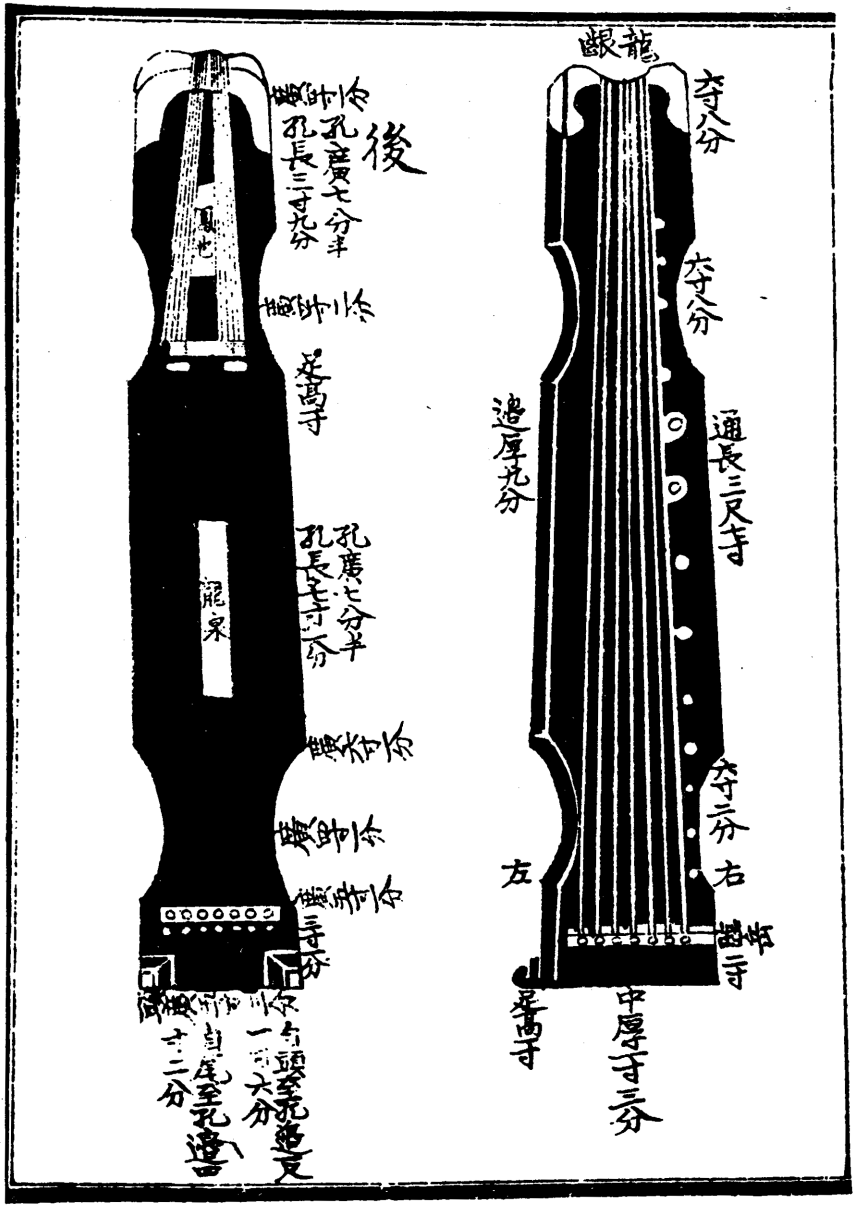


Fig. 297. The classical Chinese 'lute' (*ku chhin*), properly described as a seven-stringed half-tube zither. *Akhak Kweböm*, ch. 6, p. 21*b* (+1493).

Tung Chung-Shu, for example, in the −2nd century, when confronted by the much more striking phenomenon of sympathetic resonance, accepts it simply as being 'nothing miraculous', since it accords so well with the typically Chinese organic world-view.

> Try tuning musical instruments such as the *chhin*[1] or the *sê*.[2] The *kung* note or the *shang* note struck upon one lute[a] will be answered by the *kung* or the *shang* notes from other stringed instruments. They sound by themselves. This is nothing miraculous, but the Five Notes being in relation; they are what they are according to the Numbers (whereby the world is constructed).[b]

But in China we have to deal with two distinct currents, the literary tradition of the scholars, and the oral tradition of the craftsmen who were expert in acoustics and music. From what follows it will be seen that the latter must have done a great deal of experimentation, asking questions quite parallel to those asked by the Greeks—but the details were only rarely recorded.[c]

Tung Chung-Shu, indeed, was among the most scientific and philosophical minds of his age. In ancient and medieval times acoustic phenomena were often enough regarded as portents. Many strange sounds were recorded, but enquiry was concerned rather with what they could mean than with how they were caused. For example, it is noted that during the reign of the emperor Chhêng there occurred in −18 a case of a great rock emitting a noise like thunder.[d] The prognosticatory tradition was that such an event implied a disturbance of the element Metal,[e] due to unbridled love of war and conquest on the part of rulers. The people said simply that soldiers would come.

[a] Both the instruments named have commonly been considered lutes, but the term is literary and imprecise. The classical *chhin* is still in use today (Fig. 297)—an instrument of seven strings, correctly to be described as a half-tube zither (Sachs, 2), for it consists of a flat elongated board concave below and convex above, upon which are mounted the silk strings. A musician playing on a *chhin* may be seen on the back of a bronze mirror made in Tung Chung-Shu's own time (Bulling (8), pl. 31). The *sê* (Fig. 298) survives only in the form of a descendant called the *chêng*,[3] which has thirteen strings of brass wire but retains the integral board body. In true lutes the resonator box is distinct from the long or short neck upon which the strings are extended. Such instruments the Chinese had, but not during the seminal period of their acoustics on which much of our discussion will turn. All were variants of the celebrated *phi-pha*,[4] so often referred to in later poetry and literature. The history of this short lute has been carefully examined by Picken (6), who concludes that it was of non-Chinese provenance, introduced from some Central Asian people, probably Iranised Turco-Mongols, in the +2nd century. The most important of the earliest sources include Liu Hsi's[5] *Shih Ming*[6] (Explanation of Names) *c.* +200, and the *Phi-Pha Fu*[7] (Rhapsody on the Phi-Pha) by Fu Hsüan[8] (+217 to +278) in *CSHK* (Chin sect.), ch. 45, p. 6*a*. On musical interchange between East and West Asia see further Farmer (1, 2, 3).

[b] *Chhun Chhiu Fan Lu*, ch. 57, tr. auct., cf. Vol. 2, p. 281 above. Parallels in *Lü Shih Chhun Chhiu*, ch. 63, vol. 1, p. 122, tr. R. Wilhelm (3), p. 161; and *Chuang Tzu*, ch. 24, tr. Legge (5), vol. 2, p. 99; *Huai Nan Tzu*, ch. 11, p. 11*a*, cf. Wu Nan-Hsün (*1*), p. 167.

[c] One of the most stimulating comparisons of Greek with Chinese music and acoustics is that of Laloy (2). The work of Amiot and Chavannes in this context will be referred to below (p. 176) in connection with the 'Pythagorean controversy'.

[d] *Chhien Han Shu*, ch. 27A, p. 20*a*; *TSCC*, *Shu chêng tien*, ch. 158, p. 2*b*.

[e] Cf. Vol. 2, pp. 243ff. and Eberhard (6), p. 19.

[1] 琴 [2] 瑟 [3] 箏 [4] 琵琶 [5] 劉熙 [6] 釋名
[7] 琵琶賦 [8] 傅玄

Nevertheless, Chinese interest in sound, though it followed a different course from that of the Greeks, was by no means fruitless. Chinese invention enriched the world's civilisation in the sphere of acoustics and music no less than in other fields. The pages which follow will attempt to show first how the social life of the Chinese in pre-Han times brought them to focus attention on sound as a manifestation of Nature in equilibrium and disequilibrium. This entails a study of the concept of *chhi*,[1] subtle matter,

Fig. 298. The extinct 'great lute' (*sê*), a horizontal psaltery with twenty-five silk strings. *Hsiang Yin Shih Yo Phu*, ch. 1, p. 2*b*, in Chu Tsai-Yü's *Yo Lü Chhüan Shu* (+1620).

vital breath, or emanation. We shall then try to trace the advance towards acoustics as a science, with steadily improving systems of classifying sounds, and devices for measuring the pitch of musical notes. Finally, we shall describe some of the contributions which China has made to the world's understanding of sound, and of the nature of music.

(2) Correlation of Sound with Flavour and Colour

Few peoples ancient or modern have proved themselves more sensitive than the Chinese to the timbre of musical sounds. Van Gulik mentions[a] sixteen different 'touches' in playing on the silk strings of the classical 'lute' (*chhin*[2]) and lists yet

[a] (1), pp. 105, 125.

[1] 氣 [2] 琴

other manners of striking and pulling them. To take one example only, the vibrato termed *yin*:[1]

A finger of the left hand moves quickly up and down over the spot indicated. 'A cold cicada bemoans the coming of autumn.' The plaintive, rocking drone of the cicadas should be imitated. Of this *yin* there exist more than ten varieties. There is the *chhang-yin*,[2] a drawn-out vibrato, which should recall 'the cry of a dove announcing rain'; the *hsi-yin*,[3] a thin vibrato, which should make one think of 'confidential whispering'; the *yu-yin*[4] or swinging vibrato, which should evoke the image of 'fallen blossoms floating down with the stream', etc. Remarkable is the *ting-yin*;[5] where the vacillating movement of the finger should be so subtle as to be hardly noticeable. Some handbooks say that one should not move the finger at all, but let the timbre be influenced by the pulsation of the blood in the fingertip, pressing the string down on the board a little more fully and heavily than usual.

Such a description suggests the infinite subtlety with which any given note could be played. Indeed, even today an expert *chhin* player will himself remain intently listening long after a note has become inaudible to other listeners. As Taoist thought put it:[a] 'The greatest music has the most tenuous notes (*ta yin hsi shêng*[6]).'

This was by no means an aestheticism without basis in physical fact. The ancient zither (*ku chhin*[7]) is the only musical instrument in any culture which has no frets and actually marks the nodes of vibration on the board. Recognition of individual harmonics, 'floating sounds' (*fan yin*[8]), using the same string, was already well advanced in the time of Hsi Khang[9] (+223 to +262). In Europe on the contrary this came very late, not before the +18th century. Indeed, the technique of playing the *chhin* mainly depends on exploiting the production of different timbres at the same pitch, and this was already developed to perfection by the later Sung (+12th century).

Nevertheless, the question remains, what did early Chinese thinkers believe sound to be? Their contemporaries in ancient Greece set themselves this question and tried to answer it. The Pythagoreans, for example, believed sound to be what Laloy describes[b] as 'la chose numérale par excellence'.[c] Theon of Smyrna,[d] about +150, attributes to Hippasus and Lasus (−5th century) the establishment of a relation between sound and speed, sound being something which is thrown so quickly that like a rapid discus it cannot be perceived in flight, but only on the instant of 'landing'. Archytas (*fl.* −370) went further and defined sound as speed itself.[e]

In ancient China, on the contrary, no parallel analysis and abstraction was made. Sound was regarded as but one form of an activity of which flavour and colour were others. The background for Chinese acoustic thinking was largely determined by a

[a] *Tao Tê Ching*, ch. 41.
[b] (1), p. 52.
[c] Cf. the remark of Leibniz, quoted by Archibald (2): 'Music is a hidden exercise in mathematics by minds unconscious of dealing with numbers.'
[d] *On the Uses of Mathematics for the understanding of Plato*, ch. 12 (ed. Bouilland, Paris, 1644). Cf. Freeman (1), pp. 86ff.
[e] Theon of Smyrna, ch. 13; Laloy (1), p. 64; Freeman (1), pp. 237ff.

[1] 吟 [2] 長吟 [3] 細吟 [4] 遊吟 [5] 定吟 [6] 大音希聲
[7] 古琴 [8] 泛音 [9] 嵇康

concept which stemmed from the vapours of the cooking-pot, with its fragrant steam for which the word was *chhi*.[1] We have already had occasion to enlarge on the significance of this basic concept of Chinese pneumatism.[a] Karlgren gives for the word in Chou times the meanings 'vapour, air, breath, vital principle, temperament, to present food, to pray, beg or ask'.[b] It was clearly of wide connotation, and will be used in this Section (as in others) as a technical term for which there is no English equivalent. It moulded Chinese thinking from the earliest times, just as form and matter dominated European thought from the age of Aristotle onwards. For this reason one must have as good an understanding of its connotations as possible. Without this a European reader might consider the commentaries of many acute Han scholars writing on musical subjects as loaded with acoustic observations of a superstitious or nonsensical kind.

The common context, then, of the meanings of the word *chhi* given above is that of sacrifice to the ancestors. They are prayed in the *Shih Ching* to return and reinvigorate their descendants and their crops:

> Sonorous are the bells and drums. Brightly sound the stone-chimes and flutes.
> They bring down with them blessings—rich, rich the growth of grain!
> They bring down with them blessings—abundance, the abundance![c]

The ancestors are tempted to return to earth not only by the prayers of their descendants chanting liturgical phrases, but by the sounding of musical instruments and the delicious emanations which rise up from magnificent bronze cooking-vessels. When they arrive their eyes are also feasted with the sight of an assembly dressed in ceremonial clothing, furs and emblems all conforming to traditional themes of colour. From the earliest historical periods the Chinese were concerned with a synthesis of sound, colour and flavour, responding to the synthesis[d] of Nature manifested in thunder, rainbows and spicy herbs. One *chhi* rises up from the earth to heaven like steam from cooking-pots; another descends from heaven to earth, like ancestors spreading their reinvigorating influence. Their intermingling produces wind,[e] wherewith heaven makes music,[f] and brings into being not only rainbows which are heaven's colours, but the flowers of the changing year and with them the flavouring herbs in due season. All were signs and symbols of those great climatic processes on which the life of the ancient Chinese people depended, balancing ever between flood and drought.[g] Such was the environment which brought forth their organic philosophy.[h] A purely analytic treatment of sound would hardly have been consistent with it.

[a] E.g. Vol. 2, pp. 22, 41, 76, 150, 238, 275, 369; Vol. 3, pp. 217, 222, 411, 467, 480, 636. [b] K 517.

[c] *Shih Ching*, cf. Legge (8), pt. IV, i (1), no. 9; Mao, no. 274; tr. auct. adjuv. Karlgren (14), p. 243; Waley (1), p. 230. Perhaps −7th century.

[d] Almost an orchestration. Cf. p. 164 below.

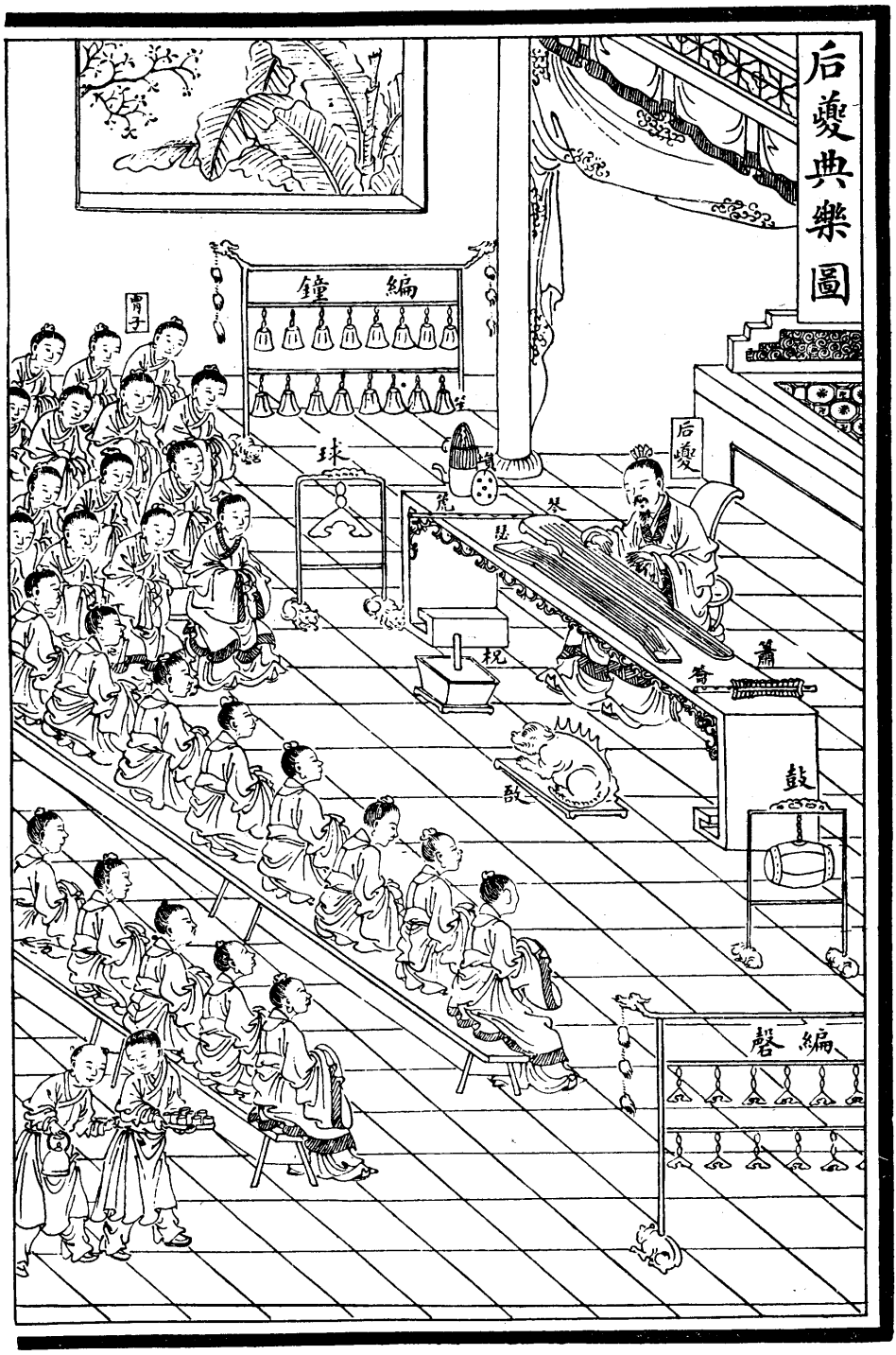
[e] *Chhien Han Shu*, ch. 21A, p. 4*a*: 'The *chhi* of heaven and earth unite and thereby produce wind.'

[f] *Chuang Tzu*, ch. 2: 'If Earth pipes, it is with all its apertures. If Man pipes, it is with the collected bamboos.' Cf. Vol. 2, p. 51.

[g] Cf. Vol. 1, pp. 87, 96, 114, 131, etc.; Vol. 3, p. 462ff., 472ff. Cf. Sect. 28 below.

[h] Cf. Vol. 2, pp. 51ff.; 281ff., 472ff.

[1] 氣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