1116-K5-371   **Anil Venkatesh*** (`anilvenkatesh@ferris.edu`). *Pythagoras to Secor: a Mathematical Approach to Musical Temperament.*

In music theory, a temperament is a system of tuning. The concept of temperament has been studied since antiquity; it arises as a consequence of the unique prime factorization property of integers, applied to pitches of musical notes.

Most instruments are capable of minutely adjusting the pitches of notes during performance, allowing them to play in any temperament. However, keyboard-based instruments such as the piano cannot adjust pitches in this way. Consequently, temperament is most relevant to keyboard-based instruments. A crowning achievement of the western musical tradition is the well tempered scale, which is the tuning convention used in modern pianos.

In this talk, we briefly review historically significant temperaments such as Pythagorean tuning and the well tempered scale. We then introduce George Secor's "miracle temperament." Discovered in 1974, the miracle temperament closely approximates an astonishing number of acoustically fundamental intervals (i.e. those arising from the Fourier decomposition). We present a mathematical formulation of the "miracle" criterion and a classification of the space of all temperaments according to this criterion. The talk includes relevant audio samples and is accessible to undergraduates. (Received August 28, 2015)