

Physics 100 - January 14, 2009

■ Brick

■ Introduce course, index cards

What is

The Human Experience

in terms of time
Distance
Mass

human Experience
Sort of in
These ranges

length $10^{-3} - 10^3$ m
time $10^{-1} - 10^9$ s
Mass $10^{-1} - 10^3$ kg

What do we see in the universe around us? ↓

See java applet at

<http://micro.magnet.fsu.edu/primer/java/scienceopticsu/powersof10/index.html>

Length:

Distance	Length (m)
Radius of visible universe	1×10^{26}
To Andromeda Galaxy	2×10^{22}
To nearest star	4×10^{16}
Earth to Sun	1.5×10^{11}
Radius of Earth	6.4×10^6
Sears Tower	4.5×10^2
Football field	1.0×10^2
Tall person	2×10^0
Thickness of paper	1×10^{-4}
Wavelength of blue light	4×10^{-7}
Diameter of hydrogen atom	1×10^{-10}
Diameter of proton	1×10^{-15}

Time:

Interval	Time (s)
Age of universe	5×10^{17}
Age of Grand Canyon	3×10^{14}
32 years	1×10^9
One year	3.2×10^7
One hour	3.6×10^3
Light travel from Earth to Moon	1.3×10^0
One cycle of guitar A string	2×10^{-3}
One cycle of FM radio wave	6×10^{-8}
Lifetime of neutral pi meson	1×10^{-16}
Lifetime of top quark	4×10^{-25}

Mass:

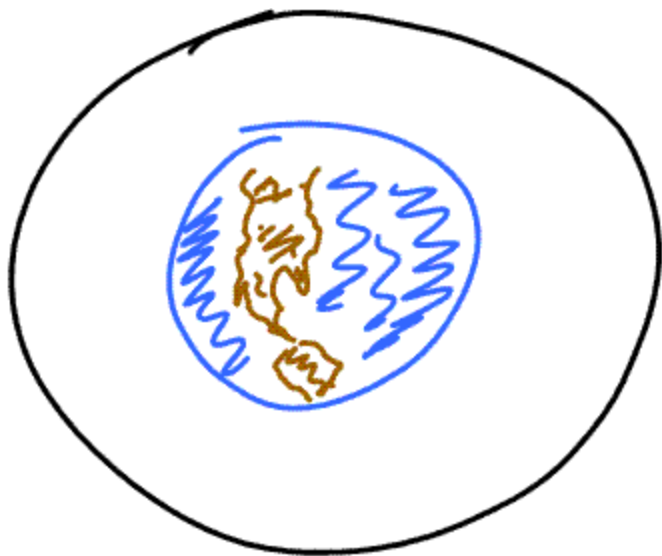
Object	Mass (kg)
Milky Way Galaxy	4×10^{41}
Sun	2×10^{30}
Earth	6×10^{24}
Boeing 747	4×10^5
Car	1×10^3
Student	7×10^1
Dust particle	1×10^{-9}
Top quark	3×10^{-25}
Proton	2×10^{-27}
Electron	9×10^{-31}
Neutrino	1×10^{-38}

Pick up a lead brick ...
usually a bit of a surprise
it is very heavy



In typical human experience things that are
the size of a brick are not that heavy
Consequently, you are surprised.

The human experience / expectations bias
our opinions about what is possible and not
possible in our view of the universe.



human experience $\rightarrow$ earth centered universe
Not backed up by experiment even though
Many humans didn't like that

Why Should nature follow our naive and
arrogant expectations??

What is science?

A way of looking at and trying to comprehend
the world around us.

Same for religion ...

Same for some art ---

What sets Science Apart?

Science bows to observation

Science is testable and refutable

Science Attempts to minimize Ambiguity

Religion is irrefutable. It is a matter
of faith and opinion

What is truth?

Religious truth is whatever the chosen book or prophet says.

Scientific truth does not exist.

we have scientific laws and principles that have withstood many experiments and are generally accepted.

But a single experiment can overthrow or show need for modifying the theory.

How does the Mission of science lead to the nature of science?

↳ next class