
Life in
Space

Gravity

- Gravity is one of the most fundamental forces in the universe.
- Acceleration due to gravity near the Earth's surface is 9.8 m/s^2 this is called 1 'g'.

Microgravity

- Once in orbit spacecraft and space stations are microgravity environments.
- As they “fall” around the Earth astronauts experience weightlessness.

Science in Microgravity

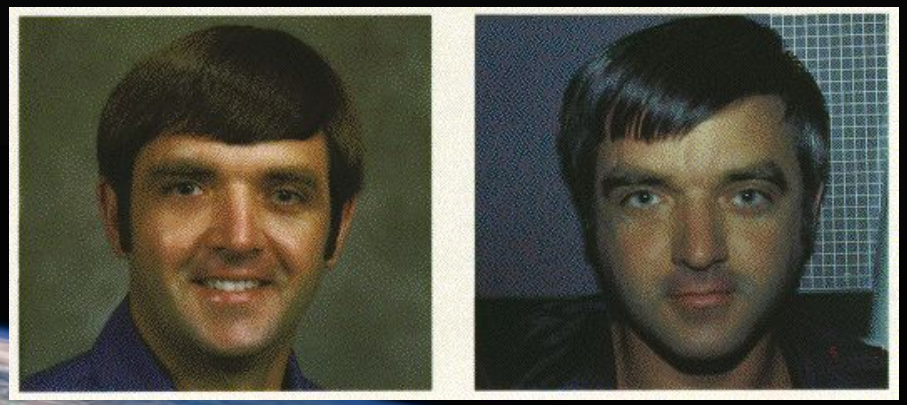
- The microgravity environment of space can be used by scientists to remove the effects of gravity while undertaking experiments.

Microgravity

- Life on Earth has developed in a 1 ‘g’ environment and many of our bodies system rely on gravity.
- The reliance of the human body on gravity is clearly seen when gravity is removed.

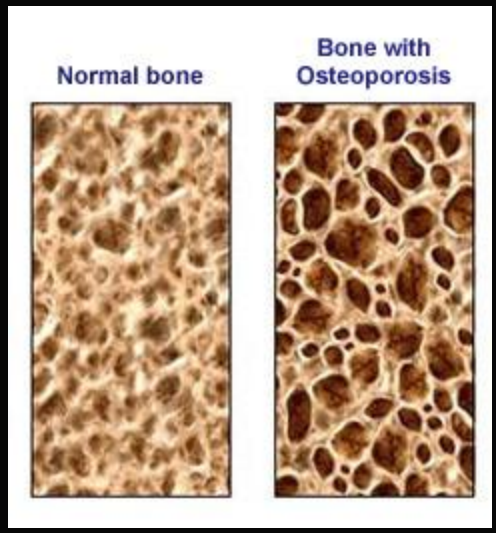
Humans in Microgravity

- When exposed to a microgravity environment humans experience many side effects.
- Headward fluid shift or “Puffy Face” is the first effect noticed as the absence of gravity allows blood to move from the lower body to the head.



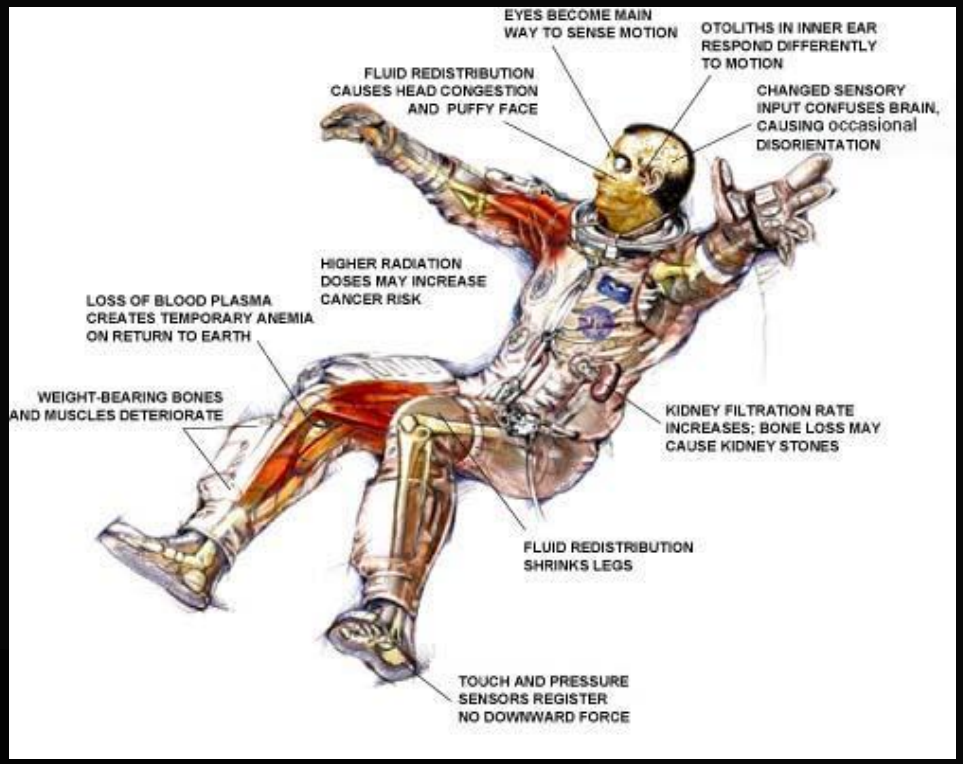
Humans in Microgravity

- The microgravity environment causes a rapid loss of bone density.
- This is thought to be caused by gravity playing a role in the generation of the hormones responsible for bone growth.



Humans in Microgravity

- In the absence of gravity muscles in the legs and back begin to weaken and atrophy as they are no longer required to support the weight of the astronauts.



Space and the Brain

- The effect of the space environment on the brain and nervous system is an important area of study.
- The space environment has a large effect on the biological clock and sleeping patterns of astronauts.

The Vestibular System

The Vestibular System

- The Vestibular System maintains balance by sending information to the brain about position and movement by sensing gravity.
- In microgravity the vestibular system becomes confused and astronauts can experience dizziness and space motion sickness.
- As astronauts adapt to the microgravity environment they begin to rely on visual sensory input for reference.

Space Motion Sickness

- Space Motion Sickness is experienced by more than 50% of all astronauts during their first few days exposure to microgravity.
- It results in nausea and vomiting and is detrimental to crew performance.

The Spacecraft Environment

- The spacecraft or space station must provide a pressurised environment, safe air and drinking water.
- The environment must be monitored to avoid microbial contamination this leads to a decrease in the astronaut's immune function.

Radiation

- Astronauts are exposed to ionizing radiation from the sun.
- The effects of radiation are separated into two categories: acute and long term.

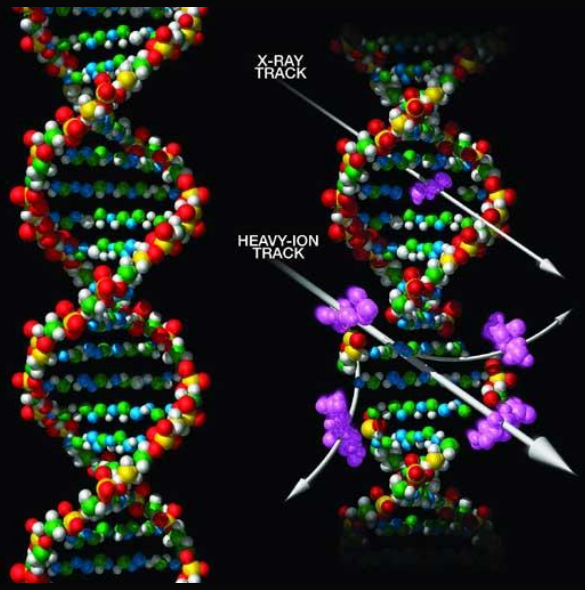
Acute Effects of Radiation

- The acute effects of radiation exposure are those that are immediately seen:
  - Nausea
  - Vomiting
  - Skin-reddening
  - Dehydration

- Because only moderate doses of radiation are encountered these effects aren't usually seen in astronauts.

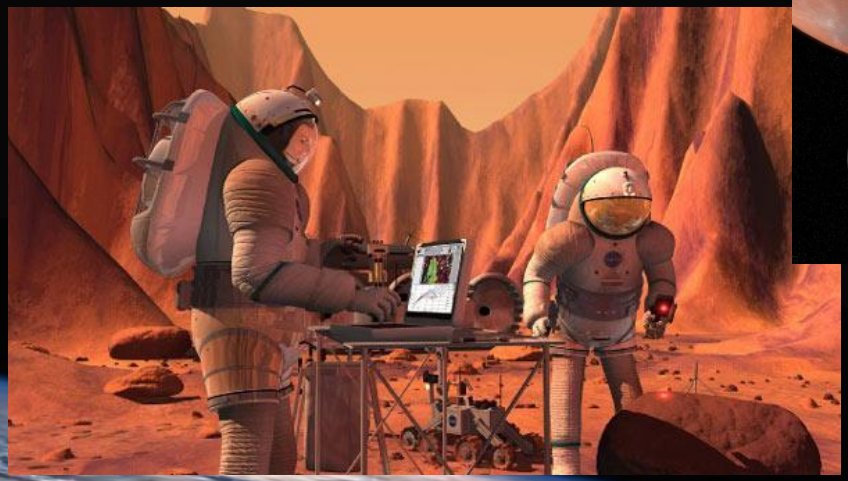
ong Term Effects of Radiation

- The long term effects of radiation exposure are much more dangerous to astronauts.
- The passage of a charged particle through a cell causes ionisation of the cellular structure causing cell death.
- Most dangerous is the non-lethal mutation of DNA molecules which can lead to cancer.



Long Duration Space Flight

- As human space flight moves from relatively short term missions into long duration space flight like the 3 year trip to Mars we must study the effect of long term exposure to the space environment.



Studying Plants and Animals

- In order to understand the effect of space on biology scientists study plants and animals in space.
- This is important not only for biological study but also for investigating plants for food and environmental functions in space.