♦♦WEEK ONE- LECTURE TWO: THE EVIDENTIAL BASIS OF KNOWLEDGE♦♦

HISTORY OF INDUCTIVE AND DEDUCTIVE REASONING

ARISTOTLE'S EMPIRICISM VS PLATO'S FORM

- Plato: humanity is born with innate knowledge of everything, and learning is basically just recall
  - Also believed knowledge was advanced via deductive reasoning; you have a general theory about how the world works, and predictions/hypothesises based on the general theory
- Aristotle: focused on inductive reasoning, whereby you undergo a number of observations, and from there, you understand how the world works

GOING A STEP FORWARD: COMBINING INDUCTIVE AND DEDUCTIVE REASONING (BACON AND GALILEO)

- Deduction allows the application of a hypothesis to a specific circumstance
- Then, you can you use inductive reasoning to generate or test a hypothesis from specific observations → this resembles the scientific process

THE HYPOTHESIS

- Aims to *explain* a group of facts, and is either accepted as the basis for further *verification* (that it, further corroboration), or accepted as likely to be true (high level of corroboration)
- The *explanation* is based on a general theory of biology
- *Verification* is where the experimental results are used to corroborate the hypothesis
- Thus, a hypothesis is used to design experiments, via deducing the possible consequences of that hypothesis, and seeing if the consequences actually occur
- In general, deductive= design experiment, inductive=test hypothesis (apply it to a number of observations)

THE DIFFERENCE BETWEEN SCIENCE AND PSUEDO-SCIENCE

- Both science and pseudo-science explain things, but scientific hypothesis must be falsifiable, refutable or testable → it's not science if it's not refutable
- Note: this is good for natural sciences, but no so much for biology; there are a number of uncertainties, and we use statistics to quantify uncertainty

THE SCIENTIFIC PROCESS

- We generate a hypothesis, and use deductive reasoning to predict the consequences of the hypothesis (i.e. if this hypothesis is true, then…), which establishes the premise for the experimental design
- We then test the predictions via observing a number of applications, and then use data and statistical analysis to see if the prediction were true or not
- Lastly, we use inductive reasoning to explain the relationship between the prediction and the observation, and from there we can build a new hypothesis

STATISTICAL ANALYSIS

NULL HYPOTHESIS

- Puts forward that the hypothesis is false; allows us to determine whether it is reasonable to reject the null hypothesis (indicating that hypothesis is likely to be true) or accept the null hypothesis (rejecting the hypothesis)

- This is done by calculating a P-value; probability (%) that certain observations would take place if the null hypothesis were true (we try to reduce this value so that certain events the take place that corroborate with the null hypothesis occur by chance)
    - Based on Descartes 'method of doubt': told us to doubt everything → P-value allows us to quantify doubt (note: as a result, there is no proof)
- Note: it doesn't indicate that hypothesis is true if p=<0.5, or false if p=>0.5

<u>PROBLEMS ARISING WITH NULL HYPOTHESIS</u>

- Type 1 error (false positive): rejecting the null hypothesis when it is actually true
    - Probability of false positive is equal to the P value
- Type 2 error (false negative): accepting the null hypothesis when it is really false

HUYGEN'S HYPOTHETICO-DEDUCTIVE METHOD

- Involves constantly refining experiments and hypothesises to increase the probability that the hypothesises are correct → can never really reach truth