

Briefing notes on Damien Hirst Beagle 2 spot painting

Key facts

- * Damien Hirst artwork on Beagle 2
- * Beagle 2 is the British led spacecraft, for the European Space Agency Mars Express mission
- Beagle 2 will land on Mars in December 2003
- * Artwork is based on a spot painting
- * First artwork on another planet
- * Art with an essential scientific role
- * Does not in any way compromise the scientific aims of Beagle 2

Beagle 2

Beagle 2 is the tiny British designed and built spacecraft which will land on Mars on Christmas eve 2003. It will be launched with the European Space Agency Mars Express mission from Baikonur in Kazakhstan in May. Before Mars Express orbits the red planet, Beagle 2 will be jettisoned and land on the surface where the on-board laboratory will remotely analyse sub-surface soil, rock interiors and atmospheric samples to answer the question "Is there, or was there, life on Mars?"

Calibration target

Beagle 2 must survive the violent stresses of the rocket launch, a journey through space of seven months, the rapid descent through the Martian atmosphere, slowed by a system of parachutes and gas-filled bags, and the final impact onto the surface. What's more the instruments must still work and the results which will be relayed to Earth must make sense to the scientists. Just like a television set can be tuned against a colour

chart, several of the instruments need to be calibrated once on the surface. So a calibration target is fitted to the surface of the lander which the instruments can focus on to check their readings.

Why involve Damien Hirst

What better colour chart to send to Mars than a Damien Hirst spot painting. It has all the necessary ingredients, a selection of colours and can be made small and compact. And it allows the project to include an element of art without in any way unnecessarily using up any of the mass and power budget of the spacecraft, parameters which cannot be exceeded.

How does it work

Although we humans see the chart only in terms of different colours, the instruments will detect other characteristics. The chemical signatures of the pigments reflect the minerals included in them. For example the miniature Moessbauer spectrometer on Beagle 2 will analyse iron in minerals in the martian soil and will help us understand if it is the oxidised form of iron, rust, that makes Mars red. This instrument needs, therefore, before it starts its work on Mars, to be checked against standard "spots" which contain the different forms of iron so that we know it is giving measurements exactly the same as the ones we got from it before leaving Earth. We can compensate for any differences in the two sets of readings.

The Beagle 2 calibration target

The target is mounted on one of the ribs of the lander structure. It consists of an aluminium plate with indentations cut in the metal to accept the characterised and coloured spots. The whole target measures

less than 8 x 8 cm and weighs only 26.5g. The pigments are suspended in a type of clear adhesive which has been proved to be suitable for the space missions. This means, in the jargon of space engineers, that it is 'space qualified'. It will withstand extremes of temperature, the shocks of vibration and does not evaporate under the vacuum of space which could result in deposits of residues on other sensitive parts of the spacecraft.

Mars Colours

And now to the pigments themselves. Red and yellow ochre, naturally occurring iron-containing minerals have been used as colouring agents for many centuries.

At the onset of the industrial revolution, artificial iron pigments were produced as by-products of some chemical processes, though alchemists were producing them earlier. Mars Yellow, a late eighteenth century translation of *crocus martis*, was named as it was a yellow (after the yellow of crocus saffron) iron pigment and Mars was an internationally recognised name for iron. Mars Yellow, when heated, becomes Mars Red. Although the natural ochres were not in short supply, the man-made ones offered a more consistent material. Gradually a whole range of synthetic colours emerged from yellow through orange and red to, violet, brown and finally black - called the *Mars Colours*. The change in colour is due to the relative amounts of the different forms of iron; the black pigment is the most highly oxidised.

The calibration target incorporates nine synthetic Mars iron oxides of different shades of yellow, red, orange etc., these will allow scientists to match accurately the colour of the martian landscape. One of the samples

is a synthetic pigment which was produced at a time when our namesake HMS Beagle was circumnavigating the World

Other colours

The Mars pigments satisfy many of the needs of the Beagle 2 instrument package but not all of them. A white spot was needed for contrast against black; titanium oxide is a white pigment and an important geological constituent. It seems appropriate, the people from Earth should send a natural green pigment; what more appropriate than “Green Earth” a mixture of different oxidation states of iron as a hydrated silicate. A message from Earth, the blue planet, also needs a blue – the Beagle 2 choice is for Azurite a copper carbonate mineral.

Another element which is needed to calibrate the full range of the X-ray spectrometer is molybdenum; this can be found in the rare mineral Wolfenite which is another hue of yellow. The two remaining pigments contain cobalt and manganese, geologically interesting trace elements.

Surface texture of the spots

By dispersing the pigment powder or mineral grains in the sealant, the spots have acquired a relief, giving an excellent way for the depth of field of the microscope to be tested. The surface of the aluminium plate has been left unpolished so there is a wealth of microscopic texture to focus the Beagle 2 microscope.

Additional notes for editors

How Pillinger and Hirst met

In the spring of 1999, Colin Pillinger happened to watch a TV programme which featured Damien Hirst. Seeing one of his spot paintings, an idea developed that the standard calibration target required by instruments working remotely could be replaced with something with much more artistic appeal and yet do the same job.

Alex James and Dave Rowntree, musicians with the rock band Blur were already part of Beagle 2. Blur composed the call sign which will notify Earth that Beagle 2 has landed on Mars. Alex and Damien have been friends since student days. Alex telephoned Damien and the spot painting destined for Mars was born.

Quotes

"I'm sure there'll be a great demand for my work out there - they'll love me!"

[Damien Hirst]

"I am not sure how many people really thought that we would actually deliver this target painting. It has been a pleasure working with Damien and to show that artists and scientists can collaborate."

[Colin Pillinger]

"We had our reasons for wanting various things in the target and created a specification for Damien but the design, layout and final choice of colours from those appropriate was down to him"

[Colin Pillinger]

For more information on Beagle 2

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