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December 10, 2017

Pythagoras, the Greek mathematician who discovered the diatonic scale

With the rise of Greek civilization came a new idea about mankind, an idea that humans were the center of the universe and as such mankind's purpose was to discover the mysteries of the universe. To the great philosophers and intellectuals in ancient Greece these mysteries were contained in the concepts of the good, beauty and harmony. And so the Greeks championed the potential of the mind to search for harmony, symmetry and perfect balance. [1]

From these concepts we have derived from the Greeks their perceptions of the ideal, which we mostly think of in the fields of art, poetry and drama. However, music also provided a vast treasure trove for intellectual study. In the areas of harmony, music was integral in the lives of the Greeks and present throughout their rituals of daily life – marriages, funerals, theater and recitations of poems and ballads. [2] And although it is presumed that much of the philosophic and therapeutic aspects of music employed by the Greeks using both voice and various instruments originally came from the Egyptians, the Greeks went further by infusing their pursuits of the highest possible or superior nature of man and the soul with intellectual zeal.[3]

Beauty was believed to have germinated from harmony and numbers were considered foundational and fundamental to both the physical and spiritual worlds. Numbers were known and studied as a key to unlocking and understanding the harmony of the cosmos. To Pythagoras, the Greek philosopher/ mathematician who lived around 500 BC, harmonies directed mathematics, which was considered a 'divine science'. [4] Pythagoras is credited with making important musical theory discoveries including the diatonic scale, harmonic ratios and intervals using mathematics. He was deeply immersed in the

study of music as it was being taught by the priests and thought a great deal about the divine Mysteries and harmony. How he actually derived his mathematical ratios as musical intervals is not known, but a possible explanation has been constructed and it goes something like this -- one day he passed a brazier's (someone who pounds metal into tools) shop and heard various pitches made from the different sizes of hammers as they hit the metal. He entered the shop and made note of the varying weights of the hammers. Then he returned home and started experimenting by constructing wooden beams of varying lengths that held different weights of metal that corresponded to the brazier's hammers. At regular intervals along a wooden beam he attached four cords, each one holding a different weight. This produced varying tension in the strings. He could then pluck them and note the sounds. From the different tensions in the strings he calculated ratios of 2:1 between the first and fourth and a ratio of 3:2 between the second and fourth and the first and third. [5] The frequency ratio between the musical interval called a 'perfect fifth' is 3:2. It is made of 7 half steps, a perfect fourth is made of five half steps and an octave has 12 half steps. Pythagoras deduced mathematically musical intervals and intonation using a succession of perfect fifths by bringing the frequencies down in the same octave.[6] The 7 tone scale he created used this series of fifths, 5 tones of which each is a factor of 3/2 from each preceding 5th. [7]

Even though Pythagoras believed that harmony was derived from ratios and the relational proportions of mathematics as opposed to our emotional perceptions and feelings, he recognized how affected our senses and emotions can be to music and used the term 'musical medicine' to emphasize that belief.[8] There are recorded stories describing how Pythagoras cured ailments of the spirit by having special musical compositions played in front of the sufferer. At his university he opened each day with songs that were designed to clear the mind of sleepiness and invigorate it for the coming daily activities.[9]

References:

[1] Hamilton, Edith. Mythology – Timeless Tales of Gods and Heros. Hachette Book Group, New York, NY. 2011

[2] https://the-history-of-music.blogspot.com/2016/11/the-greeks-and-music.html

[3] http://www.sacred-texts.com/eso/sta/sta19.htm

[4] Ibid.

[5] Ibid.

[6] https://www.musictheory.net/lessons/31

[6] http://www.classic-guitar.com/pythagor.html

[7] http://legacy.earlham.edu/~tobeyfo/musictheory/Book1/FFH1_CH2/2D_Pythagorean-Intonation.html

[8] http://www.sacred-texts.com/eso/sta/sta19.htm

[9] Ibid.