Mars Case Study
ESA Beagle 2

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It's 2003, and you're watching a special feature on television about the European Space Agency's latest mission. The camera pans slowly over a solitary spacecraft in Martian orbit suspended miles above the red planet. It turns to follow one of the payloads leaving the spacecraft which gracefully enters the Martian atmosphere. Eventually, the payload deploys its parachutes, inflates cushioning airbags and touches down.

The airbags are jettisoned and roll away, unveiling the lander. Solar panels unfold smoothly like petals, and the camera zooms in for a closer look, rotating around the lander which now appears to be no larger than a computer monitor. A small patch of colour catches the eye, and the camera focuses on it. The lander is the Beagle 2, and the flag emblazoned on it declares the craft to be… British?

Incredible though it may seem, Britain is finally getting into the fray of space exploration.

In 1831, the HMS Beagle set sail across the world carrying Charles Darwin on the journey that resulted in the writing of his Origin of the Species which would set forth his idea of evolution. 172 years later, the Beagle 2 will land on Mars after being carried there by the ESA Mars Express mission in hope of discovering life of Mars, a task worthy of its illustrious name.

It is hardly surprising that the scientific community has had significant interest in Mars ever since the meteorite ALH 84001 (which originated from Mars 16 million years ago) was found to contain evidence suggesting there may have been life on Mars. When you consider the implications involved, the presence of life on Mars will tell us whether life is a widespread phenomenon throughout the universe, or merely an incredibly unlikely coincidence that just occurred on Earth. After all, what are the chances that the only other life in the universe happens to be on the planet next door?

Unfortunately, the evidence of life on ALH 84001 was ambiguous at best, and completely open to interpretation. The Beagle 2 should be able to rectify this problem when it arrives in 2003.

The term ALH 84001 stands for the first meteorite discovered in the Allan Hills region of Antarctica in 1984. Courtesy NASA/JPL.

The Beagle 2 team, led by Professor Colin Pillinger, were hard pressed to design a lander which would be able to gather conclusive evidence for the presence of life on Mars, past or present, in a package that would be over ten times cheaper and lighter than NASA's Pathfinder at £25 million and 60 kg. However, with ingenious use of internal space and by avoiding the unnecessary duplication of scientific instruments, the Beagle 2 will be able to perform arguably as many experiments as the Pathfinder did. What's more, the Beagle 2 has been

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fitted with a robotic arm and a small rover, dubbed the 'Mole'. As such, the Beagle 2 lander epitomises the state of the art in robotic innovation, as well as being great value for money.

One relatively easy way to tell whether life has existed on Mars in the past is looking for the remains of micro-organisms. These remains will be composed of organic material that is composed of carbon compounds. However, carbon compounds can be produced by other methods than biochemical reactions (which is one of the reasons why scientists dispute the fact that ALH 84001 showed there was life on Mars). Fortunately, by looking at the different isotopes of carbon that make up the carbon compounds, you can tell whether they were produced by life, since organisms use the 'lighter' carbon-12 preferentially over the 'heavy' carbon-13.

A photograph of the fully deployed Beagle 2.
© Beagle 2.

By burning carbon compounds that are taken from rocks on the surface and examining the carbon dioxide that is produced, scientists will be able to determine the isotopic composition of the carbon, and so discover whether life existed. Considering that the incinerator and mass spectrometer required to perform this experiment have to be fitted in a 6 kg science package, and that they would normally weigh dozens of times as much in a normal laboratory, you can begin to appreciate how much work the Beagle 2 team have put into the lander.

The one experiment that will attract the greatest attention from the public is the search for methane in the Martian atmosphere. Methane is solely produced by biological processes, and is quickly destroyed by light. Therefore, if any methane at all is found in the atmosphere, it means that life exists on Mars right now. The equipment used to perform this experiment has already proven its worth in helping us understand the process of global warming, and perhaps it will make similarly ground-breaking discoveries on Mars.

One fact remains certain: if the Beagle 2 manages to prove the existence of life on the red planet, it will be no less an achievement than its namesake attained nearly two centuries ago.

This article was adapted from Adrian Hon's 'Red star at night, Britain's delight' Daily Telegraph Young Science Writer of the Year (1999) prize-winning entry.