MUSIC AND DEEP MEMORY

Speculations in Ancient Mathematics, Tunings, and Traditions In Memoriam Ernest G. McClain 1918 - 2014

> ICONEA PUBLICATIONS LONDON Edited by Bryan Carr and Richard Dumbrill

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Prima la musica e poi le parole ICONEA PUBLICATIONS LONDON

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Ernest G. McClain Gedenkschrift

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Late 1940s post war, with ruptured duck veteran pin



On the hiking trail, USA, 1970s



Sailing on Long Island South, 1960s



Hiking in the Alps, circa 1970.

Foreword

Ernest McClain was one of the last great spiritual antediluvians. In a century during which scholarship tended overwhelmingly to regard the ancients with either scientistic or deconstructive condescension, McClain simply settled down to patiently learn from them. Eschewing the wishful projection which would cast them in the image of a lost golden age, or a defensive antiquarianism which retreated into museum exhibits, McClain discovered the ancients continuing to speak -- or more precisely, to sing -- in the musical heritage of the whole human race. Listening to this unbroken voice, he eventually attuned himself to it so well he became, himself, the living embodiment of a mode of thought which one might have guessed had gone out of the world.

Beginning in the 1970s, starting with three extraordinarily dense books and continuing in a stream of essays and correspondence that lasted until the day of his death, McClain propounded a thesis, notable equally for its profundity and its simplicity, which read the archaic mythico-speculative inheritance of the West "from the Rg Veda to Plato" and beyond, as a musical cosmology. His work never gained anything like mainstream recognition (a fact which in later years he occasionally noted with bemused resignation), but for a small cadre of researchers, McClain is (as Joscelyn Godwin called him), "one of the most original and ingenious researchers of our time."

McClain's work was concentrated upon recouping the heritage of the ancient world, but he had more proximate sources in classical European culture. He was pointed to his method and to his important conclusions by three great friends. McClain always insisted that his work had been inspired and encouraged, in a manner far from casual, by his relationships with Hugo Kauder, Ernst Levy and Siegmund Levarie. Jewish refugees who had just ahead of Hitler's expansionism, they were also representatives of a musical and cultural milieu that had grown up in Europe continuously for centuries -- the heritage of folk music, Church psalmody, carmina burana; of Troubadors, Renaissance polyphony, Baroque innovations; of the evolution and cross-fertilization of Western music from the Classical era through the Romantics to the upheavals of the early 20th century. His close friendship with these men -- composers, performers, and scholars of high order -- was why, as a clarinetist trained in the Western classical repertoire, McClain was also sensitive to a Pythagorean heritage he eventually came to believe derived from the Neolithic age, via Egypt and Sumer -- and yet reaching all the way to us. This is important to emphasize, not simply in the interests of giving due credit, but because McClain frequently puzzled interlocutors by claiming that his work had a serious contemporand was not meant merely as a divertimento of

Each of McClain's books -- The Myth of Invariance, The Pythagorean Plato, and Meditations through the Quran -- is a set of closely-argued excurses through a body of literature as if through an underground mine, looking for the telltale glint of something sparkling in the walls. That sparkle is number, and McClain demonstrated over and over that numbers are not scattered randomly throughout ancient texts. There is a preponderance of multiples of very low primes -- notably 2, 3, and 5; and very often, when a number that cannot be so reduced does occur (say, 37), looking to the context with the small primes in mind will yield a plausible rationale. The books have been noted for the density of their presentation. ("Obscure," "hard to understand," "inaccessible," are terms that come up in the (positive!) reader reviews online.) This challenge to readers is only partly due to the mathematics. More challenging is the fact that once McClain has a numerical trope established, he frequently runs with it, employing it just as the ancients (he held) did: as an extremely abbreviated of thought, which could be adapted to many different situations. And yet, he insisted repeatedly, the mathematics involved was itself "hot child can learn it," he claimed, and he implied moreover that in the era of the pocket calculator, no one, not even the math-averse, had any excuse. (As of this writing, all three of McClain's books are available in pdf from his website, www.ernestmcclain.net , as are numerous essays. The shortest, most accessible, and least tendentious introduction to McClain's basic insights, however, may be the third and fourth chapters of Jay Kappraff's excellent popular mathematics book Beyond Measure.)

Serious engagement with McClain's work cannot help but alter one's apprehension of the whole apparent shape of ancient literature -- not least, the Platonic dialogues. My own experience is probably not too aberrant in this respect. For years I had known that I did not know how to read Plato. The stupid caricature of the body-denier, the philosopher who invented "another world" since "this" one was so changeable and disappointing (and, let's not forget, who "banished the poets"!), had always rang false -- a whipping-philosopher dragged out whenever we needed to blame someone for "essentialism." But although I could "smell" that this travesty was simply wrong, I did not know what to replace it with. There was obviously a tremendous amount going on between the lines in Plato that was going right over my head. No doubt much of this was due to the fact that it was written in 2,300-year-old Greek. And yet, Plato was so obviously concerned to transcend the particular, to reach beyond the limitations of a given setting -- not to deny them, but to refuse to be ruled by them. The limitations of a particular language were real, but they could not be dispositive. There must be a way in -- but where was it?

The Pythagorean Plato pointed out that the way was right where we had always known it was. The door to the Academy famously had on its welcome mat the phrase, Some Geometry Required (loosely translated). "Platonism" was expressly characterized by its coupling to the mathematical truth-condition. But however much commentators might acknowledge this at a kind of high-altitude level, the actual mathematics that occurs in the dialogues is very frequently ignored. (One stark example of this is found in the 1947 translation of the Republic by F.M. Cornford, in which Cornford permitted himself to omit entirely Plato's "extremely obscure" account (at 8.546b) of the so-called ruling or nuptial number, and also to "simplify" the text (at 9.587b) concerning the number of the Tyrant. Even when scholars do not give themselves such free rein, they very often let the mathematics pass by without much comment.)

McClain himself did the clues in some commentary, including some very old commentary -- above all, Albert von Thimus, to whom he was pointed by Kauder, Levy, and Levarie; but also James Adam, Thomas Taylor, Plutarch, Proclus, Aristotle. Really, though, we might have guessed, for it is obvious once you think of it: Plato's mathematics is musical -- not accidentally, but essentially so. McClain understood the stakes of this interpretation to reach far beyond the exegetical:

From Philolaus in theentury BC, through Plato and Aristoxenus in the fourth, and down to Ptolemy in the second century AD and Aristides in the third or fourth, Greek acoustical theorists **thotud**en two modes of expression: the absolutely precise and the conveniently approximate. ... There is an urgent need for a review of all these ancient materials, not simply for their intrinsic interest to musicians and historians of science, but for their wider relevance to the philosophical foundations of Western culture. (The Pythagorean Plato, p.162) Indeed, (though this is perhaps not quite so obvious), this tradition is itself part of a great underground current of musico-mythical cosmology, which McClain worked very hard to unbury, stretching back to the Vedas (and likely before) and forward at least as late as the Quran. The most obvious "fossil record" of this tradition is the recurrence, not just of verymbers -- numbers which are usually

multiples only of very small primes (mostly not higher than 7) -- in cosmological and visionary contexts, but of various sets of numbers which can be seen to "go together," in a way that indicates that writers knew the provenance of the numbers, or at least that certain numbers called for certain other numbers, even when the surface meaning of the text has nothing overly to do with music -- aside from, say, the mention of a number of harpists or trumpeters attending the celestial court.

All throughout a largely misunderstood (when not ignored) career of four decades, McClain never tired of insisting upon the tremendous import of this project. He himself declined to write philosophy in any but the most occasional or offhand modes -- he was unpacking a prelude to philosophy, he said. (His friend and correspondent the Aristotelian philosopher John Holthouse once opined to me that "Ernest is a philosopher, but would rather die than admit it.") It was, I came to see, not just that the numbers were a sort of scaffolding for a widely various but shared cultural background. The numbers were symptomatic of something else. They were features of a whole way of looking at, and being in, the world -- not an arcially schematized worldview parsed out in multiples of 2, 3, and 5, but a world in which the "metaphor" of cosmic harmony came perfectly naturally, and indeed was no metaphor. (Indeed, the phrase "cosmic harmony" may make us cringe in reaction to Newagey overtones, but did no such thing for the ancients).

In saying this much, I've already gone beyond what McClain himself explicitly argued. Whatever the range of associations he allowed himself, he nonetheless held himself to a strictly empirical program. His numbers were all there on the surface of the text itself, or in a very few cases, easily derivable from those that were. No one ever disputed this. It was the rationale he deduced that earned him occasional rebuke and eventually either polite disregard or sometimes misapprehending fandom. Early on, Gilbert Ryle set the tone. "Plato would never," he informed McClain, "have planted all that musicology for you to " To which one rejoinder must surely be, well then, how is one to account for the numbers, the very numbers, in (for example) Plato's texts? The Tyrant is held, in the Republic, to be exactly 729 times less fortunate than the good ruler. Not "about 700," not 730. There are exactly thirty-seven guardians of the city Magnesia in the Laws, a city which Plato repeatedly insists will be composed of 5,040 citizens.

McClain's conclusion was not that Plato really "supposed that the well-being of the city depended almost as much on the number 5040 as on justice and moderation," (as Jowett remarks). Nor did he believe, as Ryle feared, that Plato had played a kind of nudge-wink game with his readers for the fun of a few initiates. It was, rather, that Plato's exposition of justice and moderation found a completely natural expression in terms that privileged this musical and numerical grammar, and did not it distracting. Far from being some private diversion on the part of Plato, it was an inherited vocabulary shared across a wide spectrum of wisdom texts descending from a common tradition, which lasted in oral culture even until the early strata of the Quranic tradition. Even among his disciples, there has been add the of opinion about the nature of the nature

of the importance of McClain's work, and much of this variation is occasioned by this wide-net approach which drew in a vast range of background, beginning with the Rg Veda (on which his friend Antonio de Nicholas had written a book, Four Dimensional Man, whose importance for his own work -- and for his serious students -- McClain frequently emphasized). Some readers seized upon McClain as grist for anti-modern contentions, trying to recover an ostensibly lost tradition capable of producing "real magic." Some imagined that McClain's numbers would provide something like the resonant frequencies of the soul, a means for opening the crown chakra by just the right solfeggio. Others were intrigued enough by the musicabuild instruments aligned to various tunings derived from McClain's work.

And some were content to multiply contexts in which McClain's tonal harmonics could be plausibly applied, but without raising larger questions as to why.

My own interpretation is, I am sure, no less idiosyncratic. Tuning a musical instrument is a continual practical exercise in letting good enough be good enough; in making one adjustment here and then a counter-adjustment there. The great paradox is that this became the wering seedbed of an effort to understand the whole. Because there are incommensurables built into the theory, the theory becomes a self-referential exercise in showing how theory itself fails to account for the whole, but in a way that weirdly manages to show the whole as needing no accounting. Approximation and precision become the warp and woof of cosmology and indeed of askesis. (And, I will add, Plato is especially is account because he comes at an historical moment when, under the inexorable of writing, the complete naturalness of this way of thinking is no longer so evident, but has become itself a problem.)

McClain kept a respectful engagement with all contacts and the proclaimers of all interpretations, never disdaining them; often from their suggestions even while insisting that what he was talking about was not "secret" and never had been, in any para-Masonic sense. It was all out on the surface of the texts; you just had to learn to think like the authors. (Here again, the fact that his method grew out of continuity with the whole tradition of Western music and culture, helps one to gain purchase on this point.) He had warm and deep correspondence with giants like John Bremer and Seyyed Hossein Nasr, and also with young and eager readers who had discovered his books or his website on their own and sometimes had no credentials aside from being intellectually alive and not risk-averse. In the last decade of McClain's life, many of these exchanges occurred under the auspices of the online BIBAL forum, moderated by Duane Christensen, a scholar of the Old and New Testaments and himself an embattled proponent and architect of a structural hermeneutic which read the Hebrew and Christian scriptures alike as very precisely (and numerically) engineered. An extremely accommodating moderator and an enthusiastic partner in dialogue, as well as a tireless pastor (he and his wife Martha carried out a prison ministry for years), Christensen not only fostered a conversation among a number of very diverse interlocutors -- a conversation which was very invigorating for McClain and those who encountered him there -- but also did much himself to advocate for McClain's work, including using it as an important aspect of his theoretical basis in his commentary on the prophet Nahum in his new edition for the Anchor Bible series.

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Much encouraged by this late-blooming attention, McClain evinced a palpable optimism, continuing to believe that a breakthrough insight might well surprise him and force revision of everything he'd written. I've never known anyone with more intellectual gumption. On BIBAL, he relished sharing and sparring with friends, throwing out variations on the book of Ezekiel one day, a poem the next, always ready to make mistakes in public, and insisting both that no one believe him "until you must," and that whatever your own work was, you did it "your way." (I remember a titanic debate between him and David Crookes over the pertinence of gematria, which reminded me at the time of Nabokov and Wilson clashing in the pages of the New York Review of Books: the rest of us went scurrying. Well, I did. McClain said at the time, "Two musicians couldn't agree more perfectly to disagree profoundly! Ain't that usually the way with our breed?" Crookes repaid the compliment when in his remarkable book The Lord Shall Count he thanked McClain "for his instruction, for his encouragement, and above all for his regular bursts of .")

An invaluable -- and now keenly missed -- friend and mentor, a never ging enthusiast of "adventures in ideas" (a Whiteheadian phrase he loved), McClain took with great seriousness the ancients' love of play and their easily-shifting referents. I slowly came to see that he had indeed learned to think like them. The oft-remarked density of his books is a function not of obscurity of his subject-matter, but of the extreme compression with which his mind was accustomed to move, the way he could pack whole clusters of "contradictory meaning" into root-metaphors. To the outsider this is bewildering, and looks like either eye-glazing calculus or word salad. But after spending enough time with him, one came to see that the details, while ready to open up if you did the work (which in every case turned out to be almost as easy as he promised), were actually part of the "precision" that took its accustomed place within approximation's relaxed mode. "Agreement" and "disagreement" are thus themselves in a continuous dialectic with one another, in theory as in practice -- which means that the effort to understand becomes itself an instance of what is to be understood. The musician recapitulates the music. In short, McClain taught us that the law was always already included within grace.

Bryan Carr

INTRODUCTION: MUSIC AND DEEP MEMORY Speculations in mathematics, tuning, and tradition

IN MEMORIAM ERNEST G. MCCLAIN

Ernest McClain's work is an enthusiastic and painstaking excavation of tradition. McClain always maintained that what he was "uncovering" had in an important sense never been hidden; the numbers were an inevitable side-effect and index of the phenomenon of human music, and their symbolic and "mystical" import remained recoverable with due humility and patience. He was, eventually, philosophical about his relative marginalization in Academe, and he knew he had produced work which was a taxonomical challenge to librarians and scholars. Was it history? Music theory? Philosophy? Despite its empirical foundations, McClain's work is speculative insofar as it hypothesizes certain techniques which cannot be v to have been used anciently -- though it makes sense to think they were used -- and in making use of parallels which are broadly cross-cultural (anciently) and cross-disciplinary (today). McClain was sometimes cavalier about what explanation(s) should be entertained for these parallels. Diffusion? Structural similarities? Archetypal psychology? Mystical insight? What he insisted upon was the need to be arithmetically accurate, musically realistic, hermeneutically responsible, and speculatively adventurous.

"Music" in our title, we take it, is self-evidently apposite. "Deep Memory" pertains to this tradition -both intentionally and unconsciously maintained and recorded -- which McClain felt (though he could not prove) was continuous from the Yangtze to the Thames and from Gilgamesh to the Quran (his correspondents sometimes pressed it as early as Avebury or Lascaux -- to say nothing of Atlantis! -- and as late as Snorri, or Chaucer, or Bacon). The essays in this volume explore this tradition in some of its historical, mathematical, musical, architectural, and philosophical aspects. These essays are acts of homage and affection, attempts to carry forward in the spirit of living enquiry which McClain'Exercit

topics are perhaps more various than is typical for a collection of this sort; but they belong together not merely accidentally as associations of a particular scholarly career, but essentially as different dimensions of a coherent research program of extensive relevance. However, it bears mentioning that perhaps not all of them would have met with McClain's unreserved approval. He would have applauded their seriousness and their daring; he might well have taken issue with their method or conclusions. Every essay is testimony to the unreserved encouragement of spirit he offered during his life; his willingness to critique -- and the way he did so -- was part of that generosity.

McClain was deeply concerned with how human beings, in their musical and mathematical ingenuity, devised ways of developing and exploring variation under different degrees of constraint. Such constraints are many: the resistance and different behaviors of materials, the limited capacity of the human ear and voice; the fact that all geometrical depictions are approximations of idealities. Jean Le

Mée's paper, "The Challenge of Abul Wafa," treats one particular set of constraints: the requirement, imposed by mathematical discipline, to construct geometrical (in this case, the e Platonic solids) with compass and straightedge alone. This constraint is made more rigid by Abul Wafa by restricting the compass setting to a single width: the so-called ed" or "rusty" compass. Le Mée points out not only that this challenge can (with due intrepidity) be met, but gives detailed instructions for meeting it. (It remains an open question whether Le Mée's solution is precisely the one Abul Wafa would have used; it must, in any case, be close.) This very oblem its place in a very wide and lengthy tradition of geometrical and practical inquiry, which forms the background to Leon Crickmore's contribution, "Castlerigg: Stone or Tone Circle?" Crickmore offers an interpretation of the Castlerigg, a neolithic monument situated in the northwest of England and remarkable for its preservation and its beautiful site. Crickmore reads Castlerigg in terms of both astronomical and musicological systems, seeing it not justianted to celestial events, but as a large-scale model of the octave. The background Crickmore assumes ranges from the elaborate diagrams from the 18th-century papers of John Byrom, through Greek tuning systems, to Babylonian geometrical problems (for the interpretation of which he makes somæggestions); and he concludes with a suggestion that, in "playing" with the correspondences, one may generate new insights, "even contradictory" ones, poetically resonant even if not This may seem a tremendous amount to include in a single glance, but the perhaps bewildering range of materials is underlain by an expressly musical rationale. Jay Kappraff's paper "Ancient Harmonic Law" goes into great detail explicating this. Kappraff, who has previously devoted several chapters to McClain in his books Beyond Measure and Connections, and who collaborated with McClain extensively, is perhaps uniquely to offer such exegesis. In his paper, Kappraff unpacks McClain's close reading of Nichomachus and Boethius. He demonstrates that, however broad the metaphorical applications, McClain's mathematics was always rigorously grounded in concrete and demonstrable musical proportions, with which these ancient authors were familiar and comfortable.

The number seven looms large in many of these considerations, because these proportions generate a scale of seven notes, widely associated in antiquity with the seven classical "planets." Seven is also linked to one of the earliest geometrical problems which is unsolvable with compass and unmarked straightedge alone: the drawing of a heptagon. Sarah Reichart and Vivian Ramalingam show how this challenge was navigated by convenient approximations in several striking monuments of sacred architecture. They provide a rich account of the histories and implicit symbolisms of these sites, striking in their crosscultural resonance. Their survey covers three buildings, in France, the Netherlands, and Germany (and mentions several other sites of interest along the way), and also treats the extensive symbolism of the number seven rooted in myth, scripture, and numerology. Such architectural (and acoustical) projects are of course not carried out for the sake of overcoming a geometrical Thou Shalt Not; they occur in cultural milieus which provide cosmological and spiritual grounding for those who participate in them. In "Pattern of Settlements 1-9," Petur Halldórsson shows how far back (temporally), and how widely diffused (geographically), such cosmologico-architectural impulse may be found. Halldórsson's approach is rooted in the work of Icelandic scholar Einar Pálsson, but his survey extends beyond the Icelandic context that Pálsson mostly stayed within. Considering sites in Iceland, Denmark, France, Greece, Italy, and Egypt, Halldórsson contends that one may discern in each case a method of plotting human settlements with respedandscape features in such a way as to align with important recurrent astronomical events. This practical dialogue between human ar, terrestrial environment, and celestial pattern, is of the essence for understanding the application of musical grammar McClain read. Anne Bulckens' paper "The Metonic Cycle and the Parthenon" argues that a similar (not at all identical) encoding of astronomical and musical proportions was used by the architects and builders of the Athenian Parthenon. Bulckens' work includes an imaginative but plausible method by which the lengths of the year could have been determined with considerable precision, and her architectural claims are spelled out, in many cases, down to fractions of millimeters. Her reconstruction includes a highly ingenious (albeit speculative) system whereby various astronomical time-spans would have been represented not by lengths but by areas; a solution which is, as far as I know, unique in the literature.

As a sample of McClain's own work, "The Proportional System of the Parthenon" ex the way he too experimentally applied this grammar to ancient sacred architecture. This paper, an earlier version of which built upon some of Bulckens' preliminary results, is a collaborative effort with Kappraff, who has also paper and prepared it for publication. Kappraff and McClain show not merely how numerous measurements of the Parthenon are plausibly connected, via musical proportion, to the Vedic altars whose construction is described in the Shrauta Sutras. This chapter by Kappraff and McClain is accompanied by an appendix by Richard Heath, which relates theto broader disputes in the of ancient metrology. Heath's larger contribution to this volume is "Ernest McClain's Musicological Interpretation of Ancient Texts," which is an application of McClain's method to the text of Genesis. A researcher whose work has focused upon ancient metrology and astronomy and the remarkable ways in which these intertwine with music to suggest a coherent ancient cosmology, Heath developed his website HarmonicExplorer.com (a tool which happily McClain was able to utilize during the last years of his life), in order to more readily unpack such resonances. Using graphics from this indispensable resource, Heath is able to show with considerable detail how an interplay of symbolic, narrative, and mathematical elements illustrates the way these aspects worked together in the minds of the authors and redactors of Hebrew scripture.

Such textual analysis, this time of Plato, is also the focus John Bremer's paper on "The Opening of Plato's *Polity.*" It is an honor to include this contribution by John Bremer, who did not live to see its publication; his scholarship and his care for the real ends of education made him that rarity of rarities, a philosopher in the real sense: a lover of wisdom. (He always modestly shook his head at McClain's compliment that he was "the best Greek scholar I know," and preferred to remember what was said of Thomas Taylor: "that his opponents knew more Greek, but he knew more Plato.") Making the case that Plato gave extreme care to rained micro-engineering of his texts, Bremer attends to the eight words of this dialogue – "I went down yesterday to the Piraeus with Glaucon son of Ariston." From this hyperfocus, Bremer then gradually opens up**that** arise when one takes seriously the possibility of such attention on the part of Plato as author. Bremer believed that tlæstended as far as the counts not just of lines or words, but of syllables, in Plato's texts; but he also always insisted upon remaining rooted in and oriented by the fundamental issues of philosophy: how one should live. (Forget these questions, Bremer said, and we may as well do crossword puzzles.)

Either in the case of the Bible, or in the case of the Platonic corpus, one is often struck by the question of whether such uctured engineering is historically or textually plausible; but also, why it would matter. Both Heath and Bremer show its plausibility, and moreover what such structuring could accomplish. But – granted that philosophy could take such pains – why should one attend to such a philosophy? The paper by Bryan Carr, "Ontology Inside-Out," is meant as an exploration and illustration

of what might now be at issue for successful successful of anciently, but today. It

asks this by way of a comparison between Aristides Quintilianus, the Neoplatonist musical theorist, and Quentin Meillassourcontemporary philosopher whose work aims to press as far as possible

the implications of the mathematical, as opposed to the musical, reading of the cosmos following from the Copernican-Galiliean revolution. The stakes of this philosophical contest, Carr argues, are high, and include the terms under which the Hellenic and the Biblical heritage of the West can fruitfully engage with each other. The following paper, by Babette Babich, can be regarded as one possible set of variations on the playing-out of thirs the contemporary world. Babich's paper, "The Hallelujah

Effect," is a kind of "retrospective preface" to her book by the same title, which had its origin in ongoing email correspondence with McClain in the last years of his life. A long and meandering excursion into the conditions of musical culture today, *The Hallelujah Effect* takes its title from the remarkable song "Hallelujah" by Leonard Cohen, one of the most-recorded songs in recent decades, and traces it through several versions, raising along the way far questions about internet culture, advertising and ideology, and philosophy of music (with special attention to Nietzsche and Adorno). Those looking for the immediate connection with some of McClain's own concerns may wish to start with section III of the paper: "On Nietzsche's Greeks and Nietzsche's Beethoven."

So much, then, for allegations that McClain's contentions are implausible, or irrelevant. There remains, however, an oft-mbout whether they are anachronistic. This is the question addressed by Pete Dello in his paper on "McClain's Matrices." Step by step, Dello shows that although it remains an open question whether it was utilized precisely in the form in which McClain presents it, it is plainly not anachronistic when compared with the mathematical and musical achievements of the Sumerians already in the third millennium BC. Dello gently insists that a musical scribe of the era, easily grasping McClain's method and point, would readily have recognized him as one of their own. The question of anachronism also informs the next paper, Richard Dumbrill's "Seven? Yes, but…", an extensive inquiry into the tuning systems that can be decoded – not uncontroversially – from Akkadian and Sumerian sources. Dumbrill gives an account of – and takes a strong position in – the polemics concerning reconstruction of the scale used in this ancient music: how many notes? Where was the root tone? How did the tuning proceed? And were the scales supposed to be ascending or descending? Over a long professional friendship, Dumbrill and McClain argued over the details of various such reconstructions; Dumbrill always insisting that the texts had to have the word; McClain often shrugging that his mathematics made perfect symbolic sense, and that practical musicians were always entitled to ignore theoretical niceties in any case.

The questions of mediation between antiquity and today, between music and mathematics, between the Hebrew and the Greek (and Egyptian, Sumerian, Chinese!) heritage, and between the venned the extremely broad, remain the focus of the next chapter. Howard Barry Schatz argues, in "Through the Eyes of Plato," that McClainesay be fruitfully applied to -- or perhaps, are themselves an application of -- a spiritual technique that has its provenance in the foundational Kabbalistic document, the *Sepher Yetzirah*. Pointing out the essential continuity of McClain's work with that of Kauder, Levy, and Levarie, and that of the important and neglected Albert von Thimus, Schatz argues that these insights shed crucial light on comparative religious studies, the musical history of the West, and indeed on the eventual promise offecory of the whole universe in terms of string theory; most

perhaps, he underscores their import for the contemporary possibilities in ecumenical dialogue and interreligious spiritual discipline.

In keeping not only with our intention to honornt scholar, but with the spirit in which his work unpacked the intertwining of the particular and the universal, many of our chapters include personal recollections of Ernest McClain by the authors. We conclude the volume as a whole with a moving memoir by Gerald M. Turchetto, who recounts in vivid terms both the philosophical stakes of McClain's project and the culties of understanding it oneself -- let alone of getting it a fair hearing. The (pseudo?-) Platonic *Epinomis* includes this prediction:

To the man who pursues his studies in the proper way, all geometric constructions, all systems of numbers, all duly constituted melodic progressions, the single ordered scheme of all celestial revolutions, should disclose themselves, and disclose themselves they will, if, as I say, a man pursues his studies aright with his mindon their single end. As such a man eceive the revelation of a single bond of natural interconnection between these problems. [Epinoimis 991e>]

This moment of insight bears comparison with account Turchetto gives of his own Eureka-moment during his lesson from McClain with the monochord: "By following his various placements of the triangular fret along the monochord and listening as he did so, the mathematics and the music merged in my experience. All the mathematical decisions that drive the music, and all the musical decisions that drive the mathematics, were brought home to me, along with the intense frustration of wanting to make them work together harmoniously without compromising the integrity of either. Good luck! That dilemma is at the core of it all."

These essays are each attempts to wrestle with this dilemma. They all bear the marks of practice in the studio where learning is the fret, speculation the tuning peg, and the string is the human soul itself. Knowing the stakes, the poised tension between spirit and letter, Ernest McClain would surely have argued strenuously with (or against!) any number of contentions herein, even while insisting that his opponents stick to their guns. What is crucial is the rapport, in which argument and agon is but a single phase – albeit an essential one. Offered in a spirit of tribute and homage, these writings are given also as continuation of a great adventure in which each of us is tempered by every other.



Ernest and Augusta on their wedding in 1973



2010

Ernest G. McClain (August 6, 1918, Massillon, Ohio - April 25, 2014, Washington, DC)

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THE GEODETIC AND MUSICOLOGICAL SIGNIFICANCE OF THE SHORTER SIDE LENGTH OF THE PARTHENON AS HEKATOMPEDON OR 'HUNDRED-FOOTER'

Richard HEATH

This note responds to Kapraff and McClain's preceding paper, in which they discover a many faceted musical symbolism in the Parthenon. , Ernst Berger's new measurements

include the shorter side of the triple pedestal of the monument as an accurate length to represent one second of the double meridian of the earth. By applying a knowledge of ancient metrology, Anne Bulckens' doctoral derivations of a root foot can resolve to a pygme of 9/8 feet, of which one second of latitude would contain 90 such feet. However, as a 'hundred footer', the foot length should then be 81/80 (1.0125) feet, the ratio of the syntonic comma. This would indicate a replacement, by Classical times, of the geographical constant of 1.01376 feet within the model of the earth since the original model, by the late megalithic, assumed that the Meridian was exactly half of the mean circumference of the earth. These alternative geographical constants co-incidentally represent a ubiquitous theme in ancient musicology of the transition between Pythagorean and just tunings and their respective commas.

By Classical times the term hekatompedon or 'hundred-footer' had evolved, to describe the ideal

dimensionality of Greek peristyle temples. One of the earliest, the Heraion of Samos, came to be 100 feet long by the end of the 8th century¹, in contrast to the surface width of the Parthenon's stylobyte which had been established as in the range 101.141 (Stuart, c.1750) to 101.341 (Penrose in 1888) feet².

Recent measurements in 1982 by Ernst Berger³ found that the top surface of the stylobyte was just over 101.25 feet wide⁴ and that the most frequently occurring length was 857.6 mm. Anne Bulckens²⁵ corresponding foot measure for this would be a step of 2.5 feet, each of 9/8 (1.125) feet, to within one part in 2500; a foot length called a pygme within historical metrology, after the size of small men mentioned when Herakles was travelling back from India⁶. The shorter ends of the Parthenon's stylobyte would then be 90 such feet across.

However, should the two ends be divided by 100, the required foot length of 101.25 feet becomes a microvariation of the English foot, namely 81/80 (1.0125) feet, a ratio identical with the syntonic comma. This is another ratio crucial to the history of ancient tuning theory; being found between pure Pythagorean tones (9/8) and their counterparts within just tuning (10/9); when string lengths are giverhole number lengths to specify their pitches intellectually.

A recent article by Jay Kapraff and Ernest McClain⁷ observes that the width of the Parthenon symbolically de one second of latitude (taking surface lengths as linear fractions of latitude). This implies the double meridian length was

¹ Hurwit, Jeffrey M., (1987), *The Art and Culture of Early Greece*, 1100-480 B.C., Cornell: Ithaca, 74-77.

² Berriman, A.E., (1953) *Historical Metrology*, London: Dent. IX, 116-120.

³ Berger, E., ed. (1986) *Parthenon-Kongress Basel*, 2 Vols, Mainz: Philipp von Zabern.

⁴ an average noted by Berriman, 119.

⁵ Bulckens, A.M. (1999) *The Parthenon's Main Design Proportion and its Meaning*, [Ph.D. Dissertation], Geelong: Deakin University, 269 pp. ; (2001) The Parthenon's Symmetry in Symmetry: *Art and Science* (Fifth Interdisciplinary Symmetry Congress and Exhibition of the ISIS-Symmetry), (Sydney, 2001), no. 1-2, pp. 38-41.

⁶ Philostrates of Lemnos (c. 190 – c. 230 AD) Imagines Heracles among the Pygmies, see Loeb Classical Library.

⁷ The Proportional System of the Parthenon, in preparation for the In Memoriam volume for Ernest McClain (1918-2014)

known within 0.003% of its modern estimation. A geodetic symbolism was apparently given to shorter side length of the Parthenon, making it smaller than it would have been if modelled on the circumference of the earth as one 3,600th of one 360th part of the mean earth. If so, this geodetic meaning of the Parthenon can be compared with monuments built two thousand years earlier, such as Stonehenge and the Great Pyramid of Giza, within which the relationship of the mean earth **wala**tive to the polar radius, using the same metrological system.

The ancient model of the earth, recovered⁸ by John Neal⁹ and John Michell¹⁰, used three different approximations of π to model the distortion of the rotating planet relative to its mean, or perfectly spherical, size. In that model, the Meridian was assumed to be half the circumference of the mean earth of 44 times 126 (131,383.296) feet or 24,883.2 miles. Had the Parthenon's builders used this model then its ends would be 101.376 feet in three major thirds to the octave.

width and one hundredth of this would be a foot of 1.01376 feet, the foot known as the 'Standard Geographical Greek foot¹¹'.

The mean circumference of the earth (24,883.2 miles) and the actual double meridian length (24,859.868 miles) are in the same ratio as the geographical foot of 1.01376 (3168/3125) and 1.0125 feet: the 81/80 foot measure that makes the Parthenon's 101.25 feet a 'hundred footer'. It is therefore reasonable to assume that, between the building of Stonehenge and Great Pyramid (by 2,500 B.C.) and the building of the Parthenon (designed by 447 B.C.), a more accurate measurement of the Meridian had superseded the previous assumption, within the old model, that the Meridian was half the length of the mean earth circumference.

Further to this, one can see how the transition from Pythagorean to just tuning systems¹² is

strangely present in the relationship between the mean earth circumference and the actual meridian length, since the geographical constant of 1.01376 is near identical to the Pythagorean comma of 1.0136433 while the (chosen) ratio of 1.0125 is the syntonic comma and this, times 100, is near identical to the actual length of one second of latitude which would be 100 times 1.0128 feet¹³, just one third of an inch different from a more modern result.

The Parthenon 'Hundred footer' was able to dimensionally reference one second of the Meridian by having its shorter sides one hundred feet of 1.0125 feet long. Aligned to north, this presented accurate Classical knowledge of the Meridian's length. The monument expresses other musicological features via its metrology: the 81/80 foot unit is 125/128 of the Athenian foot of 1.0368 feet, a musical interval called the minor diesis, also found within just intonation and equaling the ree major thirds to the octave.

⁸ Michell by 1980 and, fully formed, Neal by 2000.

⁹ Neal, John., (2000) *All Done With Mirrors*, Secret Academy: London.

¹⁰ Michell, John (1982) *Ancient Metrology*, Pentacle Books, Bristol, 1982; (2008 new ed.) *Dimensions of Paradise*, Inner Traditions: Rochester.

¹¹ Using the terminology developed by John Michell and John Neal.

¹² The latter prevalent in other aspects of the

monument, see Kappraff, J. and McClain, E.G. (2005: Spring– Fall) The Proportions of the Parthenon: A work of musically inspired architecture, *Music in Art: International Journal for Music Iconography*, Vol. 30/1–2.

¹³ A non-harmonic 79/78 feet.

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ERNEST McCLAIN'S MUSICOLOGICAL INTERPRETATION OF ANCIENT TEXTS: Musicological Narrative Structures in Biblical Genesis

Richard HEATH

Introduction

This paper attempts to interpret the two books of the Bible, according to Ernest McClain's methods. It is contended that the compositions of ancient texts, as Plato insinuated¹, were both inspired and used for the science of numerical harmonics.

The invariant properties of harmonic numbers, and their evolution through limiting whole numbers, offer a large variety of distinctive scenarios which can be set into compatible narrative forms such as the Seven Days of Creation, the Garden of Eden, the Flood, the Patriarchal development of the Twelve Tribes and Moses meeting with YHWH. They are all set within a single harmonic frame of the 5th power of 60, and have features shared with other ancient texts. This paper takes numerical references, such as ages, numbers of objects, numeric values of names (as sequences, sums or as exponents), orders of the products of 3 and 5, and considers them as dimensions (and any other features) of integer matrices which McClain called 'holy mountains', and symbols such as the Star of David and other elements belonging to the octave tone-circle of a holy mountain. The resulting synthetic view points towards the presence of a secret component of harmony, in ancient texts, which supports harmonic parallelisms ascampositional technique shared

with many scribal centres of ancient storytelling. The Bible starts with accounts of the Seven-Day Creation; of Adam and Eve in the Garden of Eden; of Noah's Ark and the Flood², also found in earlier literature and probably dated from the Old Babylonian *Epic of Atra-Hasis* (ca. 1900 B.C.). The integral narrative cycle includes the complex

journey of Patriarch Abraham's children, in the second half of *Genesis* spreading into *Exodus*. There, Abraham met with a 'Mountain God', (El Shaddai), a form which would later be known as YHWH. The purpose of this development was a covenant with YHWH in which Canaan was promised to Abram's descendants and sealed with the practice of male circumcision.

Ernest McClain pioneered a technique³ in which these ancient stories would reveal a series of hidden musicological clues. However, his explanations for the underlying musicality of the Bible and other narratives, such as the formation of Twelve Tribes in the early *Pentateuch*, were incomplete. In this paper I shall apply McClain's methods and hypotheses where pure musical invariants, suggested by various means, were used within the writing of the Biblical narrative.

1. The Story of the Patriarchs

The journey of the Patriarchs ends with Moses, standing on the verge of the Promised Land (Fig. 7). Moses died at the age of 120 years. Musicologically, this would mark the completion

¹ These insinuations are lifted from McClain's *Pythagorean Plato* where in turn, the author refers to Allen Bloom's *The Republic of Plato*, (New York, 1968); Trevor J. Saunders's translation of *Plato's Laws*, (London, 1970); Taylor's *Timaeus and Critias*, (London, 1929); Cornford's *Plato's Cosmology*, (London, 1937). Further insinuations in Godwin, 1993; McClain, 1976 and 1978 which contain synthetic references to Plato as alluding to a coherent system of thought, based upon harmony, geometry and astronomy having formed a numerical science. See also Heath Aristarchus of Samos; Godwin, *Harmony of the Spheres: A Sourcebook of the Pythagorean Tradition in Music.* (Rochester, 1993); McClain, *Myth of Invariance*, (New York, 1976) and *The Pythagorean Plato*, (York Beach, 1978).

² Finkel, I., *The Ark before Noah: Decoding the Story of the Flood*, Hodder & Stoughton Ltd., (London, 2014).

³ McClain, op. cit. (1976).

of the Sumerian harmonic sexagesimal system, by the process of doubling. However, according to McClain, the story of the Children of Israel had already tripled 60 since Isaac, descended from Abram renamed as Abraham, who was 180 years at the time of his death. This set the musicological scene for the future Twelve Tribes, located in a fresh part of McClain's 'Holy Mountains', a topography based around powers of 3 and 5. Babylon's limit of 60 (Fig. 1) is located upon 3 times 5 whilst the Patriarchal limit moves to Adam's (45), whose letter-number formula adds up to an extra 3 relative to 60, the root of 15 which must be relocated to 45 to descend from Adam.

McClain was only able to form and interpret these harmonic mountains because, cryptically, Plato had alluded to their formation⁴. This revealed a scribal practice where harmonic numbers were inset into ancient texts, an ancient method connecting only important points of musical harmonic relevance. These advanced beyond aural performance and have been studied by taking musical string lengths as integer numbers forming musical intervals between them, thus producing rational fractions composed only of prime numbers 2, 3 and 5. Examples are found in the Bible, in Homer, and other texts of Heroic and Classical periods (c. 1,500B.C. to c. 500 B.C.)⁵.

McClain's musicology reveals tonal patterns which are invariably contained within the dominance of a single octave limit. It binds the arising of its tones resulting from more than a simple doubling (the number 2) instead, as a consequence of the interaction of the next two primes: 3 and 5. With this ancient discipline, numbers 3 and 5 invariably populate any octave in a distinctive and successive developmental sequence, similar to patrilineality. Following Plato's guidance, a gender parallelism became natural, in which the mother reproduced the invariant tones within her 'belly', the octave, leading Plato to assume the feminity of the number 2^6 .

3 and 5 were thought to be male numbers⁷. They impregnated the 'womb', (octave) with the father's

limiting number. This made of primogeniture a perfect subject for a musicological parallel with the Bible, where Abram saw an invisible god as an harmonic number deity. This is how Patriarchs would have conceptualized Genesis, as a story based upon harmonic values (Fig. 1).

Abram comes from the base 60 region of the 'Chaldees' and expresses two Pythagorean children: Ishmael (G) and Isaac (A) within a pentatonic Covenant with YHWH, seen as the Just 'horizon⁸' over the land of Canaan, between pitches b and f within the Tone Circle for 60. Ishmael is dismissed when his wife Sarai, renamed Sarah, gives birth to Isaac. Abram is renamed Abraham, meaning a

'father of many nations'9, by YHWH, at the age of 99. Abraham laughs since he is 100 years old and Sarah 90 when their child is born. They called him Isaac since the name means 'he laughs' (Fig. 2). The joke arises through musicological necessity where 60 is transformed in 90 through multiplication by 3/2, giving Sarah's born the prime root $9 \ge 5 =$ 45, rather than the $3 \ge 5 = root 15$ which underlies

the limit 60 as 4 x 15. In Mesopotamia, the goddess Ishtar was the principal female 'generatrix' (noting the 5 reciprocal synods to the 8 brick representing solar years). She is associated with the number 15 which, times four, becomes 60, the number for the sky god Anu. Babylonia was 'distanced' upon the form of the holy mountain, as D shifted further from the 'cornerstone', as ab (bottom left on the mountain).

Isaac died at 180 which was double the age of Sarah at his birth. This conforms with the octave as between birth at her 90th year and death at his 180th. Before his death, Isaac's wife Rachel gave birth to twin boys, G and A. The born Esau, meaning 'hairy' looses his primacy to second born Jacob, meaning 'heel holder'. (Fig. 3)

The tonal framework of 180 is heptatonic but in an unconventional way relative to Pythagorean or Just norms: the 5 whole tones are just tones of 9/8 and 4 minor tones of just intonation of 10/9, whilst the semitones, which are large, have the value of $27/25^{10}$. Jacob is doubled by

⁴ See footnote 1.

⁵ See footnote 1.

⁶ See footnote 1.

See footnote 1.

⁸ See 6 of Moses looking over the horizon and

into the promised land, at age 120, according to McClain. 9

Genesis 17:5

¹⁰ This type of Just heptatonism is exactly that

inheritance and then doubled again by means of name changing, where his new name, Israel, causes a revolutionary increase in the size and musicality of the holy mountain. 12 symmetrical tones divide the octave to parallel the fact that he will have 11 sons and 1 daughter within an octave spanning 360 to 720, rooted on the pure power of $32 \ge 5 = 45$ (Fig. 4). Joseph is the special 13^{th} tone which stands opposite Isaac's D of

The role of the tone opposite D, previously diagrammed between 'sons' G and A, has been released by shifting D to its new root at 45 so that a true 12^{th} note becomes possible, 16/15 greater than G and 64/45 greater than D = 360. This cornerstone role of opposition to D unblocks the development of twelveness, the cornerstone operating as a saviour to provide balanced tonal manifestation within a small number set. The primogeniture becomes magical through Joseph, its saviour, who moves the focus from Canaan to the great regional power of Egypt (Fig. 5).

A further doubling to 1,440 will achieve a limit in which Adam, the man, can be seen within the new root of 45 since 1 + 4 + 40 = 45 and also 1.4.40, seen as decimal place notation, equals 1,440. The symmetrical tones in this doubling are unchanged but a new phenomenon appears in the top 2 rows: the 1st brick on the 4th row equals 1,000 which implies, alongside 1.4.40, an adoption of decimal notation, according to McClain, where the upper bricks are then readable as to their fractional ratios, as if they were in decimal notation, only times 1,000. For example, the value of the top brick, 1250, being 5/4 of 1,000, expresses the major third interval of 1.25 relative to the brick equal to 1,000.

The root of the word Adam $\sqrt{\text{ADM}} = 1.4.40$, can be seen as a beginning of the story, as that starting with root 1+4+40 = 45 but also as the end of a story, in the transition to a 'decimal heaven' which can be found within the mountain for 1,440, where the great Tyrant rooted at the 6th power of 3 (= 729), appears but is exceeded by the cornerstone of 1,024. Joseph, behaves 'like' the cornerstone for the family, but Reuben, the, is actually

displaced by Benjamin, according to McClain. The tonal picture should be constrained by the Magen David pattern into 11 Just tones (see end of section 3), but even then the locations of tones as 11 plus the cornerstone hides another meaning of chromatism, as an important manifestation of twelveness involving a new organising idea.

McClain developed the view, as mentioned by Kapraff¹¹, that Joseph's siblings were organised by Jacob who died at 147. While not a harmonic number, this age of 147 can still function as a limit for the powers of 3 and 5, in the table of their products which inherently underlie the mountain itself, for 720 or 1,440 (or, in fact for any mountain greater than 144) (Fig. 6).

The born is Reuben ¹² and though 1st born, the patriarchal story always includes his displacement. As Jacob, Esau and Isaac displaced Ishmael¹³, so Reuben is displaced. The cornerstone is the traditional position for a saviour and Reuben is shunted off into exile, to new and good lands 'to the east', whilst the 12th son, Benjamin, becomes the saviour for Joseph from the other brothers, and hence becomes the cornerstone instead, enabling Joseph to determine the whole family's history and prepare the way for the Twelve Tribes. But he is 'already' translated, as 11th son, into the 11th highest product of three and e, $5^{-3} = 125$. This absolute location on any mountain, of the 11th cross-power of 3 and 5, gives Joseph, in the mountain for 1,440, a pseudo decimal value of 1,000, above the 1st 3 rows of practical Just intonation, and now beyond dependence on Babylonian roots and in the ancient land of Egypt; all this via a minor diesis jump from the cornerstone of 1st son, which always removes 27 = 128 and adds $5^3 = 125$, a vertical take-off of 3 bricks (Fig. 5). His number, as 11th, is also a key number for the Magen David's harmonic limit

symbolised by the future Megan (Shield of) David symbol when it is laid over D = 720, which excluded Pythagorean C and E, already available in their Just counterparts c and e, within that star – all that remained was the cornerstone ab which becomes the 12th tone, see 8 of YHWH matrix overshadowing the Promised Land as a transformed Eden.

¹¹ McClain, The Lost Harmonic Law of the Bible, (2006)

^{12 &#}x27;Reuben is Jacob's oldest son. As such, he is assigned the 1st number, 1, of the Harmonic Matrix. Joseph is the 11th son. He is assigned the 11th largest number of the Matrix, 125.' McClain, *The Lost Harmonic Law of the Bible*, (2006), p. 485.

^{13 &#}x27;Reuben as 'cornerstone' is exiled 'to the East' as if to 5th place in the 3rd row', the location symmetrical to the cornerstone which McClain names 'Star in the East'. 12 Sons versus 12 Tribes: *In Memoriam* (Draft for Bibal, 14/01/2013).

and also that of YHWH (Fig. 17). The completion of this decimal experience in Egypt will be the Exodus, set up by a Moses protected by a royal princess who adopted him and then arranges his education in the high Egyptian sacred sciences. While we started with an Abraham limit of 60, narrative doubling this Moses with an age of 120 at death, overlooking the Promised Land which he could never enter. (Fig. 7)

One may double 120 twice to get 480, whereupon Abram's letter-number value of 243 appears at the end of the bottom row. This brick is almost equal to low D as 240, being just 22 cents greater, and 243 has the same 5th power of 3 as YHWH would have when interpreted as being the product of both the 5th powers of 3 and 5. This could be why Abraham had to be given his new Hey = 5.

Exodus¹⁴ tells us that Abram only knew the 'Lord God' as 'El Shaddai' (= 345) and not as YHWH, whose number-letter equivalence would only become known by MOSES (= 345), 345 being a likely code for numbers and exponents of (or powers of) 6 and 5: Y.H.W.H equals 6.5.10.5 which can be seen as $6 \ge 10 = 60$, to the power of 5, which then equals 777,600,000 (Appendix One). The limiting D for YHWH would be on the 6th row of a much larger mountain, but below YHWH, on the bottom row, lies the root of Abram = 243= 3^5 . YHWH is 5^5 above Abram but YHWH's root 2 cornerstone of ab is 5⁴ above Abram, a cornerstone who will come to be seen as The Son of God through Joseph to whom Jesus has often been compared, through narrative similarities or direct references, found in the New Testament.

Abram probably as the 5 th power of 3, the necessary limitation in powers of 3 to avoid the excessive numerocity and enharmonic excessiveness of the Pythagorean cycle of 5^{ths}, found when that cycle is taken to its natural consequence in which a Pythagorean comma arises, an audible comma expressing the difference between 12 5^{ths} and the 7 octaves they would span (Fig. 8). The chromatics of the Twelve Tribes, innovated by the Patriarchal journey to 720 and beyond, could occupy a Promised Land of Just tuning and mark a return from Adam's expulsion from Eden, for eating a fruit from the tree at the centre of what was probably, a musicologically conceived garden.

2. Harmonic Narratives before the Patriarchs

The Patriarchal story is preceded by 3 stories which set the scene for its dramas which, it appears, take place within the holy mountain of YHWH, at the left and base rows of Just tuning. This garden 'stage', outside the symmetrical tone set of YHWH, becomes the Garden of Eden.

a) Adam and Eve in the Garden of Eden

Before the Flood, there is a Creation in 7 days, referring to God as Elohiym = 86, and a subsequent creation of the human called Adam = 45, and therefore keyed into the story of the Patriarchs whilst introducing the Lord God as El Shaddai. Adam lives in Eden = $126 (= 12^6)$ and he is given Eve as companion, an as yet unnamed female made from the 'rib' of Adam, who as 45 is the basis of a future Just tuning framework 'in the image and likeness of God', in the story of the Patriarchs. If Adam's rib is Hebrew TAYT = 9 =v, then ignoring 2s, Adam's Just tone of 9/10 less than 45 creates a future root value for Eve equal to $81 = 9^2$, on the base of Eden. Beyond Eve, on the bottom row to the right, lie the roots 243 = Abram $(3^5$, and source of YHWH's powers of 3) and then 729 (3⁶) (Fig. 9).

This is the serpent's 'head', which times 1024 (=2¹⁰) makes D = 746,496 would symmetrically form 12 Pythagorean intervals about itself, leading to an enharmonic Pythagorean comma, between a 1st note Ab and a 13th tone G# (and called enharmonic because Ab is then less than G#.) The 2 trees described within the garden are therefore the Tree of Life, at the root on which stands Abram = 243, future Patriarch, and the Tree of Knowledge, at the root on which lies Plato's Tyrant number of 3 to the 6th power and, as mentioned, a possible reference to EDEN = 126 (i.e. 12⁶) in which tuning through the cycle of 5^{ths} obtains a chromatism of 12 notes but leads to an audible enharmonic comma (Figures 9 and 10).

The story of the Garden of Eden sets the

¹⁴ Exodus 6:2, see note 19.

scene for the patriarchal drama which will take place in 'the Creation' west of YHWH's lozenge of symmetrical tonality, an undeveloped area in which Adam, as male prototype, is raised to 45 by the male divine number 5¹⁵, whilst his 'rib', the number 9 or (rib-shaped) alters 45 into 81 as a woman, the 5th tone on the base 'Pythagorean' row, called the earth. Adam will successively double to evolve the Patriarchs into Twelve Just Tribes as the mountain for 720 (Fig. 4) which having 18 tones inside the 19 tone area of non-symmetrical tones found in YHWH's mountain. Adam and his woman will be ejected from the Garden, and only then is Eve (=19) named, as they are cut off from the 19 Pythagorean tones in the base of YHWH's mountain by a cherubim with a sword. As the mother of all living, Eve is evidently the Tree of Life above her as Plato's 'sovereign number' (= 60⁴) and it is Adam's 'fall' which would be corrected by giving Abraham and Sarah their new Hay (=5).

It is nottborefore to see the fruit of the tree of knowledge (of harmonic good and evil) causing a fall from grace when the man eats its fruit. The subsequent naming of $Eve^{16}(= 19)$ by Adam after his fall compares the 19 non-symmetrical tones of YHWH's mountain¹⁷ with the 19 Pythagorean tones in the base of YHWH's mountain (of 605 = 777,600,000), whose symmetrical tones do not include the region including and descending from 729 (= Tyrant), to 243 (Abram), 81 (Eve), 27, 9, 3, 1, One being the ever-present 'cornerstone' of 0th power of 3 and 5, present in every mountain.

In summary: Eve, being 'named for all that lives', relates to the left hand non symmetrical area of 19 tones, within which the Garden of Eden was probably placed. This area of 19 tones has a base which forms 7 of the 19 tones forming the base of YHWH; The Tree of Knowledge as 729, was placed at the right hand limit of Eden since it is not a symmetrical tone on YHWH's mountain. This is supported in that the mountain for 720 excludes just this tone (which exceeds its limit) whilst the mountain for Adam = 1,440 has a 19th tone equal to 729 and a cornerstone which is then equal to $1,024 = (2^{10})$, the number required by the serpent's 'head' of 729 to form its body of 12 intervals, marking the redemption of Adam through Just Intonation's blending of powers of 3 and 5 and requiring only small numbers rather than 'giants' which can only be destroyed by having a Flood involving numbers even greater than YHWH or the fully developed serpent of 1,024 times 729.

b) The Story of Noah and the Flood.

The expulsion of Adam and Eve from Eden leads to evil results when the sons of God (knowledge of large harmonic numbers perhaps) have giant children¹⁸ with the daughters of men. YHWH's creative imagination became hateful to Him¹⁹. Noah, a man rather than a god, is instructed to save his household and animals from the Flood by building an ark boat which can above of large integers. This is symbolised а differently in the Veda and other ancient texts, where the victor at the head of the is like Babylonia's Marduk or the Vedic Indra. But the important fact is that the Flood was adapted by the writers of the Bible, within their context of the fall of Adam and the Patriarchal story to come. It was an important insight for McClain to see that the Jewish mind was seeking to supersede Marduk with YHWH, who a harmonic mament by standing, instead, at its far corner of 60⁵, above Abram, as 3^5 , rather than at the top of a mountain 5¹⁴ high, so as to kill the serpent's error. As McClain put it, 'In Judaism, god prefers a throne not at the top, but "in midst of his people." And in number based Just intonation, the serpent created by tuning according to a cycle of 5^{ths}, need never be encountered (see also the later section called Eve as the Mother of All Living).

¹⁵ Genesis 2:7 And the Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life; and man became a living soul.

¹⁶ Genesis 3:20: And Adam called his wife's name Eve; because she was the mother of all living.

¹⁷ This pattern of tones only appear, on their own, in the matrix for 1080 and the other area of non-symmetry to the right has 27 tones which is found in the matrix for 5400.

¹⁸ *Genesis* 6:4: There were giants in the earth in those days; and also after that, when the sons of God (powers of the divine male number three) came in unto the daughters of men, and they bare children to them, the same became mighty men which were of old, men of renown.

¹⁹ *Genesis* 6:5: And God saw that the wickedness of man was great in the earth, and that every imagination of the thoughts of his heart was only evil continually.

The actual limit required to kill the serpent is only alluded to directly in the Vedic account as both a low D of 4,320,000,000²⁰ and high D of 8.640,000,000²¹, these numbers evidently containing 57. The singular top tone of this mountain, has the hero god Indra equal to 5¹⁴, so cutting up the serpent Vrita below, whose head, containing 3⁶ = 729, is directly below, on the bottom row of the mountain (Fig. 11).

The generates a very accurate 12 th note, Indra (602 cents) and Vritra (598 cents) differing from the ideal tone (600 cents) by 2 cents either side, and therefore the Flood the most accurate Diophantine approximation to the geometric mean of D, as being the square root of two. This achievement is irrelevant to what YHWH has in mind through Just intonation and the Flood is another type of giantism. The has a root of $3^3 = 27$, limiting it to a heptatonic relationship of 3 symmetrical notes either side of D, a phenomenon encountered on the base of the mountain D = 864 (32 times 27), the 'lowest' of Pythagorean diatonic octaves. The use of decimal notation is then important to register the seven 10s (as powers of 5 times 2) which raise this Ark up to the maximum extent of the ood equal to ten to the 7th power.

This story of Noah was still needed for the transition between Adam, and Abram = 243 since it gives the context for rejecting the serpent's fruit, the root value of 243 introducing the root of three: the power of three belonging to YHWH = 777,600,000. Noting that the letter H equals 5, YHWH threw Adam out of Eden because of a serpent's wisdom and this Flood is to deal with this serpent without introducing the heptatonic

Marduk, whose ark would be the diatonic number of 864, raised up by 10 to form a shiplike Just boat, but then a boat not with the Garden story which an Ark based upon 720 into the Bible's new 'story space' of the garden of Eden and a god with 11 not 7 principle tones. While the number was omitted other details of Marduk's the extreme number of levels (14 + 1 = 15) are referenced in the 15 cubits height of

the ²². Noah is the human hero, who escapes this deluge and begins a new story associated with the human male number 5, in concert with and as a corrective to the divine male number 3.

The serpent's sin was offensive to YHWH (as the god of tonality) who innovates the balanced alternative called Just tuning, which is more intelligible, requires smaller numbers in its generation, and is best handled in a decimal frame. As Pythagorean chromatics are formed out of a tuning process, unbeknownst to the tuner the string lengths develop 12 powers of 3 which can never cancel to form octave completion. In contrast, Just chromatics can be produced as string lengths using small powers of 3 and 5, such as the root of Adam = 45, shared by Sarah at 90, and Isaac at 180, forming a 12 tribe tonal set to the cornerstone, of Just chromatics around D=720, many generations after Noah.

YHWH replaces the Flood with His regularisation upon the base sixty²³ and its easy access to 'both "paired reciprocal multiplication tables" and ating place value" ²⁴. Abram 'from the Chaldees', only saw the god as El Shaddai (KJV: Almighty = 345) rather than YHWH ($6.5.10.5 = 26 \text{ or } 6^{5}.10.^{5} = 60^{5}$). It is Moses = 345, trained in Egypt, who comes to know the Lord as YHWH²⁵ and Moses has a name of the same number as El Shaddai and it is that number which Ernest McClain interprets as being a reference to apparently shared knowledge, existing in the ancient Near East, but made somewhat explicit by Plato,

23 BIBAL, message 28229

²⁰ RgVeda 4:58:2-3: Four horns, three feet, 2 heads and seven (=107) hands, McClain 1976, p. 80.

²¹ RgVeda 1.126.3-5: Eight cows, sixty thousand kine, forty bay horses and ten (= 1010) cars to equal 8.6.40. (0000)0000000 the tenth power giving the scope of the whole decimal notation, overwritten by the 'head' number 8640, [McClain 1976, p. 81].

²² Gen 7:20: Fifteen cubits upward did the waters prevail; and the mountains were covered.

Ernest G. McClain: Thus gods 10, 15, 20, 30, 40, 50 and 60 in the early Sumerian pantheon taken over lock, stock and barrel by Babylon and Assyria with new names all preced[ing] YHWH as regularization of BASE 60 with the standard tables by Hammurabi's time. BIBAL message 28594

²⁴ *Exodus* 6:2. And God spake unto Moses, and said unto him, I am the Lord: And I appeared unto Abraham, unto Isaac, and unto Jacob, by the name of God Almighty (Shaddai), but by my name Jehovah [YHWH] was I not known to them.

^{25 [}Christensen, 2009], p. 25.

the secrets of '3:4 mated with 5', already mentioned and indicative of using $3 \ge 4 \ge 5 = 60$ as the ideal symmetrical mean when dealing with the harmonic god's domain of holy mountains. (See Appendix 1)

c) The Seven Days of Creation.

The garden of Eden seen within the holy mountain of YHWH (= $6.5.10.5 = 60^5 = 777,600,000$) and Adam = 45, the male human, address similar issues as may be found in Plato's harmonic allegories. Are the Seven Days of Creation, which start the Bible, also part of this musical composition or is it an appendage grafted on to the Pentateuch?

The story can be summarised by the achievements of each da

The story is probably creating the framework within which the later stories will be couched and so is concerned with the domain of musical harmony, ready to be used within stories in which harmonic parallelism will be employed. In a theological sense, what is being proposed is the creation of an Eternity or Heaven which can coincide with Existence and within which, harmonic coincidence is good.

1. Light was divided from darkness.

'1 In the beginning God created the heaven and the earth.

2 And the earth was without form, and void; and darkness was upon the face of the deep. And the Spirit of God moved upon the face of the waters.

3 And God said, Let there be light: and there was light.

4 And God saw the light, that it was good and God divided the light from the darkness.

5 And God called the light Day, and the darkness he called Night. And the evening and the mornging w

The light here is AUR as we would have 'aurora' meaning the light of a new dawn. This most fundamental act of division into two parts is the same as the creation of the cornerstone of unity, from which all ratios must derive. The word 'unity' itself stresses a unit, like 'the stone the builders rejected' (which haunts McClain's presentations.) But the marking of oneness is an act of division in that no other can function as 'the one' thereafter

which not only interval and tone ratios (the parts of the coming mament) but also the idea of the harmonic system (the whole). The number one is therefore the creation of a framework god, in which creation is based upon harmonic relationships between positive integers and their reciprocals.

2. A Firmament, called Heaven.

'6 And God said, Let there be a mament in the midst of the waters, and let it divide the waters from the waters. 7 And God made the mament, and divided the waters which were under the mament from the waters which were above the mament: and it was so. 8 And God called the mament Heaven. And the evening and the morning were the second day.'

This mament = rqqr = 380 = 4 x 5 x 19 can also be seen as 3 x (3 times 2 =8) and (2 times 5 = 10), giving a close formula for Plato's '4/3 mated with 5'. If this mament is made up of products of three and e, multiplied by a number of twos, and these between octave doubling, 380 suggests [3,4,5] whilst also indicating the 19 tones on row one of YHWH's kingdom of 777,600,000. Therefore the generalised formula for composing a harmonic d using the 2 numbers, 3 and 5, as 2 dimensions within which their products the locations within that space, and then the factor 19 to indicate that this creation is that of YHWH, thoughed by God as elohiym, those declaring this framework.

3. Dry land formed, and seas, growing from below.

⁶⁹ And God said, Let the waters under the heaven be gathered together unto one place, and let the dry land appear: and it was so. 10 And God called the dry land Earth; and the gathering together of the waters called he Seas: and God saw that it was good. 11 And God said, Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after his kind, whose seed is in itself, upon the earth brought forth grass, and herb yielding seed after his kind, and the tree yielding fruit, whose seed was in itself, after his kind; and the tree yielding fruit, whose seed was in itself, after his kind; and the tree yielding fruit, whose seed was in itself, after his kind; and the weeping and the morning were the

13 And the evening and the morning were the third day.'

The Elohim command the waters below this mament (reciprocals of 2, 3 and 5) to gather up and form dry land. Such holy mountains, within the mament, are accompanied by seas, which are the non-symmetrical tone areas within a holy mountain, YHWH having three of these, one at each corner. This implies that mountains were being pivoted around D to overlap with their reciprocals and form a dry land of symmetrical tones (Plato's twins or paired male warriors) and seas of nonsymmetrical tones.

4. Two lights, which illuminated Day and Night.

'14 And God said, Let there be lights in the mament of the heaven to divide the day from the night; and let them be for signs, and for seasons, and for days, and years: 15 And let them be for lights in the mament of the heaven to give light upon the earth: and it was so. 16 And God made two great lights; the greater light to rule the day, and the lesser light to rule the night: he made the stars also. 17 And God set them in the mament of the heaven to give light upon the earth, 18 And to rule over the day and over the night, and to divide the light from the darkness: and God saw that it was good. 19 And the evening and the morning were the fourth day.'

This central part of the Creation concerns the Tone Circle within which the octave places tones in a very special setting, so that invariant intervals cumulatively populate the octave as limits increase. The symmetrical tones (day 3) occupy the opposite halves of the tone circle in which the principle axis is D, the letter-name used by modern notation for (a) the geometrical mean of the 12 semitones used in our staff and keyboard. When it appears the sun and moon are being introduced, the sun perhaps stands for D, the god of a given mountain,

by a harmonic number. Standing opposite in the tone circle is (b) the geometrical mean of

the octave, then a moon or lesser luminary, of overseeing the integrity of the octave

from the perspective of the point opposite D on the base of the axis of symmetry, to rule the 'night'.

5. The Location and Multiplication of Moving Creatures.

'20 And God said, Let the waters bring forth abundantly the moving creature that hath life, and fowl that may above the earth in the mament of heaven.

21 And God created great whales, and every living creature that moveth, which the waters brought forth abundantly, after their kind, and every winged fowl after his kind: and God saw that it was good.

22 And God blessed them, saying, Be fruitful, and multiply, and waters in the seas, and

- let fowl multiply in the earth.
- 23 And the evening and the morning were the y?

The waters are the multiplications by 2. The moving creatures, fowls of the air, and great whales, are the actual combinatorials of 3 and 5 which occupy the Firmament (day 2) and constitute its identities. All of the potentials of this Firmament, held within these products of 3 and 5, must be brought into the octave through multiplication by 2. If they are in the symmetrical area of tones around D, they belong to the earth. Otherwise they belong in the air above. Beside or below the earth they belong to the sea.

6. Human beings and their pastoral fecundity.

²4 And God said, Let the earth bring forth the living creature after his kind, cattle, and creeping thing, and beast of the earth after his kind: and it was so.

25 And God made the beast of the earth after his kind, and cattle after their kind, and every thing that creepeth upon the earth after his kind: and God saw that it was good.

26 And God said, Let us make man in our image, after our likeness: and let them have dominion over the of the sea, and over the

fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth.

27 So God created man in his own image, in the image of God created he him; male and female created he them.

28 And God blessed them, and God said unto them, Be fruitful, and multiply, and replenish the earth, and subdue it: and have dominion over the of the sea, and over the fowl of

the air, and over every living thing that moveth upon the earth.

29 And God said, Behold, I have given you every herb bearing seed, which is upon the face of all the earth, and every tree, in the which is the fruit of a tree yielding seed; to you it shall be for meat.

30 And to every beast of the earth, and to every fowl of the air, and to every thing that creepeth upon the earth, wherein there is life, I have given every green herb for meat: and it was so.

31 And God saw every thing that he had made, and, behold, it was very good. And the evening and the morning were the sixth day.'

This culmination of the creation is an image of the Promised Land and of humanity built into the cornerstone area of YHWH as 60^5 , the one God of the creation, yet in the image and likeness of the Elohim. The image and likeness is presumably the ability to form mountains as seen later in the Bible, based upon 60 or 720 or anywhere in the mament, as the harmonic specialists come close to being the Elohim creating the world of musical harmony within which gods, demons, creatures, herbs and human characters can develop within the frameworks of different holy mountains.

7. Rest andpon all that had been achieved.

What was to become a distinctive number symbolism of seven enters into a harmonic canon quite naturally through the fact that only the numbers 1:2:3:4:5:6 participate in musical harmony, in the sense that the Bible would be talking about.

8. Eve as 'Mother of all which lives, beneath 81.

The fact that the 6 numbers contribute the most harmonious intervals means that these numbers and the 3 primes, produce harmony out of numerical simplicity. That is, ratios are harmonious by virtue of their relative simplicity. When something is a noise there is no tonal simplicity, as with 'white noise' which expresses a continuum of all frequencies. The 7th day caps this fertile period of simplicity with a number which does not combine easily with the earlier prime number, 2, 3 and 5. This is why tradition calls 7 a virginal number, associated with purity, genetic reluctance and of a sacred and reserved character such as the Sabbath on which nothing should be done.

Beyond 7 are 8:9:10, all derived from [2, 3, 5], and these give rise to 2 types of tone interval, one

Pythagorean as 9/8 and the other, a minor tone of just intonation of 10/9. 11 and 13 are primes too high to be harmonious and 12 on its own merely repeats 6/5, the minor 3rd, with 10, and 4/3 with 9 and 3/2 with 8 – and these are nothing other than 'similarities to the already arisen' since the Senarius has already achieved these intervals. The conditions of adjacent harmonious numbers are only met, below the number 20, by 15 and 16 which generate the Just semitone of 16/15.

This separation of numbers into those made up of only the 3 prime numbers [2,3,5] and those 'not harmonious' can be seen in the Nippur Tables [2,200 BC] which only lists the harmonious numbers. This suggest a use for the Nippur numbers with regard to investigating musical harmony and possibly generating holy mountains or their equivalent. It is also the case that the strings of fourth millennium instruments appear to be operating upon the least possible string number lengths for the scale they present, in scribal records. This implies some natural means to establish what those numbers, as lengths, should have been to achieve intervals between strings when struck or plucked (Fig. 15).

What is most remarkable is the fact that the last 2 numbers, 80 and 81 (our deduced root for Eve), form the syntonic comma of 81/80 which is the amount by which the Pythagorean tone differs from the minor tone of just intonation (204 - 182 = 22, and that 22 cents = 81/80).

If we then look at the holy mountain for the Senarius as 6! = 720 (of Israel), we see that the mountain shape for that limit (based upon a pure table of multiplication between numbers 3 and 5), when raised into the same octave 360:720, appears as a ser($\frac{3}{2}$) frunning left to

right and a series of major thirds (5/4) running the positive diagonal. This highlights the duality often found within instruments in respect of their design and tuning. Strings must have an physical length but the pitch must often be tuned through tension, relative to the other stings. The mountain shown below can represent string lengths in any units, such as a millimetre, and if only the 'wetted', darker bricks were realised as strings, then 11 of these tones would be available as rising or falling equivalents and the Pythagorean tones are in capitals whilst their Just equivalents are lower case.

In the gure below, Just tones are employed where possible, above and below, which eliminates (c & e). McClain calls this traditional Megen David 'throne' more strict than Marduk's throne in which the outline of the whole mountain for 720 is used, and hence all of its tones symmetrical when raised up to D = 8,640,000,000, like an Ark but not a shield.

This may seem a strange point until one looks at the claim that man should be in the image and likeness of god and then look at YHWH in the light of the restriction to 11 tones presented by the Magen David, since YHWH has 5 ambidextrous Pythagorean tones either side of his D, that is 11 Pythagorean tones relative to D.

Figure 17 shows the relationship of man to God as YHWH, in which the mountain for 720 occupies the region of both the Garden of Eden and the Promised Land whilst being developed through the evolution of Adam as 45 who doubles to 720 to create the Twelve Tribes within a Just intonation, which defeats the enharmonious Chromatism of the Serpent's Pythagoreanism, by including the Cornerstone and its inverse 12th tone and Savior. In contrast with the Serpent, YHWH has 11 Pythagorean tones including D, allowing the Magen David to represent God's image and likeness. But then YHWH's 12th has to be made symmetrical, 'on earth as it is in heaven', in that YHWH can make a useable 12th tone either end of his 11 Pythagorean tones using the 'non-symmetrical' G# within the mountain as his descending 12th tone and its reciprocal, then A_b, in the inverted mountain as his ascending12th tone. The two will never be heard together because they only arise in the mountain or its inverse.

The situation for YHWH, concerning his means of obtaining a 12th Pythagorean note without audible comma is therefore within the harmonic restriction of eleven Just notes where the Cornerstone (ab) 12th tone exists within the mountain and so also must its inverse (g#) 12th tone, enabling the mountain for 720, restricted to eleven symmetrical tones, to achieve twelve tones in a kind of chromatism. Another similarity between YHWH and the Magen David centred on D, is that the upper and lower arms of the star shape correspond with the top of the YHWH's mountain and its inverse, equated to Sheol by McClain.

Conclusions

Perhaps the best statement on Biblical musicology published by Ernest McClain was that written with the late Bible scholar Duane Christensen in his 2009 Anchor Yale Bible volume on Nahum. One a rare discussion of the likely context for biblical musicology:

Within ancient Israel, scribes adapted established principles to their own ends in the numerical (and musical) composition of the biblical text... Ernest McClain argues that the protoscience of ancient harmonics developed initially as "Sumerian grain piles" and eventually became Mesopotamian "holy mountains" limited to multiplicative products of 2, 3 and 5; it was acquired by Jewish scribes in Babylon in highly sophisticated forms. ... Pythagorean thought has its origins in ancient Mesopotamia and Egypt, particularly in Babylon of the sixth century BCE, where it shaped biblical thought within Jewish circles in a different direction.'

It is hoped that the above interpretation of early biblical story-telling, using McClain's methods and some of his published number insights, such as exponents, decimals, gematria and numerical and structural features of spholy mountains; will give further credence to his hypothesis: that the (otherwise) anomalous appearance of harmonic numbers within ancient texts came about due to a widespread and active interest in musicology during the Heroic to the Classical ages, as being expressive of spiritual values. The writing of the Bible and Plato's writings appear closely linked in both time and their musicological theories and techniques, the former being a demonstration of the latter. Appendix: <u>Plato's '4/3 mated with 5' and the role</u> of Powers of 60.

It is in the nature of holy mountains to be triangular due to the 2 dimensions being underlaid by the primes 3 horizontally and 5 18). The other prime number involved in such mountains is

2, but in terms of practical what is a semi-

ordered lattice of products, the size of 2 relative to 3 and 5 is brought into balance by doubling 2 to 4. This usage is rewarded by noticing that (3,4,5) generates 60, which appears as 4 times 3 times 5 as the Babylonian base number, as Anu = 60.

If the root of a holy mountain is its cornerstone of the 0th power of all 3 numbers, then the square of 60 = 3600 is the same distance from 60 as 60 is from the cornerstone. From this one sees the median nature of 60 within such mountains, a kind of backbone to which Plato refers in his Republic (See McClain, (1978), Chapter 2, for an integrated summary in which a series of powers of 60 are developed in 3 steps, leading to the 'sovereign number' of $60^4 = 12,960,000$).

Obviously Plato's 3 steps now invite a 4th since YHWH = 6.5.10.5 is given the limit 60^5 = 777,600,000 by McClain through his insight that exponent notation was meant, that is 6^5 times 10^5 .

The same number has been inferred for Apollo within the text of Plato's Ion and the work of the late Platonist Plutarch, as follows in John Bremer's Plato's *Ion: Philosophy as Performance*, (2005), chapter 13:

Plato composed his dialogue Ion around a joke and a riddle... Plutarch (c.46 to 120 A.D.), affords us some help. He was, for the last twenty or thirty years of his long life, a priest at Delphi. He had taken an oath of secrecy, and so he wrote with knowledge of much that he could not reveal but could not refrain from hinting at. The most relevant hints are to be

states that sixty 'is the of measures for such as concern themselves with the heavenly bodies,' that is, with science - astronomy and harmonics. Second, in The E at Delphi (388-9), Plutarch tells us that the Pythagoreans called e the marriage number and adds that e is an attribute of the god, Apollo, which is

med by the importance of the number in music. The right-angled triangle 3, 4, 5 is used by Plato in the Republic, in formulating his 'marriage number,' and Plutarch points out that 3 is the male number, 4 the female number, and 5 is 'in some ways like its father and in some ways like its mother, being made up of 3 and 2.' This makes 5 the human number. Thus, there is the number sixty which is the base of all work (derived, no doubt, from the

ancient Babylonian use of sexagesimals; this usage spread not only to Hellas but also, later, to India where the yugas or 'great periods' are all based on some power of 60). Together with sixty, there is the number e, an attribute of Apollo, important in music; it is the human number, and, moreover, it is designated by the letter E in the Greek alphabetized system of numerals (epsilon being the letter) and was carved in wood (and stone or metal?) at Delphi, in Apollo's temple. One combination of sixty and e produces 60 to the power, 60 $\frac{5}{5}$, or 777,600,000, which may be regarded as Apollo's number, as Plutarch intimates; it is not certain, but this number may well have been known at Delphi. The number is of the utmost importance in tuning theory and is the least number necessary for tuning with the spiral and reconciling the sexagesimal and of decimal expression of the tones involved, as will be explained below. It is thus worthy of the title of Apollo's number. Since, according to ancient practice, the zeros can be omitted [Neugebauer The Exact Sciences in Antiquity, Chapter II] we are left with 6 to the power, 6⁵ or 7776. Plato deliberately used only the head digits. Plato's joke is that the Ion has 7776 syllables - and thus Apollo does not need to be named in the dialogue since he is the whole of it. The joke is in the form of an unstated riddle, an (enigma): Why is Apollo not in the Ion? Because the Ion is in Apollo.'

The similarity between the Greek and Hebrew languages comes from their proximity to the development of the alphabetic system of phonemes, evolved near Canaan and possibly at Ugarit. The semitic languages, being Trilateral rather than Indo-European, caused Hebrew Hay =5 to be Greek E = 5 but the musicality and characterisation of the Deity as YHWH or Apollo equal to 60^5 leaves little doubt that only the usage of harmonic parallelism differed between different language groups while the harmonic facts are invariant. Thus McClain's proposed harmonic parallelism seems reasonable though quite hard to express to an audience needing to understand the texts, the harmonic facts and the imaginative way in which harmonic allusion was employed within texts, including those of Plato.

This diagram (Fig.19) was constructed to illustrate how the balanced metrical triangles of each of the 5 earliest powers of 60, of 1, 2, 3, 4, 5, climb the 'middle path' within the holy mountain of YHWH. It illustrates a commonality of approach by the musicology inherited by the Classical Greeks and Jewish compilers of the Bible, each from a similar, if not the same, tradition having a long but uncertain history lasting at least one, and possibly two, thousand years.

ILLUSTRATIONS



Figure 1. Abram comes from the base 60 region of the 'Chaldees' and expresses 2 Pythagorean children, Ishmael (G) and Isaac (A) within a pentatonic covenant with YHWH, seen as the Just 'horizon' over the land of Canaan, between pitches b and f within the Tone-Circle for 60.



Figure 2. Sarai is renamed Sarah when she gives birth, at 90, with 2 3s and 1 new 5 and indicating a change in the location of D within the narrative. All the components of Isaac's matrix are then in place except for Isaac's twin sons Esau and Jacob. Sarah, like Abraham, have both received a new Hey (H = 5), lifting her and Abram (243), one step towards YHWH through the creative male number 5 which places tones onto row 2 of the mountain, the row the bricks of which generating Just intonation.



Figure 3. Conceived when Sarah is 90 and dead at an age of 180, Isaac represents the shift out of root 15 into the richer territory rooted in 45, two powers of 3 instead of merely 1. This will 'set the stage' on the holy mountain for Jacob to give birth to the (chromatic) Twelve Tribes when Jacob is renamed Israel.



Figure 4. Jacob is doubled twice through being renamed after wrestling with the angel of the Lord, YHWH, to then form the octave 360:720 in which 12 symmetrical pitches surround Israel. The 11 sons and 1 daughter, as 12 tones, are found wanting but nerston of segregaring an epic transition to Egypt.



Figure 5. Adam's decimal completion as 1.4.40 expressed as mountain and 12 tribe tone circle.



Figure 6. Counting the 12 sons of Jacob as to the numerical order in which the root of the mountain values arise as products of 3 and 5: [1, 3, 5, 9, 15, 25, 27, 45, 75, 81, 183 125, 135]. This outline of 'bricks' does exist as the eariest pentatonic mountain, with the limit 144 = 12^2 .



Figure 7. Moses appears coded at 120 to complete the Journey of the Patriarchs, leading back to Canaan. The limit encodes 12 in the essence of the decimal notation as 12 times 10 (rather than 2 times 60.) The form of the Magen David symbol appears latent on the mountain due to the perfect hexagon at its core of symmetrical tones generated by Moses' age of 120.



Figure 8. YHWH has Abram = 243 as its root within the powers of 3, being 3,200,000 230 larger and creating the characteristic Twin Peak, when powers of 5 are introduced.



Figure 9. The harmonic mountain of YHWH with the Garden of Eden set within the non symmetrical region of 19 tones. Only Adam has a power of 5, the other actors 'on the earth'. The cornerstone is on the left and Serpent's Tree of Knowledge on the Garden.





Figure 11. The Flood Dynamics



Figure 12. (above) Narrative structure of Seven Days in "pedestal" format. 12 (below) Seven Days of creation as Ring composition: then existing text



Figure 13. Generation of all the intervals from the 6 numbers, sometimes called Senarius, the octave, fourth, major third and minor third. These are the essential intervals required for generating McClain's holy mountains and doubtless in the teachings of the Pythagoreans by the time of Plato's Academy.



Figure 14. The wholetones 9/8 and 10/9 and the Just semitone of 16/15 are new musical intervals below 20. (Non-harmonious Prime numbers seven and above are being shown in black.)



Figure 15. The d of numbers within 81 describe all of the Just heptatonic modal scales employed in Babylonia, Egypt, India and Greece. The white numbers were on the Nippur harmonic numbers list and these punctuate the black number lengths which contain factors other than (2,3,5)



Figure 16. The Senarius 6! = 720 as a Pentatonic instrument restricted to only three Pythagorean tones (G,D,A) by applying the shield of Magen (Shield) of David. The 12th tone can be provided from the mountain (ab on descent) and its inverse (g# on ascent).



Figure 17. YHWH matrix has a set of 11 symmetrical tones, matching the 11 tones selected out by the Magen David. YHWH can select an ascending or descending 12th tone 605 free from any Pythagorean comma.

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The Harmonic Trinity Primes 3ⁿ:4ⁿ:5ⁿ interacting to form Plato's "4/3 mated with 5" as 60ⁿ 51



Figure 18. The Mountainous nature of 60; the natural archetype for the Biblical Holy Mountains is Plato's 4:3 'mated with 5', showing the triangular form as emerging from their product of 60 and its powers.



Figure 19. Plato's Three Steps plus that of Apollo/ YHWH