**2018 IMAG Futures Meeting – Moving Forward with the MSM Consortium (March 21-22, 2018)**

*Pre-Meeting Abstract Submission Form*

*\*Please submit to the NIBIB IMAG mailbox (*NIBIBimag@mail.nih.gov*) by* ***January 8th, 2018***

*\*Save your abstract as “MSM PI Last Name \_ 2018 IMAG Futures Pre-Meeting Abstract”*

**PI(s) of MSM U01: David C. Zawieja and James E. Moore Jr.**

**Institution(s): Texas A&M University and Imperial College London**

**MSM U01 Grant Number: HL-123420**

**Title of Grant:** Transport Phenomena in the Lymphatic System

**Abstract**

Which MSM challenges are you addressing from the IMAG 2009 Report and how?

<https://www.imagwiki.nibib.nih.gov/content/2009-imag-futures-report-challenges>

(indicate which challenge (#) you’re addressing)

*You may insert images by copying and pasting below*

1. Integration of lymphatic biology and biomechanics to understand lymphatic function.

3. Development of lumped parameter models of lymphatic pumping; inferring currently unmeasurable system parameters from available experiments and modeling outcomes.

5. There are few models of any aspect of lymphatic function.

6. Modeling results have indicated which physiologic parameters are most important for function, which we have then pursued with experiments.

8. Modeling of immune cell communication in lymph nodes using agent-based modeling.

9. Modeling results have indicated which physiologic parameters are most important for function, which we have then pursued with experiments.

18. Our results have indicated a possible mechanism for enhancing lymphatic pumping which could be used to help treat lymphedema (currently and untreatable condition). We have developed a prototype and are testing it on healthy volunteers.

Are you using machine learning and or causal inference methods and how?

*You may insert images by copying and pasting below*

 Not as such. We are challenged with parameter inference, like most modelers, but have not had to employ these methods yet.

Please briefly describe significant MSM achievements made (or expected).

*You may insert images by copying and pasting below*

 First explanation of the origin of subatmospheric interstitial pressures. First model of lymph flow through lymph nodes. First model of mass transport of chemokines in lymph nodes. Modeling of the effects of modulating external pressure on lymphatic pumping has revealed a possible new treatment for lymphedema. First rigorous characterization of lymphatic valve behavior. Discovery that calcium channels in lymphatic endothelial cells function very differently from those in blood endothelial cells. First measurements of the mechanical properties of human lymphatic vessels.

Please suggest any new MSM challenges that should be addressed by the MSM Consortium moving forward.

*You may insert images by copying and pasting below*

 More extensive outreach to the medical and biological communities to demonstrate the value of modeling. It’s an endless battle, I suppose.

What expertise are on your team (e.g. engineering, math, statistics, computer science, clinical, industry) and who?

*Please list as “Expertise – Name, email”*

 *Engineering, biomechanics – James Moore,* *james.moore.jr@imperial.ac.uk*

*Engineering, biomechanics – Christopher Bertram,* *c.bertram@sydney.edu.au*

*Mathematics – Charlie Macaskill,* *charlie.macaskill@sydney.edu.au*

*Lymphatic biology and physiology – David Zawieja,* *dcz@tamu.edu*

*Lymphatic biology and physiology – Michael Davis,* *davismj@health.missouri.edu*

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*Engineering, computational modeling – Raoul van Loon,* *r.vanloon@swansea.ac.uk*

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