near the geometric mean of the octave or, ideally, the square root of two (of octaval doubling) found in Equal Temperament.



Figure 9 Picture of an Ancient Harmonicist realising the Matrix for 2880

According to Plato's terminology, the number 2 was seen to resemble a female womb within which the numbers three and five were needed, like male sperm, to fertilise the octave⁷. Three (Plato's *divine* male number) and Five (his *human* male number) populate Two's womb and do so symmetrically about D, as is seen in the cycles of fifths or, equally, in a theoretical cycle of thirds (see figure 7); the latter perhaps best known for the *minor diesis* of three thirds, which are not quite

⁶ D is always shown in the top of a modern tone circle but in the Olmec drawing it is placed as D in a cave looking out along the axis of its own symmetry.

⁷ One must beware: Plato may have added a patriarchal gender gloss over a more ancient tuning theory, but this approach fits the biblical usage of a patriarchy.

equal to an octave (until Equal Temperament eliminated this and many other intervals encountered by ancient numerical harmonists).

But Two's octaval powers make it easy to undervalue the fundamental reality of Three and Five as *interval makers*: that the harmonic field is in practice entirely due to 3 and 5, which then populate the many different octaval views of tonality. As stated above, the powers of three and five were seen as conjoining to form a two dimensional array of cross multiples in which the powers of three were conceived as running horizontally (serpents of the earth or the sky) and the powers of five were seen as running upwards (into the sky, the realm of the gods and the godly).

It is likely that harmonic ideas inspired an implicit value system based upon what is called in the Bible's first chapter a **Firmament**, of possible intervals, and that this was placed there to serve as the Bible's chosen model of **Eternity.** A metaphysics could be real but above the physics of the biosphere, as Aristotle indeed proposed, but one observes that in the doctrine of sin lies in the possibility that human actions, like any musical instrumentality, can fail to achieve metaphysical harmony. Also, both Pythagorean and Just intonations contain inevitable sins which are translatable into the sins committed by the divine world. This recognition of harmony as only a potential state, subject to hazard and hence dependent on appropriate human and (idiosyncratic) divine actions, seems to have made a fine literary context for dramatic interactions with the divine world in ancient narratives and poetics.

Defining Adam as the Just Cornerstone Region

The opening chapter of the Bible writes of a Firmament born out of darkness in seven days. I believe that the description given is incongruous as an actual sky astronomy, being instead an allegorical vision of the harmonic array of compound products of Three and Five. McClain's Holy Mountains, as seen in his "brick"

diagrams, are an octaval superimposition upon this firmament. Doubling each limiting number generates new harmonic features, described as dry land, seas, and creatures. In later chapters of Genesis and Exodus, harmonic numbers were then inserted into the text for esoteric guidance, so as to show the narrative exploring key regions of the harmonic firmament. These later stories include,

- 1. The creation of a prototypical man Adam, from whom is created Eve in the Garden of Eden. But they eat a forbidden fruit and so a pageant of storytelling proceeds.
- 2. The wide-spread Mesopotamian flood story is altered to having an Ark protect Noah, his family and the animal world from a necessary cull of giant men (i.e. large numbers, according to McClain see figure 10)
- 3. A Patriarchal line is eventually started from Abraham which leads to Twelve Tribes, who go to Egypt thanks to Joseph, the 11th child.
- 4. Moses escapes with the tribes, who eventually enter a Promised Land probably the harmonic Garden of Eden transformed and re-occupied to form a compositional "latch"⁸.

Declaring a Firmament as being a spiritual, celestial and harmonic space where eternal characters "exist" as tonal potentialities, became a literary canvas for ancient tuning by harmonic numbers. Within this genre, gematria letter-number correspondences were used to give vital clues to important characters such as $A.D.M^9 = 1.4.40$ which can be summed to make 45 or used in a decimal position notation to represent 1440 (McClain, 1976), that is 32 times 45. Forty five is 9 times 5, and the five has elevated Adam in the god-dimension, whilst his two threes enable two divisions by three so as to form a pentatonic frame for the Hebrews, once two has doubled it a number of times (through D = 90, 180, 360,

⁸ where the end of a story cycle touches the beginning and visa versa (Douglas, 2007).

⁹ Adam was ironically given the power to name things for himself by the Lord God, in the Garden of Eden. At first he is simply called man, suggesting he named himself Adam.

to 720 then 1440.) This doubling appears to take place through the generations of the patriarchal story (see next section).

When the Lord Almighty (*El Shaddai*, summing to 345) is revealed to be YHWH, it is only to a Moses whose name also sums to 345. YHWH, though *summing* to a non-harmonic 26, has also been exposed through being in an exponent notation¹⁰ where Y.H.W.H = $6.5.10.5 = 6^{5}.10^{5} = 777,600,000$ (McClain, 1976). YHWH's limiting D contains a large but limited portion of the firmament, to just the fifth powers of three and five. The Bible can be seen as a story of staying within certain limits, defined by Just chromatism and YHWH's D = 60^{5} .



Figure 10 "And God said, let us make man in our image, after our likeness" KJV Gen 1:26. [adapted from McClain figure 2 of Nahum (Christensen, 2009)]

YHWH as D = 777,600,000, has 11 Pythagorean notes, including his D, which He can extend into an ascending and descending chromatism by using the asymmetrical and enharmonic pair of 12th tones, Ab and G#. YHWH's D can be shown (as in figure 10) surrounded by a Megan (Star or Shield of) David, of Just chromatic tones plus the 12th note outliers, ab and g#. This pattern is then

¹⁰ One should note that exponents are native to the numerical tuning firmament and should not therefore be considered as anachronistic in an ancient context where tuning theory appears to be inspiring texts.

translatable down to the cornerstone area, where Adam as D = 45 can be raised by doubling to 1440, whereupon ab and g# provide similar (though now Just) asymmetrical 12th tones, *"in the likeness of"* YHWH's achievement of Pythagorean (Ab and G#) 12th tones.

To summarise then, the Garden of Eden is at the "cornerstone" area of a rhomboid firmament where Adam has his root value of 45. Adam is special because 45 is the first number which can generate, using the Just intonation which Five "gives", a 12th note opposite D (near the geometric mean), but all this only after the Patriarchal story has repeatedly doubled 45 to eventually become 720 then 1440, Adam's full potential.

The Flood had to come between the Garden of Eden and the Patriarchs because YHWH's doctrine was against Pythagorean cycling of fifths which created "giants" (which in tuning theory are large non-decimal numbers) causing YHWH's creative imagination (as harmonist) "to become hateful to Him". Adam's basis for Patriarchal development is nothing but the doctrine that five should be used to cut up the serpent of cycled fifths (requiring D = sixth power of three), and place its symmetrical tail sections above and below (as in figure 8) to form Twelve Tribes between Israel as 720 doubled to Adam as 1440, the higher nature of Man.

Realising the Patriarchal Chromatism

The Biblical flood is therefore a doctrinal modification of flood-themed stories found in earlier near eastern and Vedic myths. For example, Vedic Indra chooses a limit for D employing the seventh power of five to cut up serpentine Vritra. In Plato, the serpent has a head based on the Tyrant number (729) of the sixth power of three. Indra's limit was found to create two symmetrical and near perfect Diophantine approximations to the square root of two separated vertically by a massive fourteenth power of five, spanning fifteen vertical rows of a tuning mountain (McClain, 1976 pp. 76-78). Both of the above powers, the seventh of five and the sixth of three, place Indra and Vritra outside the Bible writer's frame of YHWH = $6^{5}.10^{5}$, that is of the fifth powers of both these primes. As already stated, Adam is the earliest possible Firmament member (45) where, when developed, a workable twelfth note can form, tonally opposite D, using only the powers of Two to achieve it. Because of this, a set of low harmonic numbers based upon 45 generate a Just intonation with twelve notes, allowing the Patriarchal story to defeat the numerical complexity of the Cycle of Fifths, the serpent's high powers of Three, without using the excessive powers of Five implied within Indra's flood story (through the harmonic number 8,640,000,000, whose seven zeros express his powers of Five.)

To double Adam, Abraham's wife Sarah is first elevated, through the clue of Isaac being born when she was 90 years old, twice Adam's 45. Isaac then dies at 180. McClain also noted Abram (1.2.200.40) summing to 243, the fifth power of three, and that he and Sarai are both given a new hay = 5 by YHWH so as to achieve this magic birth of Isaac. Isaac's son Jacob will be completely renamed Israel, perhaps doubling his number twice, to 720 (rather than simply 360 by patrilineage), an octaval limit which then enables Israel to have an asymmetrical 12th tone opposite D, so repeating what YHWH did (see figure 10) to achieve 12th tones via an asymmetrical cycling of fifths. Having brought the 12th tone closer to D, Just intonation allows small numbers to achieve a chromatic tone set through an Adamic Israel, doubled to 1440.¹¹

¹¹ An earlier explanation may be found in Kapraff's *Beyond Measure* (Kapraff, 2002), involving the first born always being A, the rising fifth, though the first born is then often displaced, as with Esau by Jacob and, rather differently Ishmael by Isaac. Certainty in such matters may be impossible.



Figure 11 The doubling of 45 necessary to successively create a Pentatonic Just tuning and requiring doubling to Adam's 1440 so as to manifest an (asymmetrical) pair of 12th notes for ascending and descending, avoiding any audible comma.

The story of the Patriarchs, from the biblical clues given, is structurally driven by a tuning theory based upon a firmament of powers of three and five, exploring Adam's 9 times 5 = 45 through multiple octave doublings. Joseph introduces a new way of counting this firmament's numbers (see figure 12) in ascending order, whereupon Joseph is placed as the 11th son (Kapraff, 2002) at a brick then equal to decimal 1000, within Adam's harmonic limit of 1440, but above Just tuning at a minor diesis of 125/128 to the cornerstone of 1024 = ab (figures 12 and 13).



Figure 12 Joseph seen as 11th son, in order of magnitude of the products of Three and Five which make up the underlying Firmament of possible harmonic intervals.

Joseph as the Moon's Syntonic Unit

Further details of the astronomy of the moon are revealed by the biblical matrix for Adam as 1440 (figure 13), which allows the Saturn synod (= 1024) to appear as cornerstone relative to the lunar year (= 960). The 960 unit value of the lunar year allocates 80 units to each of the twelve lunar months in a lunar year. Dividing the average month of 29.53059 days by 80 gives the unit in question as 0.369132 days and so the 1000 units of Joseph equal 369.132 days, very nearly the synodic

period of Uranus (actually 369.66 days long). If Joseph/Uranus is shown in the matrix for 1440, as figure 13, one sees that there is a brick 81/80 larger than the lunar year – 960 becomes 972 units, a length of time equal to 358.8 days, which equals 360 sidereal days (to one part in 1600). The number 972 has the root of 243, the gematria value of Abram which has *the same powers of Three as YHWH*, which are $3^5 = 243^{12}$.



Figure 13 The distance functions of Just tuning are expressed in Joseph and Abram so as to point to an 81/80 syntonic comma between the lunar month and 30 sidereal days.

This shows that three types of meaning are being linked together in the Bible and other places where the special numbers 45 or 1440 (linked to Adam) are used in the ancient texts, symbolic numbers or monumental lengths.

> The Just intonation system was seen as a matrix of string lengths where the powers of Three and Five are given independence in two dimensions equating to "along" and "up".

¹² The year of 360 sidereal days should perhaps be called the Abramic year.

- 2. The notion of Patriarchy was used as a metaphor for the development of the important root number 45, by conflating harmonic doubling with human reproduction.
- 3. The unlikely coincidence of Adam's Just intonation with a biblically unstated astronomical reality of harmonic interrelationship between the outer planets, the rotating earth and the lunar month and year.

That the lunar year is intermediary to the outer planets means the combined action of the earth's orbit and the lunar orbit (which are the cause of the moon's lunation cycle) are also fused into the result. It is the additional factor, the 81/80 ratio between the lunar month and 30 sidereal days, which connects the rotation of the earth to its orbit and that of the moon, through the synodic comma which relates Pythagorean and Just tones. This triple relation is complemented by the three giant planets which are resonant to the lunar year, forming an overall system with six key elements

The Synodic periods of	The Orbits of	And the Rotation of	
1. Uranus	4. the Earth	6. the Earth	
2. Saturn	5. the Moon		

3. Jupiter

With this in mind, the idea that planets were gods proves less of a superstitious "shot in the dark" for the creators of mythic stories who drew this parallel. The connection of the planets to the earth and its moon is extremely clear and as one would expect in a post-Newtonian world, *subordinate*, in that the giant planets are unlikely to have been changed in their orbits by the earth-moon system. Obviously and without controversy, the moon is gravitationally affected by both the rotation of the earth and the synodic periodicity of the giant planets. Indeed, without the smoothing effect of a large moon, the earth's axial tilt would, like

Mars, be highly variable due to the chaotic forces known to be felt by Mars, due to the combined motion of Jupiter, Saturn and Uranus. Just intonation appears to have provided a *refuge of low number resonance* for the earth-moon system, just as YHWH sought in the Bible to bring the tribes of Israel into a Promised Land of Just tuning, at the same bottom left portion of His firmament.

Monuments to the Harmonic Gods

Monuments tell this same story but use symbols, measures and geometries to present the harmonic astronomical intervals. As with texts, the common man may not grasp the inner meaning but would have a sense of the central doctrine, of planetary divinity.

Olmec Discovery of the Eclipse Year

Returning to the matrix for 2880, as portrayed in Olmec sculpture (figure 14), we find that halving the size of unit employed doubles the limiting number from 1440 to 2880 allows some new bricks to emerge, including one forming a twin peak, shown as a circle above the octave cave's horseshoe shape.



Figure 14 A Sphere with 12 flames has crossing bands, one over the other whilst the number 1875 corresponds with the eclipse year of 346.62 days.

It is therefore clear that the monument marks a key arrival with 2880, the resolution of the eclipse year as a new integer "string length". The eclipse year is a minor diesis of 125/128 above the lunar year just as Uranus is a minor diesis above the synod of Saturn. It is a general habit to glorify a new discovery and it is probably the discoverer who is portrayed gazing out upon his discovery, rather than a god.

Some centuries after this Chalcatzingo-31 bas-relief, the Olmec city of Teotihuacan became (in the Current Era) the largest city in the pre-Columbian Americas. It sets precedents for, and had a direct influence over, the later Maya civilization. For this reason Teotihuacan is called a *pre-Classical* Maya creation. The city had large stepped pyramids and a long road with "courts" and Professor Sugiyama has worked on the city design for decades and came up with a Teotihuacan Measurement Unit (TMU) of 0.83 metres (Sugiyama, 2010). This length happens to fall at the higher range of the unit of measure called the megalithic yard and when the astronomical variant of the megalithic yard is used, the centre lines of the Pyramid of the Sun and Pyramid of Quetzalcoatl are found to be exactly 1440 AMY apart, along the axis of the road, as if the road was a string length in a harmonic scheme (figure 15).



Figure 15 Presence of 1440 units between the pyramids of the Sun and Quetzelcoatl, when corrected to the old world unit of the Astronomical Megalithic Yard of 19.008/7 feet.

The astronomical intent of the monument is demonstrated by the fact that the width of the Citadel of Quetzalcoatl is 583 AMY, whilst the periodicity of Venus (the planetary identification of Quetzalcoatl in the Maya calendar) is 584 days. Also, according to Professor Sugiyama the Pyramid of the Sun is 260 AMY square, numerically the same in megalithic yards as the number of days in the Tzolkin sacred repeat cycle of 13 day-number and 20 day-name combinations.

The Parthenon of Athena

McClain and Kapraff found many interesting numerical details in their paper on the Parthenon¹³, including the discovery of Adam's number, 1440, in terms of its building units (i.e. its metrology). The building appears to have employed a foot of 9/8 (English) feet, having a digit of 16 units per foot. This enabled the peristyle to have a width of 90 such feet, meaning 1440 digits, a length also found in the cella where Athena's statue faced the entrance. The 90 foot width (of 9/8 English feet) can be seen as 100 feet (of 81/80 English feet), introducing the syntonic comma whilst making the Parthenon a *hekatompedos* or "hundred footer" in width.

The cella introduced new smaller columns (see figure 16), and Athena's pedestal ended at the centre of the eighth column from the entrance, a measure of 960 digits (c.f. the lunar year), whilst the ninth column is centred about 1080 digits (c.f. the Jupiter synod), and the wall of the treasury (second back room of cella) completes a run of 1440 digits. The tenth columns form a back row of five leaving nine columns up to 1080 digits. Multiplied, the nine columns and the five back columns give Adam's root number of 9 times 5 = 45.

¹³ (Kapraff, 2005)



Figure 16 The Parthenon appears organised around Adam's number 1440, the 9/8 whole tone and 81/80 syntonic comma.

Between the eighth and ninth columns is found the centre of the length of the Parthenon, marked by its central column of 17 outer columns. This corresponds, in the cella length of 1440, to the geometric mean of the octave between 720 and 1440 digits. This mean would be 1018 digits, whilst the ab Saturn synod of 1024 digits runs slightly above the mean, but still through the central outer pillars

This transposes the story of Adam = 45, times 32 to 1440, with tuning order of lunar year G = Athena and Zeus/Jupiter synod A, standing behind her as if she had just emerged "fully armed and with a shout" from Zeus's headache, cut open by Hephaistos the Smith (that is Saturn), to divide the whole tone by a cut of

16/15 from G, i.e. ab. This theme of centrality within the monument, representing the geometric mean, is repeated in the vertical sense via the frieze of metopes which are alternately above the ashlar joints, the seven ashlars representing the octave of eight notes in their joints and/or ends (figure 17).



Figure 17 Arrangement of the Tones of 1440 onto the Metopes to form a Chromaticism about the central geometric mean. (The C and E have Just alternates, c and e, unused in the diagram above.)

Conclusions

The numerical tuning system recovered from Plato's allegories by Ernest G McClain, can be used to understand the inner meaning of some ancient texts which employed it as a structuring tool. The same tuning system also appears in monumental works and is the number of Adam (1440) in particular. Ancient texts like the Bible and monumental works like the Parthenon both appear to be using numerical tuning theory focussed upon Just intonation, but then conflated with ideas of divinity, these often explicitly associated with planetary gods by those cultures. This unusual fact arises because the octave series 720-1440-2880

enables the whole tone, a 9/8 interval between the lunar year and Jupiter synod, to be modelled using the ancient tuning system, so that the cornerstone becomes the 12th tritone, as the 16/15 interval between the lunar year and the Saturn synod.

The best reason for objective knowledge of the planets to have been presented within texts and monuments using Plato's tuning theory is that it was the necessary means to differentiating 2, 3, and 5, found necessary in the first instance when these planetary harmonies were first understood. In support of this, my own knowledge of these outer planet resonances only made proper sense after I had understood Ernest McClain's system based upon Plato's tuning theory.

The reason why a harmonic matrix might successfully model such celestial resonances (without the modern use of super computers or Hamiltonian integrations of phase spaces) is that all the celestial relationships in different parts of such a matrix act as a whole to maintain the pattern. When planets act upon each other within a harmonic matrix, it is to a much greater effect through a means as yet hidden to modern celestial dynamicists.

Mythology is presumed to have come from an oral world, and temple designs are often known to have been images of the cosmos, but the modern reading of both of these is as works of imagination, art or belief. Persistent notions of a music of the spheres have, since Plato, regularly failed to provide a plausible organising principle for the planets using harmonic ratios¹⁴. Yet Plato's tuning theory, as recovered by Ernest G. McClain, has proved to be my key for revealing, in ancient monuments and textual allusions, a pattern of Just intonation in the heavens that corresponds to our knowledge of these same astronomical invariants today; an actual music of the spheres.

Such an ancient "theory of everything", based upon harmonic planetary gods, could only have been detectable after 4000BC, using the megalithic techniques

¹⁴ For a Sourcebook one can turn to Joscelyn Godwin (Godwin, 1993).

of counting days, geometrically comparing the synodic periods of the three outer planets (Jupiter, Saturn and Uranus) to the lunar year, as interval ratios.

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Appendix – Astronomical and Musical Constants

Days are tropical days according the recurrence of the sun after a rotation of the earth.

Period	Duration	Units	Interval to Lunar Year	Precision (cents)
Lunar month	29.53059 days	80		
Lunar year	354.367 days	960		
Eclipse year	346.62 days	937.5	125/128	3
Sidereal day	0.99728 <u>3</u> days			
Sidereal Month	29.899722 days	81		
Sidereal Year		972	81/80	
Jupiter synod	398.88 days	1080	9/8	1
Saturn synod	378.09 days	1024	16/15	1⁄2
Uranus synod	369.66 days	1000	25/24	2 1/2
1/1000 Uranus	0.369132 days	1		2 1/2

Citations

Bernal, Ignacio. 1969, 1976. *The Olmec World*. Berkley & Los Angeles : University of California Press, 1969, 1976.

Berriman, A. E. 1953. Historical Metrology. London : J.M. Dent, 1953.

Brumbaugh, Robert S. 1954. *Plato's Mathematical Imagination.* Bloomington : Indiana University Press, 1954.

Christensen, Duane L. 2009. *NAHUM A New Translation with Introduction and Commentary (Anchor Bible v. 24F).* New Haven and London : Yale University Press, 2009.

de Nicolas, Antonio. 1976. *Meditations Through the Rg Veda*. Stoney Brook, N.Y. : Nicolas Hays, 1976.

Douglas, Mary. 2007. *Thinking in Circles.* New Haven & London : Yale University Press, 2007.

Godwin, Joscelyn. 1993. *Harmony of the Spheres: A Sourcebook of the Pythagorean Tradition in Music.* Rochester : Inner Traditions, 1993.

Havelock, Eric A. 1963. Preface to Plato. Cambridge, MA : Harvard University Press, 1963.

Havelock, Eric A. 1986. *The Muse Learns to Write*. New Haven & London : Yale University Press, 1986.

Heath, Richard. 2013. *Astronomical Musicality within Mythic Narratives, in Proceedings of ICONEA 2013.* Oxford : ICONEA.org, 2013.

—. 2011. harmonicexplorer.org. *Harmonic Explorer - Ancient Musicology by Limiting Numbers*. [Online] Universal Programs, 2011. http://harmonicexplorer.org/.

---. 2014. *Sacred Number and the Lords of Time*. Rochester, Vermony : Inner Traditions, 2014.

Kapraff, J. and McClain, E.G. 2005. The Proportions of the Parthenon: A work of musically inspired architecture. *Music in Art: International Journal for Music Iconography.* New York : Research Center for Music Iconography (RCMI), 2005, Vol. Music in Art: International Journal for Music Iconography.

Kapraff, Jay. 2002. Beyond Measure. s.l.: World Scientific, 2002.

McClain, Ernest G. 1976. Myth of Invariance. New York : Nicolas Hays, 1976.

-. 1978. The Pythagorean Plato. York Beach, Me : Nicolas Hays, 1978.

Sugiyama, Saburo. 2010. Teotihuacan city layout as a cosmogram. [book auth.] ed: Iain Morley and Colin Renfrew. *The Archaeology of Measurement, Comprehending Heaven, Earth and Time in Ancient Societies.* Cambridge : Cambridge University Press, 2010.