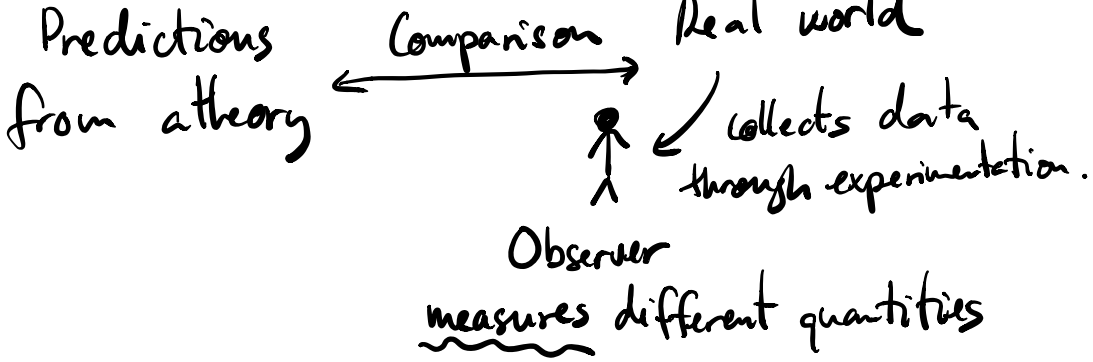
Lecture 1: Measurment and units.

Recap:

- Put Physical Science in context.
- Demarcation problem: how to distinguish a scientific theory from a non-scientific one.
  ↳ Karl Popper: falsifiability criteria.
- Criteria for progress in science
  i.e how can theories improve

- Theory: set of rules that allows us to make predictions about a physical system.



Predictions can be of two types:

- Qualitative predictions: predictions about the quality of a system. More "subjective".

  e.g "It's sunny in ATX".

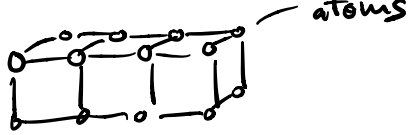
- Quantitative predictions: predictions about a measurable number quantity. More "objective".

  e.g "It's 90°F in ATX"
  "Humidity of 80%"
  "25% clouds"
  } → sunny.

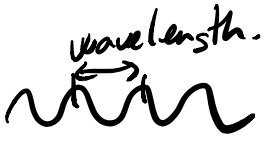
Comment: it is a strong trend in science to try to define qualities of a system by means of relations between quantifiable parts.

e.g quality: object in solid state.

for an object to be in solid state means that its atoms maintain a fixed position.



e.g quality: color.



color defines by the frequency of the light wave (or the wavelength)

- Every prediction in PS is a quantitative prediction about something that can be measured by a number/s.

Natural question: how many quantities are out there to be measured? What does it mean to measure them?

- There are 7 fundamental quantities that can be measured.

	Quantity	SI. Unit	Symbol.
	Lenght	Meter	m
PSI	Time	Second	s
	Mass	Kilogram	Kg
	Temperature	Kelvin	K
	Electric current	Ampere	A

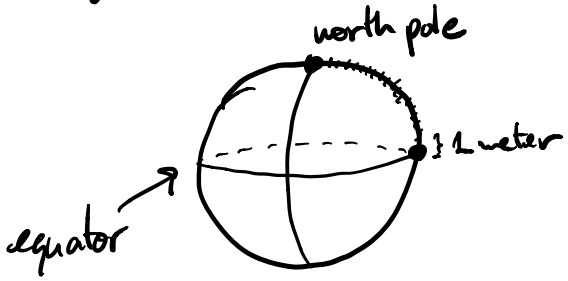
Amount of substance	Mole	mol
Lumius intensity	Candela	cd.

- Measurement: To measure something means to compare it to some preestablished definition of the unit of what we want to measure.

⇒ We need to define each of the fundamental units.

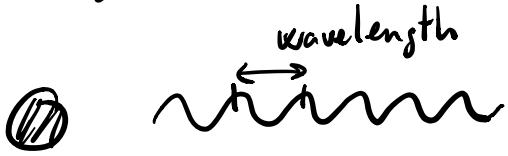
Meter:

- 1791: defined as $1/10{,}000{,}000$ of the distance from the equator to the northpole.



- 1889: distance between two engraved lines on a platinum-iridium bar.

- 1960: 1650 76.73 times the wavelength of orange light emitted by Krypton atom.



Krypton atom

- 1983: distance traveled by light in vacuum in 1/299792458 of a second.

Second:

- 1967: defined as the time required for 9192631770 Cesium atom vibrations.
  "Atomic clocks"

Kilogram:

- 1889: defined to be the mass of a platinum-iridium cylinder, housed at the International Bureau of Weights and Measures in Paris.