

REVIEW --- Books: Big Lessons From a Tiny World

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Chasing New Horizons

By Alan Stern & David Grinspoon

Picador, 295 pages, \$28

Discovering Pluto

By Dale P. Cruikshank & William Sheehan

Arizona, 475 pages, \$45

With apologies to Shakespeare, I come to praise Pluto, not to bury it. Though this tiny solar-system body was demoted to dwarf planet in 2006 to the distress of many children (and adults), it's time to dry your eyes and put away the handkerchiefs. Two books about NASA's recent New Horizons mission demonstrate Pluto's continuing importance in planetary studies.

One particular photo fired up the public's imagination during the spacecraft's flyby in July 2015. The image captured a bright white region on Pluto's surface in the shape of a heart, "creating an emotional attachment for this small, previously indistinct planet at the edge of our planetary system," write Alan Stern and David Grinspoon in their riveting account "Chasing New Horizons." Many are still unaware of the 2,500 people that it took to snap that picture -- as well as the many years of waiting.

Mr. Stern, the project leader for New Horizons, got it all started in 1989. Long dismayed that the planet had been bumped off the itinerary of the Voyager spacecraft launched in 1977, he organized a special session at a scientific conference that brought all the key Plutophiles together and, even though still a graduate student, wangled a meeting with NASA's director of solar-system exploration to seek funding for a mission study. The one planet left unexplored had become "a symbol, an open challenge, and a dare," write Messrs. Stern and Grinspoon.

To Mr. Stern's surprise, the NASA director agreed to the study. But that was only the beginning of a wild ride of many stops and starts over the next decade. One proposal wanted to make the spacecraft bigger than first imagined; a competing plan, highly controversial, suggested a lightweight probe that would get to Pluto in half the time. Neither panned out: Other NASA projects were sucking up all the available money, and planetary scientists were getting diverted by other celestial baubles, such as Jupiter's moon Europa, with its promise of an

underground ocean. In Messrs. Stern and Grinspoon's telling, NASA comes across as an agency that shifts its priorities with the political winds. Even after NASA did renew its interest in Pluto, all proposals were abruptly canceled in 2000 as cost estimates rose through the roof.

The "Pluto Underground," as the planet's scientific champions came to be known, campaigned for a resurrection. Both NASA and Congress were bombarded by thousands of letters. A high-school student in Pennsylvania even set up a Save-the-Pluto-mission website that garnered national media attention. They all had good reason to push: There was an irreversible deadline; the available launch window extended only to 2006. After that, Pluto's axial tilt would cause more and more of its surface to be in shadow, making a worthwhile flyby unfeasible for decades to come.

In answer to the public outcry, NASA requested proposals for a new, more streamlined mission that had to be built for under a billion dollars. At this point, "Chasing New Horizons" turns into a fascinating David versus Goliath story, with Caltech's Jet Propulsion Laboratory – the more experienced planetary probe maker with political weight – pitted against a relative newcomer, the Johns Hopkins University Applied Physics Laboratory. Mr. Stern went with the riskier choice, and won. "I knew that I had to go with the team that really wanted it and would back it forever," he said.

Even though we know the final outcome, the story continues to be a nail-biter as the New Horizons mission is canceled twice more. The two authors, with their insider's perspective, capture the arduous process with great narrative verve.

We can't even rest once the spacecraft is launched in 2006, only just making the deadline. Though New Horizons mainly hibernated during its 9 1/2 -year voyage, the Johns Hopkins team back on Earth needed to make sure that it arrived "no more than nine minutes off target . . . equivalent to a cross-country airline flight from Los Angeles to New York landing within four milliseconds of its planned time," write Messrs. Stern and Grinspoon. The observations to be made during the flyby, some 500 in all, had to be choreographed within the computer software as precisely as a Bolshoi ballet.

It was soon after the launch that Pluto lost its status as a full planet, as enough evidence had been gathered to conclude that it was better described as one of the larger members of the Kuiper belt, a collection of "planetismals" left over from our solar system's formation. But that hardly diminished the need to examine Pluto. As New Horizons journeyed through deep space, astronomers found out that its three known moons were accompanied by two more.

And then there was the mission's final hiccup: A mere three days out from Pluto, the scientists lost all communication with the spacecraft due to a computer overload. Flyby commands had to be completely reloaded, which they accomplished by working round-the-clock, with only hours to spare before the seven onboard instruments went to work.

On July 14, 2015, New Horizons came within 8,000 miles of Pluto's surface. Its cameras saw ice mountains as high as the Rockies, as well as myriad ridges and channels set amid smooth bright regions. "It rivals or beats many of the larger planets in geological complexity," said Mr. Stern. "Before the flyby, I could not in my wildest dreams have pictured structures like these or imagined how strong Pluto's geological personality would turn out to be."

While "Chasing New Horizons" is largely focused on the origin and development of the mission itself, "Discovering Pluto," by Dale P. Cruikshank and William Sheehan, offers the backstory of the explorations of our solar system's most remote regions. I came to think of the books as a flight of wines: "Chasing New Horizons" is the starter, nimble and refreshing, with "Discovering Pluto" offering deeper tones, scientific details that can be savored more slowly. Its first half, largely written by Mr. Sheehan, a historian of astronomy, is an excellent and engaging overview of the discovery of the solar system's far members Uranus and Neptune, which led to the legendary hunt for Planet X, the next suspected planet, by the Lowell Observatory in Arizona. This search ultimately resulted in Pluto's discovery in 1930 by Clyde Tombaugh (whose ashes are aboard New Horizons).

Mr. Cruikshank, a planetary scientist, takes over to review the renaissance in planetary studies over the succeeding decades, especially with the technological advances made after World War II. Geologists, chemists, atmospheric scientists and astronomers joined forces to explore a planet's varied properties. The history of the solar system is revealed through the examination of such planetary ices as water, methane and carbon dioxide. Mr. Cruikshank himself codiscovered frozen methane on Pluto; the substance's reflectivity made possible the first good estimate of Pluto's size and mass, largely unknown until 1976.

The stories contained within these books have not ended. New Horizons continues to glide through the farthest reaches of the solar system and on New Year's Day 2019 will fly by another Kuiper-belt object known simply as 2014 MU69, located one billion miles beyond Pluto. "At that moment, it will unseat Pluto from its briefly held distinction as the most distant targeted object ever visited by a spacecraft," write Messrs. Cruikshank and Sheehan. The New Horizons probe's "epic journey will inspire the efforts of future generations of our species to continue the unfinished work of uncovering the further secrets of the Solar System and the Universe."

Ms. **Bartusiak** is a professor of the practice in the MIT Graduate Program in Science Writing. Her books include "Black Hole" and "Einstein's Unfinished Symphony."

Credit: By Marcia **Bartusiak**

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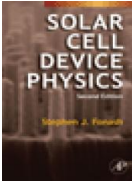
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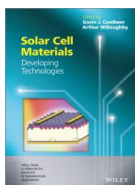
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