HOW ODD ARE ODD PERFECT NUMBERS?

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Greek mathematicians defined a whole number to be *perfect* if it is the sum of its proper divisors, where "proper" means the divisor is smaller than the number itself. An example is 6 , because the sum of its proper divisors is 1 + 2 + 3 = 6 . Since classical times, 51 perfect numbers have been found ... and every one of them is even.

That raises an obvious question: are there any odd perfect numbers? To date, no one knows. It is one of the true mysteries of mathematics.

In this talk, we trace the history of perfect numbers. This will lead us to an 1888 argument in which J. J. Sylvester proved that, if an odd perfect number *does* exist, then it must have at least three different prime factors. Although this property is far from self-evident, Sylvester's elegant proof requires nothing more sophisticated than geometric series.
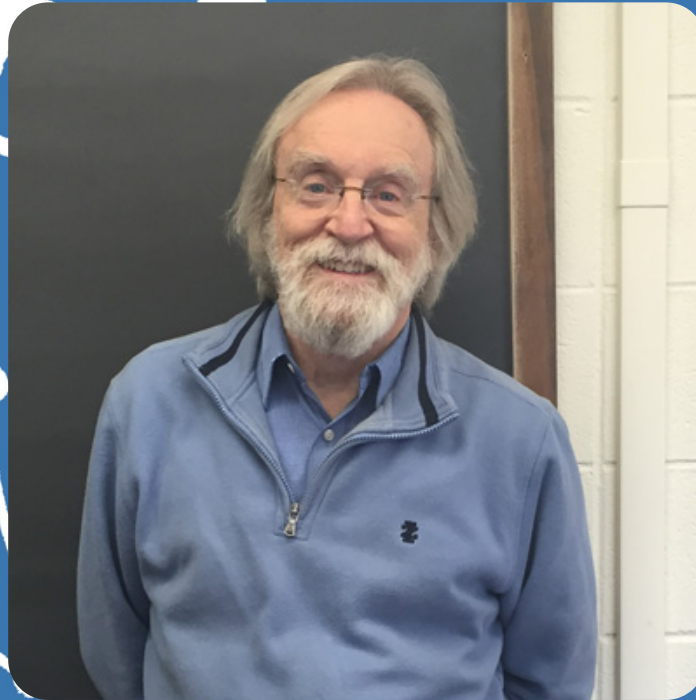
So, we'll see a bit of history and a bit of mathematics as we dabble in the fascinating realm of number theory.

NOTE: The talk is accessible to anyone who has had calculus.

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William Dunham is a historian of mathematics who has written four books on the subject: *Journey Through Genius, The Mathematical Universe, Euler: The Master of Us All*, and *The Calculus Gallery*. He is featured in the Teaching Company's DVD course, "Great Thinkers, Great Theorems" and most recently was a co-editor of an anthology from Cambridge University Press titled *The G. H. Hardy Reader*.

Dunham retired as the Truman Koehler Professor of Mathematics at Muhlenberg College (*emeritus*, 2014). Since then, he has held visiting positions at Harvard, Princeton, Penn, Cornell, and at Bryn Mawr College, where he now is a Research Associate in Mathematics.