

Physics 100 - Jan. 17, 2007

We discussed how course will be run.

All that information is available on class website

Speed of sound $\sim 340 \text{ m/s}$

Speed of light $\sim 299\,792\,458 \text{ m/s}$

Symbol usually used to represent speed of light $\equiv c$

very fast

{ NYC \rightarrow SF ~ 100 times in 1 s
8 Min Sun \rightarrow Earth

Scientific Notation

299792458.

$2.9 \times 10^8 \text{ m/s}$

(+) exponent \rightarrow # big

$$0.\underbrace{001} = \frac{1}{1000} \quad 10^{-3}$$

⊖ exponent → # is small

Physical Scales in our universe

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}

The Human
Experience is
a very tiny
fraction of
what the
universe offers

human Experience
Sort of in
these ranges

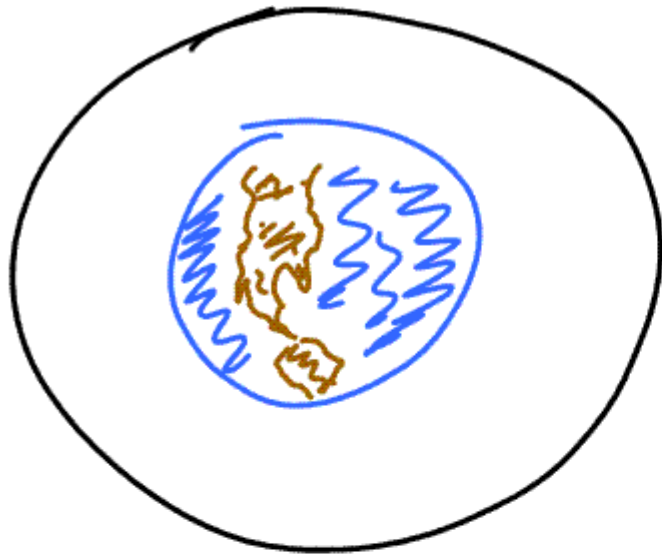
length $10^{-3} - 10^3$ m
time $10^{-1} - 10^9$ s
Mass $10^{-1} - 10^3$ kg

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 ?

↳ will come back to this on Monday