opening extract from

Moon

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Apollo 11's official badge, known as a patch.

LIFT OFF!

This was the moment of supreme danger. In their tiny module at the tip of the gigantic *Saturn V* rocket sat three astronauts. Below them lay smoking tanks packed with thousands of tonnes of rocket fuel and liquid oxygen.

TARGET: MOON

'All engines running!' Sheets of red, orange and white flame spewed forth from the five enormous engines, surging hundreds of metres to the side and driving thick clouds of smoke and dust into the warm Florida air.

A leak, the smallest spillage, a careless check or faulty calculation – one error and the rocket would transform instantly into a gigantic bomb capable of vaporizing the rocket and the steel of the gantry, destroying the launch pad and incinerating the surrounding landscape. The astronauts would not even have time to cry out. For a few heart-stopping moments, as the engines strained and roared, the ground shook and around the world millions watched on television in silent awe. It looked as if the task of raising 3,000 tonnes of rocket into the air was too great, even for those massive engines.

'Lift off! We have lift off!' The relief in the voice of the NASA official was almost tangible. Slowly, incredibly slowly at first, the rocket rose from the ground. The gantry arms swung back. 'Thirty-two minutes past the hour, lift off on *Apollo 11*!' cried the commentator. Then, seconds later, 'Gantry cleared!'

One of the greatest missions in human history was under way. *Apollo 11* was going to the Moon.

Apollo 11 crew check mission details over breakfast.

The Moon men: Neil Armstrong, Michael Collins and Buzz Aldrin.

Blast off! Saturn V inches skywards off the launch pad.

THE *APOLLO* PROGRAMME

By the summer of 1969 the *Apollo* programme had been in place for eight years. It began in May 1961, when US President John F. Kennedy announced confidently, 'I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the Moon and returning him safely to the Earth.' It was a tall order. The first American in space, Alan B. Shepard (1923–98), had made his voyage only twenty days earlier.

America's National Aeronautics and Space Administration (NASA) was made responsible for the programme and given a massive boost in funds and personnel. During the 1960s, the first ten *Apollo* missions tested every step of the journey except the last – that of actually putting a human being on the surface of the Moon. This was the momentous task of Neil Armstrong (b. 1930), Michael Collins (b. 1930) and Buzz Aldrin (b. 1930), the astronauts in the *Saturn* rocket that was now gathering speed on its famous journey.

US President John F. Kennedy, the politician who launched the Moon mission.


The New York Times

MEN WALK ON MOON

ASTRONAUTS LAND ON PLAIN; COLLECT ROCKS, PLANT FLAG

Just about every newspaper in the world made the Moon landing its headline story.

THE MOON

But what exactly is the Moon? The second brightest object in our sky and the Earth's only natural satellite, it looks round. Actually, it bulges on the side nearest to us. Even with the naked eye we can make out the lumps and bumps on its surface: for billions of years, having no atmosphere to protect it, the Moon has been bombarded with debris from outer space. Crashing in at great speed, it has left a maze of Moon craters.

MOON MAKING

Only fairly recently have scientists worked out for certain how the Moon was formed. Around 4.6 billion years ago, before the Earth was really solid, a slightly smaller but similar object bumped into it. It was not a head-on collision but a glancing blow, after which the smaller object spun off into space. The debris created by this galactic accident went into an eccentric orbit about 384,000 km from the Earth. Over time it came together to form the Moon.

IRON AND WATER

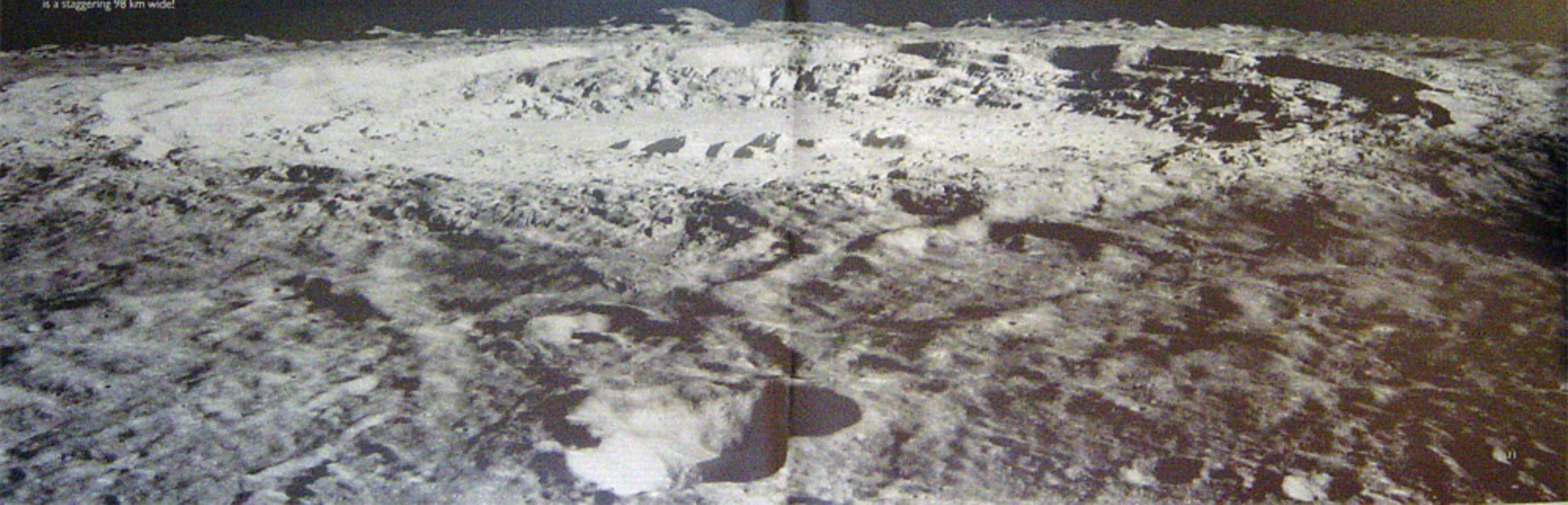
The collision theory explains why the Moon contains so little iron, the main ingredient of the Earth's core. The bits and pieces that formed the Moon came from the outer layers of the Earth and the object that hit it. The water on the Moon's surface (a tiny amount in the form of ice) probably arrived with incoming comets and meteoroids.

DUSTY DEATH

With a radius of 1,738 km, the Moon is much smaller than the Earth and has only one-sixth of its gravity. That is why astronauts on its surface can leap huge distances. It has almost no atmosphere, certainly no oxygen, and it has never hosted any form of life. Temperatures on the surface range from a scalding 127°C in the sunlight to a super-chilling -173°C in the dark. The battered and rocky surface is thick with dust.

As the Earth turns, the Moon's gravity causes our seas to surge with tides. The Moon rotates at the same rate as it orbits the Earth, so we always see the same sunlit face: whether this be full Moon, half Moon or another phase depends on the alignment of the Sun, Earth and Moon. With the Moon circling the Earth once every 27.322 days, not surprisingly it became the basis of the first calendars.

Some impact: the crater known as 'Umb of Copernicus' is a staggering 98 km wide!



MOONLIGHT

Nothing has fired the human imagination quite like the mysterious Moon. Over the centuries, its gleaming radiance has inspired wonder and worship, pictures and polkas, love and loss, fairy tales and horror movies, calendars, rituals and festivals…

Love and moonlight go hand in hand: *A Carnival Evening* by the French painter Henri Rousseau, 1886.

'And then the moon like to a silver bow new-bent in heaven, shall behold the night of our solemnities.'

WILLIAM SHAKESPEARE

LIGHT IN THE DARK

The Moon is our friend. When the world is black and dangerous, it comes to our rescue with its silvery light. How bright it is, too! One has only to walk down a remote country road under a full Moon to realise why, in ancient times, travellers frequently journeyed by moonlight.

MOON LOVERS

Composers, artists and writers in all places and at all times have taken their inspiration from the silvery disc that fills the world with its eerie beauty. Because it shines at night-time, the Moon is closely linked to love. The lovers in Shakespeare's *A Midsummer Night's Dream* meet at night; and Romeo, the most famous lover of all, swears by the Moon to remain true to Juliet: 'Lady, by yonder blessèd moon I vow…'

CYCLE OF LIFE

We are stirred by the Moon's ceaseless regularity. Day after day, month after month, year after year, it waxes larger, shines at the full, then wanes to a sliver before beginning the sequence once more. The pattern reflects the seasons and even life itself. The monthly cycle mirrors human fertility, too, so that primitive people worshipped the Moon as the bringer of new life.

For thousands of years the Moon was the measure of all time longer than twenty-four hours, and many religious festivals are still fixed by the Moon. But it has its tricks, too. Tradition says that at the full Moon sane people go mad and men turn into wolves. And this goddess of the night occasionally allows her brilliance to be eclipsed, handing over the world to the powers of darkness and evil.

John Simmons' *Hermia Surrounded by Fairies* (1861) in *A Midsummer Night's Dream*, standing forlorn in the moonlight.