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

Geometric Ratio [-]
**CFD Coupled to Population Balance Model of Nephron as a Continuous Crystallizer**

**Physical Flow CV (Nephron)**

**Imaginary Growth CV**

**Continuous Crystallizing Reactor**

**Nucleation**

**Growth**

**Agglomeration**

**Breakage**

**Normal-Microgravity**

**Stone Former-1G**
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:
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