

# Re: Measurement of pitch

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*Source:* <http://sci.tech--archive.net/Archive/sci.physics/2006-12/msg01252.html>

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- *From:* "OG" <[owen@xxxxxxxxxxxxxxxxxxxx](mailto:owen@xxxxxxxxxxxxxxxxxxxx)>
  - *Date:* Thu, 7 Dec 2006 18:58:04 -0000
- 

"Tom Potter" <[tdp1001@xxxxxxxx](mailto:tdp1001@xxxxxxxx)> wrote in message  
[news:4577df83\\$0\\$15492\\$88260bb3@xxxxxxxxxxxxxxxxxxxx](mailto:news:4577df83$0$15492$88260bb3@xxxxxxxxxxxxxxxxxxxx)

"OG" <[owen@xxxxxxxxxxxxxxxxxxxx](mailto:owen@xxxxxxxxxxxxxxxxxxxx)> wrote in message  
[news:4tou9nF156p8vU1@xxxxxxxxxxxxxxxxxxxx](mailto:news:4tou9nF156p8vU1@xxxxxxxxxxxxxxxxxxxx)

<[tdp1001@xxxxxxxx](mailto:tdp1001@xxxxxxxx)> wrote in message  
[news:1165381044.657388.249430@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx](mailto:news:1165381044.657388.249430@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx)

OG wrote:

"John Bailey"  
<[john\\_bailey@xxxxxxxxxxxxxxxx](mailto:john_bailey@xxxxxxxxxxxxxxxx)> wrote  
in message  
[news:08ran2labqmc71frg5mat6v05k66o0i3v8@xxxxxxxx](mailto:news:08ran2labqmc71frg5mat6v05k66o0i3v8@xxxxxxxx)

On 4 Dec 2006 16:29:27  
-0800,  
[matt271829-news@xxxxxxxx](mailto:matt271829-news@xxxxxxxx)  
wrote:

Hi

At what  
time in  
history were  
the range of  
frequencies  
of audible  
sounds  
first roughly  
known?  
Who made  
the first

## Re: Measurement of pitch

scientifically  
accurate  
measurement  
of the  
frequency  
of a sound  
wave, and  
when?

"Mersenne's description in his Harmonic universelle (1636) of the first absolute determination of the frequency of an audible tone (at 84 Hz) implies that he already demonstrated that the absolute–frequency ratio of two vibrating strings, radiating a musical tone and its octave, is as 1 : 2.

Fascinating

And I found this description of how he did it "The first major step toward defining pitch into an exact number of vibrations per second – its frequency – was Mersenne in the 1600s, who stretched a brass wire 138 feet and counted its vibrations by eye. He then stretched smaller wires until they matched the tuning of an organ pipe and scaled up the numbers from the long wire and correctly calculated its frequency."

[http://digitalcontentproducer.com/mag/avinstall\\_measure/](http://digitalcontentproducer.com/mag/avinstall_measure/)

Mersenne's method was not as good as the method used by the Pythagoreans.

Maybe, but the OP's question was regarding the first scientific

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measurement of ACTUAL frequency rather than relative frequency, which was Pythagoras' work.

Apparently "OG" didn't get the message.

Comparing a frequency directly to a frequency standard such as middle C, is more precise and more fundamental than comparing a frequency to an artificial, politically set, real number, pseudo-frequency such as the second.

It seems that you're not aware that there is no inherent 'standard' to the frequencies used for particular notes.

Here is an extract from the Wikipedia article on Pitch (music)

[http://en.wikipedia.org/wiki/Pitch\\_\(music\)](http://en.wikipedia.org/wiki/Pitch_(music))

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Quote

"Until the 19th century there was no concerted effort to standardize musical pitch, and the levels across Europe varied widely. Pitches did not just vary from place to place, or over time?pitch levels could vary even within the same city. The pitch used for an English cathedral organ in the 17th century for example, could be as much as five semitones lower than that used for a domestic keyboard instrument in the same city.

Even within one church, the pitch used could vary over time because of the way organs were tuned. Generally, the end of an organ pipe would be hammered inwards to a cone, or flared outwards, to raise or lower the pitch. When the pipe ends became frayed by this constant process they were all trimmed down, thus raising the overall pitch of the organ.

Some idea of the variance in pitches can be gained by examining old pitchpipes, organ pipes and other sources. For example, an English pitchpipe from 1720 plays the A above middle C at 380 Hz, while the organs played by Johann Sebastian Bach in Hamburg, Leipzig and Weimar were pitched at A = 480 Hz a difference of around four semitones. In other words, the A produced by the 1720 pitchpipe would have been at the same frequency as the F on one of Bach's organs.

From the early 18th century, pitch could be also controlled with the use of tuning forks (invented in 1711), although again there was variation. For example, a tuning fork associated with Handel, dating from 1740, is pitched at A = 422.5 Hz, while a later one from 1780 is pitched at A = 409 Hz, almost a semitone lower. Nonetheless, there was a tendency towards the end of the 18th century for the frequency of the A above middle C to be in the range of 400 to 450 Hz.

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The frequencies quoted here are based on modern measurements and would not have been precisely known to musicians of the day. Although Mersenne had made a rough determination of sound frequencies as early as the 1600s, such measurements did not become scientifically accurate until the 19th century, beginning with the work of German physicist Johann Scheibler in the 1830s. "

end quote

As a practical example, how could you know what actual pitch Pythagoras used as his 'standard'?

As Maxwell pointed out when he formulated Dimensional Analysis, a measurement consists of two parts, a reference unit, and a number that represents the number of these reference units in the quantity to be measured.

As we've seen there is no reference unit that is inherent in the idea of 'pitch' itself. Yes, you could define a 'standard' pitch in some measure such as 'the pitch that is the same as that that produced by a 1 metre long steel wire of density  $X$  kg per metre<sup>3</sup> and strung to a tension of  $Y$  Newtons", but these are at very best no more 'fundamental' than the definition of the second.

The Pythagorians probably used the most stable instrument available to them, as their reference "atomic clock" against which to compare all other things that cycled, vibrated, or could be made to ring, perhaps including days, months, years, etc.

But there is no stability to the Pythagorean instrument.

Hopefully "OG" will explain what "ACTUAL frequency" really is.

It is the number of cycles per unit time.

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