From Reduction to Unification

The Case of Cultural Evolutionary Psychology

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Project Information

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- DFG funded research unit *Inductive Metaphysics* (FOR 2495); subproject *Creative Abductive Inference and its Role for Inductive Metaphysics: Contingent Modality, Metaphysical Modelling, and Explanations in IM*.

Introduction

Humans have distinctive cognitive abilities/mechanisms:

- Complex Causal Understanding
- Mindreading
- Formal Reasoning (deductive/inductive/abductive)
- Moral Reasoning
- Metacognition
- Intentional Teaching
- True Imitation
- Language Understanding
- Mental Mapping
- Selective Social Learning (e.g. success-based learning)

Introduction

Where do we get these abilities from?

Evolutionary Psychology: each of these mechanisms is constructed out of innate mental modules in our brain, which we inherit genetically, and which have not changed since the Pleistocene ('cognitive instincts theory').

Cultural Evolutionary Psychology: we inherit these mechanisms culturally ('cognitive gadgets theory').

Aim of the talk: To rationally reconstruct the development of cultural evolutionary psychology.

Result: It's a development from reduction to unification

The Framework: Reduction & Unification

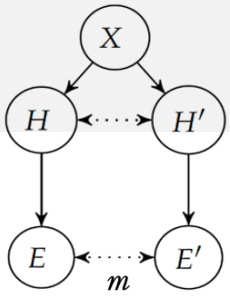
Structural and Evidential Unification

There is no overall consensus in philosophy of science about what a unification is.

1. Structural aspects of a unification:
   "[A] feature [of a unifying theory is that it] encompasses phenomena from different domains under the umbrella of a single overarching theory. Theories that do this are typically thought to have 'unifying power'; they unify, under a single framework, laws, phenomena or classes of facts originally thought to be theoretically independent of one another." *(Morrisson 2000, p.2)*

2. Evidential aspects of a unification:
   "The basic idea of the unificationist account [of explanation] is that scientific explanation is a matter of providing a unified account of a range of different phenomena. This idea is unquestionably intuitively appealing. Successful unification may exhibit connections or relationships between phenomena previously thought to be unrelated and this seems to be something that we expect good explanations to do." *(Woodward 2018)*

Structural and Evidential Unification



1. Structural Unification, see Morrisson (2000):
   - Focus on overarching 'structures'.
   - Domains are unified by means of a set of common (mathematical) models, which can be (separately) improved and fed with empirical data within both domains.
   - E' and E are gathered independently.
   - E'/E only confirms H/H' indirectly.
2. Evidential Unification, see Myrvold (2003, 2017), Lange (2004):
   - Focus on 'evidence linking'
   - Domains are unified by means of an overarching framework.
   - E' and E are gathered independently but a mechanism (m) is identified empirically, which links both domains.
   - E'/E can confirm H/H' directly.
   - Correlation between E' and E can be explained via m.

Assumption: In general, (2) brings more unificatory (explanatory) power and is harder to establish.

Classical Evolutionary Psychology (EP) as Reduction

EP: Cosmides and Tooby (1997)

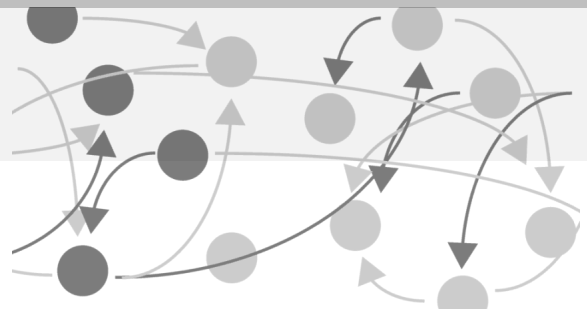
Evolutionary Psychology on Cognitive Abilities:

- According to classical ('High Church') evolutionary psychology (EP), we still have a stone-age mind, which works modular.
- 'Human nature' (mind & genes) is fixed since the Pleistocene.
- What we call 'culture' can be satisfyingly explained by relying on ancestral fitness conditions.
- To inquire these conditions: use the method of 'adaptive thinking'.

Main Principles of EP:

1. $_{EP}1$ the massive modularity hypothesis of the mind
2. $_{EP}2$ the assumption that the modules are passed on genetically ('cognitive instinct hypothesis')
3. $_{EP}3$ the method of 'adaptive thinking'

EP's Adaptive Thinking?



Adaptive thinking is a four-step method in EP:

1. Try to determine the possible Pleistocene problem.
2. Search for a psychological mechanism that would provide an optimal way to solve the problem.
3. Posit the existence of such a mechanism in the mind of extant humans.
4. Gather evidence (e.g. in laboratory test situations or via observation of normal life situations) in order to confirm its existence in modern humans.

Buller (2005): Adaptive thinking is a form of 'reverse engineering'.

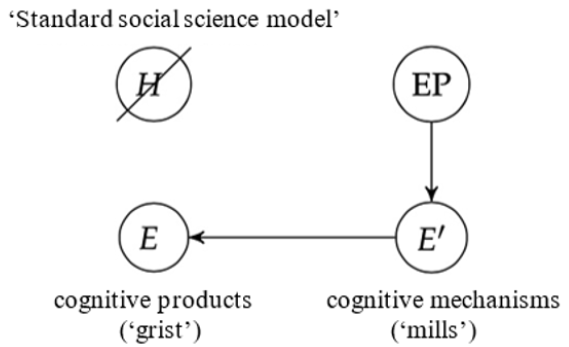
EP as a Reduction

Buller (2005), Dupré (2008) or Barrett (2015) have claimed that EP is reductionistic. EP even aims at eliminative reduction, ultimately (not proximately).

H (standard social science model) can be bypassed because E (culture/cognitive products) is already covered by H' (EP) via E' (cognitive instincts).

Pleistocene modules still present in modern humans explain behaviour and culture of modern humans.

Idea tempting and (most likely) wrong, see all the various criticism on EP, like Mameli (2009), Richardson (2007), Smith (2019).

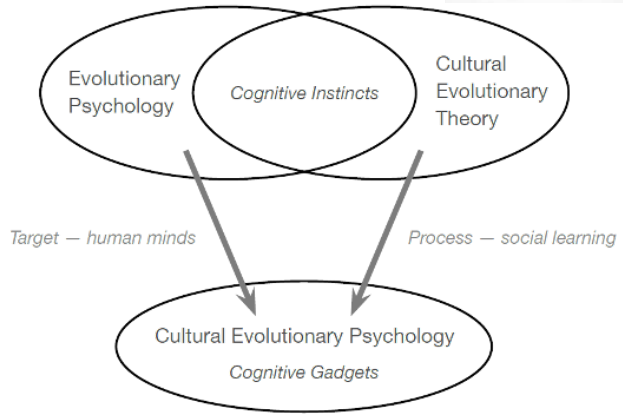


Cultural Evolutionary Psychology (CEP) as Unification

What is Cultural Evolutionary Psychology (CEP)?

CEP:

> *"Cultural evolutionary psychology is like evolutionary psychology in having the human mind as its explanatory target, and it is like cultural evolutionary theory in emphasising the importance of social learning as a force in human evolution, but it differs from both of these approaches in suggesting that distinctively human cognitive mechanisms get their adaptive characteristics from cultural rather than genetic evolution."* *Heyes (2018)*



"Copernican turn": Not only cognition forms culture, but culture also forms cognition.

Mechanism: 'cultural learning' (e.g. teaching; imitation).

Difference to EP: CEP recognizes *H* (culture) as a crucial explanatory part, that cannot be reduced to *H′* (biology).

For *H*, CEP incorporates Donald Campbell's version of cultural evolutionary theory (CET).

CET: Campbell (1965)

CET:

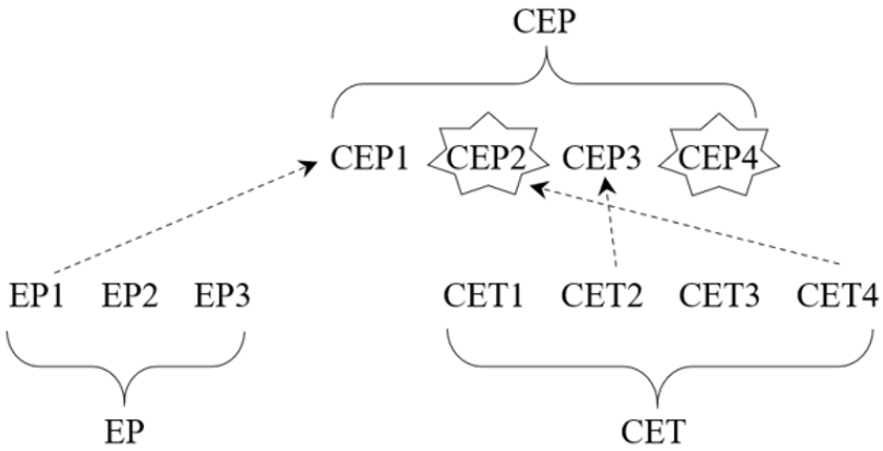
- CET1 Human sociocultural evolution (i.e. information transmitted via teaching and imitation) should be studied using Darwinian methods. Like genes, sociocultural evolution has descent with modification.
- CET2 Cultural and genetic evolution are linked (culture-gene coevolution).
- CET3 The 'argument from natural origins': Natural selection remains the master force for cultural evolution. It is the ultimate source of the rules that proximally guide sociocultural evolution.
  $\Rightarrow$ **EP**
- CET4 The 'dual inheritance argument': selection on cultural variation can (in certain cases) also be an ultimate cause like selection on genes.
  $\Rightarrow$ **DIT**

Later, the tension between (CET3) and (CET4) was called 'evoked culture' versus 'transmitted culture'.

CEP: Heyes (2018)

CEP:

- CEP1 modularity hypothesis of the mind
- CEP2 modules are passed on culturally (cognitive gadgets), via a robust second system of inheritance.
- CEP3 genetic and cultural evolution can influence each other in positive or negative ways (culture-gene coevolution)
- CEP4 assumption of 'cultural learning' as a culturally transmitted trait (except for 'starter kit')



Massive Modularity ... (EP1)
Cognitive Instinct ... (EP2)
'Adaptive Thinking' ... (EP3)
Sociocultural Evolution ... (CET1)
Culture-Gene Coevolution ... (CET2)
Argument from Natural Origins ... (CET3)
Dual Inheritance Argument ... (CET4)

The Biological 'Starter Kit'

Mind of a newborn is not a tabula rasa.

'Starter kit' = set of genetically inherited psychological features, which contribute to distinctive human cognition (Heyes 2018).

1. **Social Tolerance & Social Motivation:**
   Humans inherit a genetic disposition for less aggressive and less egoistic behavior than other non-human primates; importance of oxytocin hormone, Henrich 2015; Burkart, Hardy, and van Schaik 2009; Silk and House 2011; Tomassello 2014; Skuse and Gallagher 2011; Csibra and Gergely 2006; Gangestad 2016.
2. **Attentional Biases:**
   Babies have an inborn bias for human voices and faces, Johnson 2005; Kano, Call and Tomonga 2012.
3. **Central Information Processing:**
   Humans have a unique domain-general cognitive mechanism for associative learning, storing and filtering of information, inhibitory control and flexibility, Diamond 2013; Evans and Stanovich 2013; Kahneman 2003.

Evidence for CEP: Imitation

Imitation: Input is observed action; output is topographically similar executed action.

- Issue: How can an agent solve the 'correspondence problem'?

Meltzoff and Moore (1997): Imitation device ('active intermodal matching') is a powerful genetically inherited mechanism.

- Newborn infants, sometimes only a few hours old, can imitate a range of facial expressions and hand movements.

Questions and report of failures to replicate (Anisfeld, 1979, 2005; Jones, 2006, 2007, 2009; Slaughter, 2021, Oostenbroek, et al., 2016).

Discovery of 'mirror neurons' (Rizzolatti et. al. 1997) in macaques supported the innate view of imitation.

- But it remains unclear, how exactly mirror neurons solve the correspondence problem.

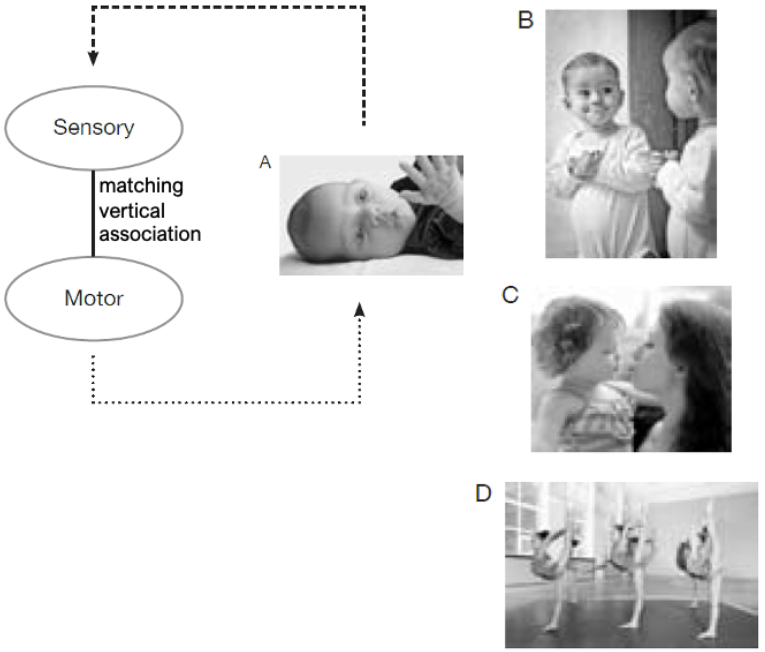
Evidence for CEP: Imitation

Evidence mounting that the 'correspondence problem' is solved by 'matching vertical associations' (exitatory links):

- Sensory representation of an action linked to a motor representation of the same action (A). No correspondence problem yet.
- For sensory opaque actions to solve the correspondence problem, (B, C and D) are necessary.

Imitation: primarily processes of social learning

- E.g. B (frowning) or D (dancing/sports).
- Catmur, Press, and Heyes (2016); Catmur et al. (2009); Heyes and Ray (2000).



Evidence for CEP: Imitation

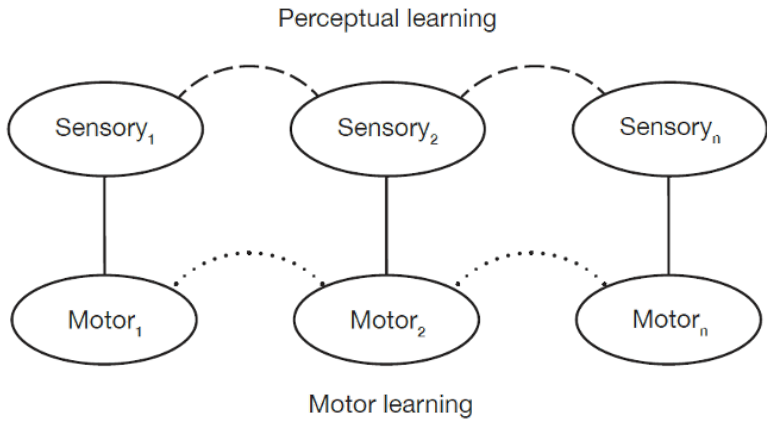
ASL Model of Imitation (Heyes 2018):

- True imitation = imitation learning = associative sequence learing (=cognitive gadget)
- Mechanism in which perceptual sequence learning drives motor sequence learning
- Ability to acquire new actions.

Relatively simple mechanism:

- No calculation of degree of topographic resemblance
- No inner 'phenomenal self-model' (Metzinger 2017) needed.

True imitation is culturally learned, not genetically inherited.

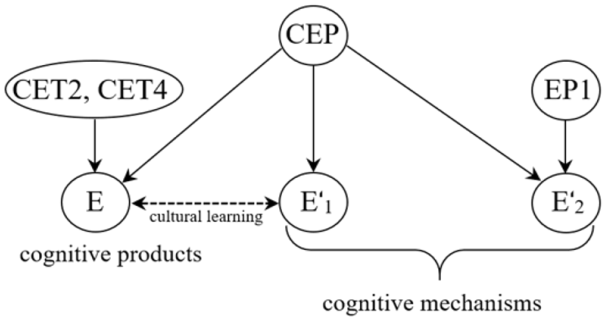


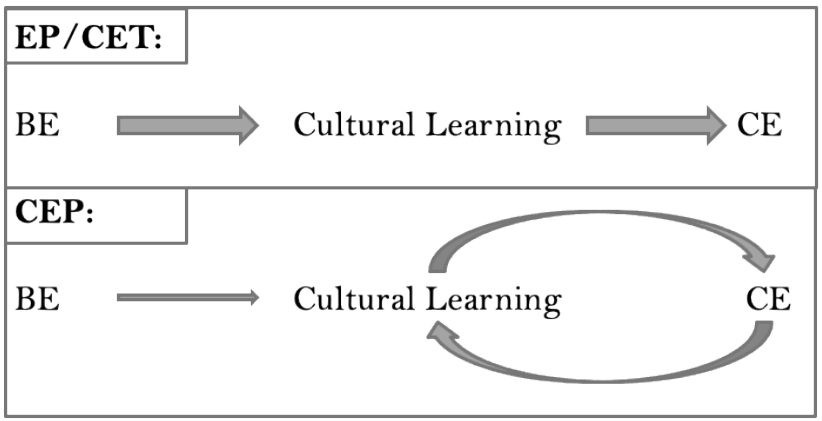
CEP as Evidential Unification

CEP makes evidence E' and E informationally dependent of each other.

It posits a mechanism ('cultural learning'), which mutually explains E and E'_1 in terms of each other.

- It does so in the sense of 'mutual information unification', see Myrvold (2017).
- When assuming CET, E and E'_1 carry more information about each other.

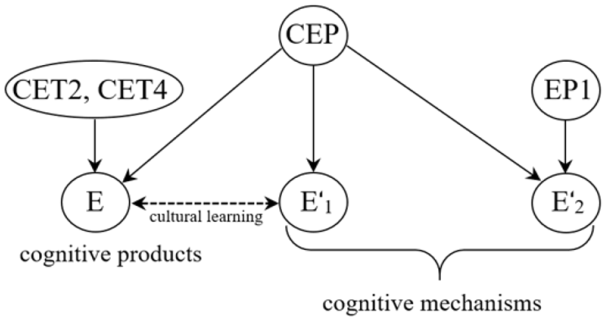




Conclusion

We have discussed:

- two different forms of unification (structural/evidential).
- problems of classical EP as reductive enterprise.
- that CEP is a unification, which unifies (aspects of) CET and EP, but also differs from both.
- an empirical example for CEP's plausibility, namely that imitation is probably culturally learned.



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Objections against CEP as Unification

Objection#1: Just like Memetics, CEP cannot solve the 'Unitization Problem'.

Objection#2: EP has Changed a lot since its Tooby/Cosmides, so CEP is Probably Superfluous.

Objection#3: CEP Unification is Superfluous, since Dual Inheritance Theory (DIT) already achieved Unification in the Nature-Culture Domain.