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Mysterious Martian Methane



Summary (Dec 29, 2004): Counting down the top ten astrobiology stories for 2004 highlights the accomplishments of those exploring Mars, Saturn, comets, and planets beyond Pluto. Number seven in this countdown was the startling detection of methane on Mars. Since methane concentrations would fall dramatically after only 300 years, some source of replenishing this gas is needed, whether biological or non-biological in origin.

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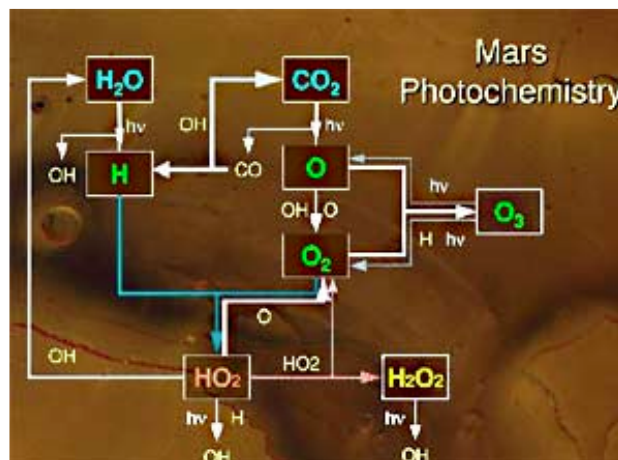
Mysterious Martian Methane

Number 7: Top Ten Astrobiology Stories, 2004

Six years ago, then NASA Associate Administrator Wesley Huntress, Jr., [stated](#) , "Wherever liquid water and chemical energy are found, there is life. There is no exception." Few opportune years like 2004 have presented astrobiology with as many remarkable vistas and fresh perspectives on this fundamental triad of water, chemical energy and life.

Consider this year's accomplishments of those dedicated to searching for life in the universe.

[Landing on Mars](#) not once, but [twice](#). Then finding [evidence for water](#) on



Chemical reactions triggered by ultraviolet (hv) in the thin martian atmosphere.

Credit: Sushil, UMich

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Ephemerids On this day in...

1066

18th recorded perihelion passage of Halley's Comet

1835

Charles Darwin reaches Los Arenales, in the Andes

1840

Draper takes 1st successful photo of the Moon (daguerrotype)

1857

Elisha Otis' 1st elevator installed (488 Broadway, NYC)

1858

Streetcar patented (E A Gardner of Phila)

1903

Wright brothers obtain airplane patent

1922

1st airplane lands at the US Capitol in Washington, DC

1950

UN World Meteorological Org established

1965

Gemini 3 becomes the first U.S. two manned flight and the first flight to change the path of its orbit.

[opposite sides](#) of the red planet. Picking up what appears to be [methane signals](#) in the martian atmosphere, one of the residues that might prove one day to be the product of underground biology. Scientists began to discuss seriously what [colonization](#) strategies make sense.

Setting off to explore the even [richer atmosphere](#) of the Earth-like moon, [Titan](#). Spiraling into orbital capture [around Saturn](#) and photographing its [majestic rings](#).

Flying through the [tail of a comet](#) and heading home after [collecting](#) the first [extraterrestrial samples](#) from such dusty iceballs. Launching the [Deep Impact](#) probe to smash into a comet and watch how the dust and ice get kicked up.

Filling the astronomy catalogs with well over a hundred [new planets](#), including what may prove to be the [first visible exoplanet](#). Finding some nearby candidates that might occupy temperate locations or [safely orbit](#) Sun-like stars.

Witnessing the once-per-century passage of our [neighboring Venus](#) across [the face](#) of the Sun. The MESSENGER probe took off on its decade long tour of the inner solar system to orbit Mercury.

Discovering the [largest planetoids](#) beyond Pluto among those [outer nurseries](#) where only comets visit.

The editors of [Astrobiology Magazine](#) revisit the highlights of the year and where possible point to one of the strongest lineups ever for beginning a new turn of the calendar. Between the marathon still being run by the twin Mars rovers and the expected descent to Saturn's moon, Titan, next year promises no letdowns.



Perspective view. Ophir Chasm in northern Marineris Valley network.

Credit: ESA/Mars Express

Number seven on the countdown of 2004 highlights was detection of methane on Mars. Relatively [high levels of methane](#) have been detected on [Mars](#) using a combination of ground based spectroscopy and the orbiting Mars Express probe.

Mars resembles Earth more than any other planet in our solar system, and studying its atmosphere gives us a greater understanding of our own.

Having methane appear on Mars is something of a mystery, because the planet

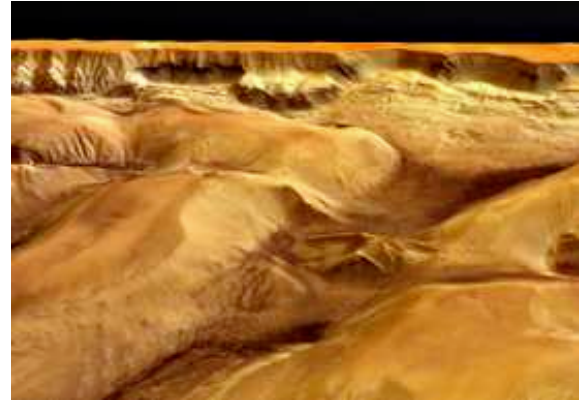
was not believed to have active volcanism or tectonics. Could the methane be evidence of martian life forms buried underground?

Methane on Mars could be produced by non-biological methods or by biological ones. "Biologically produced methane is one of many possibilities," said Sushil Atreya, professor and director of the Planetary Science Laboratory in the University of Michigan College of Engineering. "Methane is a potential biomarker, if a planet has methane we begin to think of the possibility of life on the planet. On Earth, methane is almost entirely derived from biological sources."

How the methane got to Mars is the big question, and there are [several possible sources](#), Atreya said. The most exciting scenario is that methanogens---microbes that consume the Martian hydrogen or carbon monoxide for energy and exhale methane---dwell in colonies out of sight beneath the surface of the red planet.

"These are anaerobic so they don't need oxygen to survive, if they are there," Atreya said. "If they are there, they would be underground."

Spectroscopy detected an average 10 parts per billion by volume (ppbv) of methane on Mars, a small amount compared to the approximately 1700 ppbv on Earth. The methane gas was distributed unevenly over Mars' surface, which tends to support the theory that an internal, on-site source, rather than a comet, is the source generating the methane, said Atreya.



Perspective view. Ophir Chasm in the northern Marineris Valley network.
Credit: ESA/Mars Express

Speculation is tempting, but many more experiments are necessary before drawing any conclusions.

"While it's tantalizing to think there are living things on Mars, we aren't in a position to say that is what is causing the methane," Atreya said.

What Next?

2005

- Mars Reconnaissance Orbiter ([MRO](#)) launch, Mars Orbiter to collect high-resolution, 1-meter, images in stereo-view of Mars
- European [Venus Express](#), Venus Orbiter for two-year nominal mapping life [486 days, two Venus year]

2006

- [New Horizons](#), Pluto and moon Charon flyby, mapping to outer solar system cometary fields and Kuiper Belt
- [Dawn](#), Asteroid Ceres and Vesta rendezvous and orbiter, including investigations of asteroid water and influence on meteors
- [Kepler](#), Extrasolar Terrestrial Planet Detection Mission, designed to look for transiting or earth-size planets that eclipse their parent stars [survey 100,000 stars]
- [Europa Orbiter](#), planned Orbiter of Jupiters ice-covered moon, Europa, uses a radar sounder to bounce radio waves through the ice
- Japanese [SELENE](#) Lunar Orbiter and Lander, to probe the origin and evolution of the moon

2007

- Japanese [Planet-C](#) Venus Orbiter, to study the Venusian atmosphere, lightning, and volcanoes.
- Mars [Scout](#) mission, final selections August 2003 from four Scouts: [SCIM](#), [ARES](#), [MARVEL](#) and [Phoenix](#)
- French Mars Remote Sensing Orbiter and four small [Netlanders](#), linked by Italian communications orbiter

2009

- [BepiColumbo](#), European Mercury Orbiters and Lander, including [Japanese](#) collaborators, lander to operate for one week on surface
- [Mars 2009](#), proposed long-range rover to demonstrate hazard avoidance and accurate landing dynamics

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Note: *Mars Life*

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