MathSnacks

Dan Brown, ϕ and Da Vinci: Doh!

by Marty Ross, Burkard Polster, and QED (the cat)

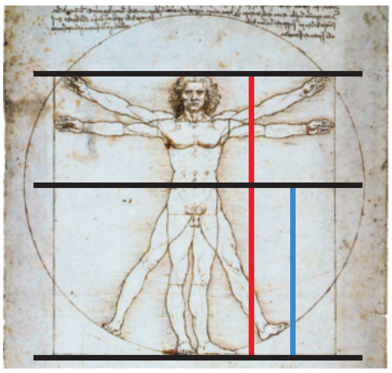
ϕ from Fibonacci?

$$a,\ b,\ a+b,\ a+2b,\ 2a+3b,\ 3a+5b,\ \ldots$$

D.B. claims that "phi [the golden ratio] was derived from the Fibonnaci sequence." In truth, Euclid thought of ϕ around 300 BC, about 1500 years before Fibonacci came up with his numbers. It is true that you *can* get ϕ from the Fibonacci sequence; however, you can get ϕ from many sequences. Start with any positive numbers a and b, and form a sequence by adding, as shown. (If $a = b = 1$, then this is exactly the Fibonacci sequence). Then, whatever a and b, the ratio of adjacent terms in this sequence approaches

$$\phi = 1.618\ldots$$

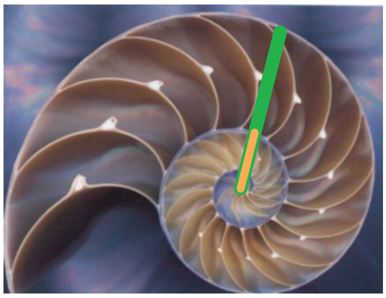
Bogus Belly Button



Measure your height, and the distance from your belly button to the ground. D.B. claims that the ratio of these two lengths will equal ϕ. Try it! You may get close to ϕ, but if so you may as well say the ratio is close to 1.6.

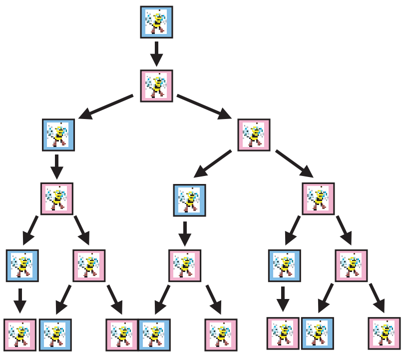
More careful writers claim that only for a "well-proportioned body" will the ratio of the two lengths be close to ϕ: this claim is still silly. In any case, Da Vinci's *Vitruvian Man* is based upon the idea of small whole number ratios (whereas ϕ is irrational!).

Naught from the Nautilus



The beautiful chambered nautilus forms (approximately) a *logarithmic spiral*: that is, the ratio of two successive radii does not depend upon the direction. However, this constant ratio is about 2.9: despite what D.B. says, it has nothing to do with ϕ!

Fibbing Bees



What proportion of bees in a hive are female? D.B. claims that the ratio of females to males is ϕ. In reality, the ratio is anywhere from 50:1 to 100:1.

What *is* true is that the number of *ancestors* of a given bee are all Fibonnaci numbers. Suppose F_n and M_n are the number of female and male ancestors in the n'th generation. Then $F_{n+1} = M_n + F_n$. But, $M_n = F_{n-1}$, since male bees have no father. Combining these equations, we find

$$F_{n+1} = F_n + F_{n-1}.$$

Ripper (?) References*

D. Brown, The Da Vinci Code, Doubleday, 2003.
M. Livio, The Golden Ratio, Broadway, 2002.