03.Overview

Tuesday, January 18, 2011

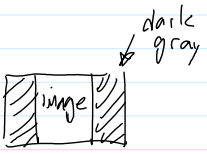
Today:

- Admin
- Finish First Assignments
- Start Overview: Choices in imaging

Put signed Use Agreement, Syllabus Agreement, on piles up front.

ITLL orientations: For after-hours access and computer login, attend a 1/2 hr tour. Find out what resources are here, agree to not spill drinks on the keyboards.
Lecture notes will be posted on the Flow Vis site. Feel free to nag me.
First Assignments
http://flowvis.org/media/course/initialassignments.pdf
Have you read this? Questions?
Clouds: There will be two Cloud assignments, with the first due Monday Oct 3, and the second image due November 14. This is to give plenty of opportunity to observe a variety of atmospheric conditions. Images made before August 22 2016 will not be acceptable for the Cloud First assignment, and images made before October 3 will not be acceptable for the Cloud Second assignment.
Keep notes on your location and orientation (facing north etc).

Creative Commons License: Allow commercial use?
Make your image uploaded to flowvis.org no larger than 1300px wide, no more than 900 tall. Best to pad width of portrait oriented images.




## Overview 1: Topics will be presented iteratively.

Previsualization: Have a goal, think about what you want it to look like.
Make CHOICES:

1. Flow phenomenon: Water boiling? Faucet dripping?
2. Visualization technique: Add dye? See light distorted by air/water surface?
3. Lighting (source of worst image problems)
4. Image acquisition: Still? Video? Stereo? Time lapse? High speed?
5. Post processing, final output. Edit, at least crop the image and set contrast.

## 1. Flow phenomenon: ***Why does it look like that***?

What are the forces? = a framework for interpretation of the image
Minute paper. In groups (3 or so) list all the forces that can act on a fluid.

Write on a scrap of paper to hand in.

Surface tension
Drag
Body force
Normal force
Shear force
Friction
Pressure
Gravity
Buoyancy
Atomic forces
Oscillating pressure forces
Kaye effect
Inertial forces
Mass flow
Thermal/heat
Viscosity/intermolecular forces
Centripetal force
Electromagnetic
Coreolis
Sound
Chemical force/reaction
Electrostatic
Vanderwaals

Minute paper results:

Gravity
Buoyancy
Intermolecular
Pressure
Temperature
Kinetic energy/potential energy
Surface tension
Magnetism
Viscous force
Centripetal
Coriolis
drag

Viscous
Shear
Gravitational
Buoyancy
Magnetic
Inertial
Centripedal/centrifugal
Pressure
Body forces: gravity, buoyancy, EM
Viscosity, shear, friction
Thermal diffusivity
Interaction with other fluids
Surface tension

Air resistance
Cohesion
Adhesion (capillary action)
Normal force
Stress
Strain
Thermodynamic
Electro-magnetic
Compressible
Heat
Convection
Osmosis
Solar radiation

Composition of fluids
Densities of fluids
Chemical reactions
Impact
Wind
Mass
Acceleration
Temperature
Phase change
Strong, weak nuclear forces
Cavitation
Vortex structures
vortex stretching
concentration gradient

Marangoni forces; surface tension

Good, inclusive list. Not all are forces, but all can 'drive' a flow via a set of physics or mechanism. Heat, for example.

All *forces* can be categorized like this: 2 types of forces

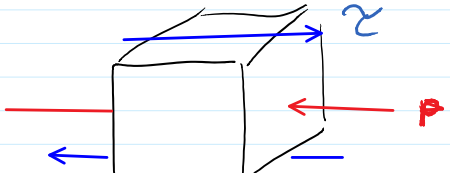
Body

Acts directly on every molecule equally
a) Gravity
b) Electromagnetics

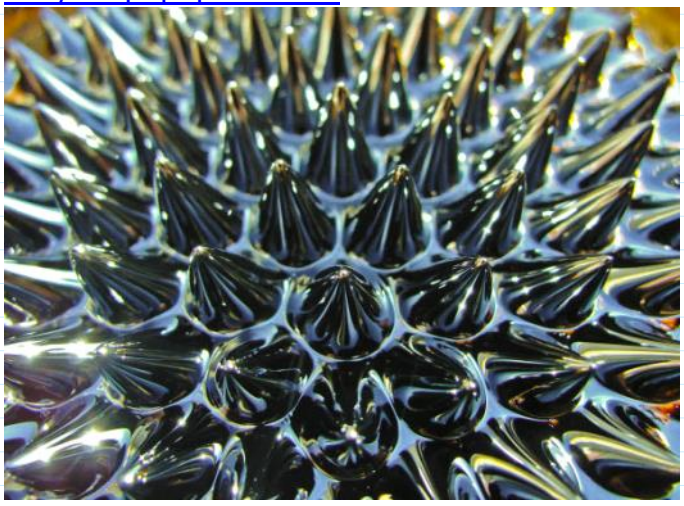
http://www.youtube.com/watch?

Surface

Acts on the surface of a volume of fluid

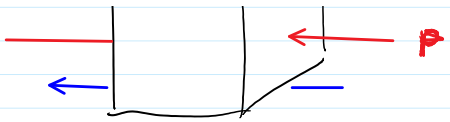


http://www.youtube.com/watch?v=fAbycqD2UmQ Protrude Flow
Ferromagnetic fluid (ferrofluid). Iron nanoparticles suspended in oil, follows magnetic field direction.
We have a couple of quarts available.
Nontoxic, but very messy.
"Normal field instability"
http://www.flowvis.org/OldGalleries/2010/Team-2/FV_popup1-16.htm



Daniel Notary, Nathan Weigle, Allison Hamrick
Team-2 Spring 2010
Ferrofluid on a magnetized bolt.

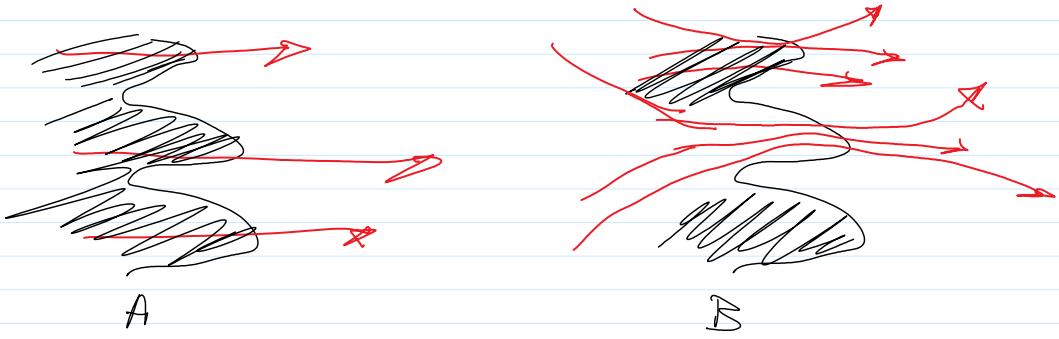
https://vimeo.com/album/1871269/video/55075720




P Pressure: always perpendicular to surface

τ Shear: always parallel to surface

Any surface force can be decomposed into a shear plus pressure
Note: these are actually STRESSES = Force acting on an area.




Yes, ferrofluid is available for checkout for you to play with.

The only force that is not so easily categorized is SURFACE TENSION

It's the result of intermolecular forces, so it affects every molecule, like a body force

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But it is only obvious at interfaces between fluids, kind of like a surface force.

http://upload.wikimedia.org/wikipedia/commons/thumb/f/f9/Wassermolek%C3%BCleInTr%C3%B6pfchen.svg/300px-Wassermolek%C3%BCleInTr%C3%B6pfchen.svg.png

http://www-math.mit.edu/~dhu/Striderweb/striderweb.html Water-walking insects

Conclusion: Whenever you are observing fluids, list the forces that may be acting, ***that make it look like that.***

Examples? Let's look at http://fuckyeahfluiddynamics.tumblr.com/