PLUTO IS A BUMP IN THE ROAD

NICHOLAS A. CHRISTAKIS
Physician, social scientist; director, Human Nature Lab, Yale University; co-author (with James H. Fowler), *Connected*

On July 14 of last year, NASA's *New Horizons* spacecraft flew within 7,800 miles of Pluto, after traversing 3 billion miles since its 2006 launch, and began sending back astonishing and detailed images of mountains and plains composed of ice from the last planet in our system to be explored. But for me, these images were not the most newsworthy aspect of its mission.

The science involved in accomplishing this feat is amazing. *New Horizons* is an engineering marvel, with radioisotope power generation, sophisticated batteries, optical and plasma scientific instruments, complex navigation and telemetry, and so on. Its primary missions—all successfully completed—were to map the surface of Pluto and its main moon, Charon; to characterize the geology and composition of these bodies; and to analyze their atmosphere. In the process, *New Horizons* has also shed light on the formation of our solar system.

We succeed in this kind of solar-system exploration so reliably nowadays that it seems to us routine, just a bump in the road of our endless inquiry. But the exploration of Pluto is, alas, a bump in the road in another, rather more dispiriting way.

Most Americans (58 percent, in a 2011 Pew survey) are supportive of space exploration, valuing its contributions both to science and to national pride. And most Americans (59 percent, in a 2015 Pew survey) approve of sending astronauts into space. Yet Americans and their politicians appear unwilling to spend more money on our space program; a 2014 General Social Survey indicated that just 23 percent of Americans think we should do so. By contrast, 70 percent of Americans think we should spend more on education and 57 percent think we should spend more on health. NASA's budget has been roughly constant in real dollars since 1985 (it's now 0.5 percent of the federal budget), but it is well below its peak in 1965, when it was more than 4 percent of the federal budget (and it's below even the 1-percent level of 1990).

The captivating photos of Pluto occupied a week or so in the news cycle in the middle of last summer, and we moved on. What amazed me about the news from Pluto was that there weren't more people who found this accomplishment astonishing, that there was not even a more sustained support for space exploration. NASA's entirely sensible push to make both manned and unmanned space exploration reliable, standardized, and safe has had the unfortunate side effect of making it routine and even boring for many people. For me, this is the real newsworthy part of the Pluto mission.

My paternal grandfather, who was born in Greece in the 1890s, used to tell me that he simply could not believe that he had heard about the first heavier-than-air flight of the Wright brothers when it happened, in 1903, and had also watched the Moon landing in 1969. He had fought in World War I and would tell me stories about how his unit was transferred from Ankara to Kiev on horseback "when the Bolsheviks revolted" and about how, during World War II, he kept his family alive in Athens "when the Nazis invaded." But space exploration interested him more, because it was so much more optimistic. Humans had gone from skimming over a beach in a plane made of canvas

and bicycle parts to operating a lunar lander in sixty-six years. It amazed him, and the pace and sheer wonder of it astonish me even as I write this.

I realize, of course, that the great accomplishments in space exploration of the 1960s and 70s were largely motivated by the Cold War. I realize as well that many people are now arguing that private enterprise should take over space exploration. And I know that commitment to space exploration is low because many see better uses for our money. Is it better to vaccinate children, care for the poor, and invest in public health and medical research rather than invest in space exploration? Part of my response is the customary one that science and discovery are the ultimate drivers of our wealth and security. But my main response is that this is a false dichotomy. The real question is whether we would rather wage war or colonize Mars. Which would be, and should be, more newsworthy? In this I think my grandfather had it right.

PLUTO NOW, THEN ON TO 550 AU

GREGORY BENFORD
Novelist and emeritus professor of physics and astronomy, UC Irvine; co-author (with Larry Niven), *Shipstar*

The most long-range portentous event of 2015 was NASA's *New Horizons* spacecraft arrowing by Pluto, snapping clean views of the planet and its waltzing moon system. It carries an ounce of Clyde Tombaugh's ashes, commemorating his discovery of Pluto in 1930. Tombaugh would have loved seeing the colorful contrasts of this remarkable globe, far out into the dark of near-interstellar space. Pluto is now a sharply seen world, with much to teach us.

As the spacecraft zooms near an iceteroid on New Year's Day, 2019, it will show us the first member of the chilly realm beyond, where primordial objects quite different from the wildly eccentric Pluto also dwell. These will show us what sort of matter made up the early disk that clumped into planets like ours—a sort of family tree of worlds. But that's just an appetizer. *New Horizons* is important not just for completing our first look at every major world in the solar system. It points outward, to a great theater in the sky, where the worlds of the galaxy itself are on display.

Beyond Pluto looms a zone where the Sun's mass acts as a giant lens, its gravitation focusing the light of other stars to a small area. Think of it as gravity gathering starlight into an intense pencil, focused down as dots on a chilly sphere. Einstein calculated such gravitational bending of light in 1912, though