SASTA OLIPHANT SCIENCE AWARDS

SOUTH AUSTRALIAN SCIENCE TEACHERS ASSOCIATION

Prize Winner

Science Writing

Year 5-6

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Living on the Moon

(Lunar Jaunt)

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Lunar Jaunt

How about going to Lunar Disneyland? As Neil Armstrong took his first step on the moon, he famously uttered, "That's one small step, one giant leap for mankind". There will be ground-breaking changes, once humans can live on the magnificent moon. Picture a future where the Moon casts an additional gleam in the night sky, revealing the visible lights of a bustling lunar metropolis as humanity establishes a lasting foothold on our neighbouring natural satellite. What can we expect from a permanent human settlement on the Moon?

Moon Sweet Home

Many people wonder how humans could survive on the moon, be protected against cosmic and solar rays, seal off meteorites, and regulate temperature fluctuations. One proposed solution is constructing a dome using 3D printing technology with a protective shield. The construction process would take three months on Earth to complete. The European Space Agency (ESA) has suggested building an inflatable igloo-like structure covered in a 2-meter thick layer of regolith, which robots would construct on the moon. Due to the low gravity, the structure would not need to be very sturdy, as the mass would help maintain the integrity of the inflatable dome. It would create a mini-environment similar to Earth, including suitable pressure and oxygen levels - which are vital for almost every solar system body.

https://spaceplace.nasa.gov/moon-habitat/en/

Fact File

- Age: 4.5 billion years
- Average distance from Earth: 384,400km
- Temperature on the surface: -153°C
- Time to orbit the Earth: 27.3 days
- Only 12 astronauts have ever walked on the moon.

Food from Greenhouse

A remarkable feat has been accomplished by a team of scientists and engineers who have developed a greenhouse prototype capable of sustaining human life on the moon. The inflatable and deployable structure is specifically designed to facilitate the growth of plants and crops, which in turn support air revitalisation, water and waste recycling, and nutrition. This innovative and efficient system is known as a Bio-regenerative Life Support System (BLSS) which utilises solar panels to generate electricity and produce 26 grams of consumable biomass per kilowatt-hour.

According to Dr Ray Wheeler, the lead scientist in Kennedy's advanced life support research, the lunar project will facilitate the growth of vegetables for food and the cultivation of plants to support life support systems.

Figure 2 https://www.nasa.gov/feature/lunar-martian-greenhouses-designed-to-mimic-those-on-earth

Water from Ice

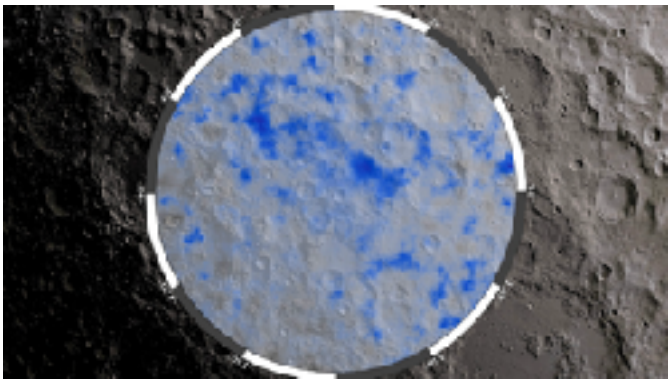


Figure 3: https://moon.nasa.gov/inside-and-out/composition/water-and-ices/

What's big, covered in ice water, yet 100 times drier than the Sahara Desert? It's the Moon! The Moon's ice water is a fascinating discovery that is mainly located in the permanently shadowed regions of the lunar poles. In 2009, the Indian Chandrayaan-1 mission detected the widespread presence of water molecules across the lunar surface.

While the Moon does not have liquid water, NASA confirmed in 2018 that there is ice on its surface. To gather this ice, rovers could be utilised to locate, drill, and collect it.

This would be a significant step forward in ensuring the accessibility of water, a fundamental requirement for survival, in a space exploration context. In 2020, data from NASA's SOFIA mission confirmed water exists in the sunlit area of the lunar surface as molecules of H2O embedded within, or perhaps sticking to the surface of, grains of lunar dust.

Breathable Air

It is easy to overlook that breathing is essential for survival. Despite the moon's lack of air, it has an abundance of oxygen-rich lunar regolith. We can unlock the vital oxygen needed to breathe by mining these minerals. This would be especially important in non-polar regions where water is scarce. NASA is experimenting with institute resource utilisation methods to generate oxygen, including splitting H2O into hydrogen and oxygen, utilising the carbon dioxide/oxygen cycle with greenhouse plants, heating the regolith to 900 degrees Celsius and mixing it with imported hydrogen to produce water and oxygen. One such project is the Precursor In-situ Lunar Oxygen Testbed (PILOT). Helium-3 is rare on Earth, but plenty on the Moon.

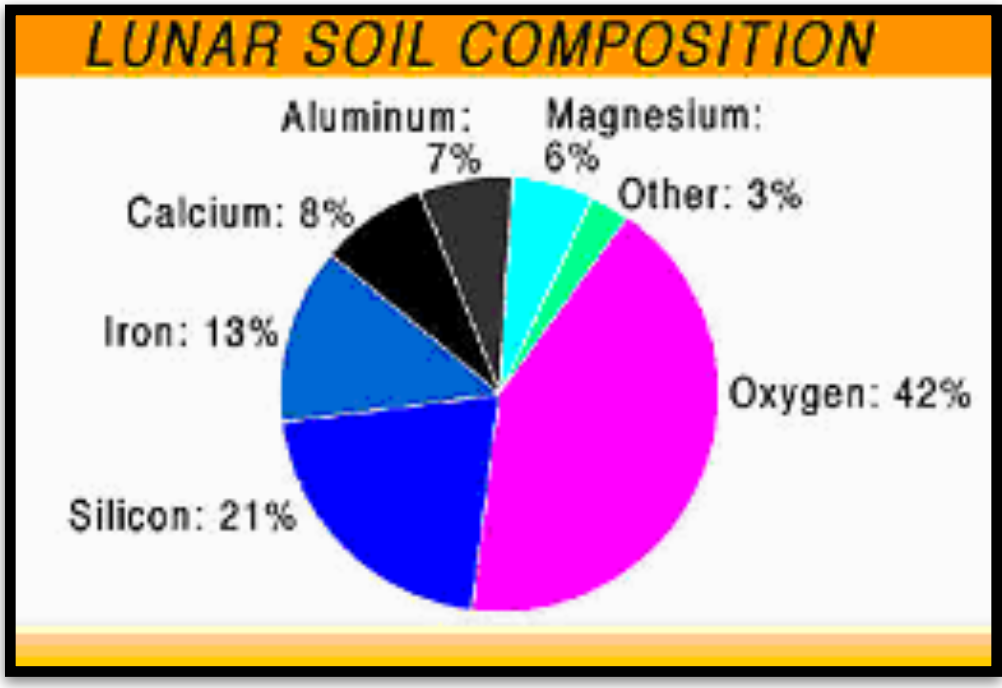
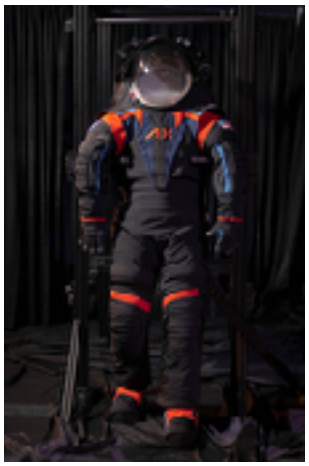


Figure 4: https://www.researchgate.net/figure/1-Lunar-Soil-Composition-Composition-Averaged-Over-Entire-Surface_fig1_277963633

Apparel



The new type of spacesuit will be worm on the Artemis mission. It is a crucial component of the upcoming lunar exploration. It can adapt to the environment's temperature and includes a custom-fit design that improves comfort and range of motion and a new communications system that allows for easier communication between astronauts and mission control. The suit also features a built-in waste management system, reducing the need for frequent spacewalks and increasing overall efficiency.

Figure 5: https://edition.cnn.com/2023/03/15/world/nasa-spacesuits-moon-artemis-unveil-scn/index.html

What is the best place for settlement?

Lunar equator	lunar poles
- Day and night temperature fluctuations -173 degrees Celsius - Plenty of helium-3 and other minerals of interest - Easier to fling materials into equatorial orbit	- Steady temperature:—50 degrees celsius - Fewer minerals of industrial interest - Solar winds creates electrical charge on crater rims

Table 1: Space Farers Book, Christopher Wanjek

Conclusion:

I have a strong belief that the future will bring about revolutionary changes. One such change might be the growth of tourism, mining, among other things. My dream is to witness hundreds of people vacationing on the moon, with some delving into a scientific exploration that could have an impact on how we live in the future. Time is ticking fast and soon we can call our Moon, Disneyland!

Figure 6: https://www.pinterest.com.au/pin/one-ticket-to-the-moon-by-donutgangster-in-2023--665618019934790061/

Word count: 767 Not including Fact File, Table and References

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