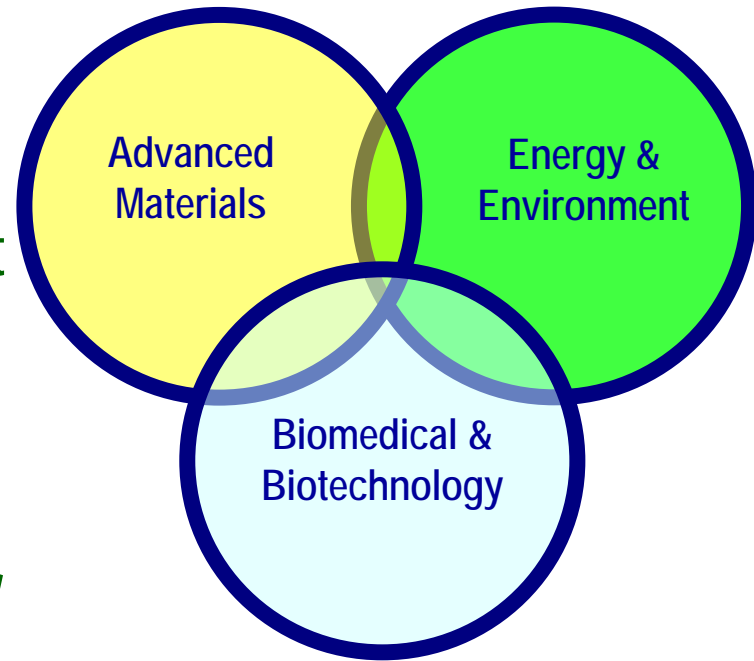




College Strategic Research Focus Areas

- **Focus areas:**



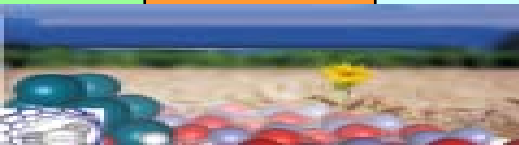
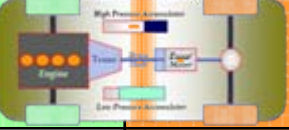


- Energy & Environment
- Advanced Materials
- Biomedical Engineering/
Biotechnology



- **Wide range of technologies/applications**
- **122 grant awards in FY2008 for 11.5M\$**



Research Highlights

EXAMPLES	Energy & Environment	Advanced Materials	Biomedical & Biotechnology
Fuel Cells			
Bio-Fuels			
Sustainable Nanomaterials			
Hybrid Vehicles			
Helmet Project			
Spine Research			



Advanced Materials

- **Fatigue and Fracture Mechanics** – Dr. Fatemi
- **Polymers & Polymer Nanocomposites**– Faculty in many ENG depts
- **Membranes** – Drs. Lipscomb and Escobar
- **Smart Automotive Materials** – Drs. Elahinia and Naganathan
- **Nanomaterials** – Drs. Jayatissa, Azad and Berhan
- **Sensors and Nanodevices** – Faculty in many ENG depts
- **Optoelectronic materials** – Dr. Georgiev
- **Biomaterials** – Dr. Bhaduri

Polymers and Polymer Nanocomposites

- Development of novel polymer nanocomposite materials – large research team led by Dr. Maria Coleman
- Polymers and polymer nanocomposite materials for packaging applications – led by Dr. Saleh Jabarin at the Polymer Institute
- Characterization of polymer nanocomposites – led by Dr. Ali Fatemi and other faculty





Energy and Environment

Energy Research

- Hydrogen and ethanol (Varanasi, Schall, Relue)
- Hybrids (Olson, Stuart & Elahinia)
- Energy conversion (Shenai, Stuart, King)
- Fuel Cells (Lipscomb, Azad, Bhaduri, Gan, Li)

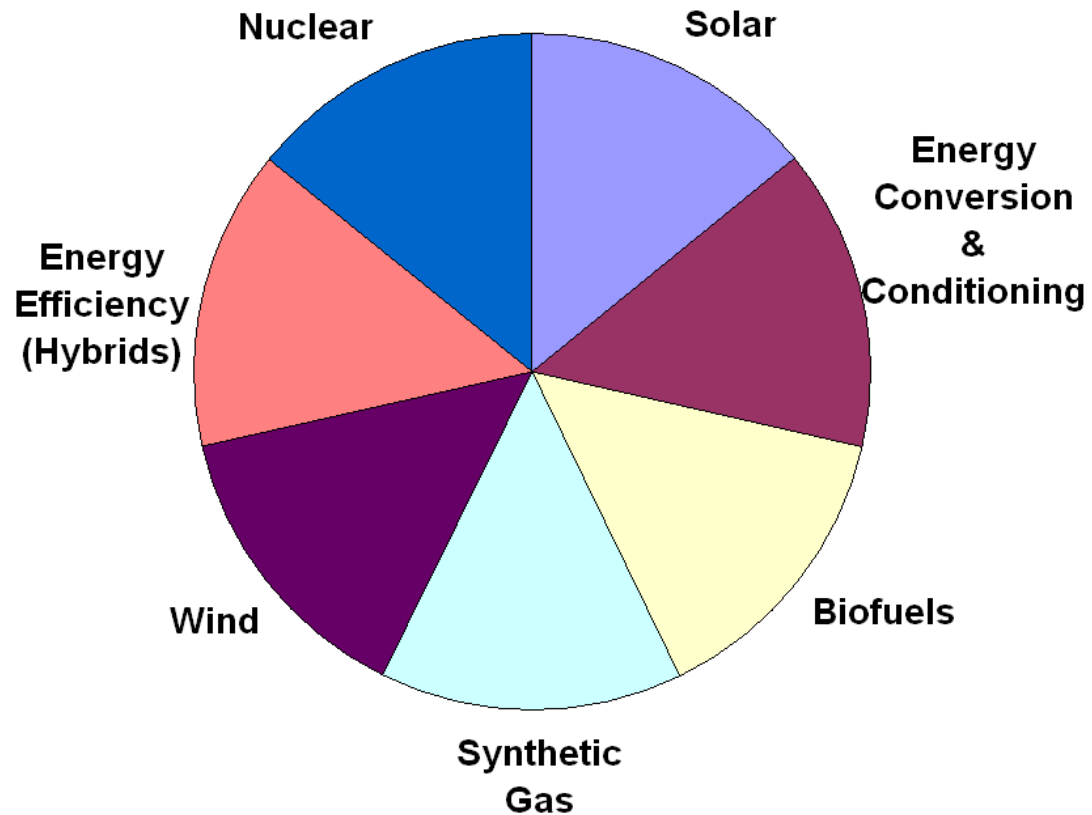


Environmental Research

- Air pollution monitoring and modeling (Kumar)
- Water quality and microbial sensing (Escobar & Gruden)
- Monitoring storm water and agricultural runoffs (Drs. Apul & Heydinger)



COE Energy Research & Education





Biofuels Research

- Over the last 18 months more than \$2 million in grants
 - US Department of Energy
 - Ohio Advanced Energy Program
 - Consortium for Plant Biotechnology
 - EISC, Inc.



"Plugged-In"

Partnership between WGTE and UT (ENG, BUS, ARS, Research Development, Mktg. & Communications)





Biomedical/Biotechnology

- Spine Research – Dr. Goel
- Biomechanics and Assistive Technology – Drs. Hefzy and Elahinia
- Chemical/Bio Sensors – Drs. Cameron, Nadarajah, Jayatissa, Gruden and Azad
- Biomass Conversion to Ethanol
- Ultrasound Imaging – Dr. Lu
- Biomaterials – Dr. Bhaduri

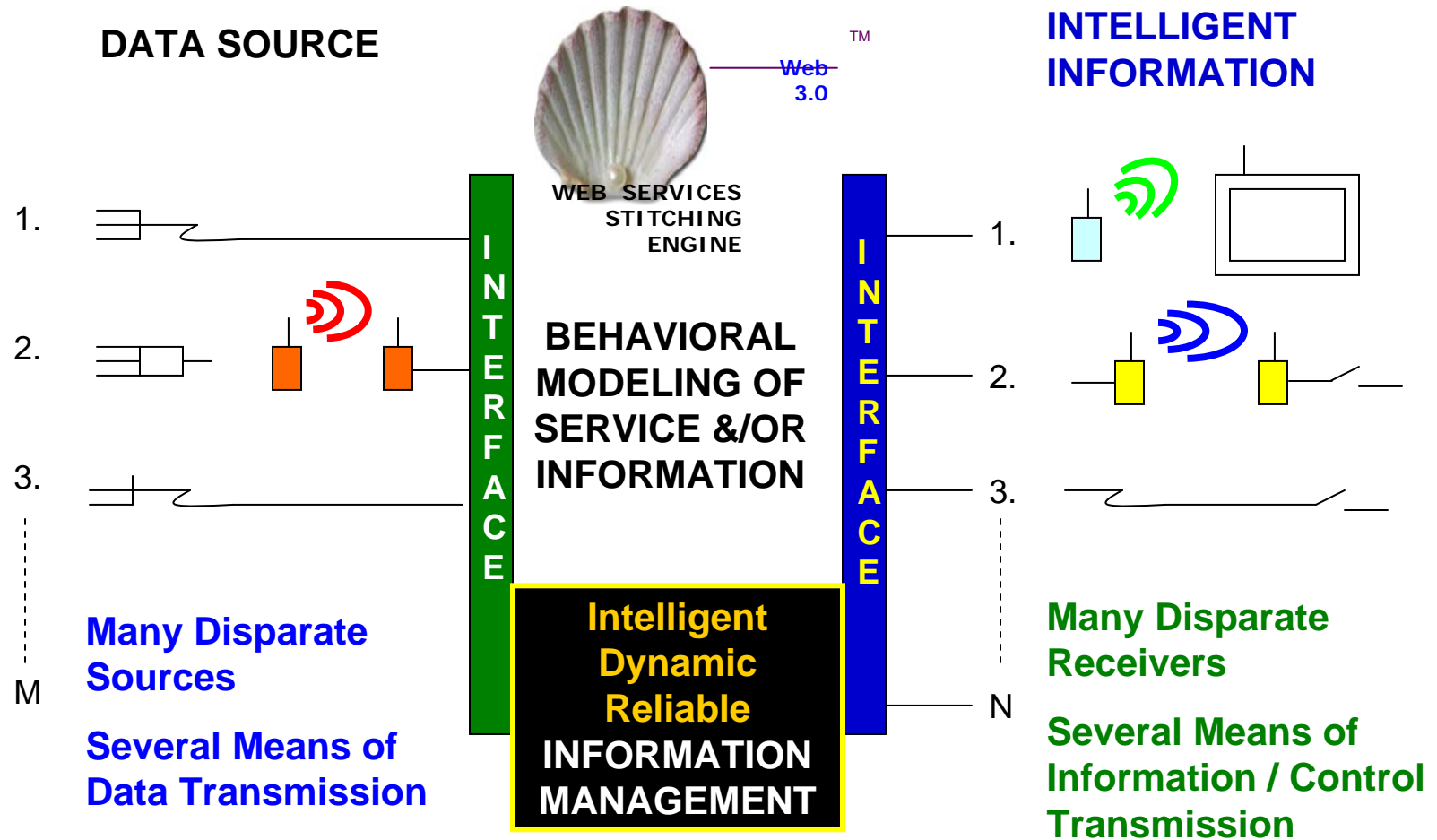




Other Research Projects

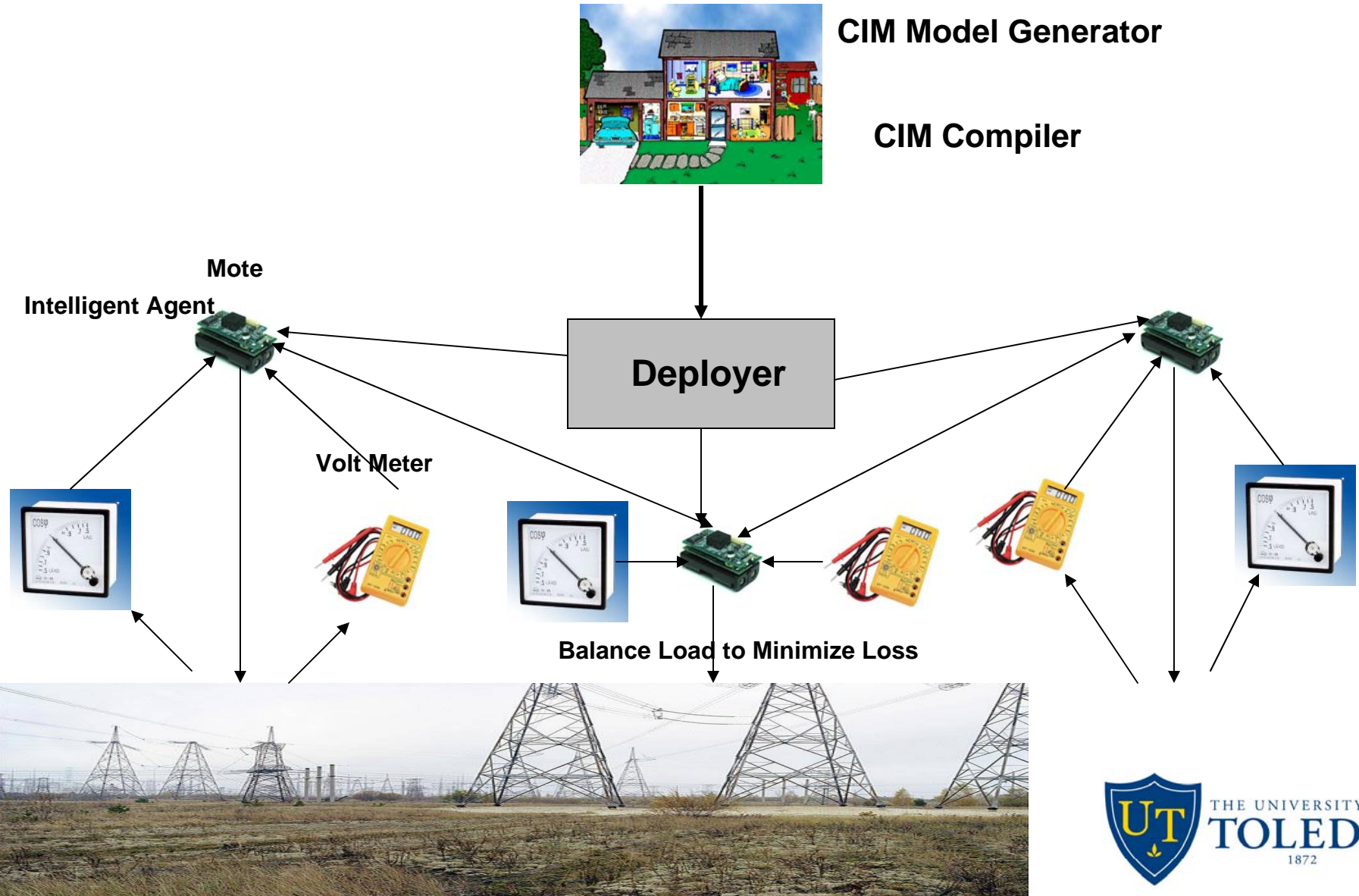
- **Polymer Institute – Dr. Jabarin**
- **Small Turbine Institute – Dr. Afjeh**
- **Engineering Center for Orthopedic Research (ECORE) – Dr. Goel**
- **Cognitive information management & Cognitive Electric Grid – Dr. Shenai**
- **Precision Micromachining Center – Dr. Marinescu**
- ...

Cognitive Information Management (CIM)



Applications: Energy and Water Management, Materials Synthesis and Manufacturing, Environmental Monitoring and Control, and Healthcare Management and Medicine

Cognitive Electric Power Grid





Ohio Third Frontier Program

- **Hydrogen Production for Fuel Cells**
 - Part of the \$18 million Wright Fuel Cell Group (with Case, OSU, & CSU as partners)
- **Polymer Nanocomposites**
 - Part of the \$23 million Center for Multifunctional Polymer Nanomaterials and Devices (with OSU, Akron, Dayton, & Kent State as partners)
- **Small Turbine Research**
 - Affiliated with the \$11 million Ohio Center for Aero Propulsion and Power (with OSU, Case, Cincinnati, & Akron as partners)
 - UT also received a separate \$1 million capital project grant.
- **Chemical/Biological Sensor Research**
 - Part of the \$28 million Institute for the Development and Commercialization of Advanced Sensor Technology (with Dayton, Cincinnati, Miami & OSU as partners).

Over
\$15.5M

Recent Research Awards State of Ohio Programs

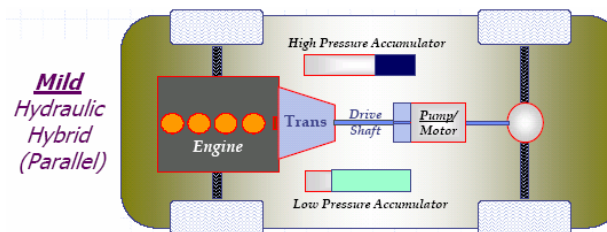
- Hydrogen for Fuel Cells (with Case, OSU, CSU)
- Chemical/Biological Sensors (with Dayton, Miami, Cincinnati, & OSU)
- Polymer Nanocomposites (with OSU, Akron, Dayton, Kent)
- Small Turbine Wright Project (with NASA, Teledyne)
- **Advanced Energy Program – Biofuels (with Suganit Systems)**
- **Choose Ohio First Scholarships – Entrepreneurship (with OSU, OCC, PTI, SSOE, RGP, Battelle,...)**
- **Ohio Research Scholar in Spinal Implants (with Cleveland Clinic)**





Hybrid Research

- **Hydraulic Hybrids**
 - Dr. Walter Olson, Mechanical Engineering
 - Dr. Mohammad Elahinia, Mechanical Engineering
- **Plug-in Hybrids & Battery Management**
 - Dr. Tom Stuart, Electrical Engineering





Hydraulic Hybrid Research

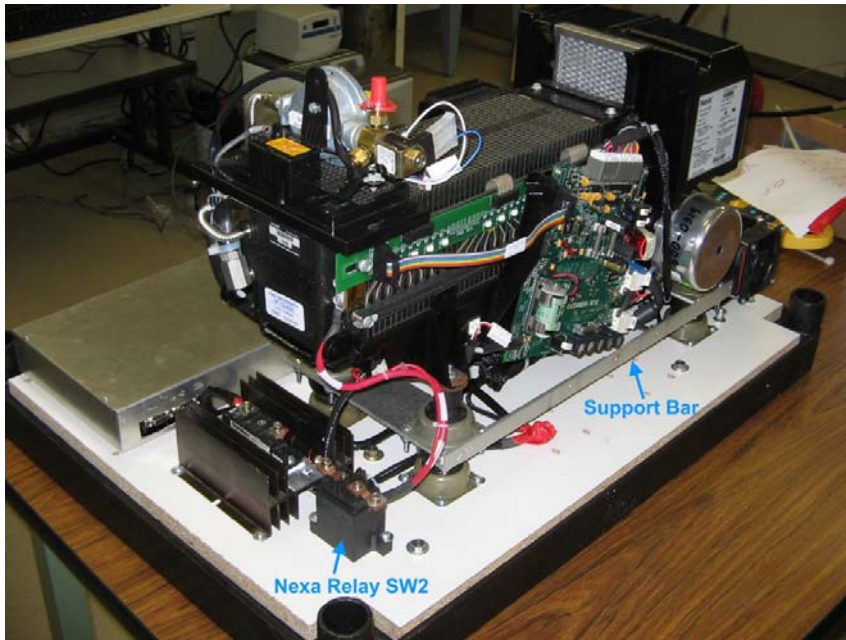
Sponsor: US Army (\$1 Million)

Dr. Walter Olson
Mechanical Engineering

Fuel Cell Hybrid Vehicle to be Fueled with Solar Produced Hydrogen

Sponsor: US Dept. of Energy, Ohio Dept. of Development

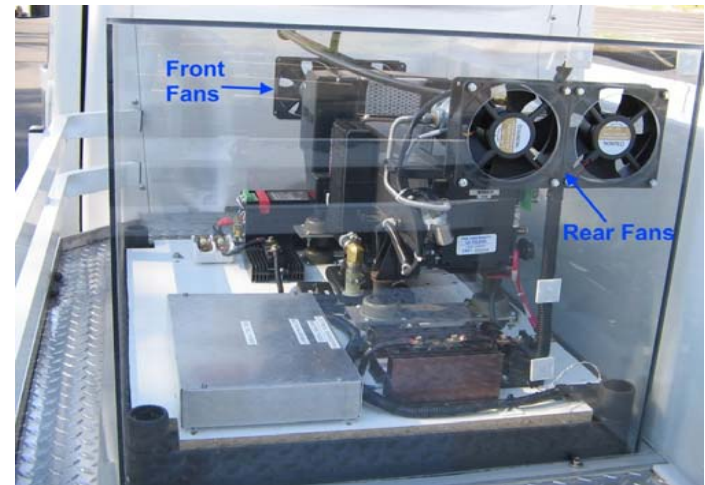
Investigators: Thomas Stuart, Mustapha Barakat, Sandy Mubenga



FCCS Laboratory Integration, Angle View



Complete GEM FCH, Side View



FCCS Enclosure, Back View



Plug-in Hybrids & Battery Management Research

Dr. Tom Stuart
Electrical Engineering

Seahorse AUV (Dr. Stuart)



- **Diameter** 38 inches
- **Length** 27 feet - 4 inches
- **Weight** 10,000 pounds
- **Range** Min 300 nm @ 4kts
- **Power Source (initial)** Alkaline batteries, (quantity 9216 D Cells)
- **Operational depths** 30 - 300 meters

New Initiatives Underway

- Formation of an *Institute for Sustainable Engineering Materials*, focused on developing a wide variety of sustainable and nanomaterials.
- *Microscopy and Material Characterization Laboratory* housing state-of-the-art instrumentation for transmission electron microscopy (TEM), scanning electron microscopy (SEM) and atomic force microscopy (AFM).

