

***RESEARCH IN THE BIOFLUID
DYNAMICS LAB:
Biomechanics, Imaging, Vascular Biology and Translation
to Patients***

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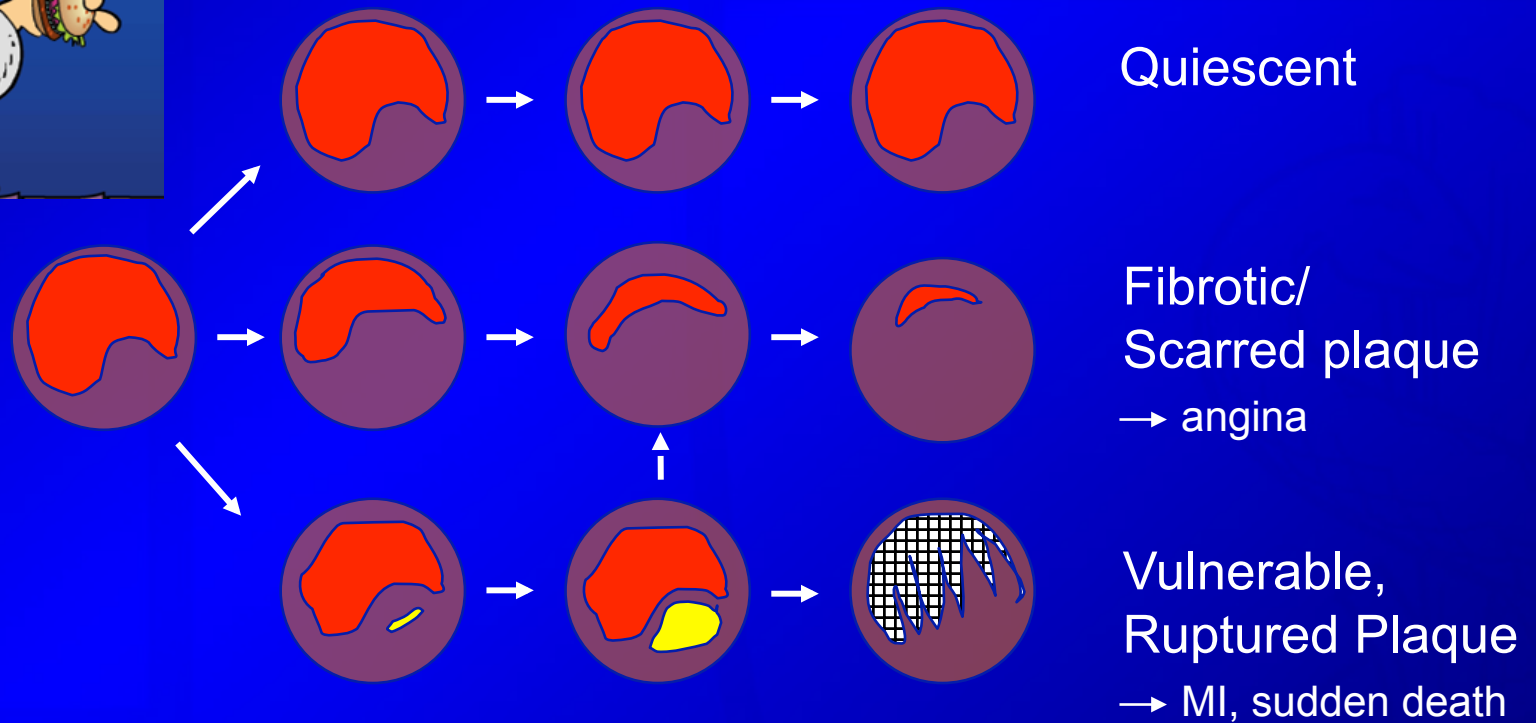
Current Projects

- Hemodynamics and atherosclerosis in mice
- Relation of wall shear stress to plaque progression and rupture in human coronary arteries
- Fluid dynamics of cerebral aneurysms
- Flow field effects on convection and attachment of nanoparticles in arteries
- Hemodynamics of the liver

Vulnerable patient



What is the Vulnerable Plaque?





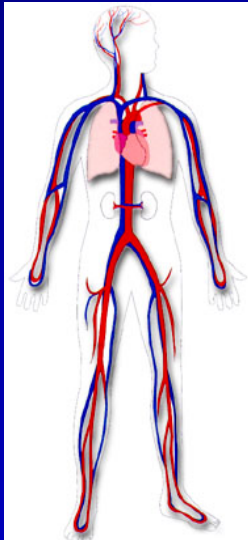
*The Wallace H. Coulter Department of Biomedical Engineering
at Georgia Tech and Emory University*

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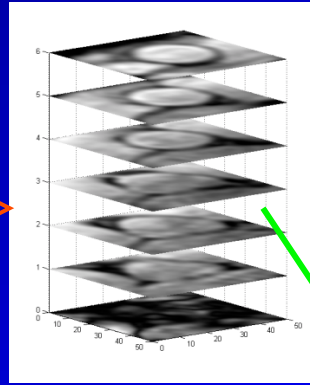


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Human vascular system

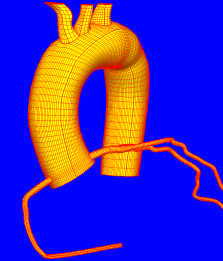


Medical imaging *in vivo*



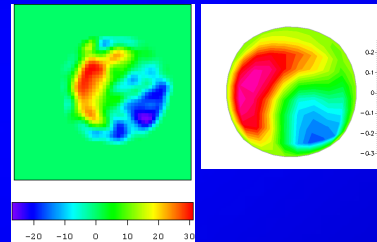
Geometry of arteries
Velocity distribution on sections
Compliance and motion information of vessels

Reconstruction of arterial model

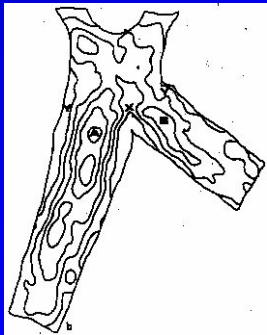


Principles of fluid mechanics

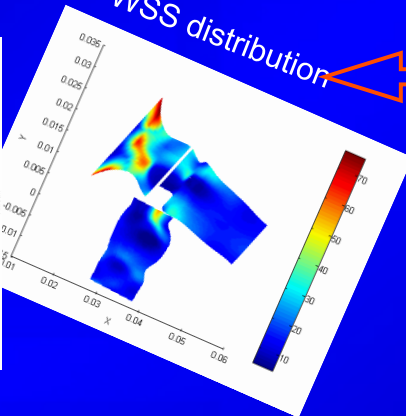
Calculation results are validated by PC-MRI measurements



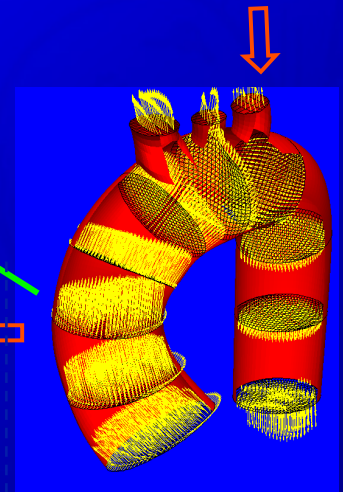
Plaque frequency contours of autopsies



WSS distribution

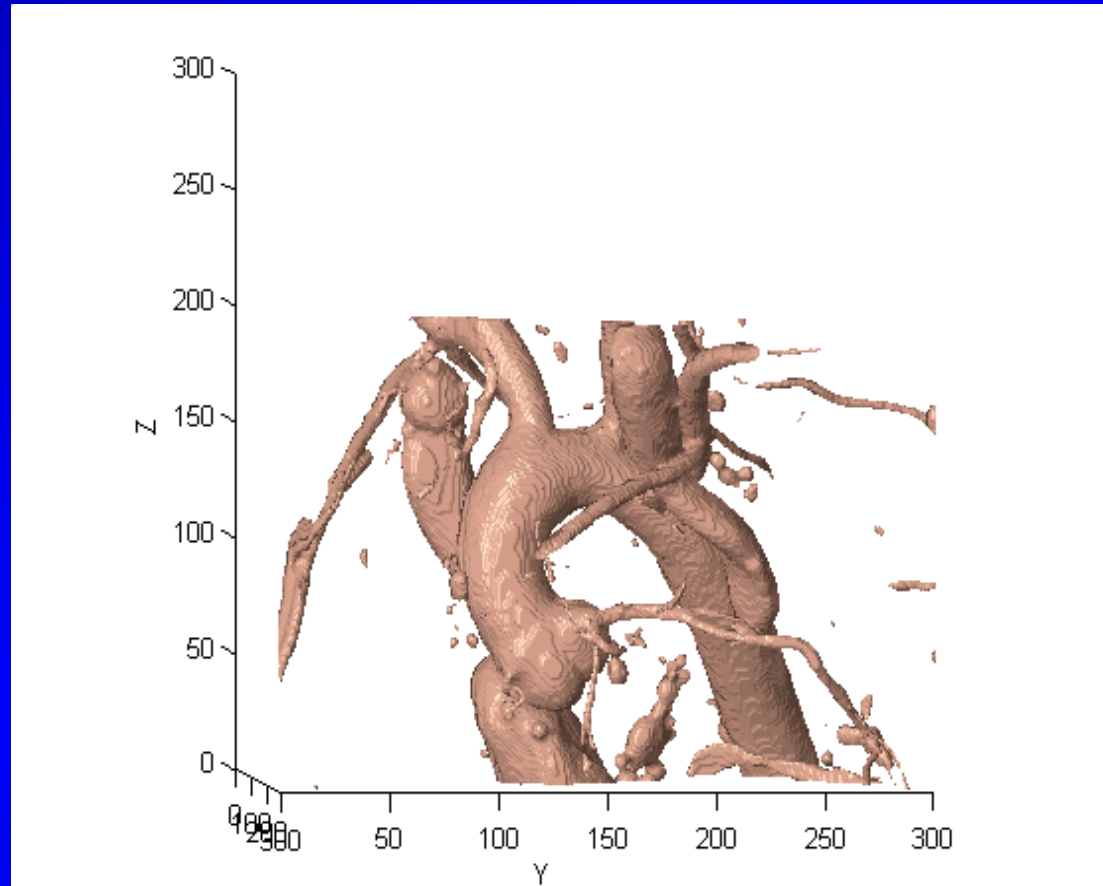


Relationship with atherosclerosis –
Examine the relationships between the flow and plaque distributions in the proximal segments of the coronary arteries



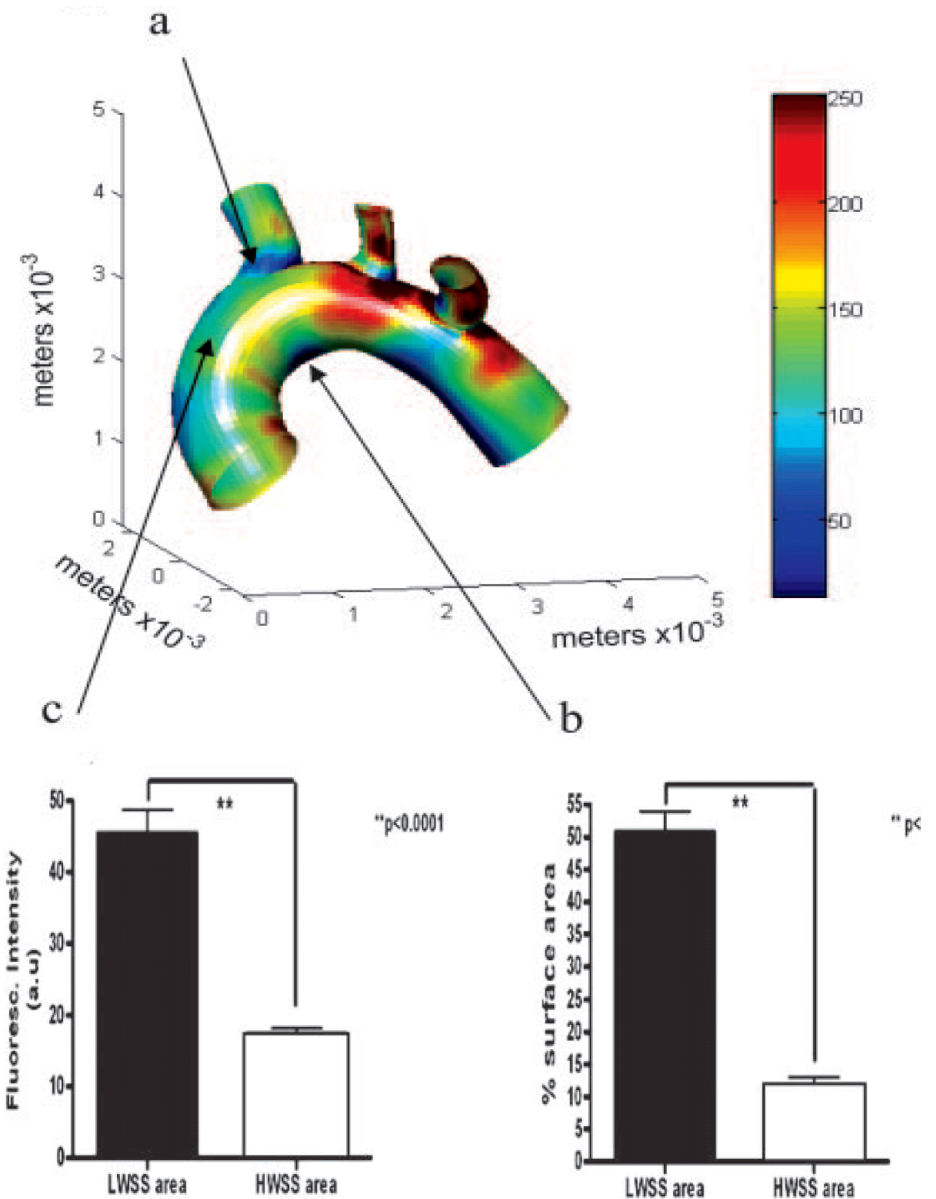
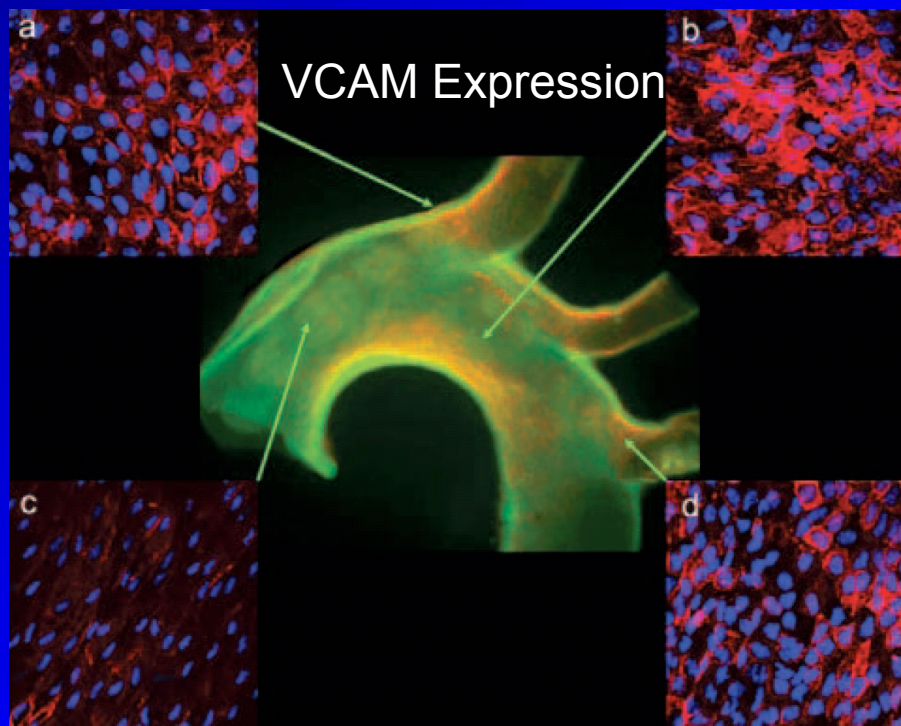
Reproduction of blood flow with higher precision

Hemodynamics and Atherosclerosis in Mice

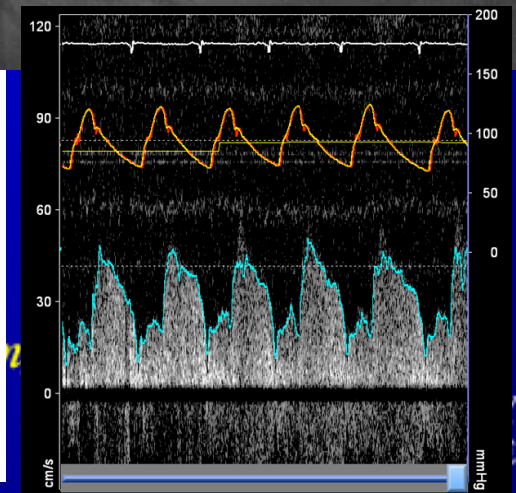
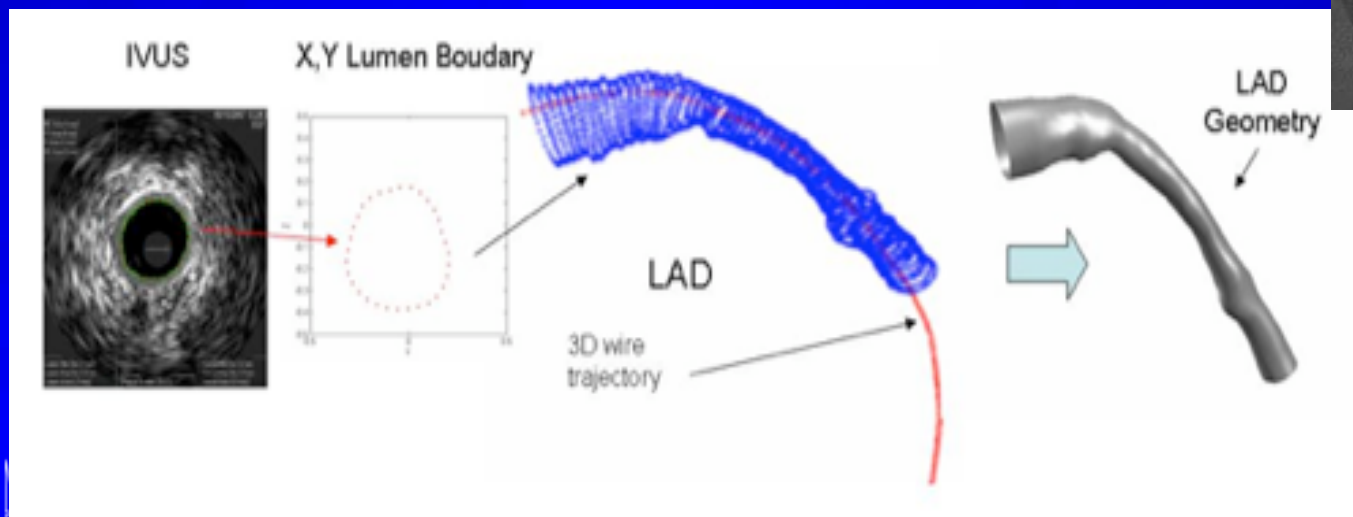


Low Shear Stress Increases VCAM in Mice

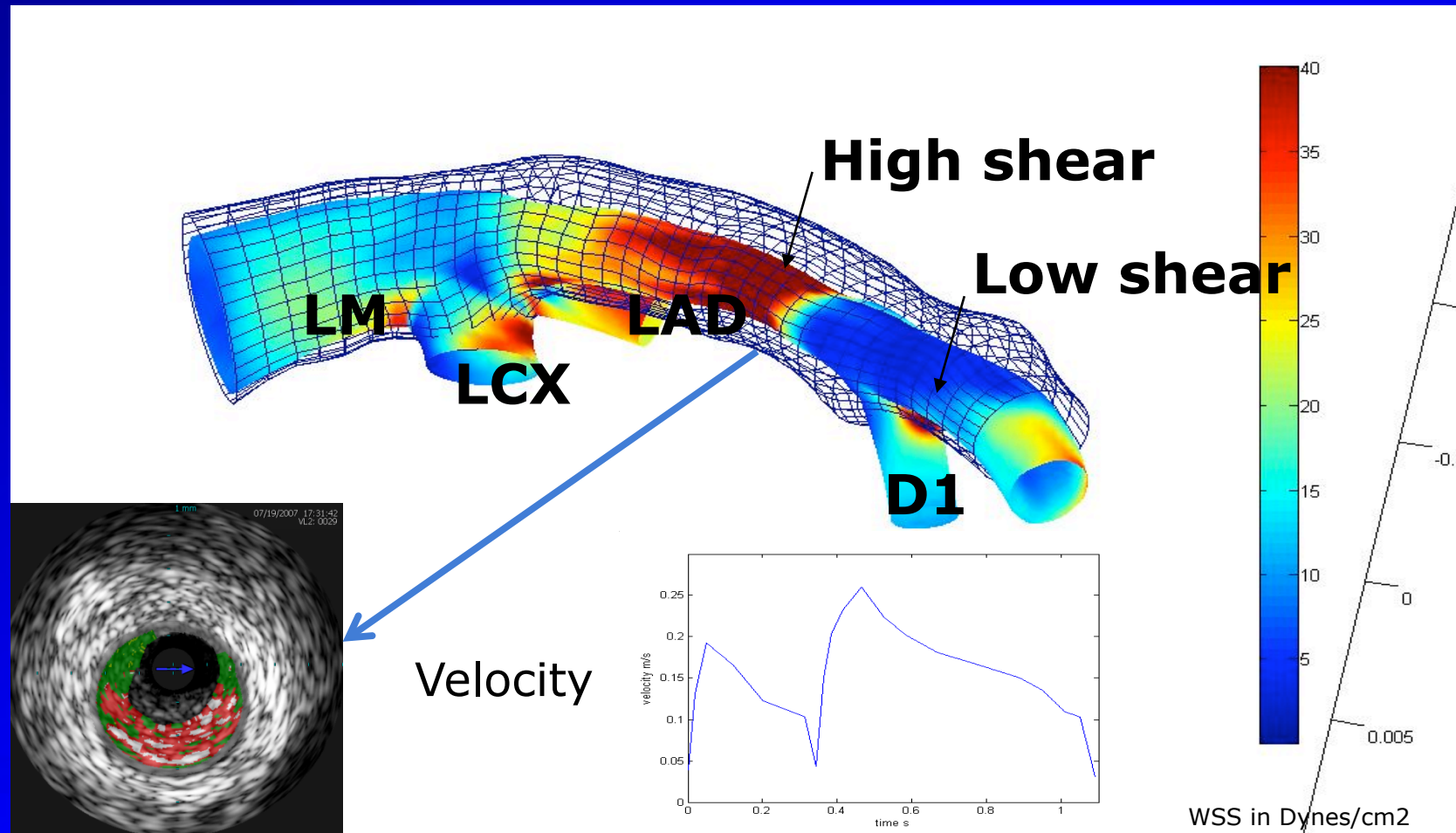
Suo, Ferrara, Sorescu, Guldberg, Taylor, Giddens. ATVB. 2007;27:346



Plaque Progression in Human Coronary Arteries

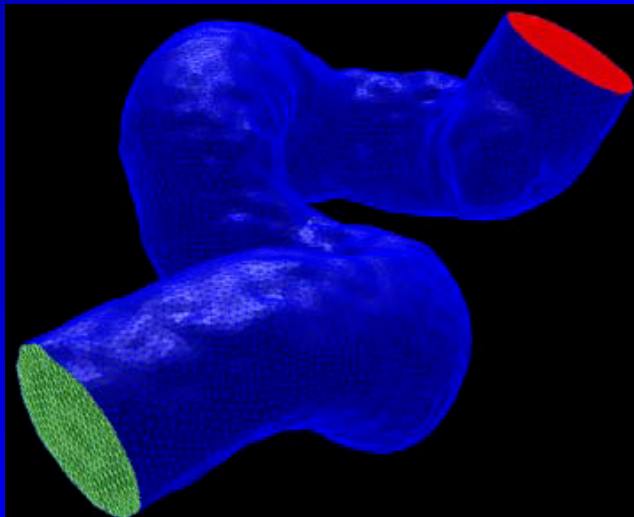


Plaque Progression in Human Coronary Arteries

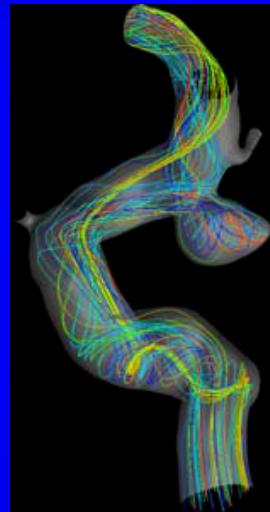


Fluid Dynamics of Cerebral Aneurysms

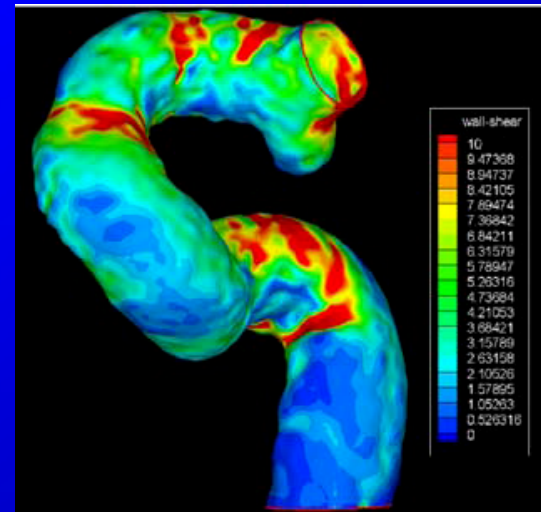
Computational Mesh

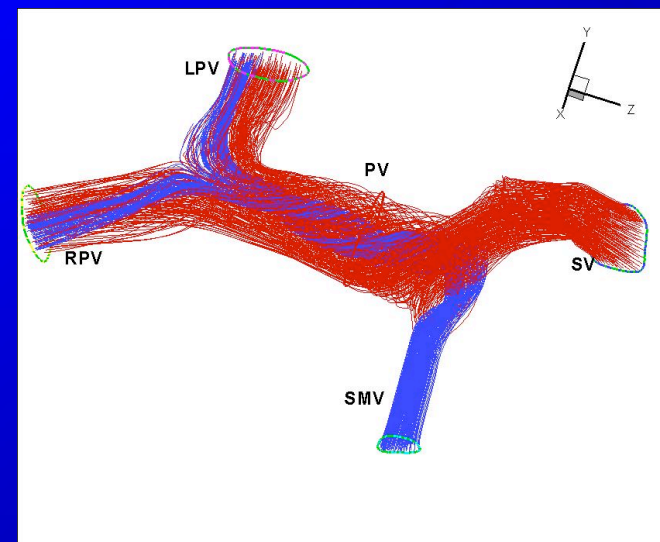
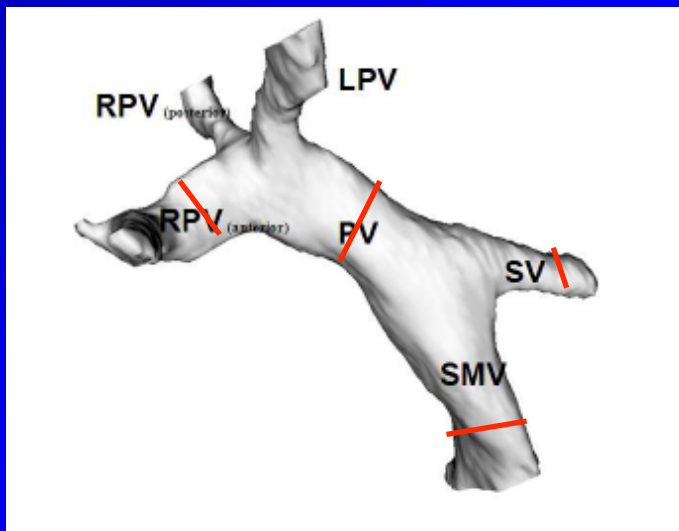
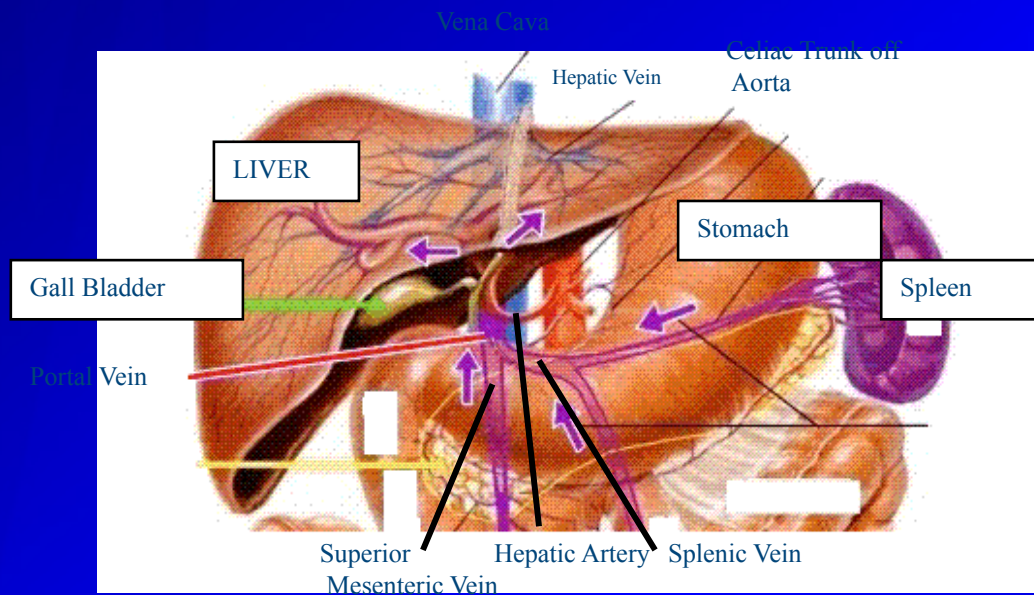


Pathlines



Wall Shear Stress





Principal Collaborators and Students

- Jin Suo, Ph.D. – BME
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- Diego Martin, M.D. - Radiology
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- Robert Taylor, M.D./Ph.D. – Cardiology/BME
- Frank Tong, M.D. – Radiology
- Stephanie George, Ph.D. – BME Postdoctoral Fellow
- Yi Gao
- Sungho Kim
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