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20.0.J Summary Status Report April 7

Christopher F. Bauer
University of New Hampshire, chris.bauer@unh.edu

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Recommended Citation

Bauer, Christopher F., "20.0.J Summary Status Report April 7" (2016). *Day 20 Apr 07 Heat transfer application*. 48.
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Fire & Ice Chem 444A

April 7 Status Report

Heat movement by three mechanisms:

Convection Bulk movement of a fluid (air or liquid)

Caused by differences in density of pockets of the fluid
Could also be by mechanical mixing

Density differences being caused by relative differences in amount of motion of hotter vs colder molecule/atoms – hotter are moving more and expand volume relative to colder zones, so less dense things rise in gravity field

sets up "convection currents"

in a room, in ocean, in atmosphere

e.g open windows in summer, top and bottom
hemispheric atmospheric cycle, equator/pole
ocean currents – rises in south, dives in north

How fast -- at speed of the wind or current (10s of miles/hour)

Conduction Collisions of molecules, atoms, electrons which are moving a lot (higher temperature) transfer energy of motions to those that are moving less (lower temperature)

Direct contact atom-to-atom
How fast – at speed of movement of molecules – slower than miles/hour

Predominant mechanism in solids

Radiation Movement of matter causes emission of light (photons), which is not matter – from oscillation of electrons and nuclei and vibration of bonds in molecules (complicated)

change in oscillation type for molecule creates the light in infrared; absorption of the light, causes change in oscillation of molecule hit by light

How fast -- moves at speed of light: 186,000 miles/sec

In absence of conduction or convection effects, you feel warm in a room where you are receiving more IR radiation than you are giving off. Your skin temp is about 70-75 ^{o}F.

If you want to predict movement of heat, you have to consider how effective each mechanism is for the given structure or scenario.

Christopher F. Bauer, Principal Investigator.
This material is based upon work supported by the National Science Foundation under Grant No. 1245730.
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