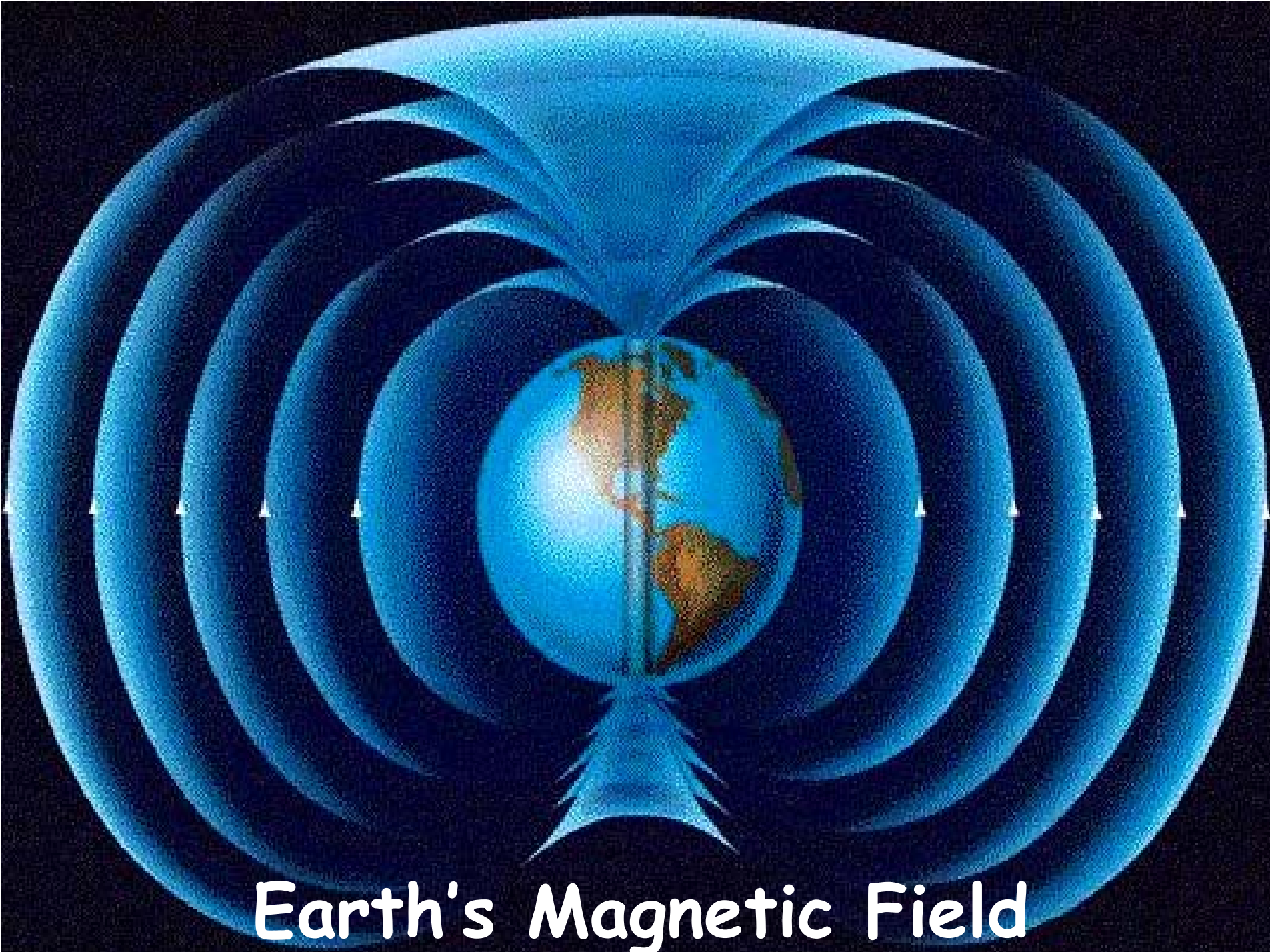


Arlo's Random Walk of Counting Anecdotes

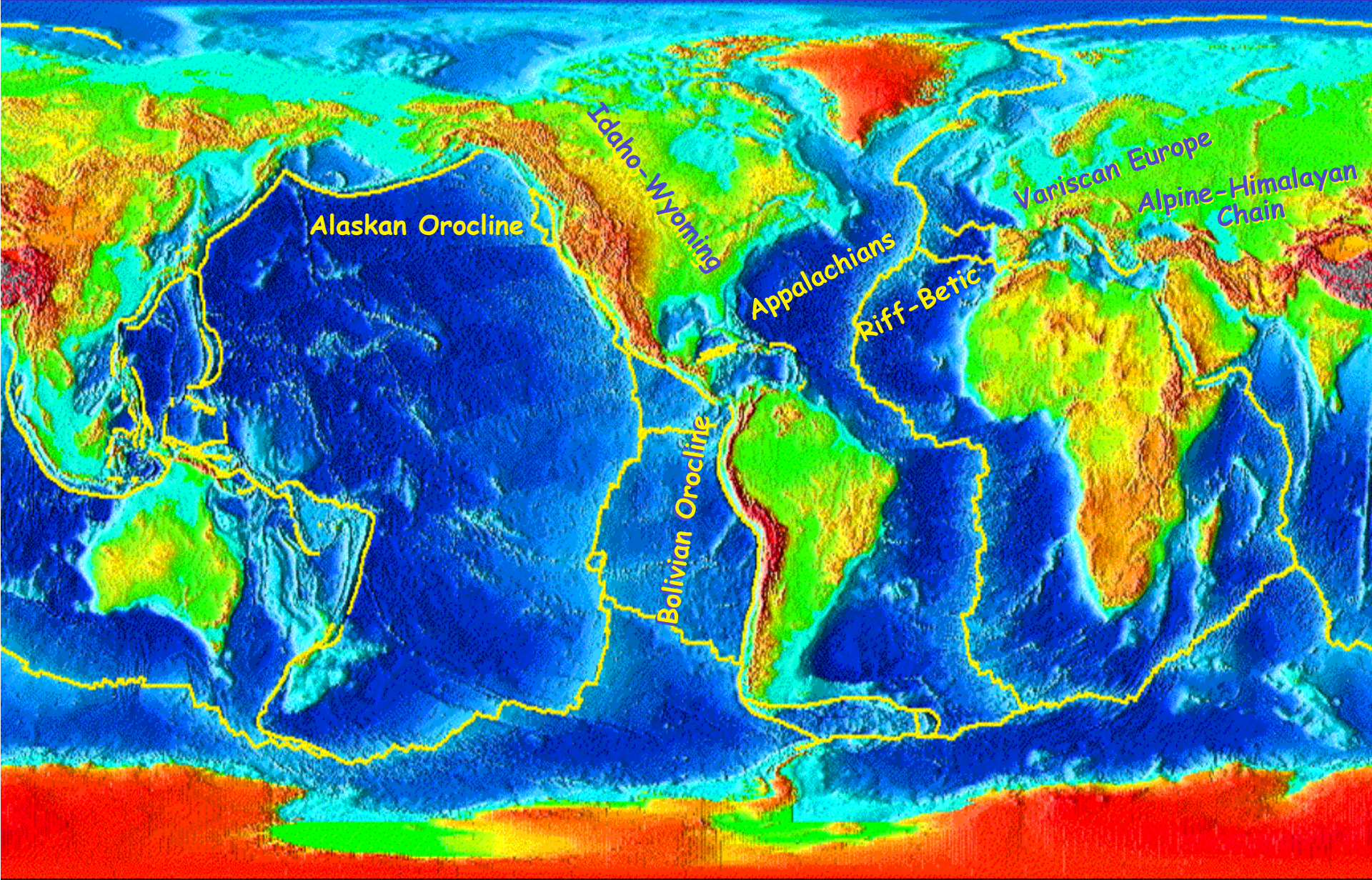


Arlo Weil
Department of Geology



Earth's Magnetic Field

Curved Mountain Belts

















Error

Vs.

Uncertainty

Error

Error refers to the disagreement between a measurement and the true or accepted value.

Uncertainty

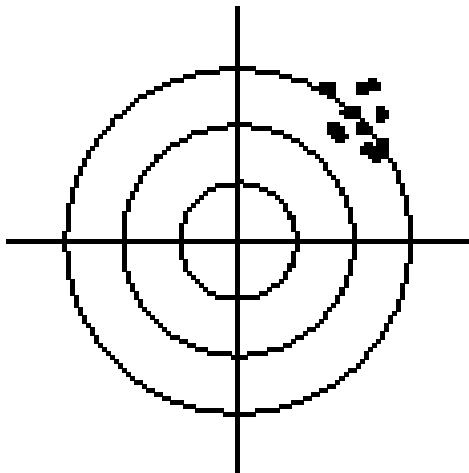
Is an interval around a measured value such that any repetition of the measurement will produce a new result that lies within this interval

Sometimes stated as a probability in the format "value \pm 1 SD" (68%)

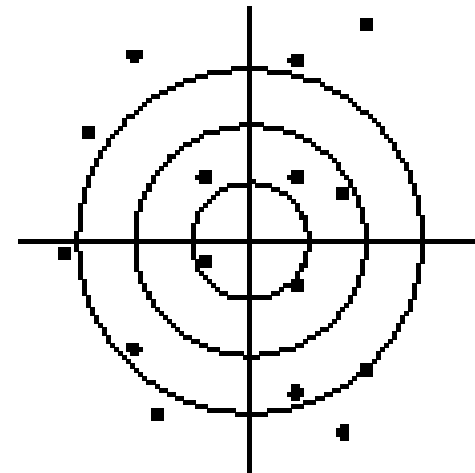
Accuracy

Vs.

Precision



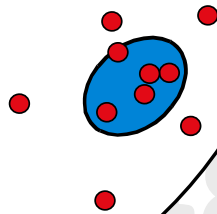
PRECISION



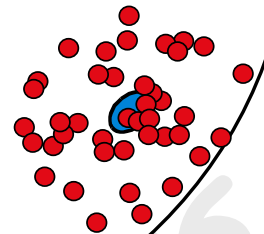
ACCURACY

The way in which **I** count

Precision = 42
Alpha 95 angle = 10°



Precision = 40
Alpha 95 angle = 4°



The way in which **WE** count
Counting with the **BASE 10** system

436143738748556572484

591475**0123456789**14398

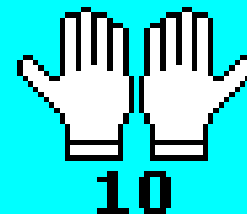
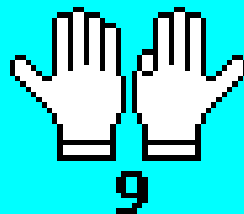
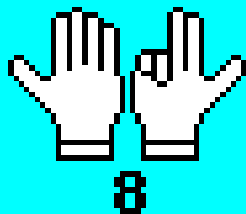
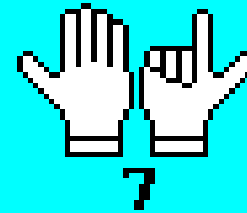
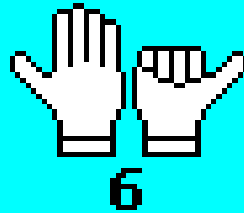
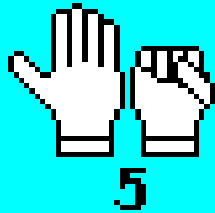
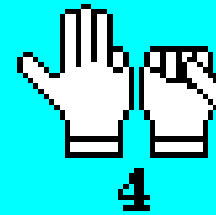
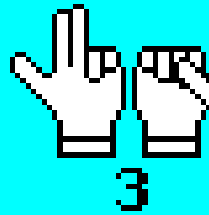
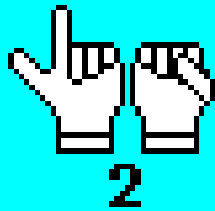
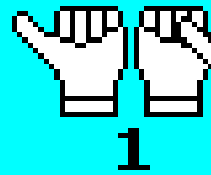
123468736481646721894

128461325678951987234

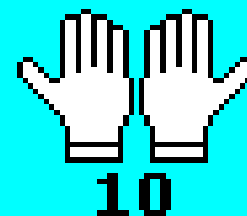
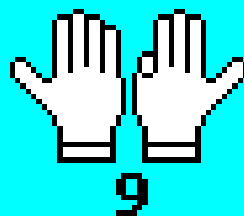
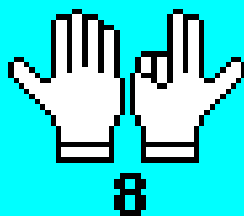
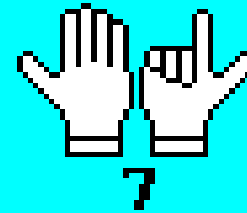
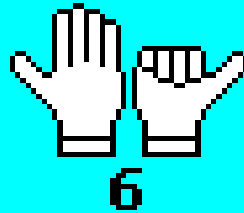
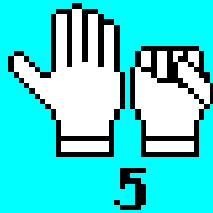
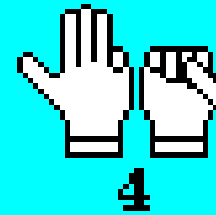
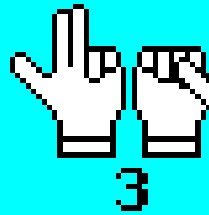
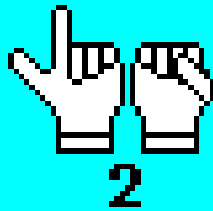
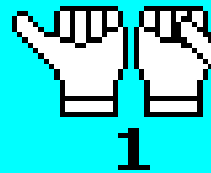
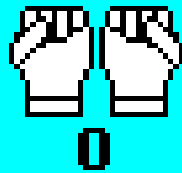
817647312948189516563

864791983746815791000

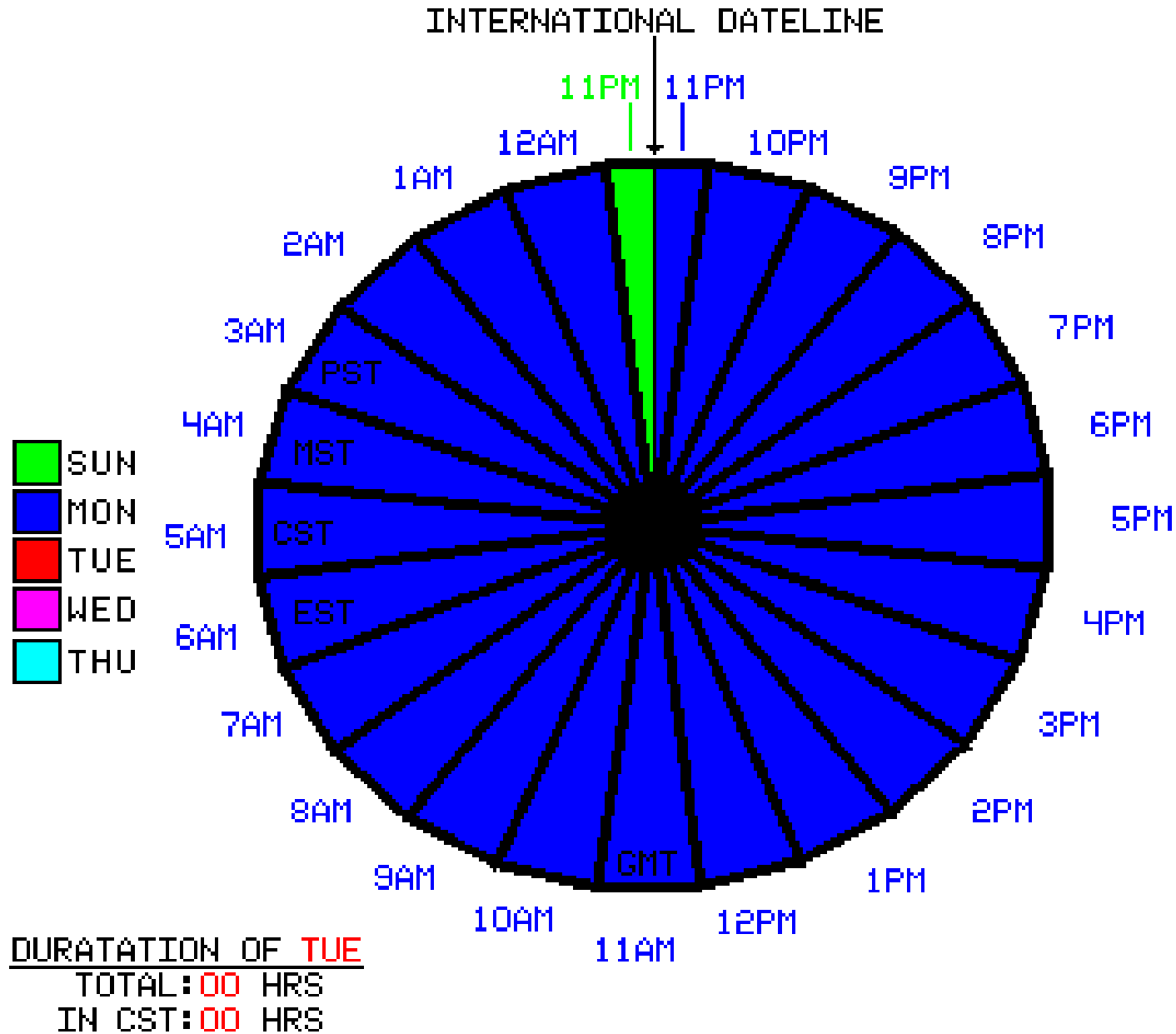
Counting with the **BASE 10** system



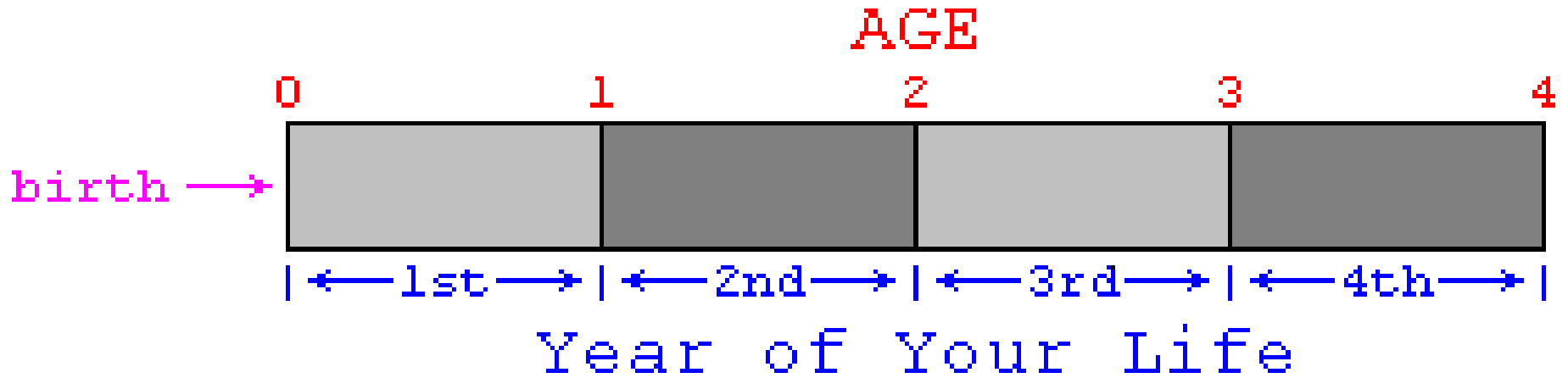
Counting with the **BASE 10** system



How many hours in a day?



Counting with the BASE 10 system But **WE** forget the **ZERO**



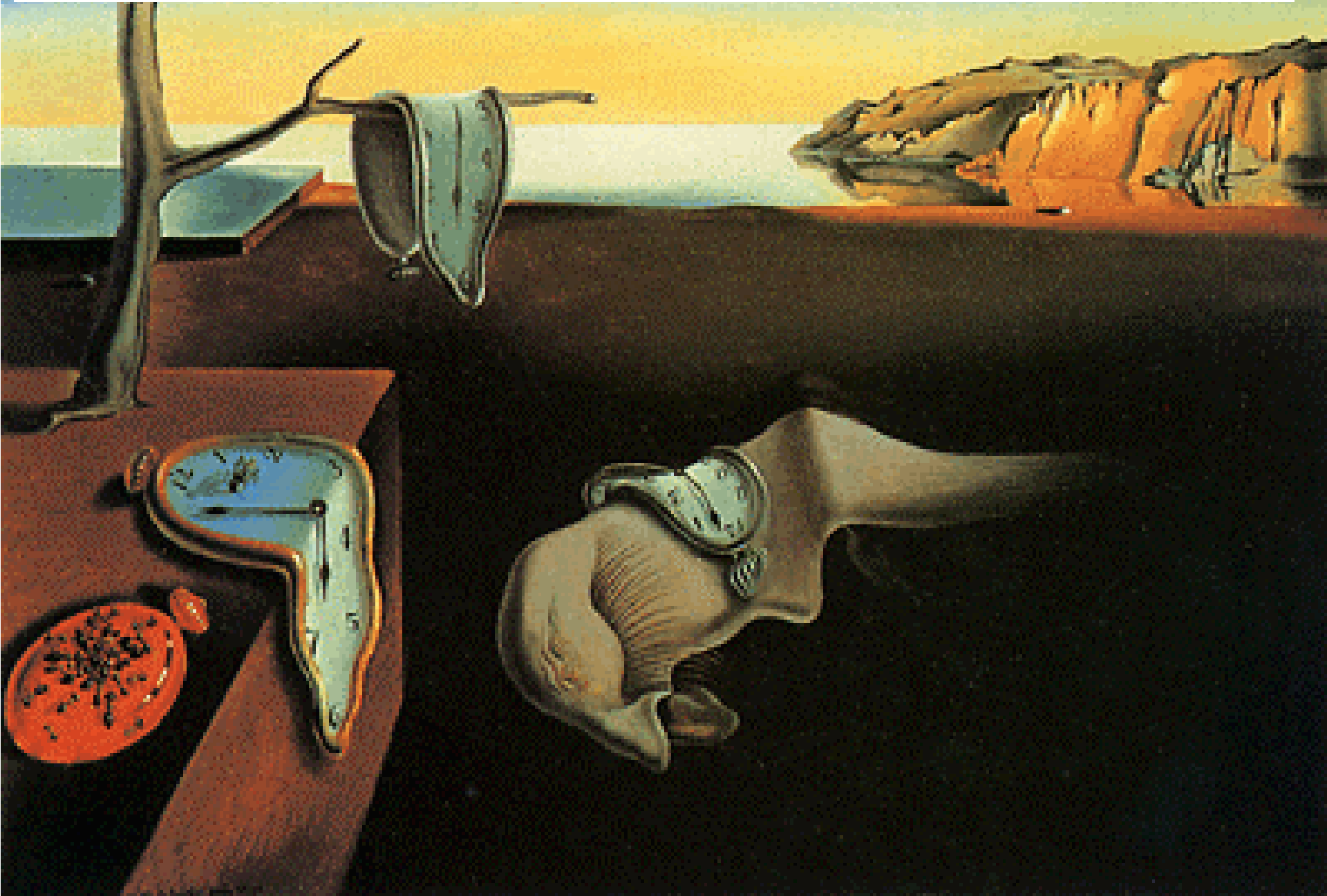
764731294818951656386
479198374681579100000

Counting incorrectly with the **BASE 10** system

Millennium	First Year	Last Year
FIRST	0	999
SECOND	1000	1999
THIRD	2000	2999

And the TRUTH is...

The way in which we are able to count

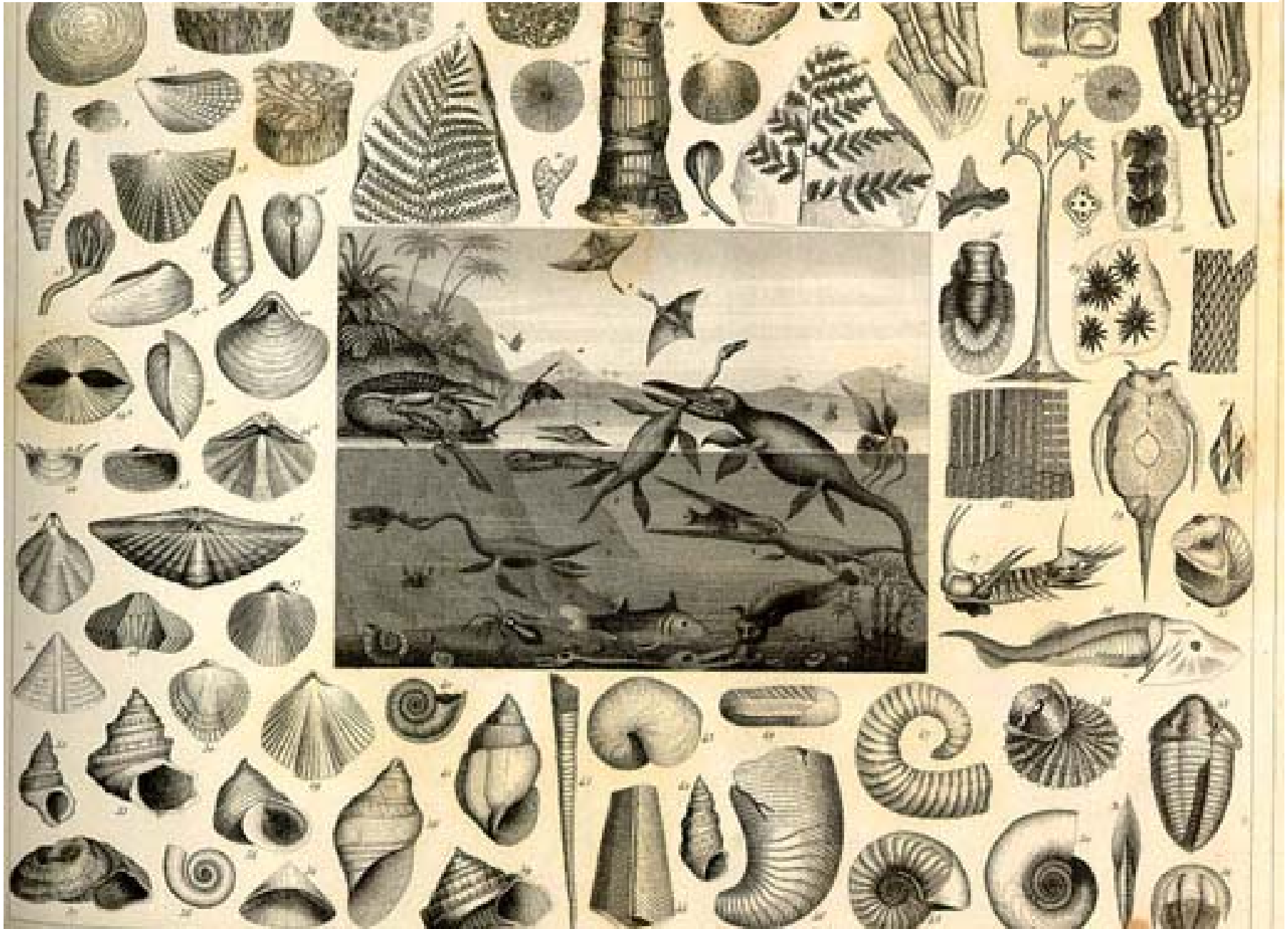


So, can **WE** count?



Understanding the context of what **WE** count?

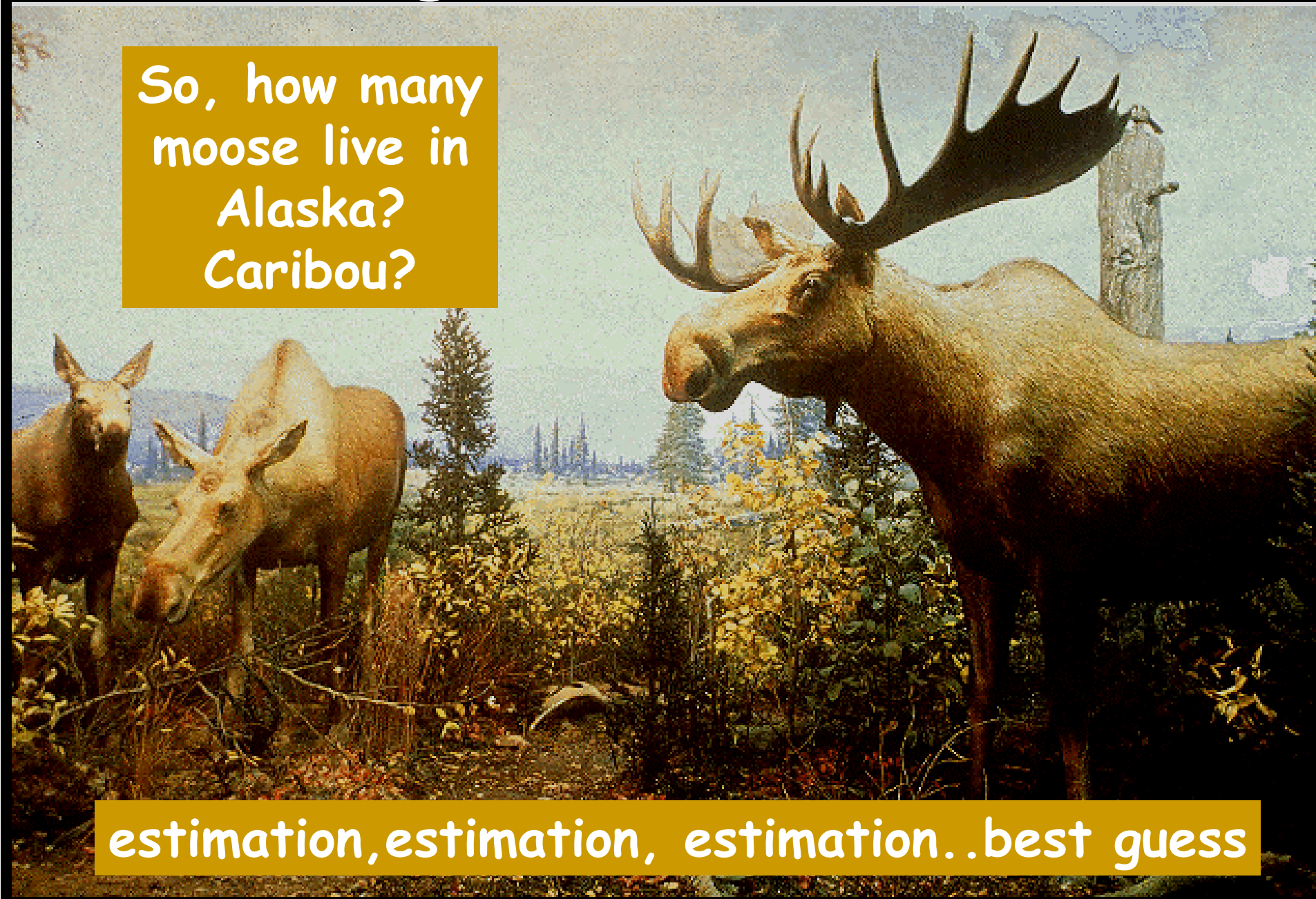
Understanding the context of what **WE** count?



Counting the huddled masses

So, how many
moose live in
Alaska?
Caribou?

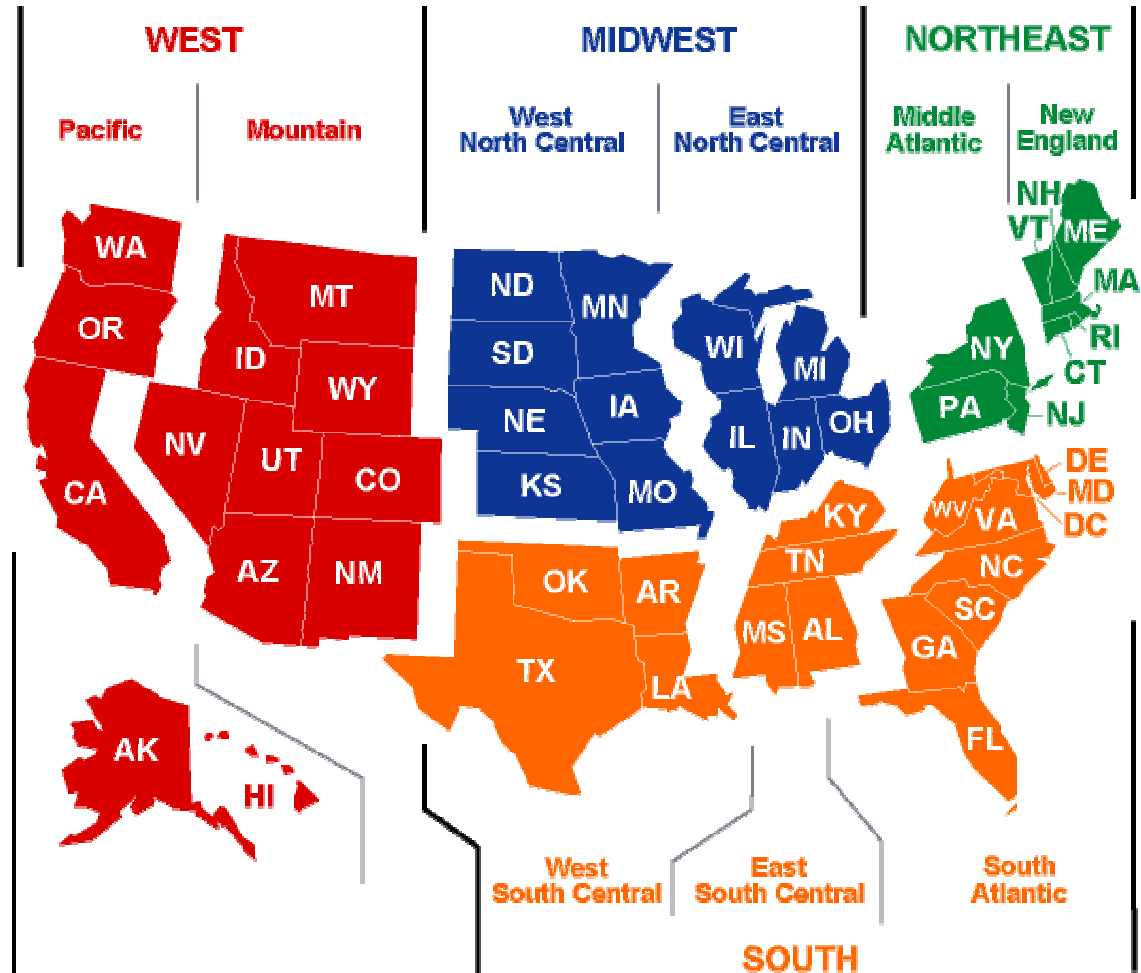
estimation, estimation, estimation..best guess



Counting the huddled masses



Counting the huddled masses



• ~4.0 million people undercounted in 1990 census

• A rate of ~ 1.6%

• Minorities undercounted at a higher rate than whites ~4.4%

• Children undercounted at twice the overall rate

Estimating, Estimating, Estimating

Dividing the land surface of the earth evenly, how much land would each person get to call there own.

Earth Radius ~4000 miles

Surface Area of the Earth ~200,000,000 miles²

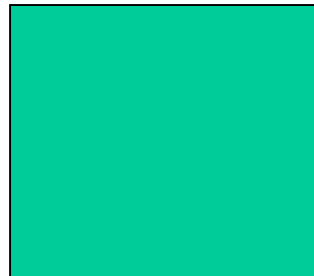
~ 5,600,000,000,000,000 feet² (quadrillion)

70% of Earth covered by Water

~ 1,700,000,000,000,000 feet² (quadrillion)

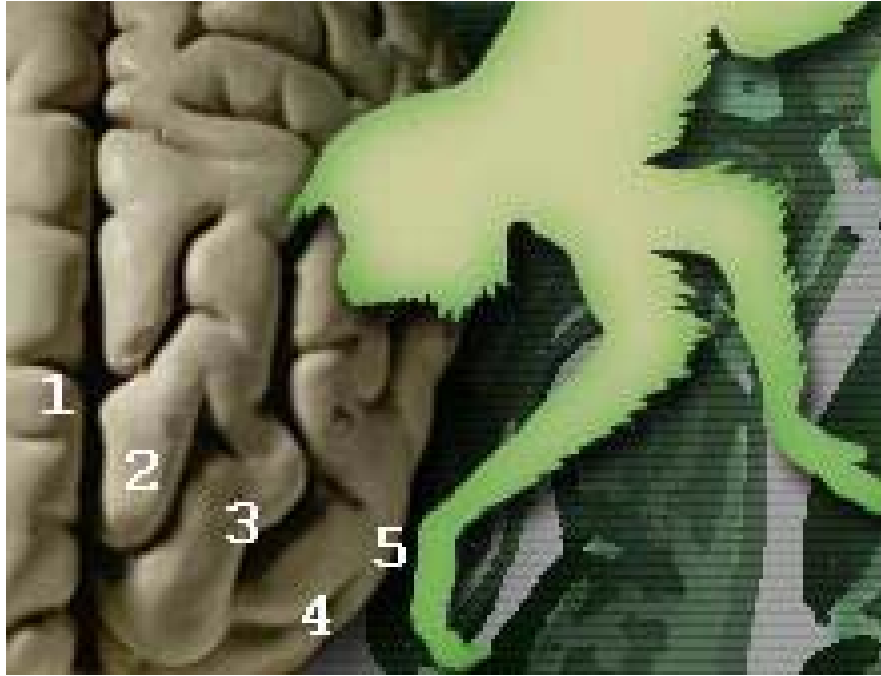
~6,000,000,000 people

~ 280,000 feet² to call our own



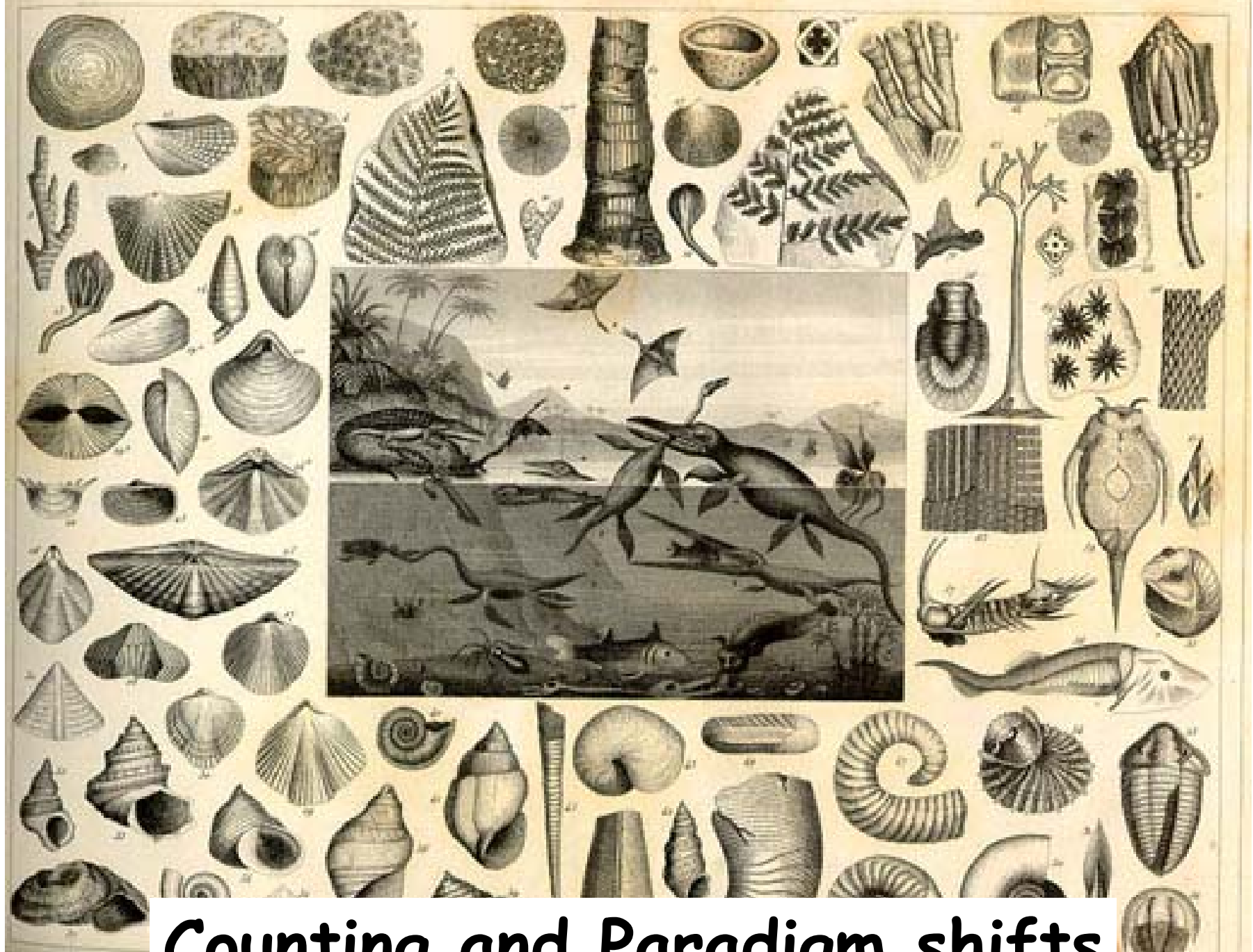
500 ft

Can **THEY** count?



"Our evidence is imprecise, but the monkeys showed a language-independent ability to discriminate numbers"

-Andreas Nieder (MIT)



Counting and Paradigm shifts

SUN



Low-mass star



Brown Dwarf

Jupiter



Earth



Counting and Paradigm shifts

The missing Cosmic Mass??

Visible • WFPC2



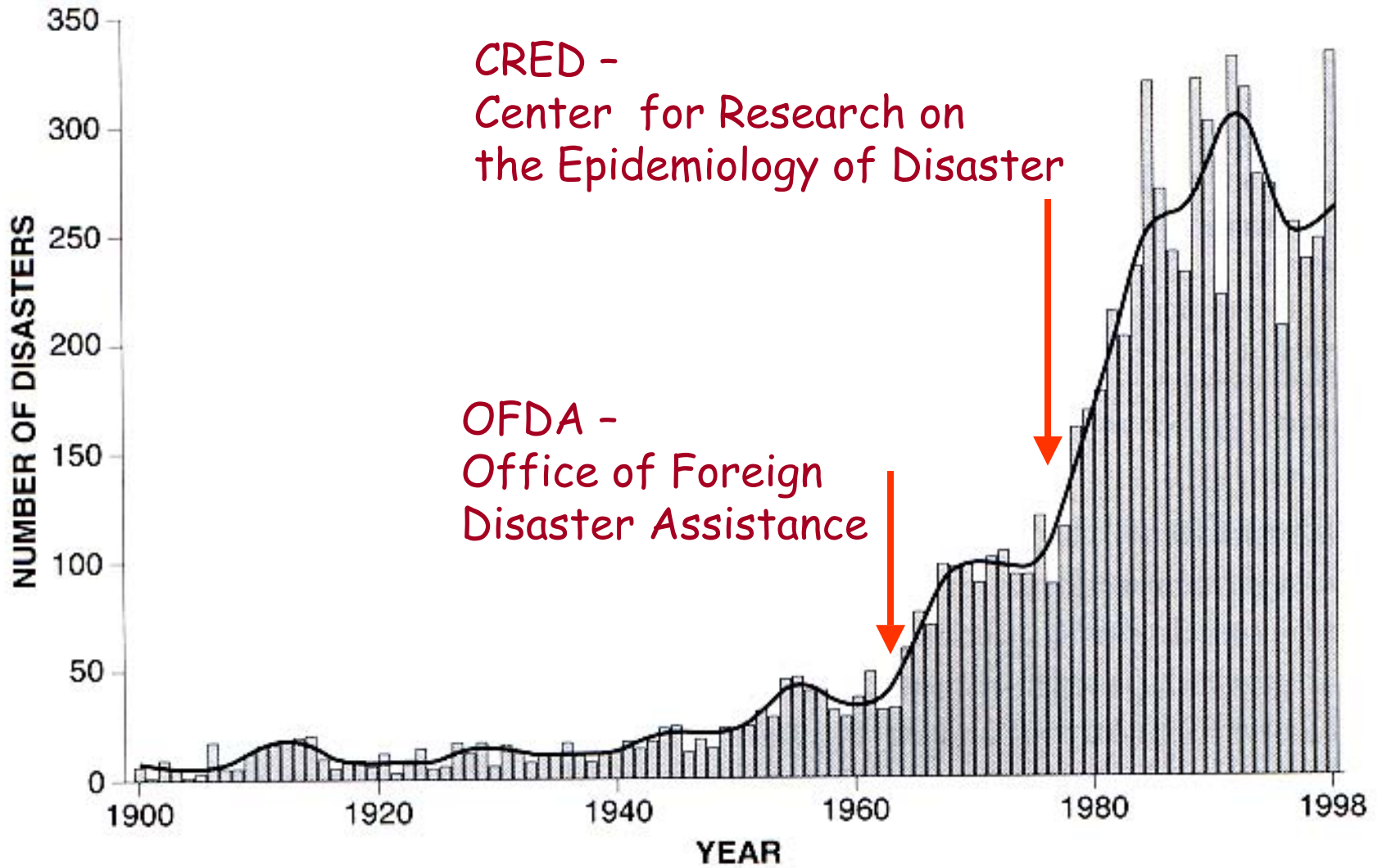
Infrared • NICMOS

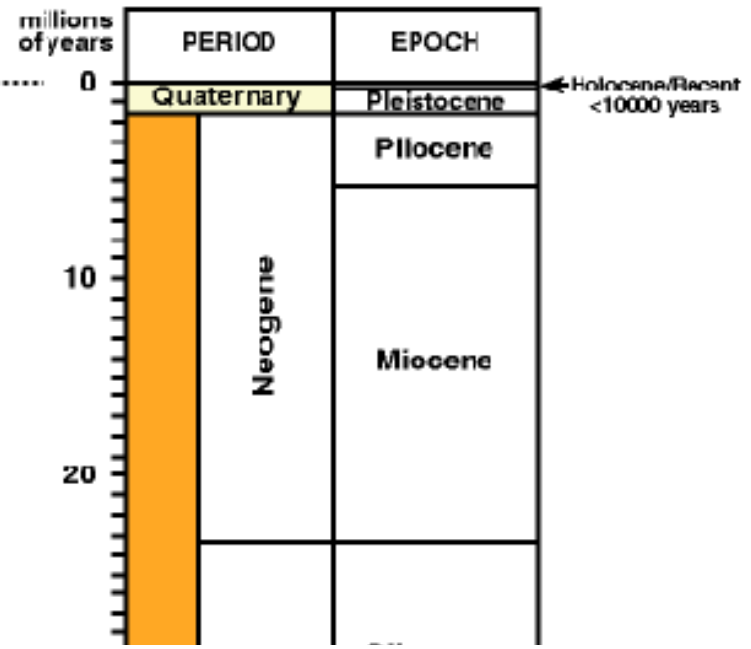
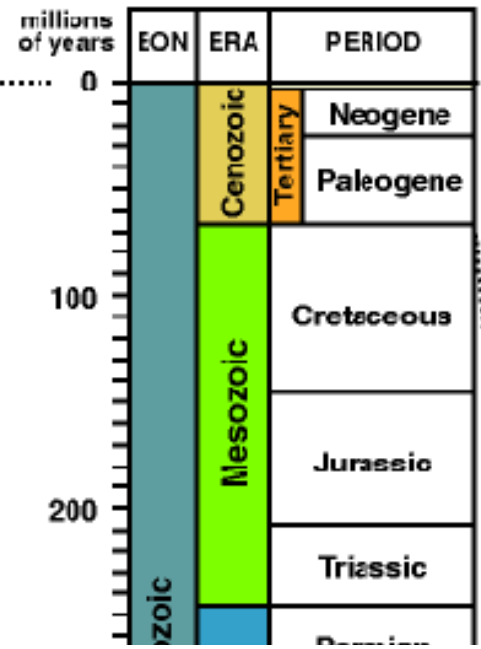
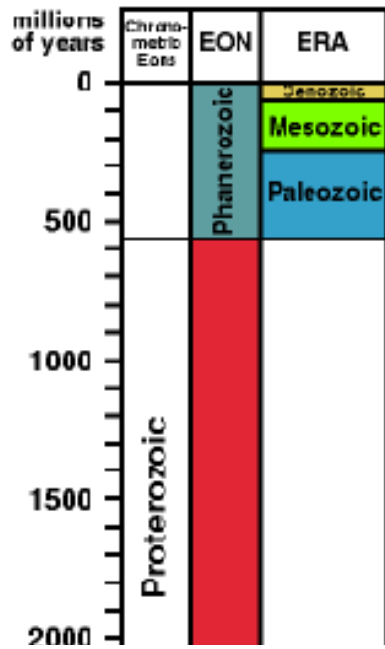


Trapezium CLuster • Orion Nebula

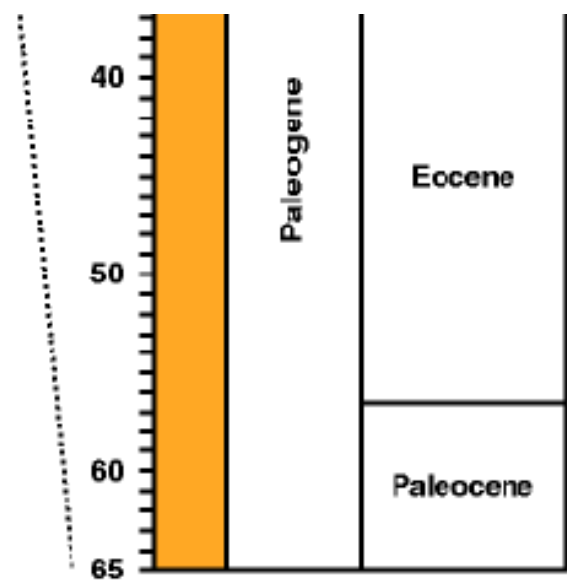
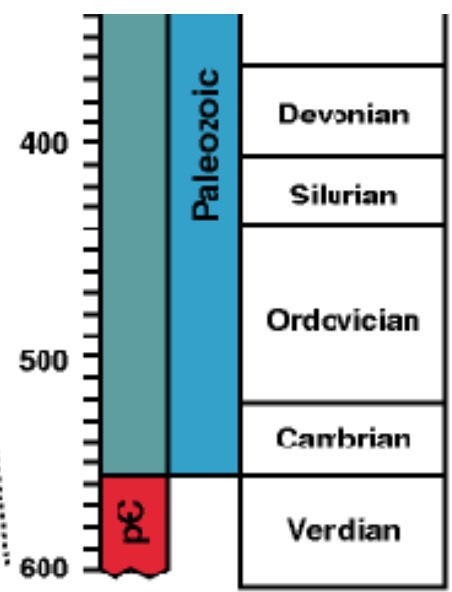
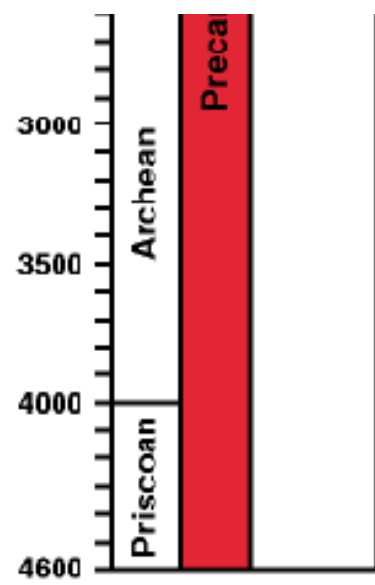
WFPC2 • Hubble Space Telescope • NICMOS

NASA and K. Luhman (Harvard-Smithsonian Center for Astrophysics) • STScI-PRC00-19

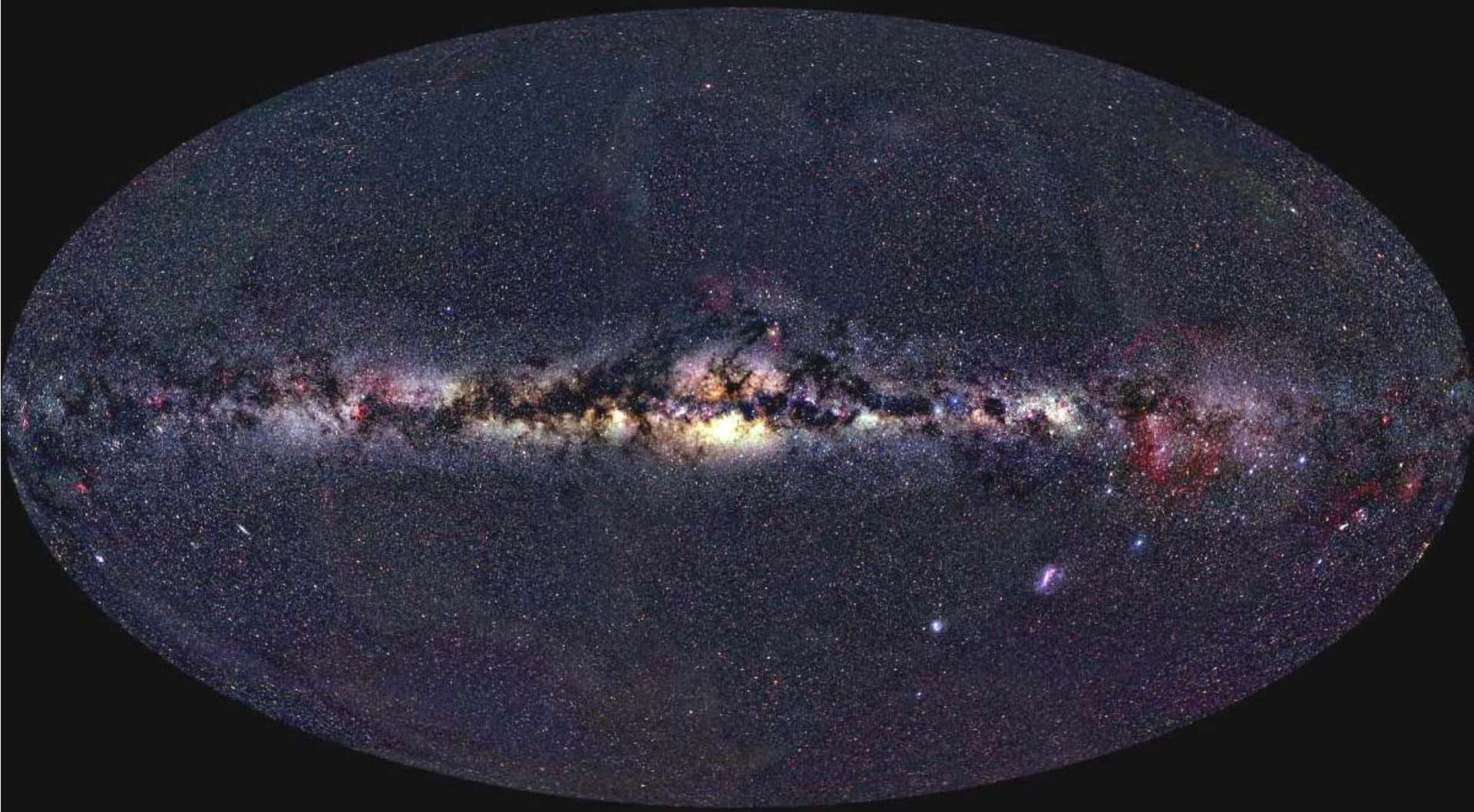




December 31st, 12:59:59.08 pm

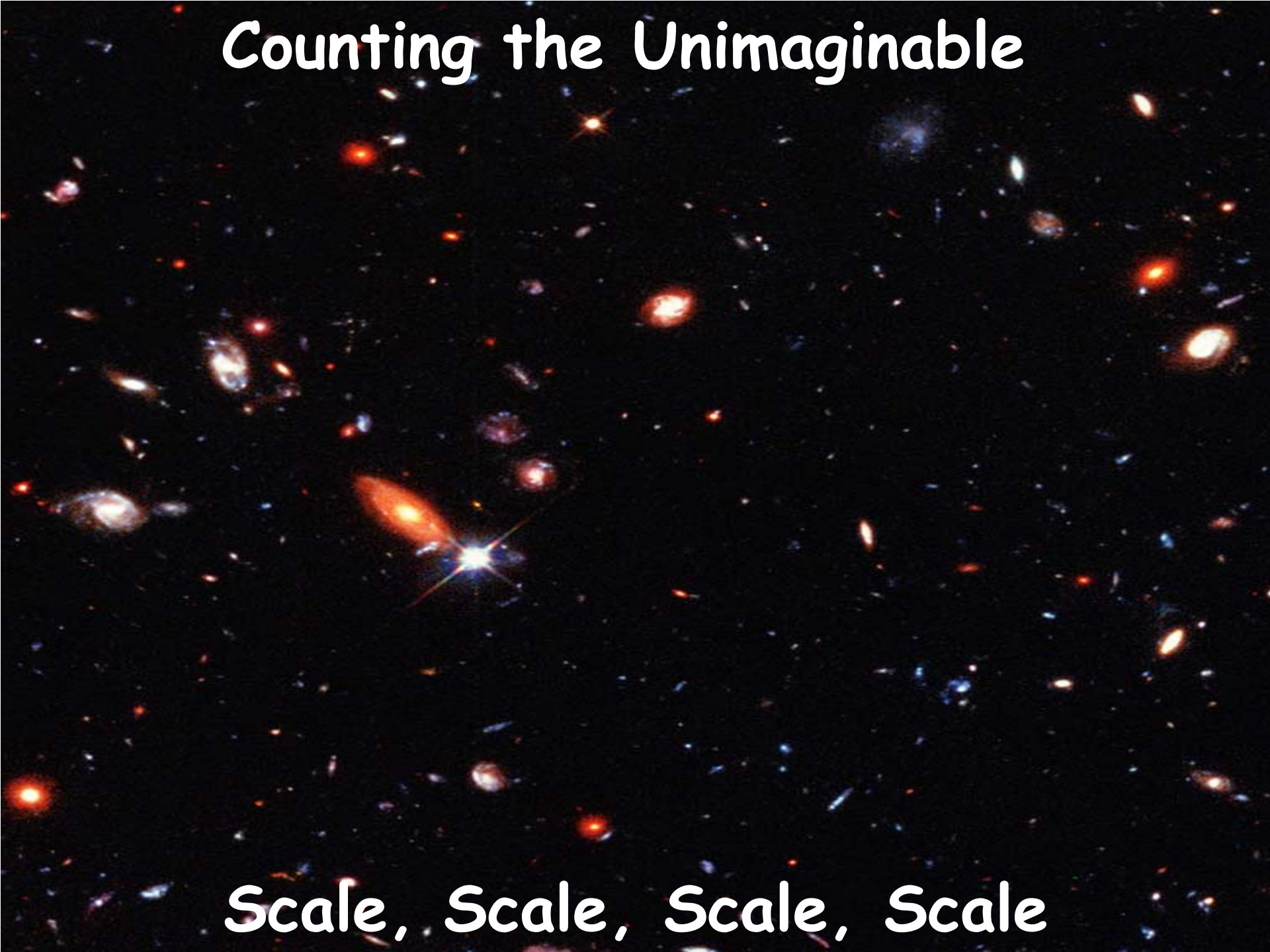


Counting the Unimaginable



Scale, Scale, Scale, Scale

Counting the Unimaginable



Scale, Scale, Scale, Scale

How important is Counting?



The counting house

There are, it is said, three types of lies: lies, damned lies and statistics. Many scientists, who find their work assessed through attempts to gauge how often it is cited in the scientific literature, would surely subscribe to that view. Citation analysis, in the hands of non-experts, can be an extremely blunt instrument. What's more, the specialists in the field have found that raw citation data often contain errors.

Nobody knows how accurate the raw data are, but they're certainly not clean, accurate data in the way that some people think.



Counting Mines Inexact Science



Estimates have ranged from 119 million to 20 million mines in 63 countries.

Since 1975, mines have exploded under one million people, currently killing at an estimated 800 people per month.

Odds of dying in the United State due to from selected causes

1. Food Poisoning
2. Murder
3. Venomous bite
4. Firearms accident
5. Motor Vehicle Accident
6. Fire
7. Electrocution
8. Airplane Crash
9. Flood
10. Tornado
11. Asteroid or Comet
impact

**Table 15.5 Odds of Dying in the United States
from Selected Causes**

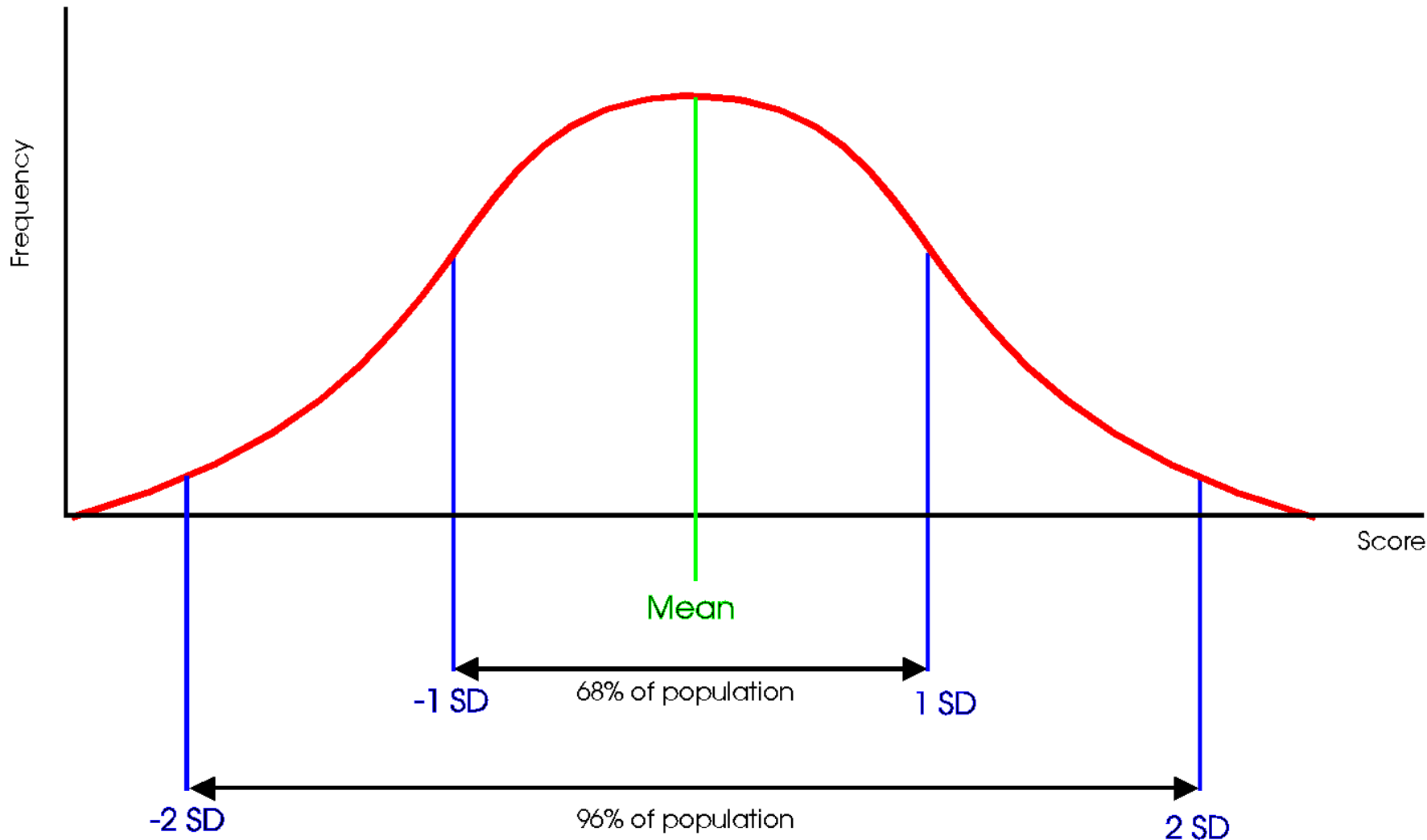
Cause of Death	Odds of Happening
Motor vehicle accident	1 in 100
Murder	1 in 300
Fire	1 in 800
Firearms accident	1 in 2,500
Electrocution	1 in 5,000
<u><i>Asteroid or Comet Impact</i></u>	1 in 20,000
Airplane crash	1 in 20,000
Flood	1 in 30,000
Tornado	1 in 60,000
Venomous bite or sting	1 in 100,000
Food poisoning by botulism	1 in 3,000,000

Source: D. Morrison (1992).

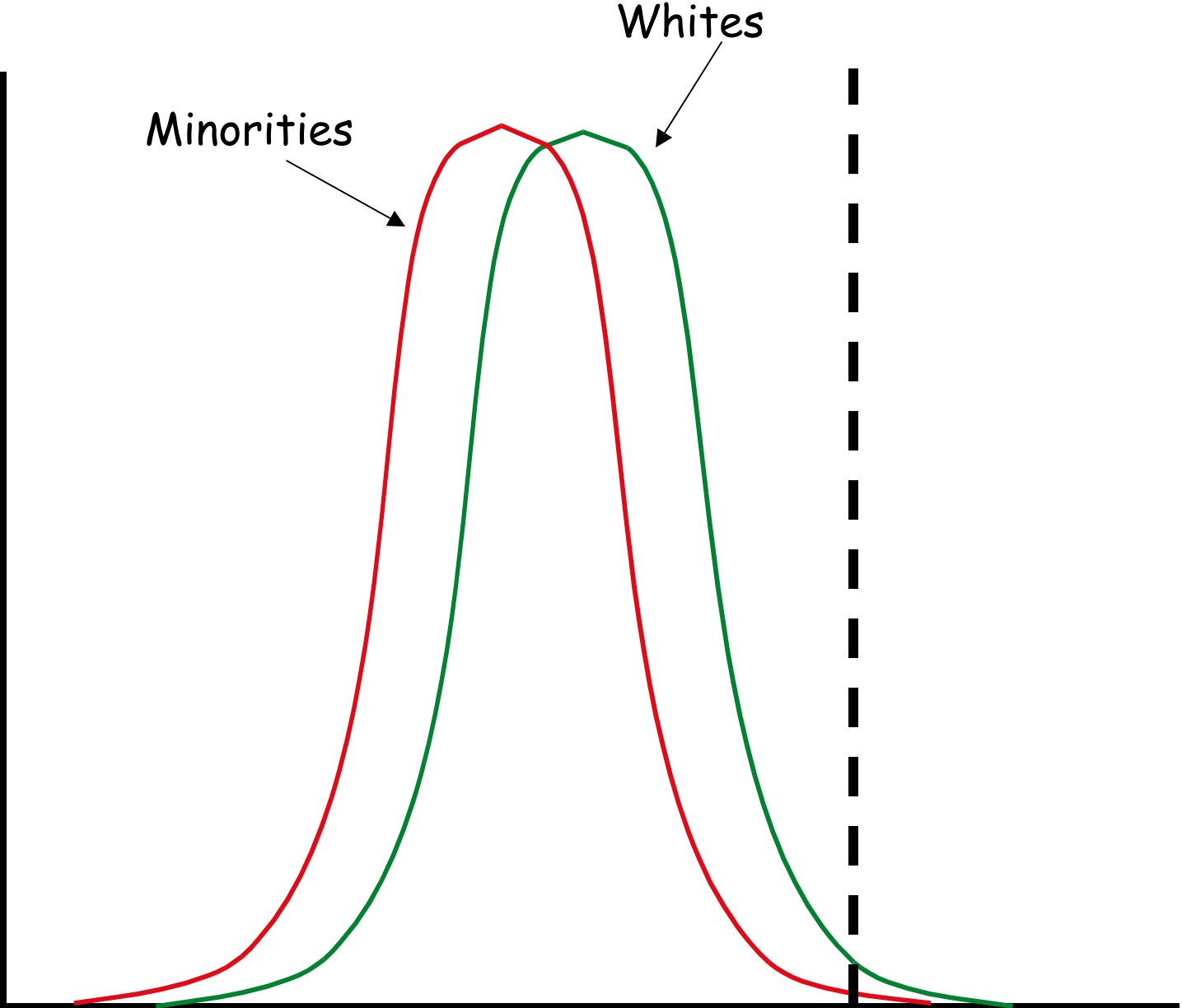
Counting and Policy



The Normal Distribution Curve



Counting by Numbers - Test Scores



Counting for Profit



DigiCount, has moved beyond just counting how many people go into or come out of a store, they are now able to count people moving in multiple directions. They can actually determine whether someone went into an area and then turned to the right or to the left or went straight.