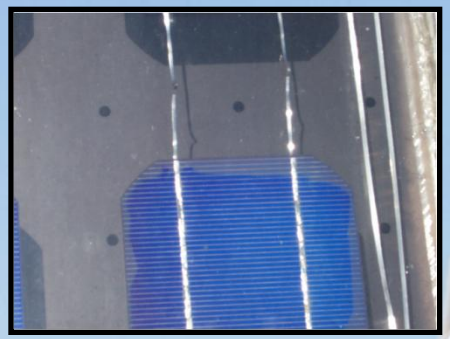
Solar Thermal Research Lab

Prof. Mike Collins
ERC 3008

PV / Solar Thermal Hybrid Systems



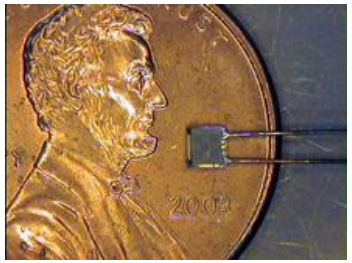
Solar Assisted Heat Pumps

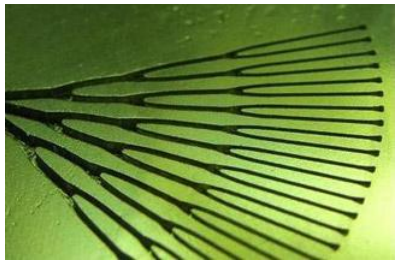
Solar/Optical Material Characterization

Green Buildings North House

Microelectronics Heat Transfer Laboratory

- ✓ Evaluation & modeling of next generation electronics cooling
  - thermo electric coolers
  - micro refrigeration
  - micro pumps & compressors





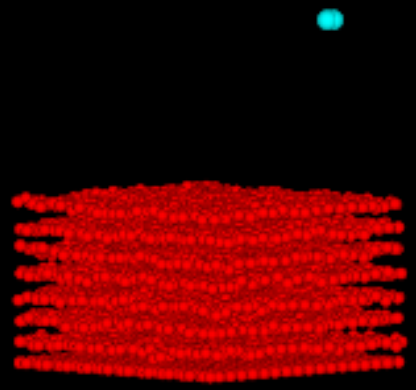
- ✓ Materials characterization

- ✓ Shape memory alloys

- ✓ Analytical modeling & testing of electronic equipment

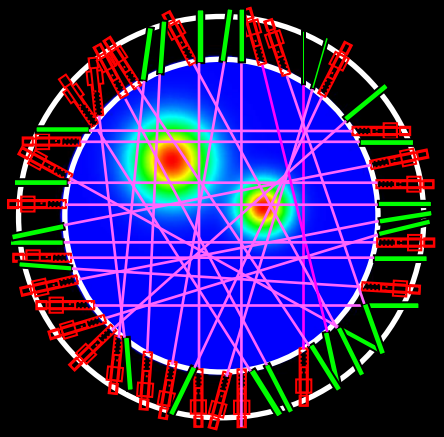
Inverse Problems in Combustion and Heat Transfer

Laser-based nanoparticle diagnostics

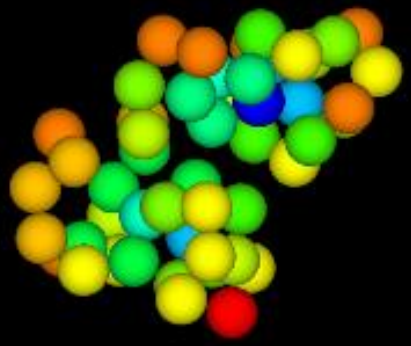


Molecular dynamics

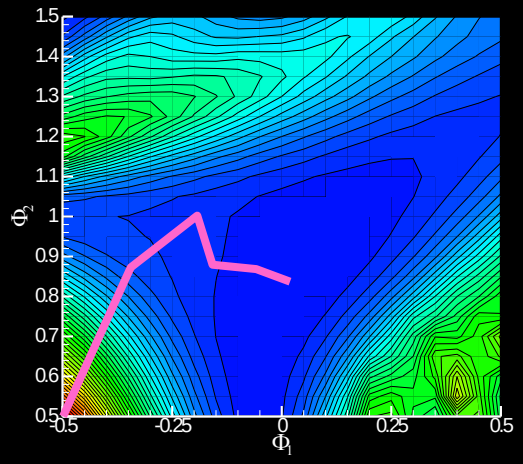
Prof. K. J. Daun
ERC 2028



Combustion tomography



Heat conduction from nanoparticles



Design optimization

Research Activities – R.A. Fraser

Plug-in Hybrid Electric Vehicles (PHEV)

EcoCAR

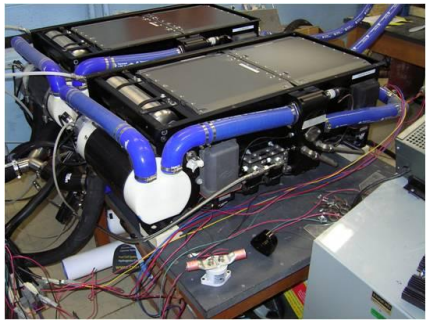
Design

Modelling

Hardware-in-the-loop (HIL)

Integration

Controls

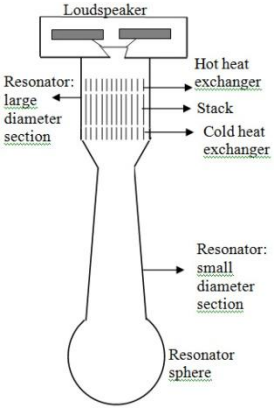


Fuel Cells

Engines

Alternative Fuels

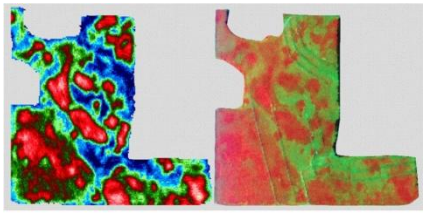
Thermoacoustics



Enviro Friendly Refrigeration

Energy Systems Optimization

Materials
Shape
Exergy



Ecosystem Health

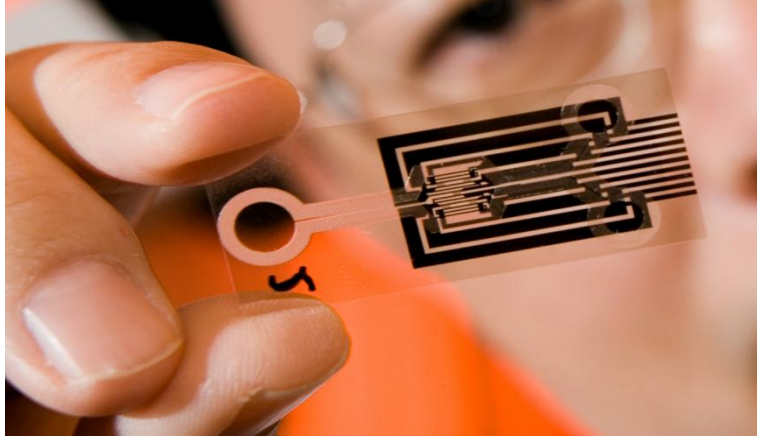
Solar Exergy

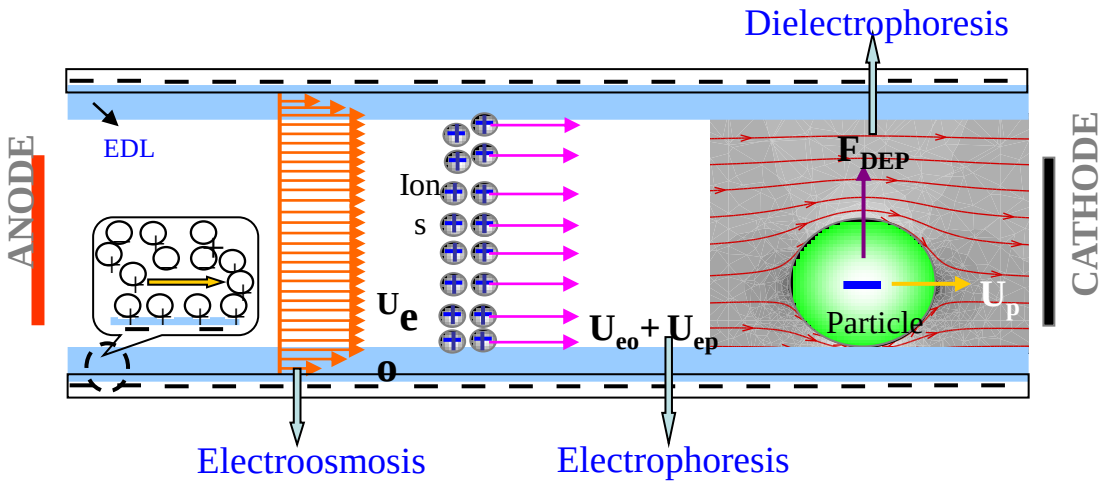
Batteries

Harmonic Drive Motors

+ Thermal Engineering

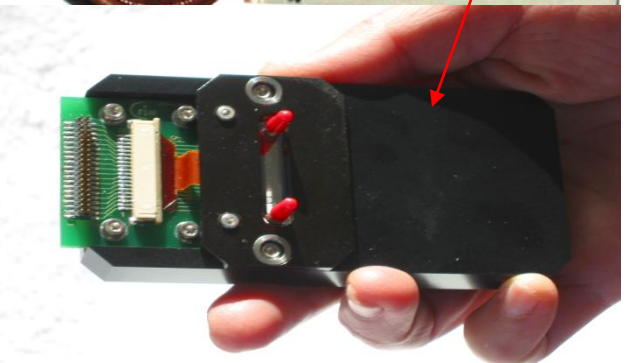
Professor Dongqing Li
Microfluidic Lab-on-a-Chip Devices for BioMedical Applications



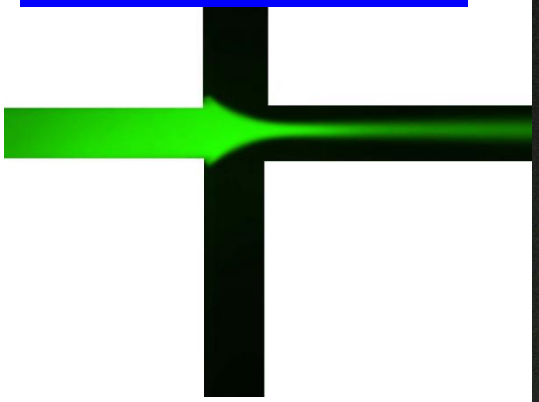


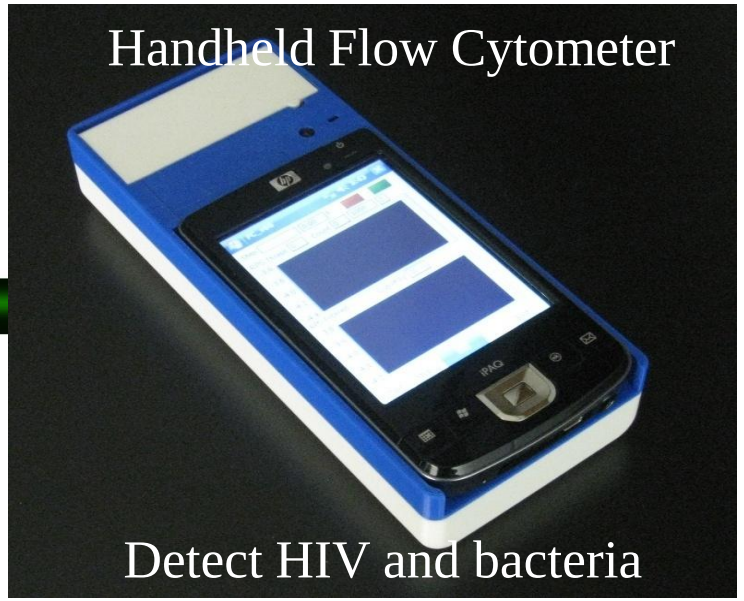
Studies of flow, transport of molecules and cells in micro and nanochannels.

"PhotoCopy"



Electrokinetic Microfluidics



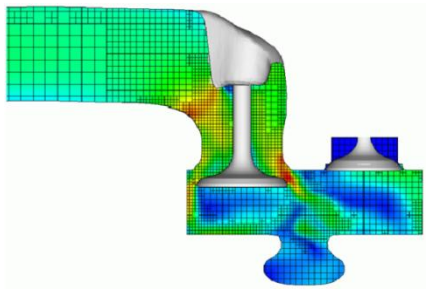


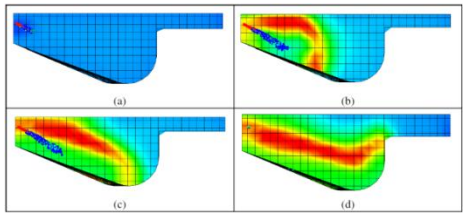
Laboratory for Fuel Cell and Green Energy RD&D

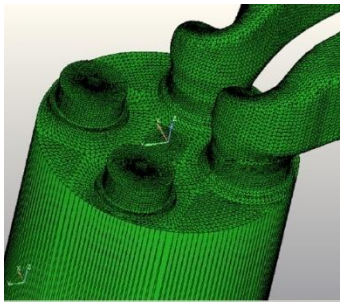
Prof. Xianguo Li
ERC 3021

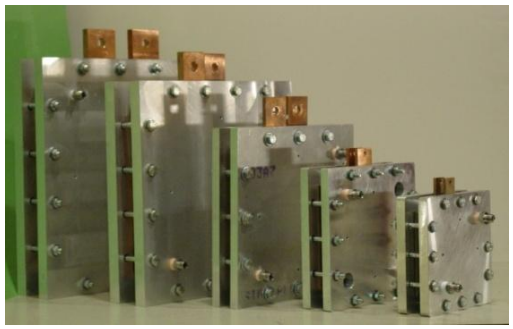
Diesel and Biodiesel Engines:

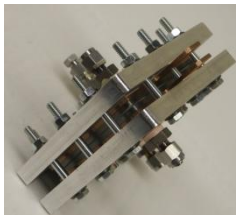
- ✓ Engine Performance & Emissions
  - • Biodiesel vs petro-diesel
  - • Bio-/petro-diesel blends
- ✓ Fuel Injection Characterization
  - • Fuel injection strategies/systems
  - • Fuel droplet size distributions
  - • Spray penetration and cone angles
- ✓Engine Combustion Modeling











Fuel Cells:

- ✓ Design & Fabrication
  - • Bipolar plates and flow channels
- ✓ Testing & Experiments
  - • components, performance, accelerated durability
- ✓Dynamic response/cold-start
- ✓ Modeling & Simulation
  - • water & thermal management
  - • containment effects (CO, H_2S poisoning)

20/20 Laboratory for Fuel Cell & Green Energy RD&D

Prof. Metin Renksizbulut

Research Interests:

- Chemically reacting flows in micro/nano-scale devices
- Molecular simulation of nano-scale reactors
- Electro-kinetic/osmotic liquid flows in microchannels
- Rarefied gas flows and heat transfer in microchannels

Prof. G.E. Schneider

Research Interests

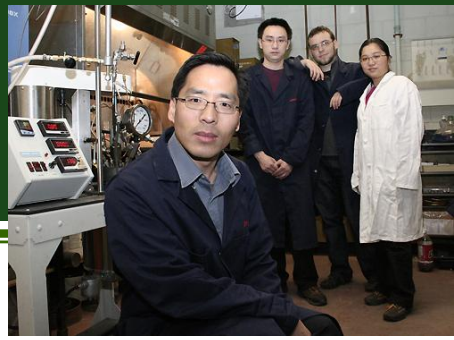
1. Computation of flow at all speeds
   - ✓ M = 0 to M >= 10

2. Fluid Flow and Heat Transfer in Microfluidics
   - ✓ DNA analysis
   - ✓ Application to lab-on-a-chip

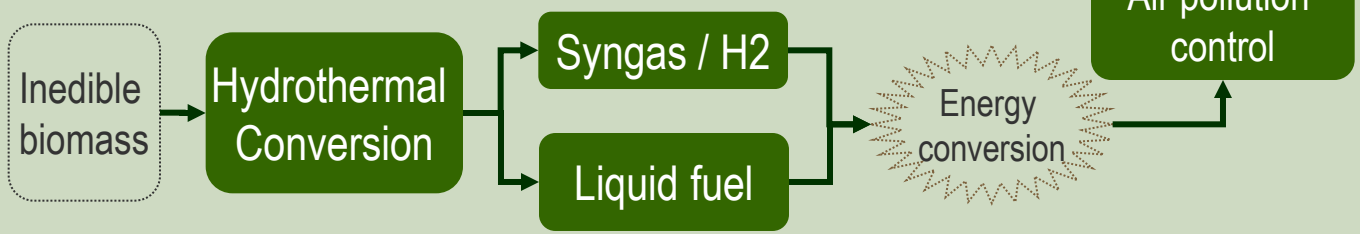
3. Alternative Energy Systems
   - ✓ Wind, photovoltaics, fuel cells, hybrid systems, etc.

Bioenergy Lab

The Laboratory for Research in Thermo-chemical Process for Bioenergy



Main research: 1) Alkane biofuel from inedible biomass
2) Post-combustion air pollution control

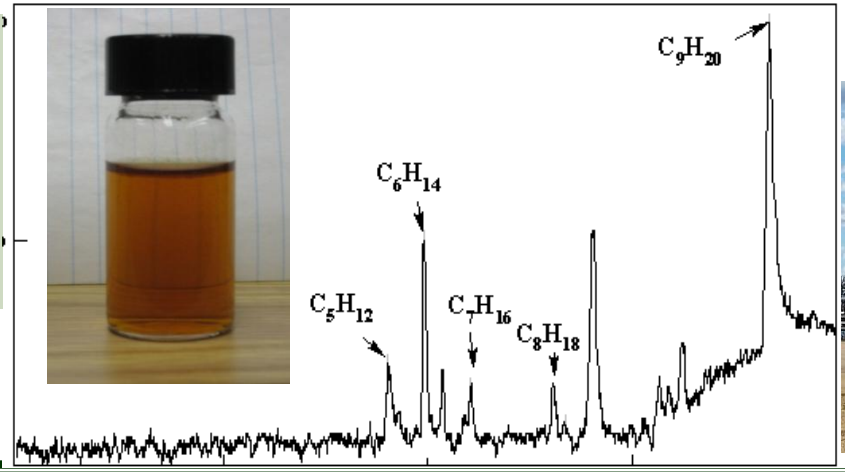


Features:

- ❑ High yield of syngas (hydrogen)
- ❑ Alkanes (C_nH_{2n+2}) from inedible biomass
- ❑ Air emission control for clean air
- ❑ Waste water to clean water

Training students with

- ❑ Industrial relevance
- ❑ Hands-on experiences
- ❑ Creative thinking



University of Waterloo

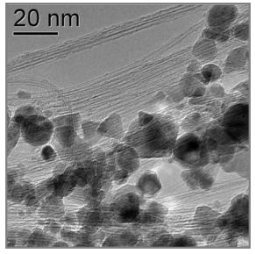
Bioenergy Lab
The Laboratory for Research in Thermo-chemical Engineering for Bioenergy
Email: tanz@uwaterloo.ca
Phone: 38718 **Web:** tan.uwaterloo.ca

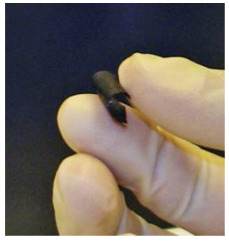
Laboratory for Emerging Energy Research (LEER.UWATERLOO)

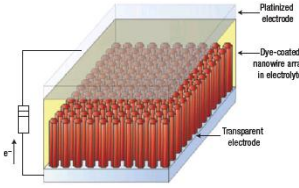
Prof. John Wen
ERC 2003

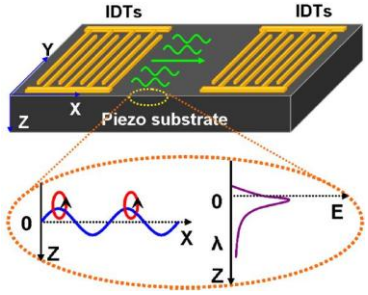
Nanotechnology

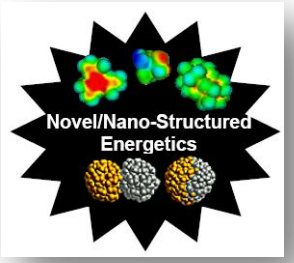
- Nanomaterial synthesis, characterization and applications
- Flexible energy storage and management devices: *carbon nanotube based supercapacitors*
- 3D solar power generation: *dye sensitized solar cells*
- Micro-scale power generation and manipulation: *acoustics and nanothermite* in micro-channels and sampling droplets





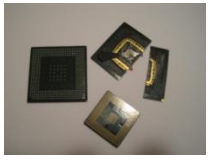


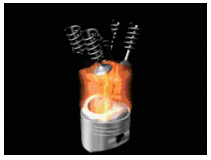


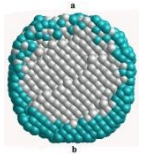


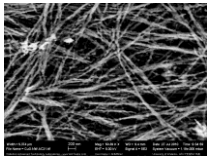
Energy

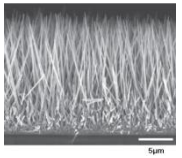
- E-waste gasification; advanced engine design; biomass and biofuel combustion; carbon management and nanomaterial based devices.



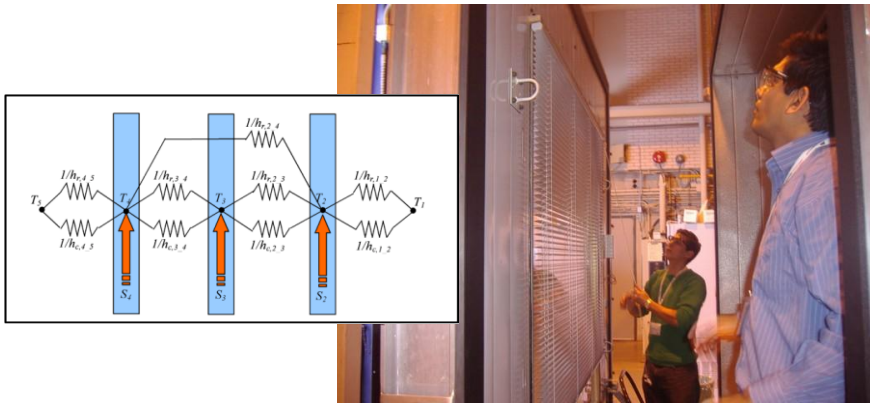




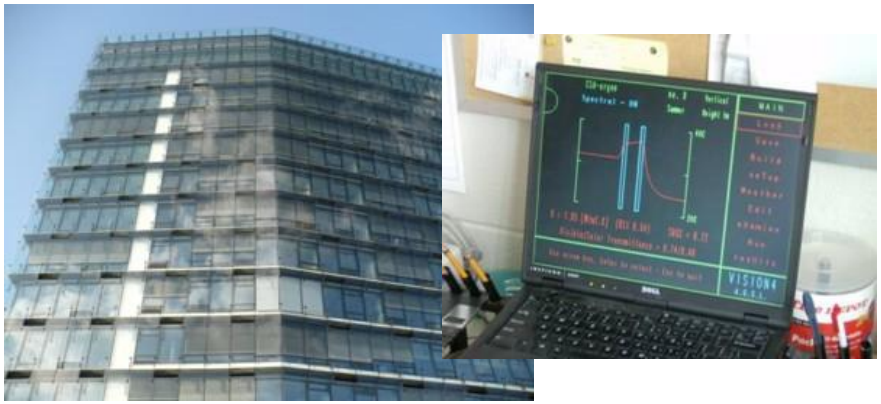




Advanced Glazing Systems Laboratory

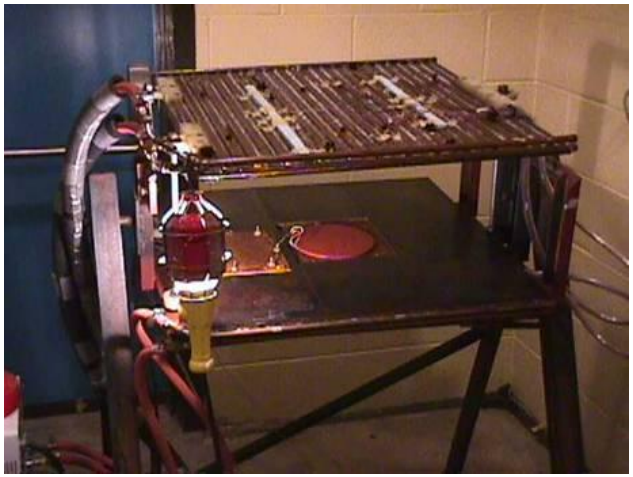


Simplified Window and Shade Models for Energy Simulation

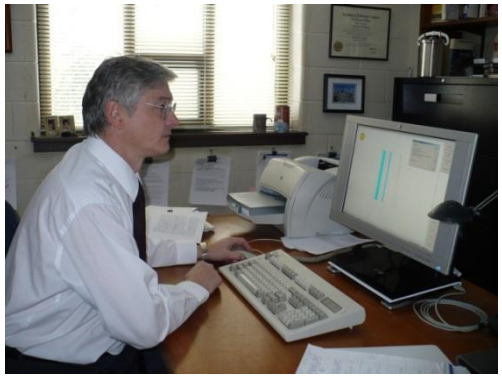


Building Energy Simulation / Green Buildings / Software Development

Condensation Resistance in Windows



Heat Transfer Measurements



Prof. John Wright
ERC 3007