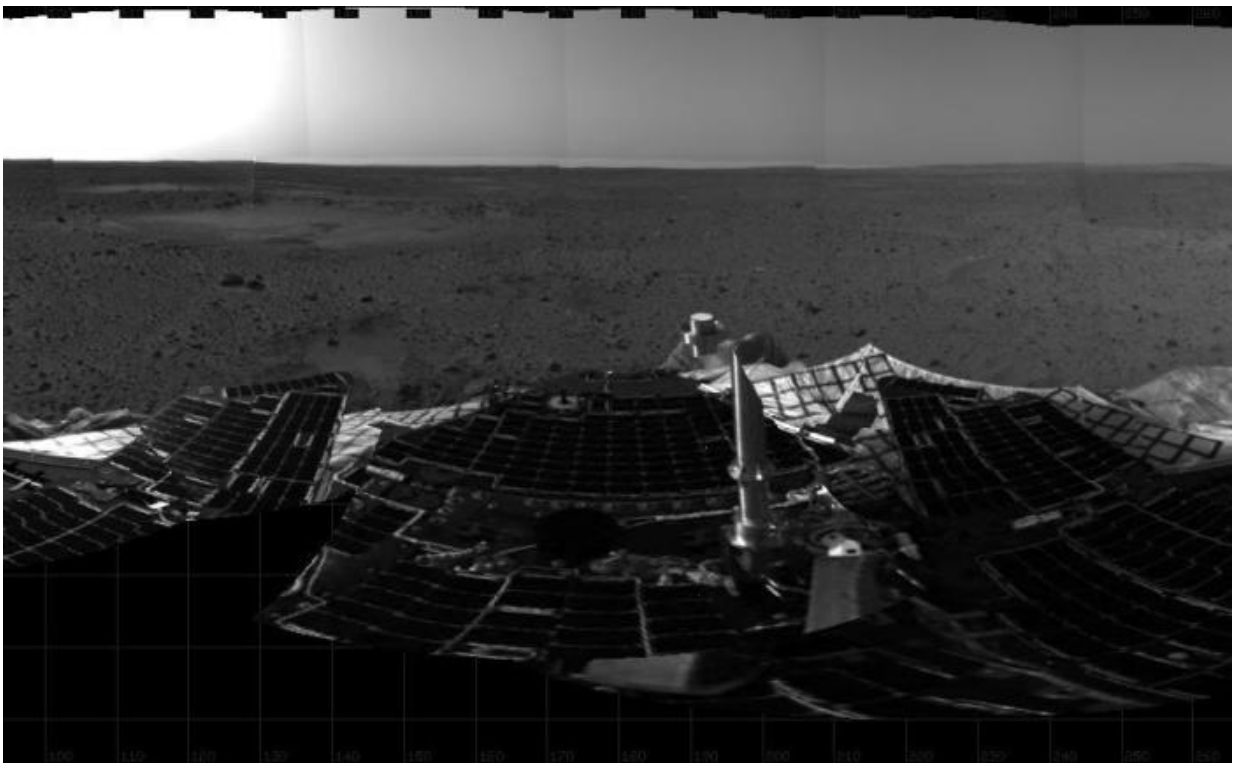


Spirit rover touchdown 12 years ago started spectacular Martian science adventure

January 7 2016, by Ken Kremer



This mosaic image taken on Jan. 4, 2004, by the navigation camera on the Mars Exploration Rover Spirit, shows a 360 degree panoramic view of the rover on the surface of Mars. Spirit operated for more than six years after landing in January 2004 for what was planned as a three-month mission. Credit: NASA/JPL

Exactly 12 Years ago this week, NASA's now famous Spirit rover touched down on the Red Planet, starting a spectacular years long

campaign of then unimaginable science adventures that ended up revolutionizing our understanding of Mars due to her totally unexpected longevity.

For although she was only "warrentied" to function a mere 90 Martian days, or sols, the six wheeled emissary from Earth survived more than six years – and was thus transformed into the world renowned robot still endearing to humanity today.

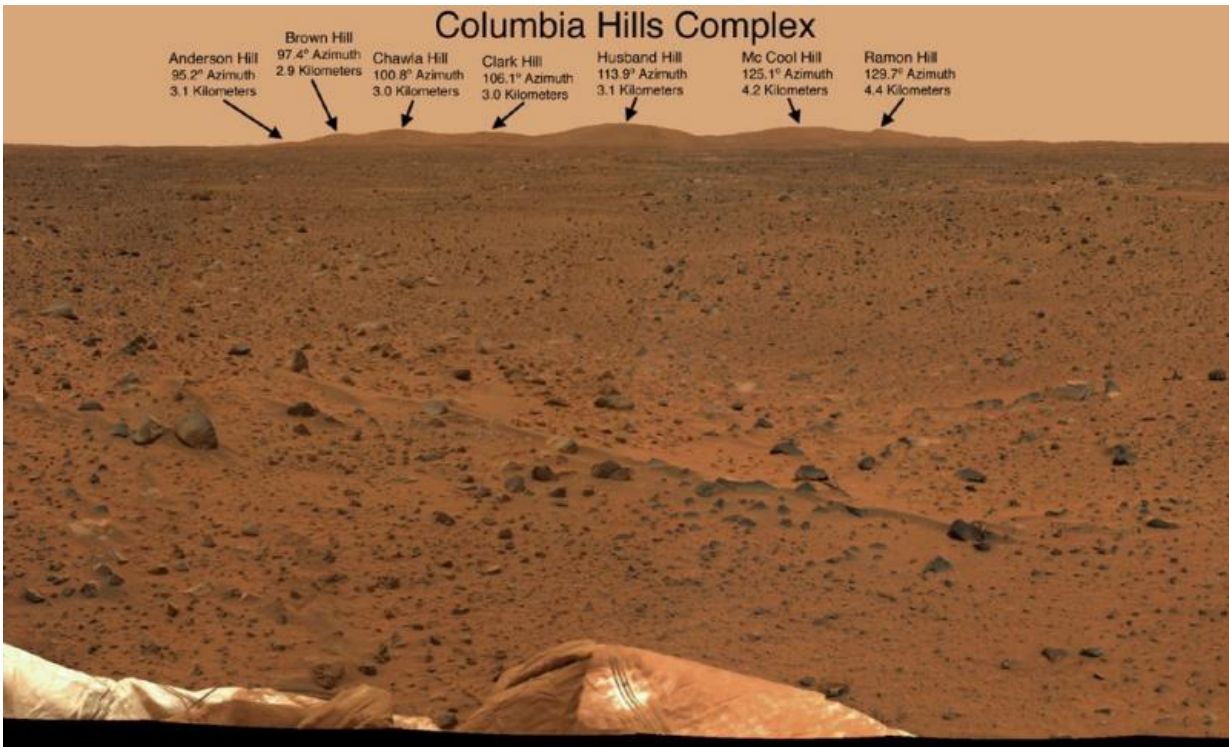
Spirit even became the first Martian mountaineer! – ascending up to the summit of 'Husband Hill' and back down

And to top that off, Spirit was only one half of a marvelous sister act of NASA's Mars Exploration Rovers (MER) that continues to this day.

Her younger twin sister Opportunity endures today, trundling forth on the opposite side of the Red Planet continuing to expand on their jointly established heritage of endless groundbreaking discoveries.

Together they each conducted the first overland expeditions on another planet. In essence they are truly the first long roving "Martians."

Jan. 3 marks the 12th anniversary since Spirit's safe landing on the plains of Mars inside 100-mile-wide Gusev crater on Jan. 3, 2004, after smashing into the thin Martian atmosphere and surviving the harrowing descent and scorching temperatures dubbed the "Six Minutes of Terror!"



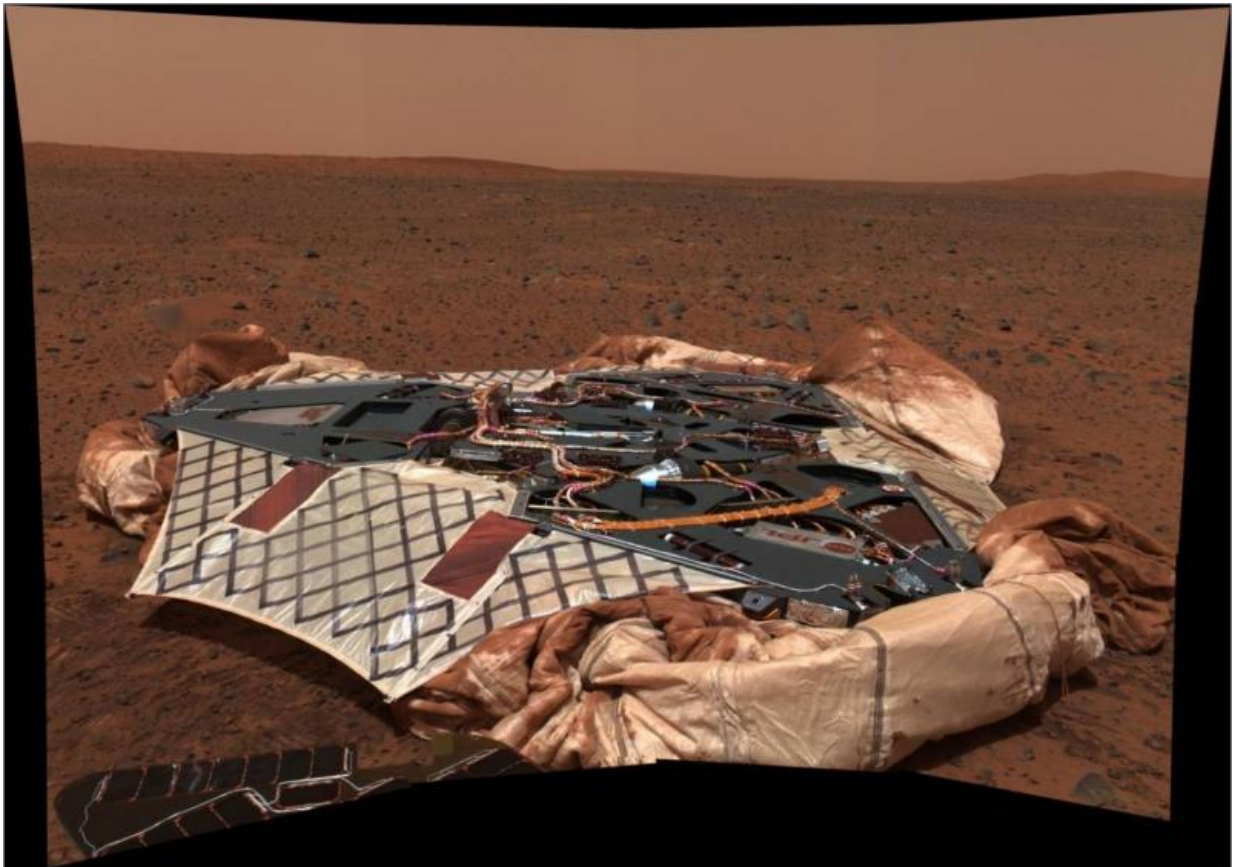
The “Columbia Hills” in Gusev Crater on Mars. “Husband Hill” is 3.1 kilometers distant. Spirit took this mosaic of images with the panoramic camera at the beginning of February, 2004, less than a month after landing on Mars. Spirit soon drove to the Columbia Hills and climbed to the summit of Husband Hill. Credit: NASA/JPL-Caltech/Cornell

Twin sister Opportunity likewise plummeted through the Martian atmosphere and landed on the plains of Meridiani on the opposite hemisphere three weeks later – on Jan. 24, 2004.

After carefully choreographed retro rocket, parachute and airbag assisted landings both sisters bounced some two dozen times while carefully cushioned inside their cocoon like carriers, before rolling to a stop, unfolding and driving down from the three petaled lander pedestal days later onto the alien terrain to begin their research expeditions.

The goal was to "follow the water" as a potential enabler for past Martian microbes if they ever existed.

Together, the long-lived, golf cart sized robots proved that early Mars was warm and wet, billions of years ago – a key finding in the search for habitats conducive to life beyond Earth.



Spirit rover images her Lander Platform after egress following touchdown in January 2004. Lander had 3-petals and airbags. Credit: NASA/JPL-Caltech/Cornell

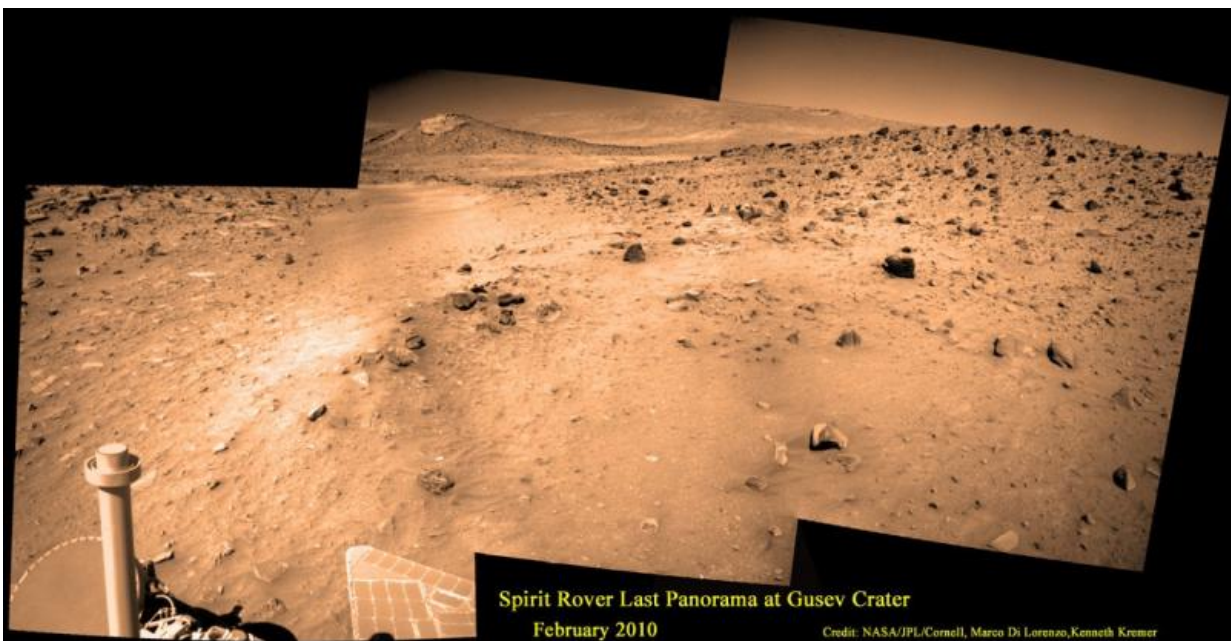
During her more than six year lifetime spanning until March 2010, Spirit

discovered compelling evidence that ancient Mars exhibited hydrothermal activity, hot springs and [volcanic explosions](#) flowing with water.

"Spirit's big scientific accomplishments are the silica deposits at Home Plate, the carbonates at Comanche, and all the evidence for hydrothermal systems and explosive volcanism, Rover Principal Investigator Steve Squyres of Cornell University, told Universe Today in a prior interview.

"What we've learned is that early Mars at Spirit's site was a hot, violent place, with hot springs, steam vents, and volcanic explosions. It was extraordinarily different from the Mars of today."

Altogether the golf cart sized Spirit snapped over 128,000 raw images, drove 4.8 miles (7.73 kilometers) – about 12 times more than the original goal set for the mission and ground into 15 rock targets.



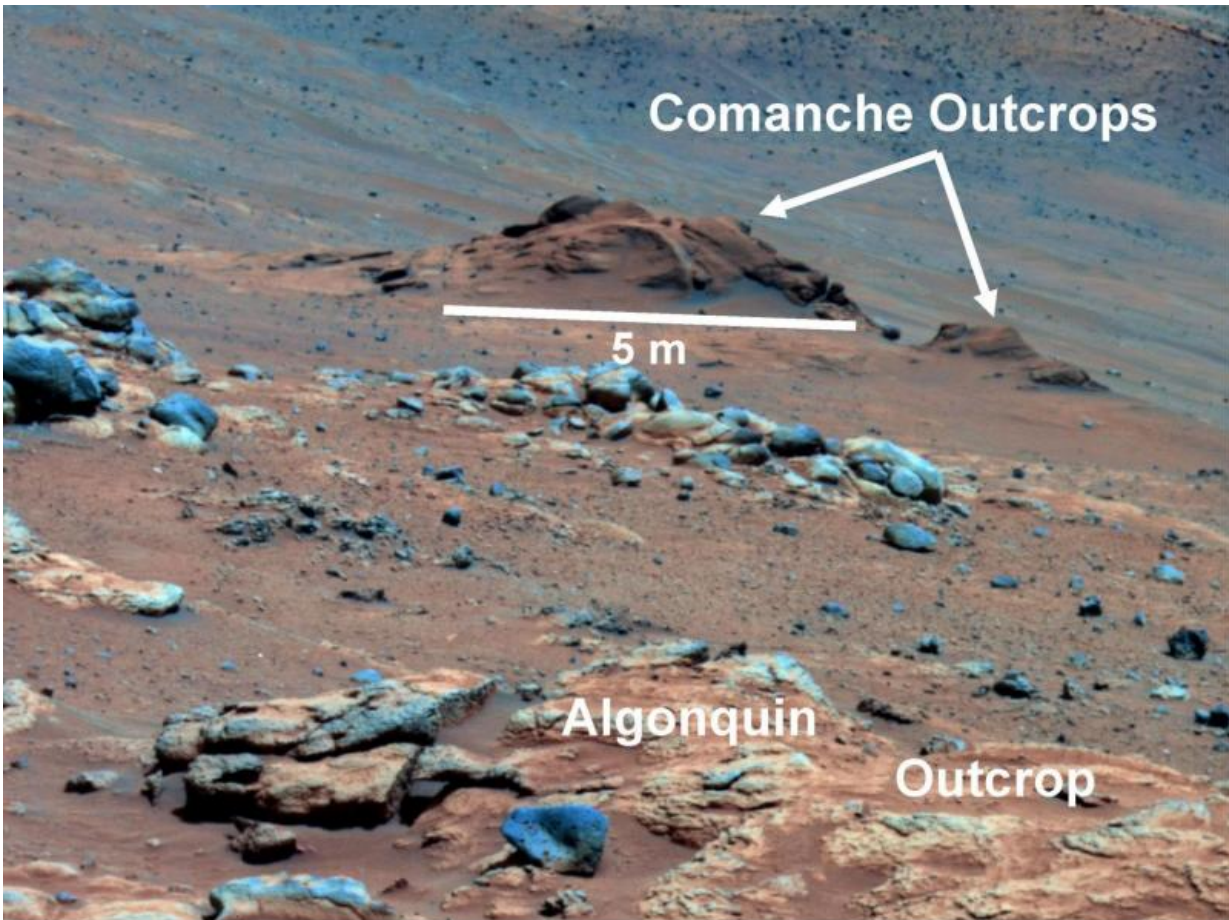
Spirit's last panorama from Gusev Crater was taken during February 2010 before her death from extremely low temperatures during her 4th Martian winter. Spirit was just 500 feet from her next science target – dubbed Von Braun – at center, with Columbia Hills as backdrop. Mosaic Credit: Marco Di Lorenzo/ Kenneth Kremer/ NASA/JPL/Cornell University. Mosaic featured on Astronomy Picture of the Day (APOD) on 30 May 2011 – <http://apod.nasa.gov/apod/ap110530.html>

Before they were launched atop Delta II rockets in the summer of 2003 from Cape Canaveral Air Force Station in Florida, the solar powered robo dynamic duo were expected to last a mere three months – with a 'warrenty' of 90 Martian days (Sols).

Either dust accumulation on the life giving solar panels, an engineering or computer malfunction, or the extremely harsh Martian environment with daily temperatures plunging to Antarctic-like lows was expected to terminate them mercilessly.

In reality, both robots enormously exceeded expectations and accumulated a vast bonus time of exploration and discovery in numerous extended mission phases.

No one foresaw that Martian winds would occasionally clean the solar panels to give them a new lease on life or that the components would miraculously continue functioning.



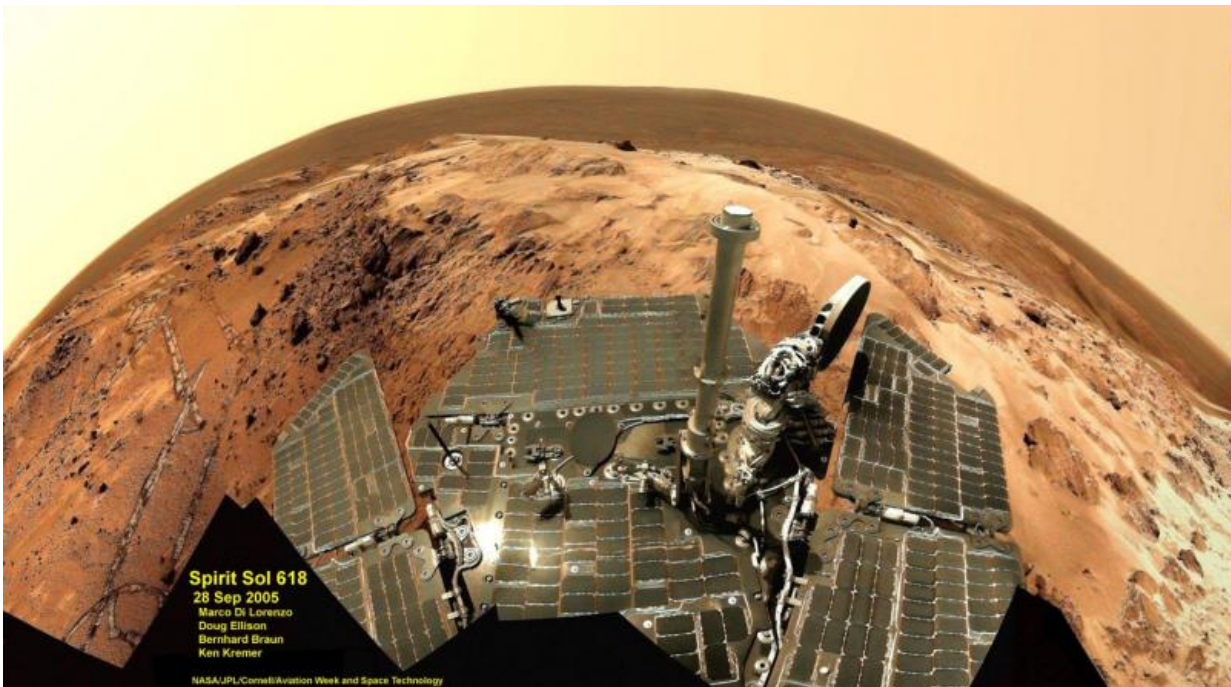
Spirit collected data in late 2005 which confirmed that the Comanche outcrop contains magnesium iron carbonate, a mineral indicating the past environment was wet and non-acidic, possibly favorable to life. This view was captured during Sol 689 on Mars (Dec. 11, 2005). The find at Comanche is the first unambiguous evidence from either Spirit or Opportunity for a past Martian environment that may have been more favorable to life than the wet but acidic conditions indicated by the rovers' earlier finds. Credit: NASA/JPL-Caltech/Cornell University

Spirit endured the utterly extreme Red Planet climate for more than six years until communications ceased in 2010.

Opportunity is still roving Mars today, and doing so in rather good condition!

After landing in the dusty plains, she headed for the nearby Columbia Hills some 2 miles away and ultimately became the first Martian mountaineer, when she scaled Husband Hill and found evidence for the flow of liquid water at the Hillary outcrop.

The rovers were not designed to climb hills. But eventually she scaled 30 degree inclines.



Spirit Mars rover – view from Husband Hill summit. Spirit snapped this unique self portrait view from the summit of Husband Hill inside Gusev crater on Sol 618 on 28 September 2005. The rovers were never designed or intended to climb mountains. It took more than 1 year for Spirit to scale the Martian mountain. This image was created from numerous raw images by an international team of astronomy enthusiasts and appeared on the cover of the 14 November 2005 issue of Aviation Week & Space Technology magazine and the April 2006 issue of

Spaceflight magazine. Also selected by Astronomy Picture of the Day (APOD) on 28 November 2005. Credit: NASA/JPL/Cornell/ Marco Di Lorenzo/Doug Ellison/Bernhard Braun/Ken Kremer

The rover was equipped with a rock grinder named the Rock Abrasion Tool (RAT) built by Honeybee Robotics.

Spirit ground the surfaces off 15 rock targets and scoured 92 targets with a brush to prepare the targets for inspection with spectrometers and a microscopic imager

Eventually she drove back down the hill and made even greater scientific discoveries in the area known as 'Home Plate'.

Spirit survived three harsh Martian winters and only succumbed to the Antarctic-like temperatures when she unexpectedly became mired in an unseen sand trap driving beside an ancient volcanic feature named 'Home Plate' that prevented the solar arrays from generating life giving power to safeguard critical electronic and computer components.



Mosaic of microscopic images of Spirit's underbelly on Sol 1925 in June 2009.

Mosaic shows predicament of being stuck at Troy with wheels buried in the sulfate-rich Martian soil. This false color mosaic has been enhanced and stretched to bring out additional details about the surrounding terrain and embedded wheels and distinctly shows a pointy rock perhaps in contact with the underbelly. Mosaic Credit: Marco Di Lorenzo/ Kenneth Kremer/NASA/JPL/Cornell

In 2007, Spirit made one of the key discoveries of the mission at 'Home Plate' when her stuck right front wheel churned up a trench of bright Martian soil that exposed a patch of nearly pure silica, which was formed in a watery hot spring or volcanic environment.

Spirit was heading towards another pair of volcanic objects named 'von Braun' and 'Goddard' and came within just a few hundred feet when she died during winter, stuck in the sand trap.

Thus Spirit was dramatically born and lived through milestone events that will be forever remembered in the annals of history because of the groundbreaking scientific discoveries that ensued, due to the unexpected and unbelievable longevity of the NASA's twin Mars Exploration Rovers.

No one on the team expected them to last much past none months or so.

Meanwhile, younger sister rover Curiosity has reached the base of Mount Sharp inside Gale Crater – which is about the same diameter as Gusev crater.



Spirit examined spectacular layered rocks exposed at “Home Plate.” The rover has driven around the northern and eastern edges of Home Plate. Before departing, Spirit took this image showing some of the most complex layering patterns seen so far at this location. Scientists suspect that the rocks at Home Plate were formed in the aftermath of a volcanic explosion or impact event, and they are investigating the possibility that wind may also have played a role in redistributing materials after such an event. Credit: NASA/JPL-Caltech/Cornell

Source: [Universe Today](#)

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