Human Behavioural Ecology
&
Evolutionary Psychology

Outline

1. Adaptive behaviour and optimal choice
2. HBE: Human Behavioural Ecology
3. The assumptions and methods of evolutionary psychology

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Cognition and optimality

cognitive science

Functional analysis and description of proximal mechanisms (compare to Marr's three levels of description)

- → Optimal learning
- → Optimal choice

Evolutionary psychology

Functional description makes sense in the light of evolution, including cognition

Determination of optimal choice

1. Calculate expected utility for each available choice

2. Select the choice with the highest expected utility

$$a^* = \arg\max_{a \in A} \sum_{s'} P(s'|s,a)u(s')$$

Determination of optimal choice

1. Calculate expected utility for each available choice, in view of what you know.

2. Select the choice with the highest expected utility

$$a^* = \arg\max_{a \in A} \sum_{s'} P(s'|s,a)u(s')$$

Determination of optimal choice

1. Calculate expected utility for each available choice, in view of what you know, including what you know about others.
2. Select the choice with the highest expected utility.

$$a^* = \arg\max_{a \in A} \sum_{s'} P(s'|s,a)u(s')$$

What is utility, anyway?

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Utility is what you maximise.

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Utility is:

- Material gains
  (and the utility of each potential gain can be measured).
- Material gains and many other things, including
  - Social distribution, reputation, ...
  - Items of 'happiness economics':
    health, freedom, leisure time, ...
- What motivates an individual

What is utility, anyway?

Inclusive fitness

Outline

1. Adaptive behaviour and optimal choice
2. HBE: Human Behavioural Ecology
   - The basics of evolutionary biology
   - Adapted human behaviour
   - limits and criticism of HBE
3. The assumptions and methods of evolutionary psychology

Evolutionary biology and inclusive fitness

Inclusive fitness: average contribution/propensity to contribute to the gene pool of the next generations, through:

- survival and reproduction (including sexual selection)
- kin selection (gene's eye view)

Why can we assume that behavior maximises inclusive fitness?

What is fitness anyway?

Because fitness, the number of descendants left by individuals following a strategy at a point many generations in the future, cannot usually be measured within a study, this generally means measuring the consequences of behavioral strategies in some more immediate proxy currency related to fitness, such as survival, mating success, or energetic return.

Nettle et al. 2013

Blind variation and selective retention

Three words about Darwinism

- Population thinking (*versus* typological thinking)
- Heredity (via genetic material; Weissman *versus* Lamarck)
- Blind variation (*versus* teleology)
- Selective retention, differential reproduction
- Selfish gene

Adaptations: what are they

A naturalistic explanation to functional explanations in biology.

> *Inherited and reliably developing characteristics that came into existence through natural selection because they helped to solve problems of survival or reproduction better than alternative designs existing in the population during the period of their evolution.*

Buss

Compare with "Our neural circuits were designed by natural selection to solve problems that our ancestors faced during our species' evolutionary history." Cosmides and Tooby

What behaviours maximize inclusive fitness

- Somatic
- Reproductive
  - Mating effort
  - Parental investment

Kin altruism

"I would lay down my life for two brothers or eight cousins" (Haldane)

Hamilton's rule:

$$rB > C$$

Kin recognition and viscosity

What's the 'Ecological' for?

BE is the investigation of how behavior evolves in relation to ecological conditions

Measurable variation in ecological conditions predicts variation in the behavioral strategies that individuals display,

Optimal foraging

Productivity of Bari fishing and hunting: it varies with monthly rainfall patterns, and, in general, the Bari spend more time fishing when this activity is more productive than hunting, and more time hunting when the reverse is true.

Puzzle: they never abandon hunting entirely, even in months when the return rate from fishing is several times better.

Solution to the puzzle: high variability in fishing + individual differences in skills.

Reproductive rate

!Kung San women's wide birth spacing: averages about four years

Because:

- It is better for the community, which avoid over-population

$\Rightarrow$ Group selection

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Optimal sharing

Risk reduction based reciprocal altruism

Gurven's (2004) study of Hiwi and Ache foragers:

- high variance food items are shared more widely than small, easily acquired food items.
- Reciprocal altruism based on risk reduction (rather than tit-for-tat)
- Marginal value rather than quantity of calories better explain patterns of exchange

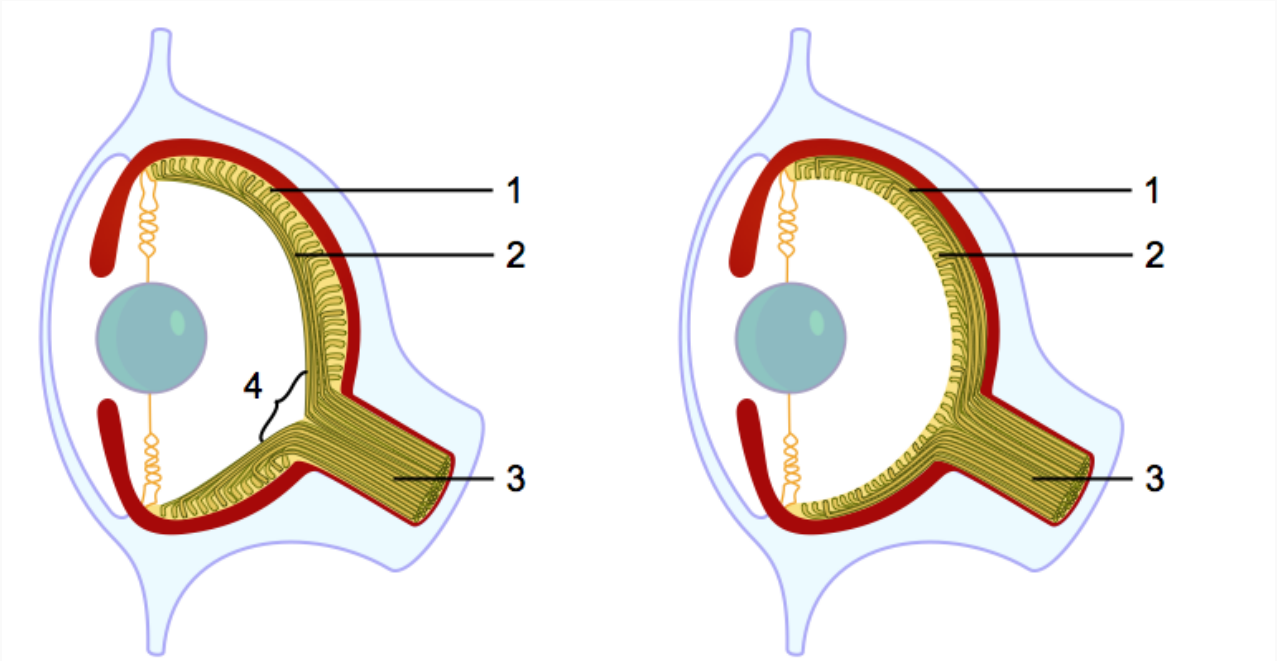
Evolutionary thinking going wild

Just-so stories

Evolutionary thinking going wild

Against Panglossian adaptationism:

- Spandrels
- Evolutionary time-lags
- Constraints on optimal design
  - General constraints from the laws of physics
  - Common descent (c.f. the human eye).



The heirs of sociobiology

Wilson's 1975 *Sociobiology: The New Synthesis*
Biological determinism?

Responses:

- Human Behavioral Ecology
- Memetics and dual inheritance theory
- evolutionary psychology, evo-devo

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3. The assumptions and methods of evolutionary psychology
   - Evolution of human cognition
   - The method of evolutionary psychology

Adaptive behaviour?

What is adaptive?

- Behaviour (Human behavioural ecology).
- Cognitive mechanisms (Evolutionary psychology).
  Consequence: behaviour is not necessarily maximising fitness.
  E.g. decreased birth rate.
- Further down the line: learning capacities, cognitive development.

Functions versus mechanisms

Ultimate and proximal causes

Multiple realizability of behavioural strategies

Evolved cognitive traits

- sexual desires
- fear of snakes

Mechanisms might be maladapted when the environment differ from the environment of evolutionary adaptedness.

Exploitation of the actual domain (vs. the proper domain) of evolved cognitive mechanisms.

Functional description

Cognitive analyses ⇒ functional analysis: the material events occur because of the informational processes they implement

Carving nature at its joints

- Under-determination of the algorithm in view of a finite input-output database
- Functional analysis is about evolved function

Behavioral gambit

Assumption that there is no constraint (at the implementation level) on adaptive behavior (functional strategies).

Can we ignore the fact that there are maladaptive behaviours and what is their causes?

What evolutionary psychologists do

1. Make hypotheses about adaptive cognitive mechanisms
   - Heuristic value
     - Specify the problems which have had an impact on inclusive fitness
     - think about how these problems could be solved by an efficient cognitive mechanism.
   - Integrative constraint

     Prefer hypotheses that are compatible with a plausible evolutionary story
2. Test your hypotheses: do some experimental psychology work.

What evolutionary psychologists do NOT need to assume

- Genetic determinism

↪ environmental input and development matter; possibility to change

- Pan-adaptationism

↪ the existence of spandrel, genetic drift, ex-adaptation
. . . and maladaptations ?

- Optimality

↪ cost-benefit analysis and trade-offs: e.g. error management

↪ evolutionary time lags

↪ constraints, including those coming from common descent

Experimental psychology and evolutionary theory

How to discover evolved psychological mechanisms?

Top-down strategy

1. Derive hypotheses from existing evolutionary theories
2. Derive and test predictions
3. Evaluate whether empirical results fit predictions

Bottom-up strategy

1. Develop hypothesis that could account for known empirical evidence
2. Check the compatibility of the theory with existing theory
3. Derive further predictions, test and evaluate

Empirical data

Looking for human specific psychological features

1. Data from experimental psychology
2. Comparative psychology
3. Anthropological records,
   especially about hunter-gatherer societies
4. Comparative anthropology,
   especially about cross-cultural universals
5. Archeological records

Too speculative?

- Heuristic value of evolutionary psychology
- Supplementary constraints on psychological hypotheses (robust, cross-disciplinary explanations)