



# It's not all over RED ROVERS

They were meant to expire after three months but three years later the two Mars rovers are still sniffing the red planet and sending back amazing pictures, as **KATE ROSE** writes

**F**ROM ancient times humans have looked to the sky in wonder, but there are not many of our forebears who could have imagined robots one day crawling across the surface of Mars, sending information back to Earth at the speed of light.

The window of opportunity was meant to be 90 days, but NASA has gleefully taken more than 12 times that from the rovers that refuse to die. Opportunity, the second of two Mars exploration rovers sent to the red planet in 2004, celebrates the third anniversary of its landing on Wednesday.

It touched down three weeks after its "twin" rover Spirit, surviving the 456 million kilometre journey to make it to the Meridiani Planum on January 24, 2004.

At the time of the launches in 2003 — Spirit on June 10 and Opportunity on July 7 — those in charge of the project at the California Institute of Technology Pasadena's Jet Propulsion Laboratories thought they would already

exceed expectations if the rovers landed and survived their three months without breaking down.

There was every possibility botched landings would finish the \$1 billion expedition.

Even if they lasted longer, the harsh Martian winter — with temperatures as low as minus 104C and little sunlight — was expected to render the solar-powered batteries on the units useless.

But the rovers — little bigger than golf carts, measuring 1.5m high, 2.3m wide, 1.6m long and weighing 174kg — have survived long after travelling past their initial design expectations of 1km and three months.

University of Melbourne associate professor Dr Antoinette Tordesillas says as the anniversary of Opportunity's landing approached, it was worth thinking of what has been achieved.

"It is mind-boggling to think how these two rovers have managed to be so productive while navigating through the harsh Martian environment and for such a long time," Prof Tordesillas says.

"But they will be a hard act to

follow, not just for future generations of robots but also human explorers. Their phenomenal success constitutes one of the greatest triumphs of mathematics, science, and engineering, all rolled into one."

In its first three months Opportunity travelled 811m and sent home 15.2 gigabits of data, including 12,429 images. Since NASA extended funding to keep the crater crawlers on assignment, it has travelled closer to 9.8km and returned more than 80,700 images.

But it's not the same rover that left Earth, with four software upgrades making it smarter.

The latest program helps the rovers keep track of landmarks and enables them to figure out if they can use their equipment on rocks or soil.

**U**NTIL now, Earth-based boffins have had to look at pictures and decide whether the rovers' instruments can tackle the environment or not.

Project manager for the Mars exploration rovers Dr John Callas says their navigating skills had also been improved.

"Before this, the rovers could only think one step ahead about getting around an obstacle," Callas says. "With this new capability, the rover will be smarter about navigating in complex terrain, thinking several steps ahead. It could back out of a dead-end cul-de-sac. It could even find its way through a maze."

More importantly to NASA and those at Caltech's JPL, the rovers



provide a chance to test new technology for future missions without having to compromise new shuttles or equipment.

But scientists are learning more than just whether their robot technology is successful.

Since arriving, Opportunity has analysed a series of exposed rock layers, recorded changing environmental conditions, and has discovered wind-blown dunes have been part of the changing Martian landscape. Water was once present on the red planet and like Earth it had a fluctuating water table.

Spirit has recorded "dust devils" (giant storms) forming and moving, events that were made into movie clips providing new insight into the interaction of the Mars atmosphere and surface.

And both rovers have found metallic meteorites, with one rock even possessing a composition similar to a meteorite that reached Earth from Mars.

The information is sent back at the speed of light and a one-way transmission takes about 10 minutes, depending where Mars is in its orbit.

Martin Bush has just put together the Space exhibition at Melbourne's Scienceworks and also works in the Planetarium.

Mars, he believes, has always captured the popular imagination because it is close enough during parts of its orbit for people to see.

"It's quite remarkable, thinking about sending these vehicles to another planet at all, initially controlled from Earth," he says. "The

most significant discovery they've made is further, almost conclusive evidence that Mars did once have surface water. Where it (Opportunity) landed appeared to be near a shoreline near an ancient lake or sea."

Towards the end of last year Opportunity had made its way to Victoria Crater — a 21-month journey from its landing place — a destination beyond the wildest dreams of those at NASA.

**M**ARS rover mission manager Cindy Oda said all those involved in the mission could not believe the robots had lasted so long.

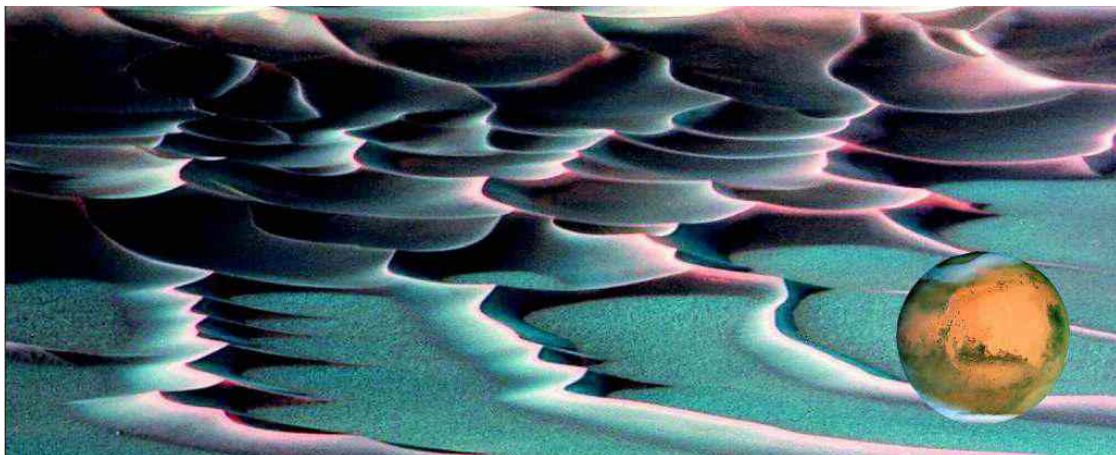
"We're so proud of Opportunity, the rover that takes a lickin' but keeps on tickin'," she says. "It continues to overcome all challenges despite its ageing parts and difficult terrain."

But while the importance of the knowledge acquired about our nearest neighbour can't be underestimated, Prof Tordesillas said she hoped the rovers' work might have another unexpected bonus.

"The work of the men and women behind these incredible machines will continue to inspire our best and brightest young minds to become the next generation of mathematicians, scientists, engineers — some of whom will no doubt become leaders in the future explorations of our universe.

"I hope some of our young Australians will have a major role to play in this voyage of discovery."

**The Scienceworks Space exhibition runs until April 29.**



**Out of this world:** the rover Opportunity found these blue-tinted crests at the bottom of the Endurance Crater, and inset, white water clouds swirl above the red planet. Pictures: AP/NASA



**Herald Sun**  
**20/01/2007**  
Page: 92  
General News  
Region: Melbourne Circulation: 540000  
Type: Capital City Daily  
Size: 862.33 sq.cms  
MTWTFS-



**Huge success:** one of the rovers, left, and the discovery of blueberry-like beads of hematite, centre, and where Spirit drilled into the surface of the planet in the shape of a flower