

Research Projects

Energy Research

"Utilization of Coal Syngas in High Temperature Fuel Cells"

Sponsor: NETL, DOE, WV EPSCoR, WVU Research Corporation

"Simulation of Fundamental Transport Processes in Solid Oxide Fuel Cells"

Sponsor: NETL-DOE

"Simulation Tools for Solid Oxide Fuel Cell Stacks"

Sponsor: CMU/NSF

Environmental Engineering Research

"Hood Capture and Protection Efficiencies"

Sponsor: NIOSH

"The Spread of Influenza by Human Cough"

Sponsor: NIOSH

"Worker Exposure Assessment Using CFD"

Sponsor: NIOSH

Biological Flow Simulation

"Particle Deposition in Human Airways"

Sponsor: NIOSH

"CFD Simulation of Intracranial Aneurysms"

Sponsor: WVU Research Corporation

Fluid Dynamics Research

"Large Eddy Simulation of Bubbly Turbulent Flow: Investigation of Free Surface Effects and Wall Effects"

Sponsor: US Navy

"Quantification of Numerical Uncertainties in CFD Applications"

Contact Information

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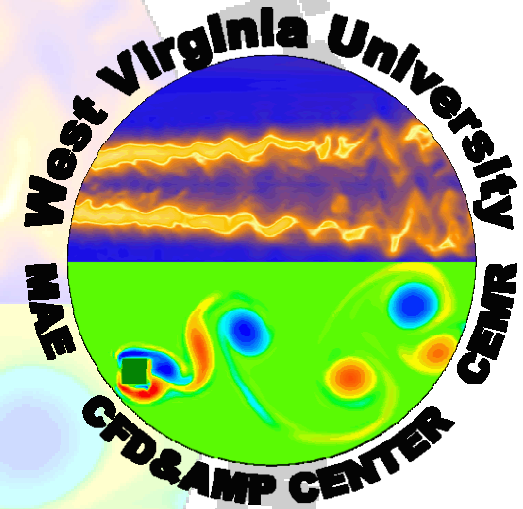
Graduate Students

Nihan Fatma Cayan, BSChe, MSChe
Ertan Karaismail, BSChe, MSChe
Jose Escobar-Vargas, BSME
Kedar Panday, BSME

Facilities

48 core Linux Cluster (NIFTY)
6 x Dual Quad-Core Xeon 2.66 GHz Processor Nodes
96 GB RAM, 2 TB Network Storage Server
Large Software Repository: FLUENT, MATLAB, FORTRAN, C/C++
Several Quad-Core And Dual-Core Desktops With Large Capacity Graphics Cards

Computational Fluid Dynamics & Applied Multi- Physics Center



<http://cfd.mae.wvu.edu>
<http://nift.wvu.edu>

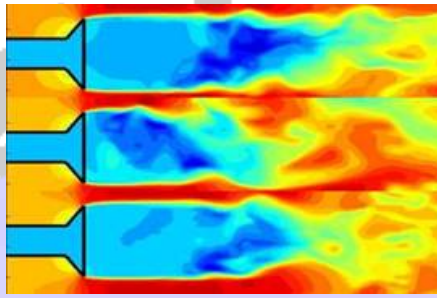


“The day when computations will lead experiments is not too far ahead”

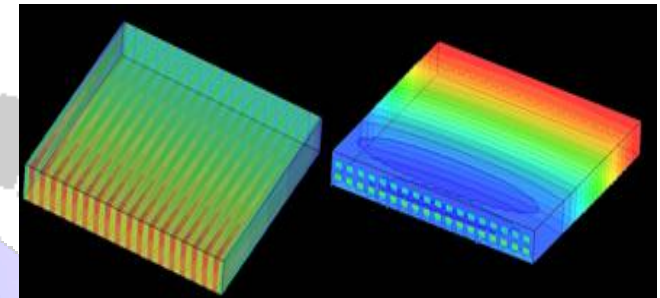
Our research is shaped by a multi-disciplinary approach where the tools we develop are applicable to many areas of science and engineering. The breadth of applications range from classical aerodynamics with large scales to bio-fluidics in the micro scales and transport and reaction in Fuel cells at nano scales. We focus on challenging problems involving turbulence, multi-phase flows, reactive flows, and flow through porous media with micro scales interacting with macro scales through electro-chemical and biological reactions. Our goal is to develop accurate computational tools that can be used in advancing the science and engineering field so as to make human life more affordable, comfortable and sustainable with possible contributions to happiness of mankind while preserving the invaluable resources of our bio-sphere.

Current research efforts are focused

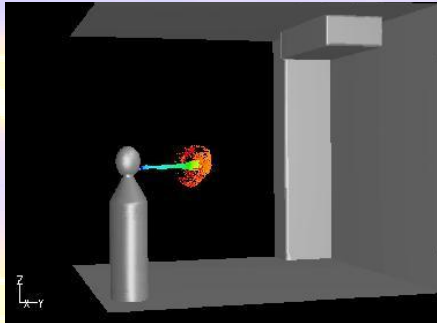
- Energy Research (Gas Turbine Combustors, Fuel Cells etc.)
- Bio Engineering Research (spread of influenza virus, worker exposure in chemical hoods, blood flow through cerebral aneurysm etc.)
- Fluid Dynamics Research (Sub-grid scale models, Large Eddy Simulation of reactive flows, multi-phase flows, Assessment measures for CFD applications)



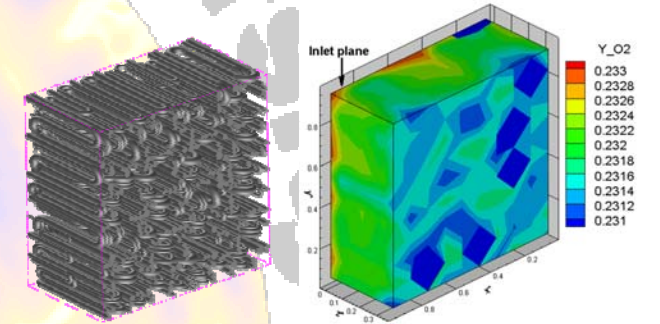
Large Eddy Simulation of Lean Premixed Methane-Air Flame



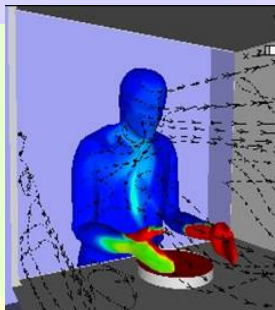
Fuel Cell Stacks: Heat and Mass Transport Simulations



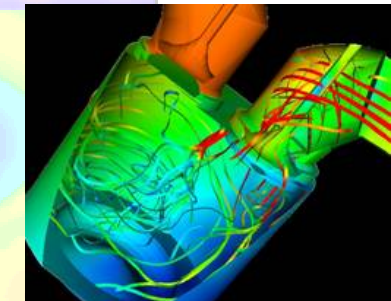
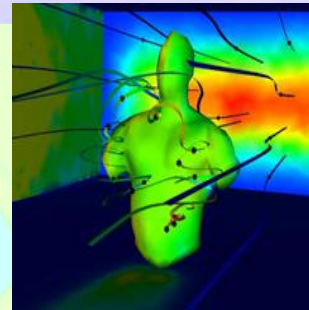
Simulation of Cough Generated Aerosol Transport in a Hospital Waiting Room



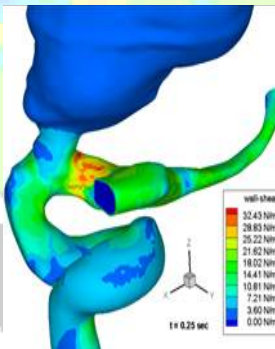
Direct Simulation of Mass Flow Through Reconstructed Porous Virtual Electrode



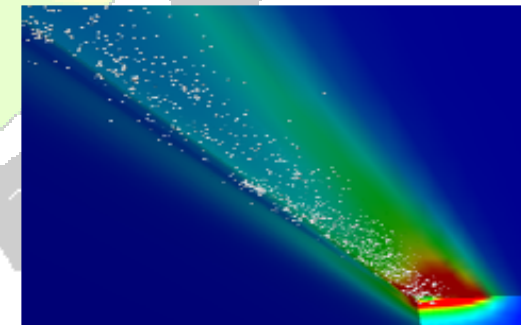
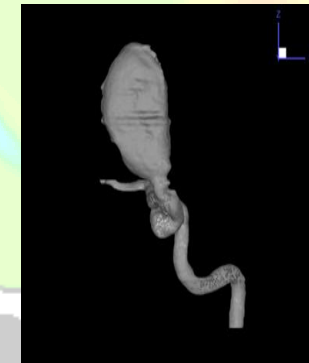
Worker Exposure in Chemical Hoods



Large Eddy Simulation of IC Engine Flows



Flow Through Cerebral Aneurysm



LES of Multiphase Flows: Bubbles in Ship Wakes