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THE RED PLANET: PART 2

Ken Tapping, 26th December, 2017

Mars is the fourth planet out from the Sun. Earth is the third. Mars lies about 230 million kilometres from the Sun, compared with our 150 million. With a diameter of 6,792 km, it is much smaller than our 12,756 kilometre Earth. Its red colour in our sky is quite obvious, which is why it is also known as the Red Planet. Today, its surface is a dry, almost airless desert. The atmospheric pressure is only about 0.4 kilopascal, compared with around 100 kilopascals at the surface of the Earth.

The thin atmosphere means no greenhouse effect to speak of, so there is little trapping of solar heat. There are huge daily temperature changes because heat escapes easily to space after sunset. The pressure is actually so low that liquid water cannot exist on Mars' surface. It changes directly between ice and water vapour. There are ice caps in the Polar Regions, although nothing like as extensive and deep as those on our world, and when the Sun comes up on Mars, it shows the rocks white and glistening with frost.

However, there is a lot of evidence that Mars was not always like this. There are river canyons, river courses and deltas where they must have drained into ancient seas. There are numerous water-worn drainage channels. Now they are all dry. Where did all that water vanish to, and why? A lot of it went underground; one of the Martian Rovers scraped the surface dust away, revealing a white layer of ice. However, we don't think there is enough there to fill all those ocean basins and river beds. The rest probably vanished off into space, scraped away by the Solar Wind. Our Earth's atmosphere is thick enough to stop this radiation from reaching the ground. Mars' atmosphere is not. This means complex molecules, such as those in living things, are likely to be destroyed. We think life might be hiding underground.

It is likely that Mars was made from the same mixture of construction materials, as was the Earth. Long ago, both planets had thick

atmospheres and surface water, and maybe life. However, that beginning ended when Mars' liquid core solidified.

Today, the Solar Wind is kept away from the top of the Earth's atmosphere by our planet's magnetic field. This is generated by the circulation of material, mainly molten iron in Earth's molten core. Mars had a similar magnetic field. However, being a smaller world, it cooled faster, its core solidified and the magnetic field vanished. Then the Solar Wind got to work, scraping away at the top of the planet's atmosphere, slowly removing it, leading to the almost airless desert we see today.

Around the world there are huge deposits of red sandstone. The colour comes from iron oxide, which was formed when oxygen appeared in the Earth's atmosphere and oceans and reacted with minerals containing iron. Mars has red rocks too, suggesting that long ago water and oxygen were available on the Red Planet, and there may have been living things. Maybe they died out when conditions became hostile. Maybe living things are eking out an existence today, underground.

This raises the issue of the traces of methane we are detecting in Mars' atmosphere. On Earth Methane is produced by rotting vegetation and animal flatulence. This gas would vanish quickly from the atmosphere, so something is keeping it topped up. It could be the product of living things. The discovery of living things on Mars, or even evidence they existed in the past, would change our ideas about life in the universe. It might also persuade us to take better care of our own world.

Jupiter shines brightly in the southwest before dawn. Mars, fainter, lies to its right, with Mercury low in the dawn glow. The Moon will reach First Quarter on the 26th and be Full on the 1st.

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