Mars rover Spirit (2003–10)

NASA commits robot explorer to her final resting place.

Spirit was born in 2003 to mission manager Mark Adler and Steven Squyres, a planetary scientist at Cornell University in Ithaca, New York. She was delivered at NASA's Jet Propulsion Laboratory in Pasadena, California, and it was there that she spent her formative months being schooled in roving. Later, she moved to a finishing school at the Kennedy Space Center in Florida. Her graduation was epic: a 490-million-kilometre flight to Mars, where she and her twin Opportunity would pursue their destinies as roving geologists.

Her adult life began in January 2004, with an airbag-cushioned landing in the Gusev crater in January 2004 on the opposite side of the planet from her twin. The aim: to find evidence of water, and of environments that might once have been conducive to life.

With three spectrometers, an abrasion tool and panoramic and close-up cameras on board, the young rover quickly gained confidence. Her geological mettle was proved when just 32 days into her Martian voyage she picked out a rock, named Adirondack, swept it clean and drilled into it, confirming that it was the volcanic rock basalt.

Before long, she got her driving licence. She began controlling her own movements using her hazard-avoidance camera, rather than only following instructions from her large team of Earth-based mentors.

She went on to use her wire brush to uncover different-coloured layers in a rock in the Gusev crater that suggested multiple exposures to water — leading one Earthly scientist to declare the find a “miracle”.

By the time the initial mission of 90 sols

(Martian days) was complete, Spirit had driven 600 metres, but that was only the beginning. Well beyond her appointed days, she continued to gather valuable scientific information about Mars, sometimes with unexpected help, often against all odds. Dust was a constant nuisance, covering her life-giving solar panels. But in 2005, a dust devil happened to sweep the panels clean, giving her an energy boost.

In March 2006, Spirit's right front wheel stopped working. But she struggled on over soft ground towards McCool Hill, in the Columbia Hills region, dragging the broken wheel — and had another lucky stroke. The broken wheel churned up the soft soil, exposing dirt that Spirit analysed to show was unexpectedly rich in silicates, which need water to form.

Each winter, Spirit had to bed down on a north-facing slope to make the most of the low winter sun to charge her solar panels. A favourite spot was Home Plate, a sunny plateau that provided her with not only a winter home, but also a place to explore. While wintering here

in 2006, Spirit discovered a pair of iron-rich meteorites using her thermal-emission spectrometer. That same winter, in October, Spirit reached a milestone 1,000 sols on Mars and survived a technical hitch that support teams on Earth worried might be a Martian version of the millennium bug.

News reports back on Earth suggested that the rover's days were numbered, yet she constantly confounded any prophets of doom. But in late January 2009, Spirit's lucidity deteriorated. She had trouble moving around, couldn't identify the position of the Sun correctly, and her family on Earth had trouble understanding her. Cosmic rays were blamed.

In April 2009, the ailing rover chose to reboot her computer twice. Worried controllers on Earth encouraged Spirit to press on, but more trouble lay ahead.

In a location called Troy, Spirit unwittingly crunched through the surface of a sandpit, and became entrapped. In November 2009 engineers on Earth, who had been testing a replica rover in a sand pit, tried to help her get out of her sticky situation — but to no avail. Even though the rover, by now suffering another broken wheel, did manage to climb up a few centimetres, Spirit finally gave up trying on 26 January 2010.

Her odometer read 7,730 metres. She will continue to radio back observations — of the atmosphere, of the planet's rotation — from her stationary position for as long as possible.

Spirit leaves behind her sister Opportunity — who is still active and is on her way to peer into a crater called Concepcion — and an extended family at NASA.

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