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Who Cares About Poincaré?

MILLION-DOLLAR MATH PROBLEM SOLVED. SO WHAT?

By Jordan Ellenberg

Posted Friday, Aug. 18, 2006, at 11:59 AM ET



The *New York Times* recently reported that reclusive Russian geometer Grigory Perelman has apparently proved the century-old Poincaré conjecture. The *Times* calls Poincaré "a landmark not just of mathematics, but of human thought." But just *why* it's so significant is left a bit hazy. Big

mathematical advances often generate the same kind of lofty but content-free rhetoric found in political speeches about "the family." Like the family, math is a subject everyone agrees is very important without being able to specify exactly why.

I'm here to help. (With the Poincaré conjecture. As for the family, you're on your own.) Poincaré conjectured that three-dimensional shapes that share certain easy-to-check properties with spheres actually *are* spheres. What are these properties? My fellow geometer Christina Sormani describes the setup as follows:

The Poincaré Conjecture says, *Hey, you've got this alien blob that can ooze its way out of the hold of any lasso you tie around it? Then that blob is just an out-of-shape ball.* [Grigory] Perelman and [Columbia University's Richard] Hamilton proved this fact by heating the blob up, making it sing, stretching it like hot mozzarella, and chopping it into a million pieces. In short, the alien ain't no bagel you can swing around with a string through his hole.

That's zingier than anything the *Times* will run, but may still leave you without a clear picture of Perelman's theorem. Indeed, it's pretty hard to give an elementary account of the statement that Poincaré conjectured and that Perelman seems to have confirmed. (If that's what you're after, Sormani's home page links to a variety of expositions, including one in the form of a [short story](#).) Instead, I'll try to explain why Perelman's theorem matters *without* explaining what it is.

The entities we study in science fall into two categories: those which can be classified in a way a human can understand, and those which are unclassifiably wild. Numbers are in the first class—you would agree that although you cannot *list* all the whole numbers, you have a

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