

# Discussion on the Physical Properties and Musical Properties of Sound

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**Abstract:** The enrichment of musical materials is a very long process, and the exploration of new materials is also a traditional thing. These foundational works deepened the understanding of music and sound, and at the same time promoted the progress of music as a discipline.

Keywords: Music; Overtone; Sound; Physical

#### 1. Introduction

In the traditional music category, sound has four basic attributes: timbre, timbre, pitch and intensity, which is also a subjective evaluation of sound rather than the nature of sound.

#### 2. The essence of sound

The book records that the nature of sound is vibration. The vibration of an object causes fluctuations in the pressure of the surrounding medium, which, once it reaches the human ear, converts the fluctuations into a bioelectrical signal, the brain then reflects this bioelectrical signal into the timbre, pitch, pitch and intensity just mentioned. The result of this whole reflection is actually the subjective cognition formed by the external stimulation, which is not objective. The objective existence corresponding to these four basic properties is actually: the structure of overtones, the duration of vibration, the frequency of vibration, amplitude, these are the essential properties of sound. However, in addition to these, the sound also covers some other non-basic, more advanced properties. When all the music is reduced to sound, the music shakes off its original meaning of mode, tonality, melody, harmony, etc., the gap between music and noise ceases to exist when the material of music ceases to be confined to music and all sounds around it become music. All that remains of sound is its amplitude, its phase, its image, its frequency, its overtones, and so on.



Fig. 1 Vibration of sound

## 3. The development of music

On the other hand, the enrichment of music material is a very long process, the exploration of new material is also a traditional thing, which is not unique to composers. The material of music covers musical sound system, melody, timbre (musical instrument) and so on. We can review the development of the material of music from these points.

From the perspective of musical system, the establishment of early medieval modes in Europe to major and minor positions, halftone to artificial mode, people continue to explore the field of musical system has more possibilities. Finally, from the melodies and rhythms, the early introduction of secular tones into the Gregorian chant, to the emphasis placed on folk melodies and rhythms by ethnic groups, to the influence of jazz on serious music, even the appearance and prosperity of World music, New Age and other New Age music in the past half a century, all of which embody the process of rich melody and rhythm materials.

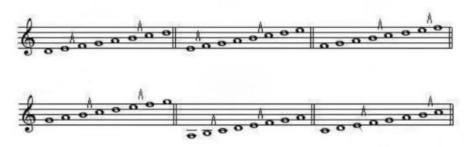


Fig. 2 Staff spectrum

To better understand the physical and musical properties of sound, we can start with the evolution of timbre and instrumental music, from primitive percussion to plucked strings and wind instruments, later to bow string, keyboard instruments, and so on, instrumental music production technology is also constantly improving, many new instruments continue to emerge, the whole process of artificial evolution of instruments also shows the development of human history process.

Many players who grew up with an instrument may not know much about the instrument with which they spend their lives. For example, we are born on this earth, it seems that little care whether it is square, or circular. It's like the string players, with their bows on their violins, and there's at least 10 million of them going back and forth, most can not convincingly say how strings, usually less than a dozen centimeters from the tip of their noses, produce music. More regrettable is that most of the domestic natural science researchers, the string vibration of such an insignificant problem has long lost interest. But, in fact, if we could look at the mechanics of string vibration and other related questions, it would be an indisputable scientific guide not only to string playing techniques, we will also find that on the strings of the piano, there are many great poems about human being's understanding and changing the world, which contain some useful inspirations about philosophy of life, art aesthetics and so on. In this way, there seems to be an exciting world of beauty and wonder on the strings.

# 4. The Musical Properties of Piano

The piano is more complex than other instruments because of its physical properties. Because of its rich structure, the piano has a wide range of sound. It can be played solo or accompaniment. In recent years, the research on the relationship between physical attributes and musical attributes of piano has been more and more in-depth.

The relationship between physical attributes of piano and musical attributes is mainly embodied in three aspects: physical principles of piano sound, physical principles of power transmission, and physical principles of pedal operation. Through the analysis of these three aspects, we can have a more accurate understanding of the relationship between the physical attributes of sound and musical attributes. Generally speaking, the sound of the piano is also one of the kinds of acoustical problems. The sound is transmitted through the medium. The air is an important medium for the transmission of sound. When the sound begins to vibrate, it travels out through the air, causing the air to vibrate, and then the eardrum to vibrate, and you can hear the sound. Piano is also based on this physical principle to sound, so, transmission and vibration is the piano sound of two very important factors. The physical attributes of the piano and musical attributes there are inextricably linked, familiar with the physical attributes of the piano, as well as the relationship between its musical

attributes can improve the level of piano performance.

The enrichment and development of music materials have deepened the leap in the understanding of music and sound, and promoted the progress of music as a discipline. When there is no limit to the type of sound, there is no more subjective judgment of the music's merits and dislikes.

Every advancement in music also includes the contributions of some of the greatest musicians, artists and scientists. Just Think, there is no trial and error, there is no material innovation and development, this is our study of music and sound is a significance.

### References

- [1] Wu WG. Interpretation of Magical Esoteric Music [M]. Shanghai: Shanghai Music Production, Press Association, 2008.
  - [2] Zhou HS. Analysis and Treatment of piano works and style expression [M]. China Book Publishing House, 2017.