Microgravity Fluids for Biology Workshop

ASGSR Workshop III

Contributors:
DeVon Griffin, NASA GRC
Fred Kohl, NASA GRC
Gioia Massa, NASA KSC
Brian J. Motil, NASA GRC
Patricia Parsons-Wingerter, NASA GRC
Charles Quincy, NASA KSC
Kevin Sato, Lockheed Martin/ARC
Bhim Singh, NASA GRC
Jeff Smith, NASA ARC
Raymond Wheeler, NASA KSC
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  μG Caloric Stimulation Test  Rotational Chair Test

Integrated Multiscale Cardiovascular Model

Ultrasound Measurement of μG Cardiac Shape  FE Predicted Cardiac Shape Change in μG

**Experiment**  **Analysis Results: Location R1**  **Analysis Results: Location R2**
**CFD Coupled to Population Balance Model of Nephron as a Continuous Crystallizer**

**Nephron: Anatomy and Physiology**

**Continuous Crystallizing Reactor**

**Physical Flow CV (Nephron)**

**Imaginary Growth CV**

**Nucleation**

**Growth**

**Agglomeration**

**Breakage**

**Normal-Microgravity**

**Stone Former-1G**

**Simulation**

**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 – ongoing.

Provide to presenters today or email to:
Brian.J.Motil@nasa.gov

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