Unlike a pure sinusoidal signal, a musical pitch is characterized by what is known as a “harmonic overtone series”: The various overtones sound at the same time as the fundamental frequency. The frequency of each harmonic is a multiple of the fundamental frequency. Together, the fundamental and its harmonics produce an overall musical pitch.
Example: The 2nd overtone of the pitch a1 (= 440 Hz) has a frequency as follows (remember the 2nd overtone is the same as the 3rd harmonic):
3 x 440Hz = 1320Hz.
This basic principle is truly the fundamental law of music. It can be generalized as follows:

$F_o = \Delta f$

Here, F_o is the frequency of the fundamental and Δf is the frequency spacing between each of the pairs of overtones F_i and F_{i+1}. The human ear is capable of hearing the pitch of a musical sound even in cases where the fundamental F_o is outside the range of sounds we can hear. This is possible since we can hear the “virtual pitch” based on $F_o = \Delta f$ from the perceived series of harmonic overtones (with the relevant overtones spaced at frequencies of Δf apart).

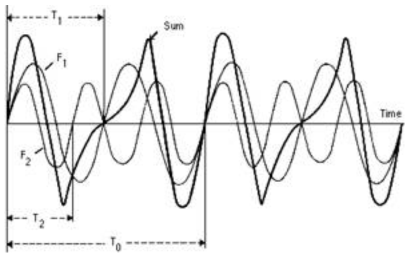

Abb.: Zeitbereich einer Schwingung. Die dicke Linie zeigt die Summe des zweiten und dritten Harmonischen. (F1 bzw. F2) mit der jeweiligen Periodendauer T1 bzw. T2. Die Periodendauer der Summe ist gleich lang wie die Periodendauer der Grundschwingung (T0)!

This process is known as “fundamental tracking” and is very important with an instrument such as the cello. Otherwise, the notes produced in the first position on the C string would not be audible at all since the fundamental is almost entirely missing (due to a lack of resonance in this low-frequency range for reasons related to the design of the instrument).