

Culture

SCIENCE: A NEW VIEW OF HOME

Viewing Earth from outer space changes an astronaut's perception for good. Our planet looks fragile and mysterious, a precious jewel set in unimaginable blackness

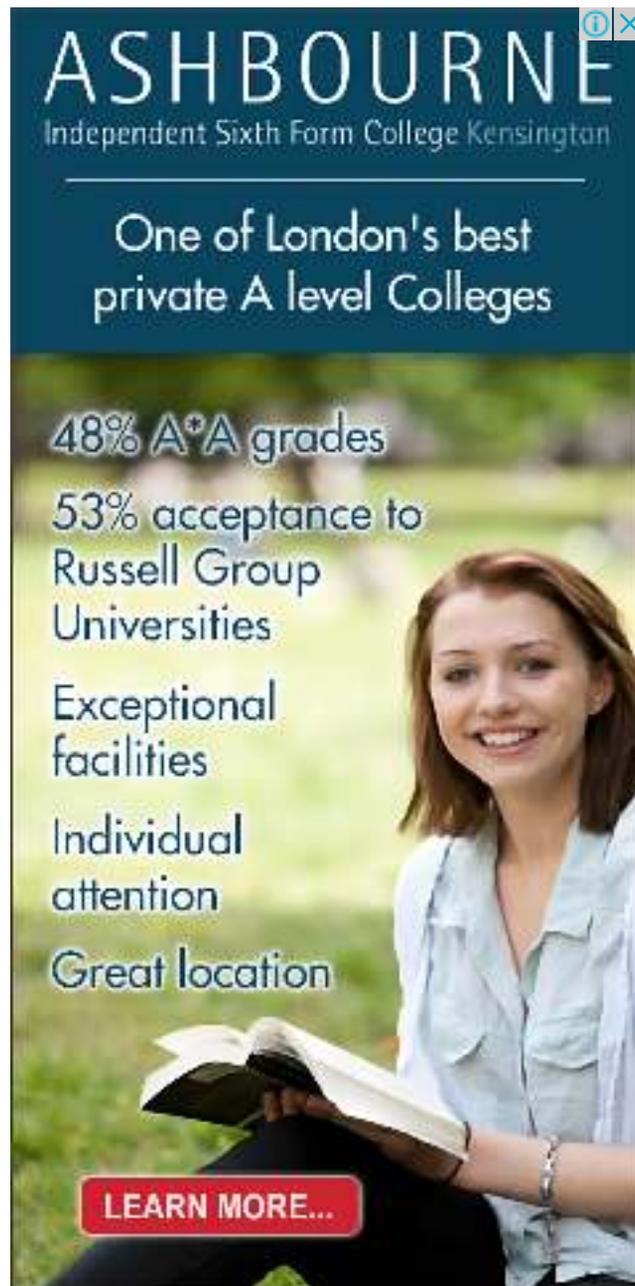
Martin Redfern | Sunday 21 April 1996 00:02 |



Once a photograph of the Earth, taken from the outside, is available... a new idea as powerful as any in history will be let loose.

Fred Hoyle

The Astronomer Fred Hoyle, now Sir Fred Hoyle, wrote those words as long ago as 1948. It was a remarkable prophecy, the impact of which we are still feeling today, 35 years after the first manned space flight. Cheap reproductions of photographs of our planet from space are so widespread now that we almost take them for granted. But that does not diminish their practical and psychological impact. They have become indispensable tools for weather forecasters and map makers, environmentalists and prospectors, global statisticians and spies. They have also stimulated a sense of awe and wonder in millions and especially in the few hundred astronauts and cosmonauts who have seen the view first-hand. It is a perspective on our planet that makes it seem very fragile and alone in the vast blackness of space.



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It is hard to pinpoint exactly when that first image of the Earth as a whole, taken from space, was seen here. Even in 1948 Fred Hoyle must have suspected that his prediction would become a reality, since captured German V2 rockets were already being used in the US to make sub-orbital flights 60 or 70 miles above the ground and return blurry photographs and even cine sequences of the clouds beneath. The first weather satellite, Tiros 1, was launched in April 1960 and returned 23,000 photographs. But that and all the other craft in low-Earth orbit were still too close to the planet to take it all in at once. They extended our horizons, but the cameras had hardly left home. In 1966, the US weather satellite Essa 1 became the first to be able to fit the entire globe into a single

picture, from its orbit 900 miles up.

It was 35 years ago this month that the Russian cosmonaut Yuri Gagarin became the first person to see the home planet from outside the atmosphere for himself in his single orbit of the Earth. Again, seen through the narrow porthole of Vostok 1, the view was a comparative close-up. The true impact of seeing the home planet as a tiny, isolated ball did not come until Christmas 1968 when Frank Borman, Jim Lovell and Bill Anders orbited the Moon in Apollo 8. Their live broadcast on Christmas Eve, according to Jim Lovell, was heard by the largest audience that had ever listened to a human voice. Their photograph of "Earthrise" from above the Moon became the image of the era. Since then, more than 3,000 men and women have been able to admire the view from space first-hand, and a surprisingly large number of them admit that the experience has had a profound and lasting effect on them.

Astronauts and cosmonauts go through a rigorous selection procedure. Not only are they intelligent, highly educated and physically fit, but they must also conform to rigorous psychological requirements. The last thing anyone needs in the middle of a mission in a cramped space capsule, surrounded by the vacuum of space, is an unstable crew member suffering a fit of claustrophobia or panic. The term "the right stuff" aptly describes the mettle US astronauts are expected to be made of. Many of the first were already Air Force test pilots, used to keeping their cool and thinking fast. In the more automated era of the Space Shuttle, crew members can also be scientists, experts in their chosen field, trained to lend a hand in flying the spacecraft. When you hear them over the in-flight radio links, they are all concentrating on the job in hand, speaking in jargon and keeping words to a minimum. At the post-flight press conferences they are presented as confident and competent, playing down the tension and excitement and only adding jokes and personal comments that have been scripted and vetted by the space agency. But speak to many of them in private after the initial publicity has died down, and they tell a different story.

It's even true of astronauts who have flown on recent US Space Shuttle missions - as routine as space flight has ever been, or is likely to get for several decades. The experiences of Sam Durrance are typical. A successful astrophysicist at Johns Hopkins University in Baltimore, he trained as a mission specialist to fly with the Hopkins Ultra-violet Telescope on the Shuttle. The instrument was all ready to fly in 1986 when the disastrous explosion of the Shuttle Challenger set the whole programme back by several years. He finally took off in Columbia in December 1990 after no fewer than five launch delays. "To say that they were frustrating," he says, "is an understatement." But the day

(or rather the night, for this was a night launch) finally arrived; among the multitude of memories, the moments Durrance picks out, are the salty sea breeze on the launch pad as he waited to climb aboard; the feeling of calm anticipation when lying on his back awaiting the final launch command; the creaking and groaning of the whole structure as the main engines ignited and the shaking acceleration as the solid rocket boosters lifted it from the pad.

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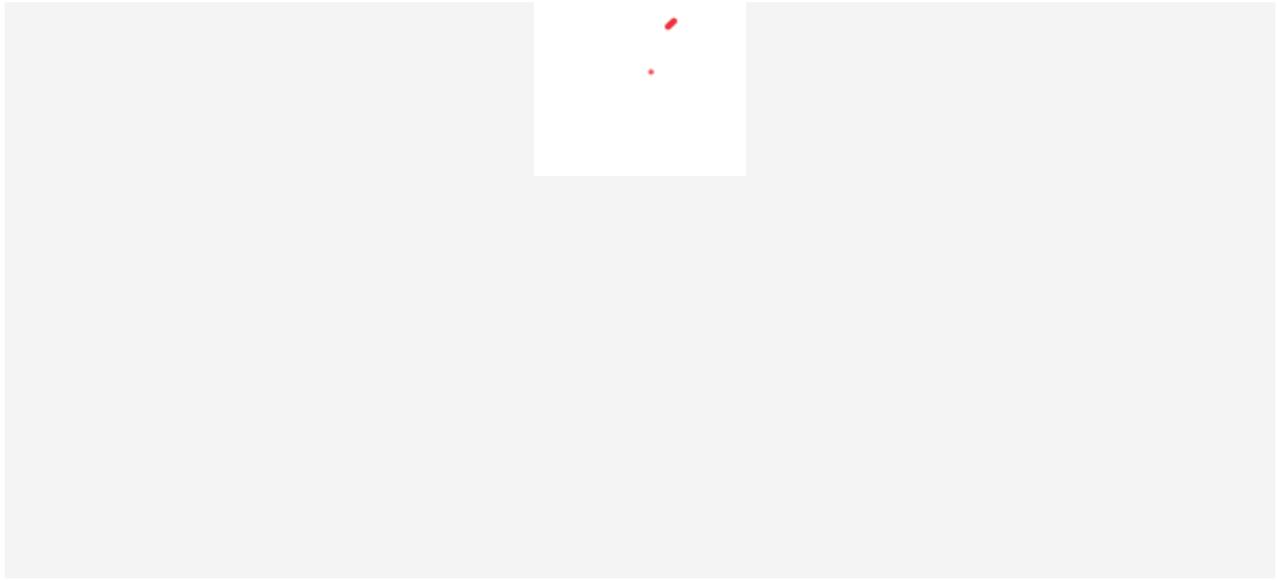
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With that, apparently, comes a feeling of relief that you are at last on your way, and relief again two minutes later when the solid rocket boosters finish their task and break away. Once ignited, like fireworks, these cannot be extinguished (it was a leak in one of them that destroyed Challenger). Only a few minutes later, the noise and acceleration die away and suddenly, almost surprisingly, you discover you are weightless. Then, at last, there is time to look at the view. This is the experience Durrance will never forget.

"That's the one thing nobody can prepare you for," he said. "You've seen pictures and you've heard people talk about it. But nothing can prepare you for what it actually looks like. The Earth is dramatically beautiful when you see it from orbit, more beautiful than any picture you've ever seen. It's an emotional experience because you're removed from the Earth but at the same time you feel this incredible connection to the Earth" - and here his voice falters - "like nothing I'd ever felt before."



FOR MANY of the Apollo astronauts the ties to Earth were, if anything, even stronger. Their journey to the Moon took them much further from the home planet than the Shuttle can ever go - and the further they went, the smaller and more delicate the Earth appeared and the greater the sense of darkness around it.

As I looked out into space I was overwhelmed by the darkness. I felt the flesh crawl on my back and the hair rise on my neck.

William Pogue, Skylab 4

It was a texture. I felt like I could reach out and touch it, it was so intense. The blackness was so intense.



Charles Duke, Apollo 16

But it has always been the image of the Earth itself that has dominated the eyes and minds of astronauts. Not only does it excite their wonder but also their sense of compassion.

The Earth was absolutely round. I believe I never knew what the word 'round' meant until I saw the Earth from space. The Earth was small, light- blue and so

touchingly alone, our home that must be defended like a holy relic.

Aleksei Leonov, Voskhod 2 and Soyuz 19

It is this impression, more than any other, that crops up again and again in the astronauts' accounts. The Earth is not as vast, solid and invulnerable as it seems when you are standing on it. It is a delicate, precious jewel - and it is all we've got. As the various Apollo crews drew further and further away, their homesickness seemed to grow.

The Earth reminded us of a Christmas tree ornament hanging in the blackness of space. As we got further and further away, it diminished in size; finally it shrank to the size of a marble, the most beautiful marble you can imagine. That beautiful, warm, living object looked so fragile, so delicate, that if you touched it with a finger it would crumble and fall apart. Seeing this has to change a man, has to make a man appreciate the creation of God and the love of God.

James Irwin, Apollo 15

When Jim Irwin saw the Earth from Apollo 15, the impact completed a transformation that was already beginning in his mind. Soon afterwards, in 1972, he left the astronaut corps and founded what he called the "High Flight" ministry. He travelled the world sharing the religious experience he had had in space, becoming known as the Moon Missionary.

In his book, *A Man on the Moon*, writer Andrew Chaikin suggests that changes such as those that overtook Jim Irwin did no more than bring out tendencies that were already in the psychology of the astronauts. #Irwin, for example, was already a committed Christian. According to Apollo 14 astronaut Stu Roosa, "space changes nobody". He admits you can't see the earth from space and not be affected, but it doesn't change you. "You bring back from space what you bring into space," he says.

Certainly, a "where-are-they-now" list of the Apollo astronauts turns up the sort of range of life situations you might expect from a group of top professionals. For some, their present still reflects their Moon mission. Many still make public appearances at schools, colleges and on the banquet circuit. Some stayed with Nasa for many years. John Young clocked up a further five space flights and only stopped when the Challenger disaster delayed his next mission. Alan Bean spends his time painting scenes from the Apollo missions. Many Apollo astronauts became successful executives, often in aerospace companies. Bill Anders was listed among Fortune magazine's top 10 highest-paid chief executives. Of the Apollo 11 astronauts, Mike Collins became the first director

of the National Air and Space Museum; Neil Armstrong kept a surprisingly low profile and became an engineering professor in Cincinnati; Buzz Aldrin entered a period of severe depression and alcoholism, but he climbed out of it and is still devising novel space transport systems.

But if space flight only confirms what is already in their psychological make-up, many astronauts must have had a very strong sense of the fragility of the world and the interdependence of all of us upon it. What emerges is a vision of the concept of world unity - "One World"-ness. A Saudi Arabian prince flying as a guest on the Space Shuttle Discovery in June 1985 summed up what so many have felt:

The first day or so we all pointed to our countries. The third or fourth day we were pointing to our continents. By the fifth day we were aware of only one Earth

Sultan Bin Salman al-Saud, Discovery 5

That feeling of unity is not simply an observation. With it comes a strong sense of compassion and concern for the state of our planet and the effect humans are having on it. It isn't important in which sea or lake you observe a slick of pollution or in the forests of which country a fire breaks out, or on which continent a hurricane arises. You are standing guard over the whole of our Earth

Yuri Artyukhin, Soyuz 14

BY THE 1970s, the image of the Earth from space had become a symbol of the new global ecology movement. Until that time, many had thought of pollution as a local problem - a thick smog that would blow away, or an oil slick that would disperse in a limitless ocean. Suddenly, the Earth had limits and the connectedness of everything on it. It had to activity within the one delicate, blue sphere. w of how acidic gases from power stations in one country could fall as acid rain and damage the lakes and forests of another nation. It was then that the possibility of global warming as a result of the burning of fossil fuels and the destruction of forests began to be taken seriously. It was observations from space that first showed a hole in the ozone layer above Antarctica - though it took measurements from the ground to make people believe what the satellites showed.

The British space scientist and ecologist Professor James Lovelock believes that image of the Earth as a tiny blue ball with swirling clouds has become an icon

almost as powerful as the cross or the crescent. It has been a powerful influence in the development of an ecological concept that he has called Gaia. The Gaia hypothesis, which Lovelock developed in the 1970s, proposed that the Earth acts like a single self-regulating system, almost an organism, with the atmosphere, the oceans or hydrosphere and life - the biosphere - all working together to preserve constant conditions on the Earth as a whole. Thus the Earth has been able to remain hospitable to life for three billion years, even though the Sun's output has increased dramatically over the same period.

Strangely, Lovelock's work had begun in the Sixties - just before the first images of the whole Earth appeared - with attempts to detect the presence of life on Mars and Venus. Thinking about the global signatures life might leave on the composition of a planet's atmosphere, producing otherwise unstable oxygen and hydrocarbons, Lovelock began to look at our own planet in the same way. He remembered the words of geologist James Hutton, in a talk to the Royal Society in Edinburgh in 1788. "I consider the Earth to be a super-organism and its proper study should be through its physiology."

The image of the whole Earth came at a critical time for the science that studies the planet's physiology: geology. For decades, that science had concentrated on the details of rock deposits, the microscopic mineral structure of rocks and the morphology of fossils. Space flight made it possible to begin to understand the Earth as a whole, global surveys revealing the gravitational and magnetic anomalies that give clues to the topography of the ocean floor and the slowly circulating mantle beneath, on which the great continents float like mighty rafts. With the pictures came final acceptance of the theory of Continental Drift.

Out of the images of the Earth, concepts such as "deep ecology" were born - the ecology not just of one small habitat but of all the interactions and ramifications that affect it, including the effects of humans. Suddenly, human beings were no longer the dispassionate observers of it all; they were part of the system, part of the planet - and, in the new ecology, they have a compassionate role to play.

During a space flight, the psyche of each astronaut is re-shaped; having seen the Sun, the stars and our planet, you become more full of life, softer. You begin to look at all living things with greater trepidation and you begin to be more kind and patient with the people around you. At any rate, that is what happened to me.

Boris Volynov, Soyuz 5 and 21

Perhaps the astronaut who was most deeply changed by his experience in space

is Edgar Mitchell, who flew to the Moon on board Apollo 14. On the way back, he had a very powerful revelation.

On the return trip home, gazing through 240,000 miles of space towards the stars and the planet from which I had come, I suddenly experienced the universe as intelligent, loving, harmonious.

Edgar Mitchell, Apollo 14

Ever since Mitchell returned from that mission in 1971, he has been trying to understand what happened to him in that flash of understanding. He finds it strange that what he saw with his own eyes made him utterly convinced that there is more to the Universe than meets the eye. He sought out researchers studying the phenomenon of consciousness, and in particular what are often described as higher states of consciousness. He found out all he could about the things most scientists do their best to avoid; reports of clairvoyants, telepathy, the bending of metal by mind alone, with other things commonly lumped together and called the paranormal.

To bring a more rigorous approach to such phenomena, he founded the Institute of Noetic Sciences in California in 1973. Rather than simply collecting together unsubstantiated anecdotes, this aims to test observations against the fundamental assumptions of science, looking for anything that cannot be explained away using present scientific methods but which might expose a chink in the armour of science. Mitchell's conviction in founding the Institute was that it would lead to new metaphysical assumptions so profoundly different from those of reductionist science that they would embrace the feelings of love, harmony and purpose that he himself experienced in space.

We went to the Moon as technicians, we returned as humanitarians.

Edgar Mitchell, Apollo 14

The experiences of astronauts may simply be the natural psychological impact of a peak event at the peak of a very special career. They may have sent the space-farers slightly insane, or they may just have brought out what was within them already. But the images with which they returned seem to have touched chords within us all, and become symbols of our age.

! All quotes are taken from 'The Home Planet' by Kevin W Kelley. The book is now out of print, but was published in Britain by Queen Anne Press in 1988 and by Headline in 1991. It should be available from good libraries.

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