How science research works?
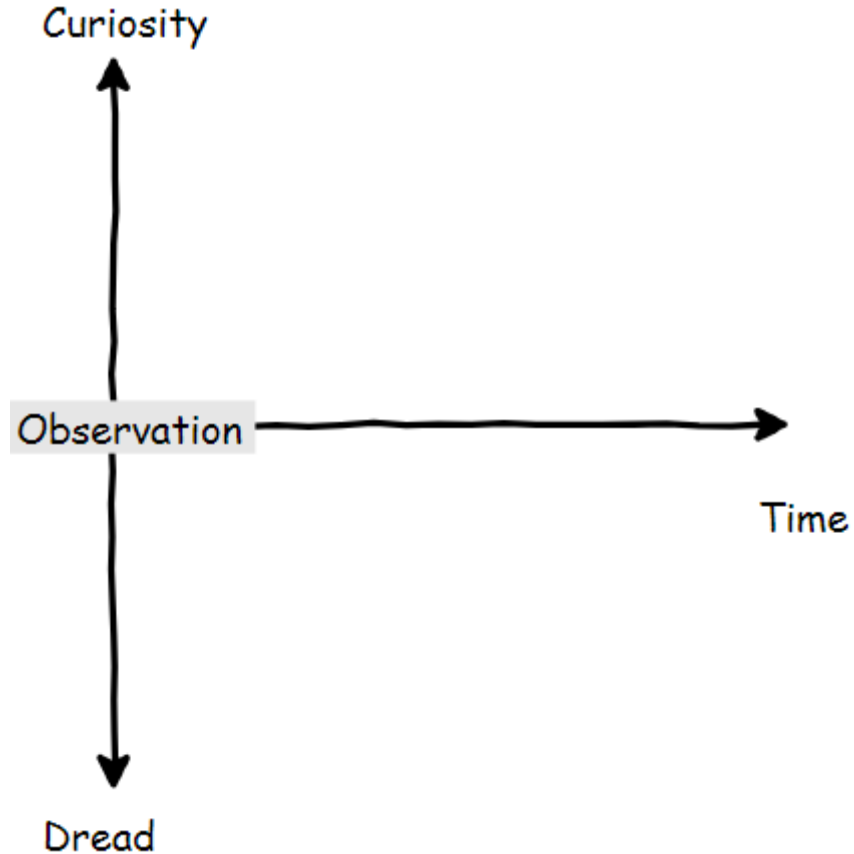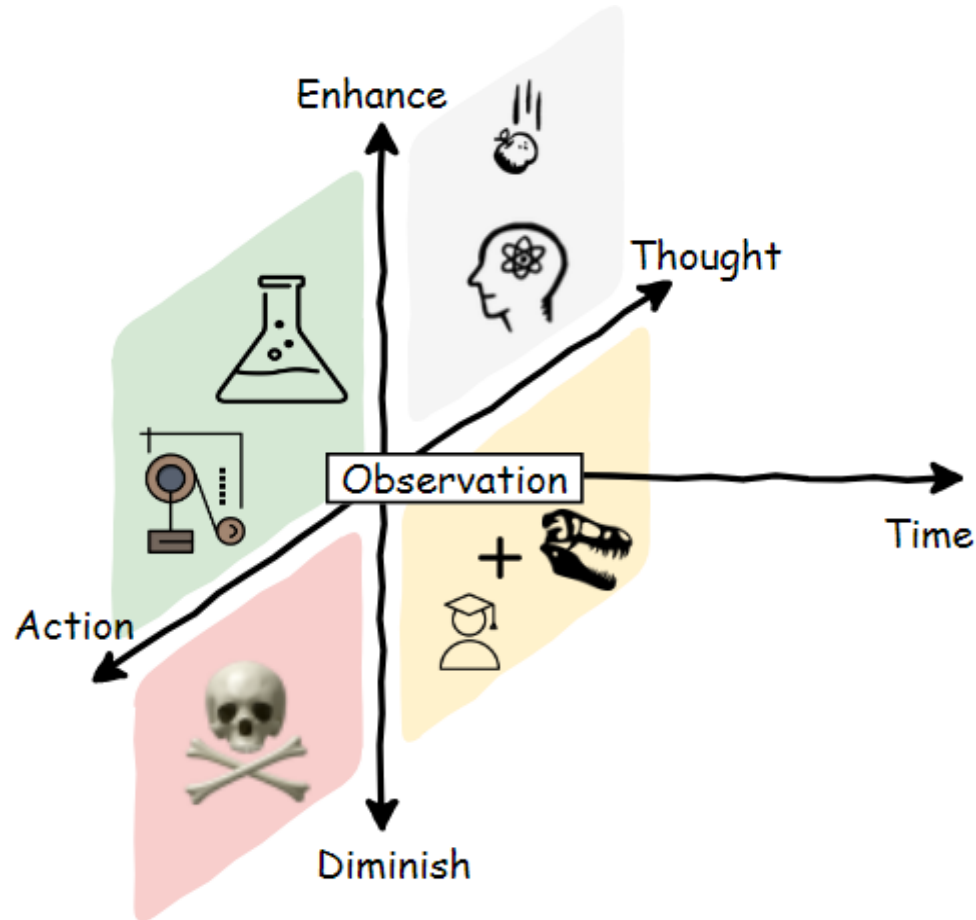
A <u>simple</u> model of scientific research
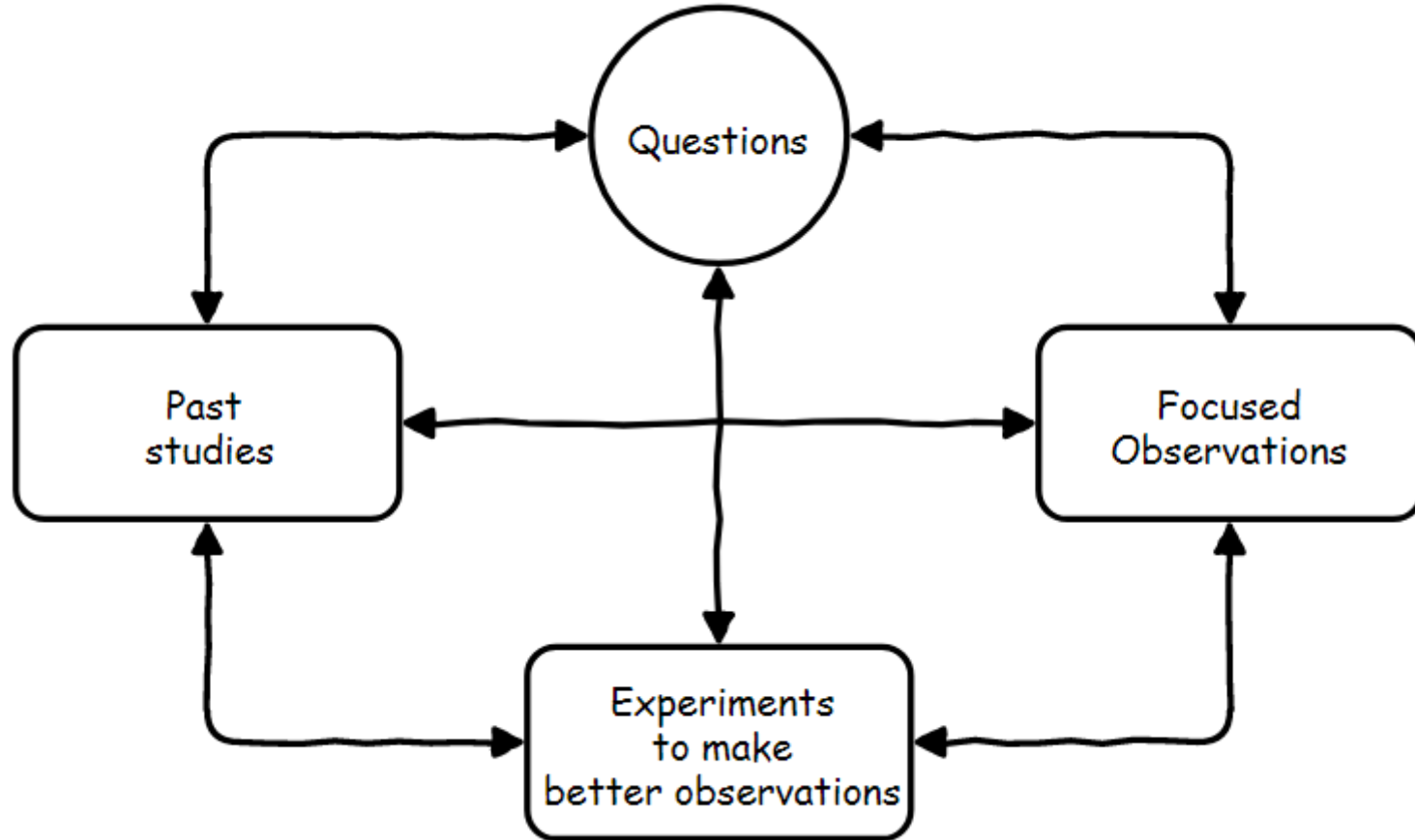## A) Curiosity

A <u>simple</u> model of scientific research
B) Action & Thought

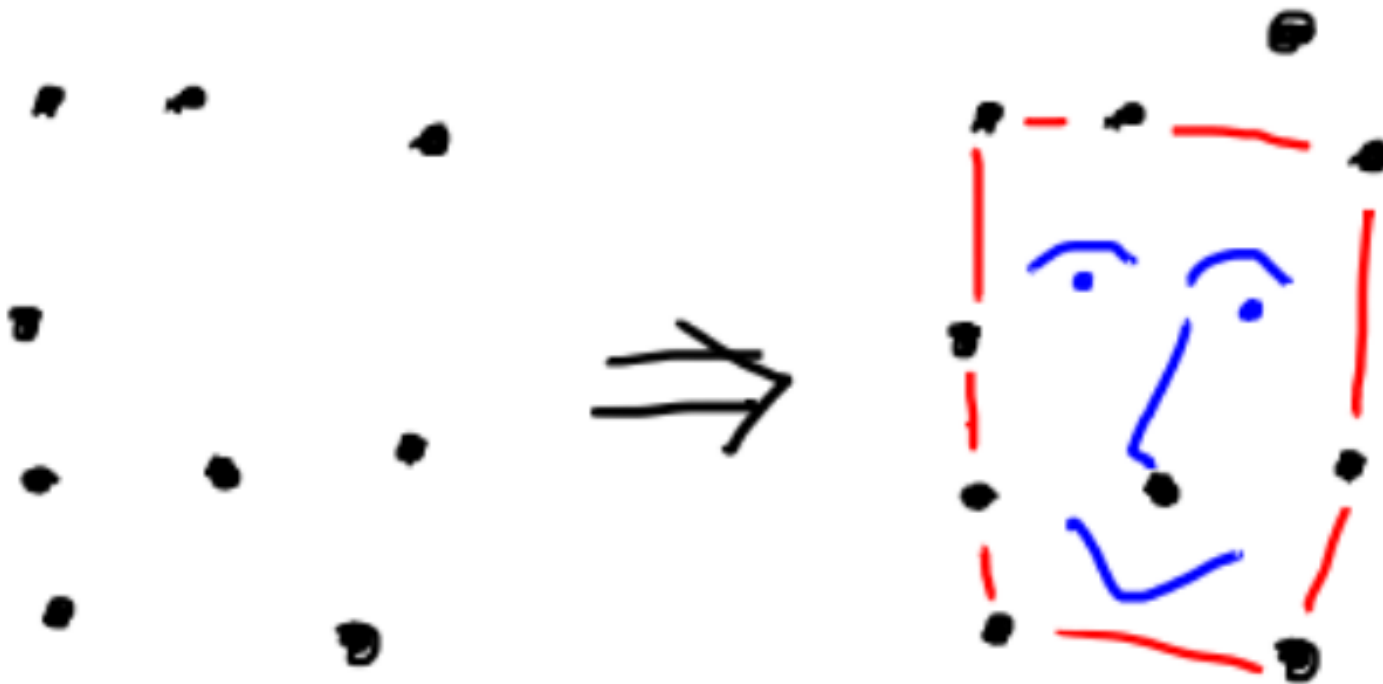# A <u>simple</u> model of scientific research
C) Gathering information

A <u>simple</u> model of scientific research
D) Overwhelming information
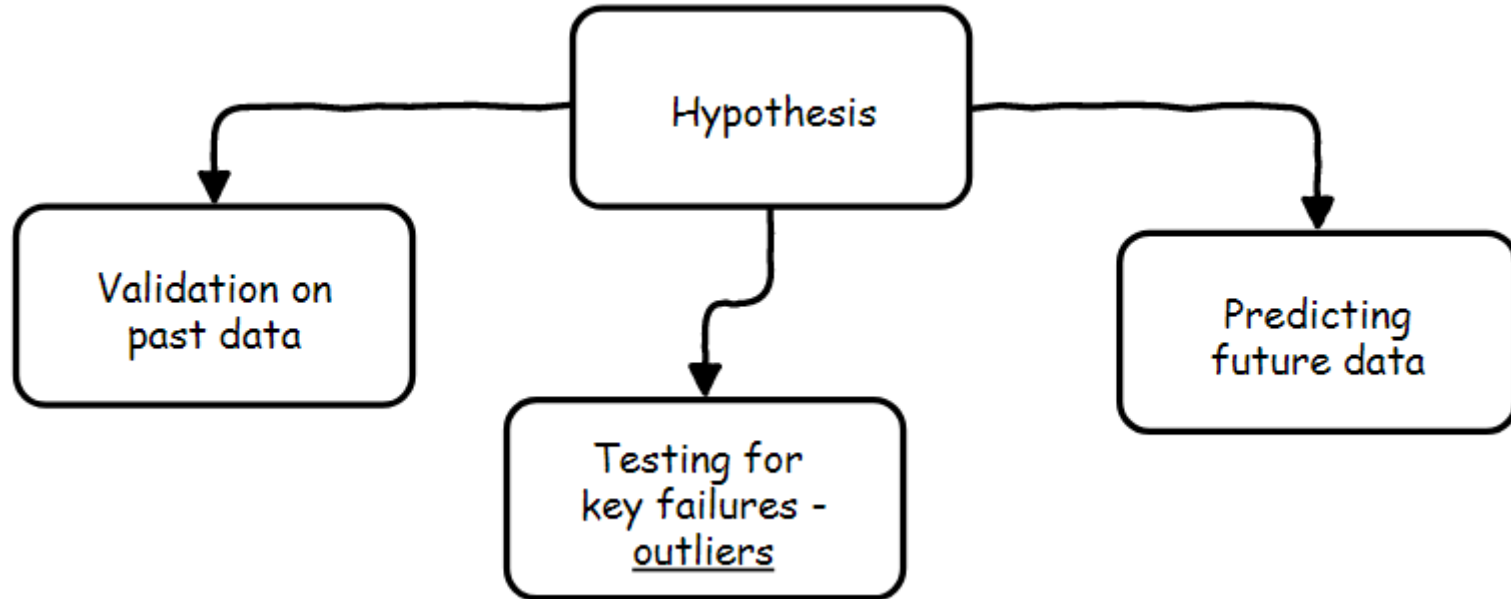
A <u>simple</u> model of scientific research
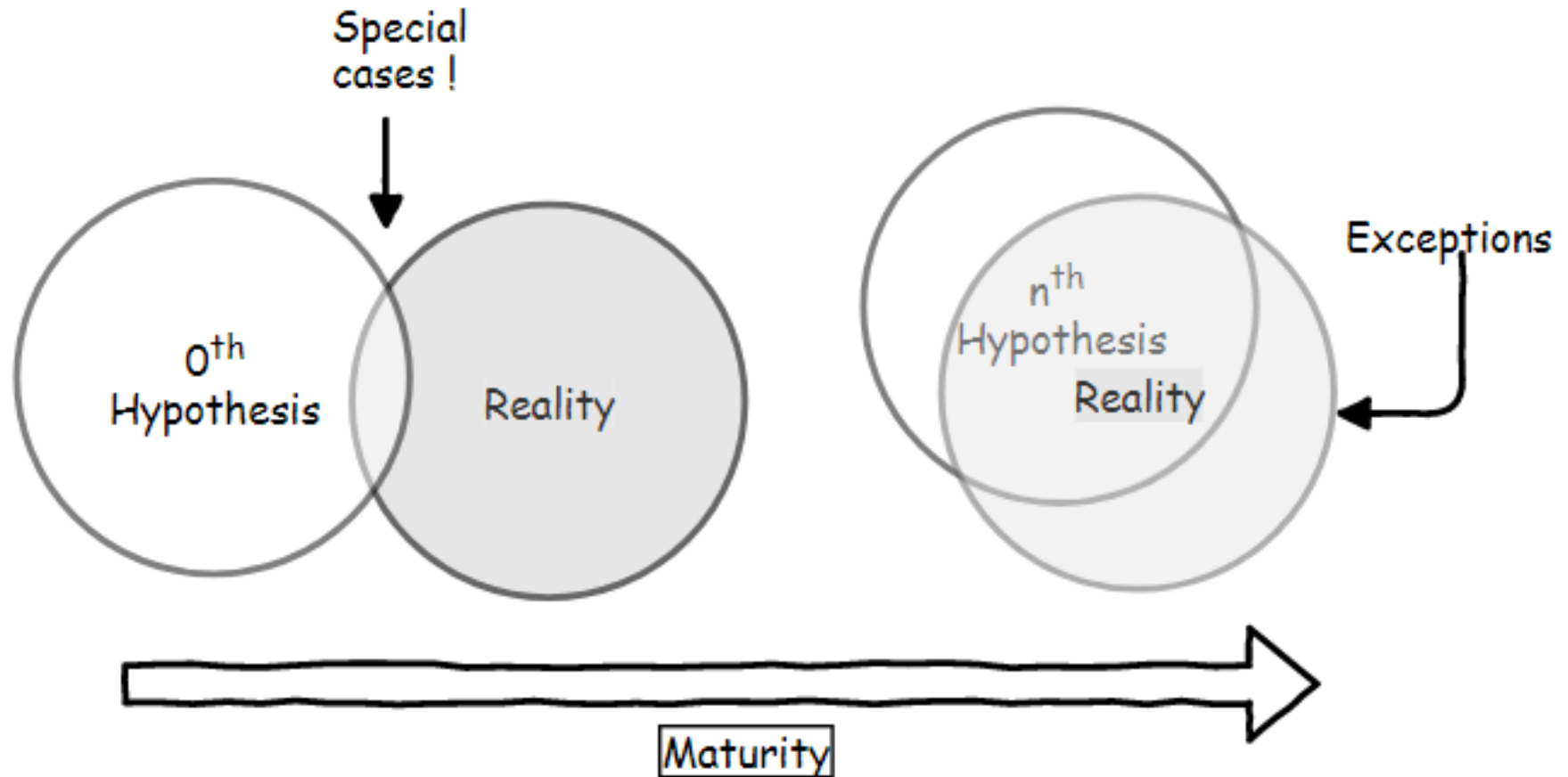## E) Hypothesis

A <u>simple</u> model of scientific research
F) Hypothesis testing

A <u>simple</u> model of scientific research
G) "Normal science"

A <u>simple</u> model of scientific research
H) The path ahead...

What You Know vs How much you know about it
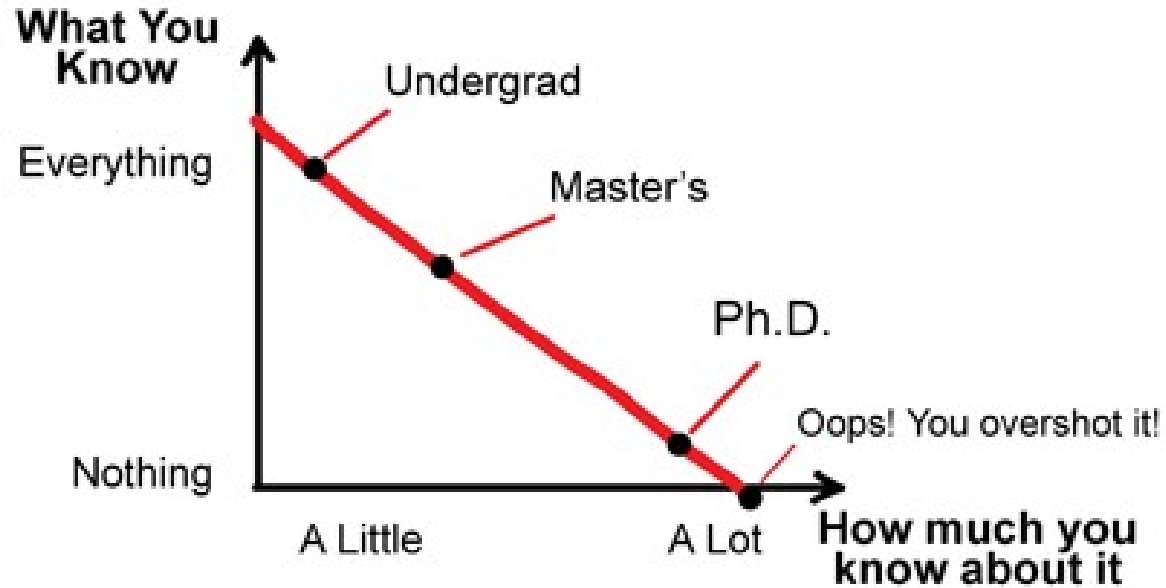
Why is it necessary to teach science?

- To know and understand the world

- To be able to use tools and make practical guesses

- To generate scientific spirit

- To be able to address problems surrounding us

- To research and give back to society

How is science taught in India?

- Learn and remember works of others
- Science instruments are costly, so don't bother
- Know that science is tough and needs lots of math
- Science is too serious to be enjoyable
- Mug up and spit-out in exams, and forget!
- Getting science degrees gets jobs
- Science degree necessary for competitive systems

How it should be taught?

- Focus on curiosity - the blood of science
- Asking genuine questions on everyday stuff
- Information only after sufficient questioning
- Mathematical rigor < generation of curiosity
- Play with science and scientific tools
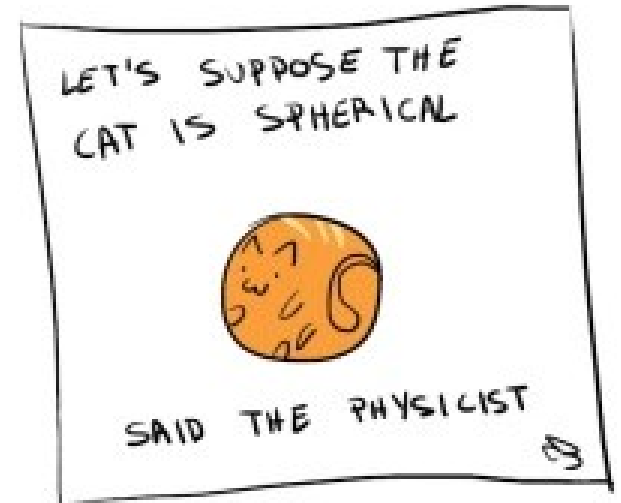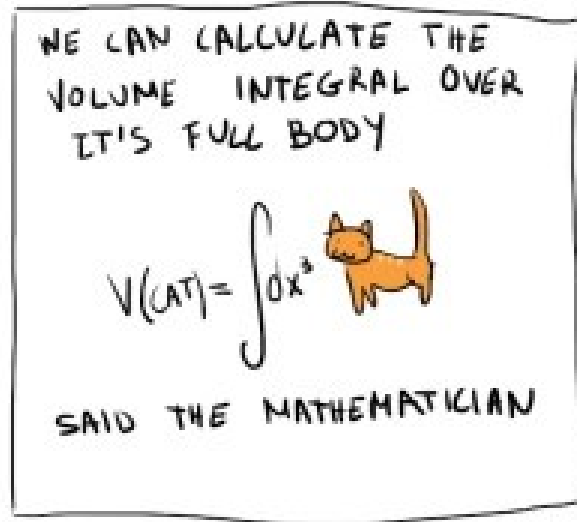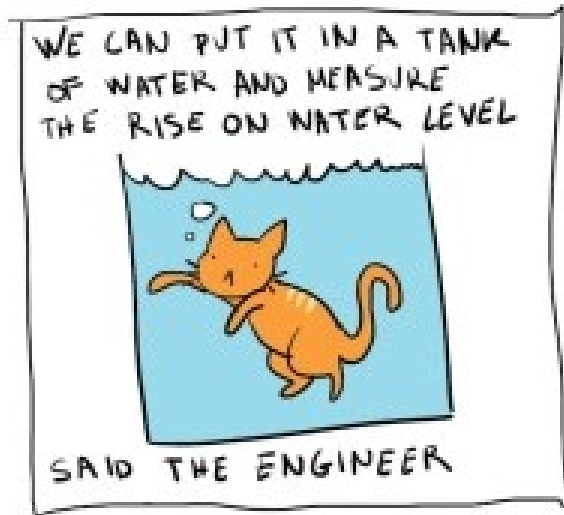
How to get into science?

- Institutional : graduation, PG, etc.
- Extra-institutional : very difficult in India
- Collaborative projects : liberal arts approach!

The structure of scientific revolutions - T.S. Kuhn

- **Normal science** - discover uses of current tools

- **Crisis** - normal science Vs. too many anomalies

- **Extraordinary science** - new tools, more problems!

- **Exemplar**: One shows the way, others perfect it.

Language of science (a joke)

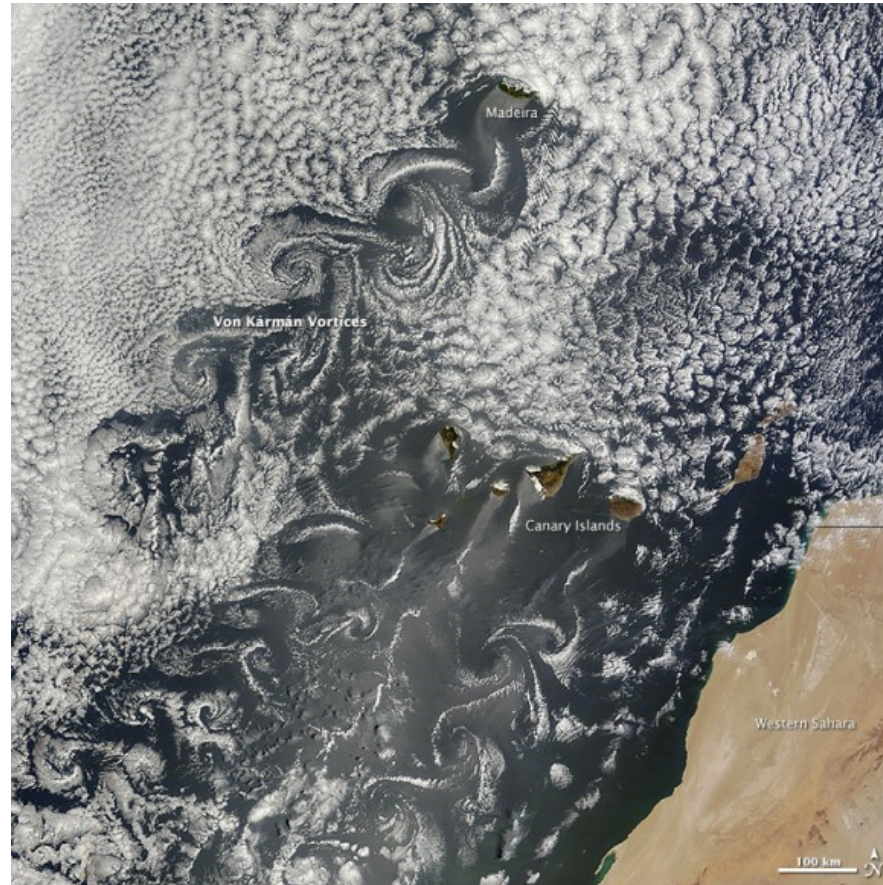HOW TO CALCULATE THE VOLUME OF A CAT ?

WE CAN PUT IT IN A TANK OF WATER AND MEASURE THE RISE ON WATER LEVEL

SAID THE ENGINEER

WE CAN CALCULATE THE VOLUME INTEGRAL OVER IT'S FULL BODY

$$V(CAT) = \int \rho x^3$$

SAID THE MATHEMATICIAN

LET'S SUPPOSE THE CAT IS SPHERICAL

SAID THE PHYSICIST

No animals were harmed while making this joke - (credits: anonymus)

Language of science (Not a joke)

Image: NASA