SCIENCE

METEORITES are from Mars - not men: NASA rover's shock finding

That whole women-Venus bit pretty unlikely too, to be honest

By Lewis Page, 17th October 2013

A foolproof way of telling whether a given meteorite fallen here on planet Earth is actually from Mars has been developed, courtesy of NASA's nuclear-powered rover Curiosity prowling across the ochre landscape of our planetary neighbour.

Over the billions of years that the two planets have circled the Sun in adjacent orbits, Mars has often been struck by space rocks in collisions mighty enough to blast bits of it off so powerfully that they then sail through space and eventually come down on Earth. Until now, while scientists might be fairly sure that a given meteorite was from the red planet, they couldn't be absolutely sure.

But now they can, because the Sample Analysis at Mars (SAM) instrument aboard the rover has confirmed the exact ratio of two isotopes (specifically Argon-36 and -38) of the gas Argon occurring in the Martian atmosphere. Argon is found everywhere in the solar system, but on Mars the ratio of the light and heavy kinds is out of whack because of the way in which the atmosphere has been largely lost into space. Naturally the light Argon-36 has been more easily lost and so on Mars one finds a higher proportion of Argon-38 than elsewhere.

So much had been known for a long time, with boffins examining tiny gas bubbles trapped inside meteorites and comparing the ratio of Argon to that seen in the Martian air by the Viking landers of the 1970s. But the Vikings were only able to pin down the ratio of light to heavy Argon within a range of four to seven. Curiosity has now come in with a more exact reading of 4.2.

“We really nailed it,” said Sushil Atreya, lead boffin on the Martian Argon research. “This direct reading from Mars settles the case with all Martian meteorites.”

It seems that the Argon ratio of the primordial solar system, still found in such places as Jupiter where the gravity is too strong for gases to escape, was 5.5. This, in Atreya's view, offers confirmation that Mars has lost a lot of atmosphere and was once a much more hospitable world. He and his colleagues write:

> **[The Curiosity reading] points to a significant loss of argon of at least 50% and perhaps as high as 85-95% from the atmosphere of Mars in the past 4 billion years. Taken together with the isotopic fractionations in N, C, H and O measured by SAM, these results imply a substantial loss of atmosphere from Mars in the post-hydrodynamic escape phase.**

The boffins' new paper can be read here in the journal *Geophysical Research Letters*.

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