Boulder Fluid and Thermal Sciences Seminar Series

Tuesday, May 16, 2017
3:30pm-4:30pm (refreshments at 3:15pm)
Bechtel Collaboratory in the Discovery Learning Center (DLC)
University of Colorado, Boulder

Dynamics and Control of Encapsulated Ultrasound Microbubbles for Biomedicine

Michael Calvisi, *University of Colorado, Colorado Springs*

Ultrasound contrast agents are comprised of microscopic-sized bubbles – encapsulated with a shell of surfactant, polymer or protein – that are injected intravenously to enhance blood-tissue contrast in ultrasound imaging. More recently, encapsulated microbubbles (EMBs) are emerging as powerful tools for noninvasive therapeutic treatments ranging from drug delivery to tumor destruction. To utilize EMBs effectively in biomedical applications, it is necessary to understand the effect of the incident ultrasound on the radial and shape dynamics of microbubbles. For example, the nonlinear radial response of EMBs is essential for ultrasound imaging, while nonspherical shape instabilities can be an important mechanism for enhancing drug uptake or tissue ablation. In this talk, various models of EMBs will be discussed and the results of numerical simulations presented. It will be shown that the shell and ultrasound properties strongly influence the EMB dynamics. This leads to the prospect of optimizing the shell properties and ultrasound protocols to control the EMB response based on its specific application.

Biography: Prof. Michael Calvisi joined the faculty of the Department of Mechanical and Aerospace Engineering at the University of Colorado, Colorado Springs in 2010 as an Assistant Professor. He recently received tenure and promotion to Associate Professor. He received his B.S. degree in Mechanical Engineering from the University of California, Berkeley where he received his M.S. and Ph.D. degrees in Applied Science and Technology. After completion of his Ph.D. in 2006, he held post-doctoral researcher positions at the University of Birmingham in the United Kingdom and at Northwestern University prior to joining the faculty at UCCS. Prof. Calvisi's research interests are in theoretical and computational fluid dynamics with an emphasis on multiphase flows and biofluid mechanics. He has particular interests in cavitation and ultrasound, along with their applications in biology and medicine. He recently received the National Science Foundation CAREER Award (2017) and the *Researcher of the Year* award from the College of Engineering and Applied Science at UCCS (2016-2017).