

## Software Technologies for Surgical Simulation

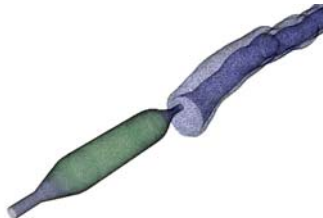
*The NRC Industrial Materials Institute is developing materials software technologies for surgical simulation.*

### Research Themes

Research themes focus on the development and hardware integration of materials deformation, fluid flow and biological response software technologies, in particular for:

- Virtual surgical trainers
- Patient-specific interventional and surgical planners

Percutaneous interventions, minimally invasive and open surgeries are targeted. Potential applications include cardiovascular interventions, neurological, colo-rectal and breast cancer surgeries.



Simulation of Endovascular Intervention

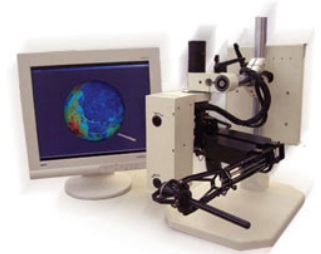
### Infrastructure

The research themes are supported by two major laboratory infrastructures at the Industrial Materials Institute, the Virtual Materials Technology Centre and the Biological Tissue Testing Laboratories.

Twenty-five workstations, a 256 CPU parallel computer, visualization, laser scanning, imaging and haptics platforms are available to support the development.



Immersive Virtual Reality and Computational Platform



Hardware consoles for software integration (IVUS imaging and haptics platform)

A level 1 wet lab is available for OCT and IVUS tissue imaging work. A level 2 wet lab is available for characterizing:

- Tissue deformation and fluid flow behaviour
- Tissue damage, tissue growth and biological response



Tissue Biorheometer



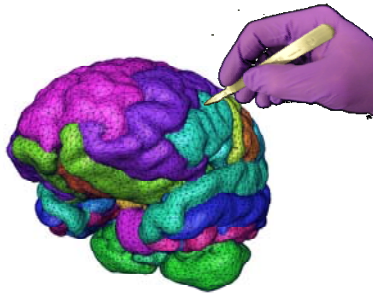
Loaded Bioractor



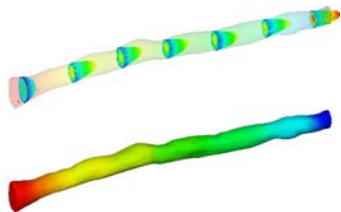
### Virtual Surgical Trainers

Realistic material and tissue behaviour in a 3D visualization environment.

Integrated onto a bi-manual (6-DOF/7-DOF stylus) low inertia-high resolution haptics platform.



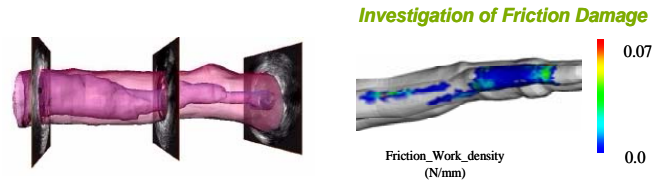
Neurosurgery



Blood Flow in Stenosed Artery

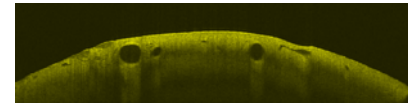
### Patient-Specific Interventional and Surgical Planners

Prediction of biological response and tissue behaviour integrated onto tissue imaging hardware.



IVUS Image Reconstruction

Patient-specific Response



#### *In vivo Deformed Geometry*



$P_{Low}$

$P_{High}$

$P_{Balloon}$

Identification of Vulnerable Plaque

For more information, please contact:

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Ce document est également offert en français  
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