

---

# Music in the World of Islam

## A Socio-cultural study

Amnon Shiloah

SCOLAR  
PRESS

© Amnon Shiloah, 1995

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise without the prior permission of the publisher.

Published in Great Britain by  
Scolar Press  
Gower House  
Croft Road  
Aldershot  
Hants GU11 3HR  
England

British Library Cataloguing in Publication Data

Shiloah, Amnon  
Music in the world of Islam: a socio-cultural study  
I. Title  
306.4840917671

ISBN 0 85967 961 6

Typeset in Sabon by Raven Typesetters, Chester and printed in  
Great Britain by Biddles Ltd, Guildford

## 5 The Science of Music

### General background

The treatment of Arabic music theory as a subject of significant intellectual value *per se* began with the process of translation of non-Arab texts, mainly Greek treatises on music. Under Caliph al-Ma'mūn (813–33), the process of accumulating and translating Greek scientific and philosophic books reached its culmination and became a well-organized activity. The Institute of Science – *Bayt al-hikma* – created by al-Ma'mūn and established at the huge government-supported library in Baghdad, became a centre of translation into Arabic. Among the most active translators were the Nestorian Christian from al-Hīra, Ḥunayn ibn Ishāq (d. 873); his son Ishāq (d. 911); and the distinguished mathematician and astrologer Thābit ibn Qurra (a member of the pagan community of Harrān) (d. 901). Consequently, a large corpus of Greek scientific and philosophical writings was thereafter within reach of Arabic-reading scholars. The great impetus given this enterprise and the enthusiasm with which it was received by the ruling class and intelligentsia had practical reasons, such as fortune-telling, safeguarding health, determining time of prayer, the direction of Mecca, and so on; concomitantly, there was marked interest in theoretical and abstract questions.

The revitalization and cultivation of the declining Greek intellectual tradition may be regarded as a continuation of the activities carried on in the important Alexandrian school in Antioch and Harrān as well as in Jundishapur (south-west Iran). The latter had been an active centre of learning in which Greek, Persian, Syriac, Jewish and Indian ideas had intermingled. In the new cultural framework and environment, as A. I. Sabra writes:

For the first time in history, science became international on a really wide scale; and one language, Arabic, became its vehicle. A large number of scholars belonging to different nations and professing different beliefs collaborated in the process of moulding into this one language materials which had previously existed in Greek, Syriac, Persian and Sanskrit. (Sabra 29: 182–183)

One of the leading ideas found in writings of the time was the claim that one should acknowledge truth and absorb it, from whatever source it comes, always assuming that the borrowed material could and would be improved. Thus, while profoundly respectful of their Greek mentors, the best of the Arab scholars were not slavish followers of their Greek predecessors but regarded them as fallible human beings subject to criticism and correction. The question of their indebtedness to the Greeks was a recurrent subject of lively discussion among Muslim scholars. Under all circumstances, the influence exerted by the translated Greek writings was felt particularly in those branches of learning defined by Muslim scholarship as 'foreign sciences', in contradistinction to 'native sciences'. The latter encompassed the traditional or religious sciences, linguistic sciences including koranic exegesis and criticism, the science of apostolic tradition, jurisprudence, scholastic theology, grammar, lexicography, rhetoric and literature. The 'foreign sciences' comprised philosophy, geometry, astronomy, music, medicine, magic and alchemy. But here too, Muslim scholars did not blindly reproduce everything they received from the Greeks. They expanded, changed, improved, or at least shed new light on every subject, including the theory of music.

#### Music theory and theoretical writings on music

Arabic music theory is expounded in texts of many forms and types; its material ranges from *musica speculativa* to *musica practica*, from encyclopedism to specialization. In its broadest sense, therefore, it encompasses a wide spectrum of theoretical activity, often offering a vast arena for intellectual pursuits. Due to its multiple connections with other disciplines and cultural areas, Arab treatises on music, like those of antiquity and the Middle Ages, elaborate on a variety of subjects that are interconnected in a very special manner. Because of their interdisciplinary nature, the best contributions are important links in the chain of history of sciences and vital factors in the transmission of knowledge.

It is certain that the appearance of the first Arabic writings on music coincides with and results from newly made acquaintance with translated Greek treatises, a fair many of which were probably known to the earliest generations of Arab music theorists. In this respect, the Baghdadian bibliographer and bookseller Abū'l-Faradj ibn al-Nadīm (d. 995 or 998) provides us with enlightening testimony. His *Kitāb al-fihrist* (Book of the Index to Arabic Books) was designed as a catalogue of all books in Arabic known in his time, whether original or translated. It contains ten discourses (*maqālat*), the first six dealing with books on Islamic subjects and the last four with non-Islamic subjects. The third section of the third discourse gives the titles

of Arabic musical works concerned with biographies of famous musicians, famous collections of songs, instruments and the like; they all belong to the class of Arab native sciences, have an affinity with the oldest form of Muslim historiography and all fall under the literary anecdotal category described in Chapter 3. The first and second sections of the seventh discourse give the titles of books on the theory of music, including 18 treatises translated from the Greek. Among those whose works were translated are Pythagoras, Aristotle, Plato, Aristoxenos, Archimedes, Nicomachous of Gerase, Euclid, Aristides Quantilianus and Themistius. Of the entire list of 104 musical writings mentioned in *Kītab al-fihrist*, only 11 have come down to us, including a few items translated from the Greek. With respect to the lost Greek treatises, traces of them can be found in Arabic writings of earlier and later periods. Many texts included alleged or genuine quotations and references that provide valuable information about ancient Greek theory, as expounded in works the original versions of which have been lost (Farmer 43; Shiloah 76: 201–206).

Although little has remained of the large corpus, the availability of an impressive number of treatises, covering a period extending at least until the close of the first millenium, is highly significant. It also indicates an obvious awareness of the distinction between two basic types of treatises on music: scientific texts reflecting intellectual activity and literary, anecdotal works generally referring to aspects of musical practice and life, including an occasional theoretical contribution. As a matter of fact, these two types have continued to co-exist, either separately or side by side, through the ages.

### Scope and development of theoretical writings

The first steps toward shaping the new scientific approach were taken by authors involved in translation. The Christian philosopher and physician Hunayn ibn Ishāq (d. 873) was the most important medium for transmission of ancient Greek science to the Arabs. Hunayn, who headed a team of translators, is credited with a tremendous number of translations as well as books he himself wrote on medicine, philosophy, zoology and other themes. He dedicated three chapters of his *Kitāb 'ādāb al-falāsifa* (Book of Aphorisms of the Philosophers) to music. Pursuant to the vogue prevalent among the Greeks, Hunayn's chapters on music profess to be records of rare sayings (*nawādir*) uttered by ancient Greek philosophers at festive banquets. According to a certain Ammonius who appears in the incipit of the first chapter as a secondary source, the occasion leading to the compilation of the musical aphorisms was a wedding feast given by King Heraclius for his son. After listening to musicians who enhanced the festivities, the host asked philosophers allegedly present at the celebration to discuss the meaning and

value of music. They did so in the form of aphorisms. The 41 sayings refer to the moral and therapeutic effects of music; its spiritual meaning as opposed to its intoxicating influence; cosmological associations of the four strings of the *'ūd*, and so forth. Many of these sayings are ascribed to famous names such as Plato, Aristotle, Alexander, Solon, Euclid and Hermes Trismegistos. A similar work, but on a larger scale, is attributed to a certain Bülos (Paul) and was translated by Hunayn's son Ishāq ibn Hunayn.

This genre seems to have been highly esteemed, as two other important contemporary musical sources included a section called *nawādir* with similar aphorisms: the *Risāla fī adǧzā' khabariyya fī'l-mūsīqī* by al-Kindī, and the *Rasā'il Ikhwān al-Ṣafā* by the Brethren of Purity (see below). Hunayn's work was widely known among medieval Jews through the Hebrew translation rendered by the Andalusian poet Solomom al-Ḥarīzī (1170–1235). Isolated sayings extracted from these texts appear in many writings from the ninth to the nineteenth century.

The three sons of the astrologer Mūsa ibn Shākīr, protégés of the Caliph al-Ma'mūn, who became known for their persistent efforts to obtain books from Byzantium and for their generous support of translation activities, wrote a treatise on an automatic hydraulic organ: *al-'Āla allatī tuzammīru bi nafsīha* (The Instrument that Plays by Itself). The wind supply to activate it is obtained by means of compensating water cisterns; this differs little from the automatic wind instrument described by Apollonius of Perga (d. ca 190 BC) whose Greek version was translated into Arabic under the title: *San'at al-zāmīr*. However, the remaining part of the apparatus built by Mūsa's sons is quite novel (Farmer 45: 80–88). Another famous translator from Greek and Syriac into Arabic at the academy *bayt al-ḥikma* was the Christian physician Yuhanna ibn al-Ba ṭriq (d. 815). In a pseudo-Aristotelian work he translated reports to the effect that in his advice to Alexander on affairs of government and administration, Aristotle included the recommendation to use a huge organ in wartime to warn fellow-citizens, encourage the army and create fear and disarray within the enemy ranks. It was said that the sound of this remarkable instrument travelled 60 miles, a statement that appears verbatim in the title of the Arabic translation of *San'at al-urghun al-būqī* (On the Construction of the Flue-pipe Organ) by Muristus. The text describes a large hydraulic organ, more than six metres high, that emits resonant, powerful sounds. Incidentally, this is one of three translated treatises attributed to Muristus (Farmer 45: 88–114).

One of the above-mentioned sons of Banū Shakir was also responsible for introducing the mathematician and astrologer Thābit ibn Qurra (d. 901) as chief astrologer to the court of the Caliph al-Mu'taḍid (892–902). A translator from Greek and Syriac into Arabic and member of the Sabeen pagan community of Ḥarrān, he contributed several treatises on music in Arabic and an important one comprising 500 folios in Syriac. All have been lost

except one entitled: *Mas'ala fī'l-mūsīqī* (A Musical Problem). The work was written in reply to a question concerning occasional singing in octaves as well as the appropriate accompaniment of a vocal piece on the 'ūd (Shiloah 67). A similar problem occurs in the pseudo-Aristotelian *Problemata*, fairly well known in medieval Europe through its Latin translation. The 'Problem' in question was raised by the musician and astronomer 'Alī ibn Yaḥya al-Munadjjim (d. 912) who wrote a *Risāla fī'l-mūsīqī* (Tract on Music) that deals with the differences between 'the masters of Arabian music and the masters of Greek music' (Wright 61; Shawqī 73).

### The ethical, cosmological and therapeutic approach

This approach attained pre-eminence with the philosopher and music theorist Ya'qūb ibn Ishāq al-Kindī (d. 870). The figure of al-Kindī towers over the threshold of Islamic science and philosophy; because of his southern Arabian origin he was called the philosopher of the Arabs. A member of the Arab aristocracy, he established himself as promulgator of the Greek scientific and philosophic tradition. He was the author of at least 265 works covering various branches of knowledge, including music. According to different Arab bibliographical sources, he composed 13 treatises on the science of music in which he took full advantage of newly translated material (Farmer 3: 8–10; Yūsuf 57). Only six treatises have come down to us, but they are fairly representative of his emphasis on the ethical, cosmological and therapeutic approach discussed in this section. Following the Greek model, music is included in the quadrivium – the four mathematical propaedeutic sciences that prepare the student for higher studies of philosophy and for knowledge of the wonders of the creation. The science of harmony in its broadest sense is central for understanding the complex network linking music to all attributes of the universe; it dominates even the technical aspects and the parameters comprising a musical system – whether the theory of sound, intervals, scales and rhythms, or the problems of setting poetry to music and the different kinds of musical composition. The skilled musician must be proficient in the science of harmony in order to adapt his music to any given situation, just as the physician must diagnose his patient's illness before prescribing suitable treatment. The range, volume and timbre of his voice should therefore be in harmony with the predominant feeling and the age of the hearer, as well as with geographical, atmospheric and astrological conditions, days, seasons, elements, winds and humours.

The network of correspondences is explained in reference to the four strings of the 'ūd, called by al-Kindī the 'instrument of philosophers'. By this he meant the Greek philosophers who allegedly conceived the instrument

and its parts as the image of the perfect harmony ruling the universe. In this context quite some numerological speculations are involved. Al-Kindī proceeds in the same spirit when dealing with the harmony of colours and smells and their influence on the human soul (Farmer 106). The differences that affect the music and musical systems of the various ethnic groups and nations populating the world is explained by what we may call an environmental theory. Al-Kindī claims that the multiplicity of music and musical systems reflects the natural differences among human groups in behaviour, tastes, customs and conceptions – differences due to atmospheric and astrological causes. Characteristic examples are to be found in certain culture-bound instruments, in the system of *octoechoes* of the Byzantines, the modal system of the Persians, or the eight rhythmic modes of the Arabs. The technical aspect with which the rhythmic modes are treated also characterizes the exposition of other elements of music, for example intervals, consonances and dissonances, scales, melody types, the setting of poetry to music in song, and the like. Al-Kindī also uses an alphabetical notation by means of which he provides a notated example in two parts for lutanists (Shiloah 71: 203–207).

Al-Sarakhsī (d. 899), one of al-Kindī's most distinguished disciples who also acquired fame as a philosopher, wrote five treatises on music, one of which had the same title as al-Fārābī's monumental work, *Kitāb al-mūsīqī al-kabīr* (The Grand Book on Music). The author of *al-Fihrist* called al-Sarakhsī's book 'the greatest of all the books of its kind'. Alas, all his writings on music have been lost. However, he is frequently cited with veneration by later authors.

The trend represented by al-Kindī reached its zenith in the *Epistle on Music* of the *Ikhwān al-Ṣafā* (the Brethren of Purity), a brotherhood that flourished in Basra in the second half of the tenth century as a society for the pursuit of holiness, purity and truth. They wrote a vast encyclopedic work including 52 tracts and a summary. The tract on music is placed fourth after astronomy, conforming to the order of the quadrivium. The encyclopedia deals with the whole gamut of sciences and philosophy and is meant to initiate the brethren into the basic doctrines. Pursuant to this goal, the tract on music focuses on harmony in its broadest sense, emphasizing the idea that music reflects the harmonious beauty of the universe. Awareness of this supreme beauty should stimulate the reader to seek to transcend material existence, as one who understands the basic laws of musical harmony understands all the secrets of Creation. Musical harmony conceived according to the laws of the well-ordered universe helps man in his attempt to achieve spiritual and philosophical equilibrium. It refines his desires and rouses his courage, propels him toward balanced behaviour, generosity, clemency and renunciation. In short, it acts to create inner harmony among the contradictory forces of man's soul. In the same way, the proper use of music at the right time has a healing influence on the body.

This influence is expressed particularly in the change in composition of the humours; as they are strengthened or weakened they attain an ideal balance. Although this phenomenon is common to all human beings on earth, there are differences among the races and nations. According to the theory of racial differences, which we found in the same context in al-Kindī as well, the distinguishing marks characterizing races and nations are not the result of inheritance, but are caused by climate and by the geographic location of the different groups.

Musical harmony in its most exalted and perfect form is embodied in the heavenly spheres and their music; earthly harmony, including that of the music made by man, is only a pale reflection of the lofty universal harmony. The harmony that governs all celestial and earthly phenomena is expounded numerically. Consequently the *Epistle* is full of arithmetic speculations that overflow into many and varied domains such as calligraphy, language, poetic metre, human corporal structure, the system of the stars and waves, the art of numerology and so forth. The tract elucidates another kind of bond between the celestial bodies and things of this world that has had a considerable effect on the medical dimension of music. It concerns astrology as a whole and places special stress on one of its major aspects: the science of the edicts of heavenly bodies, founded on the general principle that all changes occurring in the sublunary world are intimately linked to the particular nature and movements of the celestial entities. Finally, over and above its strong ideological aspect, the tract contains a valuable theoretical contribution to the study of sound, the science of rhythm and the science of instruments, especially in its discussions of the *'ūd*. It is noteworthy that the dimensions, contents and details of the section on the science of sound serve as an exemplary model of everything written up to that period (Shiloah 75).

### *The medical dimension*

The fervent belief in the therapeutic power of music that we came across in the writings of al-Kindī and the Brethren of Purity can be traced back to a remote past. A biblical instance referred to by medieval authors tells how King David's playing drove away the bad spirit that haunted King Saul: 'And when the minstrel played, the power of the Lord came upon him' (2 Kings 3:15). Frequent references to the method practised by the Pythagoreans, who healed patients with music played on the lyre and aulos, can be found in Greek and Arabic literature as well. Indeed, from the ninth to the sixteenth centuries, many Arabic sources provide details about the doctrine of music therapy. This doctrine incorporated aspects of the theories of medicine and music. Medical theory was indebted chiefly to Aristotle's doctrine according to which physicians established four humours of the human body – blood, yellow bile, black bile and phlegm – analogous with

the four cosmic elements (earth, air, fire, water). They also envisaged four qualities of matter – heat, dryness, moisture and cold – consisting of two pairs of opposites. They then ascribed all material existence to various combinations of the four elements and qualities. This doctrine, therefore, could account for climate and temperature as well as for the different temperaments of people: sanguine, choleric, melancholy and phlegmatic (caused by a mixture of the four humours that comprise the body and the four qualities that comprise the climate). All elements of this doctrine and more are developed extensively in the musical writings of al-Kindī and the Brethren in connection with the classical *ūd* and its four strings (Shiloah 82: I, 199–203).

The association between music and healing procedures was also dealt with by physicians. In his sizeable medical encyclopedia *Miftāḥ al-ṭibb* (The Key to Medicine), Ibn Hindū (d. 1019), one of the earliest Arab authorities on medicine, included a chapter entitled ‘Enumeration of those aspects of the sciences the physician must know to be perfect in his profession’. Music is among the sciences referred to. Ibn Hindū acknowledges that in treating certain diseases physicians often have recourse to musical modes which correspond to the condition of the patients and thereby contribute to healing. However, as he says, this does not imply that the physician himself is expected to blow a trumpet or reed-pipe or get up and dance; rather he should use the services of an expert musician, just as he uses the services of other experts, assistants and practitioners (Shiloah 69). Ibn Hindū’s more famous contemporary, the great philosopher and physician Ibn Sīnā, Latinized as Avicenna (d. 1037), refuted and rejected as nonsense all theories linking music with astrology and cosmology; but in his monumental *Qānūn fī’l-ṭibb* (Canon on Medicine) we find a special relationship between music and medicine that recurs in Arabic and European texts even as late as the nineteenth century. This relationship combines rhythm, consonances and pulse as chief indicators of good health or illness. A sixteenth-century writer, the blind doctor Dāhūd al-Anṭākī, included in his medical encyclopedia *al-Tadhkirā* many of the ideas encountered in the tract on music of the Brethren of Purity, from which he drew extensively. Referring to the doctrine of the Greek scholar (probably Pythagoras) who arranged melodies in accordance with the overall condition of patients’ bodies and applied them to astral musical proportions, rhythms and sounds, al-Anṭākī enumerated the various modes and melodies by their characteristics and proper correspondences. More concretely, he introduced medical appellations for the eight rhythmic modes, giving them names that suggested their major effects.

From about the fifteenth century on, the theory of music therapy held a prominent place in literature about music. During this period both medical and musical writings provided detailed tables of correspondences in which the melodic modes under their specific names replace the rhythmic modes of al-Anṭākī and other authors. Thus, according to an anonymous author, the

mode *rast* is said to be good for hemiplegy (paralysis of one half the body); the mode *'irāq* helps to cure acute conditions of the humours such as brain diseases, vertigo, pleurisy, suffocation and so forth.

In conclusion, from evidence found in the sources we may assume that musico-therapy belongs more to the musician acting as an auxiliary to the physician, although of course, a physician may also be a musician (Shiloah 82: VI).

### The speculative approach

This approach reached its culmination in al-Fārābī's writings on music. A philosopher and musician, Abu Naṣr al-Fārābī (d. 950) wrote on logic, ethics, politics, mathematics, philosophy and music; he became known as the 'second teacher', the first being Aristotle. In Europe, where his works appeared in Latin translation, he was known as Alpharabius Avenassar. His book *Iḥṣā' al-'ulūm* (Classification of Sciences), which enumerates all the known sciences and defines their nature and object, became known in medieval Europe through several different renditions in Latin; it was also translated into Hebrew. One of its chapters includes a comprehensive definition of the theoretical and practical aspects as well as the scope and purpose of the science of music; this chapter influenced Latin music theory of the later Middle Ages (Farmer 42; 'Uthmān 64).

Al-Fārābī's two books on the science of rhythm deal with its governing principles: they define rhythm and its constituents, the different possible arrangements of a succession of beats and the pauses between them, the prime time, basic patterns, their practical combination into modal structure and the various devices permitting change of basic rhythmic patterns (Neubauer 65). However, his *Kitāb al-mūsīqī al-kabīr* (The Grand Book on Music) is foremost among Arabic theoretical treatises in the field, and as such, it exerted remarkable influence on subsequent Arabic music theory. In the preface to the work, al-Fārābī states that he agreed to write it at the request of the vizir Dja'far al-Kirkhī only after he had examined the contents of Greek treatises and found them incomplete, as many lacunae remained with respect to various branches of the art of music. Although he borrowed openly from the Greeks, al-Fārābī shed new light on the borrowed elements and contributed new ideas, while simultaneously basing much of his study on the living music of his time, which as a trained performer he knew well. Later Arab authors, extolling the excellence of his musicianship, cast him in a legendary role; a popular anecdote, attributing to him the invention of the *'ūd*, has been ascribed to several highly authoritative figures.

In the introduction to his monumental work, al-Fārābī emphasizes the

necessity of basing theory on musical practice. He points out, however, that the perfect theorist should reason on the basis of his knowledge of all rudiments of the art, from which subsequent material can be deduced in light of the governing scientific principles. Hence the theorist's role is to abstract the essence of knowledge. In addition, he must be capable of discussing erroneous theories, analysing opinions of other authors and correcting their mistakes. Implementing these ideas, al-Fārābī divided his book into two treatises, the second of which is no longer extant. We know from the preface, however, that it comprised the critical analysis of theoretical works written by previous famous theorists explaining 'the value of what each of these theorists has attained in this science, and we have rectified the errors of those who have fallen into fault'.

The extant treatise is divided into sections. In part one al-Fārābī deals with the first principles of musical science, a definition of music, its classification into *musica speculativa* and *musica practica*, musical talent, origin of music and its evolution, musical education and so on. As to the question of origin dealt with in Chapter 4, al-Fārābī proposes a rationalistic theory according to which music was primordially generated by man's natural instinct and inner disposition, to the exclusion of all divine or supernatural powers. Adopting the principle of evolutionary development, he describes how, from a stage determined by instinctive forces, through observation and experience man attained a sophisticated vocal art enhanced by musical instruments, with musical theory subsequently crowning the long developmental process. It is interesting to note that in his learned presentation the peak of the art of music corresponds with the peak of achievement of Islamic civilization.

The second and largest part of this monumental work is divided into three major sections. The first deals with the theory of sound, definition of the note, the different classes and sizes of intervals – accompanied by instructions as to their arithmetic calculations, the consonances, the genres and their various species, their combination into systems and elements of rhythm. The second section includes a description of the following musical instruments: the *'ūd* (short-necked lute), two types of *tumbūr* (long-necked lute), flutes and reed instruments, the *rabāb* (fiddle), *ma'āzif* (cithers?) and *ṣunūdj* (open string instruments). The third section is dedicated to musical composition, encompassing melody and its components, the traditional rhythmic modes, vocal melodies and the human voice, ways of setting texts to music, types of embellishment and their relation to emotions (Erlanger 51; Ghattas 62; Hickman 108; Randel 126; Sawa 143; Farmer 235: 386–289).

The subsequent generation of theorists was dominated by the figure of the great philosopher and physician Ibn Sīnā (d. 1037), characterized by his contemporaries as al-Shaikh al-ra'īs (the leading teacher). At the age of 18

Ibn Sīnā claimed to have mastered all the sciences; at the age of 21 he was appointed court physician of the Samanid princes at Bukhara. He was appointed to a ministerial post several times, but became an object of envy and was persecuted by his enemies. His impressive work *Qānūn fī'l-ṭibb* (The Canon on Medicine) was regarded until the seventeenth century as the physicians' Bible; it enjoyed wide circulation by means of its Latin and Hebrew translations, commentaries and abridgements. The Canon includes an important passage on the musical nature of the pulse. Ibn Sīnā's most significant contribution to music theory, however, is to be found in the substantial chapters in his two philosophical works: *Kitāb al-nadjāt* (Book of Delivery) and *Kitāb al-shifā'* (Book of Healing of the Soul). In both cases the science of music is part of the mathematical sciences. The above-mentioned theoretical topics all appear in these two works and are explored from Ibn Sīnā's viewpoint. Of particular interest are the chapters on ornaments and embellishments of melody that elaborate devices used in both melody and rhythm, and the chapter dealing with genres and systems that foreshadows the systematic modal presentation of Ṣafī al-dīn al-Urmayī (Hefni 44; Erlanger III, 52; Farmer 235: 329–332).

Ibn Sīnā's disciple ibn Zayla (d. 1048) abridged the sections on the natural sciences in his master's *Kitāb al-shifā'* and wrote a treatise on music, *Kitāb al-kāfī fī'l mūsīqī* (Book of Sufficiency in Music), in which he quotes long extracts from al-Kindī's theory on rhythm, and includes a whole passage reminiscent of al-Fārābī's writings.

A significant change in music theory occurs in the first part of the thirteenth century with the famous theorist Ṣafī al-dīn al-Urmayī (d. 1294). He was a boon companion and librarian of the last 'Abbāsīd caliph al-Mu'tasīm. After the fall of Baghdad (1252) he became official musician of the Mongol conquerors. Ṣafī al-dīn was a distinguished musician and the inventor of two musical instruments. An eminent theorist as well as musician, he achieved a systematization of the general scale and the whole modal system that was probably in practical use long before his time, as can be gathered from rudimentary presentations in earlier works. His two major treatises, the *Kitāb al-adwār* (Book of Cycles) and the *Risāla al-Sharafiyya fī'l nisab al-ta'lifiyya* (The Sharafian Treatise on Musical Proportions) became the authoritative models for subsequent generations; they were widely explicated and commented on. Ṣafī al-dīn based his theory mainly on the music in vogue, thus becoming an ideal junction of the old Persian modal tradition and all the other elements incorporated within the framework of the art of music in Muslim civilization. This may explain the wide acceptance of his works and their lengthy survival throughout an extensive geographical area. Each Eastern theorist in his own way formulated and reformulated the basic principles established by Ṣafī al-dīn. But the majority of treatises written after him differed from their model by singling out local

particularities and stylistic features that reflect the practice of each author's milieu (Carra de Vaux 38; Erlanger 51; Shiloah 303: 24–34).

One of the most important later theorists who refer to Ṣafī al-dīn was the music theorist and lutanist 'Abd al-Qādir ibn Ghaybī al-Marāghī (d. 1435). He was chief minstrel of Tīmūr in Samarkand and is usually placed with Ṣafī al-dīn in the front rank of theorists. His five treatises are of the utmost importance because of the information they contain about the practical art of music and, although written in Persian, they exerted an influence over wide areas, particularly, of course, in Persian-speaking regions ('Abd al-Qādir ibn Ghaybī 74, 79; Bardakci 136).

Shortly after the death of Ṣafī al-dīn a new theoretical trend seems to have emerged, based on principles derived from, but not identical with, those of Ṣafī al-dīn's Book of Cycles. This is indicated by al-Qādirī 'Askar al-Ḥalabī (seventeenth century) who refers to the physician and encyclopedist Ibn al-Akfānī (d. 1348) as representing the modern scholars dealing with musical practice. In his encyclopedia *Irshād al-qāsid ilā asnā'ī-maqāsid* (Guiding the Seeker to the Most Sublime Purposes), Ibn al-Akfānī dedicates a chapter to the science of music. He presents a new classification of the musical modes by reference to those practised by the musicians of his time. An expanded version of the new classification was introduced in the form of a didactic poem by Shams al-dīn al-Dhahabī, who probably lived in the fourteenth century. In his *Risāla fī'l-mūsīqī* (Epistle on Music) Shams al-dīn offers an original contribution – a notational system using a coloured eight-line staff. The names of notes and their equivalent letters are placed between the variously coloured lines, as are the different symbols indicating the initial note, the *finalis* and the direction of the melody. From the early seventeenth century until our own time, a number of European scholars and writers have used this treatise as a sample of Arab musical scholarship and an Arabic notational system (Shiloah 138; 149: 87–90; Farmer 235: 323–326). (See plates 4 and 17 on pages 199 and 212.)

The years following Ṣafī al-dīn's death saw the advent of dozens of important theoretical works in Arabic, Persian and Turkish. Special mention should be made of two most prominent fifteenth-century Ottoman authors: al-Lādhiqī and al-Shirwānī. The former, one of the greatest Arab theorists, and outstanding among his contemporaries in the field, was a favourite of sultan Bayazid II (1481–1512). He dedicated the *Risālat al-fathīyya fī'l-mūsīqī* (The Epistle of Victory Concerning the Science of Music) to the sultan, probably in commemoration of the ruler's victory (Erlanger 51: IV, 259–484). Another treatise by al-Lādhiqī is called *Zayn al-alḥān fī 'ilm al-ta'līf wa'l-awzān* (Adorning of Melodies Involving the Science of Composition and Rhythm). Nothing is known about Mawlāna Faḥ Allah al-Mu'min al-Shirwānī beyond the fact that his *Risāla fī 'ilm al-mūsīqī* (Tract on the Science of Music) was dedicated to the sultan Mehmed, son of

Murad. Among other things, this important treatise includes valuable information about the different kinds of composition known at that time (Shiloah 76: 11–12).

### Techniques of scholarship

As we have seen, the study of music in the first centuries of Islam led to the establishment of fundamental patterns and recognized paradigms in scholarship that would be followed by writers in this field until the end of the nineteenth century. The scope of material in the predominant classical paradigm fluctuates between encyclopedism and specialization, and the literary style ranges from anecdotal to theoretical. Many texts that fall within these two extremes combine diverse tendencies and styles, as exemplified by some of the didactic works belonging to the category of theory of practice. These, as we shall see, incorporate cosmological, ethical, therapeutic, speculative, anecdotal and practical aspects. As with most other writings on music, in these texts one usually finds great respect for scholarly and literary authorities, so much so that past authorities were often cited to enhance the prestige of current works. Thus, the works of al-Kindī, al-Sarakhsī, the Brethren of Sincerity, al-Fārābī, ibn Sīnā, Ṣafī al-dīn, as well as several Greek authors, are frequently cited, quoted and even brought into mutual confrontation.

It was perfectly acceptable, for example, to quote lengthy excerpts, to intersperse a quotation with glosses, or even to combine and rearrange several different passages written by the author being quoted. Although the beginning of a quotation was generally indicated by the author's name followed by the verb *qāla* (he said), the end of the quote was rarely marked. Stylistic factors played an important role here. It was considered bad form to interrupt the narrative flow with too many citations and it was assumed that readers would be able to differentiate between the style of the quotation and that of the current author. Sometimes, however, acknowledgement of borrowed material is omitted altogether. As Franz Rosenthal notes, 'The fraudulent omission of the proper acknowledgement of material derived from the works of other authors was no uncommon phenomenon. It is, however, difficult and often impossible to determine where permissible literary usage ends and fraud begins' (Rosenthal 17: 46).

One of the best examples illustrating the aforementioned techniques, the didactic approach and the combination of literary anecdotal material with a highly technical investigation into what might be called the theory of practice, is al-Hasan al-kātib's *Kamāl adab al-ghinā'* (Perfection of Musical Knowledge) written in the eleventh century. This is a scholarly text conceived primarily in the spirit of a literary work; information is imparted through the use of brief, well thought-out and eloquently formulated liter-

ary sequences. The treatise, which very likely constitutes a summary of the author's teaching experience, comprises 240 pages that include an introduction and 43 chapters. The work contains a general discussion of the virtues of music and of elements pertaining to musical practice and performance. There is also a good deal of theoretical material based, in the main, on al-Fārābī's Grand Book on Music which al-Ḥasan considered a model of scholarly perfection. He quotes other authorities as well, notably al-Kindī and al-Sarakhsī. A keen critical approach is another distinguishing attribute of al-Ḥasan's work. In the last chapter of his treatise, for example, he provides the student with what may be called an analytical bibliography that distinguishes between scholarly works and the writings of *littérateurs* (Shiloah 68; Ghattas 72).

Ibn al-Ṭāhḥān's fourteenth century work entitled *Ḥawī al-funūn wa salwat al-mahzūn* (The Collector of Sciences and Consolation of the Vexed), follows a similar approach, but has a more significant literary character. Many of its 102 tiny chapters discuss the biographies of famous musicians who lived and worked during the first centuries of Islam; it includes important details regarding musical practice and performance, musical instruments and their construction, and a presentation of the modal theory according to the then-new trend.

A cultural phenomenon that enjoyed considerable popularity among medieval Arab scholars was the technique of abridging a basic work in a given area of learning. The main objective of authors of such compendia was didactic. By abridging, they offered educated readers the essentials and made specialized works more accessible to them, while relieving them of the need to peruse lengthy tracts. An author sometimes abridged his own work, as was the case, for instance, with ibn Sinā who condensed the entire philosophical system contained in his extensive treatise *al-Shifā'* into a small volume, *al-Nadījāt*. In an abridgement the author generally follows the form and content of the original work more or less strictly, while feeling free to add his own glosses – which occasionally grow to considerable dimensions. In the process, such abridgements approach another form commonly practised in medieval scholarship – systematic commentary of an authoritative work, wherein the original work is usually presented phrase by phrase, with the addition of notes and comments. The anonymous gloss on Safī al-dīn's The Book of Cycles is a good illustration of the techniques of systematic commentary. The end result is a work three times the length of the original treatise. The author, a physician who studied music as an indispensable part of his medical training, deplores the general ignorance of musical theory, which prompted him to do his own investigating. He states that his commentary is meant to elucidate Safī al-dīn's complex opus by unravelling its perplexing enigmas and clarifying its obscurities. The original passages in the commentary include a long discussion on musical composition with

descriptions of vocal and instrumental forms, and an enumeration of Greek poetical genres related to music (Shiloah 147: 94–95).

### Concepts and general characteristics

Our excursion into the field of various types of texts on music has revealed a great deal, but unfortunately it cannot compensate us for the absence of actual sounds that so delighted past generations. From the abundant literature, however, one can glean many hints as to the major characteristics of the practised art, and from them some of its prevailing concepts can be inferred. Alan Merriam was of the opinion that ‘Without understanding the concepts held about music, there is no real understanding of music, . . . this is because they underlie the sounds and values associated with them’ (Merriam 382: 103). With this statement in mind, we should like to shed further light on some of the prevailing concepts covered so far.

First and foremost, it is essential to understand what music meant to most of its consumers in the lands dominated by Islamic civilization. As noted in a previous chapter, the term music – in its Arabized form *mūsīqī* – was mainly used in a theoretical context; the Arabic term *ghināʾ* (cantus) was adopted as the equivalent of art music. There is no doubt that both *mūsīqī* and *ghināʾ* and their underlying concepts are applied, in theory and practice, exclusively to the type of sophisticated urban art that developed after the advent of Islam. Consequently, folk and religious music are not considered music and their various forms are given appellations that emphasize their verbal character. The musical component is subordinate and these forms are usually used in contradistinction to the *ghināʾ*. Music-making is designated by the verb ‘to say’: a local style is *lahdja* (dialect); a folk musician is called *qawwāl* (one who says), *shāʾer* (poet), *ʾāsheq* (lover), *beytbig* (the Kurdish bard who performs narrative and didactic songs, *beyt*), *naqqāl* (transmitter), *maddāḥ* (eulogist) and so forth. Cantillation is called reading or reciting, while sacred and religious music as a whole is treated under the general term of *samāʾ* (audition) which includes music – sometimes embodying a fairly well-developed form – as practised by the mystical orders.

With respect to the manner in which music acts upon the individual, the prevailing perception is that it is an overwhelming power capable of affecting the listener’s soul in many different ways. The average person expects to be strongly moved and indeed is easily excited by the sound of music, to the extent of abandoning himself to its domination. Often combined with expressions of sweetness and loving tenderness, music stirs a whole gamut of feelings, from subtle sensual delight to strong emotion described as *ṭarab*. The great faith in the power of music as a sublimating or sensuous agent

does not include the obvious quest for what we may call esthetic values. One finds numerous references to artistic devices manifestly targeted towards increasing the beauty and elegance of a musical composition. Such devices include adequate moulding of musical phrases, the proper use of ornaments and vocalizations, the modalities of notes that lend elegance to the melody and render it more pleasing to the ear.

Once the art of music is considered as a creation of human beings, it is perceived as embodying the hubris and evanescent nature of man. It is perceived as irreconcilable with the fundamental moral and theological demands of a religion that proclaims the omnipotence of one God. The sole sovereignty of the transcendental God is challenged the moment music is seen as akin to satanic magic whereby the devil is enabled to control and direct the deeds and wishes of human beings. Considered from the standpoint of its overwhelming power, music indeed has much in common with those magical powers that can effectively 'force' themselves on the individual; religious elements on the other hand, must be 'served' or sought after. In contrast to the forces of magic, religious forces are depicted as able to guide and determine a man's fate. From this standpoint it is easy to understand the religious purists' attitude that considers the powerful effect of music as an intoxicating, misleading agent of the devil. The mystics, in turn, insist on the divine origin of music and its consequent exalting and illuminating impact on the devotee.

In this connection it is interesting to note that the philosophers regarded the sensual and over-excited reaction evoked by music as disrupting the desirable harmony of the soul and social balance. Therefore, unlike the important role played by musical thought in the upbuilding of an educated man, musical praxis never became an integrated part of the official educational system.

In sum, the attitude toward music has always been ambivalent, as expressed in a series of contradictory feelings and concepts: predilection and mistrust; divine-devilish; exalting-disruptive; admissible-prohibited.

In all musical categories, speech and melody are intimately connected, intermingling and complementing each other. Even in the sophisticated art form melody is ideally considered as the best interpreter of the text to which it is set. Speech and melody come closest to one another when the modulating voice is the carrier of both word and music. A major concern of both sacred and secular music is the potential expressiveness of the human voice as a symbol of life, a reflection of the human soul and a medium of communication. A rich palette of timbres enables the musician's voice to interpret the various feelings and meanings contained in the text, whether it is sung or recited. The highest achievement of this potential expressiveness is obtained in the ideal combination of the poetic and melodic, considered by theorists as perfect music; hence the primacy of vocal music that has become a distin-

guishing mark of Near Eastern music throughout the ages. In that part of the world music-making is essentially individual, based on the skill of individual artists who usually address themselves to an intimate audience. This holds true even when the performance is by a group of musicians, the group generally being small. It comprises a solo singer and three to four instrumentalists who frequently demonstrate their art by performing improvised solo passages.

The audience, never passive, expresses its reaction by frequent applause. Its value judgements are expressed in loud approval or disapproval, demonstrated not by hand-clapping but verbally. Al-Hasan al-kātib (eleventh century) devotes a special chapter of his book *Kamāl adab al-ghinā'* (The Perfection of Musical Knowledge) to applause (*zahzaha*) and value judgements (Shiloah 68: 179–182). He distinguishes between two types of spontaneous reaction to a beautiful performance; the one is that of ignorant folk, the other of genuine connoisseurs. The former applaud indiscriminately with the sole aim of satisfying the performer; they do so while using absurd language. The latter express value judgements in their applause, the effect of which al-Hasan compares to the brilliancy of a pearl, meaning that if the song contains a pearl, the applause helps display its brilliancy. It also encourages the performer to repeat his achievement, while stimulating his creativeness. Inopportune applause, on the other hand, may mislead the singer, particularly if the musician lacks intelligence, or is highly impressionable. Applause intensifies the artistic communion between the musician and his audience and affects the shaping and development of the musical style. Above all the artist's imaginative power receives immediate stimulation, emphasizing the relatively extensive freedom the musician enjoys. Indeed, the artist is permitted, even encouraged, to improvise spontaneously and gratify his preoccupation with the details comprising a work. In so doing he seems less concerned with a preconceived plan than with allowing the structure to emerge empirically from the details. As in other branches of the arts, one receives many minute observations and images but rarely a full view of the whole process. Cognizant of the fact that, even at its most complex, art music is transmitted orally, we may assume that the *zahzaha* was of particular importance in defining musical style (Sawa 143: 192–200).

The ideal, perfect musician is a singer endowed with a natural disposition for music, one who has solid theoretical knowledge, the faculty of rapidly assimilating all music he hears and retaining it in his memory, who can move his audience and be moved himself. He must possess a beautiful, expressive voice in addition to great creative power evinced in improvisation or the re-creation and embellishment of existing models. Existing models may be transmitted so freely that the borderline between re-creation and the creation of a new composition is blurred – a phenomenon that touches upon another important concept: originality. Indeed, originality does not

mean creation *ex nihilo*, but more the expansion or improvement of pre-existing models. Borrowing a beautiful verse or beautiful melody is not disapproved, provided the borrower succeeds in disguising the original in such a way that the adopted material appears convincingly different from its model – a new composition altogether. Alongside the general acceptance of this concept, however, the culture developed criteria for distinguishing between reworking material and plagiarism, the latter being absolutely rejected (Sawa 143: 192–200).

### Instruments

Instruments are described in a variety of ways and in almost all known genres used to write about music. Sometimes the approach is anecdotal, sometimes it is of a systematic, scientific nature. A description may embody historic, ethnic, lexicographic, etymological, cosmological, theological, organological or classificatory aspects, and may focus on one or several classes of known instruments.

The earliest works, those going back to the ninth century, refer to instruments by the generic term *malābī* (pl. of *malha*), or occasionally *'ālāt al-labw*, linked to the word *labw* which means 'game, pastime, amusement'. The term is included in the title of eight treatises devoted entirely to *malābī*, seven of which appeared in the ninth century. Among the oldest works that have come down to us are *Kitāb al-malābī* by the famous grammarian Mufaddal ibn Salāma (d. ca 905), and *Kitāb al-labw wa'l-malābī* by the celebrated geographer ibn Khurradādhbih (d. 911). The first begins by refuting the view that the Arabs did not know the *'ūd* or other *malābī* and that their language lacked technical terms for the various parts of instruments, and for musical features in general (Robson 49; Farmer 366). In the course of contesting this fallacy the author comments on a large number of terms relating to instruments and music, all gleaned from classical Arabic poetry.

Alongside lexicographic and etymological issues, the author's method of presentation leads him to relate to the important question of the origin of each instrument. The *'ūd*, regarded as the king of instruments, heads the list. In this connection, the author quotes the story attributed to the historian Hishām ibn al-Kalbī (d. 819), according to which the inventor was the biblical figure Lamech. The story telling how Lamech made an *'ūd* in the form of his defunct son's bones is reproduced in Chapter 4.

Ibn Salāma then discusses other biblical inventors of instruments and details of terminology, supporting each comment with references to poetry. He reviews the different names for the *'ūd*: *kirān*, *mizhar*, *barbaṭ* and *muwattar*, and the special names given to the *'ūd*'s four strings. He enumerates other stringed instruments and ten different kinds of wind instruments:

*mizmār, zammāra, nāy, qusṣāb, musbtaq, yarāʿ, zanbaq*, and so on. In addition to its lexicographic importance, this work, as well as others of similar nature, is of special musicological interest: all of them provide the scholar with information about many instruments that have since fallen into disuse.

The second treatise, *Kitāb al-malāhī* by ibn Khurradādhbih, also reproduces the story of the invention of the *'ūd* by Lamech and tells of other inventors of musical instruments in biblical times, but the author directs his work toward wider and more universal horizons. His interest indeed centres more on cultural and historical than lexicographic issues. Consequently, he touches on the music and instruments typical of other peoples, in particular those of the Persians, Greeks and Indians; the term *malāhī* has a broader meaning here and becomes the equivalent of 'music' (Shiloah 82: X, 112–116).

These two works are the beginning and end of this category of texts on the *malāhī*. They also mark the introduction of a genre of writings on music already mentioned in these pages: texts that borrow from the anecdotal, edifying *adab* literature which no longer includes the word *malāhī* in its titles. Nevertheless, the term was to appear sporadically for a long time to come, finding its most extreme and protracted use among the religious authorities who opposed music.

### The pejorative view of *malāhī*

The theologian and jurist ibn abi'l-Dunyā (d. 894), a contemporary of the two authors cited above, used the term *malāhī* altogether differently, emphasizing its negative association with diversion and entertainment. His work, *Dhamm al-malāhī* (Book of the Censure of Instruments of Diversion), the oldest extant treatise of this kind, is a violent attack on music and musical instruments; he regards them as reprehensible digressions from a life of devoted piety (Robson 50). The same model was followed by the next generation of authors who discussed *samāʿ*: they thereafter equated *malāhī* with instruments of forbidden diversion.

However, not all of them rejected all instruments; some, after a detailed discussion about the various instruments, differentiated between those that might be tolerated and those that should be banned. Al-Adfuwī (d. 1347), for instance, in his treatise *al-Imtāʿ bi ahkām al-samāʿ* (The Benefit of the Laws of Listening to Music), identified the concept *malāhī* mainly with the stringed instruments that are closely linked to art-form music; he tolerated the *daff* (frame-drum), the *yarāʿ* and the *shabbāba* (flutes).

The flute occupies a prominent place among the mystics, to whom it symbolizes the human windpipe. A charming legend depicting the divine origin of the flute recounts that before Adam was expelled from the Garden of

Eden, a secret was delivered to him. Soon after his expulsion, the secret he was forbidden to divulge weighed on him, causing him painful torment. Coming to his aid, the archangel Gabriel advised him to throw the secret into a well; he did so and was relieved. The secret penetrated the reeds that grew around the well and imbued them with the divine substance; it was from these reeds that the first flute was manufactured. In an anonymous Ṣūfī treatise the seven holes of the *nāy* (flute) were compared to the seven heavens and seven planets.

In the overall schema of literature on *samā* there are other points of view about the term and concept of *malāhī*. Al-Nābulusī (d. 1731) in his *ʿĪdāh al-dalālāt fī samāʾ al-ʿālāt* (Clarification of Proofs Concerning Listening to Musical Instruments) suggests that the word *lahw*, by which one describes the instruments (*malāhī* or *ʿālāt al-lahw*), does not necessarily indicate that musical instruments are invariably used for purposes of entertainment. This qualification and the implied prohibition are relevant when the desired end is merely amusement, but they are no longer valid when the issue is the spiritual elevation of the Ṣūfī.

### The cosmological approach

A network of astrological, cosmological, therapeutic, and ethical correspondences is explained by al-Kindī, Ḥunayn ibn Ishāq and Ikhwān al-Ṣafā in reference to the four strings of the *ʿūd*, which they called the ‘instrument of philosophers’. By this they meant the Greek philosophers, who allegedly conceived of the *ʿūd* and its parts in the image of the perfect harmony ruling the universe. In addition to a special tract on the *ʿūd*, al-Kindī wrote a work entitled *Kitāb al-musawwītāt al-watariyya min dhāt al-watar al-wāḥid ilā dhāt al-ʿasharat awtār* (Book of Sounds Made by Instruments Having One to Ten Strings). In this work al-Kindī undertakes to explain why there is such a great variety of instruments and music. His fundamental assumption is that the instruments help create harmony between the soul and the universe; consequently, each society has instruments that reflect its nature, and each instrument is purported to express the specific beliefs and characteristics of the society to which it belongs. Thus, he claims that the *kinkala* – a one-stringed instrument – is characteristic of the Indians; a two-stringed instrument, of the Khorasanians, etc. In their Epistle on Music, Ikhwān al-Ṣafā developed many similar ideas, but also devoted a special section to the making and tuning of instruments. This section begins with a list of 17 instruments, although the only one it describes at length and in detail is the *ʿūd*. The list includes a few Greek and Byzantine instruments: *urghan* (organ), *armīnikī* (panpipes), *salbāb* or *salbāk* (*sambyke* or *sambuca*); the Persian *djank* (harp), and 13 others (Shiloah 82: III,

32). A contemporary encyclopedic work *Mafāṭih al-'ulūm* (Keys of Sciences) by Aḥmad al-Khwārizmī, contains a section listing the names of 20 different instruments, with indications of their respective origins; 11 of the names appear in both sources. In addition to the three Greek and Byzantine instruments, al-Khwārizmī included the *lūr* (lyre), the *qitāra* (cithara) as well as the Chinese mouth organ *mustaq* or *mushtaq* also mentioned in other ancient sources (Farmer 54: 2–3).

### Musical apparatuses and automatons

In connection with such 'foreign' instruments, mention should be made of treatises, both translated and original, devoted to pneumatic and hydraulic apparatuses and organs. Among the treatises translated from the Greek, mention should be made of the following: *Fi 'amal al-bankāmāt* (On the Construction of Clepsydras) attributed to Archimedes (d. 212 BC), which describes an instrument with pipes made to whistle by means of hydraulic pressure, and an automatic wind instrument that plays four times a day; *Ṣan'at al-zāmīr* (On the Construction of the Wind Instrument Automaton) by Appolonius of Perga (d. ca 190 BC), an elaborate example of a water-operated automaton, consisting of the figure of a man playing a reed pipe – (Farmer 45: 80–88); *Madjmū' 'ālāt wa-ḥiyāl* (Collection of Apparatuses and Machines) by Ayrūn (Heron of Alexandria fl. AD 62), which describes several pneumatic and hydraulic automatons. Among them is one activated by water; it has birds perched on rocks or trees that produce different sounds by means of whistles placed in their beaks (Farmer 45: 114–118). Three other treatises are ascribed to the author Mūristus whose identity is obscure. They are: *Ṣan'at al-urghun al-būqī* (On the Construction of the Flue-pipe Organ), a hydraulic organ, more than six metres high, with a powerful, resonant sound said to 'travel sixty miles'. This may be the same instrument mentioned by Yuḥanna ibn Batrīq (d. 815) in his pseudo-Aristotelian translated work *Kitāb al-siyāsa fī tadbīr al-riyāsa* (The Book of Administration): (See Chapter V) (Farmer 45: 119–138).

The three sons of the astrologer Mūsa ibn Shākīr (fl. ninth century) were among the scientists installed by Caliph al-Ma'mūn in *Bayt al-ḥikma* (House of Wisdom). Their works include translations from the Greek and original texts on geometry, astronomy and mechanics. Among the latter is *al-'Āla allatī tuzammīru bi nafsiha* (The Instrument That Plays by Itself), a treatise on an automatic hydraulic organ. The wind supply to activate it is obtained by means of compensating water cisterns; in this it differs little from the automatic wind instrument described by Appolonius. However, the remaining part of the apparatus built by Mūsa's sons is quite novel (Farmer 45: 88–114; Cara de Vaux 365).

One of the most important Arabic works on automatons is *Kitāb fī ma'rīfat al-ḥiyāl al-handasiyya* (The Book of Knowledge of Ingenious Mechanical Devices) by Badī' al-zamān al-Djazarī (twelfth to thirteenth century); several musical automatons are described in it. One of them depicts two drummers, two trumpeters and a cymbalist who play every hour on the hour up to six. Another portrays a drinking session. On a balcony are four slave-girls, one with a flute at her lips, another with a frame drum slung around her neck. Above this balcony is a platform where a dancer holding batons in both hands stands on a ball. Another drinking party takes place in a boat floating on a pond. On the poop deck opposite the king is a platform with a flute-player, a harpist and two frame-drummers. These and many other automatons are depicted in illustrations that adorn the text (Wiedemann 364).

### The classificatory approach

In writings of a speculative nature, the approach and treatment are considerably different. Endeavouring to evaluate and classify musical instruments in his Grand Book on Music, al-Fārābī offers two explanations. The first, included in the introduction, concerns the question of origin and function. Al-Fārābī argues that instruments were invented to accompany and enrich vocal music which had already undergone a long process of development, and he maintains that instruments are inferior in quality to the voice. In the hierarchy suggested by al-Fārābī, the string and wind instruments are at the highest level, followed by drums and percussions, with dance at the end of the list. Among the melodic instruments, the *rabāb* (fiddle) and the winds were given priority over all the others because of their ability to sustain sounds, implying that they are closest to the voice (Erlanger 51: I, 20–23). The second explanation appears in two long sections devoted to the study of instruments proper. To test the theoretical elements, al-Fārābī here considers the instruments empirically. The *'ūd* enjoys first and highest place; it is followed by the long-necked lutes, winds, *rabāb* and harps (Erlanger 51: I, 165–215).

In his *Kitāb al-shifā'*, Avicenne classified instruments as follows: fretted and plucked (short- and long-necked lutes); board zither and open string (types of lyre and harp); other instruments such as the *urghanun* (organ) and one that is struck with sticks – *sandj dīni* (xylophone?) (Erlanger 51: II, 233–234). Ibn Ghaybī, in his *Djāmi' al-alḥān* (Compiler of Melodies), established three major classes: chordophones or stringed instruments offering an impressive list of 25 different instruments, many of which are no longer known; aerophones or winds numbering 12, including the *urghanun* (organ) and three idiophones or percussions; the drums are not mentioned.

In his monumental bibliographical work *Kashf al-zunūn 'ann asānī al-kutub wa'l-funūn* (Clarification of Conjectures about the Names of Books and Sciences), the Turkish encyclopedist Ḥadjjī Khalīfa (d. 1657) includes a section 'On the science of musical instruments'. He grouped the instruments in three classes: drums, wind instruments, and strings.

Finally, an interesting anonymous treatise called *Kashf al-ghumūn wa'l-kurab fī sharḥ 'ālāt al-ṭarab* (The Unveiling of Grief and Sorrow in Commenting on Instruments of Music) should not be overlooked. This lengthy treatise, devoted entirely to instruments, contains separate chapters on the organ, 'ūd, *djank* (harp), *sanṭir* or *sanṭūr* and *qānūn* (two types of trapezoidal zither, the first being struck, the second plucked), three kinds of drums, *shabbāba* (flute), *rabāb* and *kamandje* (fiddles), *shu'abiyya* (pan-pipes) and different ensembles, the largest of which comprises seven musicians (four drummers and three flautists). The work also includes eight beautiful coloured miniatures illustrating the above-mentioned instruments and the ensemble.

A glance at the multiple sources reveals a bewildering number of instruments designated by name and specific characteristics, many being of widely divergent origin including, to mention only a few, the Bible, the Greeks, the Indians, and so on. They number 138, not including the pneumatic, hydraulic and mechanical automatons. By family affiliation the 138 instruments subdivide as follows: idiophones 10; membranophones 18; aerophones 48 and chordophones 62. Many of these instruments, of course, have fallen into disuse.