

The Moon's Greek mythological name is "Selene"

The Moon is 385,000 km (240,000 miles) or

1.3 light-seconds from the Earth

During a spacewalk astronauts breathe pure oxygen

A full oxygen tank lasts approx. 6-8 hours

Apollo 11, the first mission to land on the Moon, took 3 days to get there

The module landed 24 hours later with just seconds of fuel to spare

After the fuel tank explosion on Apollo 13, the crew had to make manual in-flight corrections

The corrections were made using an on-board sighting scope and a wristwatch

All three crewmembers returned safely to Earth

Saturn's rings are 280,000 km (175,000 miles) in diameter

A Formula 1 car would take about three months to complete one lap

The rings are also very thin, ranging from just 10m to 200m thick

It's thought that the rings may only be around 400 million years old

That's much younger than Saturn itself, at 4.5 billion years old

The rings are mainly ice particles which are slowly raining down on Saturn

The rings may therefore only last another 100 million years or so

Saturn's density is only 0.69g/cm³ which means that...

... if you could find a large enough bathtub, it would float!

When a large star runs out of hydrogen, it eventually explodes as a supernova

The very large ones collapse to form black holes

Whereas the smaller ones become something different

Their cores are compressed to form very dense neutron stars

Although only a few miles across, they can have a greater mass than the Sun

Some neutron stars emit powerful beams of electromagnetic radiation

These "pulsar" beams are detected with radio telescopes

Due to the conservation of angular momentum, these tiny objects can spin extremely fast

The fastest known pulsar rotates 714 times a second

Pulsar timing is more accurate than an atomic clock...

...but you wouldn't want one sitting on your mantelpiece!

The planets all rotate at different speeds

Mercury: 58d 15h 30m Venus: 243d 26m

Earth: 23h 56m Mars: 24h 36m

Jupiter: 9h 55m Saturn: 10h 33m

Uranus: 17h 14m Neptune: 16h 0m

The Sun exhibits "differential rotation"

The equator rotates every 25 days, whereas the poles rotate every 38 days

This twisting creates disturbances in the Sun's magnetic field ...

... resulting in the release of charged particles (plasma) known as coronal mass ejections

Plasma flows away from the Sun, carried on the "solar wind"

This flow of charged particles can move at 750km per second (466 miles per second)

The radiation caused by these particles is dangerous to human and animal DNA

Fortunately, due to its liquid iron core, the Earth has a strong magnetic field

...

... that safely deflects most of these charged particles away into space

However, some particles make it through, and interact with the Earth's magnetosphere

Aurora: Roman goddess of dawn

Borealis: Greek god of the north wind

Australis: Greek god of the south wind

The Sun is losing 4.3 million tonnes of mass every second
Don't worry
There's still plenty of it left
This loss of mass means the gravitational pull on the planets is steadily decreasing
The Earth is therefore slowly drifting away from the Sun
So, every year is getting LONGER
An Earth year lengthens by 2 hours every billion (1,000,000,000) years!
What will happen to our Sun?
4-5 billion years from now...
The Sun's core will shrink to become a white dwarf
Whatever species still inhabit our home planet...
...will face certain annihilation
As the core shrinks, the outer shell will expand enormously
The terrestrial planets Mercury, Venus, Earth & Mars will be scorched and destroyed
In the millennia that follow, the Sun will become a planetary nebula, like ...
... the Dumbbell Nebula (Messier 27)

There are 88 keys on a full-size piano
and 88 official constellations in the night sky
Stars of all sizes are dying regularly within our galaxy
On average:
planetary nebulae: 1 per year
supernovae: 2 per century
Yet galaxies contain billions of stars, so collectively they can't 'die'
Instead ...
... they collide!
That was a computer simulation, yet real galaxies are colliding all the time
(far more slowly)
Will this ever happen to our own Milky Way galaxy?
Yes
The Milky Way and the Andromeda galaxy are rushing towards each other
Around 4 billion years from now the two will begin to merge
The merger will take around 2 billion years
Eventually, the galaxies will become one

On average, it cost \$272,000 ...
... to launch 1 kg of payload on the (now retired) Space Shuttle
\$2million was saved on every launch simply by not painting the external fuel tank white
With 135 missions, the Space Shuttle program cost a total of \$192 billion
Built in 1989, the 3.6m New Technology Telescope in Chile cost 12.5 million Euros to build..
That is 31 million Euros in today's money
Due for completion in 2025, the 39m Extremely Large Telescope will cost a little more..
The projected price tag is in excess of 1.3 billion Euros
With flight and spaceflight, testing is very important...
... and mistakes must be made to learn valuable lessons
Of course, these mistakes cost money ...
... and over the decades this has become more and more expensive ...
... and much more spectacular!
Might we find riches in space?
Asteroid #16 "Psyche" is a possible failed planetary core made of iron, nickel, and gold

This 225km wide "rock" is estimated to have a value of
£10,000,000,000,000,000,000

Yet we likely won't be mining it anytime soon!

Studies suggest that lightning in Jupiter's atmosphere causes methane to
carbonise into soot

The soot falls towards the core, experiencing increasing temperatures and
pressures as it does so

The result? It rains diamonds!

In many parts of the world, the rich literally rub shoulders with the poor
Highrise executive apartments exist immediately next to tightly-packed slums
The nine most populated cities in the world each has over 20 million
inhabitants

Top of the list is Tokyo, with a population of 37.4 million (2023 data)

In February 2023, the world's population exceeded 8 billion

It's expected to reach 10 billion by the year 2057

Although dramatic and devastating, oil spills from ships aren't the biggest
polluters of the world's oceans

Land-based run-off from road vehicles contributes ten times more oil pollution
annually

18% of the world's population own motor vehicles

The global total in 2022 was 1.5 billion vehicles

Zarya, the first module of the International Space Station (ISS), was launched
in November 1998

Since then, a further 38 modules have been added to complete the structure

The ISS is now 109m long with a solar array span of 74m

The ISS travels at 27,600 km/h (17,100 mph)

It takes just 93 minutes to complete one orbit

Astronauts on board experience 15 sunrises and sunsets every day

NASA has announced that the ISS will cease operations in mid-2030

After nearly 180,000 orbits over 32 years, it will enter the Earth's atmosphere
and burn up

The UN has documented that there are 1.6 billion people residing in poor
housing worldwide

Around 15 million people are forcibly evicted each year

Since the start of the 20th century there have been 68 major conflicts

This has led to the deaths of an estimated 174 million people

This is William Herschel, discoverer of the planet Uranus

Most famous as an astronomer, he also performed experiments with light

He expanded on Newton's dispersive prism experiments from 134 years earlier

He used thermometers to measure the temperature of each wavelength of light

But he noticed that the temperature was higher BEYOND the red end of the
spectrum

He named this invisible radiation "Calorific Rays"

Herschel had discovered infrared radiation

One year later, Johann Ritter discovered ultraviolet radiation using a similar
method

He placed paper soaked in silver chloride (AgCl) at the violet end of the
spectrum

Aware that AgCl reacts to visible light, he observed invisible rays beyond the
violet causing the same effect

Over the next 112 years the rest of the electromagnetic spectrum was discovered

1887

Radio waves
& microwaves

Heinrich Hertz

1895

X-rays

Wilhelm Röntgen

1900

Gamma rays

Paul Ulrich Villard

1912

Cosmic rays

Victor Hess

So, we now know that visible light is just one part of a much larger spectrum

Astronomers use this fact to their advantage

Far more knowledge can be gained by observing in multiple wavelengths

A plethora of ground & space-based telescopes now observe the Universe in all wavelengths

You really can filter the Universe with "Any Colour You Like"

People with the desire to explore outer space are a special breed..

NASA regards them as being made of "the right stuff"

Others regard them as being "lunatics"