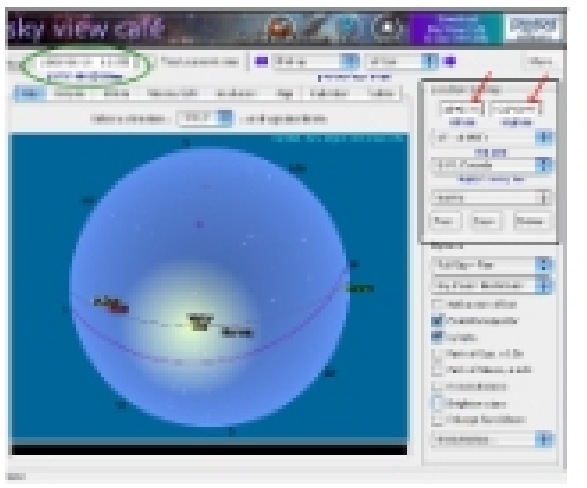
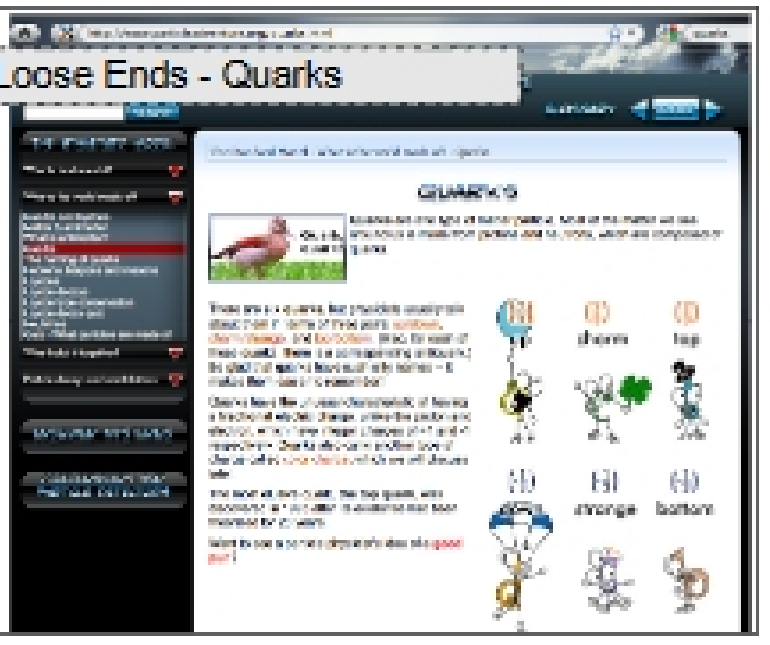
Announcements 10/03/11

- ✓ Check course calendar
  - Find link to lesson(s) for the week
  - Check out assignments
- ✓ Course Pack should be available before Thursday at UBS.
  - Spectral analysis (preparatory work + exercise)
  - Print your own copies for color
- ✓ Will get "real" star finder on Tuesday (please return card-stock ones to TA)
- ✓ Open House Jacobsen Observatory - Weds. 9 pm (7 pm is full) - if clear!

Loose ends - Sky View Cafe



Loose Ends - Quarks



MATTER AND ENERGY

Learning goals

- Distinguish among the following kinds of energy
  - kinetic
  - thermal
  - gravitational potential
  - electric potential
  - radiative
  - mass energy
- Give examples of how energy is conserved.

The Atom + isotopes & ions

atomic number = number of protons
atomic mass = number of protons+ neutrons

Hydrogen (^{1}H) | Helium (^{4}He) | Carbon (^{12}C)

atomic number = 1
atomic mass = 1
(1 electron)

atomic number = 2
atomic mass = 4
(2 electrons)

atomic number = 6
atomic mass = 12
(6 electrons)

The number of electrons in a neutral atom equals the atomic number.

Isotopes of Hydrogen

hydrogen | deuterium

^{1}H (1 proton)

^{2}H (1 proton + 1 neutron)

Isotopes of Carbon

carbon 12 | carbon 14

^{12}C (6 protons + 6 neutrons)

^{14}C (6 protons + 8 neutrons)

What is an ion?

An atom that has lost 1 or more electrons

5

Nomenclature you need to know

Astronomers note how many electrons the atom has lost through Roman numerals.

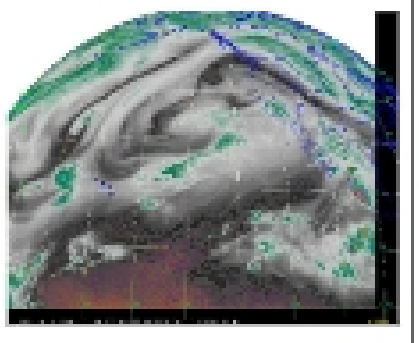
H I = neutral hydrogen
He II = singly ionized helium
Ca II = singly ionized calcium

Fe IV = iron atom has lost 3 electrons
Fe XII = iron atom has lost ___?___ electrons

___?___ = oxygen atom missing 2 electrons

6

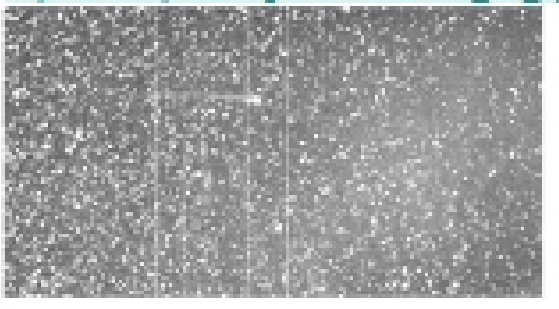
States of matter



7

Video taken by satellite STEREO

http://en.wikipedia.org/wiki/File:Encke_tail_rip_off.ogg



PLASMA

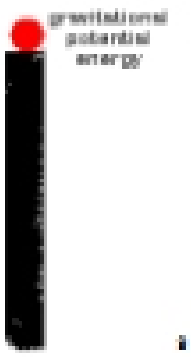
6

Energy

Kinetic vs Gravitational Potential

$KE = \frac{1}{2} mv^2$

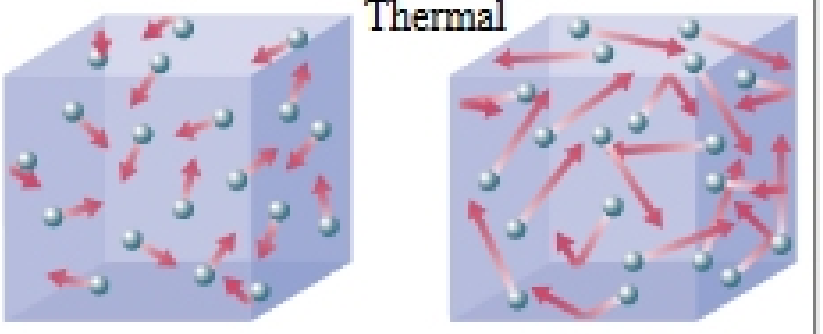
$GPE = mgh$



8

Energy

Thermal



Longer arrows mean higher average speed.

Thermal energy is a measure of the average kinetic energy of a system of particles.

10

Energy

Radiative

Electric Potential

\+ –

11

Energy

Gravitational Potential

vs

Electric Potential