Deep Space Petri-Pod:

*Understanding life beyond the Van Allen belts*

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The need to study life in deep space

• Ultimate survival of humankind likely dependent on ability to colonise other planets

• Worlds’ Space Agency’s (and commercial space company's) common goal of Mars habitation/ deep space exploration

• However, major obstacles to achieving these aims include:
  – Prolonged µg/ increased cosmic radiation exposure
  – Exponential negative health consequences
  – Serious risk to human health/ mission performance

• However, it is not safe to do this in humans first, thus need initial demonstrations of viability of life and life support technology in model systems
Deep Space Petri-Pod

- **Aim:** establish a multi-user, common interface platform for deep space life science experiments, e.g.

- **Integrate with multiple launch vehicles**
  - Phobos Sample Return
  - CubeSat

- **Accommodate multiple experimental systems**
  - In vivo
  - Microbiology
  - Synthetic biology

- **Other key considerations:**
  - Small (up-mass)
  - Permits environmental monitoring
  - Sample termination (planetary protection)
  - In-flight sample analysis (remove need for sample return)

NSTP-2 funding: ~£75,000
DSPP prototype

- Dimensions: 100 x 75 mm (‘matchbox’ sized)
- Comprises a series of ‘biopods’
  - Individual culture pods with ‘wet’ and ‘dry’ chambers for culture media and O\textsubscript{2} supply
- Separated by gas permeable membrane

DSPP incorporates a range of ‘bio-pod’ configurations/sizes
Planetary protection

• Planetary protection is an central aspect of any interplanetary mission

• DSPP therefore incorporates a heated ‘kill switch’
Capacity for future development

- RadFET for radiation monitoring
- NANOPORE for in-flight, real-time RNA sequencing
- Internal 3D μ-fluidics for automated media exchange
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