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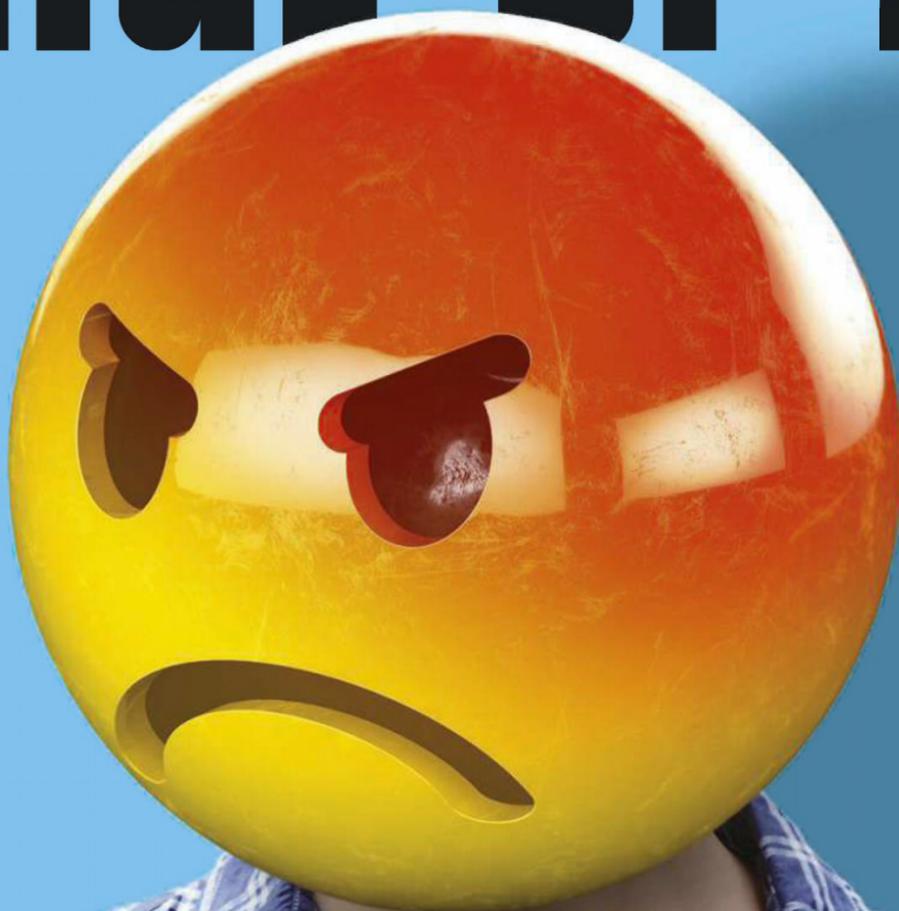
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Dr Stuart Clark astronomer and cosmologist

Horizons

The Voyager mission and the Pale Blue Dot: How the most famous picture in science came to be

One of Voyager's founding scientists Garry Hunt tells astronomer Stuart Clark about the idea behind the image, how it shaped his life and how NASA has changed since the photo was created 30 years ago.

They call it the Pale Blue Dot. It is simultaneously one of the least striking photos you are ever likely to see, yet at the same time, probably the most significant. The only thing of real importance in the image is one single pale blue pixel. Yet the light captured in that pixel is coming from Earth. It's what our entire planet looks like from a distance of around six billion kilometres (four billion miles). It inspired the famous planetary scientist Carl Sagan to write his 1994 book, *Pale Blue Dot: A Vision Of The Human Future In Space*. In it, he wrote, "Look again at that dot. That's here. That's home. That's us."

It was a realisation that even the team who masterminded the picture were not fully prepared for until they saw the image. "We all realised that what this actually shows is that the Earth is no more than a tiny speck among the stars.

It was a very chilling picture," says Garry Hunt, a founding member of Voyager's imaging team. He uses the word 'chilling' advisedly because he says it really made him recognise just how fragile the Earth is. "It really brought it home to us that you cannot go and live on Mars, you can't go and live on Titan, you can't go and live on Enceladus. There is nowhere else we can go," he says.

Hunt became involved in the Voyager mission when he was working at NASA's Jet Propulsion Laboratory in California as an atmospheric physicist. He saw the mission as an opportunity to study the atmospheres of other planets and relate them to Earth. It set him on a career path he has been travelling ever since.

"For many decades, I have been talking to audiences in schools, universities, and businesses – you name it – I'll talk to anybody about climate change. And the first picture I always show is this picture of the Earth as a blue dot."

SNAPPING THE SOLAR SYSTEM

In 1990, Voyager 1 had already encountered Jupiter, Saturn and Titan, and was heading into deep space. The imaging team continued working together for Voyager 2's encounter of Uranus and Neptune, but they chose Voyager 1 to take the picture on 14 February because it had the best vantage point to snap the photo. The Pale Blue Dot was just 1 of 60 images taken that day that were designed to capture the planets of the Solar System (Mercury and Pluto could not be imaged).

"The mission was essentially over by that time and we wanted to finish with something really special," says Hunt. "The planets were all in perfect alignment and we thought if we could take the family portrait of all the planets it would be wonderful. The imaging team

The iconic Pale Blue Dot image was photographed 30 years ago. The image seen here is a version that was remastered by NASA to mark the occasion

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"We all realised that what this actually shows is that the Earth is no more than a tiny speck among the stars"

said, this is our last thing, then we will turn the camera off.”

And NASA agreed but the team had to wait for the results. Although the image was taken in February, it could not be downloaded immediately because NASA's Magellan and Galileo spacecraft were using all the bandwidth of the NASA Deep Space Network. Only in March could the images begin to be downloaded. In total, there were 640,000 pixels of data to be downloaded. That might not be much by modern image standards but when the spacecraft is six billion kilometres away and the antenna only has a few hundred watts of power, it takes a long time. By May, all the images were received, processed and made public.

The twin Voyager spacecraft left an enormous scientific legacy. They discovered the volcanoes on Jupiter's moon Io, and the underground ocean on

Europa. They gave us our first close-up look at Saturn's rings and the complex way they behave.

Looking to the future, Hunt thinks that one destination is crying out for a return visit. “Oh I'd go for Titan without question,” he says. This is because Titan is thought to be similar to Earth before life began. The Voyager team analysed Titan's thick atmosphere in 1980, then the European Space Agency's Huygens lander touched down on its surface in 2005. But Hunt thinks there is much more to do because of what it could tell us about the primordial Earth. “There is no question that we've got to have a jolly good look at Titan,” he says.

GOLDEN OPPORTUNITY

Hunt recognises that his stint on the Voyager project happened at a golden time. Space exploration was in its infancy,

and there was a tremendous pioneering spirit that pervaded the endeavour at that stage. Now, he says, NASA is different. “It's much tougher now because money is tight. It was tough in my day, but it's very much tougher now. The joy of JPL was the ability to experiment, to try, to learn, to make mistakes. That's more difficult now.”

And it is more than just money that is invested in these missions: it can be people's entire careers. “I gave my first interview to the BBC about Voyager 48 years ago, and here I am this morning doing another interview about Voyager. When you go and watch a spacecraft launch, just imagine if it failed on the pad or some other aspect went wrong. People's careers are destroyed.”

Luckily that did not happen for Voyager, and in the three decades since the Pale Blue Dot was first released, its significance has only grown.

“I have been battling climate change since my research days in the late 60s and early 70s. In the 90s I was involved in the debate with businesses over whether climate change was important. And I lost. And I was horrified that I lost. But now, people are suddenly realising what is actually happening,” says Hunt. “The whole planet has got to work together and the Voyager picture is almost the badge that we should be looking at. It is certainly the Valentine's Day card that Voyager is giving to everyone, and saying, ‘This is where you are, take note. You are a very frail fragment amongst all the stars.’”

by **DR STUART CLARK**

Stuart is an astronomer, cosmologist and science writer. His new book, Beneath The Night (£14.99, Faber), comes out in October this year.