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Charles Darwin, Isaac Newton, John Hattie – what do they have in common?

How the nature of science influences good science teaching

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Background

Inquiry is a central term in present science education reforms in Europe

Positive contacts with science at school → raise young peoples' interest in science studies and careers

"The primary goal of science education should be to educate students both about the major ideas of science and about the way science works"

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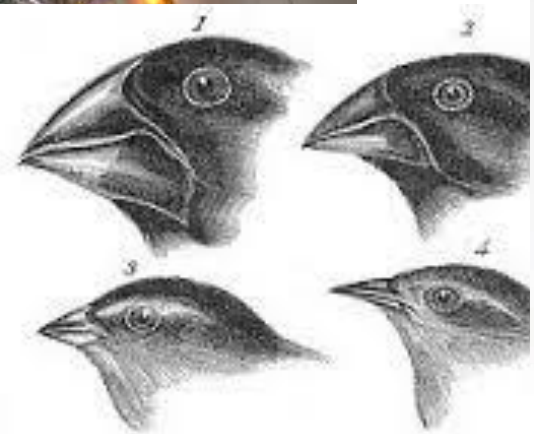
What is the nature of science - How do scientists work?



1. Geospiza magnirostris
2. Geospiza fortis
3. Geospiza parvula
4. Certhidea olivacea

Finches from Galapagos Archipelago

*"Science has many methods of investigation, but all are based on the notion that **some form of evidence is the basis for defensible conclusions**. Much scientific knowledge is tentative and is continually refined in the light of new evidence" (Abd-El-Khalick 2004)*

Scientific knowledge is …

…. objective: it is derived from observations of the natural world

…. subjective: involves human inference, imagination and creativity

…. tentative: it is subject to change

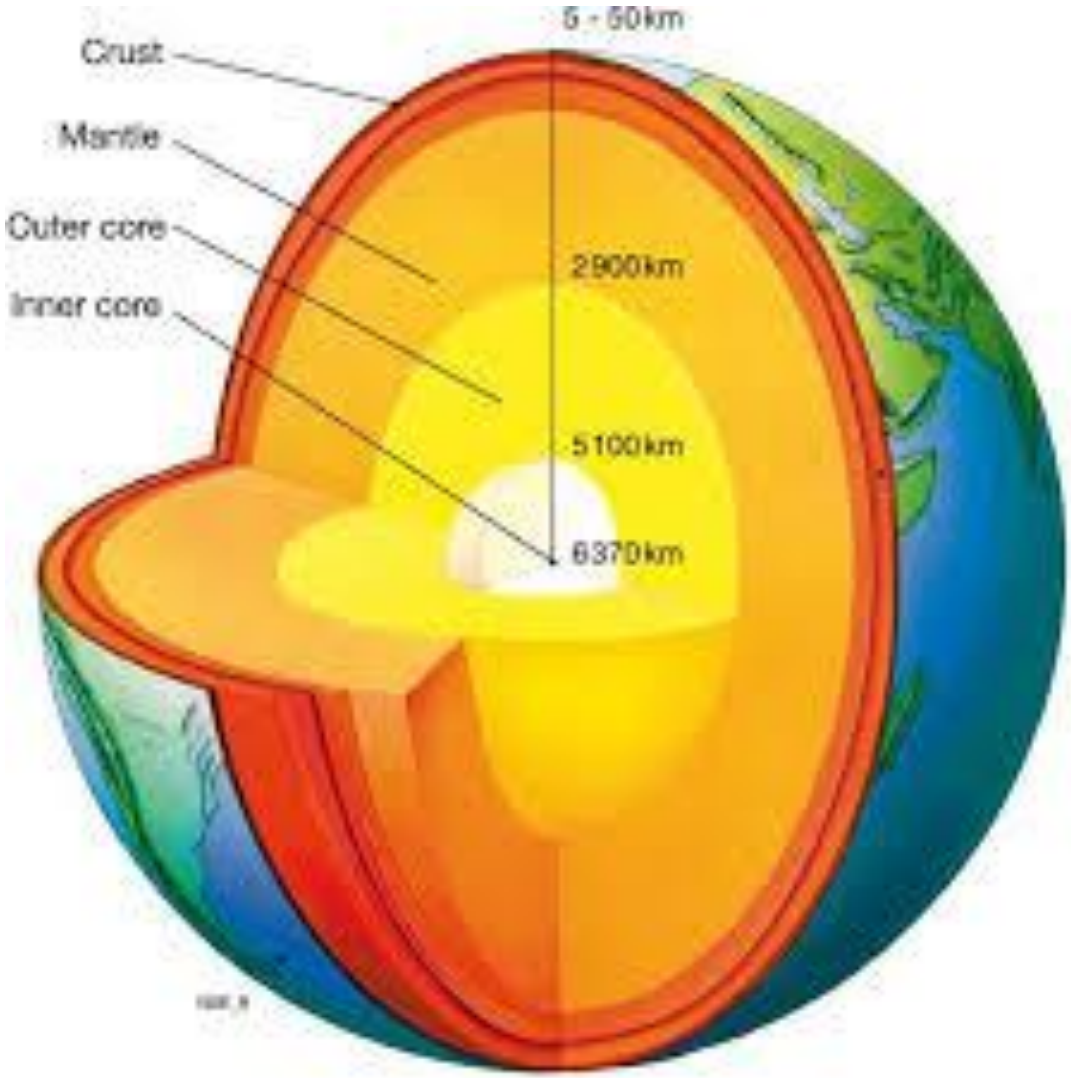
Observation

Observations are descriptive statements about natural phenomena that are “directly” accessible to the senses (or extensions of the senses) and about which several observers can reach consensus with relative ease

Inference

Inferences are statements about phenomena that are not “directly” accessible to the senses

Inference


5 - 50km
Crust
Mantle
Outer core
Inner core
2900km
5100km
6370km

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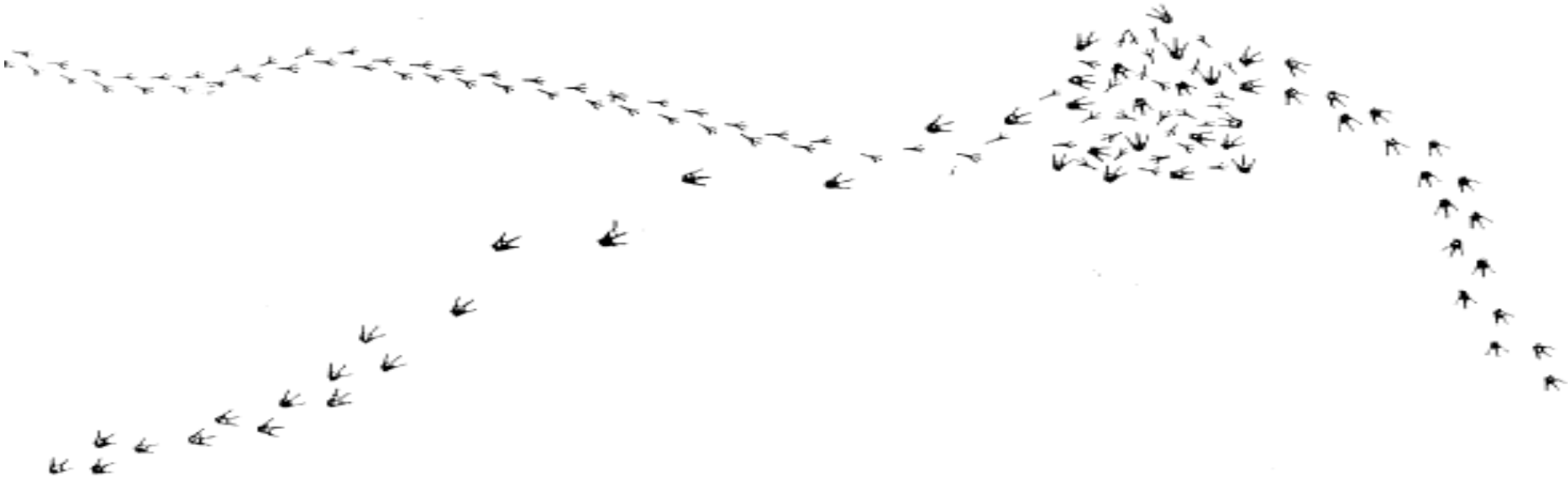
Tricky Tracks



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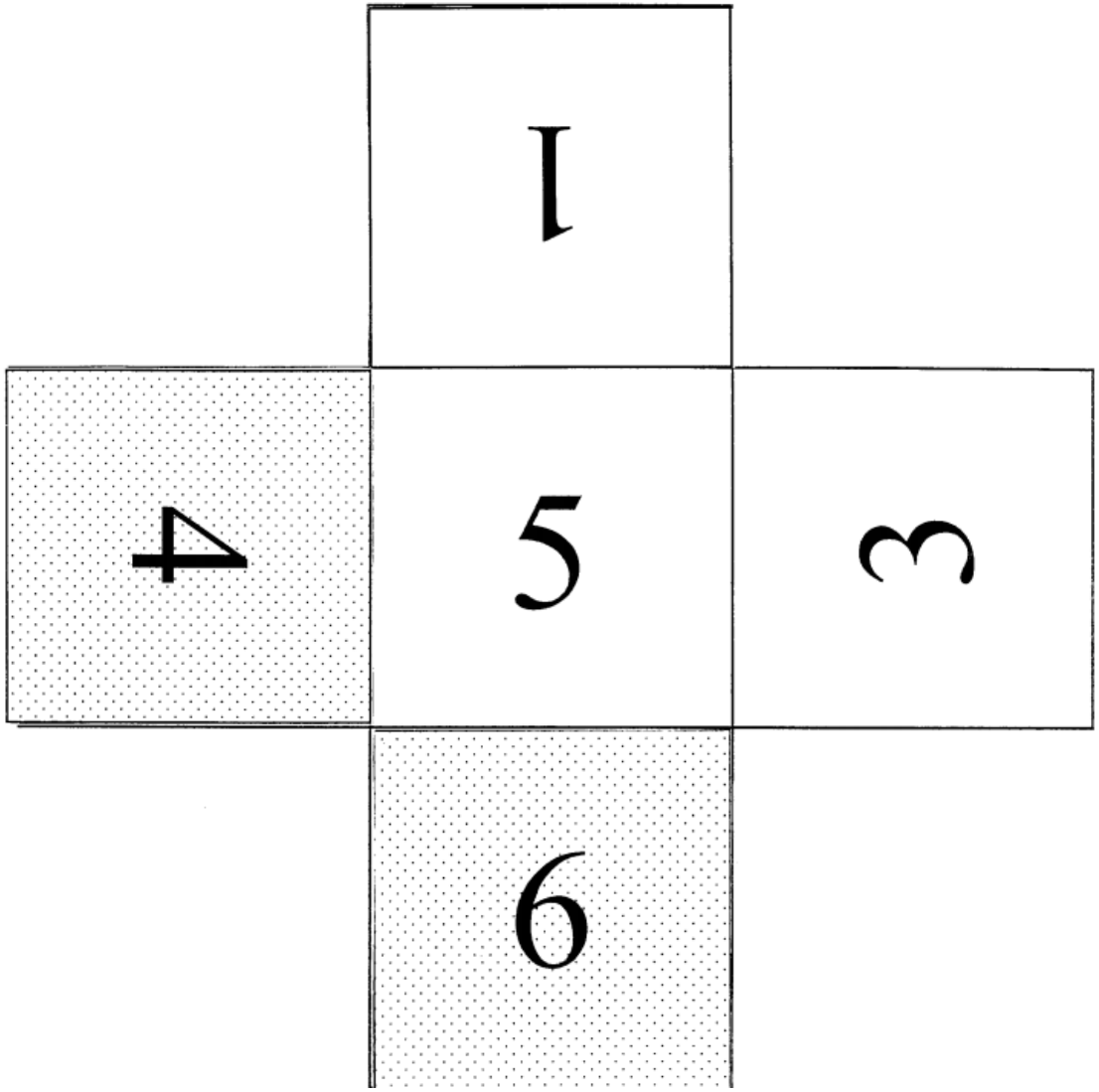
Science is about looking for patterns in data



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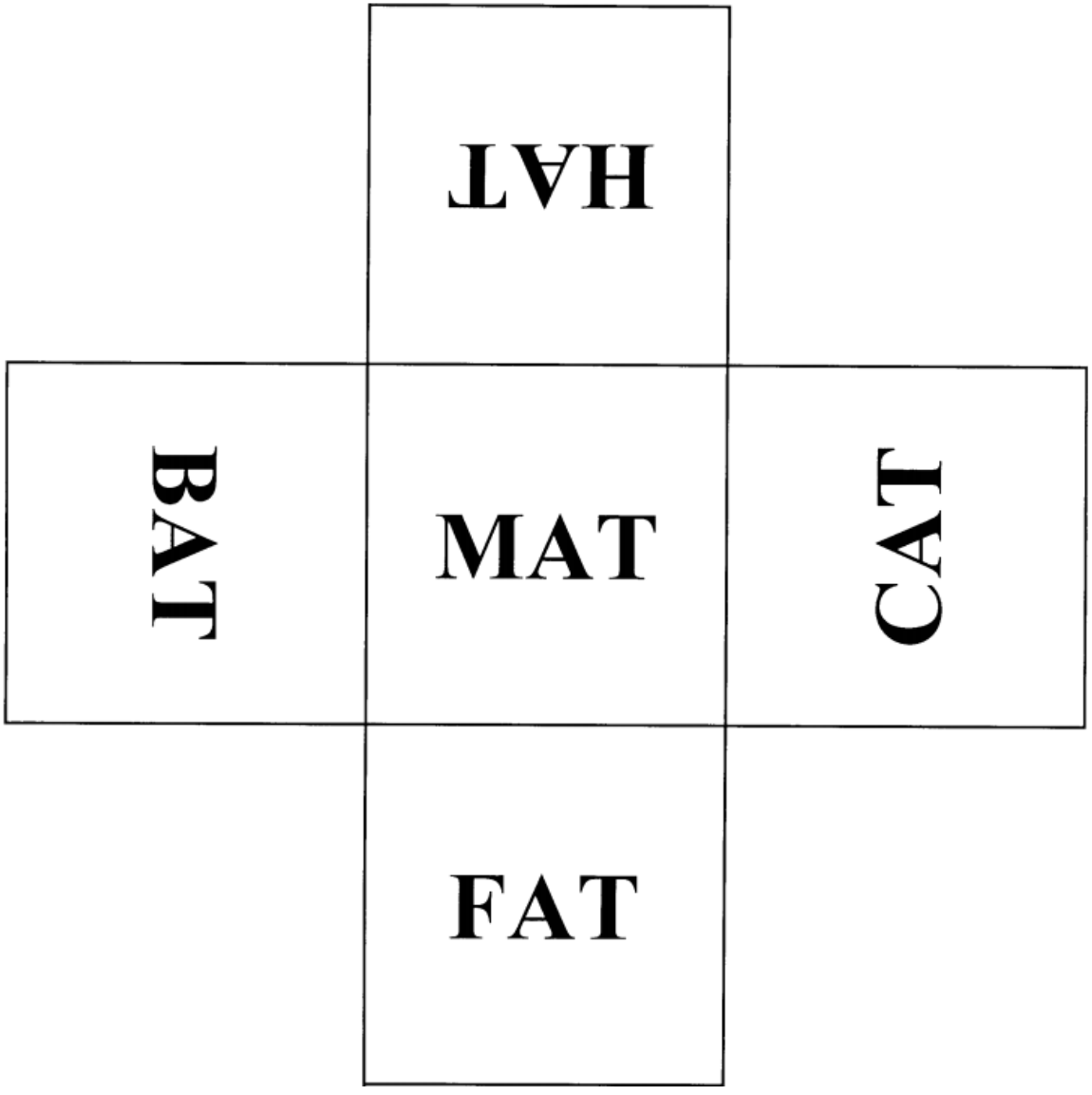
Science is about looking for patterns in data



Conclusions

- *Science has been taught too much as an accumulation of ready-made facts with which students are to be made familiar, not enough as a method of thinking*
- *Teaching science and teaching about science is at its best by having students perform scientific investigations*
- *Doing science doesn't necessarily change ideas about science*
- *Teaching science and teaching about science is at its best by having students perform scientific investigations* ***followed by reflection on these activities and the nature of the knowledge produced***
- *As teachers are the key factor for good science teaching they must be supported in learning about inquiry and NOS and how to implement it in school*

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