



Chasing New Horizons: inside the epic first mission to Pluto: Alan Stern and David Grinspoon. Picador, New York, May 2018. ISBN 978-1-250-09896-2. Hb pp 295, 32 pages of mainly colour illustrations. £13.

Chasing New Horizons is a natural companion to *Discovering Pluto* but from an even more intimate aspect. As said in the review of *Discovering Pluto*, by the end of the twentieth century it was acknowledged that only direct observation by robotic spacecraft would answer some of the growing questions about the outer solar system but NASA, after the success of the Pioneer and Voyager missions to Jupiter, Saturn, Uranus and Neptune, was reluctant to finance such an expensive one-off mission to Pluto.

The Pioneer and Voyager missions involved big, complex spacecraft far too expensive for a flyby mission to visit a small planet like Pluto. As early as 1989, Stern had proposed a study of a mission to the American Geophysical Union which had attracted the interest of a group of young planetary scientists the 'Plutophiles', later called the 'Pluto Underground' at the Applied Physics Laboratory. The idea attracted media attention and public support which incentivised other groups, including the Jet Propulsion Laboratory, to put forward scaled-down missions including Pluto Fast Flyby and Pluto 350.

First they had to convince NASA whose guiding mantra by then had become "Faster, Better, Cheaper". By the mid 1990's, several proposals had been made by different groups, including Stern's but prioritization of missions to Mars and budget cuts threatened a cancellation of all proposals for a Pluto mission which by then had cost over \$300million. Any mission to Pluto would have to wait

until the 2020s. This was too late, Pluto had passed perihelion and was already moving outwards in its eccentric orbit. To study its atmosphere before it froze back onto its surface necessitated a launch window between 2002 and 2006 at latest. In late December 2000, Alan Stern got word that NASA was going to move forward after all on a Pluto mission. On 19 December he learned that the APL team was the favourite to win the NASA contract. Snag was that they only had until March 2001 to offer a project in one fell swoop: instruments, spacecraft, ground-operation plan, and science investigation: Everything. Alan was wary that JPLs track record of bloated missions still made APL the underdog but was determined to meet the deadline.

In early February 2001, the new Bush administration released its first federal budget and, despite NASAs just-announced competition for Pluto missions, the budget zeroed all NASA funding for a Pluto mission and instead gave JPLs Europa mission a new start. Nevertheless, public support for a Pluto mission was still strong and eventually APLs re-named New Horizon mission to Pluto went ahead.

Half of the book, *Chasing New Horizons*, deals with the 'is-it-on, is-it-off' politics involved in the seventeen years leading up to the launch in 2006. It can become tedious to read but is essential for understanding the back story. The second half of the book, covering building 'the bird', the planning, science targets and the voyage out to Pluto is more immediate and more interesting, and at times nail-bitingly so.

With ten days to go before the flyby and New Horizons approaching Pluto at 1.2 million kilometres a day, on Sunday afternoon July 4 Alan Stern received a phone call from APL Mission Control Centre. He was used to operating on little sleep even during the Independence Day holiday weekend during this final approach phase and had been awake most of the previous night, going into MOC in the early hours for the upload of the crucial, massive set of computer instructions, the Core upload, representing a decade of work to automatically guide the spacecraft through the upcoming close flyby. The call was to say that MOC had suddenly lost contact with New Horizons.

Loss of signal had not happened before, but the primary computer was programmed to re-boot and switch to the backup. Over an hour passed before New Horizons phoned home. All of the Core flyby files had been lost, but they could be uploaded again; more seriously, the software files instructing how the Core files ran, uploaded from as far back as December, were also lost. There were now only three days remaining before the July 7 deadline when the Core programme sequence had to work flawlessly to initiate and operate the flyby instructions automatically controlling spacecraft orientation, imaging sequences, data collection and its transmission back to Earth as New Horizons raced through the Pluto-Charon system. Months of computer programming had to be re-tested, and re-sent to New Horizons before that final flyby procedure could begin just three days later.

Chasing New Horizons is a superb first-hand account of the trials and tribulations before, during and immediately before the eventually triumphant success of this first encounter with Pluto. The book isn't as well published as *Discovering Pluto*, its paper is rougher and the overall impression is that it was published more cheaply and in a rush, but what it lacks in physical quality, it makes up in the suspenseful narrative and far more colour images lacking in the first-reviewed book.

About the authors: Alan Stern is a planetary scientist, NASA space-programme executive and author. He was a prime-mover, subsequently principal investigator and team leader of NASAs New

Horizons mission from its early inception to the successful flyby of Pluto and Charon in July 2015. David Grinspoon is an astrobiologist, a prize winning science communicator and is on the science teams of several interplanetary space missions.