



Secrets of Space

CAHOOTS

Once there were two girls called Suni and Mae,
who became fascinated, one might even say obsessed
with everything to do with Space.

They covered their bedroom walls and ceiling with stars
that glowed in the dark.

Sometimes, they would just stare out of the window
as darkness fell, and watch as the real stars began
to shine, and they began to ask questions.

‘How did they get there?’

‘How far away are they?’

‘One day we’ll find out Mae.’

‘What?’

‘*The secrets.*’

‘The secrets Suni?’

‘The secrets of Space.’

Suni and Mae began to read a lot of picture books about their favourite subject. They discovered that human beings throughout history have had lots of different ideas about our solar system and the place of planet Earth within it. They discovered that for thousands of years humans thought the Earth was at the centre of everything that existed.

They thought this because every morning, the sun rose and every evening, the sun set. It looked and felt as if they were standing still and the sun was going round and round them.

But time turned over and over until there was a great invention that changed everything. The Telescope!



Time turned over and over and telescopes got bigger and bigger - allowing people today to see the planets in our solar system, the beauties and the beasts, in all their glory.

Mercury - 36 million miles from the Sun.
So close to the Sun,
You'd burn to death - really fast.

Venus - 67 million miles from the Sun.
Bright and lovely to behold,
But beware - it's deadly gas.

Earth - 93 million miles from the Sun.
The perfect place for life.
Not too hot, not too cold, beautiful and blue.

Mars - 142 million miles from the Sun,
Is rust and dust and red of hue.

Jupiter - 483 million miles from the Sun.
A world of storms that spins so fast,
You could never stand still.

Saturn - 886 million miles from the Sun.
It's lovely rings - so peaceful and so calm,
Are really rock and ice
Flying fast enough to kill.

Uranus - 1.8 billion miles from the Sun.
Sixty times bigger than Earth,
A not very nice giant of gas.

Neptune - 2.8 billion miles from the Sun.
So far away, so far.
Lonely and cold it hides in the dark,
It's story yet to be told.



The movements of the planets were studied and a great secret was revealed.

A new truth. We are not at the centre, standing still. We never were.

We are part of something else, something bigger.

Part of a system of planets, a solar system, moving around the Sun.

Which means we are *flying*, all of us, flying incredibly fast through Space on a spaceship called Earth!

The idea that Earth itself is a kind of spaceship flying through Space was amazing to Suni and Mae, and it raised a question many scientists in the past struggled to answer.

If we're really flying through Space, and spinning at the same time at incredible speed, why aren't we just thrown off the surface of the world?

There must be something holding everything in place - a power.

A secret super power no one can see called *gravity*.

Every single thing with physical mass - the Sun, the Earth every person on Earth is affected by gravity.

'Just imagine', said Suni one evening.

What would happen if there was no gravity? Without the super power of gravity the rain wouldn't fall down. It would go 'up', away into Space and the Earth would lose all its water.

Mae was shocked. 'And if the rain didn't fall Suni, nothing would grow. There'd be no food to eat and before long there'd be no sky.'

'No sky?'

'Because all the air would drift into space. Our beautiful garden would fade away. There'd be no food to eat, no air to breathe, and everyone on Earth would-'

'Oh my.' Said Mae

And they both realised in that moment why gravity is so important to us all.



In their room at home the two girls dreamt of going into Space on a rocket like Apollo Eleven, which they had seen on the TV.

'But', said Mae, 'If gravity keeps everything on Earth, how do we escape it and reach outer Space like Apollo Eleven?' The problem was always going to be power. Suni painted the words *Apollo Eleven* on the side of a boomerang and used the power of her arm. She threw it out of the window, but it came back and nearly hit her on the nose.

Next they made a paper plane with a balsa wood spine and used the power of an elastic band. It didn't work. Gravity was doing its thing. But then came their best plan.

They made their very own homemade rocket, with the words *Apollo Eleven* written on the side. The rocket was made of Sellotape and glue, *lots* of glue which got everywhere, but they didn't care. It was one small step, one giant leap, and in their minds, it was just like the real thing.



The second stage tanks are now pressurised

35 seconds and counting

We are still go with Apollo 11

30 seconds and counting

Astronauts report: Feels Good.

T minus 25 seconds

20 seconds and counting

Not anymore!

T minus 15 seconds

Guidance is internal

12 - 11 - 10 - 9 -

Ignition sequence starts

6 - 5 - 4 - 3 - 2 - 1 - 0!

All engines running

Lift off!

We have lift off!

32 minutes past the hour - lift off on Apollo 11.

The girls discovered that the secret to escaping Earth's gravity was firstly the imagination of human beings. The idea of space travel had to be thought over before it could become fact. In reality Apollo Eleven needed raw power - thousands of tonnes of rocket fuel.



Since 1969, when Neil Armstrong first stepped upon the Moon, hundreds of men and women have worked towards the dream of building a living city in Space.

One night there was a blackout and all the lights went out in the street where Suni and Mae lived. They lit candles because it was properly dark. They thought it was lovely but their Mum was annoyed because her computer crashed and their Dad was annoyed because he couldn't watch the TV. But Suni and Mae, and their Nan who lived with them, thought it was great fun. Real darkness - like in Space.

The girls couldn't sleep, so they looked out of the bedroom window, and because there were no other lights on, they could see more stars than they'd ever seen before. Just then, a light passed over head.

'A shooting star?' Asked Suni.

'Too close.' Said Mae.

'A plane?'

'Too far!'

Then they realised that they'd just seen the International Space Station. A city in Space.

'Cool', they said in perfect unison.

They began to wonder what it would be like to be up there, in Space, in a spacecraft the size of a football field, 250 miles above their street? Going round and round the Earth once every ninety minutes at 17,000 miles per hour.

'What would it be like to be weightless?' Wondered Mae.
To sleep in a sleeping bag tied to a wall in a place where there is no up or down?

What secrets would be revealed when it's possible to see sixteen sunsets and sixteen sunrises in a day?

To see the dancing lights of the auroras?

To see whole continents and oceans?

What would it be like to float like a feather
to the window of a spacecraft
and look back
at Earth?



They were so inspired by these questions that together they wrote a song.
Mae Wrote the words and Suni wrote the tune, but they sang it together,
like real pop stars.

Through the window of a spacecraft I saw a simple truth.

Our home the Earth is a fragile home, alone in a bucket of black.

I raised my hand to the window and the Earth it vanished behind.

I was overwhelmed by a feeling, reeling, as if I'd been attacked.

Tears appeared upon my cheeks - I felt weak at the knees and the heart,

I shivered with emotion - saw the rivers and the oceans,

The city lights in the dark.

I saw whole the world breathing,

The whole planet breathing,

Like one living thing,

Worth singing about.

When the astronauts of Apollo Eleven returned, they were filled with a new awareness. The sky which seems so endless when seen from Earth looks so different from Space. They saw how delicate and fragile our world really is and that we need to find new ways of living to protect the children of the Earth like Suni and Mae.

The picture of the lonely blue ball
spinning in the dark
became the symbol of our age.
Humans went into Space
looking for the Moon and the stars,
but the biggest secret we discovered
was in ourselves when we looked back - at home.



In their minds Suni and Mae could soar through Space like real astronauts. Then they'd fall back down to Earth. Back to their bedroom, playing music, watching TV shows like Star Trek. It was this show that sparked a new obsession in Suni and it led to a very rare argument.

'Whoa!' Shouted Suni suddenly.

'What?'

'What if -'

'What Suni?'

'If - we could travel through space and TIME - go back say to the 1960's.'

'You mean before Mum and Dad were born?'

'Groovy.'

'What's groovy Suni?'

'It's a word they used to use in the sixties Mae, meaning wonderful.'

'But we wouldn't be born Suni. We wouldn't exist. There's no going back in time - it's not possible.'

'Then what about travelling forward in time like - in Star Trek? Cool.'

Time travel is possible Mae - I know it is.'

'No it isn't.'

'Yes it is'

'No it isn't'

'Yes it is.'

This kind of argument could carry on for a long time, but Suni was determined to unravel the secret and was determined to prove time travel was possible - if only in theory.

She did a lot of research and this is what she discovered.

A camera needs light to take a picture.

Because light is the fastest thing in the Universe it seems to take no time at all to create a photograph.

But it does take time for light to travel anywhere - from the Sun - to all of us on Earth.

Eight point three minutes.

So, to get to the Sun in eight point three minutes you'd need to build a spaceship that could go 700 million miles per hour - which is the speed of light.

If Mae was to travel on a ship like that, for 4 light years, when she came back to Earth, her sister Suni, would be at least 90 years old. Which as Mae exclaimed was absolutely MIND BLOWING.

The secret is this, that the faster you travel the slower time passes for the traveller. So in theory time travel *is* possible!

Suni and Mae were thrilled when they heard these words by Stephen Hawking - the famous scientist.

'My name is Stephen Hawking. We are all time travellers journeying together into the future.'

'But let us work together to make that future a place we want to visit. Be brave, be determined - overcome the odds.'

Time it seems, really is a mystery that still has many secrets, and those secrets are held by the stars.



'One day, when the girls were thirteen, their Nan died. Of course they were both really upset. But their Mum knew them better than anyone else and to help console them she gave them a new book she thought might help them.

One night Suni read the book to Mae. It was called Stardust.

'Once upon a time, before Earth even existed there was a huge cloud in Space, made of gas and dust. Over time, gravity pulled the gas and dust together into a dense ball. It started to spin - faster and faster and more gas and dust from old stars were drawn to its surface so it got bigger and bigger until a star was born.

It started to burn and produce huge amounts of heat and light.

It shone for billions of years but slowly, very slowly it started to run out of fuel. It began to die.'

'I don't want it to die.' Said Mae sadly.

'Stars don't live for ever', said Suni. 'They live and die, just like us. Some stars die quietly - in their beds.'

'Like Nan?'

'Yes Mae. But other stars, do something else.'

'What?'

Suni read on.

'They collapse inwards, pushing all its material together until there is a massive explosion, a Supernova, which lights up the whole galaxy.

The star is changed, changed utterly.

The explosion spreads stardust across the galaxy. Almost everything on Earth - your house, your room, Mum and Dad-'

'And Nan?'

'Yes Mae - everyone is made of stardust, from old stars that have changed. Changed utterly. That live and die to make new stars. New worlds. Over and over.'

'For ever and ever?' Asked Mae.

'Maybe', thought Suni, but she wasn't sure because that really is a secret of Space.



By the time the sisters were fourteen their room was full of things they'd been making and not throwing away. Their Mum complained that she couldn't even open the door because the International Space Station was in the way.

Over the years they'd covered every inch of wall and ceiling with homemade stars. At Christmas they covered their whole house with stars, because they became aware that the Universe was getting bigger all the time.

Perhaps the biggest secret of all is how large the Universe really is and how many stars are in it. It's almost impossible to describe.

People try, by saying things like,

'There are more stars in the sky than blades of grass in a field',

or

'grains of sand on a beach.'

But the girls thought that a star looked more like a bright shining snowflake in the sky.

Imagine each snowflake is one star. Not enough snow could ever fall to show how many stars there truly are, because the Universe is huge beyond belief and contains more stars than all the flakes of snow Suni and Mae could ever dream of.

If that's how enormous the Universe is then a new question arises.

Is there other intelligent life out there in the Universe?

Are we alone?

**The stars are out there waiting to be found.
New worlds waiting to be discovered.
Their secrets revealed by new
scientists, new explorers, who look like you.
Who could if you dare to dream, be YOU.**



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With thanks to

**PRINCIPAL
FUNDER**



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