On the relation between folk psychological and scientific concepts of mental representation

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‘(…) when a cognitive scientist works on mental representation, what we often find is a special kind of meeting between two conceptual frameworks and mindsets (…). The representational concepts used in cognitive science are products of marriages between folk semantic concepts and a family of naturalistic concepts of physical specificity (…)’ (P. Godfrey-Smith 2004, p. 159)

Plan of talk

1. Two problems of representation.
2. Mechanistic explanation and personal/sub-personal distinction.
3. Personal-level representation.
4. Representations at sub-personal level?

Two problems of representation

- The problem of naturalising intentionality
  - Target: to state necessary and sufficient (natural) conditions for possession of belief.
  - Intentional states of persons.
  - Representation as an explanans.
- The problem of explanatory role of representations in cognitive science and cognitive neuroscience
  - Target: to answer the question of wether we need to invoke representations in order to explain phenomena.
  - Receptor cells, points in phase space, emulators, etc.
  - Representation as an explanandum.

Two problems of representation

How are the problems related?

- Proposal 1: the problems are deeply connected. To naturalise intentionality, you need to show that folk notion of representation can vindicated by science.
  - E.g. 1: eliminative materialism as a consequence of thinking that naturalising intentionality requires propositional attitues to be explanatorily relevant from the point of view of cognitive (neuro)science.
  - E.g. 2: Fodor's intentional realism as requring that the idea that folk-psychological notion of representation needs to be vindicated by computational psychology.
  - The idea of mental states as literally entities inside the head.

Two problems of representation

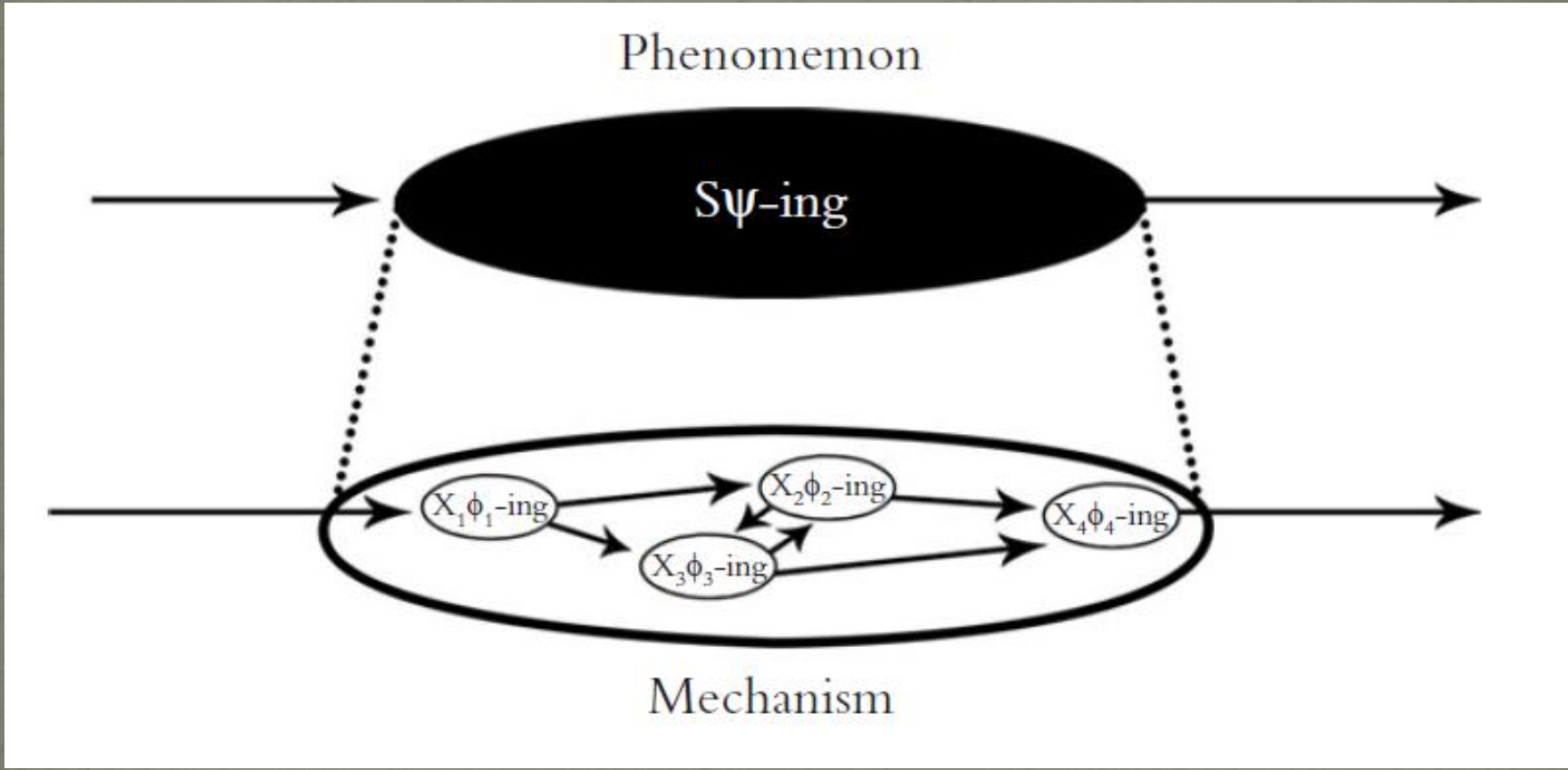
How are the problems related?

- Proposal 2: the two problems and the representational concepts associated with them are largely autonomous.
  - Folk-psychological concepts of representation are different than scientific concepts and have a significantly different explanatory role to play.
  - The existence of propositional attitues does not require to be vindicated by facts about the brain.
    - E.g. there need no be brain states that have the semantic and/or functional properties of beliefs in order for beliefs to exist.

Mechanistic explanation

- Explanations in cognitive science are mechanistic
- Phenomenon – behavior, capacity or property possesed by a cognitive agent
- To explain the phenomenon, you need to show a mechanism responsible for it, by.
  - Decomposing the system into organized, interacting working parts.
  - Showing how organized, interacting working parts bring about system-level behavior in question.

Mechanistic explanation



Craver 2007

Mechanistic explanation

- Mechanistic explanations are multi-level.
- Hierarchical levels of composition: a system as a whole consititutes one level, its working parts are at another, lower level.
- Talk of levels relative to a system.
- Ontological levels, but also epitemic - different vocabularies are associated with different levels.
- No need for interlevel isomorphism. For mechanistic explanations to work it is not required for system-level properties to be exemplified by discrete parts of the mechanism. Some things are only visible at the level of whole system.

Personal – sub-personal distinction

- Personal level: the level of describing and explaining the actions of cognitive agents by attributing to them mental states with propositional content.
- Sub-personal level: the level of describing and explaining the working of neural and/or computational machinery that underpins behavior.
- Personal-level explanations can be complete and accurate without invoking sub-personal-level facts + personal-level vocabulary and principles are irreducible to personal-level ones.

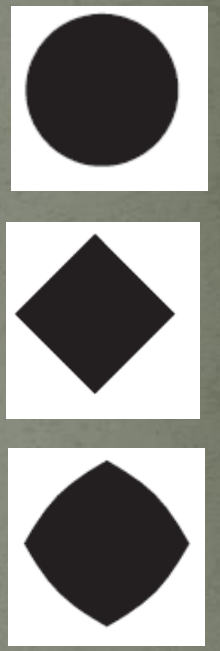
Personal – sub-personal distinction

Two ways to understand personal-level autonomy:

- Personal level and sub-personal level are alternative, incommensurable ways of describing and explaining action/mind.
  - Antinaturalistic, since we end up with some kind of dualism (e.g. factual-normative dualism).
- Personal-level explanations are autonomous, however, they petrain to different level of organisation of cognitive systems than sub-personal-level ones.
  - Personal level deals with cognitive agents situated in their environments.
  - Sub-personal level deals with parts of agents that enable certain agent-level phenomena.

Personal – sub-personal distinction

- R. Beer (2003): simple, simulated, evolved agent.
  - Behavior underpinned by 14-node neural network.
  - Task: catch circural objects, avoid diamond-shaped objects
- No internal representations needed to explain agent's behavior.
  - Behavior internally mediated, but not by representations.
  - No internal states that would correspond to ‚circles' or ‚diamonds'.
- However, the relation of an agent as a whole in relation to its environment is characterized in intentional terms!
  - Categorical perception, avoiding and catching, perceptually distinguishing obejcts, deciding.
  - Without those notions, we do not know what the agent does.
- M. Pinedo-Garcia, J. Noble (2007): ‚why-questions' vs. ‚how-questions'.
- J. McDowell (1994): constitutive vs enabling explanations of content.



Personal-level representation

- Personal level petrains to cognitive systems as wholes engaged with their environments (natural, social, cultural) in various complicated ways – it deals with ‚why-questions'.
- Folk intentional categories are only attributable to cognitive agents as wholes in virtue of facts about cognitive agents as wholes.
  - Propositional attitues as agent-level dispositions (see L. Rudder-Baker, E. Schwitzgebel).
- Folk psychology is not (conceptually) commited to any specific theses regarding the sub-personal machinery– no need for interlevel isomorphism.

Sub-personal representation

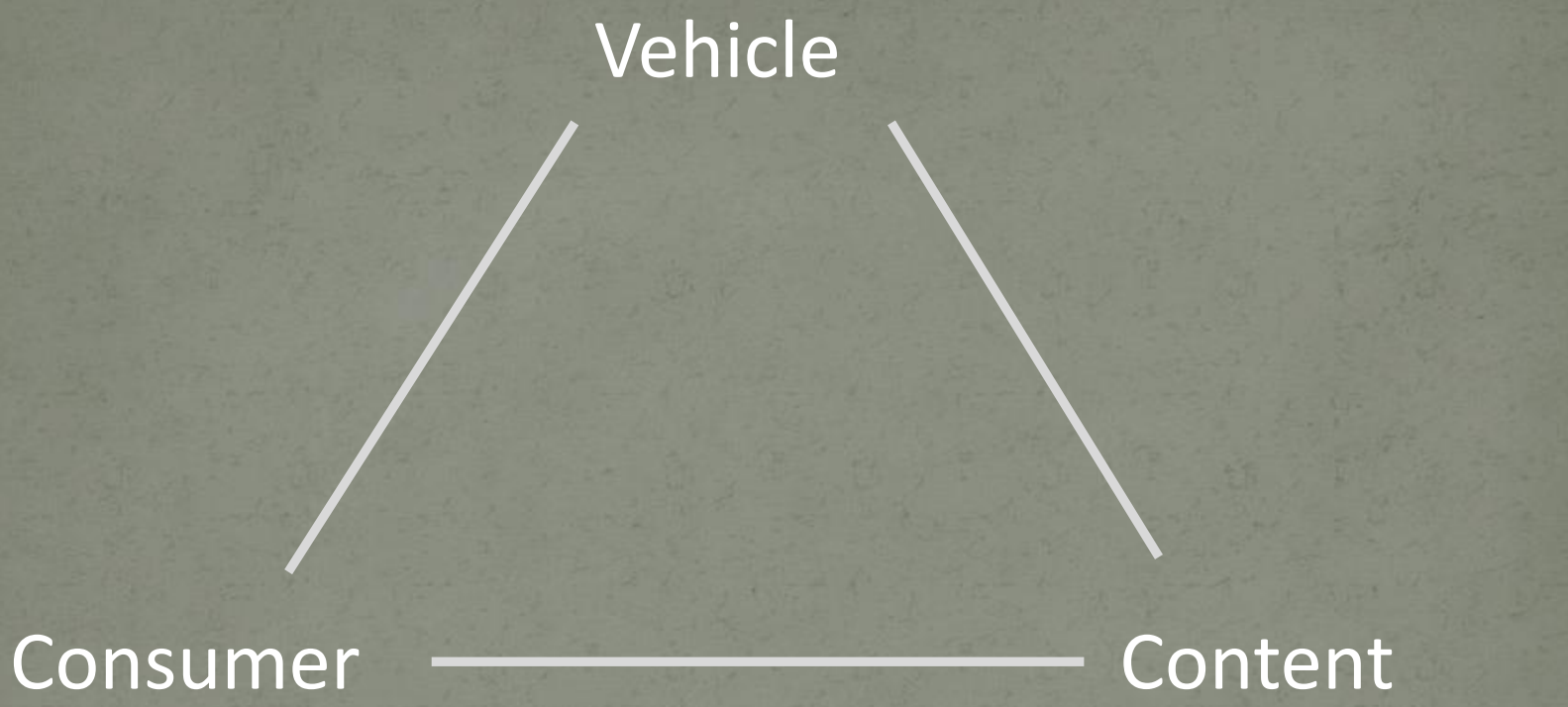
- Sub-personal level – ‚how-questions'.
- Are there representations at the sub-personal level?
- Is representing an operation of some components of mechanisms that underlie specific agent-level capacities?
- Are representations viable explnanses for (at least some) explananda of cognitive (neuro)science?
- Most of all, what could representations be at sub-personal level?
- Remember: this is not naturalizing (personal-level) intentionality, but a methodological problem of cognitive (neuro)science.

Sub-personal representation

2 principles for sub-personal representations

- Sub-personal representation must not owe their representational status by being appropriately related to full-blown cognitive agents.
- The function of the component in question must be nontrivially representational – it needs to serve as a ‚stand-in' for states of affairs outside the mechanism. (Ramsey's ‚job description challenge')

Physical structures in the brain



Parts of the mechanisms whose proper working is systematically dependend on vehicle-content relation. They ‚use' the vehicle as representation.

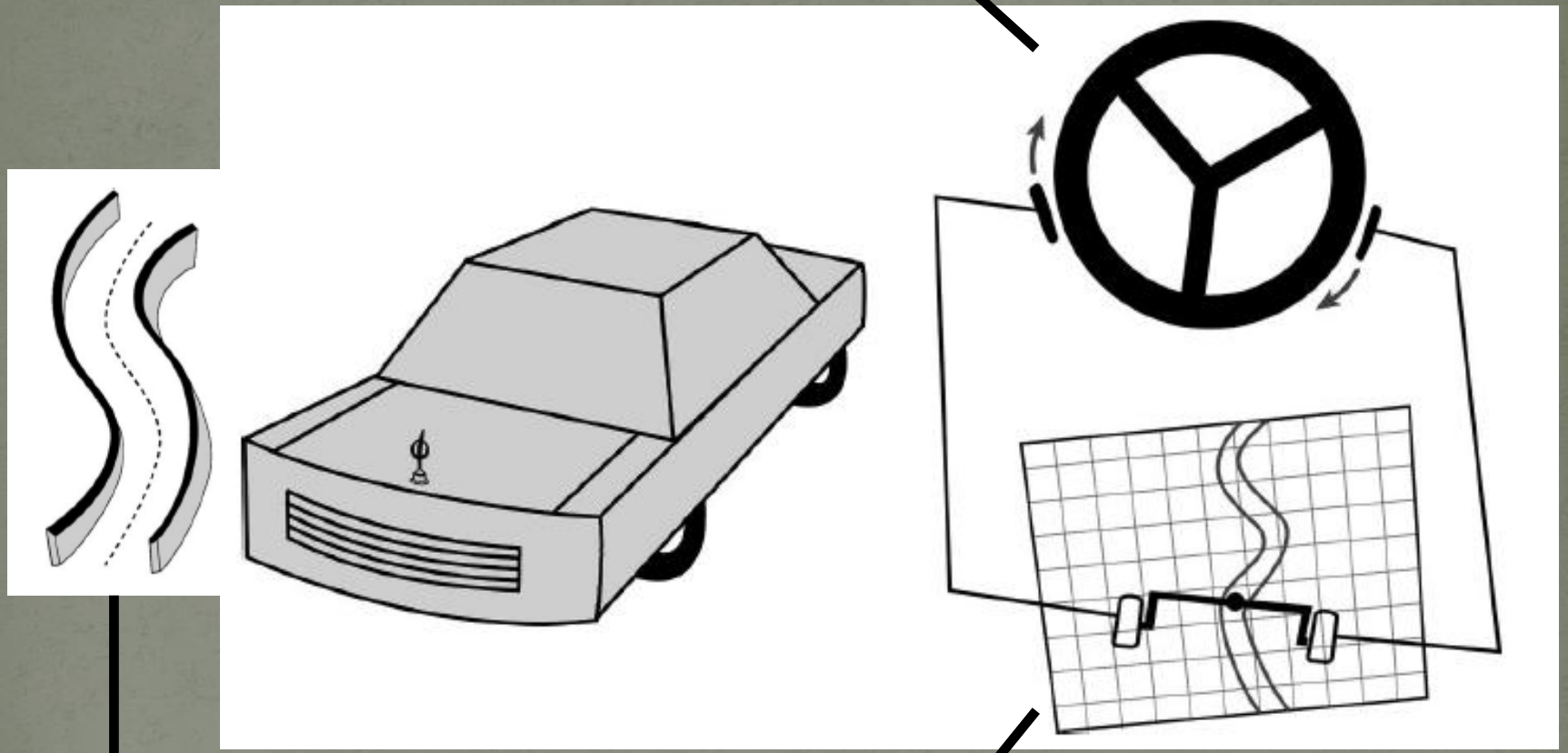
States of affairs, events, processes. Unless the vehicle is appropriately related to them, consumers can not perform their functions.

Sub-personal representation

S-representation (see Cummins, Ramsey)

- The content is grounded by the relation of structural resemblence between the vehicle and what is represented.
  - There is structural resemblence between two systems S*V* = (*V*, R*v*) and S*O* = (*O*, R*o*) if, for at least *some* objects in *V* and *some* relations in R*v* , there is a one-to-one mapping from *V* to *O* and a one-to-one mapping from R*v* to R*o* such that when a relation in R*v* holds of objects in *V*, the corresponding relation in R*o* holds of the corresponding objects in *O*. (from Opie, O'Brien 2004).
- Maps, scale models, mercury thermometers, etc.

Consumer - the navigational (steering) system



Content – the track

Vehicle – the internal map

Ramsey 2007, 195, 199

Sub-personal representation

Calvo, P., Rodriguez, A.G. (2009). Where is cognitive science heading? *Minds and Machines* 19 (3), 301-318

1. The idea of S-representation rests on a thesis that the very existence of a resemblence relation explains the cognitive success of the system in representational terms. This is not true – resemblence is not sufficient for representation.
   - ‚(…) underlying thought must be that the very existence of a map, as used by a mindless system, is sufficient to explain a given cognitive success in representational terms. So, if as claimed car B employs a sort of map, then car B is a mindless but representational system.' (p. 310)

Sub-personal representation

Calvo, P., Rodriguez, A.G. (2009). Where is cognitive science heading? *Minds and Machines* 19 (3), 301-318

- Structural resemblance is by itself necessary, but not sufficient for representation (or explaining cognitive success).
- In order to be representational, the resemblance has to be employed by consumers in order for them to perform their functions.

Sub-personal representation

Calvo, P., Rodriguez, A.G. (2009). Where is cognitive science heading? *Minds and Machines* 19 (3), 301-318

2. S-representations do not represent by themselves (‚naturally'), but only when they can be/are related to full-blown cognitive agents or users. They require knowledgable interpretation.
   - E.g. coded maps – one needs to know how to use them in order for them to represent anything.
   - ‚The important thing is that coded and uncoded maps alike require the idea of a cognitive user, as opposed to (direct, simple or natural) fit, to explain any cognitive (e.g. navigational) success.' (p. 311)

Sub-personal representation

Calvo, P., Rodriguez, A.G. (2009). Where is cognitive science heading? *Minds and Machines* 19 (3), 301-318

- True for S-representations that are cultural artifacts, created and used by human beings (map vs. ‚map').
- However, in sub-personal S-representations it is the consumer that acts as a user (‚interpreter') of the representation.
  - Consumer's performing its function is systematically, non-accidentally dependent on there being structural resemblance between the vehicle and the content.
  - The vehicle acts as a stand-in for the consumer to work properly.
  - It is resemblence (‚fit') *and* consumption that explains cognitive success.

Sub-personal representation

Calvo, P., Rodriguez, A.G. (2009). Where is cognitive science heading? *Minds and Machines* 19 (3), 301-318

3. There are no isomorphisms or structural resemblances in the world without cognitive agents (i.e., they are mind-dependent).
   - ‚(…) the gist of this criticism is that talk of a natural fit, or isomorphism, independently of cognitive agents themselves, is an illusion. This is not to say that there are no such things as (natural) isomorphisms; it is only to say that (natural) isomorphisms are not intelligible in the absence of cognitive agents.' (p. 311)

Sub-personal representation

Calvo, P., Rodriguez, A.G. (2009). Where is cognitive science heading? *Minds and Machines* 19 (3), 301-318

- The claim is true for isomorphisms/resemblances that represent. Representational resemblances need interpreters/users in order to really be representational.
- However, structural resemblances themselves are mind-independent.
  - Whether there is a mapping of objects and relations of one system to objects and relations in other system is an objective matter.
    - E.g. whether topographic structure of a map mirrors topographic structure of some terrain is dependent solely on (objective…?) strutural-spatial properties of both.
  - However, only small part of the objective resemblances in the universe are representational.