ME 305 Fluid Mechanics I

Part 0

First Lecture

These presentations are prepared by

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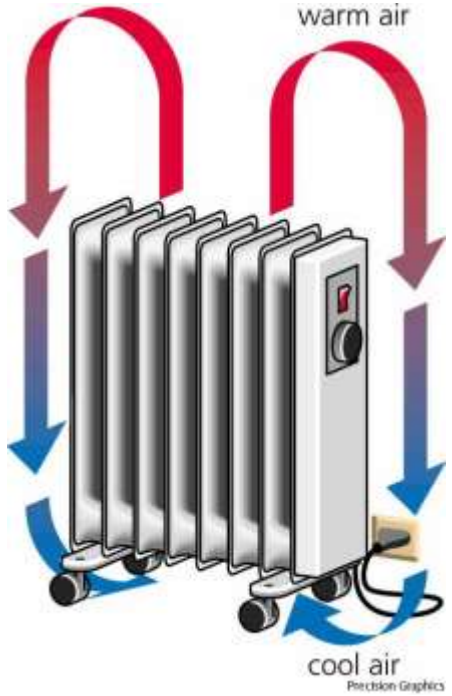
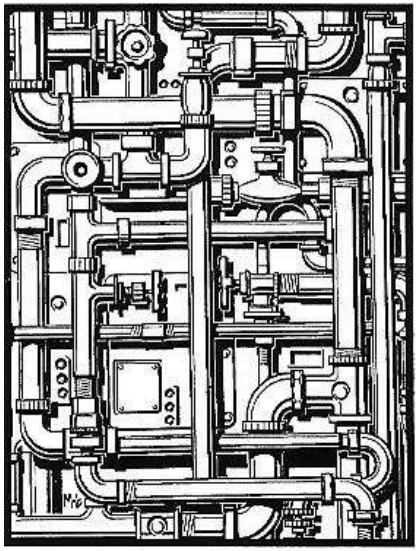
A Day Full of Fluid Mechanics

You wake up in the morning and the room is comfortably warm. Free convection driven by the radiator heat the room up all night.

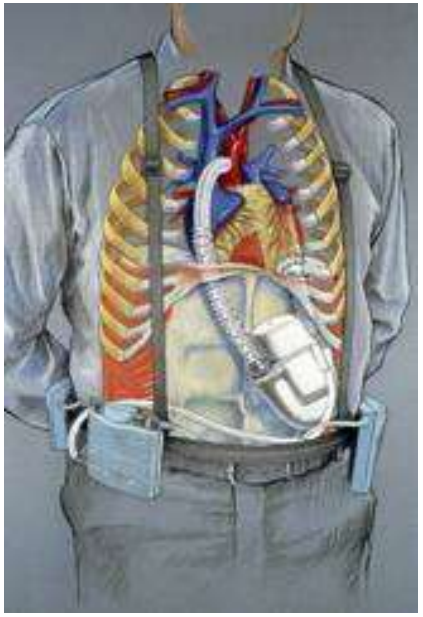


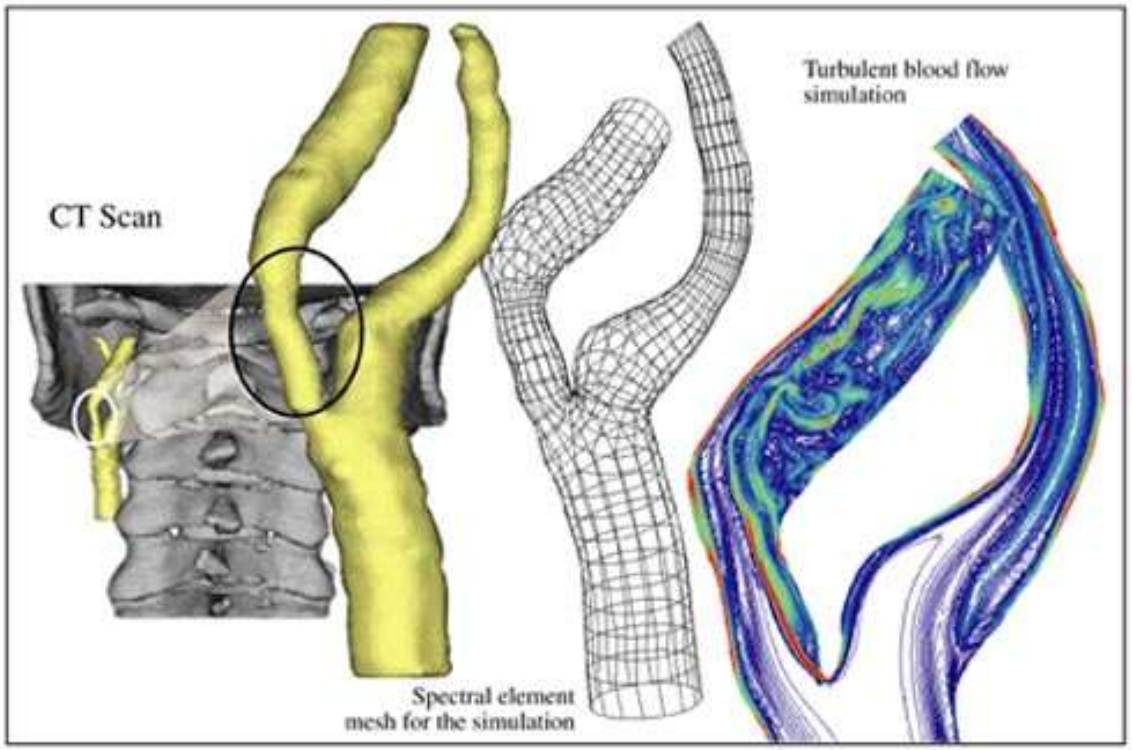


You wash your face. The water first passes through a flow meter outside your house and travels inside pipes before coming to the faucet.

A Day Full of Fluid Mechanics

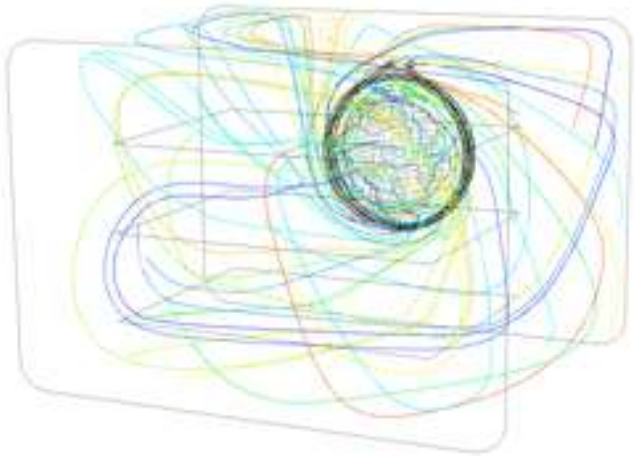
You have classes to attend, but you feel a bit sick. Maybe all you need is a pain reliever, but who knows...





A Day Full of Fluid Mechanics

You have your breakfast. The coolant moving inside the tiny pipes at the back of your refrigerator, and the air circulating inside it are both fluids.

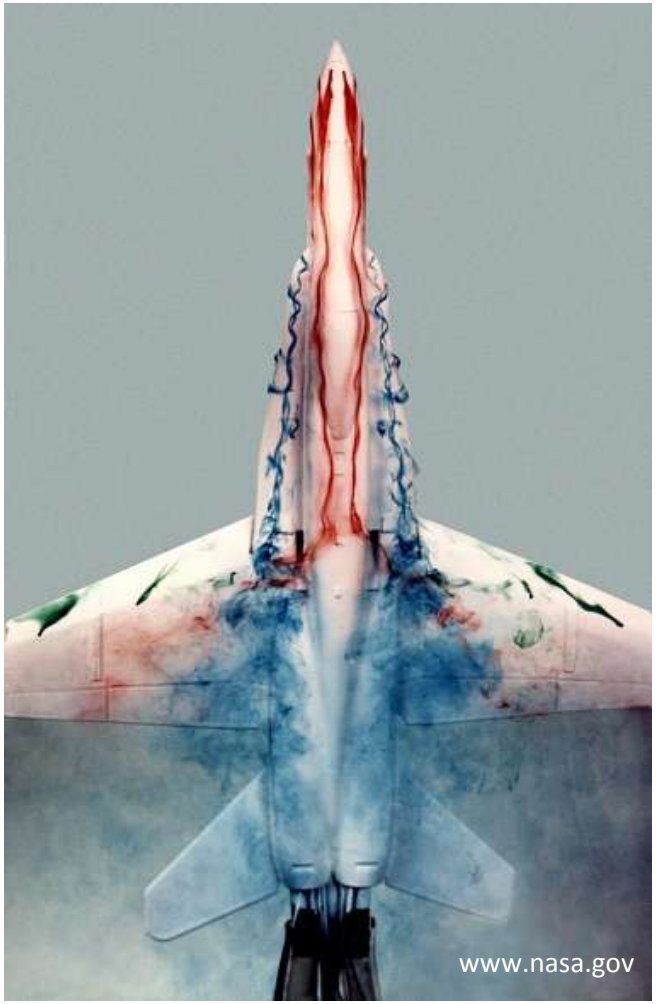


You decide to do some cleaning before heading to school. Fluid mechanics is involved in proper suction of air and filtering dust.

A Day Full of Fluid Mechanics

You watch TV to get the morning news. Nothing good again :-(

Fluid mechanics is involved in countless military/defense applications.

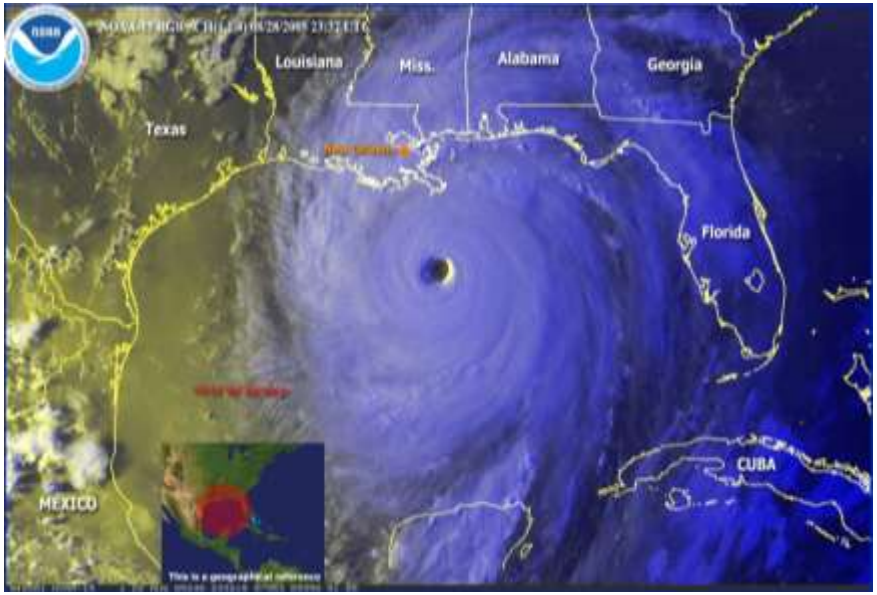


A Day Full of Fluid Mechanics

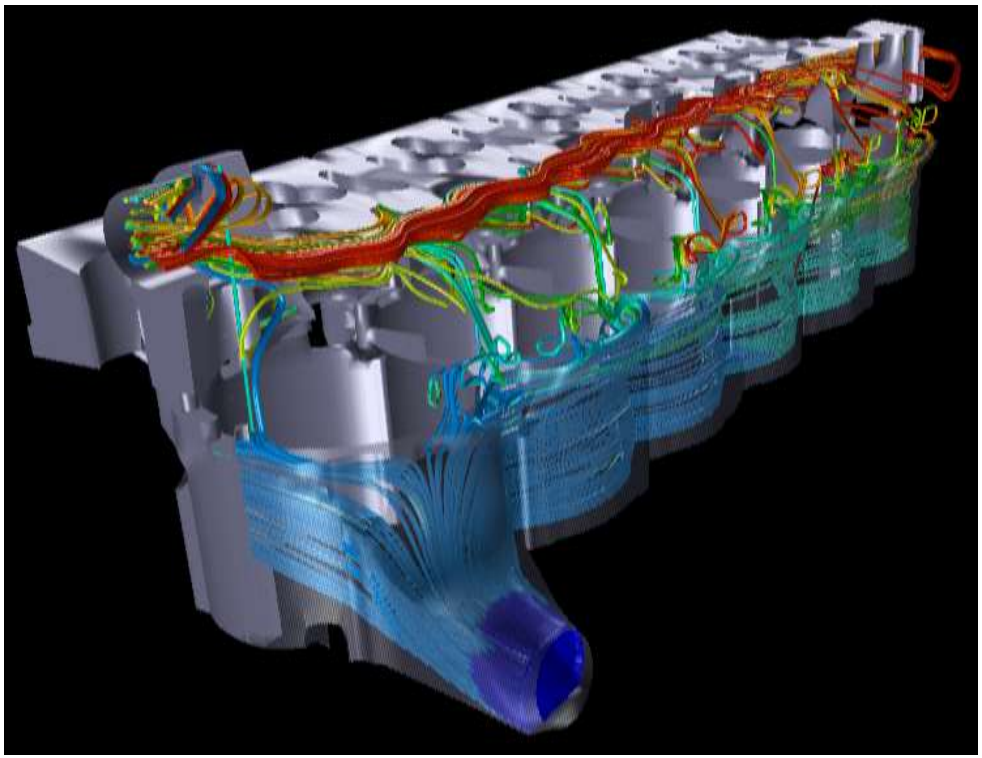
Weather forecast says it will be a sunny day.

You are lucky being far away from the hurricanes sweeping the East coast of the United States.

http://www.osei.noaa.gov/Events/Current/TRCkatrina2240_G12.avi



A Day Full of Fluid Mechanics

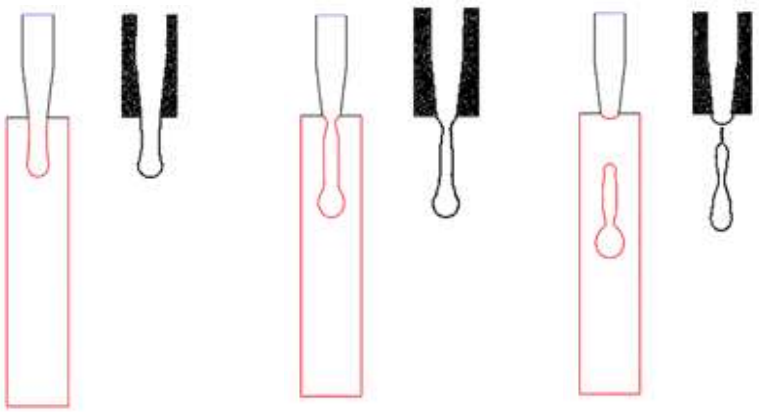


You get on your car. When you turn the engine on, the fuel is first pumped from the tank, mixed with air, and combustion gases do work inside the engine.

You can also use the metro, which needs to be designed considering the air flow related comfort of passengers waiting at the stations.

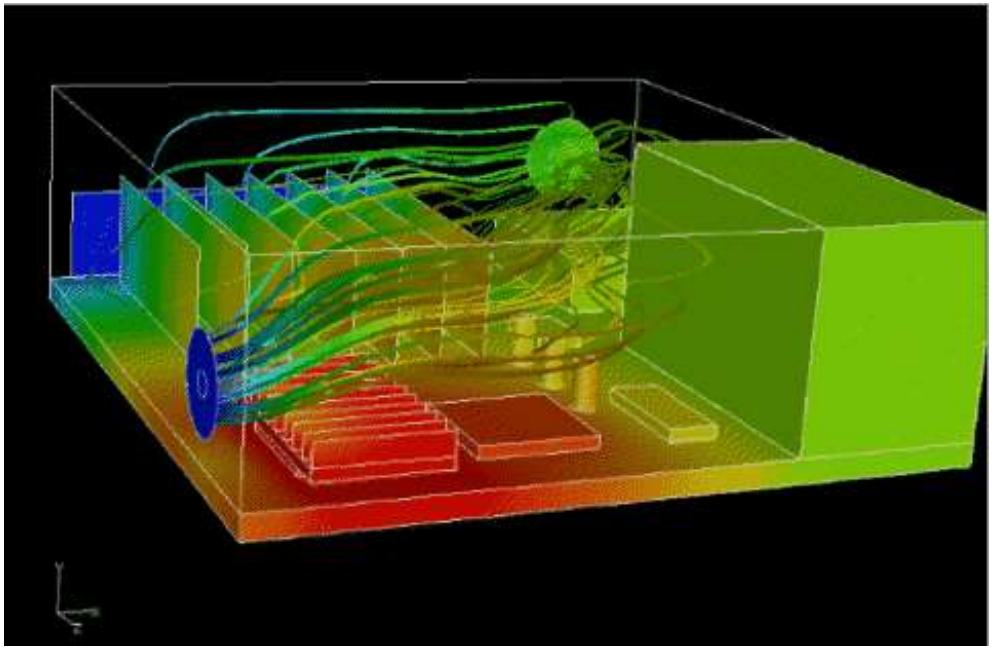
A Day Full of Fluid Mechanics

Before your class you go to the PC lab and print your homework. Inkjet printing and electronics cooling also involve fluid mechanics.



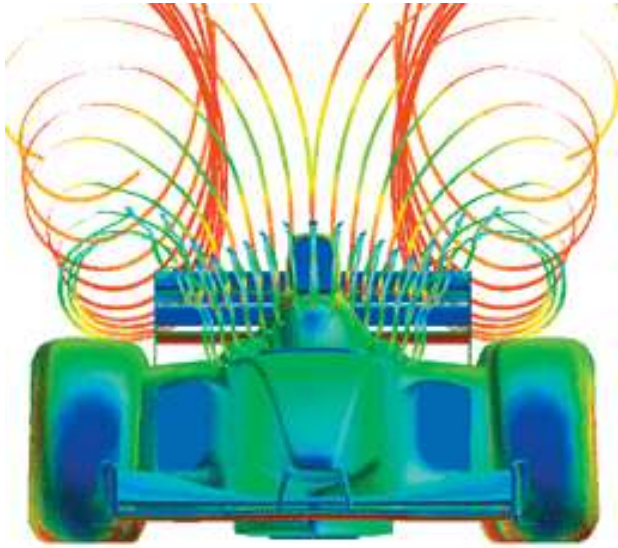
How inkjet printers work

http://computer.howstuffworks.com/inkjet-printer3.htm



A Day Full of Fluid Mechanics

Before sleeping you watch some sports.



A Day Full of Fluid Mechanics

You go to bed after studying for tomorrow's exam. In your dream you find yourself in the middle of an ocean, surrounded by off-shore wind turbines. Side effects of too much ME 305. Night night :)

Fluid Mechanics Applications

(www.fluent.com , www.cfdrc.com)

- Aerospace / Defense
- Household Appliances
- Automotive
- Biomedical
- Chemical Processes
- Consumer Packaged Goods
- Electronics Cooling
- Environmental
- Food and Beverage
- Fuel Cells
- Glass
- HVAC & R
- Marine & Offshore
- Nuclear Power
- Oil & Gas
- Turbomachines
- MEMS
- Sports & Athletic Equipment

Fluid Mechanics Applications

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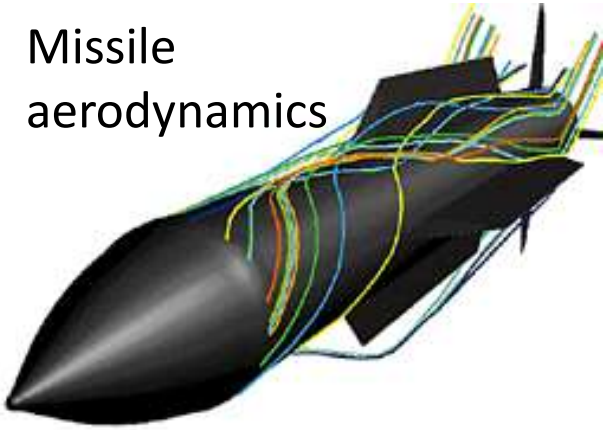
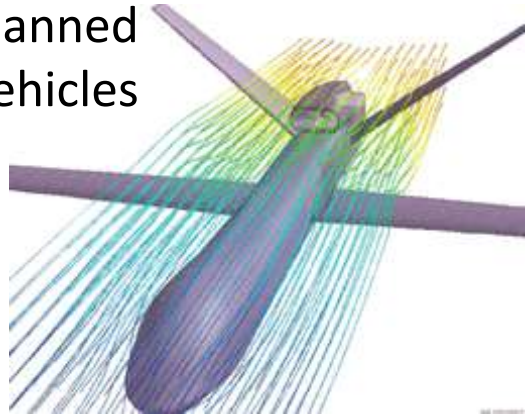
Missile aerodynamics



Rotorcraft aerodynamics

Unmanned air vehicles



Ejecting pilot from a fighter aircraft

Micro air vehicles

Chemical agent dispersion from a tank

Fluid Mechanics Applications

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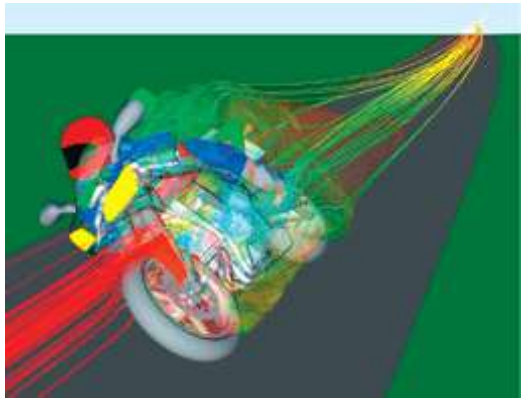
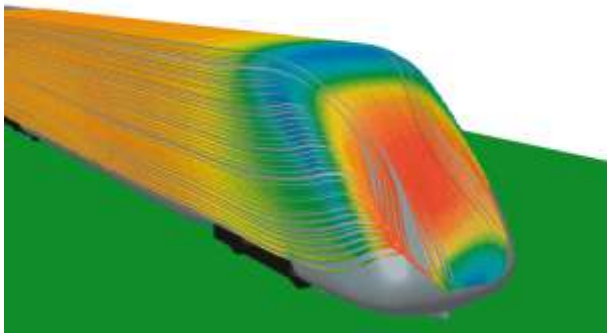
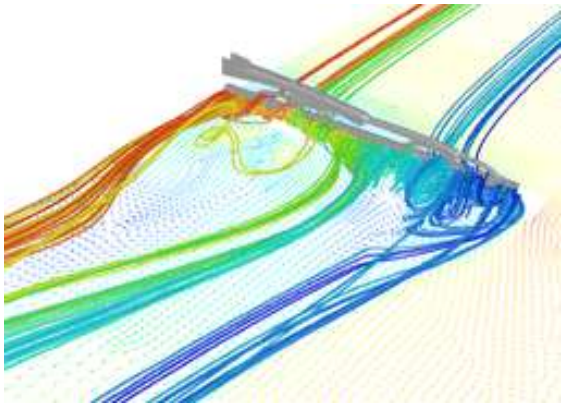


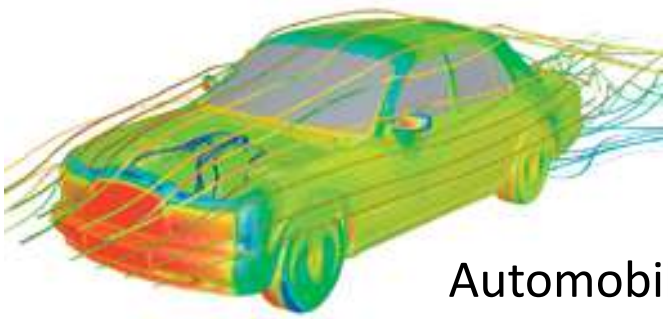
Motorcycle aerodynamics

High speed train



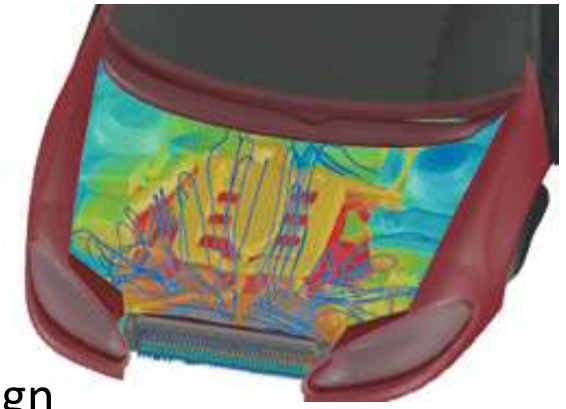
Windshield wiper design at high speeds





Automobile aerodynamics

Underhood thermal design



Fluid Mechanics Applications

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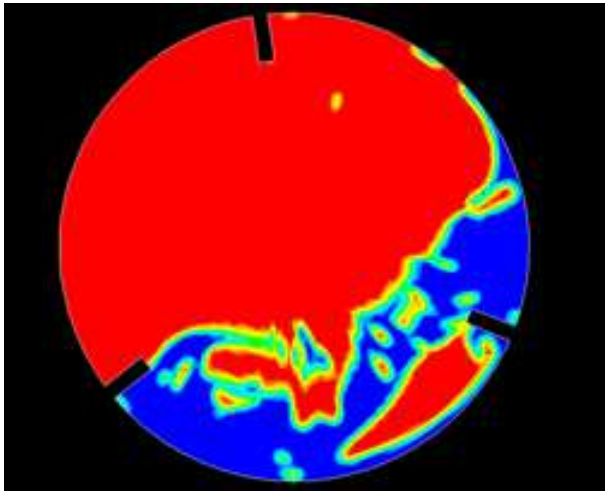
Vacuum cleaner

Refrigerator

Oven

Washing machine



Fluid Mechanics Applications

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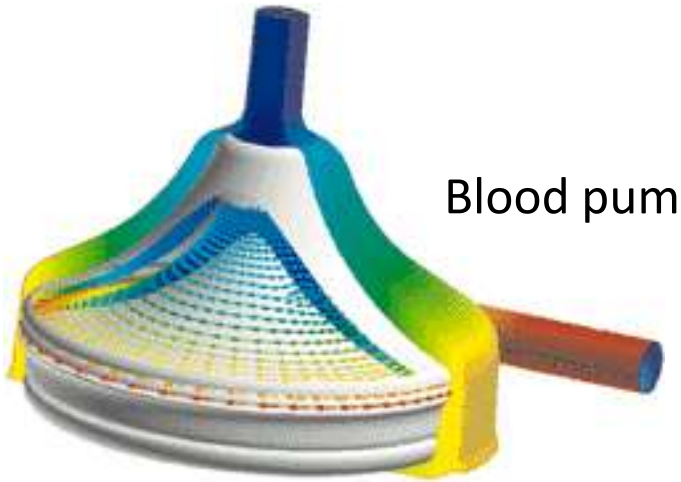
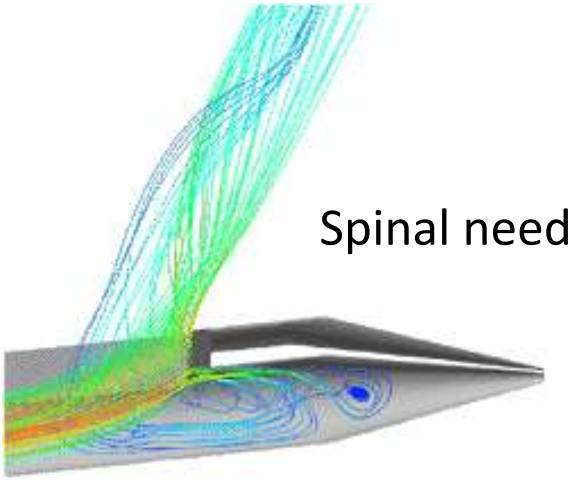
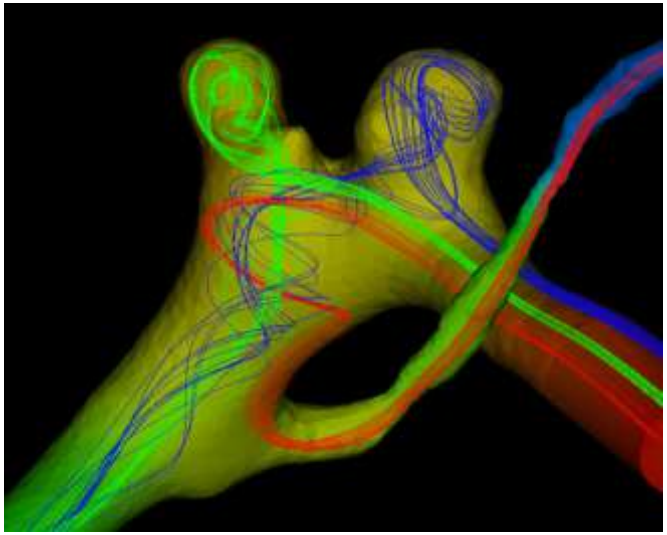


Blood pump



Spinal needle

Glucose monitor



Blood flow

Fluid Mechanics Applications

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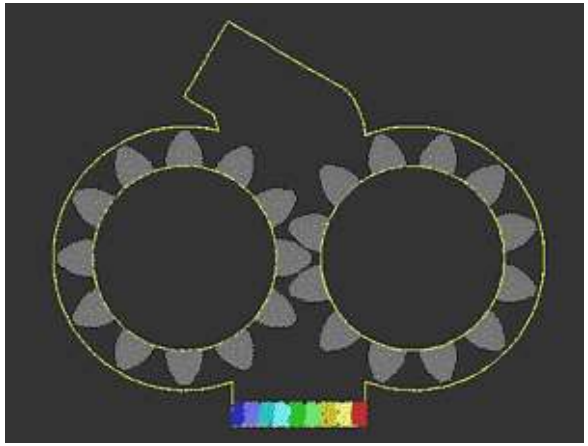
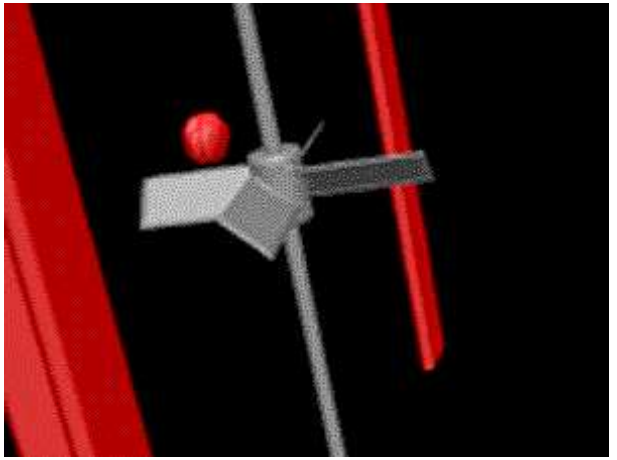
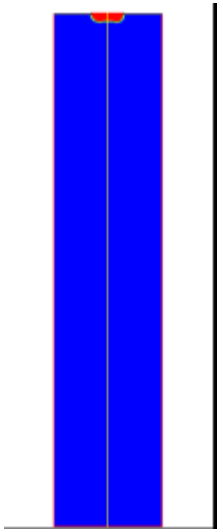


Laminar mixing

Blending and mixing

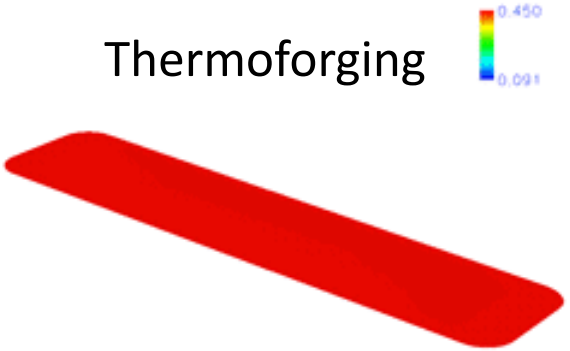


Blow molding of a milk container



Inkjet printer

Thermoforging



Fluid Mechanics Applications

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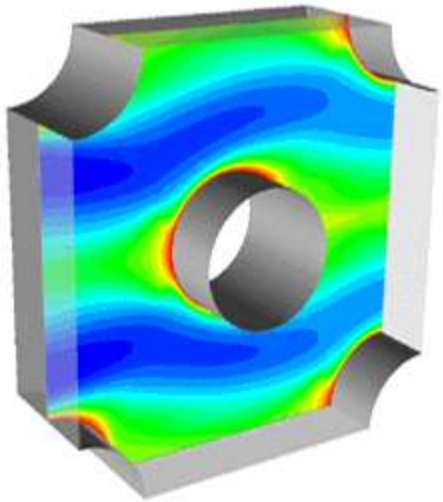
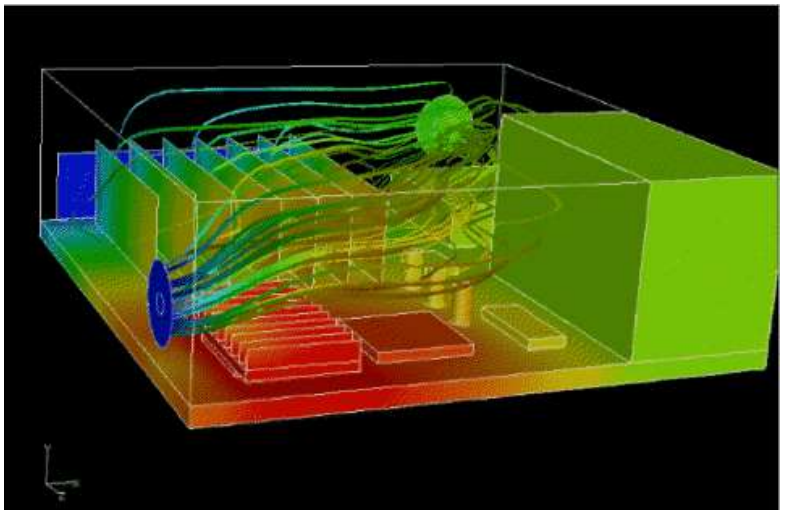
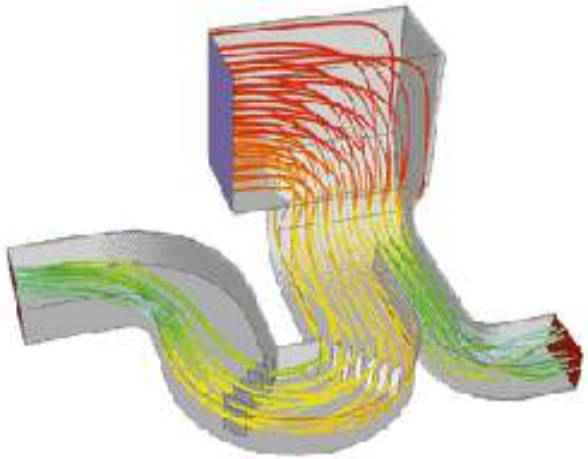


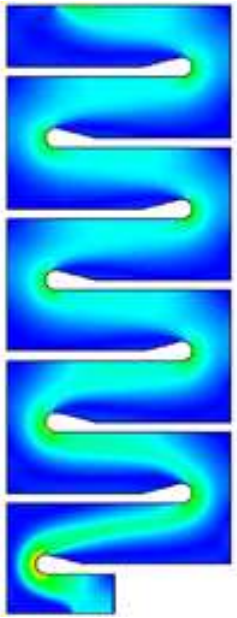
Heat exchanger

Desktop PC Cooling

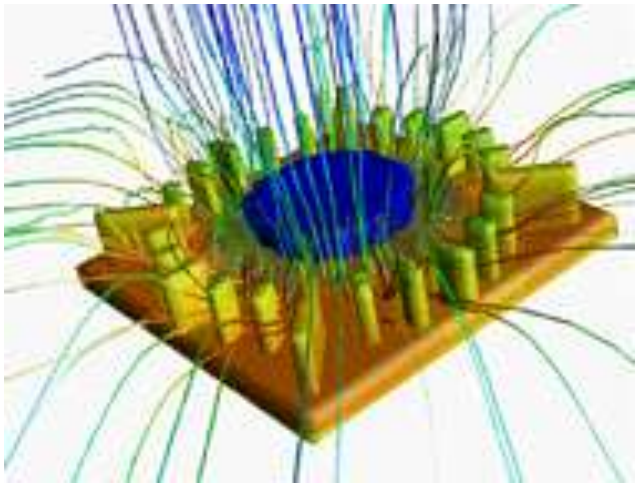


HVAC & R





Water purification



Heat sink

Fluid Mechanics Applications

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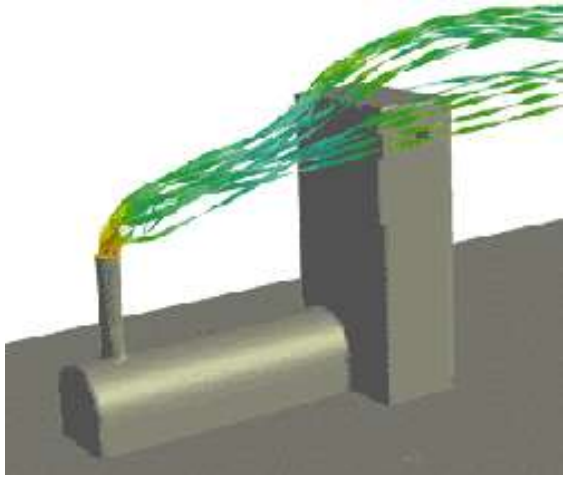
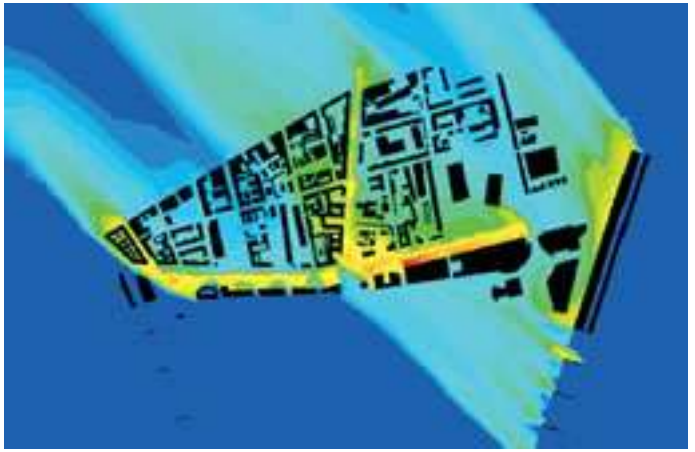


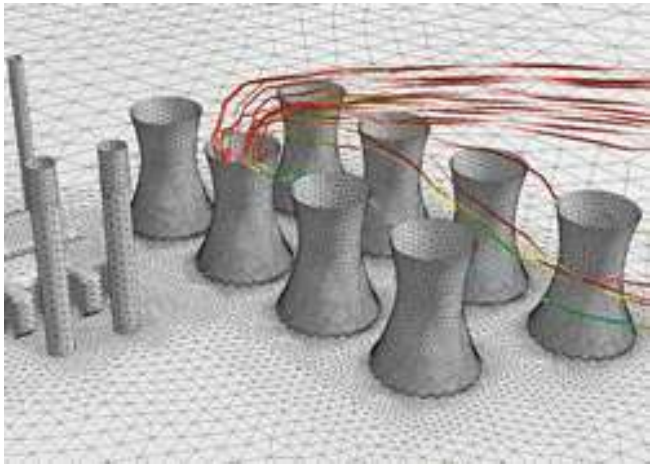
Smoke from
a stack

Pollutant dispersion over a city



Wind
turbines

Plume dispersion from a cooling tower



Fluid Mechanics Applications

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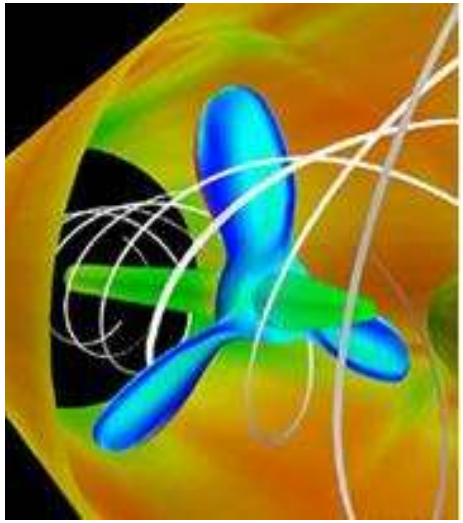
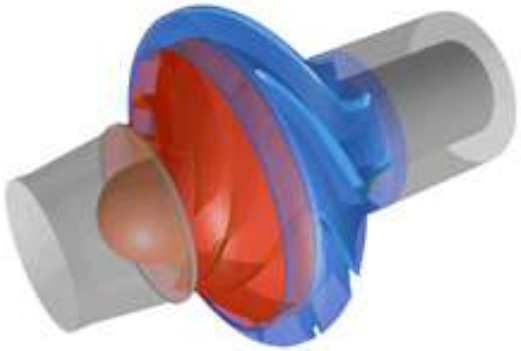
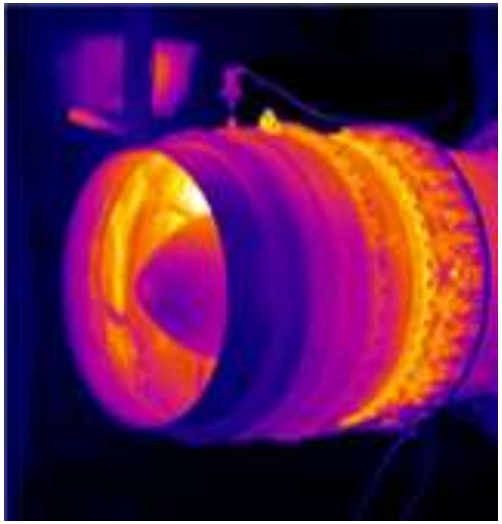


Propeller

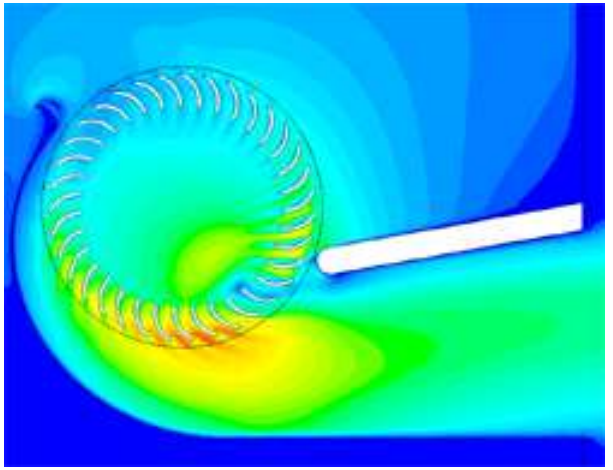
Fan

Centrifugal Pump





Jet Engine
Propulsion



Crossflow fan

Fluid Mechanics Applications

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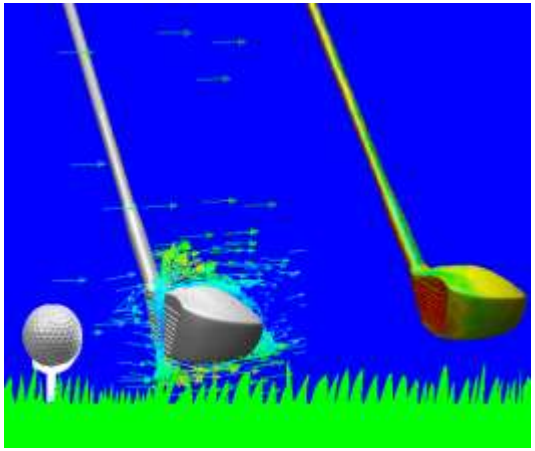
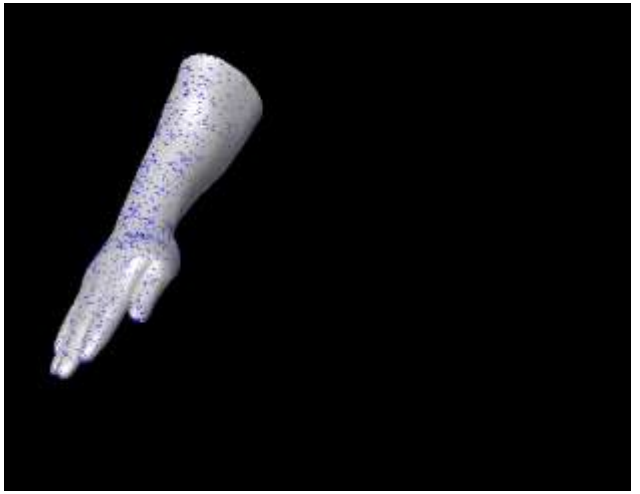
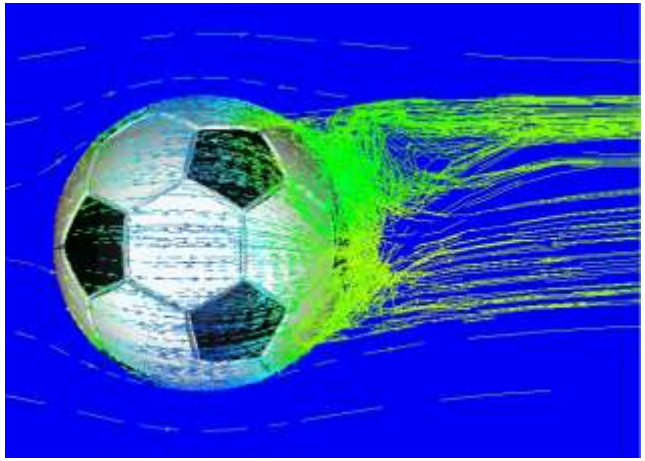
Ski Jumping



Golf

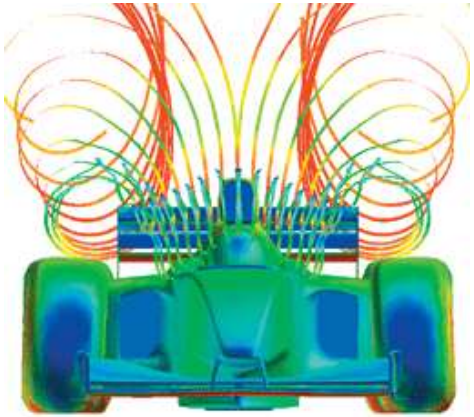


Swimming



Football

Cycling



Indy Car Racing

Fluid Mechanics on the www

- Google: http://directory.google.com/Top/Science/Physics/Fluid_Mechanics_and_Dynamics
- A General FM Site: http://www.efluids.com
- Gallery of FM Experiments: http://www.efluids.com/efluids/pages/gallery_exp.htm
- Gallery of FM Motion: http://pof.aip.org/pof/gallery
- Gallery of FM: http://www.galleryoffluidmechanics.com
- A Fluid Mechanics Blog: http://fuckyeahfluiddynamics.tumblr.com
- Another Fluid Mechanics Blog: http://flowviz.tumblr.com

About Me

- Born in 1974.
- B.S. in Mechanical Engineering from METU in 1996.
- M.S. in Mechanical Engineering from METU in 1998.
- PhD. in Mechanical Engineering from Texas A&M Uni. in 2003.
- Working as a faculty member at METU since 2003.
- Teaches fluid mechanics and numerical methods related courses.
- Research interests are simulation of fluid flow and heat transfer problems using Computational Fluid Dynamics (CFD), biological flows, parallel computing.
- Married, has two daughters.
- Loves silent computers and sunset.
- Hates the word verify and user unfriendly software.
- More info at http://users.metu.edu.tr/csert