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[1] Admin & Overview

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DARWIN IN PHILOSOPHY

0. Outline

1. Admin
2. Course overview
3. The living world: some noteworthy features
4. Probability and inference: a primer

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- **Course composition:**
 - 18 x 1h lectures
 - 4 x 1h seminars
- **Time & location:** Caird room, Mondays & Wednesdays 2-3pm.
- **Course website:**
 - Location: Philosophy Moodle
<http://moodle2.gla.ac.uk/philosophy/moodle/>
 - Contents: syllabus, reading list, lecture slides, downloadable articles and, towards end of the course, sample exam questions.
 - Lecture slides posted online 1-2 days after each lecture

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- **Readings:**
 - 1 compulsory piece + optional readings per lecture
 - Feel free to contact me for even further reading if interested
- **Assessment:**
 - 1 examination
 - 1 formal essay, due in towards end of term (exact date TBA)
 - Essay topic to be posted on Moodle in the next few weeks.
 - For further details on essay policies (style, length, submission guidelines, etc.), see Honours Handbook, available on departmental website.

1. Admin

- **Finally...**
 - Questions:
 - For everyone's sake please try to keep interventions during lectures to a minimum.
 - More than happy to answer any queries via email or during office hours.
 - Office hours:
 - Location: Dept of Philosophy, ground floor, room 307.
 - Times: Mondays & Wednesdays 10-11am.

2. Course overview

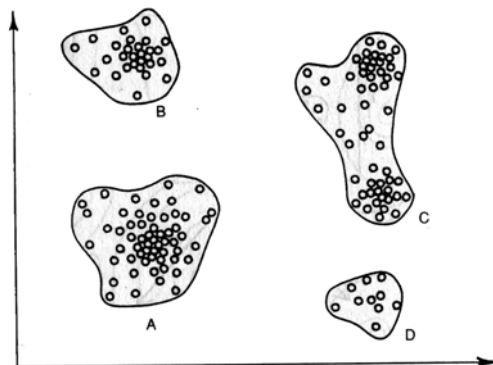
- **Course schedule:**
 - *Unit 1: Evolutionary biology (6)*
 - Primer on probability & scientific inference,
 - Overview of basics of evolutionary theory,
 - Evolution vs intelligent design,
 - Biological function...
 - *Unit 2: Evolutionary approaches to philosophy of mind (4)*
 - Review of some issues in philosophy of mind,
 - Teleosemantics and its problems.

2. Course overview

- *Unit 3: Evolutionary Ethics (4)*
 - Review of some issues in ethics,
 - Evolution of cooperative behaviour,
 - Evolutionary ethics.
- *Unit 4: Evolutionary Epistemology (4)*
 - TBA

3. The living world: some noteworthy features

- Many aspects of the living world seem to 'cry out' for an explanation (aside from its very existence).
- For instance: *actual* living forms occupy only a small portion of the space of all *possible* living forms (aka 'design space' or 'morphospace').

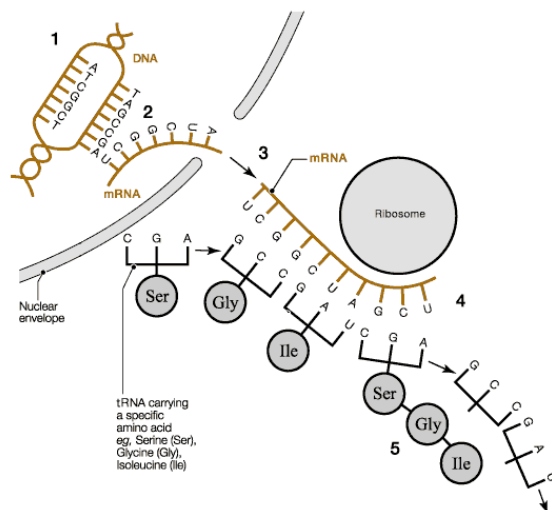


3. The living world: some noteworthy features

- In other words: of all the possible combinations of biological traits, only a small subset are actually instantiated.
- Some traits are present (and their alternatives absent) in all living species. This is especially common at the microbiological level...

3. The living world: some noteworthy features

- *Protein synthesis:* proteins synthesised in the same manner across all living species, via decoding of sequences of nucleosides.



3. The living world: some noteworthy features

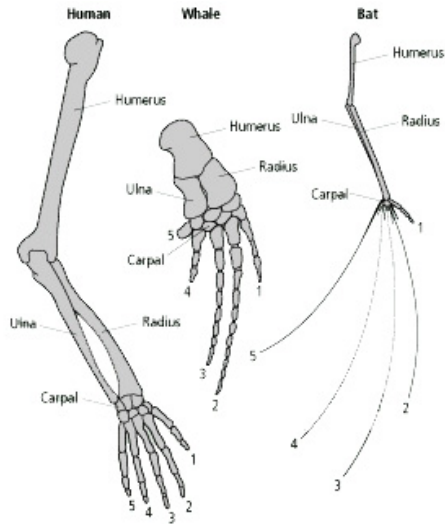
- Interestingly, note that across *all* living species:
 - the *sequences of nucleosides* that are decoded are invariably composed of the same 4 nucleosides (adenosine, thymidine, cytidine, and guanosine), out of a 102 naturally-occurring varieties.
 - the *proteins* resulting from the decoding are invariably composed of the same 22 amino acids, out of 390 naturally-occurring varieties.
 - with a few rare and minor variations, the same *nucleic-acid-to-amino-acid mapping* is found in all living organisms.

3. The living world: some noteworthy features

- Other traits co-occur with certain observed combinations of traits but not others:
 - *Mammary glands*: found exclusively in mammals.
 - *Echolocation*: found in a small but morphologically diverse set of species, such as bats, whales and the South American Oilbird.

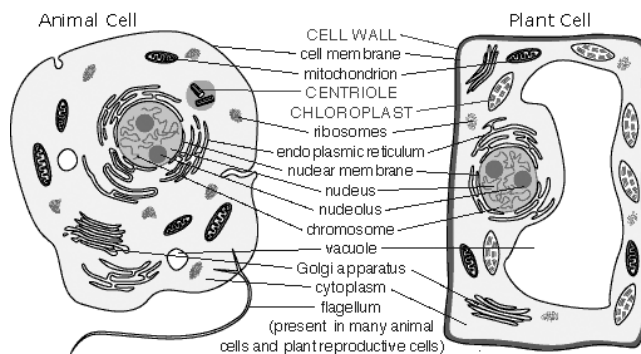
3. The living world: some noteworthy features

- Tetrapod**
pentadactyly: all existing 4-limbed organisms (e.g. mammals, amphibians, birds, reptiles, etc.) have five digits, either as adults or at some stage or other in embryonic development.



3. The living world: some noteworthy features

- Cell composition**: same kinds of structures (e.g. endoplasmic reticulum, mitochondria, Golgi apparatus, etc.) found in all eukaryotic cells (e.g. animal and plant cells) but not in prokaryotic cells (e.g. bacteria and Archaea).



3. The living world: some noteworthy features

- But possibly the most striking feature of the biological world is the prevalence of *organism/environment 'fit'* (i.e. something along the lines of organisms having traits that are well-suited to achieve their goals and meet their needs in their current environments).
- This intuitive notion of 'fit' is actually quite difficult to analyse precisely, but overall we do seem to agree on its applicability to various cases.
- Some examples...

3. The living world: some noteworthy features

- *Body surface/volume ratio*: heat dissipation is an increasing function of surface/volume ratio; the morphologies of the Jackrabbit (left; hot climate) vs the Snowshoe Hare (right; cold climate) are, in this respect, well suited to their respective environments.



3. The living world: some noteworthy features

- *Beak shape*: birds of prey, such as the Eagle (left) have sharp, curved beaks, well suited to tearing up meat, whilst the Hummingbird (right) has a long slender beak, well suited to extracting nectar from flowers.



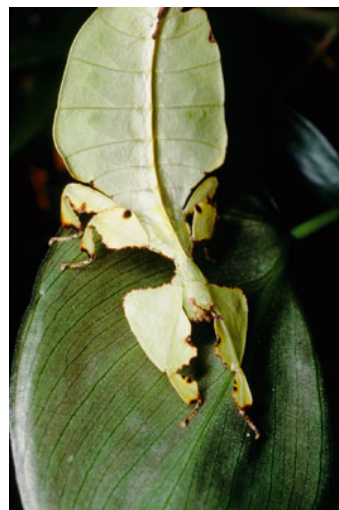
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3. The living world: some noteworthy features

- *Camouflage*: the leaf-like morphology of the Javanese Leaf Insect renders it inconspicuous in its native habitat.



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3. The living world: some noteworthy features

- *Batesian mimicry*: the Viceroy Butterfly (left) has markings that are strikingly similar to those of the Monarch Butterfly (right), with whom it shares a common environment. The Monarch is poisonous to the Viceroy's natural predators.



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3. The living world: some noteworthy features

- *Carnivorous plants*: unlike many other plants that can rely on the nutritional contribution of the surrounding soil, the Venus Flytrap resides in nutrient-poor acidic bogs; it is however equipped with a complex mechanism that can help it meet its dietary requirements by attracting, trapping and digesting small insects.



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3. The living world: some noteworthy features

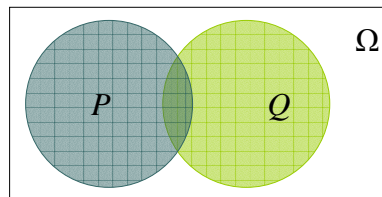
- I'll shortly be giving you a brief overview of a process which is widely seen as going some distance towards accounting for this data: evolution by natural selection.
- But before I do this, as some of the arguments that we will discussing presuppose an elementary understanding of probabilistic reasoning, I need to review some basics... (for an in-depth treatment, see my Belief & Inquiry course next term)

4. Probability and inference: a primer

- A *probability function* is a function assigning a real-valued number to the elements of a certain set of propositions (technically, a set that is closed under negation, disjunction and hence intersection).
- It obeys the following constraints:
 - [P1] $0 \leq \Pr(P)$
 - [P2] If P is a tautology, then $\Pr(P) = 1$
 - [P3] If $P \& Q$ is a contradiction, then $\Pr(P \vee Q) = \Pr(P) + \Pr(Q)$

1. Probability and inference: a primer

- A number of useful theorems can be derived from [P1] to [P3]:
 - [T1] $\Pr(P) = 1 - \Pr(\neg P)$
 - [T2] If P is a contradiction, $\Pr(P) = 0$
 - [T3] $\Pr(P \vee Q) = \Pr(P) + \Pr(Q) - \Pr(P \& Q)$
- The previous axioms & theorems are easy to verify visually on a probabilistic Venn diagram (i.e. a Venn diagram in which proposition-area is proportional to its probability, with area of the tautology $\Omega = 1$)



1. Probability and inference: a primer

- $\Pr(P)$ denotes the ‘unconditional’ probability of P’s being true.
- We can also express the notion of ‘conditional’ probability of proposition’s being true: the probability of a proposition’s being true *given* the truth of another proposition.
- The probability of P given Q is denoted $\Pr(P | Q)$.
- Conditional probabilities are related to unconditional probabilities as follows:

$$[P4] \text{ if } \Pr(Q) > 0, \text{ then } \Pr(P|Q) = \frac{\Pr(P \& Q)}{\Pr(Q)}$$

1. Probability and inference: a primer

- Note: in the context of scientific inference, in which one is considering the relationship between a body of evidence E and a hypothesis H , one finds the following jargon:
 - $\Pr(E|H) =_{\text{def}}$ the ‘likelihood’ of H ,
 - $\Pr(E)$ and $\Pr(H) =_{\text{def}}$ the ‘prior probabilities’ of E and H , respectively,
 - $\Pr(H|E) =_{\text{def}}$ the ‘posterior probability’ of H .

Next lecture: ‘Chance’

- Reading:
 - Skyrms, B. [2000] *Choice and Chance*. Wadsworth Publishing. Chapter 6 ‘The Probability Calculus’
- Supplementary reading:
 - Humphreys, P. [1998]: ‘Interpretations of Probability’, in E. Craig (ed.) the *Routledge Encyclopaedia of Philosophy*. London: Routledge. Available online at www.rep.routledge.com/article/q084