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The Chinese Scholarship on Musical Pitch and Tuning systems and Its Musicological and Acoustical Achievments

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This presentation introduces an ancient Chinese interdisciplinary scholarship in art and science called *lǚxue*, which can roughly be translated as "study of musical pitch and tuning systems" or "the study of tuning and temperament."

In ancient China, musical pitches and astronomy were treated as one subject and were connected to society's order and rules. Therefore, the Chinese courts needed to "unify the measurement of length, volume, and weight with the same musical pitch." This area of study was also related to mathematics, the astronomical calendar, meteorology, philosophy of *yin-yang* and the five elements, and even political matters. The earliest historical record of the twelve *lǚ* in one octave dates back to 645 BCE and is verified by the archaeological discovery of a bell set buried in 433 BCE.

In China, the so-called *sanfen sunyi* (one-third reduction and addition) method resulted in ascending perfect fifths and descending perfect fourths. At the same time, the Pythagorean tuning involved ascending perfect fifths or descending perfect fifths. The difference makes six of the twelve pitches between the two similar, and the other six different. Therefore, whether the Chinese system influnced the Greek one in the ancient time or the other way around becomesdebatable.

Since the Han dynasty (202 BCE ～ 220 CE), when ancient Chinese scholars discovered that the trajectory of heavenly bodies all returned to their starting points, but that a scale calculated using the *sanfen sunyi* method did not, finding a way to close the diatonic comma (or Pythagoreant comma) became an important metaphysical and political issue. Numerous academic discoveries have been recorded in official historical records ever since, which in many ways pioneered human being's academic endeavor in acoustic and musicological research, among them the discovery of the equal temperament formula by the sixteenth century Ming dynasty scientist Prince Zhu Zaiyu (1536-1611). His discovery is at least four years earlier than the less accurate mathematical extraction of the 12^{th} square root of 2 by the Dutch scientist and engineer Simon Stevin.