

Angular Harps Through the Ages

A Causal History

Bo Lawergren

ZUSAMMENFASSUNG

Die Harfe wurde um 1900 v. Chr. in Mesopotamien erfunden. Von ihren Anfängen in Westasien an verbreitete sie sich über weite Teile des Kontinents. Durch die großen Entfernungen nahm der Verbreitungsprozess einen langen Zeitraum in Anspruch. Das Instrument erreichte China nach zwei Jahrtausenden und Japan einige Jahrhunderte später, wobei die Verbreitung im Fernen Osten durch die heiligen buddhistischen Texte angeregt wurde. Diese beschrieben die Freuden des Paradieses, in dem ständig süße Musik erklang, erfrischendes Wasser friedlich dahinplätscherte und Blumenduft die laue Luft erfüllte. Weitere Inspirationen gingen von Geschichten um Buddhas Leben aus. Sein Vater war Herrscher über ein kleines Territorium in Nordindien, und in seinem Wohnsitz spielte ein Frauenorchester auf Harfen, Flöten, Schlaginstrumenten, etc., um den jungen Mann zu unterhalten. Diese Instrumente waren entlang der Seidenstraße und in China im ersten Jahrtausend n. Chr. sehr beliebt. Mit dem Niedergang des Buddhismus starb die Harfentradition allerdings um 1100 n. Chr. im Fernen Osten aus. Die Religion in Verbindung mit der Harfentradition spielte jedoch in anderen Regionen weiterhin eine Rolle. Das reiche Musikleben des Iran beeinflusste die islamische Welt, und so breiteten sich die Harfen im Irak, in der Türkei, in Ägypten und in Spanien aus. Illustrierte Bücher, in denen Schlachten und Harfen bevorzugt dargestellt wurden, kamen zwischen 1300 und 1600 n. Chr. in Mode. Die Harfen waren prachtvoll verziert und oft in den Kontext erotischer Szenen gesetzt. In dieser Region verblieben die Instrumente bis in rezente Zeit. Das letzte Exemplar findet sich in Istanbul vor etwa drei Jahrhunderten dokumentiert. Griechenland und Rom hatten Winkelharfen, aber sie verschwanden mit dem klassischen Altertum. Abgesehen von dieser begrenzten Aufnahme verbreitete sich die Winkelharfe niemals wirklich in Europa. Stattdessen entstanden Rahmenharfen in Nordfrankreich um

800 n. Chr., die sich letztendlich zu den heutigen Konzertharfen entwickelten.

1 PREAMBLE

This article is based on a lecture-recital that Tomoko Sugawara¹ and I presented at The 5th Symposium of the International Study Group on Music Archaeology. I have previously published two studies on the angular harp (Lawergren 1996, 2001), but both seem to have had scant impact. In 2004 I visited Japan for an international conference in Musical Acoustics in Nara. A dozen years earlier Professor Shigeo Kishibe had told me that Professor Toshirō Kido, Director of the National Theater in Tokyo, had commissioned reconstructions of the angular harps² in the Shōsōin repository, Nara. This time I was pleased to meet people involved in the reconstructions. They have taken note of the uniqueness of the surviving harps and made fully functioning replicas. Later I learnt that scholars in Korea also were making replicas. Perhaps, one day, all regions that once had angular harps will rediscover it. My inner eye saw a congress of angular harp players from Japan, Korea, China, Central Asia, Iran, Iraq, India, Syria, Lebanon, Greece and Egypt. They discussed repertoire, playing technique, and the latest discoveries by scholars. I sobered up, but my interest had revived, and I asked a fine Japanese *kugo* player to collaborate in an effort to further awareness of the instrument. I am grateful to Ms. Sugawara that she consented.

¹ In the text I write Japanese and Chinese names in the Western fashion, i.e., given name precedes family name.

² Each region had its own name for “angular harp”, which is the musicological and organological name in English. I list some: *trigonon* (Greek), *čang* (Farsi), *jank* [or less often *šanj*] (Arabic), *konghou* (Chinese), *kugo* (Japanese), *gonghu* (Korean).

Another event spurred me on: Professors Rembrandt Wolpert and Elizabeth Markham had become members of the New York Qin Society³. They brought expertise on the music of the Tang dynasty, the period when the angular harp reached its peak in China, and their transcriptions could be viewed as an appropriate repertoire of the harp. It is not uncommon to reconstruct ancient instruments, but the music produced – as distinct to the sound produced – may only appeal to the most gullible souls. Not so here. At least four components have fused in a symbiotic stew: the physical instrument, its history, the Tang tunes, and the expert harpist.

The talk follows below. At the symposium it was layered with *kugo* playing. A sample of the music is given on a CD accompanying the book.

2 INTRODUCTION

Harp first appeared around 3000 B.C. in Mesopotamia and Iran. They were arched harps, probably developed from hunter's bows, and the body was made of one piece of wood. A thousand years later, around 2000 B.C., a new type was conceived when two pieces of wood were joined at right angle, one drilled into the other. The result was the angular harp which lasted until recently. The last sighting was in Constantinople, 300 years ago. For all that time it had been confined to Asia.

Harp designers waited millennia before taking the next logical step: connecting the two extreme ends of the angular harp with a long rigid pillar. When they did, around A.D. 800, it became the frame harp (also known as the "pillar harp"), a more rigid structure that allows higher string tension and more strings. The first images of the new harp was shown in Carolingian illustrated bibles and psalters produced in the vicinity of northern France. The modern concert harp is a direct descendant of the frame harp. The history of the frame harp comprises a mere 1200 years, while the predecessor, the angular harp, had a continuous history of nearly 3000 years.

In hindsight, the invention of the frame seems an obvious step. Its rigidity is desirable: without it the harp could easily break in an accident (Fig. 1) or under excessive string tension. Moreover, there is ample space for a pillar on a traditional angular harp. The addition of a pillar seems less an "invention" than the breaking of a taboo against it. What caused the longevity of the angular harp – or the delay installing the pillar? Was it merely a blind adherence to tradition? The power of tradition permeates this subject. Isn't it also present in the seventeenth-century statement: "The angular harp was invented by Pythagoras to solace Solomon?" We will encounter it later.

3 GENERAL SURVEY OF HARPS, 3000 B.C.–A.D. 1600

Figures 2 and 3 feature regional harps drawn on time-lines. Arched harp are plotted on a blue time-line. They belong to Mesopotamia, Iran and Egypt of the 3rd millennium. Egyptian ones continue until the Hellenistic period, but angular replaced them in Mesopotamia around 1900 B.C. These are plotted on a red line. Two types are shown on terracotta plaques: vertical and horizontal ones. They differed in playing position, playing technique, and construction. Vertical angular harps had a large number of strings⁴, often around 20, while horizontal ones had less than 10, in Egypt often as low as 5. Vertical angular harps were plucked by fingers, but horizontal ones were struck with plectra.

To define the parts of the angular harp, consider the harp drawn on the line "Silk Road & China" (Fig. 3). The strings run diagonally between the vertical box and a horizontal rod with circular cross-section. The box is a hollow trough, and the front is closed by a thin sound-board. Glued along its vertical center-line is a long and narrow rib. It has tiny holes parallel to the sound-board, and the strings are tied through these. At the other end of the string is the tuning contraption. Most commonly it was a thick collar encircling the rod, and each string was tied to a collar. A twist of the collar changed the string tension. But towards the end of the 1st millennium A.D., pegs were also accepted as tuning devices. The pegs were similar to those of violins.

When angular harps entered the scene, arched ones exited. They disappear everywhere except in India and Egypt, regions far from the heartland of Mesopotamia and Iran. The Indus script, which flourished between 3000 B.C. and 1800 B.C., contains characters that resemble harps, but after the script died out, there are no representational images of any kind until the 2nd century B.C. At that rebirth of the Indian pictorial arts, arched harps are immediately present. One suspects that harps may have existed all along⁵. The imagery was Buddhist, often showing scenes from Buddha's life. Arched harps became associated with Buddhism in India, but appeared also in less religious contexts, e.g., on rock paintings⁶. When they entered the Silk Road, one may safely assume the Indian associations were maintained.

Except in India, the angular harp became the standard type in Asia. It quickly spread across the

³ See <<http://www.newyorkqin.org/>>.

⁴ Treated quantitatively in Lawergren 1994a.

⁵ Lawergren 1994b, 239–240.

⁶ Dubey-Pathak 2000, 29.

Near East, but entered Egypt only five centuries later. There are three extant angular vertical harps from the 15th and 14th centuries B.C., but the type remained much less popular than arched types, but migration increased during the Hellenistic period. The empire included the harp-rich Near East, and the relative ease of travel affected harps as well as other objects and ideologies. Roman campaigns in Asia Minor brought the army in contact with exotic eastern goods. According to Livy, soldiers brought back sumptuous furniture after a successful campaign in 187 B.C. They acquired a taste for eastern exotica and demanded female players of lutes and angular harps at banquets⁷.

Greece follows a different orbit through harp history. After the “Cycladic harps” had disappeared about 2000 B.C., there are no depictions or reference until the mid-5th century B.C. The absence is odd, since angular harps were popular in neighboring regions to the east. But Plato disowned them⁸, and when finally adopted, the Greeks subjected them to extensive modifications and even introduced pillars. The alteration produced the first frame harp. These old harps disappeared with the decline of the Greek city states, but basic angular harps returned with the rise of the Hellenistic empire.

Around A.D. 643 Iran became part of the Muslim world, and Iranian music began to spread around the Muslim sphere-of-influence. Iranian harps spread to many parts of the Muslim world (Greater Iran, Iraq, Turkey, and Spain). Another religion, Buddhism, adopted harps and brought them to East Asia. This brought harps to China, where they flourished until approximately the 12th century A.D. They survived until about A.D. 1680 in the Muslim world.

4 EPISODES IN THE HISTORY OF ANGULAR HARPS

After this brief review, I will expand a few topics, ending with an examination of the Far East.

4.1 ISLAMIC HARPS, A.D. 1300–1600

During the Sasanian period in Iran, with Zoroastrianism as state religion, harps were often shown in courtly circles, and epics tell of kings who loved them. But, clearly, other social classes also appreciated angular harps (Fig. 4). By 700 the region converted to Islam, but this tumultuous event did not decrease the affection for harps. By the 1250s Mongolian armies from Central and Eastern Asia had vanquished Iran and Iraq, and their generals had installed themselves as rulers.

But these nomads quickly adopted local Iranian customs, including a love of harps.

The Mongol dynasty of Iran began to commission illustrated books. Popular texts were the *Shāhnāmah* (“Book of Kings”) composed by Ferdowsi about 1010, and *Khamsa* (“Five Poems”) written by Nizami near 1190. These provided ample opportunities to illustrate harps.

Two sections of *Khamsa* give a big role to harps: *Haft Paykār* (“Seven Portraits”) and *Khosrow va Shirin*. Both *Shāhnāmah* and *Haft Paykār* contain a famous story in which Bahrām Gōr goes hunting with his harp-playing mistress Āzādeh (also called Fitna). He sits at the front of a camel, she at the back⁹.

Another story in *Haft Paykār* concerns Bahrām Gōr’s marriage to seven beautiful princesses from seven countries. He keeps them in seven pavilions, each painted in special color, and devotes one day a week to each princess. His conjugal visits are usually illustrated, and the color scheme reveals which day it is. Musicians, including a harpist, often sit outside the pavilion and entertain the royal couple. Inside the princess entertains Bahrām with story-telling. One tale concerns a young man who owns an orchard. While walking he passes a gate, peaks in, and sees several naked nymphs bathing in the garden pool. Frequently, the scene is drawn with a harp player providing water music.

Such texts give artists ample scope to draw harps familiar to them. Two types can be distinguished. One was popular at the ateliers of western Iran and in Iraq, the other in eastern Iran, Afghanistan, and Uzbekistan. The former has a short tail and a body with rounded corners. The latter has a long undulating tail, and a body with sharp angles (Fig. 5). That was probably the model known to Darwish Ali Changi (ca. 1550–1620), who lived and worked in Bukhara¹⁰. His work *Treatise on Music* contains Central Asian legends about musical instruments. In it the harp is the “bride of musical instruments”, a saying that is still familiar to musicians in Central Asia – although the instrument disappeared many centuries ago.

The harps were usually played on quiet and peaceful occasions, but there were exceptions (Fig. 6).

Although only two basic models existed, there was a considerable amount of small variations around the basic structure. Many details can be singled out, but here I illustrate only the various shapes of the uppermost part of the box, the “top”

⁷ Livy XXXIX, vi. 8 (= Livius 1936: 237).

⁸ Lawergren 2001, 887–888.

⁹ Lawergren 2003b.

¹⁰ For Darwish Ali, see Rashidova 1992, 51–68.

(Fig. 7). Each row in the figure contains tops with similar features: in row (a) they are square-cut; in row (b) they have simple curves that end in a point; in (d) and (e) they resemble bird's heads. Fancier and fancier shapes appear in the lower rows, some of them quite amusing. Such richness of forms may have been normal during the long stretch of time when instruments were hand-made. We do not know since few instruments have survived.

By 1600 the images in Iranian book show increasingly odd models; the features start to deviate radically from the norms established centuries earlier. Presumably, the changes indicate that harps had died out in Iran, but painters were obliged to promulgate the topos. Without physical objects to copy, they relied on faulty memory.

In Turkey the harps continued for another century. About 1660 Ewliyā Chelebi (1611–ca. 1669) made an inventory of players and makers of instruments in Constantinople. He wrote:

“[...]The harp was invented by Pythagoras to solace Solomon. It has forty strings and its sound is astonishing. There are but few who play it because it is a difficult instrument. [There are] ten makers with two shops and ten players.”¹¹

Surely, angular harps had arrived at the end of their historical path. Only ten harp players in a city where Chelebi counted over 2,000 lutenists! It is a curious circumstance that one of the finest and most realistic depictions comes from the same milieu. The instrument at the end on the Turkish time-line in Figure 2 was drawn by the Danish artist Melchior Lorck in 1576¹². He had lived more than four years in Constantinople during the 1550s, roughly a century before Chelebi's inventory.

Lorck's harp has more than 30 strings tuned with pegs occupying two rows, one above the other. This arrangement also occurs on pictures made by native Turkish artists and is distinctly Turkish. The front end of the rod rests against the floor, a position that stabilizes the large harp. As usually is the case, the left hand plucks the short strings, while the right hand stays with the long ones.

4.2 STEPPE HARPS FROM ASSYRIA, 800–400 B.C.

How did these harps come to China and the Far East? China lay outside the Islamic orbit, and other reasons were at play.

They arrived in China in two distinct waves that differed greatly in character and success. To study

the first one, we return to northern Iraq around 700 B.C. The region was the heartland of the Assyrian empire with capitals at Nimrud and Nineveh. The outer limits of the empire touched the Mediterranean, Egypt, and the Persian Gulf. Dominating the capitals were large palaces, their stone walls covered with low reliefs that illustrated royal exploits. There were scenes of battles, hunting, worship, rituals, banquets, etc. Musical instruments played at sacrificial rituals. The most prominent were angular harps, both vertical and horizontal.

The horizontal models had 9 strings (Fig. 8). They were usually played in pairs with two players standing shoulder-to-shoulder. Their left hands are pressed against the strings, while the right hands hold long narrow plectra. Three typical examples are shown at the top of the figure and line-drawings are given below. These Assyrian reliefs have been known for 150 years, but extant harps – similar to these – have recently been excavated in Xinjiang Province in north-western China¹³. The latter are dated to the 5th century, i.e., two centuries after the Assyrian ones. Harps from both proveniences have similar size and shape. Before Chinese archaeologists found the Xinjiang harps similar ones were already known from Pazyryk and Olbia (Fig. 9). All find spots lie on the rim of the Eurasian steppe, and we may call the harps “steppe harps” (Fig. 10)¹⁴. All have 5 strings, whereas all Assyrian ones have 9. Apart from this detail, steppe harps and Assyrian harps are similar, and it is reasonable to assume they were played the same way, i.e., played horizontally with a long plectrum.

Most likely, nomadic tribes such as the Scyths brought the harps from Iraq to the Xinjiang province. At this time, the Scyths were the dominant tribe on the Central Asian steppe. During the eighth century BCE members served in the Assyrian army and could have seen, and adopted, the harp¹⁵. On horseback they could move around fast.

Recently a replica of the Yanghai steppe harp was made for a TV program. As already mentioned, the original harp had five strings, but 10 strings were put on the replica. It's a fantasy that may have been meant to “improve” the harp, but it distorts history. The Mesopotamian 9-stringed harp was famously used to demonstrate Mesopotamian tuning theory¹⁶, which used diatonic scales like ours. But having moved east, it ended

¹¹ Farmer 1936, 31.

¹² Morgan library 1998, 158–159. Lorck also sketched a group of two harpers, a tambourine, and a dancer (“Three prostitutes dancing”) in Constantinople, Fischer 1962, No. 55.

¹³ Lawergren 2003a, 89–90.

¹⁴ Lawergren 2003a, 90.

¹⁵ Roux 1964, 315.

¹⁶ Kilmer 1997.

up with five strings, and this probably implies it had severed any association with the Mesopotamian tuning theory. It arrived in Xinjiang without the theoretical framework.

Steppe harps never reached the heart land of China, and occurred before 400 B.C., long before the Silk Road was established, and they had no influence on the vertical harps that later came to travel the road in great numbers.

4.3 THE SILK ROAD AND THE FAR EAST, A.D. 100–1000

Large-scale trade was developed during the Han dynasty (206 B.C.–A.D. 220) along the Silk Road, but a sizable effect on musical matters was not felt until in the first centuries of our era. The western end of the road passed through regions familiar with angular harps (Figs. 2–3), and these were brought along by merchants and musicians.

A full journey west to east would last approximately one year. Initially harps traveled only to nearby sites, but the sites advanced steadily toward China, a much slower process. The advance can be followed by dating the paintings of harps.

The harp in Figure 11 comes from Gaochang, 300 km west of Dunhuang, and is dated to A.D. 850. It is not the first harp at that site, but it is typical: most harps were vertical and had more than 20 strings.

Buddhism was the force that pulled harps into China. Influential sacred texts had been conceived far west of China, in India, Bactria, and Iran. They put music in prominent places, e.g., in Paradise. Blessed beings would hear wonderful music, experience pleasant scents, and languish in gently flowing streams. The sacred texts named the instruments which, naturally, were those familiar to the writers in the west: harps, lutes, flutes, and percussion. Most Chinese instruments were ignored. To emulate the Buddhist vision, Western instruments were required. Many such orchestras were cultivated at courts and palaces that had converted to Buddhism. In China the greatest appreciation of harps came during the Sui and Tang dynasties.

Harps appeared in China, Korea, and Japan under slightly different names, but were essentially the same type of instrument. Everywhere they were associated with Buddhism. But this religion declined in China after A.D. 1000, and during the Song dynasty – which succeeded Tang after a short interregnum – officials tried to stem the popularity of foreign music. As a result, many instruments vanished from China. Harps disappeared from China around 1100. Some instruments migrated to Japan, where they still survive.

Harps lasted only a short time in Japan – between the eighth and tenth centuries. This period produced Japanese images of harps (Fig. 12) and left two extant examples (Fig. 13) of which only the lower parts survived. Their upper parts may have looked like the sketch in Figure 14, which is based on images of other Asian angular harps. They had 23 strings and the body was made from a single piece of *kiri* (*Paulownia tomentosa*, royal paulownia) wood. The rod was made of *kaki* (*Diospyros kaki*, Japanese persimmon) or *kuwa* (*Morus bonbycis*, mulberry)¹⁷. This extant pair had probably been made in China and sent to Japan shortly before 752. It was the year when the Great Buddha in the Todai temple was inaugurated with an “eye-opening” ceremony. Adjacent countries had sent many other sumptuous gifts, and some were put in the Shōsōin repository, Nara. Many have survived.

5 TANG DYNASTY TUNES FOR ANGULAR HARPS

Not only did harps disappear from China at the end of the Tang dynasty, so did most music manuscripts. Some were brought to Japan and survived. Tang music is still played by Japanese court orchestras, but interpretations have changed during the intervening 1200 years. Efforts to recover the original music in the Tang manuscripts were initiated by Kenzō Hayashi in Japan and Laurence Picken at Cambridge University, England. Some of the subsequent Japanese work has been surveyed by Tozawa (2004) and Endō (2006). In England Picken supervised five doctoral students (Rembrandt F. Wolpert, Allan J. Marett, Jonathan Condit, and Elizabeth J. Markham), and the group has published numerous transnotations in the last 30 years (e.g., Picken et al. 1981–). It is heterophonic ensemble music where the melody instruments play in near-unison but add small idiosyncratic ornaments.

No harp-parts have been preserved, but harps were shown on numerous paintings of orchestras in China (Fig. 15) and, less frequently, in Japan (Fig. 16). It is reasonable to assume that harps joined the heterophonic ensembles and played the same tunes as other melody instruments. The harps would have played both solo and in ensemble. Both situations are amply illustrated. Solo performances are also described by Tang dynasty poets such as Gu Kuang (725–816) and Li He (791–817), see appendix. We read that the sound was wonderful and heavenly – even able to release miraculous powers.

¹⁷ Tokyo 1994, 10–12.

I propose that harps would have played most Tang tune written for ensemble. Presumably, they played versions germane to the instrument. Since none has survived, I asked the composer Stephen Dydo to write such pieces. We were fellow students in composition classes taught by Professor Wen-chung Chou at Columbia University 1967–1970. In addition, Dydo studied Chinese music with him and received a DMA in composition at the university. As a founding member of the New York Qin Society, he came to know Professors Wolpert and Markham, and immersed himself in their Tang dynasty work. As a result, he composed “Three Tang Dynasty Konghou Pieces: Wang Zhaojun¹⁸, Qin Wang Pozhen Yue, Qinghai Bo [The Waves of Kokonor].” Dydo kept the modal scheme, added ornaments typical for Tang, and expanded the range across the three octaves of the angular harp.

The tune “Waves of Kokonor”¹⁹ has deep significance in Chinese and Japanese literary history. Kokonor (Turkic for “Blue Sea”) in the title refers to a large lake in the western Chinese province of Qinghai. The great Tang dynasty poet Bo Li (701–762) hailed from the region. His tears would flow when he heard the tune, especially when drunk – which often was the case²⁰. In Japan the name strikes a resonant chord, for the melody is mentioned in “The Tale of Genji”, written A.D. 1000. The work is the national epic, maybe the first novel ever written in any language. In the renowned translation by Arthur Waley, the relevant passage reads:

“Prince Genji danced the “Waves of the Blue Sea [=Kokonor]”. To no Chujo was his partner; but though both in skill and beauty he far surpassed the common run of performers, yet beside Genji he seemed like a mountain fir growing beside a cherry-tree in bloom. There was a wonderful moment when the rays of the setting sun fell upon him and the music grew suddenly louder. Never had the onlookers seen feet tread so delicately nor head so exquisitely poised; and in the song which follows the first movement of the dance his voice was sweet as that of Kalavinka whose music is Buddha’s Law. So moving and beautiful was this dance that at the end of it the Emperor’s eyes were wet, and all the princes and great gentlemen wept aloud.”²¹

It was a moment of joy and refinement, and later painters have tried to illustrate it (Fig. 17).

Genji was well acquainted with the tune, but he could not have heard it played on a harp. By 1000 the instrument had died out in Japan; lutes and zithers were the rage. Had he lived in China, harps might have played Kokonor as late as A.D. 1000.

But the tune was much older, going back at least to the eighth century. There is some evidence that it came from Kucha, a Central Asian city, where harps had flourished at that time.

6 COMPOSITIONS NOT BASED ON TANG TUNES

The angular harp lasted from 1900 B.C. to A.D. 1600 and for most of this long stretch we do not know the music it played. The Tang dynasty is an exception, and so is the Islamic period. It offers one ancient piece, a song published ca. A.D. 1300 by Qutb al-Dīn al-Shīrāzī, who was a distinguished polymath from Shiraz, Iran²². The notation gives the voice part and two drum parts, but the tune is likely to have been played on the harp as well, since illustrated books often show them grouped with other instruments and a singer. As in China, heterophony is the likely mode of performance, and harps would have played the tune along with the singer, a flute, a lute, a tambourine and a drum.

These historical pieces make a limited repertoire, so it is fortunate that contemporary composers have started to take an interest in angular harps. Concert harps can easily produce chromatic scales, but angular harps cannot. Once the tuning is fixed, it must stay that way throughout a continuous performance. This presents a dilemma for composers used to a nearly unlimited choice of pitches, and who follow current fashions which do not favor tonal pieces. It is hard to write a piece in diatonic tuning and still sound fresh and exciting. In my opinion Robert Lombardo has succeeded. His “Haikugo” uses only pitches corresponding to the “white notes” on a piano, but rhythmic subtleties build tension and excitement²³.

The compositions by Lombardo and Dydo were played by Tomoko Sugawara at the Berlin

¹⁸ The tune is written as tablature for the five-stringed lute in the scroll *Gogen-fu*, a manuscript classified as an Important Cultural Property and held in the *Yōmei Bunko* library in Kyoto. The scroll is 12 m long and 30 cm wide. It was analyzed and transnotated by Rembrandt Wolpert as part of his doctoral work (1975) and sections were later published (Wolpert 1981, 120). *Gogen-fu* is a copy, probably from the 11th century, based on original material of the eighth or ninth century. Another of its tunes, Qin Wang Pozhen Yue, is performed by Ms. Sugawara on YouTube <<http://www.youtube.com/watch?v=grSH2-7jPpY&feature=related>>.

¹⁹ In Chinese “*Qinghai Bo*” and in Japanese “*Seigaiha*,” Wolpert *et al.* 1974. For analysis, see Marett 1985.

²⁰ Waley 1950, 59.

²¹ Murasaki 1935, Chapter VII.

²² Wright 1978, 231–244, 255–269.

²³ Robert Lombardo offers the following program note: “I wrote *Haikugo* in 2004 after I received a video tape from

conference, and two examples are included in the CD accompanying this book.

7 RECONSTRUCTED ANGULAR HARPS (*KUGO*)

It is time to examine the instrument itself.

7.1 THE HARP USED IN THE RECORDING

All angular harps have a slender box joined to a rod. Vertical angular harps have many (> 20) strings, whereas horizontal angular ones have few (< 10). There are many representations and most agree about size and shape. If a player holds the vertical harps at a comfortable position, the rod will be near the level of the navel and the sound box will rise above the player's head. The height *above* the player's head is approximately equal to the height of the head itself. This is true for the majority of depicted harps, irrespective of the region where it was drawn, and the gender of the player.

Ms. Sugawara's harp (Fig. 18) was patterned on a harp image painted on a cylindrical box found by the Japanese Otani Expedition at Kumtura near Kucha, Xinjiang, China. The box, dated to the sixth or seventh centuries, is now kept in Tokyo National Museum. The harp has the normal dimension defined above, and some details are copied from the extant harps in the Shōsōin repository, in particular the pin inserted between the rod and the sound box. The idea of the pin goes back to about A.D. 600, when it was introduced in Iran, on the Silk Road and in China²⁴. The pin creates a cantilevered mechanism; it forms the fulcrum around which the rod may rotate. On the harp in Figure 18 the strings exert a counter-clockwise torque on the rod around the pin, and the tail gives a clockwise torque. This innovation allows a slim and elegant construction. Earlier harps had sturdier structure, where the box was thick enough to provide a solid joint between the box and the rod. Here unnecessary wood is eliminated.

One of the Shōsōin harps has tuning pegs – like those on the present harp. The other has tuning collars – like those on most ancient string instruments, such as lyres in the Aegean, and arched harps in Egypt. Collars were more common and had older roots, but the former are easier to use by modern players.

7.2 A RECONSTRUCTION BASED ON THE SHŌSŌIN HARPS

The two harps preserved in the Shōsōin repository are larger than those shown on paintings. Since the

top ends are missing, sizes and shapes can only be estimated, but the reconstruction²⁵ (Fig. 19b) seems reasonable: its lower section is close to the dimensions of the extant harps. This makes it approximately 1.8 times bigger than the harp in Figure 18. To facilitate a comparison, both harps in Figures 18 and 19 are properly scaled to each other. The large harp has a flat top which differs from the elegant curve seen on representations.

The large size is curious, for it disagrees with most illustrations. As already said, the Shōsōin harps were probably made in China and presented in a grand ceremony at the royal capital of Nara in 752. Perhaps the grandeur of the event motivated the large size of the harps. Another unusual instrument in the Shōsōin repository is the Chinese *qin*-zither. Here the size is normal, but the decoration is extraordinary, far more sumptuous than on any other *qin*. This feature, too, may be motivated the importance of the occasion.

Since the two harps are a rare survival of an extinct instrument²⁶, they have received much attention. Their wonderful preservation for 1200 years is a tribute to the care Japan lavishes on its cultural heritage. However, the harps are unlikely to preserve any specifically Japanese features, for they were probably manufactured in China, the artistically most resourceful region at the time. They are magnificent examples of the longest lasting family of harps, the angular harp.

Bo Lawergren of a performance on the harp by Tomoko Sugawara. I was fascinated by the instrument and after corresponding with Ms. Sugawara, I decide to compose these little pieces for her.

The challenge for me was to find a way to create something interesting for an instrument with a limited range and tuning possibilities. For the first and third pieces I decided to use a white note scale but with an F#. The middle piece kept the same tuning except for the F#, which was tuned to F. I limited the re-tuning to one string, since I thought it would be distracting to the audience to have the performer spend time changing many strings.

By limiting myself to a single scale, I found ways to shift pitch centers and create a feeling of harmonic movement within each piece. When I returned to the original scale in the third movement, I incorporated harmonics to bring a new color to the work. I think that my lyrical writing lends itself to composing for this ancient instrument. It is a great pleasure for me to dedicate these pieces to Ms. Sugawara."

²⁴ Lawergren 1995/1996, 239–40, where I called them "lever harps". But I discovered that the name had already been adopted for an entirely different type of modern harp, where levers sit on the sound board and make a buzzing sound. For that reason I changed the nomenclature and renamed them "light harps" in a later publication (Lawergren 2001, 886–887).

²⁵ Tokyo 1994, 17.

²⁶ Beside three fragmentary angular harps from ancient Egypt, Manniche 1975, 62–63.

7.3 STRING TENSION

An important question remains: how do string tensions on angular harps compare to those on frame harps? Having less rigid mechanical structure, one expects smaller tensions on angular harps. Actual measurements are given in Figure 20, in which the horizontal scale is drawn with even-spaced octaves. The vertical scale²⁷ is logarithmic on base 10.

As expected, a modern concert harp²⁸ has the highest tensions, followed in descending order by a small frame harp²⁹, an angular harp (Fig. 18)³⁰, and the Pazyryk harp³¹. The tensions on the *kugo* strings are three times less than on those of the concert harp, and the Pazyryk harps has 25 times less tension.

The choice of pitch, diameter and material affects the string tension. The builder needs to make a judicious choice, balancing the loudness and the mechanical stability of the harp. Since frame harps can tolerate high tensions, the choice is less critical there than on angular harps. Special attention must be paid to the long strings. Because they are attached *far* from the point where the rod meets the box, they would exert higher torque than the short strings – if all string had equal tension. On concert harps long strings have higher tension than short ones, but on angular harps the long strings have nearly the same tension as medium-long ones have (Fig. 20, blue curve). Harp makers fine-tune this condition by adjusting string diameters.

The string tension affects the frequency of the string's oscillation according to Mersenne's formula. But loudness is also affected. It depends on several factors, including the properties of the sound board and sound-box, but an important factor is Z , the characteristic string impedance³². On angular harps Z has a low value, because it depends on the string tension. As a result, angular harps are soft-spoken. This quality often affects ancient string instruments. They are tuned by collars, and the finger pressure limits the amount of tension. For harps the mechanical fragility also restricted the amount.

8 APPENDIX: TWO TANG DYNASTY POEMS ABOUT THE ANGULAR HARP (KONGHOU)

Among a multitude of poetic images and metaphors lie concrete pieces of information on manufacture and playing technique. The first poem tells about a harpist employed at the court of Chang'an. The phrase on line 7, "she lowers her left hand and raises her right hand," seems to imply that the left and right hands plays the short

and long strings respectively. This is contrary to the usage on concert harps, but many ancient images support the observation.

The second poem describes the harper Bi Ling in an extraordinary solo performance. The poet employs an extensive repertoire of allusions, but Frodsham's learned notes guide us through. The opening line "Silk from Wu, paulownia from Shu," gives concrete evidence, as does the "23 strings" in line 15.

1. Gu Kuang: Attendant Li's Performing on the Harp³³

Translator: Yuanzheng Yang, University of Hong Kong, Department of Music

- 1 The musician in the imperial court plays her harp, [an instrument that has] yellow and red cords and a golden body.
- 2 Early in the morning, there are imperial orders [requiring her attendance at] the Palace of Yuanyang³⁴ during the peaceful night, she, therefore, [accompanied] the singing at the Hall of Bright Moon.
- 3 With lovely erect posture, she performs the fingering of baocuo, that is to pluck one string by her middle finger while her thumb rests on another.
- 4 When performing the fingering pola, her hand moves [so swiftly that] the flowers she wears on her wrist falls, her dancing dress tears, and birds are frightened and fly away.
- 5 [Sitting on] the coral mat, [she plays the music] one note after another that sound "xi xi"; [playing in front of] the muslin screen, [she plucks] one string after another, as if ringing a bell.

²⁷ The tension was obtained from Mersenne's formula $f = 1/2L \cdot (T/\mu)^{1/2}$, where f is the frequency in Hz, L the length in m (meters), T the tension in N (Newtons), and μ the mass/unit-length in kg/m.

²⁸ The "Diana" model made by Victor Salvi has 47 strings. Only the four top octaves of strings, made of nylon and gut, are included in the graph.

²⁹ Clark Irish Harp, No. 1943 made 1918–1926. It has 31 strings, but only the 20 highest strings made of monofilament nylon are included.

³⁰ With 23 gut strings (see Fig. 18).

³¹ Replica made by the author in 1984 (Lawergren 1990, Fig. 58:1). The original Pazyryk harp made ca. 400 B.C. had five sinew strings, by the replica has five graduated nylon strings.

³² Given by the formula $Z = (T \cdot \mu)^{1/2}$, Morse and Ingard 1986, 138.

³³ This is the first English translation of this poem on the angular harp in China. It makes an important observation of the playing position of the hands: the left hand plays the short strings, the right hand the long strings.

³⁴ *Yuanyang*, the mandarin ducks, which always go in pairs, are the symbols of lovers or marital harmony.

- 6 Whenever fast or slow, her playing is always perfect; whenever listing from far or close distance, the sound is always pleasing to the ear.
- 7 [She] lowers her left hand and raises her right hand, in order to change the tunes and make the various sounds that are bestowed from heaven.
- 8 The bass produced by plucking the thick strings sounds like a flock of autumn geese flying over the Yumen Pass; while the tremble on the fine strings resembles the low chirp of small spring birds.
- 9 How swift her fingers are, and how flexible her wrists! [Her hands dart] back and forth as if stirred up by the wind.
- 10 The sounds “suo suo” are refined and cooling, [like] dropped pearls and shattered jade falling from the sky.
- 11 The beautiful female courtiers compete with each other to watch [the player] stealthily through the curtain made from tortoise shell, and the Emperor rolls up his pearl screen [to view the playing].
- 12 The thick strings are long, while the thinner ones are short. The thin strings are tense, while the thick ones are slack.
- 13 At the beginning, the music is performed as if yuanyang sings on the water, and in the end the melody sounds as if red-crowned cranes hover in this serene place.
- 14 Attendant Li, who has elegant manner and face, is just six Chinese feet and one inch high.
- 15 [The emperor] allows Li to teach only occasionally outside the imperial court, and her music performance was forbidden among common people.
- 16 Her fingers look like newly peeled white onion cores, her wrists look like slender jade. [Her playing] spices up the music with non-pentatonic notes.
- 17 [She] plays all the unusual and wonderful pieces under the heaven, so that people from the human world cannot tell the name of those melodies.
- 18 Whether it is a barbarian piece or a Chinese piece, they are the heart of the music repertoire.
- 19 [Her music] enters rooms through the air, and descends on the spring grass together with the wind.
- 20 If the wind comes, the grass will move with the wind.
- 21 The grass does not feel the arrival of the wind; and meanwhile, the wind does not know the rhythm of the sound.
- 22 Light up the jade candle! Light up the silver light! I dislike that the light shines only on her hands, for it merely illuminates the gestures in front of the harp, but do not illuminate the skills reflected in the sound of the harp.
- 23 Everyday, the emperor listens to her performances attended by the high nobility. Running to the imperial court [to serve the emperor musically], her melodies varies each day.
- 24 [Her music] is really precious. [The emperor] does not mind spending a fortune to purchase one single piece.
- 25 Those silver vessels and foreign glass bottles [given her by the emperor] require horses for transport and the rewarded silks need chariots.
- 26 She is not only the best player regionally, but nationally.
- 27 She seemed sent from the heaven, rather than from earth.

2. Li He: Bing Li at the Vertical Harp ³⁵
Translation in Frodsham 1970, 10–11

- 1 Silk from Wu, paulownia from Shu,
2 Open high autumn³⁶.
3 In the white sky the frozen clouds
4 Falling, not floating³⁷.
5 Ladies of the River weeping among bamboos,
6 The White Girl mournful³⁸;
7 Such is Bing Li playing his harp
8 In the Middle Kingdom.
9 Jade from Mount Kun is shattered,
10 Phoenixes shriek³⁹.
11 Lotuses are weeping dew,
12 Fragrant orchids smile.
13 Before the twelve gates of the city
14 The cold light melts⁴⁰.

³⁵ Bing Li was one of the emperor's musicians, from the famous Pear-garden School.

³⁶ Shu (Sichuan) was famous for its *tong* trees (*paulownia imperialis*), from which these harps were made. Similarly, the best silk came from Wu, in south-east China. “High autumn” is the term used for the ninth lunar month.

³⁷ The music is so exquisite the clouds come down to hear it.

³⁸ The Ladies of the River Hsiang are the two daughters of the legendary Emperor Yao, consorts of the Emperor Shun. Their teardrops, falling on the bamboos growing by the latter's grave, left speckled marks on them. The White Girl played a zither with 50 strings (*a se*) for the Yellow Emperor. The tune she played was so sad that he was forced to break her *se*, leaving her with only a 25-stringed instrument.

³⁹ Mount Kunlun was a mythical mountain of the west, said to produce the finest jade. Here the Peace of Immortality was to be found.

⁴⁰ Both Changan and Luoyang had twelve gates. The light melts because music had power over the elements.

- 15 The twenty-three strings have power to move
 16 The Purple King⁴¹.
 17 The goddess Gua Nü smelts her stones
 18 To weld the sky⁴².
 19 Stones split asunder, the sky startles,
 20 Autumn rains gush forth.
 21 He goes in dreams to the Magic Mountain
 22 To teach the Weird Crone⁴³.
 23 Old fishes leap above the waves,
 24 Gaunt dragons dance⁴⁴.
 25 Even Gang Wu, unsleeping still,
 26 Leans on his cassia tree⁴⁵,
 27 While wing-foot dew drifts wetly
 28 Over the shivering hare⁴⁶,

⁴¹ One of the most famous rulers of Heaven.

⁴² Gua (or Wa) Nü was a goddess with a snake's body, consort of Fuxi. When the demon Gong Gong butted his head against the north-west pillar of heaven, tilting the earth downwards to the south-east and making a hole in the sky, Nü Gua repaired the hole by fusing minerals of five colors.

⁴³ The Weird Crone is perhaps the Furen Cheng of the *Sousben ji*, who is said to have been an expert performer on the vertical harp.

⁴⁴ *Liezi* mentions a certain Pa Hu, who was such a performer on the classical zither (*qin*) that fishes danced and dragons leapt whenever he played.

⁴⁵ Gang Wu was banished to the moon, where he must forever unavailingly try to cut down the cassia tree growing there. The music makes him pause from his endless toil.

⁴⁶ The moon was believed to contain a hare, a toad, and a cassia tree; "shivering hare" is a kenning for "cold moon".

BIBLIOGRAPHY

ENDŌ, T. 2005

Heian-chō no gagaku: kogaku-fu ni yoru
Tōgaku-kyoku no gakuriteki kenkyū. Tokyo.

FARMER, H. G. 1936

Turkish Instruments of Music in the Seventeenth Century, *Journal of the Royal Asiatic Society of Great Britain & Ireland*, 1–43.

FISCHER, E. 1962

Melchior Lorck. Drawings from the Evelyn Collection at Stonor Park England and from the Department of Prints and Drawings, The Royal Museum of Fine Arts, Copenhagen. Copenhagen.

FRODSHAM, J. D. 1970

The Poems of Li Ho (791–817). Oxford.

DUBEY-PATHAK, M. 2000

Musical Depictions in the Rock-Paintings of the Pachmarhi Hills in Central India, in E. Hickmann/R. Eichmann (eds.), *Studien zur Musikarchäologie I*, *Orient-Archäologie* 6, 21–33. Rahden/Westf.

GRÜNWEDEL, A. 1912

Altbuddhistische Kultstätten in Chinesisch-Turkistan, Bericht über archäologische Arbeiten von 1906 bis 1907 bei Kuca, Qarasahr und in der Oase Turfan. Berlin.

HARICH-SCHNEIDER, E. 1973

A History of Japanese Music. London.

KILMER, A. D. 1997

Musik. A. I. Mesopotamien, in *Reallexikon der Assyriologie und Vorderasiatischen Archäologie* Bd. 8, 463–482. Berlin

LAWERGREN, B. 1996

Harfe, in L. Finscher (ed.), *Die Musik in Geschichte und Gegenwart* 4, 39–62. Kassel/Stuttgart.

LAWERGREN, B. 1990

The Ancient Harp from Pazyryk, *Beiträge zur allgemeinen und vergleichenden Archäologie* 9/10, 111–118.

LAWERGREN, B. 1994a

Counting Strings on Ancient Egyptian Chordophones, in C. Homo-Lechner/A. Bélis (eds.), *La pluridisciplinarité en archeologie musicale*, 519–533. Paris.

LAWERGREN, B. 1994b

Buddha as a Musician, *Artibus Asiae* 54, 226–240.

LAWERGREN, B. 1995/96

The Spread of Harps between the Near and Far East During the 1st Millennium A.D.: Evidence of Buddhist Musical Cultures on the Silk Road, *Silk Road Art and Archaeology* 4, 233–275.

LAWERGREN, B. 2001

Harp (ancient), in S. Sadie (ed.)/J. Tyrrell (exec. ed.), *The New Grove Dictionary of Music and Musicians* (second ed.) 10, 881–888 & 894–896. London.

LAWERGREN, B. 2003a

Western Influences on the Early Chinese Qin-Zither, *Bulletin of the Museum of Far Eastern Antiquities* 75, 79–109.

LAWERGREN, B. 2003b

Harp (čang), in E. Yarshater (ed.), *Encyclopaedia Iranica* 12(1), 7–13.

LAWERGREN, B. 2005

Musical Instruments on the Silk Road: Their Musical and Societal Dynamics, in Sheen Dae-Cheol (ed.), *The Music and Culture of the Silk Road*, 99–115. Seoul.

LAWERGREN, B. 2007

Music on Japanese Raigō Images 700–1700 – and Chinese Influences, in M. P. Ferreira (ed.), *Medieval Sacred Chant: From Japan to Portugal*, 43–87. Lisbon.

LIVIVS, T. 1936

The History of Rome in T. E. Page (ed.), *The Loeb Classical Library*. Cambridge (Mass.)/London.

- MANNICHE, L. 1975
Ancient Egyptian Musical Instruments, München Ägyptologische Studien 34. Munich/Berlin.
- MARETT, A. 1985
Tōgaku: Where have the Tang melodies gone, and where have the new melodies come from?, *Ethnomusicology* 29(3), 409–431.
- MORGAN LIBRARY 1998
Master Drawings from the Hermitage & Pushkin Museums. New York.
- MORSE, P. M./INGARD, K. U. 1986
Theoretical Acoustics. Princeton.
- MURASAKI, S. 1935
The Tale of Genji: A Novel in Six Parts, A. Waley (transl.). Boston/New York.
- MURASE, M. 2001
The Tale of Genji, Legends and Paintings. New York.
- PICKEN, L./WOLPERT, R. F./MARETT, A. J./CONDIT, J./MARKHAM, E. J./MITANI, Y./NICKSON, N. J. 1981–
Music from the Tang court: a primary study of the original, unpublished, Sino-Japanese manuscripts, together with a survey of relevant historical sources, both Chinese and Japanese, and a full critical commentary (vols. 1–5, 7). London.
- RASHIDOVA, D. 1992
Uchenyi-muzykant, poet i istorik Darvish Ali Changi (Mawerannah XVI–XVII vv.), in M. Rakhmanov (series ed.), *Kul'tura Srednegp Vostoka – razvitie, sviazi i vzaimodeistviia (s drevneishikh vremen do nashikh dnei)*, *Muzyka'naia, teatral'naia kul'tura i fol'klor*, 51–68. Tashkent.
- ROAF, M. 1990
Cultural Atlas of Mesopotamia and the Ancient Near East. Oxford/New York.
- ROUX, G. 1964
Ancient Iraq. Harmondsworth.
- TOKYO 1994
Reconstructed Music Instruments of Ancient East Asia (in Japanese: Kodai gakki no fukugen).
- TOZAWA, Y. (ed.) 2004
Musicology and Globalization; Proceedings of the International Congress in Shizuoka 2002 in Celebration of the 50th Anniversary of the Musicological Society of Japan. Tokyo.
- WALEY, A. 1950
The Poetry and Career of Li Po, 701–762 A.D. London.
- WOLPERT, R. 1981
A 9th-Century Score for Five-Stringed Lute, *Musica Asiatica* 3, 107–135.
- WOLPERT, R./MARETT, A./CONDIT, J./PICKEN L. 1974
The Waves of Kokonor: A Dance-Tune of the T'ang Dynasty, *Asian Music* 5, 3–9.
- WRIGHT, O. 1978
The Modal System of Arab and Persian Music A.D. 1250–1300. Oxford.

TRACKLIST

Track 1 1:59 min.
Track 2 1:30 min.
Track 3 2:19 min.
Three pieces for Kugo, written by Robert Lombardo for Angular Harp, performed by Tomoko Sugawara.

Track 4 2:17 min.
Waves of Kokonor, a Tang Dynasty tune expanded and elaborated by Stephen Dydo for the Angular Harp, performed by Tomoko Sugawara. The tune appears in Wolpert, Marett, Condit and Picken 1974, 9.



Fig. 1 Painting in a 15th century Persian book in British Library, London. A harp lies smashed on the ground.

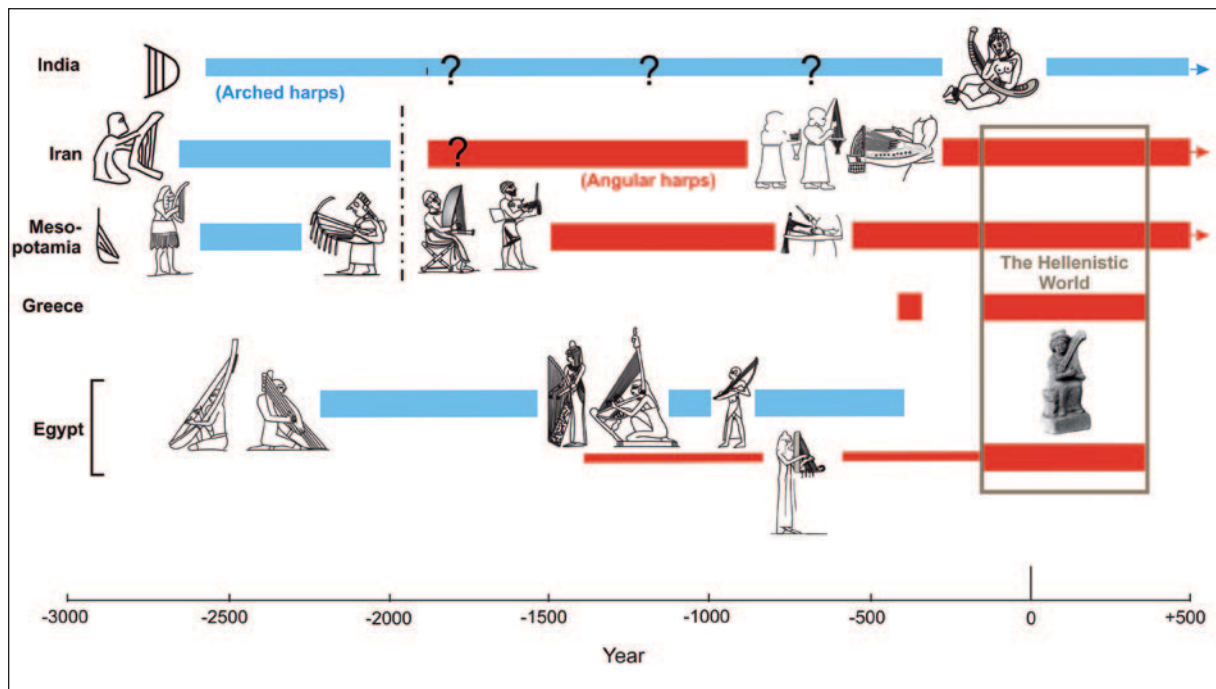


Fig. 2 Time-line for arched harps (blue color) and angular harps (red color). On the time scale at the bottom, negative signs mean B.C. The question marks in India indicate an absence of information, but arched harp are attested before and after the marks. The depicted harps are given in Lawergren 1995/96, 1996 and 2001.

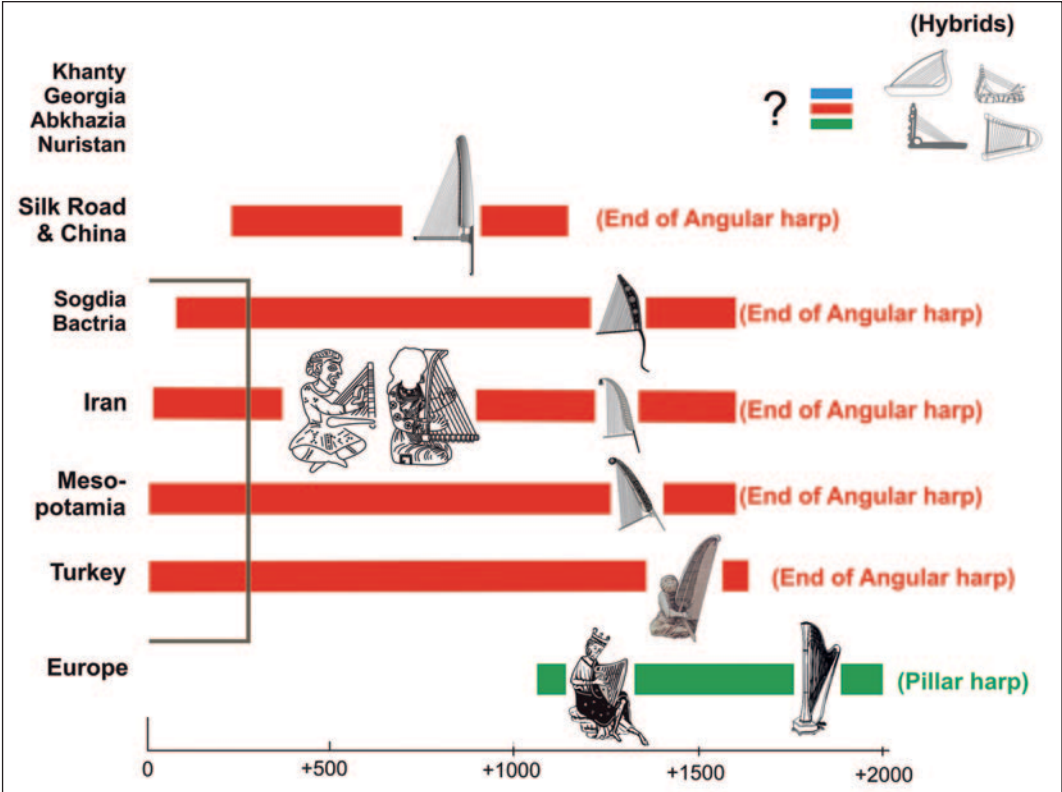


Fig. 3 As in Fig. 2, but with the addition of frame harps (green color).



Fig. 4 Angular harps with upward-expanding sound box. Mosaic from Bishapur, Iran, A.D. 250–300.

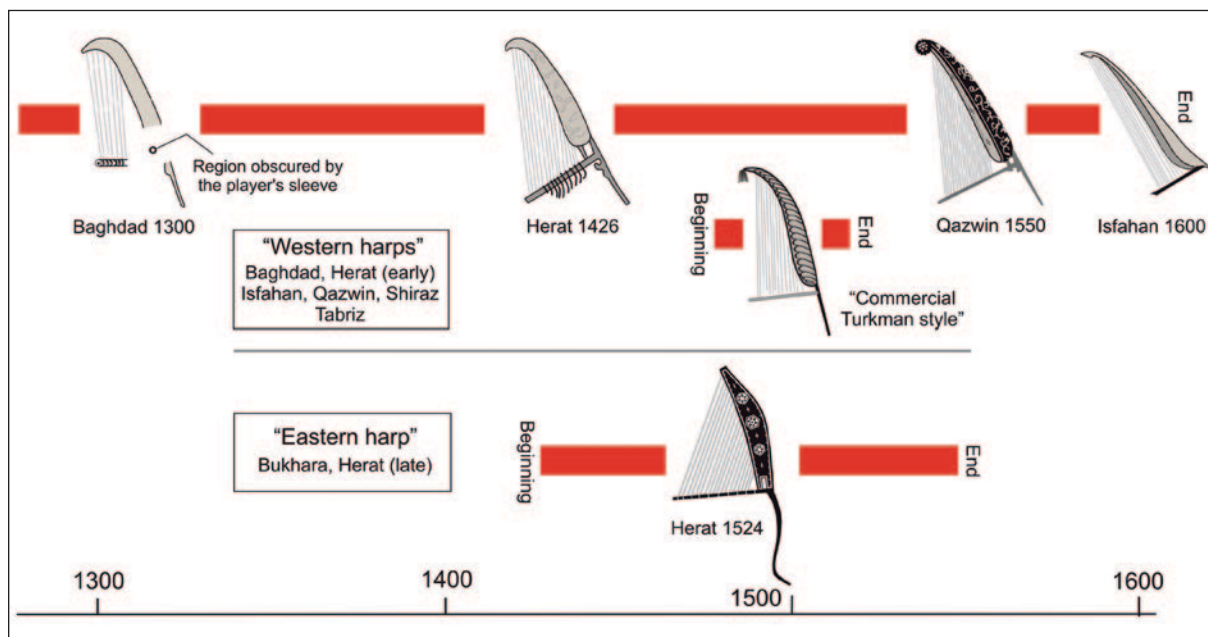


Fig. 5 Time-line of angular harps shown in Iranian illustrated books. Books produced in western Iranian and Baghdad ateliers are given on the upper time-line, those painted in eastern Iran and Bukhara are given below. Harps drawn near 1600 and later lack realistic details.



Fig. 6 Harp used as a weapon. Illustration in an Iranian book. Bibliothèque Nationale (Sup Pers. 1556 f 158 r).

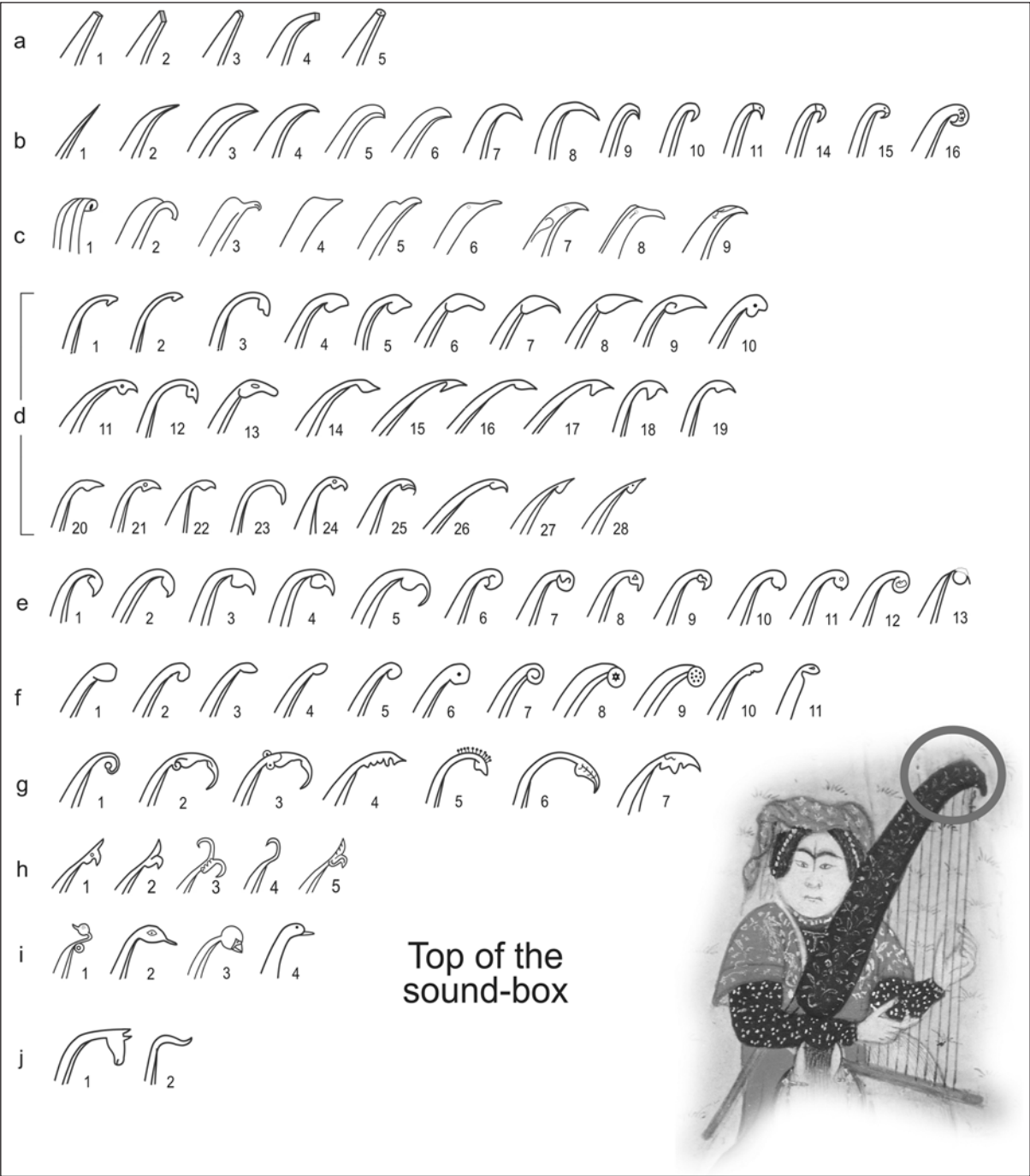


Fig. 7 Top portions of the bodies of harps draw in Islamic illustrated books A.D. 1300–1600. There are 129 tops, and each is different.

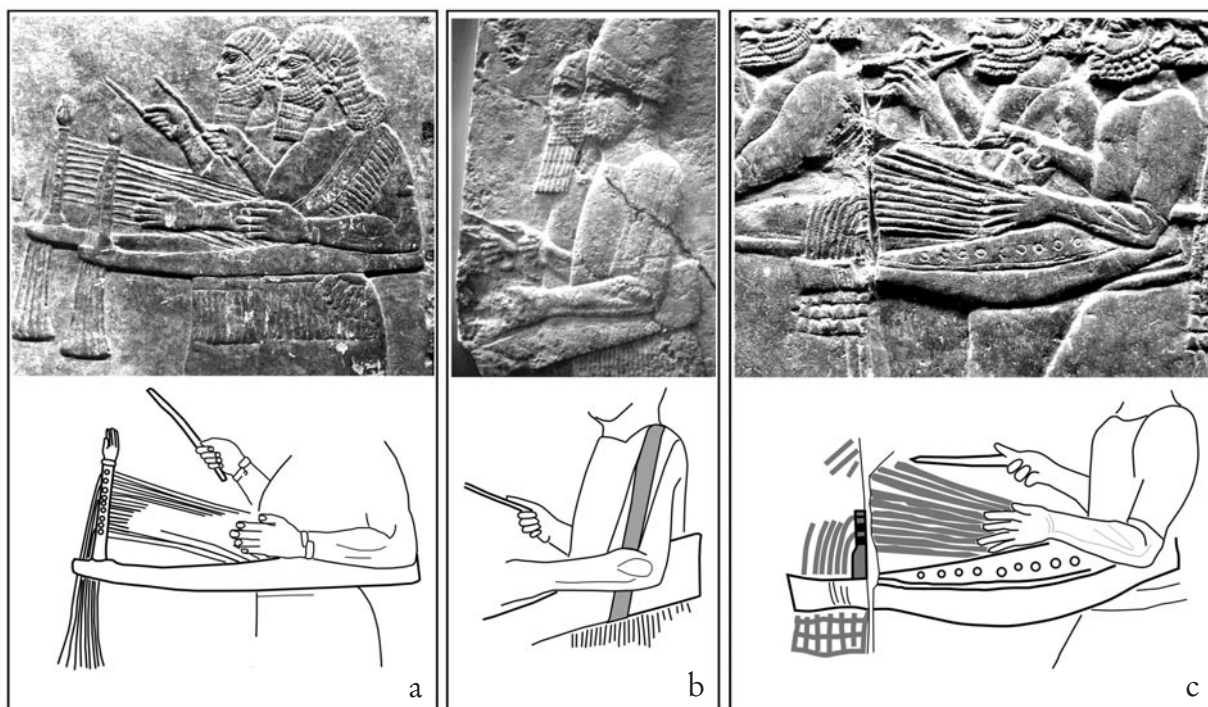


Fig. 8 Reliefs on Assyrian palace walls showing horizontal angular harps. a: The north-west palace at Nimrud, reign of Ashurnasirpal II, ca. 870 B.C.; b: the south-west palace at Nineveh, reign of Sennacherib, 700 B.C.; c: the south-west palace at Nineveh. Reign of Ashurbanipal, 650 B.C.

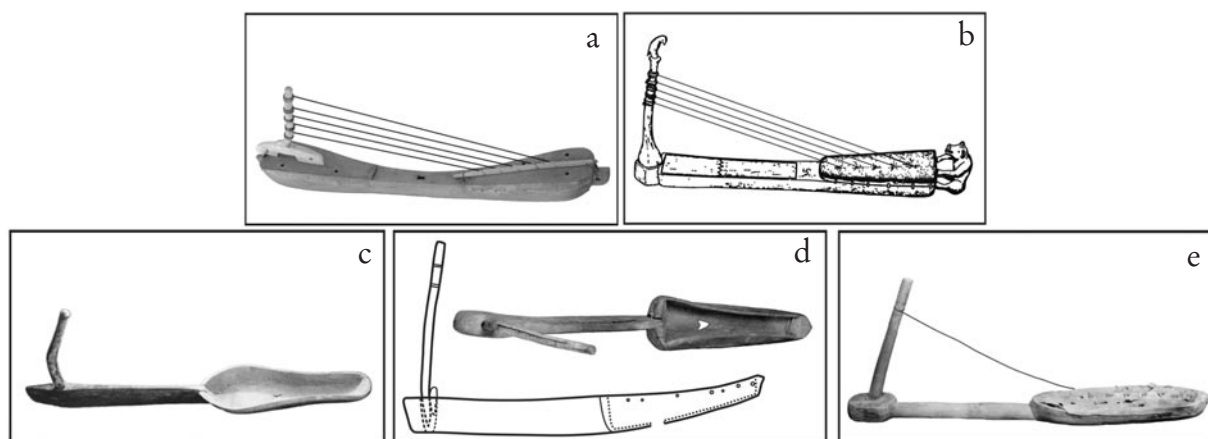


Fig. 9 Extant horizontal harps ('steppe harps'). a: Pazyryk, in the Altai mountains, 350 B.C.; b: Olbia, on the northern coast of the Black Sea, A.D. 100; c: Zaghunluq, at the southern edge of the Tarim basin, 500–400 B.C.; d: as for c; e: Yanghai, at the northern edge of the Tarim basin, 500–400 B.C.

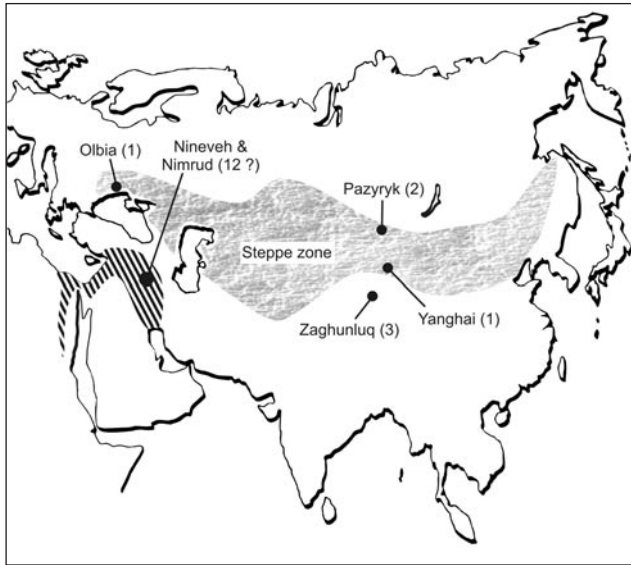


Fig. 10 Map showing the extent of the Assyrian empire in the 7th century B.C. (hatched area, Roaf 1990, 191), the find spots of steppe harps, and the Eurasian steppe region.



Fig. 11 Wall painting in a grotto at Gaochang (Khocho), dated A.D. 850. Grünwedel 1912, Fig. 664.

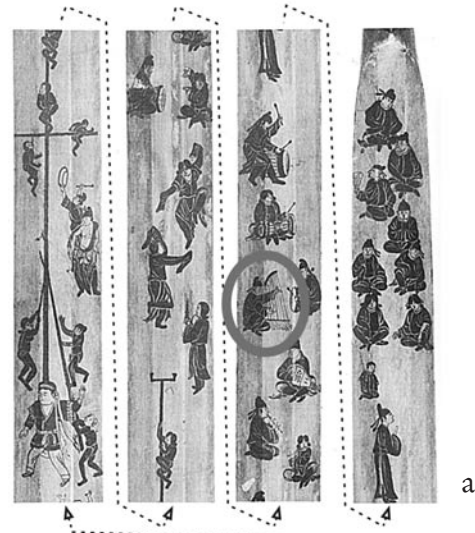


Fig. 12 Paintings on a wooden bow (*dankyū*, Harich-Schneider 1973, 55–57), in the Shōsōin repository, Nara, Japan. It is dated A.D. 730 at the latest. In each section marked with a letter, the four vertical slices form a continuous sequence with partly overlapping joints. At least 35 instruments are shown, including a harp shown within the red ellipse.



Fig. 13 An angular harps in the Shōsōin repository, Nara, Japan. It is inlaid with Mother-of-Pearl, and has a height of 144 cm.



Fig. 14 Proposed outline of the missing top of the Mother-of-Pearl harp.

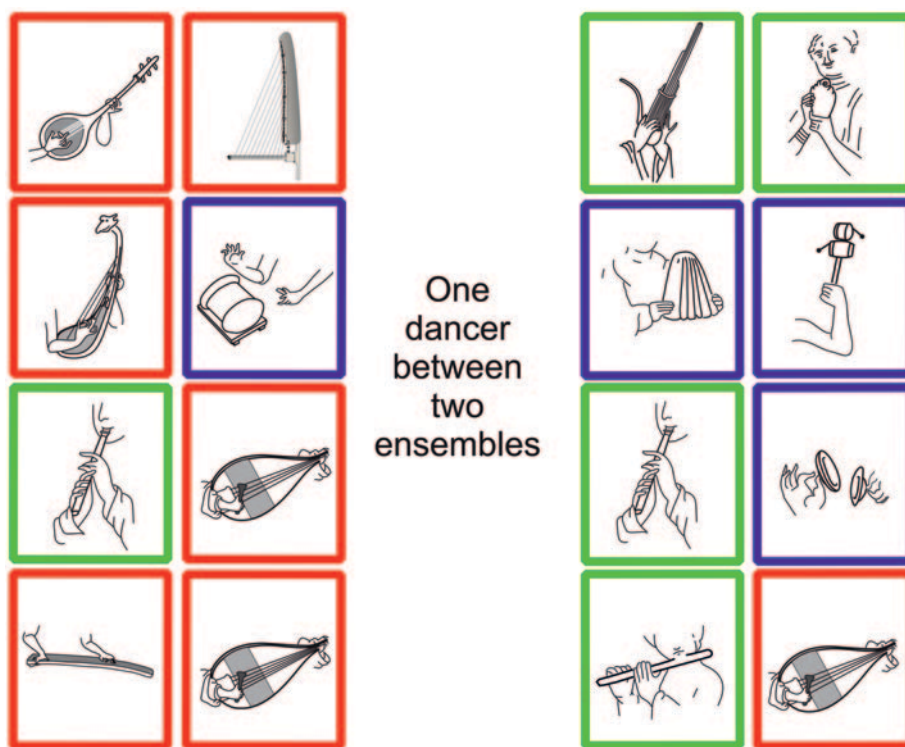


Fig. 15 Arrangement of instruments in an ensemble playing in the Western Paradise. The line drawings are based on a painting in cave 85, Dunhuang, China, dated 852–857 (Lawergren 2007, Figs. 18–23). They are not copies of the original paintings, but simplified representations. There are eight instruments on each side of platform with one dancer. Seven are strings (red color), five winds (green color), and four percussion instruments (blue color).

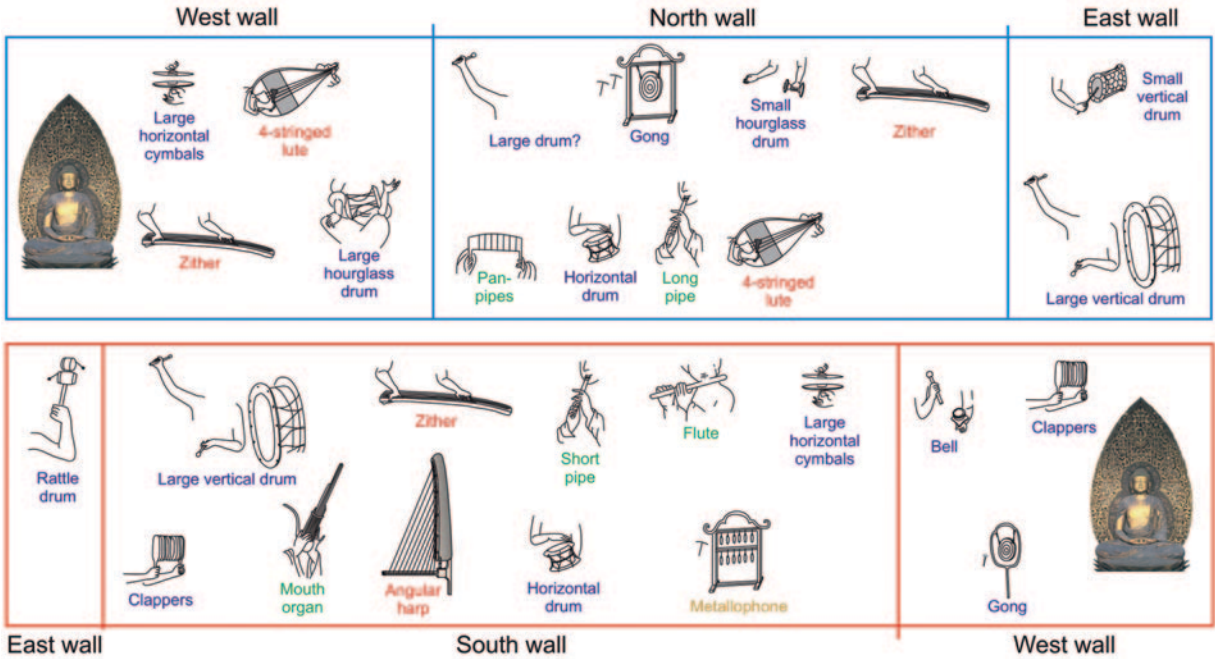


Fig. 16 Sculpted musicians with their instruments on four walls of the Phoenix Hall in the Byōdōin temple, Kyoto, dated A.D. 1053. Twenty-eight instruments surround the Buddha Amida. Six are strings, five winds, and seventeen percussion instruments.



Fig. 17 Genji and Tō no Chūjō dancing to the tune of “Waves of Kokonor.” Painted by Tosa Mitsuoki, 1617–1691 (Murase 2001, chapter 7).



Fig. 18 Angular harp with 23 strings. The length of the box is 72 cm, the tail 35 cm, and the rod is 49 cm.



Fig. 19 Reconstruction of a harp partially preserved in the Shosoin Treasure house. It has 23 strings. The length of the box is 133 cm, the tail 70 cm, and the rod 74 cm.

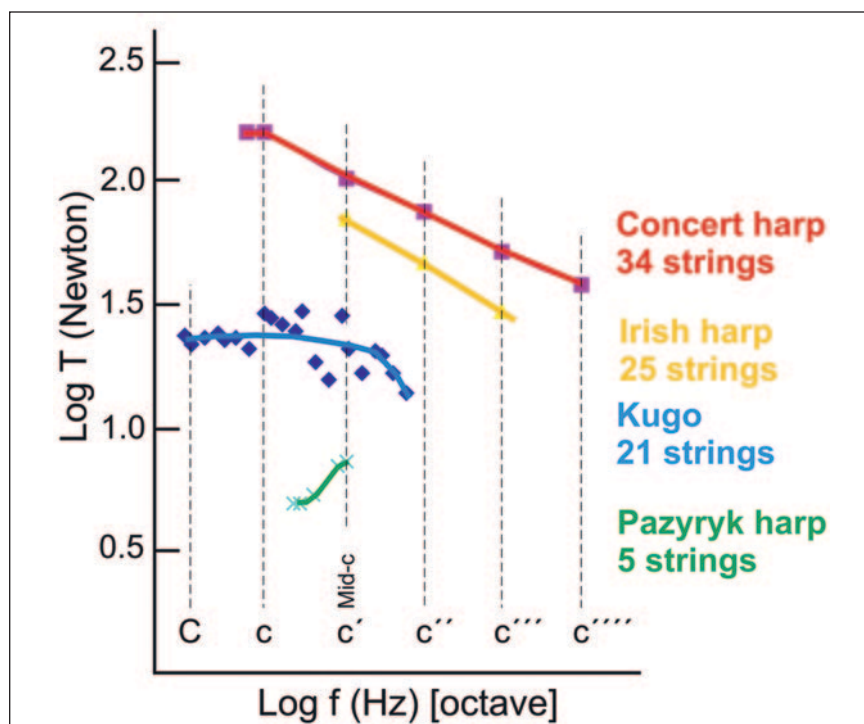


Fig. 20 The tension (T) in harp strings. The 10-base log of T is plotted on the vertical axis. The 10-base log of the fundamental frequency of the string is entered on the horizontal axis. The procedure puts each octave at equal intervals along the axis.