

Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Particle Image Velocimetry Measurements in Anatomically-Accurate Models of the Mammalian Nasal Cavity¹ C. RUMPLE, J. RICHTER, B.A. CRAVEN, M. KRANE, Penn State Applied Research Laboratory — A summary of the research being carried out by our multidisciplinary team to better understand the form and function of the nose in different mammalian species that include humans, carnivores, ungulates, rodents, and marine animals will be presented. The mammalian nose houses a convoluted airway labyrinth, where two hallmark features of mammals occur, endothermy and olfaction. Because of the complexity of the nasal cavity, the anatomy and function of these upper airways remain poorly understood in most mammals. However, recent advances in high-resolution medical imaging, computational modeling, and experimental flow measurement techniques are now permitting the study of airflow and respiratory and olfactory transport phenomena in anatomically-accurate reconstructions of the nasal cavity. Here, we focus on efforts to manufacture transparent, anatomically-accurate models for stereo particle image velocimetry (SPIV) measurements of nasal airflow. Challenges in the design and manufacture of index-matched anatomical models are addressed and preliminary SPIV measurements are presented. Such measurements will constitute a validation database for concurrent computational fluid dynamics (CFD) simulations of mammalian respiration and olfaction.

¹Supported by the National Science Foundation.

Christopher Rumple
Penn State Applied Research Laboratory

Date submitted: 03 Aug 2012

Electronic form version 1.4