

Chapter 1

The Percussion Family

Percussion instruments may be our oldest musical instruments (with the exception of the human voice), but recently they have experienced a new surge in interest and popularity. Many novel percussion instruments have been developed recently and more are in the experimental stage. What is often termed “contemporary sound” makes extensive use of percussion instruments. Yet, relatively little material has been published on the acoustics of percussion instruments.

So reads the introduction to the chapter on percussion instruments in a textbook *The Science of Sound*, the first edition of which I wrote some twenty years ago. In the meantime we have studied the acoustics of many percussion instruments in our laboratory: timpani, snare drums, handbells, gongs, tamtams, cymbals, steelpan, and other instruments. Nevertheless, these words are still true; relatively little material has been published on the acoustics of percussion instruments.

1.1. The Percussion Family

The term percussion means “struck” and strictly speaking percussion instruments are those in which sound is produced by striking. However, the percussion section in a modern orchestra employs many instruments that do not depend upon striking a blow. Indeed, the percussion section is expected to create any unusual sound effect that a composer has in mind. New instruments are constantly being invented and added to the percussionist’s repertoire.

There are several ways that have been used to classify percussion instruments. Sometimes they are classified into four groups: *idiophones* (xylophone, marimba, chimes, cymbals, gongs, etc.); *membranophones* (drums); *aerophones* (whistles, sirens, etc.); and *chordophones* (piano, harpsichord). There may be differences of opinion as to whether aerophones and chordophones properly belong in the percussion family. Whistles and sirens are generally played by percussionists in the orchestra; the piano and harpsichord are not. At any rate, this book deals mainly with idiophones and membranophones.

Another way of classifying percussion instruments is by whether or not they convey a definite sense of pitch. Idiophones that convey a definite pitch include bells, chimes, xylophones, marimbas, gongs, and steelpan. Membranophones that convey a definite pitch include timpani, tabla, and mrdanga. Sometimes we described percussive sounds as having a “high” or “low” pitch even if they do not convey an identifiable pitch, but it would be more correct to describe this as high or low range or tessitura.

Percussionists in a modern orchestra or band may have hundreds of instruments to play. Generally the timpanist plays only the timpani, but the other percussionists divide the remaining instruments depending upon the demands of the music. Some works require as many as ten or more percussionists; Schoenberg’s *Gurrelieder*, for example, calls for two timpanists and ten other percussionists.

Percussion instruments generally use one or more of the following basic types of vibrators: strings, bars, membranes, plates, air columns, or air chambers. The first four are mechanical; the latter two are pneumatic. Two of them (the string and the air column) tend to produce harmonic overtones; bars, plates, and membranes, in general, do not. The inharmonic overtones of complex vibrators give percussion instruments their distinctive timbres.

This book on the science of percussion instruments considers a large number of instruments: how they vibrate and how they produce sound. In order to understand this, we must consider some basic physics of vibrating systems as well as some psychoacoustics of hearing and perception. This will be done by inserting, when needed, sections or chapters dealing with fundamental principles. Often these are labeled as “interludes.” The musician without much previous study of the scientific principles may wish to refer back to these interludes from time to time as the book is being read.

1.2. Historical Notes

Most natural systems follow some type of rhythm: beating hearts, the motion of the planets, ocean waves, phases of the moon, the seasons, the list is long. It is only natural that primitive humans would begin striking sticks or stones together rhythmically. Rhythm is one of the key ingredients in music, and percussion instruments often establish and maintain the rhythm in the performance of music.

One of the best histories of percussion instruments is *Percussion Instruments and Their History* by renowned percussionist James Blades.[1] This book traces percussion instruments from their primitive origins to composers’ use of modern percussion.

Blades points out that the earliest instruments were probably idiophones, instruments made of naturally sonorous material which can produce sound without the addition of stretched skin or column of air. These are of five types: shaken idiophones (rattles), stamped idiophones (pits, boards, hollow tubes); scraped idiophones (notched sticks or rasps); concussion idiophones (pairs of similar items such as sticks); and struck idiophones (one or more pieces of sonorous material struck with a stick or bone).

Early in our lives we learned to play with rattles. It is interesting that rattles are among the earliest of percussion instruments. The gourd rattle, a seed pod in which the dried seeds remain, was widely used in primitive societies, especially in Africa. Rattles are still popular in orchestras and ensembles, especially for the performance of Latin American music.

Scraped instruments are found as far back as the early Stone Age. A stick could be drawn across a notched stone, bone, shell, or gourd to produce a raspy sound. The bone scraper has been closely associated with the hunt, erotic rituals, and funeral ceremonies. Scrapers were found among Indian tribes in North and South America, and also in Africa.

The earliest drums were probably log drums of various types. Later, it was discovered that by stretching an animal skin across the cavity in the log, a louder sound could be made. Eventually the membrane drum came to be the most important percussion instrument. The earliest drums were probably struck with the hands, but the use of sticks as

beaters was found to increase the loudness of the sound. Later a second membrane was added. Today, there are thousands of different types of drums found throughout the world. Throughout the years, drums have been used for signaling, for sending messages, and for marshaling troops to battle as well as for performing music.

1.3. Percussion Ensembles

Although percussion instruments have most often been used in ensemble with string and wind instruments, a number of successful ensembles have relied on percussion instruments alone. Sometimes these ensembles use one type of instrument, such as steel bands (see Chapter 10) and marimba orchestras (see Chapter 6), more often they employ a variety of percussion instruments, such as the Black Earth ensemble, shown in Fig. 1.1, whose members were once artists-in-residence at our university. A steel band is shown in Fig. 1.2.



Fig. 1.1. The Black Earth Percussion Ensemble at Northern Illinois University used a large variety of percussion instruments, as can be seen in this photo.



Fig. 1.2. The Northern Illinois University Steel Band is an example of a percussion ensemble using one type of percussion instrument.

References

1. J. Blades, *Percussion Instruments and their History* (Faber and Faber, London, 1974).