Re: Why are there 7 discrete notes? A possibly stupid question about sound...

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From: dilvie (*dilvie_at_dilvie.remove−this−to−reply.com*)
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You're both right, and you're both wrong.

Yes, it does have to do with math, and yes, different cultures came up with different scales, but the development of the seven−note diatonic scale began with pythagoras.

According to legend, Pythagoras discovered the foundations of music by listening to the sounds of four blacksmith's hammers, which produced consonance and dissonance when they were struck simultaneously. Specifically, he noticed that hammer A produced consonance with hammer B when they were struck together, and hammer C produced consonance with hammer A, but hammers B and C produced dissonance with each other. Hammer D produced such perfect consonance with hammer A that they seemed to be "singing" the same note! Pythagoras rushed into the blacksmith to discover why, and he found that the explanation was in the weight ratios. The hammers weighed 12, 9, 8, and 6 pounds respectively. Hammers A and D were in a ratio of 2:1, which is the ratio of the octave. Hammers B and C weighed 9 and 8 pounds. Their ratios with hammer A were (12:9 = 4:3 = musical fourth) and (12:8 = 3:2 = musical fifth). Interestingly, if you invert the ratio of hammer B (making it 3:4 = 12:8) it becomes the ratio of hammer C, and vise−verse, thus, the musical fourth can be described as an inverted fifth, and vise verse. The space between B and C is a ratio of 9:8, which is equal to musical whole tone, or whole step interval.

The ratio 2:1 produces perfect consonance, that is, for each cycle of the lower frequency, there are exactly two cycles of the frequency one octave higher. The ratio 3:2 produces a very similar kind of consonance. It's all about symetry. The development of western music is very much like biological evolution. A variety of musicians, scholars, and methematicians over the course of many centuries stumbled accross the natural laws that make music sound good. It isn't purely cultural −− that is, there are mathematical reasons that those specific notes sound good, but the seven−tone diatonic scale didn't simply pop into being on the discovery of any one person.

The modern scales you hear today in popular music came from the development of the equal−tempered scale. Before equal and well−tempered scales came about, different keys sounded more in tune −− as long as you played only in that key. That's because they were tuned for perfect consonance in the 5ths and 3rds for that specific scale. The problem was, the different scales sounded out of tune with each other, meaning that when you modulate keys, the key you modulate to sounds out−of−tune.

The well−tempered clavier was an attempt to confront this problem. J.S. Bach championed it with "the well tempered clavier" −− A selection of fugues and preludes that is still very popular today.

Equal temperement didn't become a standard until the late 1800's. The idea was to make every scale equally out of tune. They did this by dividing the octave into an equal number of cents (cents being a measure of pitch variation). This division was optimized to make 5ths and 3rds sound particularly good with the octaves for every scale. It wasn't an arbitrary choice. It had a very specific purpose.

This is just a rough overview. If you want all the details (including how you can mathematically discover the whole 7−tone diatonic scale), I refer you to these excellent sources:

James, Jamie _ The Music of the Spheres: Music, Science, and the Natural Order of the Universe _. New York, Grove Press, 1993

"Pythagorean hammers" _ Harvard Dictionary of Music _. Second Edition, Massachusets: Harvard University Press

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<http://www.dilvie.com/>