A Proposed Mesopotamian Origin for the Ancient Musico-Cosmological Systems of the West and China

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This paper is an abridged version of the paper A Proposed Mesopotamian Origin for the Ancient Musical and Musico-Cosmological Systems of the West and China, published by Sino-Platonic Papers (#320, December, 2021), a journal founded by Professor Victor H. Mair of the University of Pennsylvania. The intent in offering two papers is to allow the reader to make a choice: either to read the longer paper, which necessitates engaging in some basic music theory and mathematical calculations; or to read exclusively about ancient musico-cosmology in this abridged version. It is the hope of the author that the reader who makes the second choice will, after finishing this shorter paper, be inspired to read the longer one.

A B S T R A C T

As discussed in the paper "A Proposed Mesopotamian Origin for the Ancient Musical and Musico-Cosmological Systems of the West and China," cuneiform tablets translated since the 1960s have allowed music archaeologists to reconstruct the Mesopotamian musical system. The consensus is that, from at least 1800 BC onward, the Mesopotamians used a seven-note scale (and its inversions or "modes") that is the ancestor of the modern, Western major scale. Furthermore, the Mesopotamian method of re-tuning stringed instruments, from one mode to another, created five extra pitches that correspond with what, in the West, are called sharps and flats. On one tablet, these notes are generated as consecutive "fifths," suggesting that the "cycle of fifths" – a circular arrangement of the twelve pitches that make up an octave – was known to the Mesopotamians.

The Mesopotamian musical system is based on the sequence 4,1,5,2,6,3,7 which served, among other things, as an aid in the tuning of stringed instruments. This sequence is also embedded in the ancient Chinese *sanfen sunyi* method – a method that documents mathematical generation of the cycle of fifths and that was used, as early as the third century BC, to create the *shí'èr lǜ* or "twelve-pitch" system. This twelve-pitch system was in turn used to create scales having fewer than twelve notes, most notably a five-note scale and a seven-note scale – the modes of which are identical to those used in Mesopotamia.

The first section of the paper "A Proposed Mesopotamian Origin for the Ancient Musical and Musico-Cosmological Systems of the West and China" discusses the points outlined above, showing strong similarities between the musical system of Mesopotamia and those of the West and China. The second section discusses the importance of music in the cosmologies of Mesopotamia, the West, and China, and this is the material presented in this abridged version.

In China, the concept of *ganying* or "correlative resonance" was the rationale behind a system of correspondences whereby associations were made between various items (for example, each planet was linked to a musical note, direction, colour, etc.). As will be shown, a similar system of analogies existed in the West, and this system was based on the Mesopotamian musical sequence 4,1,5,2,6,3,7.

These facts, coupled with archaeological evidence showing that musical connections existed between Mesopotamia and both the West and China, suggest that the musical and musico-cosmological systems of both cultures have a Mesopotamian origin.

Keywords: Music, Musicology, Stringed Instruments, Ratio, Proportion, Analogy, Logos, Archaeology, History, Mathematics, Cosmology, Philosophy, History of Religions, Shamanism, Magianism, Music of the Spheres, Correlative Cosmology, Ganying, Mesopotamia, Elam, Persia, Media, China, Greece, Origin of the Major Scale, Origin of the Seven-day Week, Pythagoras, Plato, Aristotle, Seven, Twelve

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1. INTRODUCTION

Mesopotamia is a historical region that corresponds to modern-day Iraq. From the beginning of written history (circa 3100 BC), Mesopotamia was occupied by the Sumerians and Akkadians (including Assyrians and Babylonians). In 539 BC, Mesopotamia was conquered by neighboring Persia (the region that corresponds to modern-day Iran) and became part of the First Persian Empire (also known as the Achaemenid Empire).

Archaeological artifacts discovered in Mesopotamia include clay tablets, inscribed with what is now referred to as cuneiform script. It is estimated that over one million such tablets have been excavated. These tablets span almost 3000 years, from 3100 BC to 75 AD.

After the first century AD, knowledge of cuneiform was forgotten. Then, in the nineteenth century, cuneiform was deciphered by a small group of European and British scholars. Today, there are still only a few hundred qualified readers of cuneiform (Assyriologists) in the world. Consequently, many of the tablets, held in various museums, are yet to be translated.

Beginning in the 1960s a handful of cuneiform tablets relating to music began to be translated, allowing archaeologists to reconstruct the Mesopotamian musical system. These tablets show that the Mesopotamian musical system is based on the sequence 4,1,5,2,6,3,7 (and its inversions). This sequence served, among other things, as an aid in the tuning of stringed instruments. A detailed explanation of the mathematical origin and musical applications of this sequence is given in the paper A Proposed Mesopotamian Origin for the Ancient Musical and Musico–Cosmological Systems of the West and China, written by the author of this abridged version, and published by Sino Platonic Papers, a journal founded by Victor H. Mair of the University of Pennsylvania. Here, only a basic explanation is given:

The circular arrangement of notes in Figure 1 is called the "cycle of fifths." It is the general consensus among music archaeologists "that the cycle of fifths was known" [1] to the Mesopotamians. In Figure 1, the notes in the scale of C major are selected from the cycle of fifths and numbered consecutively: the 1st note in the scale of C major is C; the 2nd, D; the 3rd, E; the 4th, F; the 5th, G; the 6th, A;

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1 https://www.oxfordmusiconline.com/grovemusic/view/10.1093/gmo/9781561592630.001.0001/omo-9781561592630-e-0000018485

and the 7th, B. Notice the sequence of numbers generated: 4,1,5,2,6,3,7. To find the notes in other major scales, the yellow shape in Figure 1 is simply rotated on the circle.[2]

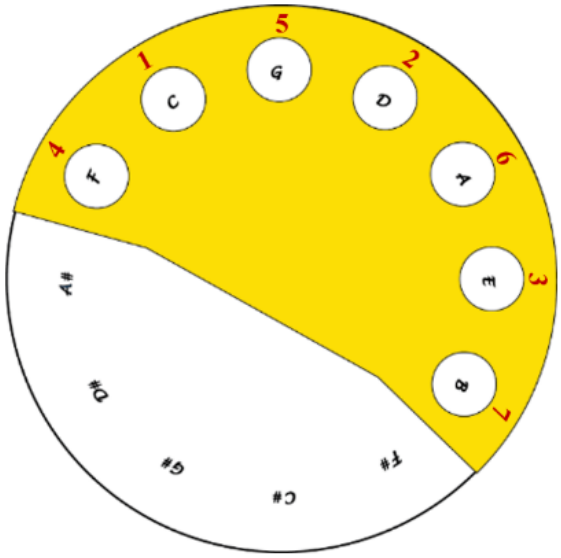

Figure 1. Selecting the Notes in the Major Scale from the Cycle of Fifths Generates the Sequence 4,1,5,2,6,3,7

As discussed in the unabridged paper, this same sequence was used by the Mesopotamians, as early as 1800 BC, to generate seven, seven-note scales – scales that are the direct ancestors of the modern, Western major scale and its six inversions (or "modes").

The Mesopotamians depicted their musical system visually, as is shown by the diagram on cuneiform tablet CBS 1766 (Figure 2), which dates to the first millennium BC. The diagram drawn on CBS 1766 is a heptagram, inscribed in two concentric circles. At the points of the heptagram are written, in cuneiform script, the numbers 1 to 7, in a clockwise direction. Also written at the points of the heptagram are the names of seven of the strings of the Mesopotamian lyre. Below the diagram is a table with four legible columns and four partially legible columns (Table 1). In each of these columns is written an inversion of the sequence 4,1,5,2,6,3,7. The diagram and the table are related: following the diagonals of the heptagram and listing the number at each point generates the sequence 4,1,5,2,6,3,7 and its inversions (Figure 3).

2 For complete instructions visit https://musicircle.net

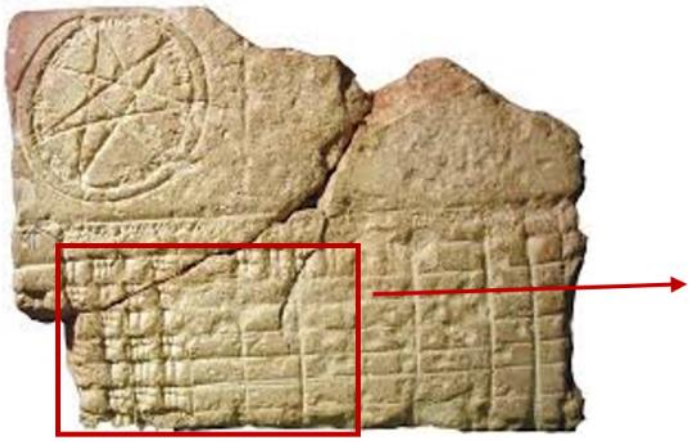

Figure 2. CBS 1766, First Millennium BC (University of Pennsylvania Museum)

2	6	1	7	5	4	7	2
6	3	5	4				
3	7	2	1				
7	4	6	5				
4	1	3	2				
1	5	7	6				
5	2	4	3				

not legible

Table 1. Table from CBS 1766

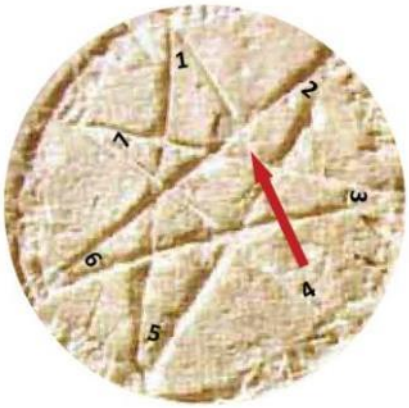

Figure 3. Heptagram from CBS 1766, detail.
Starting at the red arrow and following the diagonals of the heptagram generates the sequence 4,1,5,2,6,3,7.

As discussed in the unabridged paper, both the sequence 4,1,5,2,6,3,7 and a heptagram resembling the one drawn on tablet CBS 1766 can be mathematically derived when generating a twelve-tone scale from the cycle of fifths, using what the ancient Chinese referred to as the *sanfen sunyi* method. This heptagram, in conjunction with the sequence 4,1,5,2,6,3,7, can then be used to illustrate the Mesopotamian musical system, specifically the construction of the seven diatonic modes.[3]

3 A diatonic mode is a scale containing seven notes that are separated by the intervals tone, tone, semitone, tone, tone, tone, semitone (or inversions of this pattern). An example is the scale of C major: C-(tone)-D-(tone)-E-(semitone)-F-(tone)-G-(tone)-A-(tone)-B-(semitone)-C.

2. MUSICO-COSMOLOGY IN MESOPOTAMIA AND THE WEST

The importance of the seven, seven-note diatonic modes to the Mesopotamians may account for the fact that the number seven appeared frequently in Mesopotamian magical rituals, for 'seven-magic' was often used in conjunction with music and musical instruments. An example that music archaeologist J. C. Franklin[4] cites is from a tablet dated 2400 BC that describes offerings given to seven *balangs*: "seven liters of oil and seven liters of dates for the seven *balangs*." [5]

Assyriologist W. Heimpel[6] identifies the *balang* as the arched harp, because a pictogram that resembles an arched harp (Figure 4), used in early texts, was replaced, in later cuneiform texts, with the word *balaĝ* – which is rendered phonetically as *balang*.

Figure 4. Harp Pictogram (3000 BC) (Oriental Institute, University of Chicago)

In the text cited by Franklin, seven *balangs* are deified, receiving offerings of oil and dates. Franklin also gives an example of music seven-magic from *The Cursing of Agade* (2047–1750 BC), a text describing the god Enlil's destruction of the city of Akkad. In an attempt to appease Enlil and restore

4 John C. Franklin, "Lyre Gods of the Bronze Age Musical Koine," *Journal of Ancient Near Eastern Religions* 6.2 (2006): 58.

5 TSA 1 ix:12-14: dated to end of first dynasty of Lagash, p. IX., as given by J. C. Franklin in *Kinyras: The Divine Lyre* (Hellenic Studies Series 70. Washington, DC: Center for Hellenic Studies), 41.

6 https://chs.harvard.edu/CHS/article/display/6337.balang-gods-wolfgang-heimpel

order, seven *balangs* are ritually arranged by the chief lamentation singer, who, "for seven days and seven nights put in place seven *balangs*, like the firm base of heaven."[7]

Archaeological evidence indicates that the *balang*, or arched harp, was the first multiple-stringed instrument ever invented – and that this occurred in the Near East, at least as early as 3100 BC. In *Kinyras: The Divine Lyre*,[8] Franklin documents the evidence for the transmission of the Mesopotamian harp and lyre (a similar instrument of slightly later invention) and the related importance of the number seven, to the West. The first wave of this transmission is documented by figurines from the Cycladic culture of the Aegean Islands, the earliest of which date to circa 2700 BC. (Figure 5)

Figure 5. Marble Harpist, Cycladic Culture (2700 BC) (Metropolitan Museum of Art)

The number seven also had importance in Mesopotamian cosmology. This is no doubt due to the fact that there are only seven bodies that appear to move independently, yet regularly, and that can be seen with the naked eye: the sun, the moon, Mercury, Venus, Mars, Jupiter and Saturn.

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7 Electronic Text Corpus of Sumerian Literature 2.1.5, lines 196–204 (as given by J. C. Franklin in *Kinyras: The Divine Lyre* (2015), 41.)

8 Franklin, *Kinyras: The Divine Lyre*.

We know from cuneiform texts that as early as 1800 BC the Babylonians identified these seven bodies as "gods" and, also, as "planets." For example, the "Great Star List" enumerates: "The moon and the sun, Jupiter, Venus … Saturn, Mercury … Mars" and concludes with the statement "Seven planets." [9]

We also know that detailed planetary observations – of Venus, for example [10] – were made as early as the seventh century BC. Yet even before the making of detailed observations, the heavens were pictured as having seven levels. For example, a Sumerian text from the second millennium BC describes that "the heavens are seven, the earths are seven."[11]

As documented by historian of religion M. Eliade, the Mesopotamian fascination with the number seven influenced the mythologies and cosmologies of the West. As an example, Eliade quotes an excerpt from Origen (184–253 AD) that cites a description given by Celsus, a Greek philosopher of the second century AD. (Celsus's original writings are lost.)

> In the mysteries of Mithras … there is a representation of … the planets, and of the passage of the soul through these. The representation is of the following nature: There is a ladder with lofty gates… The first gate consists of lead, the second of tin, the third of copper, the fourth of iron, the fifth of a mixture of metals, the sixth of silver, and the seventh of gold. The first gate they assign to Saturn, indicating by the 'lead' the slowness of this star; the second to Venus, comparing her to the splendour and softness of tin; the third to Jupiter, being firm and solid; the fourth to Mercury, for both Mercury and iron are fit to endure all things, and are money-making and laborious; the fifth to Mars, because, being composed of a mixture of metals, it is varied and unequal; the sixth, of silver, to the Moon; the seventh, of gold, to the Sun – thus imitating the different colours of the two latter." [12]

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9 Neo-Assyrian; ll. 242–244, trans. Koch-Westenholz 1995: 200–201

10 Tablet 63 from the series of tablets known as *Enuma Anu Enlil*.

11 Wayne Horowitz, *Mesopotamian Cosmic Geography*, (Winona Lake, IN: Eisenbrauns, 1998), 208.

12 Origen, *Contra Celsum*, Book VI, Chapter XXII, trans. Philip Schaff, in *Ante-Nicene Fathers*, vol.4.

In *Shamanism: Archaic Techniques of Ecstasy*, Eliade cites the above quote, but, for our purposes, he cuts the quote short. For Origen continues:

> [Celsus] next proceeds to examine the reason of the stars being arranged in this order … [and gives] … musical reasons … quoted by the Persian theology; and to these, again, he strives to add a second explanation, connected also with musical considerations. [13]

To understand these "musical reasons" we must first understand how Celsus and his contemporaries, relying on earlier Babylonian and Greek knowledge, pictured the universe.

For a naked-eye observer on earth, the sun, the moon, and the planets all appear to move through the same narrow celestial band – what, in the West, we call the ecliptic. The ecliptic was first divided into twelve constellations – which the Greeks later called the "zodiac" – by the Babylonians, circa 500 BC. Yet documentation of one of the earliest zodiac constellations – the goat-fish (Capricorn) – is found on Mesopotamian cylinder seals as early as 2100 BC.

Because the constellations of the zodiac are virtually unchanging, they provide a backdrop against which the movements of the planets can be tracked. What the observer notices is that the sun, the moon, and the planets all appear to move along the ecliptic at different speeds.

The moon appears to move most quickly through the constellations of the zodiac – taking one month to complete the full circuit – while Saturn, slowest moving of the visible planets, takes almost thirty years to return to the same constellation. Because the earth seems stationary, the sun takes on the relative motion of the earth – appearing to move more slowly than Venus, but more quickly than Mars. Arranging these seven "classical" planets, from fastest to slowest, in orbits (or "spheres") that are increasingly more distant from earth creates the model shown in Figure 6.

To date, there is no proof that the Mesopotamians conceptualized this arrangement of the seven classical planets. However, the Alexandrian astronomer Ptolemy (100–170 AD), to whom this model is generally attributed, relied on the work of his Greek predecessor Hipparchus (190–120 BC), who is known

13 Origen, *Contra Celsum*, Book VI, Chapter XXII, trans. Philip Schaff.

to have had access to Babylonian knowledge.[14] A slightly different model [15] is described by Plato (428–347 BC).[16]

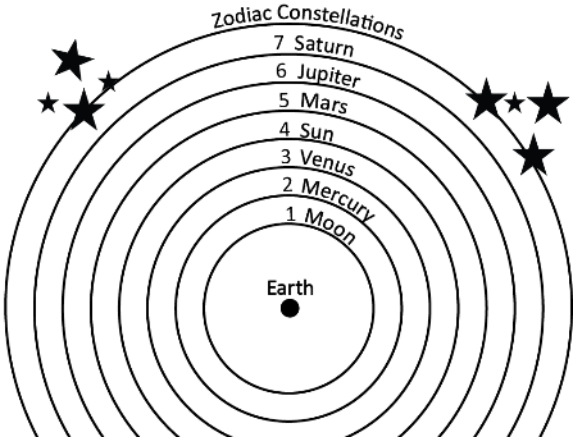

Figure 6. Ptolemaic Model of the "Universe"

Figure 7 shows the Mithraic ladder described by Origen, with each rung labelled with the name of the associated classical planet. Figure 7 also adds the sphere number of each planet, according to the model shown in Figure 6. Notice the sequence on the ladder: 4,1,5,2,6,3,7.

Origen writes that Celsus gives *two* musical reasons[17] that account for "the stars being arranged in this order," and these possible reasons are discussed in the unabridged paper. For as is shown there, the sequence 4,1,5,2,6,3,7 is *first* derived when creating a twelve-tone scale using what the ancient Chinese referred to as the *sanfen sunyi* method. This same sequence can then be *reapplied* to generate the seven diatonic modes from the twelve-tone scale. Incidentally, the Latin word for ladder – *scala* – is the root of the musical term "scale."

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14 Asger Aaboe, *Episodes from the Early History of Astronomy* (New York: Springer Verlag, 2001), 62-65.

15 Plato describes the sun, Mercury, and Venus as moving together. This is, in fact, what is seen from earth: because the orbits of Mercury and Venus lie between the earth and the sun, Mercury and Venus appear move with, yet circle, the sun – Mercury moving more quickly than Venus.

16 Plato, *Republic*, Book X, 616e, trans. Benjamin Jowett.

17 Incidentally, the heptagram on CBS 1766 is inscribed in two concentric circles, the reason for which is not known.

Figure 7: Mithraic Ladder

According to Celsus these musical reasons are "quoted by the Persian theology." Persia (modern-day Iran) was a neighbor of Mesopotamia (modern-day Iraq) and archaeological artifacts suggest that, from as early as 3000 BC, the musical instruments used in Persia (which was then called Elam) were similar to those used in Mesopoamia – and that, therefore, the musical system that was used in Mesopotamia was probably also used in Elam. Moreover, the Mithraic mysteries, a mystery religion centred on the god Mithras that was popular among the Roman military from the first to the fourth centuries AD, are believed, by some scholars, to have been inspired by Persian worship of the god Mithra.

Mithra is a central divinity in the Zoroastrian religion, which was the state religion in ancient Iran for over a millennium (600 BC–650 AD). The earliest textual reference to Mithra is from an inscription at Susa that dates from the reign of Artaxerxes II (404–358 BC): "Ahuramazda, Anahita, and Mithra protect me against all evil."

As the philosopher Porphyry (234–305 AD) describes, the symbolism of the cave played an important role in Mithraic rituals, for initiates met underground, in temples or caves:

> the Persians call the place a cave where they introduce an initiate to the Mysteries, revealing to him the path by which souls descend and go back again. For Eubulus tells us

> that Zoroaster was the first to dedicate a natural cave in honour of Mithras … this cave bore for him the image of the cosmos which Mithras had created, and the things which the cave contained, by their proportionate arrangement, provided him with symbols of the elements and climates of the cosmos. [18]

Many of these temples have survived. For example, the "Mithraeum of the Seven Spheres," in Ostia, near Rome, contains mosaics depicting not only the divinities associated with the seven classical planets, but also the twelve constellations of the zodiac. Figure 8, for example, shows the mosaic depicting Capricorn – a goat-fish (an inheritance from Mesopotamian tradition).

Figure 8: Capricorn Mosaic, Mitreo delle Sette Sfere, (circa 200 AD), Ostia, Italy

Porphyry, when describing the cave as a microcosm of the cosmos, also refers to an ancient tradition that teaches that there are two "gates" in the zodiac, through which the soul passes:

> Theologists therefore assert, that these two gates are Cancer and Capricorn; but Plato calls them entrances. And of these, theologists say, that Cancer is the gate through which souls descend; but Capricorn that through which they ascend. [19]

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18 Porphyry, *The Cave of the Nymphs in the Odyssey*, Arethusa Monograph 1 (Buffalo: Dept. of Classics, State University of New York at Buffalo, 1969).

19 Porphyry, *The Cave of the Nymphs*.

Porphyry traces this tradition – of a cave (or cosmos) with two gates – to the Zoroastrian religion, suggesting that this symbolism was transmitted to the Greeks in Homer's description of the Cave of Nymphs in the *Odyssey*, in Pythagorean teachings, and in Plato's *Myth of Er*.

Like Porphyry, Origen was also aware that the belief that the soul can ascend through the planetary spheres was not unique to Mithraic mysteries, for Origen writes that "Celsus, too, agreeably to the opinion of Plato, asserts that souls can make their way to and from the earth through the planets…"[20] Origen is referring to Plato's account of the soldier Er, who's soul, released from his wounded body, ascends through the heavens. When Er's soul returns to his body, he awakens and describes that his ascent took him through eight spheres, or "whorls." Er identifies the first and outermost whorl as the sphere of the constellations, inside which the other seven revolve. Er then describes the "widths of the whorls" (i.e., the distances between the planets):

> The first and outermost whorl has the rim broadest, and the seven inner whorls [21] are narrower, in the following proportions – the sixth is next to the first in size, the fourth next to the sixth; then comes the eighth; the seventh is fifth, the fifth is sixth, the third is seventh, last and eighth comes the second. [22]

In Table 2, the first and broadest whorl is given the number 1 and each subsequently narrower whorl is given the next consecutive number (2, 3, 4, etc.). Reading from the bottom, up, we have: 4,5,2,6,3,7,8,1. This is close enough to the sequence 4,1,5,2,6,3,7 to give us pause for thought, especially since the width of the whorls is not an observable phenomenon – for we have no depth perception when we look into outer space. Instead, as Sir D'Arcy Thompson suggests, "Plato … was composing a riddle." [23]

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20 Origen, *Contra Celsum*, Book VI, Chapter XXI, trans. Philip Schaff.

21 Plato numbers the whorls (or spheres) from the outside, in.

22 Plato, *Republic*, Book X, 616e, trans. Benjamin Jowett.

23 http://mathshistory.st-andrews.ac.uk/Extras/Thompson_Plato.html

Table 2. Widths of the Whorls

Whorl	Width
1st	1
2nd	8
3rd	7
4th	3
5th	6
6th	2
7th	5
8th	4

Knowing what we do about the musical origin of this sequence and its relationship to the rungs on the Mithraic ladder, it is reasonable to imagine that Plato is making an allusion to music. And, in fact, Plato goes on to describe that "on the upper surface of each circle is a siren, who goes round with them, hymning a single tone or note. The eight together form one harmony…" [24]

Yet if Plato is alluding to the sequence 4,1,5,2,6,3,7, why is the sequence altered? Plato's original writings do not survive. Therefore, it is possible that the sequence was unintentionally altered over time. Or perhaps Plato intentionally altered the sequence when committing it to text, for, as we have seen, the sequence played a role in Mithraic initiation and was therefore probably considered privileged knowledge. In any case, we can trace the idea that the spheres are arranged musically as far back as the sixth century BC, for the statement "there is geometry in the humming of the strings; there is music in the spacings of the spheres" [25] is attributed to Pythagoras (570–495 BC), whose teachings are known to have had a profound influence on Plato.

What we have seen – with the Mithraic ritual and (perhaps) with Plato – is a description of the *spatial* arrangement of the heavens using the musical sequence 4,1,5,2,6,3,7. It is interesting, therefore, that this sequence was also used in conjunction with a unit of *time*: the seven-day week.

The earliest known reference to a seven-day period is from the reign of King Gudea (2144–2124 BC), ruler of the state of Lagash in southern Mesopotamia, who built a seven-room temple which he

24 Plato, *Republic*, Book X, 617b, trans. Benjamin Jowett.

25 *The Houghton Mifflin Dictionary of Biography* (2003): 1250.

dedicated with a seven-day festival. Further evidence of the importance of a seven-day period is found in the Babylonian Flood Story (1800 BC): "the flood … swept over the land … for seven days and seven nights…" [26]

Cuneiform texts indicate that a seven-day period was also used by the Babylonians, not only symbolically, but for counting time. However, because a continuous cycle of seven days can never coincide with the cycle of the moon (or of the sun), the Babylonians didn't use a continuous seven-day cycle for this purpose. Instead, three seven-day periods were followed by an eight- or nine-day period, so that all four "weeks" combined to equal the lunar cycle of 29.5 days.[27] The later creation of a continuous seven-day week, independent of the lunar cycle, is often attributed to the Jews, and is thought to have first been used during the Jewish Captivity in Babylon in the sixth century BC.[28]

The final step in creating the "astrological" week – that we still use today – was the naming of the days after the seven classical planets. The first evidence of this is from "graffiti" at Pompeii (Figure 9), which was covered by volcanic ash in 79 AD. The graffiti lists the days beginning with *Sat*, an abbreviation of the Latin, *dies Saturni*: "day of Saturn." The other days follow: *Sol*, for *dies Solis* ("day of the sun"); *Lun*, for *dies Luna* ("day of the moon"); *Mar* for *dies Martis* ("day of Mars"); *Mer*, for *dies Mercurii* ("day of Mercury"); *Iov*, for *dies Iovis* ("day of Jupiter"); *Ven*, for *dies Veneris* ("day of Venus").

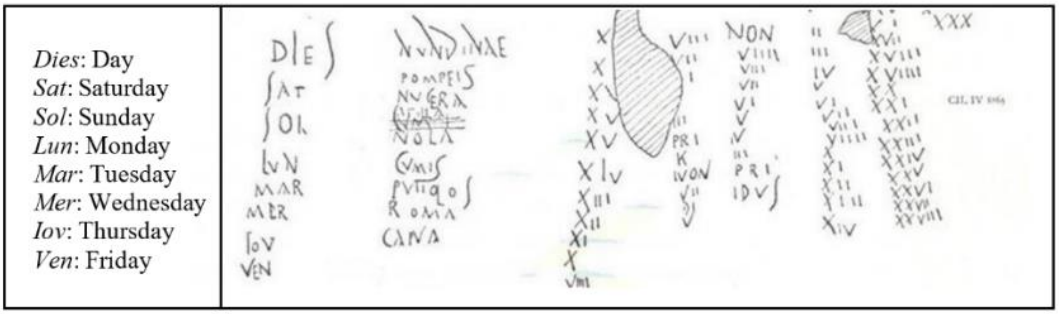

Figure 9. Names of the Days of the Week, Graffiti, Pompeii, Italy (from *Notizie degli Scavi* (1927), 98)

26 http://etcsl.orinst.ox.ac.uk/section1/tr174.htm

27 T. G. Pinches, "Sabbath (Babylonian)," in *Encyclopedia of Religion and Ethics, ed.* James Hastings (Whitefish, MT: Kessinger Publishing, 2003), 20: 889-891.

28 Frank. C. Senn, *Christian Liturgy: Catholic and Evangelical* (Minneapolis: Fortress Press, 1997), 323.

Notice that the days aren't named after the planets in the order of their speed, as given by the Ptolemaic model (Figure 6). Instead, listing the sphere numbers of the planets in their week-day order generates the sequence 4,1,5,2,6,3,7: Sunday (literally, "first" day in Persian, Hebrew, Greek, etc.): 4; Monday: 1; Tuesday: 5; Wednesday: 2; Thursday: 6; Friday: 3; Saturday: 7.

Evidence suggesting that the astrological week originated in the ancient Near East comes from the Mandeans, the last surviving Gnostics of antiquity. The Mandeans are native to southern Mesopotamia and archaeological evidence attests to their presence in the region from at least as early as the third century AD. Their scriptures, dating from a similar period, are written in Mandaic, a variety of Aramaic that shows signs of having been influenced, especially in the area of religious and magical terminology, by Akkadian – the language spoken in southern Mesopotamia from the third millennium BC.

According to E.S. Drower, the function and appearance of Mandean priests resemble those of ancient Babylonian priests: Mandean priests, like the ancient Babylonian *baru*, wear white, prepare a sacrament of bread, cleanse themselves in water, and claim Shamish, the sun-god, as their special patron. The Mandeans believe that each day is governed by a planet:

> Sunday … is governed by Shamish; Monday … is governed by Sin; Tuesday by Nirigh; Wednesday by 'Nbu; and Thursday by Bil (Bel)... Friday is the day of Libat, and … Saturday is the day of Kiwan.[29]

The Mandean names for the planetary rulers are drawn, almost completely, from Babylonian lore: the Babylonian sun deity was Shamash; the moon deity, Sin; the deity associated with Mars, Nergal; with Mercury, Nabu; with Jupiter, Marduk (the term Bel comes from Akkadian bēlu, signifying "lord" or "master" and was usually used by the Babylonians to denote Marduk); with Venus, Ishtar (who was also called, by the Babylonians, "Dilbat"); and with Saturn, Ninĝirsu. The only Mandean name not connected

29 Ethel S. Drower, *The Mandaeans of Iraq and Iran: Their Cults, Customs, Magic Legends, and Folklore* (Oxford University: The Clarendon Press, 1973), 74–75.

with Babylonian lore is that associated with Saturn: Kiwan. Yet the Middle Persian name for Saturn, Kēwān, is probably an Akkadian loanword from kajamānu "the permanent, steady." [30] To summarize, the Mandeans list the planets, using their Babylonian names, in week-day order – an order derived from the musical sequence 4,1,5,2,6,3,7.

Further evidence that the week was ordered using the sequence 4,1,5,2,6,3,7 is given by Cassius Dio (155–235 AD), who cites two reasons for the week–day order. The first is musical:

> …if you apply the so-called "principle of the tetrachord" (which is believed to constitute the basis of music) to these stars, by which the whole universe of heaven is divided into regular intervals, in the order in which each of them revolves, and beginning at the outer orbit assigned to Saturn, then omitting the next two name the lord of the fourth, and after this passing over two others reach the seventh, and you then go back and repeat the process with the orbits and their presiding divinities in this same manner, assigning them to the several days, you will find all the days to be in a kind of musical connection with the arrangement of the heavens.[31]

The "principle of the tetrachord" is a reference to the diatonic scale. For the diatonic scale was described, by the Greeks, as being constructed from two groups of four notes (two "tetrachords"). For example, the scale of C Major is constructed from one tetrachord containing the notes C, D, E and F and a second tetrachord containing the notes G, A, B and C.

Notice that, like Plato, Dio numbers the planets from the outside, in: Saturn, 1; Jupiter, 2; Mars, 3; the sun, 4; Venus, 5; Mercury 6; the moon, 7. Dio then begins with Saturn (1) and "omitting the next two name[s] the lord of the fourth": the sun (4). Then "passing over two others reach[es] the seventh": the moon (7).

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30 D. N. MacKenzie, "Zoroastrian Astrology in the *Bundahišn*," *Bulletin of the School of Oriental and African Studies* 27 (1964): 511–529.

31 Cassius Dio, *Roman History*, Book XXXVII, Chapter 18, trans. Earnest Cary (London, Heinemann, 1914).

The image on the left in Figure 10 shows the planetary names written at the points of a heptagram and numbered as Dio numbers them. Notice that following the diagonals of the heptagram (in the direction shown by the red arrow) illustrates Dio's instructions, generating the sequence 1,4,7,3,6,2,5, which is an inversion, in reverse order, of the sequence 4,1,5,2,6,3,7.

The image on the right in Figure 10 shows the planetary names written at the points of the heptagram but numbered from the inside, out, as they are in the Ptolemaic model (Figure 6). To generate the week-day order – and the sequence 4,1,5,2,6,3,7 – we start with the sun (4), and follow the red arrow to the moon (1), etc. In so doing, we are skipping *three* points each time, thereby generating a cycle of five (choose one, skip *three*, choose one). What Dio describes, however, is a cycle of *four* (choose one, skip *two*, choose one). Nevertheless, this does generate the sequence 4,1,5,2,6,3,7 – but in reverse order. (The reason for this is explained in the unabridged paper.)

Figure 11 explains what Dio's "principle of the tetrachord" has to do with the musical sequence 4,1,5,2,6,3,7. For Figure 11 reproduces the image on the right in Figure 10, but instead of writing the names of the planets, we write the notes in the scale of C Major. Following the red arrow generates seven consecutive fifths (F, C, G, D, A, E, B) and the sequence 4,1,5,2,6,3,7.

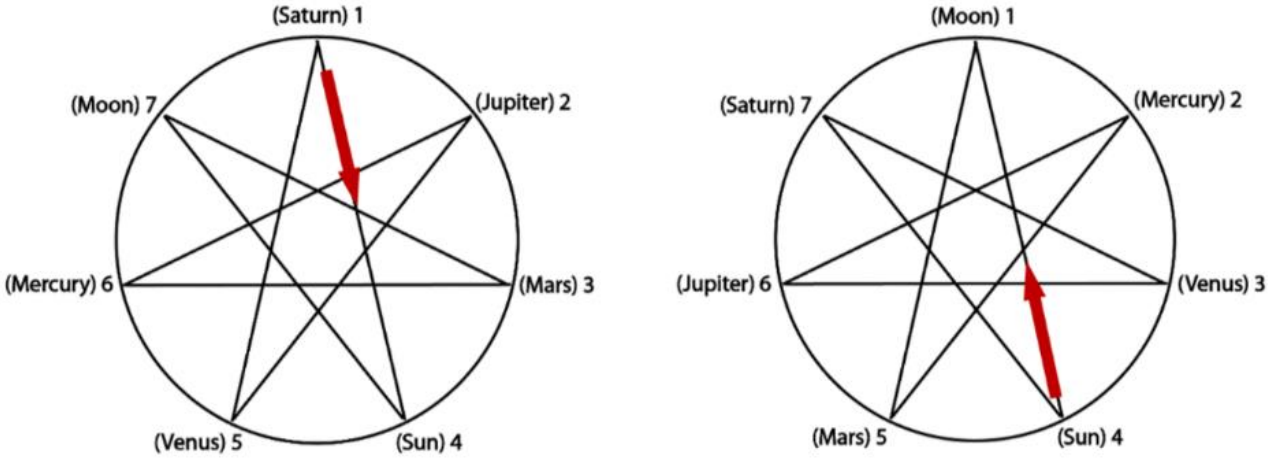

Figure 10: Generating the Week-day order:
(*Left*) Planets numbered from the outside, in (re: Plato, Cassius Dio);
(*Right*) Planets numbered from the inside, out (re: Ptolemy)

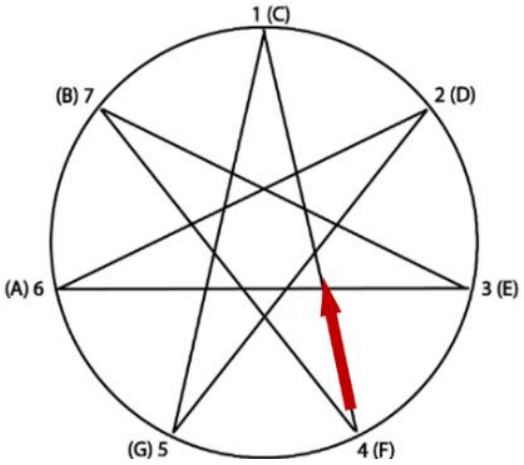

Figure 11: Moving Clockwise around the Circle gives the Major Scale;
Following the Diagonals of the Heptagram generates Consecutive Fifths – and the Sequence 4,1,5,2,6,3,7.

The second explanation given by Dio of the week-day order has to do with the division of the day into 24 hours. According to Dio, each hour of the day was ruled by one of the seven classical planets, in the order of their speeds, from slowest to fastest. For example, the first hour of Sunday was ruled by its associated planet: the sun. The second hour of Sunday was ruled by the planet just faster than the sun – Venus; the third hour was ruled by the next fastest planet – Mercury; the fourth hour was ruled by the fastest planet – the moon. According to Dio, we now return to the top of the list: to Saturn, the slowest planet – which rules the fifth hour of Sunday. The sixth hour of Sunday is then ruled by Jupiter, and the seventh by Mars. Because there are 24 hours in a day, this sequence will repeat three times (7 x 3 = 21), and three hours will remain. In keeping with the pattern, the first of these remaining hours is ruled by the sun; the second by Venus; and the third by Mercury. Twenty-four hours have now passed, and a new day comes. The first hour of this new day is ruled by the next planet in the sequence: the moon. Consequently, this new day – named for the ruler of its first hour – is called Monday.

Scholars generally dismiss Dio's first, musical explanation. For example, H. Chadwick, in his translation of Origen's *Contra Celsum*, comments on the Mithraic ladder ritual as follows:

> The order of the planets in [the] Mithraic list is not the usual order based on the ancient view of their distances from earth (Saturn, Jupiter, Mars, Sun, Venus, Mercury, Moon),

> but that of the days of the week. Evidently, Celsus mentioned explanations of this order derived from Pythagorean musical theory. Dio Cassius (XXXVII 18-19) also gives two explanations of the planetary week. The second is now regarded as correct. The first is based on the principle of the tetrachord, and is no doubt one of the two mentioned by Celsus.[32]

As described in the unabridged paper, *any* gearing of the cycles of seven and twelve generates the sequence 4,1,5,2,6,3,7. This explains why listing the planetary ruler of each day generates the week-day order: because there are seven planets and 24 (or 12 x 2) hours. What must be recognized, however, is that division of the day into 24 hours is *arbitrary*. On the other hand, as shown in the unabridged paper, the fact that twelve fifths span seven octaves is a *mathematical truth*: $2/3^{12} \approx 1/2^{7}$. It follows, therefore, that Dio's first, musical reason should not only be given consideration, but precedence.

Further evidence that the week has a musical origin is found in the Christian tradition. For in 321 AD, when the Roman Emperor Constantine decreed the week to be an official unit of time, he also introduced the practice of "octaves," whereby the celebration of certain Church festivals was extended for eight days (Sunday to Sunday, inclusive). This practice accounts for a definition of the word *octave*, still found in most dictionaries: "a period of eight days beginning with the day of a Church festival." [33] Yet, as documented by Church Father Gregory of Nyssa (335–395 AD), the "octave" was not simply a unit of time but a fundamental tenet of the Christian faith:

> Thus we accept the law concerning the octave which cleanses and circumcises because once time represented by the number seven comes to a close, the octave succeeds it. This day is called the eighth because it follows the seventh... and is no longer subject to *numerical succession* [emphasis added]. Another sun makes this day, the true sun which enlightens... [34]

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32 Origen, *Contra Celsum*, trans. H. Chadwick (Cambridge University Press, 1965), 335, footnote 2.

33 *Oxford Dictionary of English* (3rd ed.), s.v. "octave."

34 Gregory of Nyssa, *On the Sixth Psalm, Concerning the Octave* (J189) (Leiden: E.J. Brill, 1962)

For Nyssa, the week[35] has a spiritual function: to provide a means for the soul to ascend toward God. And not only does the individual undergo this passage; the entire history of the human race is seen as a progression toward the divine – a process that Nyssa calls "akolouthia." According to Christian tradition, this journey will end when the week-day cycle ceases, for "the nature of time is circumscribed in the week of days." [36] When this seven-day cycle finally comes to a close, time will cease and Christ will return, on what Christians call the "eighth day."

The Greek term that Nyssa uses to describe the transformative journey of the soul – *akolouthia* – translates as "sequence." Interestingly, the English word *week* is from Old English *wice*, of Germanic origin; related to Dutch week and German *Woche*, from a base probably meaning "sequence, series."[37]

It is interesting to note that from the time of its discovery in the 1890s until 2007, tablet CBS 1766 (Figure 2) was thought to be "an astrological scheme to relate the seven ancient planets to the seven days of the week." [38] Then, in 2007, Assyriologists Waerzeggers and Siebes[39] recognized the writing on the points of the heptagram to be the names of seven of the strings of the Mesopotamian lyre. Consequently, most scholars now believe this tablet to relate exclusively to the Mesopotamian musical system. Yet, as previously mentioned, the Mesopotamian musical system was most likely used in neighboring Elam (later Persia) and, according to Origen, Celsus traces the planetary arrangement that underlies the week-day order, to "musical reasons…quoted by the Persian theology". We must consider, therefore, that although there is no direct proof that the Babylonians or Persians invented the continuous cycle of the astrological week, CBS 1766 may have, in fact, been written at the time when the first imaginings of correlating the musical sequence 4,1,5,2,6,3,7 and the seven-day week were being made.

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35 Other archaic units of time may have been based on music. For example, Pentecost, like its Hebrew predecessor *Shavout* (literally "Weeks"), is the day after an observed period of seven times seven weeks ("octaves"). Similarly, a Jubilee year occurs after seven times seven *shmita* years (or sabbatical years: from Hebrew *shabbat*: "Sabbath").

36 Gregory of Nyssa, *On the Sixth Psalm, Concerning the Octave* (J188) (Leiden: E.J. Brill, 1962).

37 *Oxford Dictionary of English*, (3rd ed.), s.v. "week."

38 A. Jeremias, *Handbuch der alterorientalischen Geisteskultur*, 2nd ed. (Berlin and Leipzig, 1929), 197–199.

39 C. Waerzeggers and R. Siebes, "An Alternative Interpretation of the Seven-Pointed Star on CBS 1766," *NABU* (Nouvelles Assyriologiques Brèves et Utilitaires) /2 (2007): 43–45.

We have seen the sequence 4,1,5,2,6,3,7 used in association with both the measurement of space (the spacings of the spheres) and the measurement of time (the seven-day week). There is, perhaps, a third application of this sequence to measurement.

In ancient times, only three types of measurement were conceived of: that of space (i.e., distance), that of time, and that of weight. In the ancient world, weight was often synonymous with value. For example, the *mina* was, at first, a Mesopotamian unit of weight but became, also (circa 2000 BC), a unit of value equivalent to sixty shekels. (A modern parallel is the *pound* which is defined as both a unit of weight and a unit of currency.) Yet even before the invention of units of weight, the metals were seen as having a *relative worth*: a certain amount of gold was worth more than the same amount of silver. But how did this tradition develop? How was it decided that gold is more valuable than silver? To hypothesize an answer, let's look again at the Mithraic ladder.

According to Celsus, the rungs of the Mithraic ladder were made of seven metals, each associated with one of the seven classical planets. This correspondence arose naturally from the fact that there were only seven metals known in the ancient world: gold, sliver, copper, iron, lead, tin and mercury (the supposed chronological order of discovery). Mercury is not mentioned as one of the metals used on the ladder. Instead, Celsus refers to a "mixture of metals" as the material used for the fifth rung. Considering that the manufacture of bronze (an alloy of copper and tin) predated the discovery of mercury, it is probable that Celsus's "mixture of metals" is bronze.

Not all traditions linked the metals and the planets in the same way: some correspondences varied according to time and place. For example, Celsus linked copper with Jupiter, but according to most other sources it was associated with Venus. Nevertheless, three of the correspondences were universal: gold with the sun; silver with the moon; and lead with Saturn.

Table 3 lists the planets in the order of their apparent speeds and gives their associated metals, according to Celsus. Notice that this arrangement of metals is of no recognizable order. However, when we rearrange the planets as they are on the Mithraic ladder – using the musical sequence 4,1,5,2,6,3,7 (Table 4) – the metals take on a familiar pattern: they become ordered according to their traditional values: gold, the most valued metal, is at the top of the ladder with silver and bronze directly below; lead,

the least valued, is at the bottom of the ladder. In other words, the traditional value system of the metals is related to the musical sequence 4,1,5,2,6,3,7.

Table 3. Order of Planets: Apparent Speed

Apparent Speed	Planet	Metal
1	Moon	silver
2	Mercury	iron
3	Venus	tin
4	Sun	gold
5	Mars	bronze
6	Jupiter	copper
7	Saturn	lead

Table 4. Order of the Planets: Mithraic Ladder

Mithraic Ladder	Planet	Metal
4	Sun	gold
1	Moon	silver
5	Mars	bronze
2	Mercury	iron
6	Jupiter	copper
3	Venus	tin
7	Saturn	lead

As mentioned earlier, there is no proof that the Mesopotamians arranged the seven classical planets using the sequence 4,1,5,2,6,3,7. There is however, a theory, proposed in the nineteenth century, that suggests that this planetary order was known in Mesopotamia.

When excavating at Borsippa (10 miles from Babylon), Sir Henry Rawlinson (1810–1895) discovered a cylinder seal describing the ziggurat as "*é.ur.*(*me*).*imin.an.ki*": "house which gathers the seven (*me's*) of heaven and underworld."[40] Rawlinson interpreted the "*me's*" to be "the planets of the seven spheres" [41] and noted that the levels of the ziggurat were surfaced with different colors. Rawlinson

40 A. R. George, *House Most High: The Temples of Ancient Mesopotamia* (Winona Lake, IN: Eisenbrauns, 1993)

41 H. C. Rawlinson, "On the Birs Nimrud, or the Great Temple of Borsippa," *Journal of the Royal Asiatic Society* 18 (1861): 17–18.

then remembered the description by Herodotus (484–425 BC) of the seven concentric battlements of the city of Ecbatana, capitol of the Medes Empire (ancient Iran):

> The circles of the walls were, in all, seven. . . The battlements of the first circle are white, the second black, the third scarlet, the fourth blue, the fifth orange. Thus the battlements of those five circles are painted with colors; but of the last two circles, the one had its battlements coated with silver, the other with gold. [42]

Consequently, Rawlinson formulated a theory suggesting that the Mesopotamians – and, later, the Persians – arranged the seven classical planets according to the week-day order. Flaws in Rawlinson's reasoning, however, led to this theory being rejected by modern scholarship.[43]

However, what we see in Herodotus's description – seven levels, the two highest being silver and gold – is too similar to the Mithraic ladder for Rawlinson's theory to be completely rejected. For we now know that the sequence 4,1,5,2,6,3,7 – which we have seen to generate the value system of the metals, the spacings of the spheres, and the week-day order – was known in Mesopotamia as early as 1800 BC. Moreover, according to Origen, Celsus traces the origin of this "arrangement" to "musical reasons, quoted by the Persian theology" and Herodotus is describing the ancient Iranian city of Ecbatana.

During both the Neo-Babylonian period (626–539 BC) and the Seleucid period (312–63 BC), the five planets (and sometimes the sun and the moon) were listed, in Babylonian astronomical and astrological texts, using standardized sequences that have no relationship to observational astronomy. For example, during the Neo-Babylonian period the planets were sequentially arranged, in numerous texts, in the order: Jupiter, Venus, Saturn, Mercury, Mars. This arrangement was slightly altered by the Seleucid period to become: Jupiter, Venus, Mercury, Saturn, Mars. These sequences also occur in contexts that are neither astrological nor astronomical. For example, a ritual in the Seleucid period

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42 Herodotus, *The History of Herodotus*, trans. D. Grene (University of Chicago Press, 1987), 80–81.

43 Nevertheless, this theory has been recently reconsidered by S. Parpola in "Back to Delitzsch and Jeremias: The Relevance of the Pan Babylonian School to the MELAMMU Project" in *MELAMMU Symposia IV*, ed. A. Panainoand A. Piras. Milan: Università di Bologna & Istituto Italiano per l'Africa e l'Oriente (2004): 237–247.

requires that a libation of water for washing hands be offered to "Jupiter, Venus, Mercury, Saturn, Mars, Moon, and Sun, as soon as they appear."[44]

What is important, here, is that textual evidence shows that the practice of listing the planets sequentially, but in non-astronomical order, was already present in Babylon as early as 600 BC. This suggests, once again, a strong possibility of a Near Eastern origin for the use of the musical sequence 4,1,5,2,6,3,7 in creating the astrological week – for, as previously mentioned, by this date, both seven-note scales and a period of seven days had been in use in Mesopotamia for over a millennium.

F. Rochberg-Halton[45] proposes that both the Neo-Babylonian and Seleucid sequences of listing the planets are derived from the fact that certain planets were considered, by the Babylonians, to be benefic, while others were thought to be malefic. For in both sequences, the planets that were considered benefic (Jupiter and Venus) are listed first.

For the Mandeans, too, the planets are both beneficent and maleficent. The sun, for example, is regarded as overwhelmingly beneficent, as shown by the following statements – given in the 1930s to E. S. Drower by Mandean informants – that describe the beneficent character of the god Habshaba (literally "First-Day-of-the-Week"), an aspect of Shamish, the sun god:

> Sunday, which is governed by Shamish, is also associated with the personified Habshaba, First-Day-of-the-Week … [Mandean informants say that:] "The gate of the World of Light is ajar on this day and Habshaba takes the souls by means of electricity into the midst of the world of light." … "Habshaba descends into Mataratha (Purgatories) on Sunday, returning with seven Mandaean souls to the world of light." … "The revolving wheels of light whirl more swiftly on this day, thus assisting the souls in their ascent."[46]

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44 TCL 6 41:23f, trans. A. Sachs in ANET 2: 338.

45 Francesca Rochberg-Halton, "Benefic and Malefic Planets in Babylonian Astrology," *Scientific Humanist: Studies in Memory of Abraham Sachs* (Philadelphia: University of Pennsylvania, 1988): 319–324.

46 Drower, *The Mandaeans of Iraq and Iran*, 74–75.

Yet all seven classical planets are also thought, by the Mandeans, to be able to exert negative influences. M. Bloomfield, when discussing this Mandean belief, suggests that the Christian concept of seven cardinal sins came directly from the pre-Christian belief that negative influences are exerted by the planets on the soul. Bloomfield points out that Reitzenstein[47] and Bousset[48] trace the origin of this belief, and the related concept of the "soul journey," to Persia.

> Many Hellenistic sects believed that the soul, after death, had to journey through the seven zones of heaven, while the ariel spirits … attempted to hinder its passage… Persia may have been the ultimate home of the Soul Journey. Reitzenstein suggests that a representation of the Soul Journey (which he calls the Soul Drama) is the basic concept of the Persian folk-religion which passed to the west through Babylon into various religions, picking up certain Chaldean beliefs on the way.[49]

M. Boyce identifies the elements of the Persian folk-religion as originating with the proto-Indo-Iranians who "forged a religious tradition of immense strength, so that to this day elements from it are preserved by their descendants, the Brahmans of India and the Zoroastrians of Iran."[50] Boyce describes that the people who followed this "old religion" had a "belief in life after death for the individual, and according to its earliest form the disembodied spirit, the "urvan," lingered on earth for three days before departing downward to a subterranean kingdom of the dead…"[51] In other words, the proto-Indo-Iranians believed that the souls the dead *descended* to the underworld. Yet, as Boyce explains, shortly before the

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47 R. Reitzenstein, *Das iranische Erlösungsmysterium, Religionsgeschichtliche Untersuchungen*. (Bonn, Marcus et Weber, 1921).

48 W. Bousset, *Himmelsreise der Seele* (Sonderausgabe) (Darmstadt: Wissenschaftliche Buchgesellschaft, 1960).

49 M. W. Bloomfield, "The Origin of the Concept of the Seven Cardinal Sins," *The Harvard Theological Review* 34 (no. 2) (1941): 121–128.

50 Mary Boyce, *Zoroastrians: Their Religious Beliefs and Practices*. Library of Religious Beliefs and Practices. (London: Routledge/Kegan Paul, (2001), 2.

51 Boyce, *Zoroastrians*, 12.

proto-Indo-Iranians drifted apart (1800–1600 BC) to become identifiable by speech as two distinct peoples – the Indians and the Iranians – there developed a belief that the soul can ascend to a celestial paradise:

> It seems probable that it was just before the Indians and Iranians separated that they conceived a new hope concerning the hereafter. This was that some at least among them – princes and warriors and the priests who served the gods – might escape the dreaded fate of an eternally joyless existence, and that their souls might mount upward at death to join the gods in sunlit Paradise...[52]

To summarize, Boyce, Reitzenstein, and Bousset trace the origin of the concept of the "soul journey" to Persia. Furthermore, as we have seen, Celsus, associates the arrangement of the planets on the Mithraic ladder with "musical reasons...quoted by the Persian theology." Moreover, as previously mentioned, similar musical cultures are thought to have existed in Mesopotamia and neighboring Elam (later Persia) from as early as 3000 BC. It is suggested here, therefore, that the association of the ascension of the soul with music originated in Persia, probably in the early first millennium BC.[53]

In the Mithraic ladder ritual, the metaphor of music is used to describe not only "cosmic" analogies – the spacings of the spheres, the week-day order, the value system of the metals – but the human post-mortem experience. It is interesting, therefore, that the sequence 4,1,5,2,6,3,7 may also have played a role in alchemical tradition. For although alchemy is popularly known as being a process undertaken to transform base metals into gold, many scholars believe that this was simply a metaphor for the transformation of the soul.

To identify a possible relationship between alchemy and the soul journey, it must be mentioned that, as shown in the unabridged paper, when a twelve-tone scale is derived using the ancient Chinese

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52 Boyce, *Zoroastrians*, 14.

53 According to Herodotus, Ecbatana was chosen as the Medes' capital in the late eighth century BC. (*The History of Herodotus*, trans. D. Grene [University of Chicago Press, 1987], 80–81.)

sanfen sunyi method, the sequence 4,1,5,2,6,3,7 is found to repeat indefinitely – because there are an infinite number of both octaves and fifths. When we write the sequence as repetitive, the number 7 precedes the number 4: 4,1,5,2,6,3,7…4,1,5,2,6,3,7…. According to the Mithraic ladder, lead is associated with Saturn (7), and gold with the sun (4). Therefore, moving from 7 to 4 (i.e., moving from one cycle of the sequence to the next) is the equivalent of moving from lead to gold. It is interesting, therefore, that Eliade, in discussing rituals of ascent that incorporate the number seven describes that:

> A ladder with seven rungs was also preserved in alchemical tradition. A codex [in the Royal Library at Modena] represents alchemical initiation by a seven-runged ladder up which climb blindfolded men; on the seventh rung stands a man with the blindfold removed from his eyes, facing a closed door. [54]

To summarize, the sequence 4,1,5,2,6,3,7 appears to have been used in conjunction with the measurement of space, time, and value/quality (both the material value of the metals and the spiritual condition of the soul). These applications of the sequence are *artificial human constructs.* We can deduce from this that the sequence 4,1,5,2,6,3,7 was given great importance in the West.

As shown in the unabridged paper, the sequence 4,1,5,2,6,3,7 is derived from the mathematics of music. It is interesting, therefore, that, according to Aristotle (384–322 BC), there existed a Pythagorean tradition whereby "the whole of nature" and the greater cosmos was believed to be modelled on the numbers of music:

> the … Pythagoreans … saw that the modifications and the ratios of the musical scales were expressible in numbers; – since, then, all other things seemed in their whole nature to be modelled on numbers, and numbers seemed to be the first things in the whole of nature, they supposed the elements of numbers to be the elements of all things, and *the whole heaven to be a musical scale and a number* [emphasis added]. And all the properties

54 Mircea Eliade, *Shamanism: Archaic Techniques of Ecstasy* (Princeton: Princeton University Press, 2004), 490.

> of numbers and scales which they could show to agree with the attributes and parts and the whole *arrangement of the heavens* [emphasis added], they collected and fitted into their scheme; and if there was a gap anywhere, they readily made additions so as to make their whole theory coherent.[55]

As Aristotle describes, the Pythagoreans believed the numbers of music to underlie the "arrangement of the heavens." We have seen this phrase – "arrangement of the heavens" – used before: by Cassius Dio, when describing the musical reason that accounts for the weekday order. Moreover, Celsus examines "the reason of the stars being arranged in this order … [and gives] … musical reasons."

Aristotle's account is the first historical mention of a scheme linking mathematics, music, and the cosmos – a tradition that became referred to, in the West, as the "music of the spheres." But were the Pythagoreans the first to conceive of this idea? Probably not, for according to Iamblichus (245–325 AD), when Pythagoras was in Egypt he was "taken captive … [and] brought to Babylon. Here the Magi instructed him in their venerable knowledge and he arrived at the summit of arithmetic, music, and other disciplines…"[56]

The Magi were Zoroastrian priests – the word magic being derived from the name Magi. Their homeland was Media, a region of north-western Iran. (It was the Median city of Ecbatana that Herodotus described as having seven coloured battlements.) In 612 BC the Medes formed an alliance with Babylon to overthrow the Neo-Assyrian empire. From this time onward, continuing in the Achaemenid period (500–330 BC), there was a strong Mesopotamian influence on Persian culture, specifically in the areas of art and religion – an exchange that was stimulated by the presence of the Magi in Babylon.

The Magi travelled widely, affecting religious beliefs in the regions they visited. It is probable, therefore, that they influenced the Roman Mithraic Mysteries[57] which, as we have seen, encoded the sequence 4,1,5,2,6,3,7 in the ladder initiation ritual.

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55 Aristotle, *Metaphysics*, Book I, Chapter 5 (985b23-986a6), trans. W. D. Ross (Buffalo: Prometheus Books, 1991).

56 Iamblichus *The Life of Pythagoras, Ch. IV*, trans. T. Taylor, (Theosophical Pub. House, 1918), 10.

57 Franz Cumont, *The Mysteries of Mithra*, trans. T.J. McCormack (Chicago, Open Court, 1903), 24.

In summary, we have seen that, in the West, the tradition of the "music of the spheres" – which envisioned the architecture of the cosmos as being related to the numbers of music – was based on a complex system of analogies.[58] It is interesting, therefore, that in China, beginning in the Warring States period (475–221 BC), the idea of *ganying* or "correlative resonance" appears in texts to denote a cosmological principle that is described, analogically, using the principles of music. As we'll soon see, this concept of correlative resonance was so important that it played a vital role not only in Chinese philosophical tradition, but in all aspects of Chinese life.

3. MUSICAL ARTIFACTS FROM ANCIENT CHINA

Before we discuss the cosmology of ancient China and its relationship to music, let's look, briefly, at some of the ancient musical artifacts that have been discovered in China.

The oldest instruments discovered in China that are still playable – and therefore able to give information as to the nature of the ancient Chinese musical system – are sets of bronze bells that were played as a single instrument, known as *bianzhōng*.

The *bianzhōng* evolved over centuries, for the earliest bronze bells discovered in China, dating to circa 1700 BC, were not made for musical purposes at all. Instead, these clapper bells were probably used as signalling devices. By 1200 BC, archaeologist R. Bagley suggests, these individual bells were being used to accompany music.[59]

One of the first known sets of *bianzhōng* – that is thought to have been collected, rather than purposefully cast as an instrument – is dated to the eleventh century BC. Then, by the eighth century BC, *bianzhōng* sets were being precisely manufactured.

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58 The word *analogy* comes from the Greek *analogos*, which is made up of two words: *ana* ("upon") and *logos* ("reason," "word," "ratio"). Could the concept of analogy have a mathematical origin: was an analogy originally a comparison built upon (*ana*) number (*ratio*)? For this is how the sequence 4,1,5,2,6,3,7 is used: as a numerical link by which a sequence that originates in the proportions (*analogia*) of music is re-applied to create various non-musical correspondences.

59 Robert Bagley, "Ancient Chinese Bells and the Origin of the Chromatic Scale," *Zhejiang University Journal of Art and Archaeology* 2 (2015): 69.

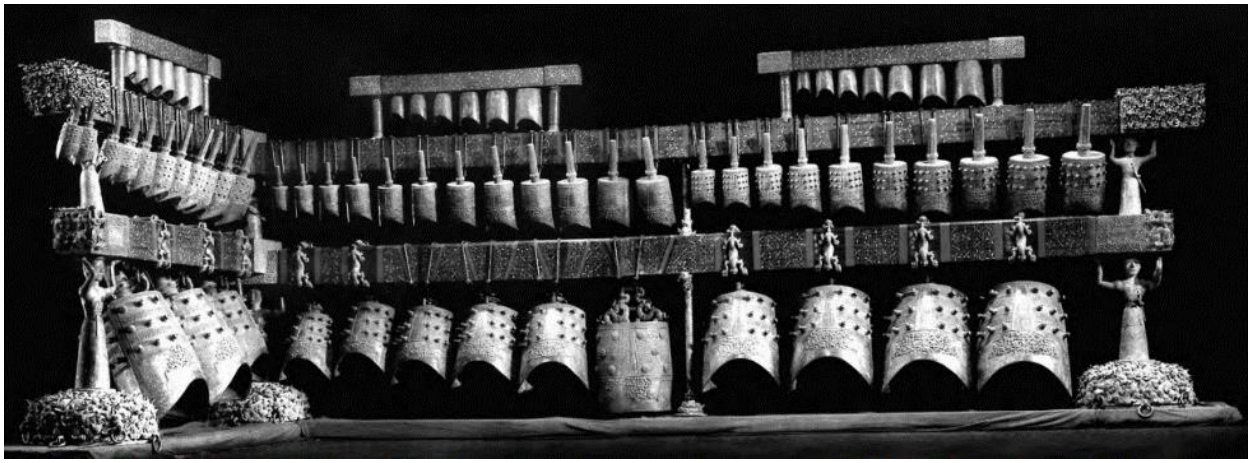

Figure 12. *Bianzhōng*: sixty-five bronze bell set. Tomb of Marquis Yi, 433 BC (Hubei Provincial Museum, China)

By far the most astounding *bianzhōng* set yet discovered was found in 1977, in the tomb of Marquis Yi of Zeng (Figure 12), in the province of Hubei. This sixty-five-bell set plays several octaves of the ancient Chinese twelve-tone scale, or *shí'èr lǜ*, which is generated using the *sanfen sunyi* method, mentioned earlier. The tomb also contained a selection of stringed instruments, among them a *qin*, an instrument usually strung with seven strings and often referred to as "the father of Chinese music." The Marquis Yi instruments prove that a highly evolved musical culture flourished in China as early as the fifth century BC – a culture that, according to traditional Chinese historians, had developed over thousands of years, independently.

However, beginning in 1996, in Xinjiang Uyghur Autonomous Region, in the far west of China, archaeologists began discovering older stringed instruments – which are now generally referred to as *konghou* ("harp") (Figure 13)– some of which predate the Marquis Yi *qin* by more than 500 years. As described by archaeologists from both the West[60] and China[61], these *konghou* resemble the angular harps that were invented in Mesopotamia circa 1900 BC. (Figure 14)

60 Bo Lawergren, "Western Influences on the Early Chinese Qin-Zither," *Bulletin of the Museum of Far Eastern Antiquities* 75 (2003): 91.

61 He Zhiling and Wang Yongqiang 贺志凌 王永强, "The Musical Archaeological Study of Konghou in Hami Wupu Eschernan Cemetery," *Chinese Music* (2018): 117–122. (English translation forthcoming in Sino-Platonic Papers.)

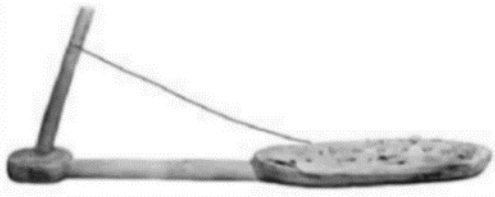

Figure 13. Angular Harp, Yánghǎi, Xinjiang Uyghur Autonomous Region, circa 1000 BC

Figure 14. Wall relief showing Assyrian Angular Harps, Upper Mesopotamia, 865 BC (British Museum, London)

Furthermore, a paper by Xie Jin published in 2005 by the Shanghai Conservatory of Music describes evidence of Near Eastern shamanic (i.e., Magian) presence in the Xinjiang graves that contain these *konghou*:

> in Shanshan graves, bows of Sassanid character, clothes of Shaman traits and skulls of Caucasus race have also been found. All those cultural relics have shown clearly that … cultural communication had already begun between Xinjiang and the areas of Altai, Assyria and the Black Sea… [T]he prevalent view of Chinese *konghou*'s origin [i.e., that the *konghou* was invented in China] is questionable. [62]

62 https://web.archive.org/web/20051120100750/http://musicology.cn/Article/ytdt/conference/200506/299.html

The Sassanian Empire, centred in Persia, existed from 224 to 651 AD. Therefore, the linking, in the above quote, of harps dating to 1000 BC with the Sassanids is anachronistic. Nevertheless, what the author implies is an association with Zoroastrianism, the Sassanid religion.

Further evidence of a link between the Xinjiang harps and Zoroastrianism is given in a recent doctoral thesis[63] detailing a total of twenty-three harps, excavated prior to 2018. One harp, excavated in Xinjiang in 2010 from Hami Wupu Eschernan Cemetery, Xinjiang,[64] dating to the sixth or seventh century BC, has a carving of a two-humped camel at the end of its poorly damaged resonance box (Figure 15). The two-humped or Bactrian camel was domesticated circa 2500 BC, east of the Zagros Mountains (which mark Iran's western border), with the practice then moving into Mesopotamia.

Figure 15. Angular Harp with Camel Carving from Grave M63:1, Hami Wupu Eschernan Cemetery, Xinjiang. Photo: He Zhiling and Wang Yongqiang, "Konghou in Hami" *Chinese Music* (2018): 119

The discovery of these *konghou* throws into question the previously accepted theory that the musical culture of ancient China developed independently. For not only do artifacts from the graves suggest a connection to cultures further west, the occupants of the graves in which the oldest *konghou* were found are Europoid.

63 He Zhiling and Wang Yongqiang 贺志凌 王永强, "The Musical Archaeological Study of Konghou in Hami Wupu Eschernan Cemetery," *Chinese Music* (2018): 117–122. (English translation forthcoming in Sino-Platonic Papers.)

64 Wang Yongqiang and Dang Zhihao 王永强 党志豪, "A New Archaeological Discovery at Hami Wupu Eschernan Cemetery, Xinjiang," *The Western Regions Studies* (2011): 134–137.

According to archaeological evidence, these Europoid people – now popularly referred to as the Tarim Basin mummies[65] – began arriving in the region as early as 1800 BC, bringing with them technologies not yet known in China, most importantly wheeled, horse-drawn vehicles and bronze metallurgy. It is almost certain, therefore, that all ancient Chinese *bianzhōng* were cast at a time when east-west contact had already been established.

Moreover, as evidenced by the discovery of *bianzhōng* sets dating to the first half of the first millennium BC, not only was the *sanfen sunyi* method used to generate the *shí'èr lǜ* or "twelve-pitch" system, this system was in turn used to create scales having fewer than twelve notes, most notably a five-note (pentatonic) scale and a seven-note (diatonic) scale (for more information, see footnotes 38, 40, and 42 of the unabridged paper) – the modes of which are identical to those used in Mesopotamia.

Now that we have examined some of the evidence showing that contact between Xinjiang Uyghur Autonomous Region and cultures to the west was established in the early second millennium BC – and that musical communication had begun by 1000 BC – let's look at the musico-cosmology of ancient China and its possible relationship similar traditions already established further west.

4. MUSICO-COSMOLOGY IN ANCIENT CHINA

The ancient Chinese conceived of the universe as an interconnected whole, a tradition that is often described as "correlative cosmology."[66] The functioning of the cosmos was thought to depend, primarily, on the interplay of two rhythms or cycles: the "five phases" (*wǔxíng*) and *yin-yang*. It was believed that patterns of change are a result of the cyclical interactions of the five phases and the vital forces (*qi*) of *yin* and *yang*. This relationship was thought to manifest itself in both the macrocosm and microcosm: in celestial patterns; in the organization of government; and in the internal structure of the human body. Consequently, the five phases theory, coupled with *yin-yang*, played a fundamental role in all aspects of traditional Chinese life.

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65 Victor H. Mair, "The Mummies of East Central Asia," *Expedition* 52 (no. 3) (Winter, 2010): 23–32.

66 See, for example: https://plato.stanford.edu/entries/chinese-metaphysics/

The English translation of *wǔxíng* is *wǔ* ("five") and *xíng* ("moving"). In the Chinese language, a planet is called a "moving star" (*xíngxīng*) and, originally, *wǔxíng* referred to the five visible planets: Mercury, Venus, Mars, Jupiter and Saturn. Similarly, the terms *yin* and *yang* correspond, traditionally, to the moon and the sun, respectively. It is important to note that the earliest documented proof of ancient Chinese study of the planets is found on what are termed the Shang oracle bones, dating to 1300 BC. As we have seen, this date is at least five hundred years after the arrival of the Europoid people in Xinjiang, circa 1800 BC. Moreover, in Mesopotamia, from 1800 BC onward, observations of the sun, the moon and the five planets visible to the naked eye (i.e., the seven "classical" planets) are recorded.[67]

According to historian of religion M. Eliade, the Mesopotamian fascination with the number seven influenced the mythologies and cosmologies of indigenous cultures as far afield as Central Asia. For Eliade explains that although the archaic belief that people can ascend to the sky is a universal phenomenon, found in all cultures, the idea that this ascent is accomplished by climbing through *seven* levels shows a Mesopotamian influence: "The identification of the seven-branched Cosmic Tree with the seven planetary heavens is certainly due to influences from Mesopotamia."[68] In documenting this widespread influence, Eliade describes that "the conception of seven heavens is even found throughout southeastern Siberia," citing the following examples: [69]

- "The Cosmic Pillars of the Ostyak have seven incisions."
- "The Vogul believe that the sky is reached by climbing a stairway of seven stairs."
- "The Altaic shaman climbs a tree or a post notched with seven or nine *tapty*, representing the seven or nine celestial levels."

67 Mathieu Ossendrijver, "The Moon and Planets in Ancient Mesopotamia," Freie Universität Berlin https://doi.org/10.1093/acrefore/9780190647926.013.198

68 Mircea Eliade, *Shamanism: Archaic Techniques of Ecstasy* (Princeton: Princeton University Press, 2004), 274.

69 Eliade, *Shamanism*, 275

As we have seen, the Chinese counted five planets, identifying the sun and moon as distinct from those five. Yet, in the ancient world, this division of the seven classical planets into a group of five and a group of two was not exclusively a Chinese concept:

> In antiquity, only five planets (Mercury, Venus, Mars, Jupiter, Saturn) were known…; in many early traditions, and also in some Iranian contexts, the two so-called "luminaries," the Sun and the Moon, were added to their number. For this reason, some sources mention both the "five" and the "seven" planets.[70]

As previously mentioned, in the Near East, as early as the Neo-Babylonian period (626–539 BC), the five visible planets were listed sequentially, in an order that was not astronomical. It is interesting, therefore, that, three centuries later, ancient Chinese texts list the five visible planets in sequences that are also of non-astronomical order. And just as, in the West, each planet became associated with a set of non-linear correspondences (for example, Saturn: lead; Saturday, etc.), so was the Chinese system based on similar seemingly irrational[71] correlations (see Table 5):

> The universe, according to this [the ancient Chinese] view, is a harmoniously functioning organism consisting of multitudinous objects, qualities and forces which … are integrated into coherent patterns by being subsumed under one or another of many numerical categories. (The best known such category, of course, is that in sets of fives, such as the five elements, five directions, five colors, etc.) *Among items belonging to a common category, a particular affinity exists between those having the same relative*

70 A. Panaino, "Planets," *Encyclopædia Iranica*, online edition (2016): https://iranicaonline.org/articles/planets.

71 The modern Western mind is taught that rational, causal thought is the only valid form. As a response to this, C. G. Jung refers to the correlations in the *I Ching* not as chance, but as "acausal." (C. G. Jung, foreword to the *I Ching or Book of Changes*, trans. R. Wilhelm, Princeton University Press, 1950: xxiv). Similarly, W. A. Callahan refers to Daoist thought not as irrational but "arational." (W. A. Callahan, "Discourse and Perspective in Daoism: A Linguistic Interpretation of Ziran" *Philosophy East and West* 39, 1989: 171).

position within their respective sequences [emphasis added]. For example, the property common to such diverse items as fire, summer, south, bitter taste, burning smell, heat, the planet Mars, feathered creatures, beans, the hearth sacrifice, the lungs, the tongue, joy, and many more,[72] is that each of them is number two within its particular sequence of five. Affinities of this kind should be thought of as functioning … along lines of spontaneous response (the response of one stringed instrument to another the same in pitch) …[73]

Table 5. Five-Phase Theory Correspondences
(Information selected from Table 75, Section 73.1, Wilkinson's *Chinese History: A Manual*, 2018)

Planets	Jupiter	Mars	Saturn	Venus	Mercury
Elements	wood	fire	earth	metal	water
Seasons	spring	summer	high summer	autumn	winter
Directions	east	south	central	west	north
Tastes	sour	bitter	sweet	pungent	salty
Emotions	anger	joy	sympathy	grief	fear
Colours	blue–green	red	yellow	white	black
Tones	*jué*	*zhǐ*	*gōng*	*shāng*	*yǔ*
Heavenly Stems	*jia, yi*	*bing, ding*	*wu, ji*	*geng, xin*	*ren, gui*

According to Bodde, affinities "should be thought of as functioning … along lines of spontaneous response (the response of one stringed instrument to another the same in pitch)." This statement is based on the use, in ancient texts, of the analogy of *ganying*, or "correlative resonance", to explain the affinity between things of the same category. An example is the following passage from the *Lǚshì chūnqiū* (239 BC):

72 A correspondence not mentioned by Bodde are the "Heavenly Stems" – a list of ten names, first used circa 1250 BC, to name the days in a ten-day "week". As shown in Table 5, a pair of Heavenly Stems are linked to each element in the five-phase system.

73 Derk Bodde, "The Chinese Cosmic Magic Known as Watching for the Ethers" *Essays on Chinese Civilization* (Princeton: Princeton University Press, 1982), 351–352.

> Things belonging to the same category naturally attract each other; things that share the same ethers [*qi*] naturally join together; and notes that are comparable naturally resonate to one another. Strike the note *gōng* on one instrument and other strings tuned to the *gōng* note will vibrate; strike the note *jué* and other strings tuned to the *jué* note will vibrate. [74]

In the above quote, sympathetic resonance or *ganying* (for example, between multiple *gōng* notes or multiple *jué* notes) is used as an analogy to describe the force that underlies the five-phase correspondences. *Ganying* is a process of interaction that transcends time and space – and rational, linear causality. Through the mechanism of resonance, an event in one location produces an effect in another location, and the medium by which this dynamic influence is exchanged is *qi*. For "things belonging to the same category" (i.e., having the same relative position within their respective sequences) "naturally attract each other." The earliest textual reference to the five phases is found in the third century BC:

> "The Five [Elements] are: water, fire, wood, metal and earth. Water pours down; fire blazes and rises; wood is either crooked or straight; metal does as it's commanded; earth sprouts crops. What soaks becomes salty; what burns becomes bitter; what is crooked or straight becomes sour; what is hard but melts becomes acrid; what is sown and reaped is delicious!" [75]

In the preceding quote, the five elements are given in the order: water, fire, wood, metal, earth (or, to list the corresponding planets: Mercury, Mars, Jupiter, Venus, Saturn) – an order that is different from that given in Table 5. Yet both were traditionally accepted orders. In fact, numerous variations of

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74 *Lǚshì chūnqiū* (春秋), Book 13, Ch. Zhao Lei (召類), trans. Knoblock and Riegel, in *The Annals of Lü Buwei*, 283.

75 *Shūjīng* (書經), Ch. *Hóng fàn* (洪範), trans. M. Palmer, J. Ramsay, V. Finlay, in *The Most Venerable Book* (*Shang Shu*), (Penguin Classics, 2014), 152.

the sequence were used: according to W. Eberhard[76], sixteen variations of the sequence are found in pre-Han and Han texts. Eventually, two sequences – "mutually generating" (wood, fire, earth, metal, water: the order given in Table 5) and "mutually overcoming" (wood, earth, water, fire, metal) – became more or less standard and are still used, today, in the practice of Chinese medicine.

V. Rubin[77] proposes that the five-phase theory was originally independent from the idea of *yin-yang*, and constituted a spatial model – as opposed to the temporal model of the cycling activity of *yin-yang*. In fact, a spatial model is one way in which the five-element theory is still depicted, today: the five elements are written at the points of a pentagram (Figure 16). When following the outer circle of this model, the sequence of mutual generation is derived; following the diagonals of the pentagram gives the order of mutual overcoming.

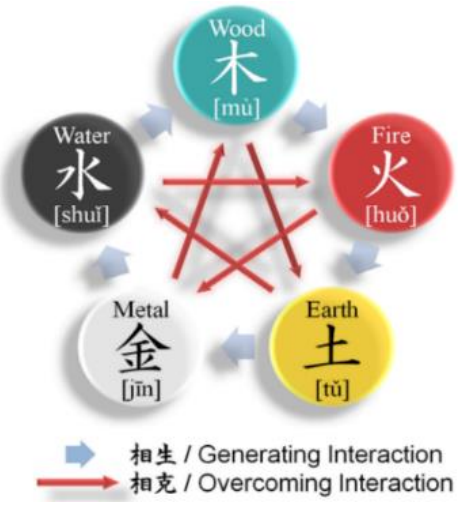

Figure 16: Five-Element Theory: A Spatial Model (Source: Wikipedia)

Early Chinese schools of philosophy used the concept of *ganying* to account for relationships of resonance within the cosmos: in Daoism, *ganying* represented the universal resonance between things in the natural world; in Confucianism, there arose the concept of *tian-ren ganying* – described as "ethical

76 W. Eberhard, "Beiträge zur Kosmologischen Spekulation Chinas in der Han-Zeit," *Baessler-Archiv* 16 (1) (1933).

77 V. Rubin, "The Concepts of Wu-Hsing and Yin-Yang", *Journal of Chinese Philosophy* 9 (1982): 131–157.

resonance" between heaven and the human realm; later, in Chinese Buddhism, *ganying* came to signify "prayers being heard."

C. Le Blanc gives the following synopsis of the concept of *ganying* (which he refers to as "*kan-ying*"), as it is described in the *Huainanzi* – a text that blends Daoist and Confucianist thought, written during the second century BC:

> *Kan-ying* may be defined … as the power of things to affect and to be affected in such a way as to bring about harmony. This power is based on the persistent affinity and attraction of things that were originally one, but that became scattered when the world began. Through the True Man *kan-ying* recreates the original unity. As a dynamic pattern *kan-ying* expresses the full cycle of cosmological, social and psychological integration. Its natural and universal character makes it binding for the cosmos as a whole and also for each and every one of the Ten Thousand Things issuing from Tao. In Chapter Six the foregoing pattern is applied mainly to the realm of human society and, more specifically, to the relations between the perfect ruler – the True Man – and the people. The argument there propounded, that these relations should be based on non-action (*wu-wei*) understood as resonance (*kan-ying*), draws its ultimate strength from the cosmological scheme outlined above. We may thus conclude that *kan-ying* not only forms a logically coherent and philosophically meaningful idea but also provides the focal point around which the Huai-nan Tzu cosmology is structured. [78]

In the above quote, Le Blanc describes the Confucianist idea of ethical resonance, whereby the perfect ruler, the True Man, acts according to the principle of *ganying* – without force yet responding to stimulus in a spontaneous manner, in keeping with the principles of harmonic resonance. The level of

78 C. Le Blanc, *Huai-nan Tzu: Philosophical Synthesis in Early Han Thought: The Idea of Resonance* (*Kan-Ying*), with a translation and analysis of Chapter Six, (Hong Kong University Press, 1985), 209.

the ruler's embodiment of *ganying* is of cosmic importance, for the quality of his moral character is directly proportionate to the prosperity of the realm.

By the second half of the first millennium AD, the concept of *ganying* became central to Chinese Buddhism. For example, Chapter Five of the *Dasheng Xuanlun,* written by Zhizang (458 AD–522 AD) explains the importance of *ganying* ("stimulus-response") as follows:

> Stimulus-response is the great tenet of the buddha-dharma, the essential teaching of the many sutras. To "stimulate" means to bring or summon forth, and to "respond" means to go forth and meet in welcome. As all sentient beings possess [the seeds of] goodness, they may induce the Buddhas to descend and take shape in front of them, and [the Buddhas] will meet them in welcome. The principle [is such that they] neither deviate nor overshoot [the mark]. This is called stimulus and response. The common person stimulates but does not respond; the Buddhas respond but do not stimulate; and bodhisattvas both respond and stimulate.[79]

To summarize, the principle of *ganying* was identified as the force responsible for establishing correlations linking the cosmic realm, the human realm, and the natural world. As mentioned earlier, these correlations were demonstrated by creating categories in which items were listed sequentially and then cross-related, to illustrate affinities. As Bodde described earlier, the most common category was that of sets of fives. Yet there were other categories – the next most important being the category based on the number twelve.

Like the Babylonians, the ancient Chinese divided the ecliptic into twelve constellations – or *ci*. The *ci* were originally conceived of as the "stations" of Jupiter (which takes approximately twelve years to circle the sun, and consequently appears, from earth, to occupy each *ci* for a period of approximately

79 Zhizang, *Dasheng Xuanlun* (大乘玄論), Chapter 5, "Chinese Buddhism and the Cosmology of Sympathetic Resonance," trans. R. H. Sharf in *Coming to Terms with Chinese Buddhism* (Honolulu: University of Hawai`i Press, 2002), 121.

one year). In keeping with the practice of correlational thinking, other categories of twelve were associated.

As mentioned earlier (see footnote 72), the "Heavenly Stems" were, originally, the names of the days in a ten-day week. Yet the ancient Chinese time-keeping system also used twelve "Earthly Branches." These two groups were fused together in the Stems-and-Branches system, to form a sixty-count cycle that was used, as early as 1200 BC, to create a cycle of sixty days – as evidenced by textual references on the Shang oracle bones.

By the Han Dynasty (202 BC–220 AD), this sixty-day period was being associated with the "sixty different sequences or scales, known…as the sixty pitch-pipes"[80] (i.e., the 5 x 12 = 60 pentatonic modes: see footnote 58 of the unabridged paper). Here, then, we see a correlation made between a unit of time and sequences found in music that brings to mind the use of the sequence 4,1,5,2,6,3,7, in the West, in ordering the days of the seven-day week.

Table 6. Categories in the Ancient Chinese Correspondence System Based on Twelve

Earthly Branches	*zǐ*	*chǒu*	*yín*	*mǎo*	*chén*	*sì*	*wǔ*	*wèi*	*shēn*	*yǒu*	*xū*	*hài*
Lunar Months	11	12	1	2	3	4	5	6	7	8	9	10
Zodiac Animals	Rat	Ox	Tiger	Rabbit	Dragon	Snake	Horse	Goat	Monkey	Rooster	Dog	Pig
Pitch Pipes	*Huáng Zhōng*	*Dà Lǚ*	*Tài Cù*	*Jiá Zhōng*	*Gū Xiǎn*	*Zhòng Lǚ*	*Ruí Bīn*	*Lín Zhōng*	*Yí Zé*	*Nán Lǚ*	*Wú Yì*	*Yìng Zhōng*
Directions	0° (N)	30°	60°	90° (E)	120°	150°	180° (S)	210°	240°	270° (W)	300°	330°
Dual Hour	23:00	1:00	3:00	5:00	7:00	9:00	11:00	13:00	15:00	17:00	19:00	21:00

The twelve Earthly Branches were directly correlated with the twelve *ci*, and other twelve-fold categories were added (Table 6). For example, in the *Liji* (third century BC), twelve lunar months are listed and correlated with the twelve *shí'èr lǜ* pitches, in their chromatic order: the longest pipe, *Huáng*

80 Bodde, "Watching for the Ethers," 354.

Zhōng, is associated with the second month of winter (which contains the winter solstice), and so on through the cycle of the seasons – winter, spring, summer, autumn – till the shortest pipe, *Yìng Zhōng*, is associated with the first month of winter. Other categories in the twelvefold system include the twelve animals of the Chinese "zodiac"[81]; a directional system used primarily by ancient Chinese mariners and astronomers based on a twelve-part (30°) division of the circle of the horizon; and a division of the day into twelve "double-hours."

By the third century BC, this twelvefold system became associated with a standardized system of weights and measures – and the element that provided the correlative basis was music:

> While other early civilizations concerned themselves with linear measure, capacity, and weight in formulating their metrological systems, the Chinese were apparently unique in including pitch-measure (*lǜ*), and that not merely on par with, but as the basis of, the other three. [82]

This metrological system is described the *Hanshu*, written in the first century AD:

> The basis of linear measure is the length of the *Huáng Zhōng* (pitch-pipe). Using grains of black millet, the length of *Huáng Zhōng* is ninety *fen* (one *fen* being equal to the width of a grain of millet) … twelve hundred (grains) fill its tube… The contents of one tube weigh twelve *chu*.[83]

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81 The term "zodiac" is a misnomer, for there are several differences between the Western (Babylonian) zodiac and the Chinese system. Two fundamental differences stand out: firstly, the animals of the Chinese zodiac are not associated with the constellations that make up the ecliptic; secondly, the Chinese twelve-part cycle corresponds to years, not months.

82 Joseph Needham and Kenneth Robinson, *Science and Civilisation in China*, Vol. 4, *Sound* (*Acoustics*) (Cambridge: Cambridge University Press, 1962), 199.

83 *Hanshu*, Chapter 21 (律曆志), trans. Needham and Robinson, *Science and Civilisation*, 201.

In order to establish the absolute units described in the *Hanshu*, it was necessary to determine the exact length (and therefore, the exact pitch) of the *Huáng Zhōng*. The ancient method for determining the pitch of the *Huáng Zhōng*, and consequently all twelve *lǜ*, was related to the cosmic, cyclic flow of *qi*. This is documented in the *Hanshu*: "the *qi* of heaven and earth combine and produce wind. The windy *qi* of heaven and earth correct the twelve pitch fixations." [84]

A thousand years after the *Hanshu* was written, the practice of determining the pitch of the *lǜ* using *qi* was still in use, as described by the philosopher Tshai Yuan-Ting (1135–1198 AD):

> The (pitch-pipes) are blown in order to examine their tones, and set forth (in the ground) in order to observe (the coming of) the *chhi* [*qi*]. Both (these techniques) seek to (determine the correctness of the) Huang-chung [*Huáng Zhōng*] tube by testing whether its tone is high or low, and whether its *chhi* (arrives) early or late. Such were the ideas of the ancients concerning the making (of the pitch-pipes) … If one desires to find the middle (i.e., the correct) tone and *chhi* without having anything available as a standard, the best thing to do is to cut several bamboos for determining the right Huang-chung length, making some shorter and some longer … If this having been done one blows them one by one, the middle (i.e., the correct) tone will be obtained, and if one sets them more or less deeply (in the ground), the middle (i.e., the correct) *chhi* may be verified. When its tone is harmonious and its *chhi* responds, the Huang-chung is really a Huang-chung indeed. And once it is really so, then (from it) may be obtained the (other) eleven pitch-pipes, as well as the measures of length, capacity and weight. Later generations, not knowing how to go about this, have sought (to construct accurate pitch pipes) only by measuring with the foot-rule.[85]

84 *Hanshu*, Chapter 21 (律曆志), trans. Needham and Robinson, *Science and Civilisation*, 187.

85 Tshai Yuan-Ting, *Lü Lü Hsin Shu*, Ch. 2, sect. 1, trans. Bodde, in Needham and Robinson, *Science and Civilization*, 187.

What Tshai Yuan-Ting is describing here is a practice known as the "watching for the ethers" or the "blowing of the ashes." This practice relied on the belief that although *qi* is invisible, its arrival could be detected by the twelve *lǜ*. The procedure was as follows: the *lǜ* were buried upright in the ground, in circular arrangement, with each pipe extending a few inches above the soil. This was done within a well-sealed chamber, with an earthen floor. The *lǜ* were then filled with ashes. The theory was that each month the *yin* or *yang qi* of that month would rise, causing the ashes to be blown from the upper end of only one pipe – the pipe corresponding to that month. The earliest detailed description of this process is credited to Ts'ai Yung (132–192 AD) and is recorded in the *Hòu Hànshū*, the "Book of the Later Han" (fifth century AD):

> As to the procedure for watching the ethers [*qi*]: a triple-walled chamber is prepared, the doors of which bar it off (from the outside world) ... Stands are made out of wood, one for each pitch-pipe, which extend deep down within (the ground) and high up outside (the ground). The pitch-pipes, in accordance with their compass points, are mounted upon these. Ashes from the pith of reeds are stuffed into the inside (of each pitch-pipe), and in accordance with the calendar, a watch is kept upon them. Whenever one (of the pitch-pipes) is reached by the ether (of its corresponding month), its ashes move.[86]

We see, therefore, that the practice of "watching for the ethers" had a correlative function, for not only was *qi* used to determine the pitch of the *Huáng Zhōng*, the pitch-pipes were used to indicate the arrival of the *qi*. In other words, music and cosmology were fundamentally linked.

No wonder, then, that in ancient times, those people thought most able to perceive the *tao* of heaven were astronomers and musicians – usually blind musicians. For example, according to a story in the *Guo Yu* (fifth century BC), when Shan Hsiang-kung predicted that there would be unrest in the state of Chin, the Duke of Lu said to him:

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86 *Hou Han shu* (后汉书), Rhythm and the Calendar (律历上), Section One, trans. Bodde, "The Chinese Cosmic Magic Known as Watching for the Ethers," *Essays on Chinese Civilization*, (Princeton: Princeton University Press, 1982), 356.

> "Now you, my lord, say that there will be disturbances. May I presume to ask whether it is the *tao* of heaven, or is it because of men?" He replied, "I am no blind (musician) or historian-astronomer. How could I know the *tao* of heaven?"[87]

In fact, the archetypal blind musician was not only believed to have knowledge of the *tao* of heaven, but to have originally determined the proportions of the twelve pitches (*shí'èr lǜ*): "The divine blind men of old examined the true notes and measured them in order to establish regulations."[88]

It is important to note, that the pitch-pipes (*lü*) were, originally, more than standardized pitches: they were considered magical instruments. For example, as Needham describes, there are "early references to the shaman-musician piping off his own *chhi* [*qi*] through bamboo tubes in an attempt to alter the process of Nature – of heaven's *chhi* [*qi*] – by sympathetic magic." [89] Needham is referring, here, to the *wu* – the traditional name of the ancient Chinese shaman.

Eliade describes the initiation ceremony of the *wu* as follows: "The ceremony consists … in mounting the *to t'ui* (the "sword-ladder")…usually the ladder is made of twelve swords."[90] The fact that the *wu* shaman climbs a ladder of twelve steps suggests a musical association for not only are there twelve *lǜ*, the term *lǜ*, which is generally translated as "pitch-pipe," originally meant "regular steps."[91] As shown in the unabridged paper, the twelve *lǜ* are identical to the twelve pitches generated by the Mesopotamian tuning cycle. It is interesting, therefore, that not only is the *wu* ascension rite reminiscent of the Mithraic ladder ritual, the word *wu* may have linguistic ties to the Near East.

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87 *Chou Yü* III, Section 1, trans. J. Pinckney Hart Jr., "The Philosophy of the Chou Yü," (1973), 357.

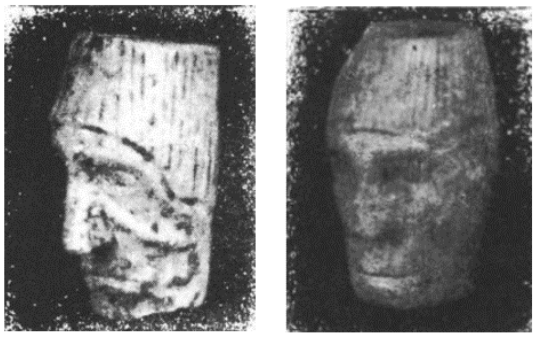
88 *Chou Yü* III, Section 7, trans. J. Pinckney Hart Jr., "The Philosophy of the Chou Yü," (1973), 396.

89 Needham and Robinson, *Science and Civilisation*, 134–135.

90 Eliade, *Shamanism*, 455.

91 Needham and Robinson, *Science and Civilisation*, 135.

In 1980, archeologists excavating a Western Chou palace in Shensi discovered two small carved heads (Figure 17), dating circa 800 BC. The consensus is that the individuals depicted are Europoid.[92] Carved on the top of head T45:6 is the symbol 卐 (Figure 18). This symbol also appears on pottery dating to 5500 BC from Tell Halaf, a site in Upper Mesopotamia.



T45:2 T45:6

Figure 17. Two carved heads (T45:2 and T45:6) from Chou-yüan, Shensi Province, China.
From Yin Sheng-p'ing, *Wen–wu*, 1986. 1, 46–49

V. Mair points out that this symbol was, in the West, "the symbol of the magician through the Middle Ages until the present time,"[93] and was referred to as the Cross Potent. Mair notes that "its shape is identical to the earliest form of the Chinese graph for *m^{y}ag ("magician"): both are written 卐."

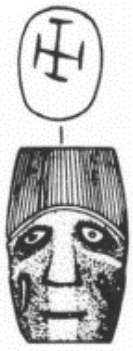


Figure 18. Drawing of Head T45:6, showing carved symbol on top of head

92 Yin Sheng-p'ing, "Investigation of the Racial Affinity of Two Western Chou Human Heads Sculpted of Shell," Wen-wu (Cultural Relics) (1986): 46–49.

93 V. Mair, "Old Sinitic "M^{y}ag," Old Persian "Maguš," and English "Magician," *Early China* 15 (1990): 40.

Mair suggests that the English word "magician" or "mage" and Modern Standard Mandarin *wu* (巫) ultimately derive from the same Indo-Iranian word: *magus*, which comes to English via Latin: *magus* (pl. *magi*).[94] The theory is that the Magi,[95] the priests of Zoroastrianism, who travelled widely, were, in fact, active in ancient China. As evidence of this, Jao Tsung-i cites the fact that "Chinese texts dating from or describing the situation during the Eastern Chou [770 – 256 BC] show that the m^{y}ag were present in nearly all of the contending states."[96]

The earliest appearance of the character *wu* (巫) is on oracle bones that date to the 1250 BC. G. Boileau[97] suggests four possible meanings of this character, as used on the bones:

- a spirit – *wu* – of the north or east, to which sacrifices are offered
- a sacrifice, possibly linked to controlling the wind or meteorology
- an equivalent for shi 筮, a form of divination using achillea (a plant)
- a living human being, possibly the name of a person, tribe, place, or territory

By the Chou and Han eras, the *wu* (shaman/magi) was most often associated with rain making rituals – and "[t]here is ample evidence that the potency of rainmaking rituals in the Chou and Han periods was understood in terms of resonance between things of like kind."[98]

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94 The earliest languages known to have been used in Xinjiang – Saka and Tocharian – are both from the Indo-European language family. (J. P. Mallory, "Bronze Age languages of the Tarim Basin." *Expedition* 52 [3] [2010]: 44–53). Furthermore, "there is massive linguistic evidence of Sinitic and Indo-European cultural exchange from at least the late Neolithic..." [V. Mair, "Old Sinitic 'M^{y}ag,' Old Persian 'Maguš,' and English 'Magician'," *Early China* 15 [1990]: 43.)

95 Incidentally, a Vatican text written in the eighth century AD, in Syriac – a language that emerged during the first century AD in Upper Mesopotamia – makes reference to twelve Magi. To learn more about the Magi in Syriac tradition, read the paper "The Magi in Syriac Tradition," [in:] Malphono w-Rabo d-Malphone: Studies in Honor of Sebastian P. Brock, editor George A. Kiraz, Piscataway: Gorgias Press (2008): 809–843.

96 Mair, "Old Sinitic 'M^{y}ag'" (referencing Jao Tsung-I, "New Light on wu"): 39.

97 Boileau, "Wu and Shaman". *Bulletin of the School of Oriental and African Studies*. 65 (2) (2002): 350–378.

98 R. H. Sharf in *Coming to Terms with Chinese Buddhism* (Honolulu: University of Hawai`i Press, 2002), 87.

> Rainmaking often involved ritual exposure, either of a woman[99] as is seen in Shang and Chou sources, a shaman (*wu*) as was more common in the Han, or a Buddhist or Taoist monk or even the emperor, as is recorded throughout medieval times. In such ritual exposure the supplicant (or victim) is exposed to the sun, sometimes naked, thereby subjecting his or her body to the same adverse effects suffered by the parched earth in times of drought. [100]

Sharf compares the views of Needham and Schafer regarding the belief system that underlies the rain making ritual:

> Schafer tends toward the anthropomorphic: the suffering of the exposed priest or sacrificial victim impresses upon heaven the pain of heat and drought. Heaven is moved (or coerced) to respond compassionately and cause rain to fall. Needham takes a more naturalistic view and understands rainmaking as an exercise in the manipulation of cosmic forces along the lines of five-phase theory and alchemy.[101]

We see, therefore, that from the time of the Shang dynasty the concept of sympathetic resonance was evident in China, in an early form. Yet there is also evidence, at this time, of the *wu* (magi), who may have brought these ideas from the West.

Let's summarize. According to both Western and Chinese scholarship, the Xinjiang *konghou* (harps) are linked with the religious traditions of the Ancient Near East. As we saw earlier, the religious traditions that arose in the Near East, as early as the second millennium BC, had the fundamental ingredients of correlative cosmology. Remember, for example, the chief lamentation singer who "for seven days and seven nights put in place seven *balangs*, like the firm base of heaven." Here, we see the

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99 Evidence suggests that in earliest times the *wu* (巫) were predominantly female.

100 Sharf, "Chinese Buddhism," 86.

101 Sharf, "Chinese Buddhism," 87.

linking of number (seven); music (*balang* = harp); and cosmic order ("firm base of heaven"). Another example is that on tablet CBS 1766, one of the string names is not simply a number, but is also linked to a god: "fourth, small/ string created by Ea." Ea is the Babylonian god of knowledge, and one of "the seven gods who decree."[102] In Babylonian texts, Ea is represented by a goat with a fish's tail, which is, in turn, linked with the constellation Capricorn (the constellation which, according to Porphyry, is the celestial gate through which souls ascend). Here, we see the linking of music ("fourth string"); god (Ea); and cosmos (Capricorn). If we remember, too, that from as early as 600 BC, the planets were listed by the Babylonians sequentially, in non-astronomical order, we have all the components of correlative cosmology.

Let us now attempt to draw some conclusions regarding the possible Near Eastern origin of the ancient musico-cosmological systems of both the West and China.

CONCLUSION

Archaeological evidence proves that multiple-stringed instruments were invented in the Near East, at least as early as 3100 BC. These instruments were then disseminated both west and east: to the Aegean Islands (the arched harp, circa 2700 BC), and from there, to Greece and, later, Europe; and to Xinjiang Uyghur Autonomous Region, in the far west of China (the angular harp, circa 1000 BC).

The musical system associated with these instruments in Mesopotamia – a system of seven diatonic tunings, in use for over a thousand years, from at least 1800 BC – was a simple mnemonic system that could have easily been transmitted, without the accompaniment of textual instruction. And, in fact, it is the general consensus among music archaeologists[103] [104] that the Mesopotamian musical system is the direct ancestor of the Western system of seven diatonic modes (still in use today), even though no absolute proof of textual transmission has been found.

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102 S. N. Kramer, *The Sumerians: Their History, Culture, and Character*, (University of Chicago Press, 1963), 123.

103 O. R. Gurney, "Babylonian Music Again," *Iraq*, Vol. 56 (1994): 101–106.

104 https://www.penn.museum/sites/expedition/the-musical-instruments-from-ur-and-ancient-mesopotamian-music/

Similarly, there is no proof of the textual transmission of the Mesopotamian musical system to Xinjiang and, from there, to the heartland of China. Yet Mesopotamian cuneiform tablets and ancient Chinese texts indicate strong similarities between the two systems. For example, the *Lǚshì chūnqiū* (239 BC) describes the use of the *sanfen sunyi* method to generate twelve pitches – the *shí'èr lǜ* – and these pitches are identical to those generated by the tuning cycle described on Mesopotamian tablet UET VII 74 (see unabridged paper). Moreover, as described in the *Guanzi* (fifth–first century BC), the *sanfen sunyi* method was used to create scales having fewer than twelve notes. As evidenced by the discovery of *bianzhōng* sets dating to the first half of the first millennium BC, and by later textual references, the scales generated by the *sanfen sunyi* method having fewer than twelve notes were primarily pentatonic and diatonic – and these diatonic scales are identical to two of the Mesopotamian modes.

To date, there is no proof that the Mesopotamians used a pentatonic scale. Nevertheless, scales that are constructed from consecutive fifths – as scales generated by the *sanfen sunyi* method are – are subsets of each other. Consequently, the Mesopotamian tuning cycle could easily have been used to tune a cycle of pentatonic modes, or even the modes of scales having fewer than five notes. Archaeological evidence seems suggest this possibility for several Mesopotamian artifacts depict instruments having less than seven strings.

There is no explicit mention, in cuneiform texts, of the Mesopotamian musical system having a mathematical basis. Nevertheless, the instructions that describe the system can be illustrated *exactly* by a seven-pointed star that is derived, mathematically, using the ancient Chinese *sanfen sunyi* method, as shown in the unabridged paper. Moreover, the derived seven-pointed star strongly resembles the heptagram drawn on tablet CBS 1766 (Figure 2).

Written on tablet CBS 1766, UET VII 74, and other tablets that describe the Mesopotamian musical system, are inversions of the sequence 4,1,5,2,6,3,7 – a sequence that is generated when the *sanfen sunyi* method is used to create the *shí'èr lǜ* pitches. Inversions of this sequence also select the notes in the seven modes of the diatonic scale from the circle of fifths – and it is this application of the sequence that forms the basis of the Mesopotamian musical system.

As we have seen, the musical sequence 4,1,5,2,6,3,7 was used, in the West, to create a complex system of analogies: the spacings of the spheres, the value-system of the metals, the Mithraic soul-ladder,

and the seven-day week. Evidence suggests that this theological/philosophical system had a Near Eastern origin for not only is this sequence fundamental to the Mesopotamian musical system, when discussing the week-day order, Celsus examines "the reason of the stars being arranged in this order… [and gives] …musical reasons …quoted by the Persian theology."

As previously mentioned, according to M. Boyce the concept of the post-mortem ascent of the soul probably originated in ancient Iran, sometime before 1800 BC, just before the proto-Indo-Iranians drifted apart to become the Indians and the Iranians. It is proposed here that by the early first millennium BC, the Zoroastrian tradition began to describe the ascent of the soul using "musical reasons" drawn from the Mesopotamian musical system and that this concept evolved into a fundamental magico-religious belief that was then disseminated to other cultures, via the travelling Magi.

As we have seen, Xinjiang harps dating to the early first millennium BC were found in graves that contained artifacts that show a connection to Zoroastrianism. Moreover, according to recent evidence,[105] it may be possible to trace the Magi, the priests of Zoroastrianism, as far back as 1100 BC, living near what is, today, the border between Iran and Turkmenistan. As V. Mair notes, this dating for the Magi – circa 1100 BC – is "a period of time compatible with the m^{y}ag who are mentioned fairly frequently in the oracle bone inscriptions."[106] We must consider, therefore, that the Magi may have reached China as early as the late second millennium BC.

As we have seen, the Western system of musical analogies (the spacings of the spheres, the value system of the metals, the Mithraic soul-ladder, and the seven-day week) is an example of correlative cosmology whereby associations are made between items having the same relative position within their respective sequences (for example: the sun; gold; the number 4; Sunday). Yet, until recently, this term – correlative cosmology – was used exclusively to describe an ancient Chinese tradition, for, as we have seen, the ancient Chinese, too, devised a complex system of correspondences.

As with the Western tradition, the Chinese made use of musical analogy: the concept of *ganying* (or "correlative resonance") was used to explain the affinity between things of the same category. This

105 V. Sarianidi, "Togolok 21, an Indo-Iranian Temple in the Karakum," *Bulletin of the Asia Institute* 4 (1990): 159–165.

106 Mair, "Old Sinitic 'M^{y}ag,' Old Persian 'Maguš,' and English 'Magician'," 37–38.

concept is first mentioned in Chinese texts circa 400 BC, evolving into a complex cosmological system around the second century BC.

It is proposed, here, that the phenomenon of correlative cosmology – that draws affinities between items in different categories by placing them in the same sequential positions, while at the same time using musical analogies – is too unique an invention to have developed, independently, in different places. Rather, it is suggested here that this phenomenon originated in the Near East and was transmitted, both west and east. This is not to say that the idea of "like affects like" – as seen in the *wu* rainmaking rituals – could not have existed, independently, in pre-historic China. Rather, it is to suggest that the co-usage of the concepts of musical analogy and sequential placement to describe cosmic order is a uniquely Near Eastern invention that was later adopted in both the West and China.

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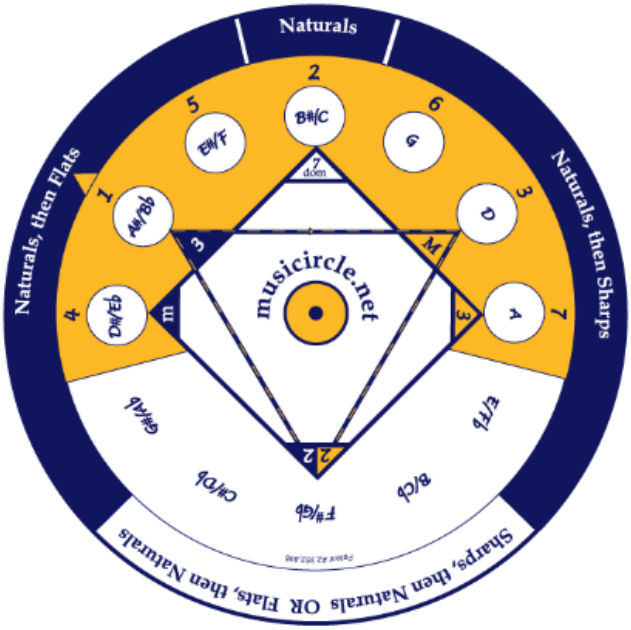
ABOUT THE AUTHOR

Sara de Rose became involved in the field of music archaeology in an unusual way. As a young adult, she discovered that the sequence 4,1,5,2,6,3,7 selects the major scale from the circle of fifths, and used this pattern as a foundation to teach herself music theory. By her mid-thirties, de Rose had expanded on her model to create a sophisticated teaching tool – the *Musicircle* – which she patented.



https://musicircle.net

"The Musicircle allows the user to locate numerous types of scales and chords with absolute accuracy. It is an ingenious and versatile tool."

Dr. Harald Krebs, Distinguished Professor and Former President of the *Society for Music Theory*

By her mid-thirties de Rose had also developed a basic understanding of astronomy, learning how to track the planets through the constellations of the zodiac. In 2001, she learned that the days of the week are named after the seven classical planets, but was confused by the order of the days. On a whim, she gave each body a number representing its apparent relative speed, coming out with the sequence 4,1,5,2,6,3,7.

This inspired de Rose to wonder about the origin of the sequence 4,1,5,2,6,3,7. Finding no written references (at this time she was unaware of the writings of Origen and Cassius Dio, and the Mesopotamian and Chinese texts), she decided to learn about the origin of the circle of fifths.

Using a strip of paper to represent a guitar string, she duplicated, without knowing it, the ancient Chinese *sanfen sunyi* method, coming out, once again, with the sequence 4,1,5,2,6,3,7. Then, because she was used to working with a circular model, she expressed this linear pattern in a circular format, deriving, in 2001, the heptagram shown here.

Heptagram made by de Rose in 2001

In 2016, de Rose became aware of tablet CBS 1766. Upon realizing that the sequence 4,1,5,2,6,3,7 is written on CBS 1766, and also that the heptagram on the tablet and the heptagram that she derived in 2001 are very similar, de Rose wrote a description of how the heptagram can be derived from the simple mathematics of music (i.e., the *sanfen sunyi* method) and sent it to an archaeologist working in the field of Mesopotamian music. Since that time, de Rose has been involved in the field of music archaeology.

Currently, de Rose focuses on educating the public about the Mesopotamian musical system and the role of the sequence 4,1,5,2,6,3,7 in ancient philosophical tradition. She has created a 90-minute curriculum unit designed for use in music or history of mathematics classes, at both the secondary school and post-secondary level. This online workshop covers the material in the unabridged paper, engaging the students in hands-on model making activities. For more information about this workshop click here.