HUMAN HEALTH IN SPACE

SERENA TANG

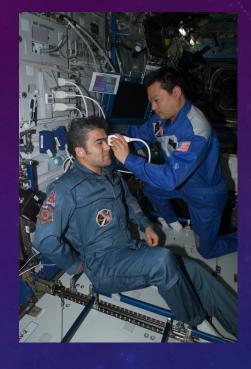
DEPT. OF PHYSICS AND ASTRONOMY, DEPT. OF NEUROSCIENCE

WHAT IS SPACE MEDICINE?

- The study of human health in space
- Began in the 1950s, becoming an increasingly popular topic due to Earth applications







SPACE MEDICINE AT HOPKINS

- Human Spaceflight Lab: Dr. Mark Shelhamer
- Ross Research Building, Medical Campus
- Other PIs: Dr. Catherine Davis, Dr. Michael Rosen, Dr. Andrew Feinberg









HUB EVENTS AT WORK JOHNS HOPKINS MAGAZINE JHU.EDU

MAKING SPACE TRAVEL SAFER

As NASA prepares to send humans back to the moon and beyond, Mark Shelhamer and fellow Hopkins scientists work to ensure that future space travelers survive and thrive out there

Laura Wexler / Summer 2019

O n July 20, 1969, Mark Shelhamer watched the televised broadcast of the Apollo astronauts landing on the moon along with 600 million other folks on Earth—including his mother, who worried Neil Armstrong would take his famous leap only to sink into the moon, buried by lunar dust. Shelhamer was 10 years old, full of excitement and awe—and 0

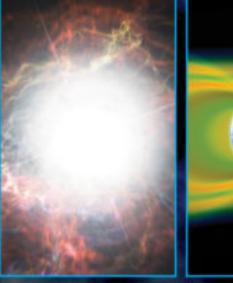
SPACE MEDICINE CURRENTLY & PROJECTED OUTCOMES ON THE MOON

CURRENT SPACE MEDICINE: RADIATION

- Danger: Cosmic Rays and Solar Flares
 - Different kinds; morphable
- CNS changes
- Reduced motor function
- Cognitive deficits
- Radiation sickness
 - Nausea, vomiting, headaches, etc





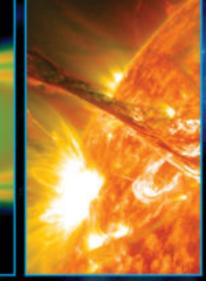


Galactic cosmic radiation Distant supernova explosions are thought to be

Destantsuper nova explosions are thought to be the source of these high-energy ions. They travel across the galaxy at close to the speed of light, and can easily pass through the walls of a spaceship. With current technology at least, they cannot be shielded against.

Trapped radiation

Earth's magnetic field can trap charged particles from the solar wind. They became confined to the Van Allen belts, two doughnut-shaped magnetic rings encircling the planet. This type of natiation does not pose a threast unless astronauts travel through the magnetic field.



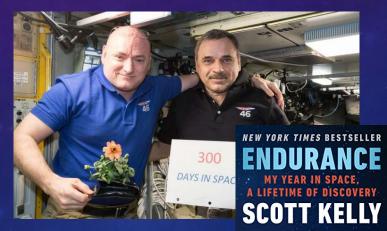
Solar energetic particles

These high-energy particles are released by the Sun-during periods of intense activity known as solar particle events. Although these events are hard to predict, astronauts and vulnerable equipment can be protected from this form of radiation using shielding materials.

CURRENT SPACE MEDICINE: ISOLATION/CONFINEMENT

- Cognitive Behavioral Deficits
 - Isolation
 - Test: Antarctica
- Sleep disturbances
- Hostile environments
 - Microbes/microorganisms
 - Elevated CO2 levels
 - Air quality











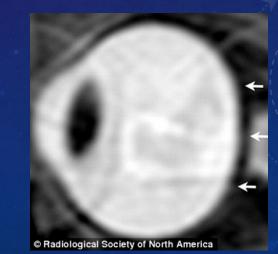
CURRENT SPACE MEDICINE: WEIGHTLESSNESS

- Vestibular changes
- Fluid redistribution
 - SANS
 - Increased ICP
 - Lowered blood pressure
- Bone and muscle loss









CURRENT SPACE MEDICINE: FOOD & NUTRITION

- Not enough fresh fruits and vegetables
- Not enough variety in diet
- Always eating dehydrated foods, rare fresh food





MITIGATION STRATEGIES





- Radiation: material science, supplements, newer technology
- Fluid shift: lower body negative pressure suits, exercise, supplements
- Food/nutrition: growing plants
- Isolation/confinement: therapy, social prescriptions
- Continuing improvement in technology



WHY DO WE CARE?

- Solutions applicable to:
 - Hostile work environments (military, marine, etc.)
 - Elderly/aging
 - Cancer
- Solutions made have been applicable to:
 - 3rd world countries
 - Backpackers
 - Medicine
- What do we want:
 - Go to the moon and stay there
 - Go to Mars?



