

# Breakthrough to our origins

Long before I dreamed of becoming a scientist, I wondered why Earth was teeming with life, while Mars was a barren, rocky outpost and Venus was shrouded in a dense atmosphere. Somewhere, I read that comets were the reason. Strike a rocky planet with one volatile- and organic-rich comet and an Earth-like environment results. Two comets produce a Venus. No comets: Mars. Of course, this theory was far too simple to explain the differences in the evolution of the inner planets, but no one had ever explored comets up close to know how they might alter a planet's composition and history—until now. Last month, after many years of planning and a decade in transit, the European Space Agency's spacecraft Rosetta reached Comet 67P/Churyumov-Gerasimenko, surveyed landing sites, and deployed its probe, Philae, to execute the first-ever soft landing on a comet's surface (see the News story, p. 1442).

To put into perspective how long Rosetta's 6.4-billion-km journey to 67P took, its launch 10 years ago with an Ariane 5 rocket from French Guiana lagged the launch of Facebook by a month but beat the debut of the iPhone 1 by 3 years. Much of the world held its breath while Philae made its descent and then bounced in the microgravity before landing in a less-than-ideal locale for recharging its solar panels. Although it was disappointing that the tools designed to anchor the lander to the comet did not function as designed, the mission is still likely to achieve most if not all of its objectives, providing important new information on how comets have contributed to the evolution of the solar system. Just last week, we learned that the isotopic ratio of water on comet 67P differs from that found on Earth, ruling out comets from the Kuiper Belt as having delivered water to our planet. For this historic first, we are happy to select the Rosetta

mission as *Science's* Breakthrough of the Year for 2014.

A description of this year's Breakthrough, along with an impressive list of runners-up and other milestones of 2014, can be found on p. 1442. This year's selections also include something new: results of an online poll in which visitors to *Science's* website voted for their favorite advances. As it turns out, the Rosetta mission finished third as the "People's Choice." First place went to a dramatic feat of synthetic biology: the "engineering" of two novel nucleic acids in the bacterium *Escherichia coli*, thus expanding the genetic alphabet in a living organism by a whopping 50%. Next in line was a spectacular demonstration that the transfusion of blood from young mice to old mice reverses aging in both muscles and brain—effectively a fountain of youth. Already this concept is in clinical trials for treating Alzheimer's patients.

Is it surprising that voters ranked the year's achievements differently from our writers and editors? Not at all. Scientific research is such a huge and multifaceted enterprise, and any attempt to reduce it to a list of greatest hits is bound to be somewhat subjective. Very

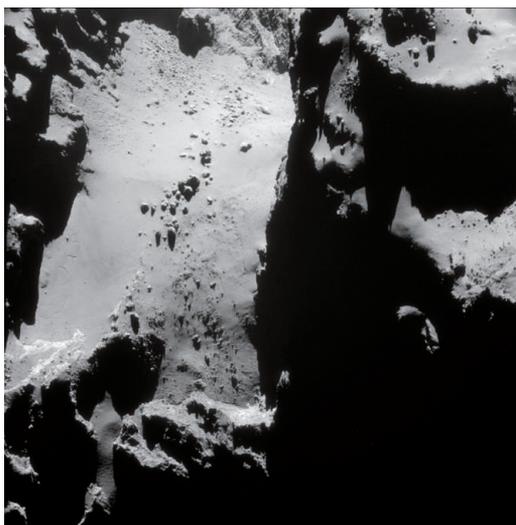
few years can boast a single result that stands decisively out from the pack. As Stephen Jay Gould said about evolutionary history, rewinding the tape and starting all over again might yield a very different result.

There were some 2014 breakdowns, unfortunately. A pair of discoveries vaporized as fast as they appeared: an alleged method for generating pluripotent stem cells (STAP cells) from ordinary cells; and the premature claim that signals detected by the South Pole telescope BICEP2 indicated cosmic inflation during the early universe, just after the Big Bang. But alas, leading this list is the global response to the Ebola epidemic in West Africa: too little, too late. We hope that this tragedy galvanizes efforts by all to stop its spread in the coming year.

—Marcia McNutt



Marcia McNutt  
Editor-in-Chief  
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# Science

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