Microgravity Fluids for Biology Workshop

ASGSR Workshop III

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Introduction

• Last year (at first ASGSR meeting) we kicked off/brainstormed ideas to foster collaboration between Fluid Physics and Space Biology.

• Developed a draft White Paper – organized to identify fluids-related knowledge/technical gaps currently facing space biology research.

• Will present overview today and invite the broader community to comment/respond.

• This is not a new concept - our goal is to reenergize both disciplines – challenge them to work together within their current budget/program limitations as well as advocate for new work if warranted.

• Fits into Open Source approach.
Multiscale Fluid-Structural-Interaction Physiological Models

Fluid- Structural Vestibular Model

Inner Ear  \( \mu \text{G Caloric Stimulation Test} \)  Rotational Chair Test

Integrated Multiscale Cardiovascular Model

Ultrasound Measurement of \( \mu \text{G Cardiac Shape} \)  FE Predicted Cardiac Shape Change in \( \mu \text{G} \)
CFD Coupled to Population Balance Model of Nephron as a Continuous Crystallizer

Continuous Crystallizing Reactor

Physical Flow CV (Nephron)

Imaginary Growth CV

Nephron: Anatomy and Physiology

Continuous Crystallizing Reactor

Nucleation
Growth
Agglomeration
Breakage

Normal Microgravity

Stone Former 1G

Growth Only
Growth & Agglom.
Next Steps

• Incorporate comments & suggestions – by November 30th.
• Prioritize risks and finalize white paper – by early next year.
• Identify areas of collaboration and match skills – on going.

Provide to presenters today or email to:
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*Please sign and provide email address*
Presentations

- *Current and Future Issues for Plant Systems*
  Gioia Massa & Charles Quincy, NASA KSC

- *Microgravity Fluids Issues for Animal Systems*
  Jeffrey D. Smith, NASA ARC

- *Microgravity Fluids Issues for Cell Biology and Microbiology*
  Jeffrey D. Smith, NASA ARC

- *Microgravity Issues for Bioregenerative Life Support Technologies*
  Raymond M. Wheeler, NASA KSC