

## Exploring the Galaxy – Part 1

### Why is space travel hard?

**Gravity** – Getting off the Earth to begin with is not easy! Especially in a heavy two stage rocket loaded with fuel and equipment.

**Radiation** – Our solar system is flooded with **radiation**, produced by the sun and sources outside the solar system. Long exposure to this radiation can cause serious health issues.

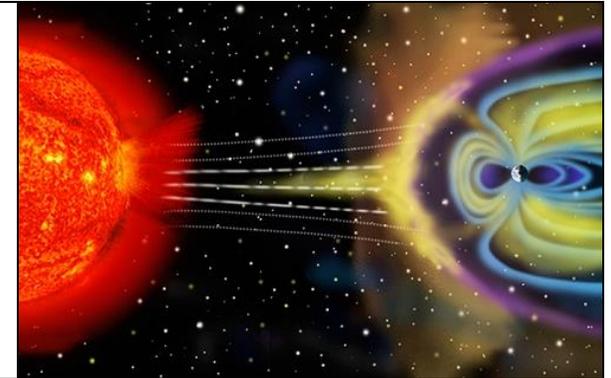
**Sustainability** – Humans need a lot of things to stay alive. **Oxygen, water, and food** just to name a few. None of these things are present in the vacuum of space!

### What do we need?

**Thrust** – Thrust is the *'push'* provided by rocket engines to beat Earth's gravity, and then to direct us where we need to go. For the engines to produce thrust, we need some kind of fuel.

**Radiation shielding** – The ship needs strong radiation shielding to prevent harmful **cosmic rays** from affecting the crew. Aluminium (what the ISS is made of) is no good, as it's too heavy at the thickness needed for protection. Engineers are thinking of new sources of shielding possibly involving plastics, liquid hydrogen, or water.

**Supplies** – At the moment, the ISS has a resupply mission about nine times per year. If we were journeying into deep space, or colonising a planet, there would be no way to pop back to Earth that often. We can produce oxygen from water by a process called **'electrolysis'**, and water from urine and breath is easily recycled (as on the ISS). Food is harder!

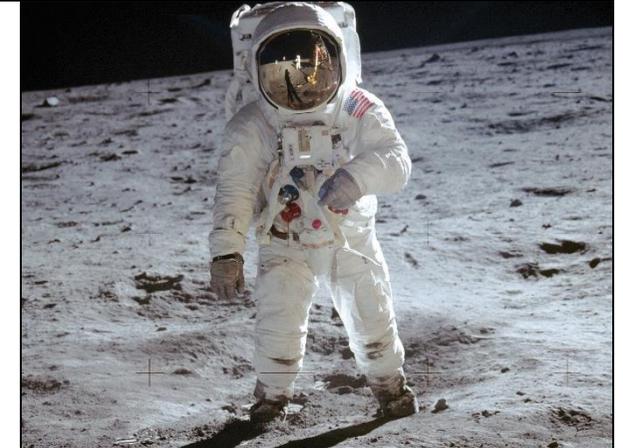


### Where have we gone?

**Low Earth Orbit** – The ISS orbits about 220 miles above the Earth's surface and has been continuously occupied by humans since November 2<sup>nd</sup> 2000.

**The Moon** – The Apollo program ran between 1961 and 1972 was a mission to land a human crewed spacecraft on the surface of the moon. In July 1969 Apollo 11 succeeded in the goal, with Neil Armstrong and Buzz Aldrin being the first humans to set foot off the Earth.

That's it for manned missions! Humans have never travelled further than our moon. But satellites we've produced (such as the Voyager 1 and Voyager 2 satellites) have just about passed beyond the edge of our solar system, into interstellar space.



### Where should we go?

**Mars** – Mars is the next logical step for manned missions. It has a solid rocky surface suitable for landing craft, it's the nearest planet to us, and it's a place of great scientific interest!

**Enceladus** – Enceladus is the large ice moon of Saturn, thought to hide a **water ocean** beneath its icy surface. A landing craft could sit on the thick ice crust and bring equipment to drill down and explore the ocean below.

**The Proxima Centauri system** – Proxima Centauri is the closest star to the Earth, at about 4.2 light years away. One of the stars three known planets is thought to lie in the **goldilocks zone** of Proxima Centauri, so would be an exciting world to visit and study. Journeying to another solar system would truly signify humanities spread out into the cosmos.

