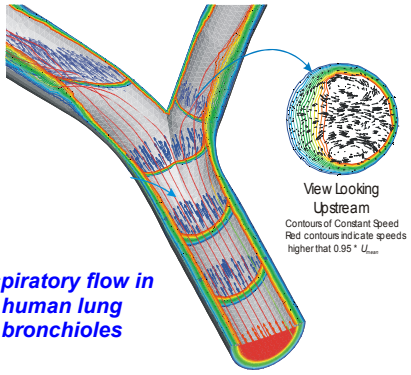
OAK RIDGE NATIONAL LABORATORY FACT SHEET
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

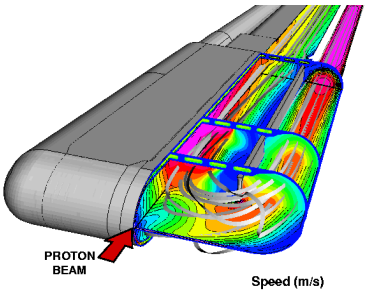
Scientific Computing Within the ORNL Modeling & Simulation Group: Computational Fluid Dynamics

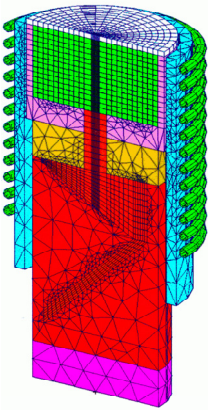
The ORNL Modeling and Simulation Group (MSG) develops sophisticated numerical solutions for a wide range of scientific, engineering, and operational applications. MSG's core competency is computational physics and engineering, and within this context we have extensive expertise in Computational Fluid Dynamics (CFD). MSG's CFD problem-solving scope encompasses an extremely diverse set of solution software, computing platforms, and applications. Categories of worked problems include coupled thermal, chemical, electromagnetic, structural, and metallurgical physics; compressible, incompressible, Newtonian, non-Newtonian, and reactive fluids; forced, buoyancy-driven, low-gravity, laminar, turbulent, steady, and unsteady flows; as well as single-phase, multi-phase, and phase-change systems. In-house codes developed by MSG to support these analyses include the general-purpose finite-element code ***PHI3D***, ***BEPLATE*** for electroforming simulation, ***NORVEX*** for analysis of latent-heat thermal energy storage in low gravity, and ***REHAP*** for thermal/hydraulic analysis of industrial thermosyphons. Public domain and commercial software expertise includes ***CFX, CFDesign, ProCAST, KIVA, SOLA-VOF, RELAP5,*** and ***CTH***. These applied scientific computing capabilities represent an extremely versatile modeling and simulation resource for a broad range of R&D, industrial, homeland defense, and military applications. We welcome the opportunity to discuss your potential applications and ways MSG can contribute to a solution.



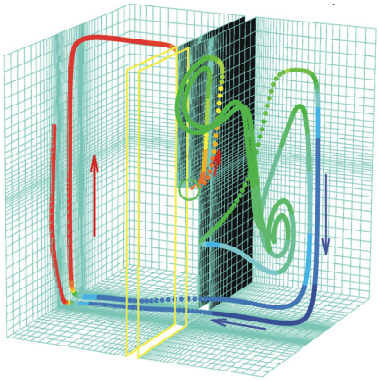
Inspiratory flow in human lung bronchioles

Mercury flows & convective heat transfer within Spallation Neutron Source experimental targets

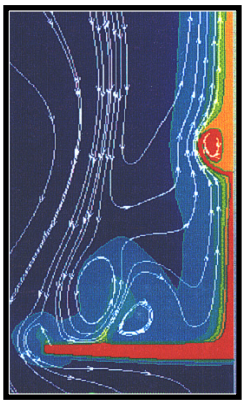




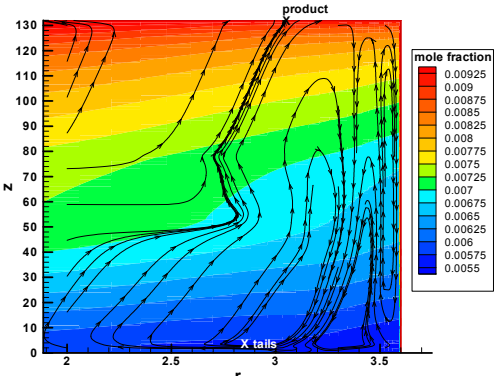
Casting behavior & carbide flotation in laboratory-scale uranium hemishells



Incompressible laminar buoyancy-driven flows to predict indoor room air movement



Compressible laminar forced convection to define initial conditions for immersion-quench manufacturing process



Flow stability & separative work in uranium enrichment gas centrifuges

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