# Doing without Concepts

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# Issues

- How is knowledge organized in long-term memory
- How is it used in higher cognition?
- What are the best notions for studying it?

# Doing without Concepts

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# Take-Home Message

It is a mistake to attempt to develop theories of concepts,

and to avoid ceding to the temptation, it is better to eliminate the term "concept" from the theoretical vocabulary of cognitive science.

# Menu

- Are there default bodies of knowledge?
- Are all default bodies of knowledge of the same kind?
- Are the coreferential bodies of knowledge really distinct concepts?
- Is the notion of concept useful for cognitive science?

# Menu

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# Higher Cognitive Competences

Categorization, induction, analogy, concept combination, linguistic understanding...

# Knowledge Dependent Processes

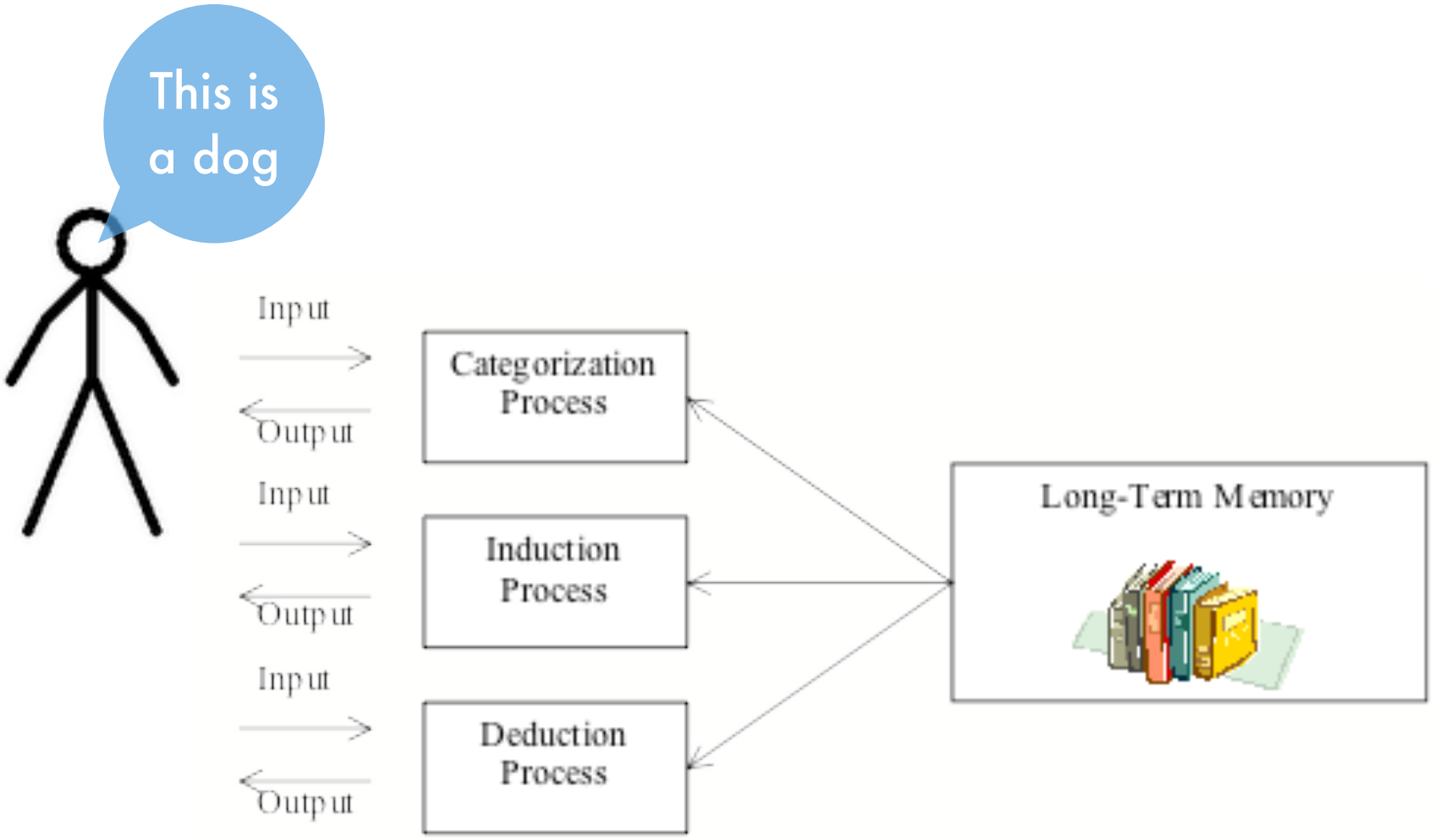


**Figure 1.1: Long-Term Memory**

# Background vs. Conceptual Knowledge

The knowledge in long-term memory about (say) dogs is divided into two distinct components:

*my concept of dogs*, which is retrieved quickly and in a context-insensitive manner when I think of dogs,

and *my background knowledge about dogs*, which is retrieved only in a contextual manner.

# The Invariantist Picture

Dogs and wolves have a common ancestor

Dogs are also called canis lupus

Dogs are animals

The typical colors of dogs are white, brown, and grey

Dogs have four legs

Dogs are furry

Dogs bark

Dogs are mammals

There are hundreds of breeds of dogs

I like dogs

Chihuahua are dogs

Labradors are dogs

Fido is a dog

Virus was my first dog

Dogs herd

Humans hunt with dogs

Dogs make good stew

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Retrieved by default

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Concept of dog

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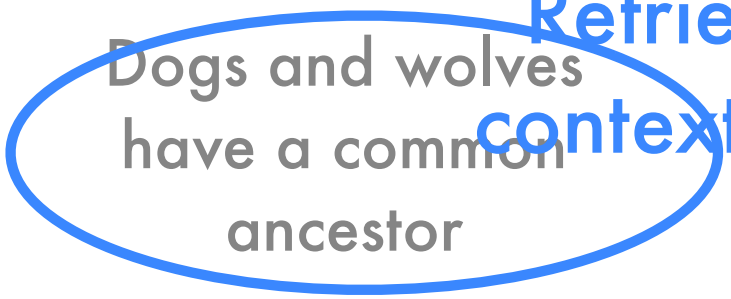

Retrieved contextually

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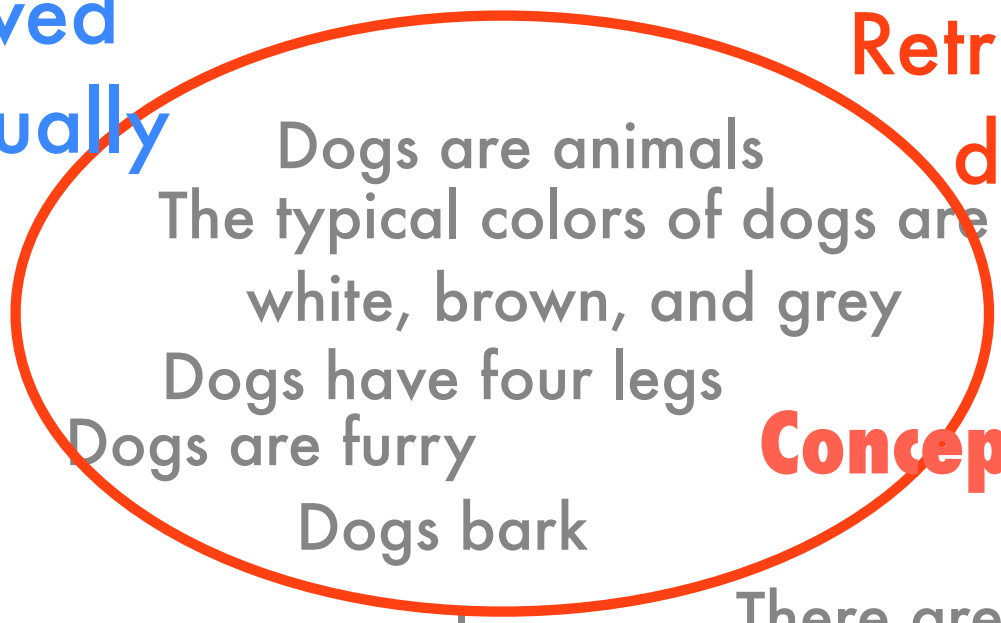

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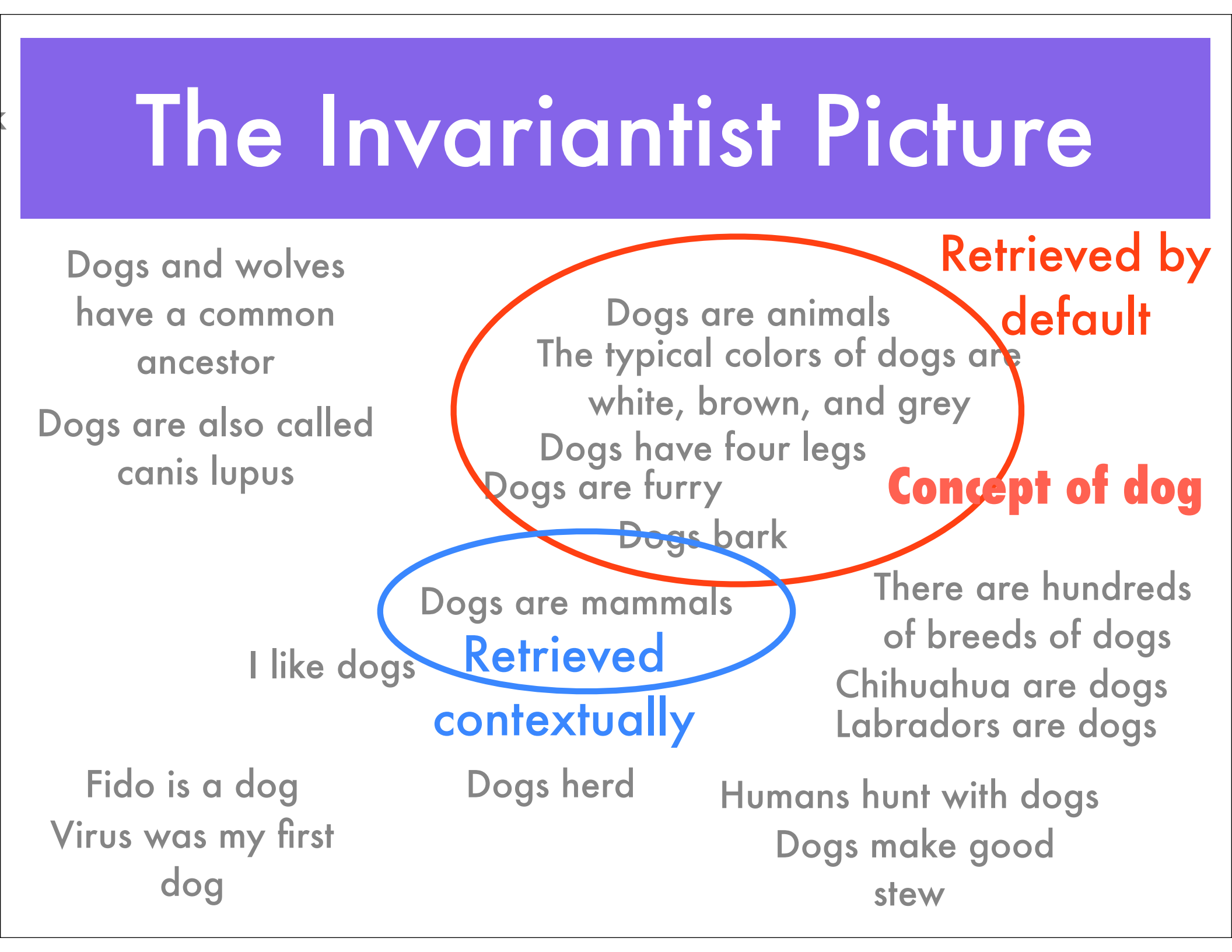

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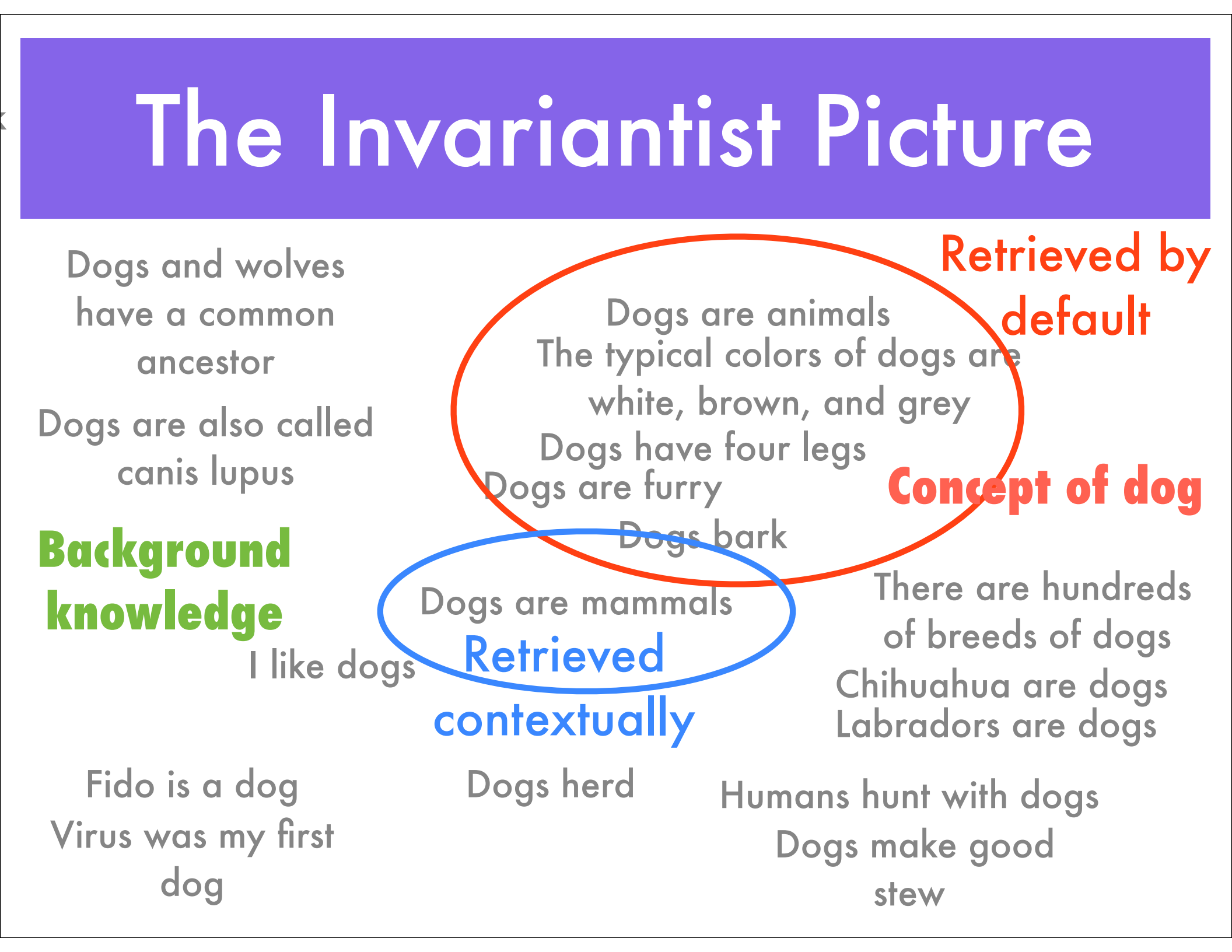

# Caveats

The boundary between the concept of *x* and the background knowledge about *x* can be *vague*,

and what elements of information are parts of the concept of *x* can *change over time*.

# The notion of Concept

A concept of $x$ is a body of knowledge about $x$ that is stored in long-term memory and that is used by default in the processes underlying most, if not all, higher cognitive competences when they result in judgments about $x$.

# A Correct Picture?

"it may be impossible in principle to segregate default knowledge in some domain from associated general background knowledge, and thus impossible to define concepts as Machery has done with reference to what is retrieved by default."

**B. Malt, 2010, *M&L***

# A Correct Picture?

"a theoretician who wishes to base an account of concepts on the notion of default knowledge has a rather large burden of proof."

**C. Hill, 2010, *Phil. Stud.***

# A Correct Picture?

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# A Two-Fold Reply

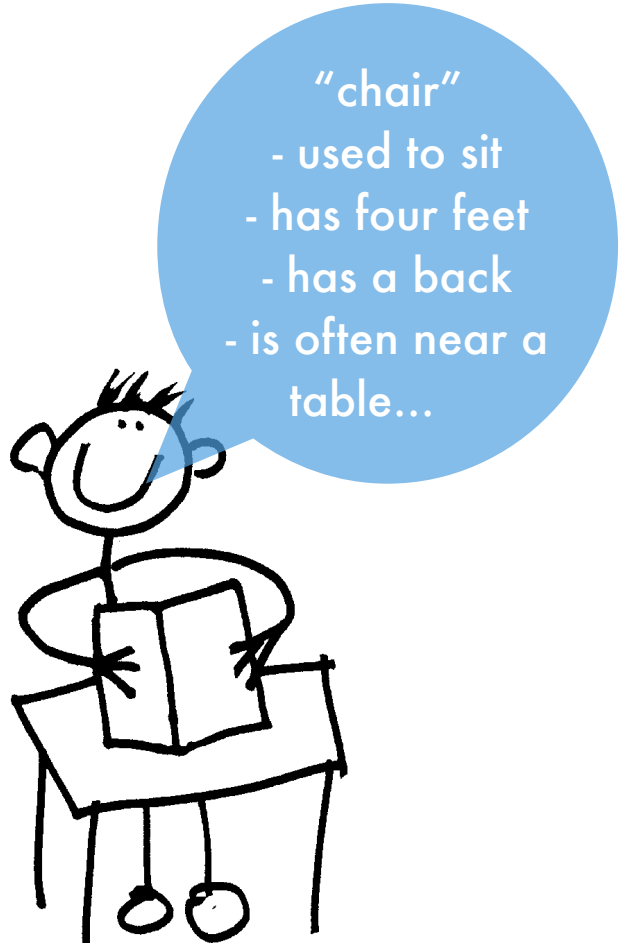
(Machery 2009, 2010, *M&L*, *BBS*)

The main evidence for the contextualist picture is compatible with the idea that there are default bodies of knowledge.

Evidence that there are default bodies of knowledge

# 1. The Flexibility of Knowledge Retrieval

A range of findings show that knowledge retrieval is *flexible*.




Feature Listing Task
(e.g., Barsalou)

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If the contextualist picture is true, then the flexibility of knowledge retrieval is expected.

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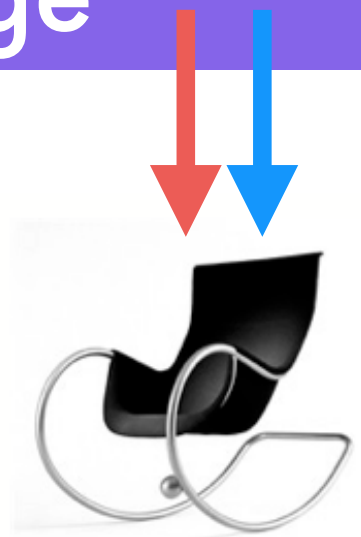

# 1. Flexible Knowledge Retrieval and Default Bodies of Knowledge

The flexibility of knowledge retrieval is consistent with the existence of default bodies of knowledge.

# 2. Behavioral Evidence (Barsalou, 1982)

Table 1
Examples of Materials Used in Experiment 1

| Property | Context | Item |
|---|---|---|
| | | Context-Independent "True" Items |
| Has a smell | Unrelated | The *skunk* was under a large willow. |
| | Related | The *skunk* stunk up the entire neighborhood. |
| | Control | The *fire* was easily visible through the trees. |
| Can contain money | Unrelated | The *bank* had been built ten years ago. |
| | Related | The *bank* was robbed by three bandits. |
| | Control | The *jar* was an old antique. |
| | | Context-Dependent "True" Items |
| Can be walked upon | Unrelated | The *roof* had been renovated prior to the rainy season. |
| | Related | The *roof* creaked under the weight of the repairman. |
| | Control | The *tightrope* was high off the ground. |
| Where cooking can occur | Unrelated | The *hospital* was internationally famous for its progressive techniques. |
| | Related | The *hospital* was quiet when dinner was served. |
| | Control | The *kitchen* had been repainted over the holidays. |
| | | "False" Items |
| Has gills | | The *cheese* was growing moldy in the refrigerator. |
| Can be tied in a knot | | The *refrigerator* was set to a low temperature to cool the beer. |

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**Table 3**
**Average Latencies and Error Rates per Subject for Correct True Trials (Experiment 1)**

| | Predicate Relation | | | | | |
|---|---|---|---|---|---|---|
| | Control (Unrelated) | | Unrelated | | Related | |
| Condition | L | % E | L | % E | L | % E |
| Context-Independent | 1335 | 11 | 1113 | 0 | 1145 | 3 |
| Context-Dependent | 1098 | 1 | 1404 | 11 | 1259 | 3 |

*Note*—*L* = average latency; *%E* = error rate.

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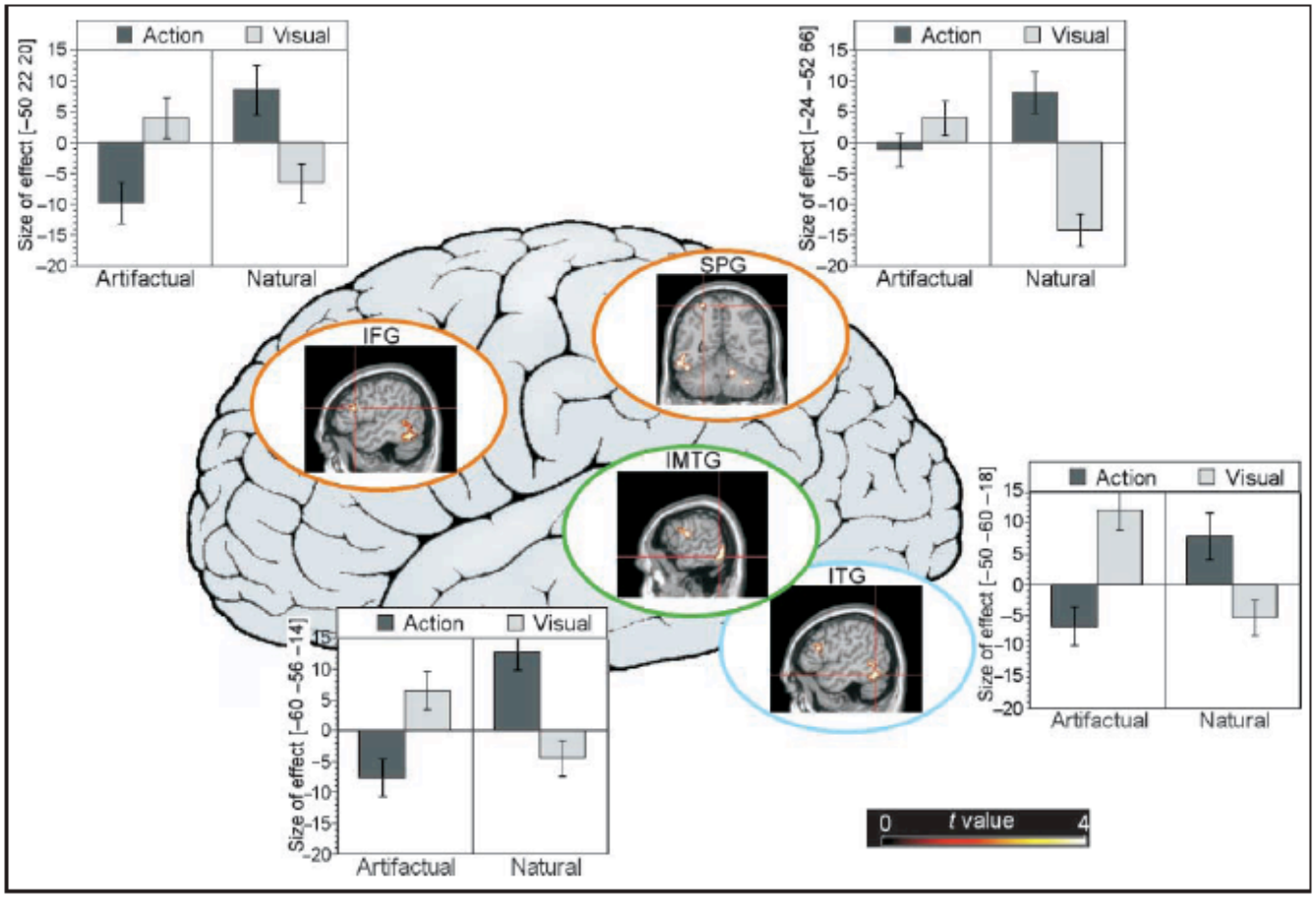


Hoenig et al. 2008

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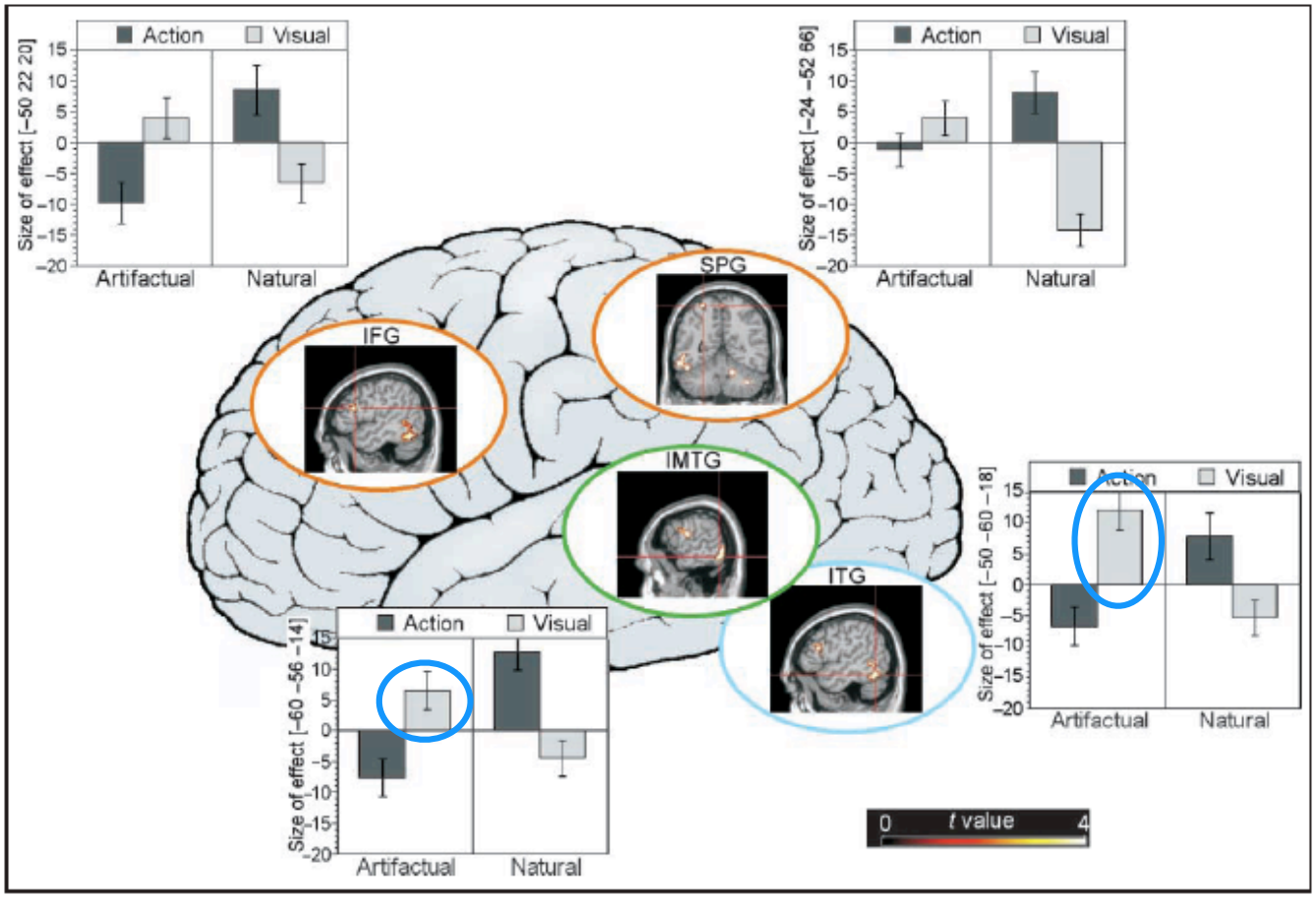


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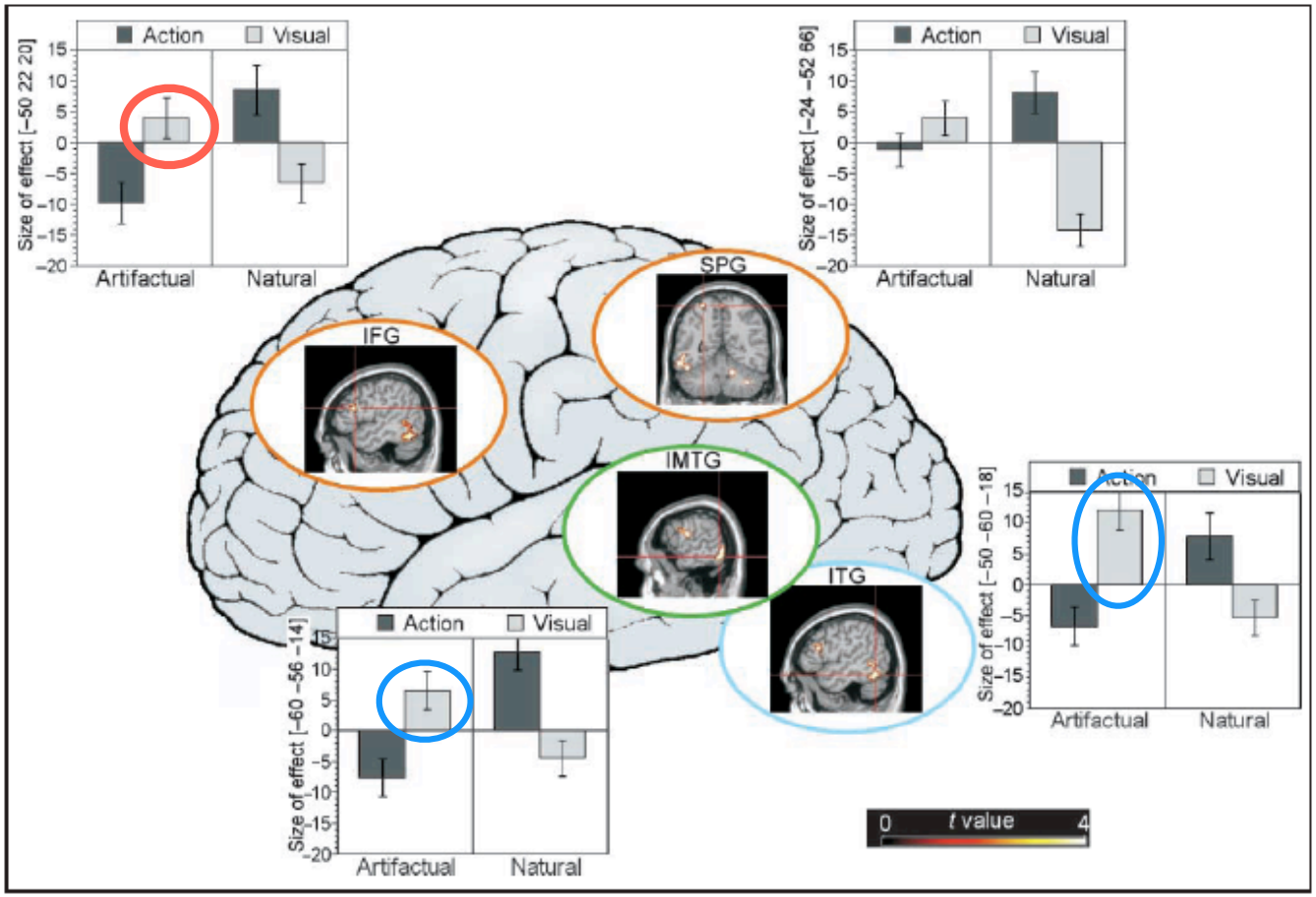


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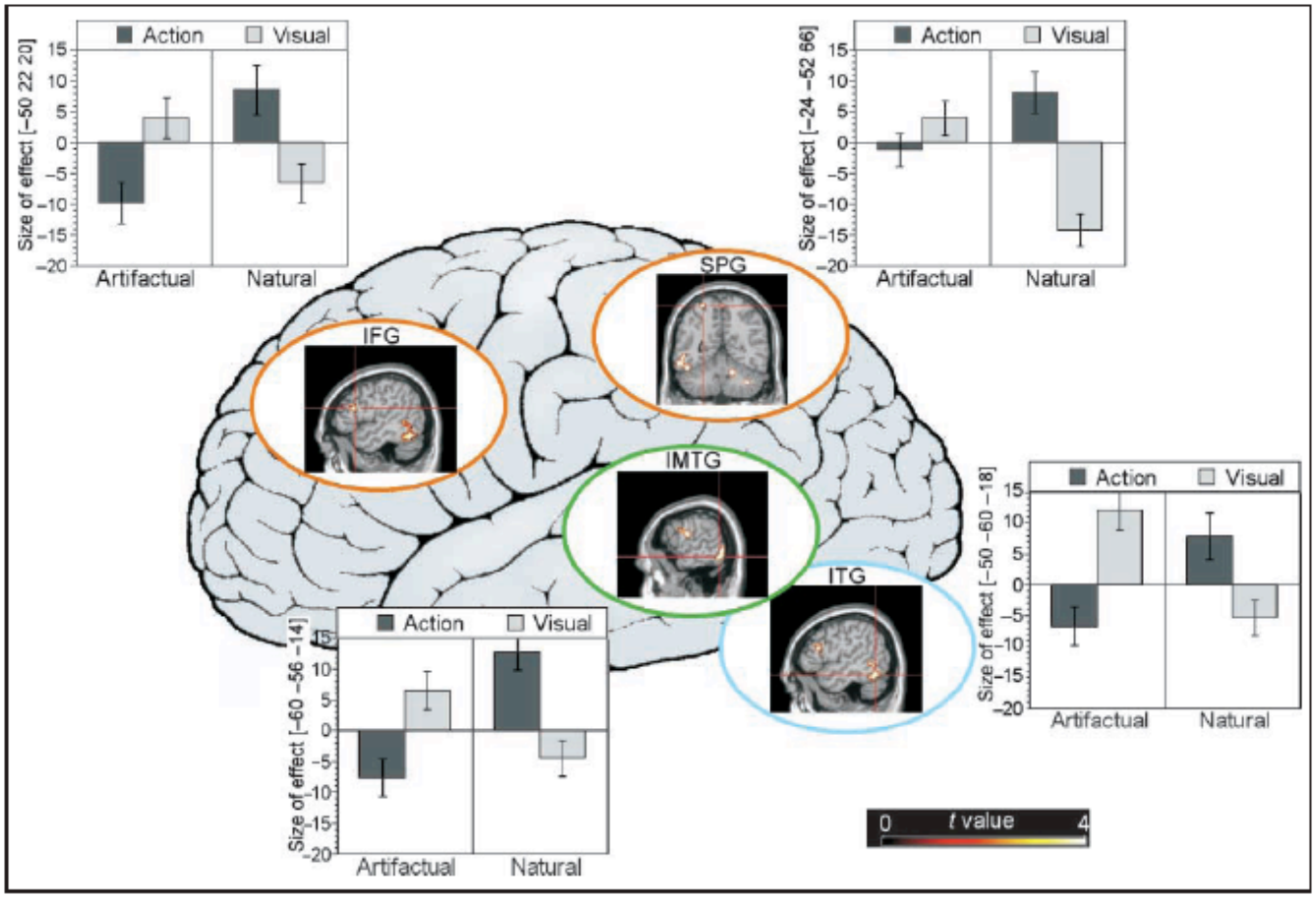


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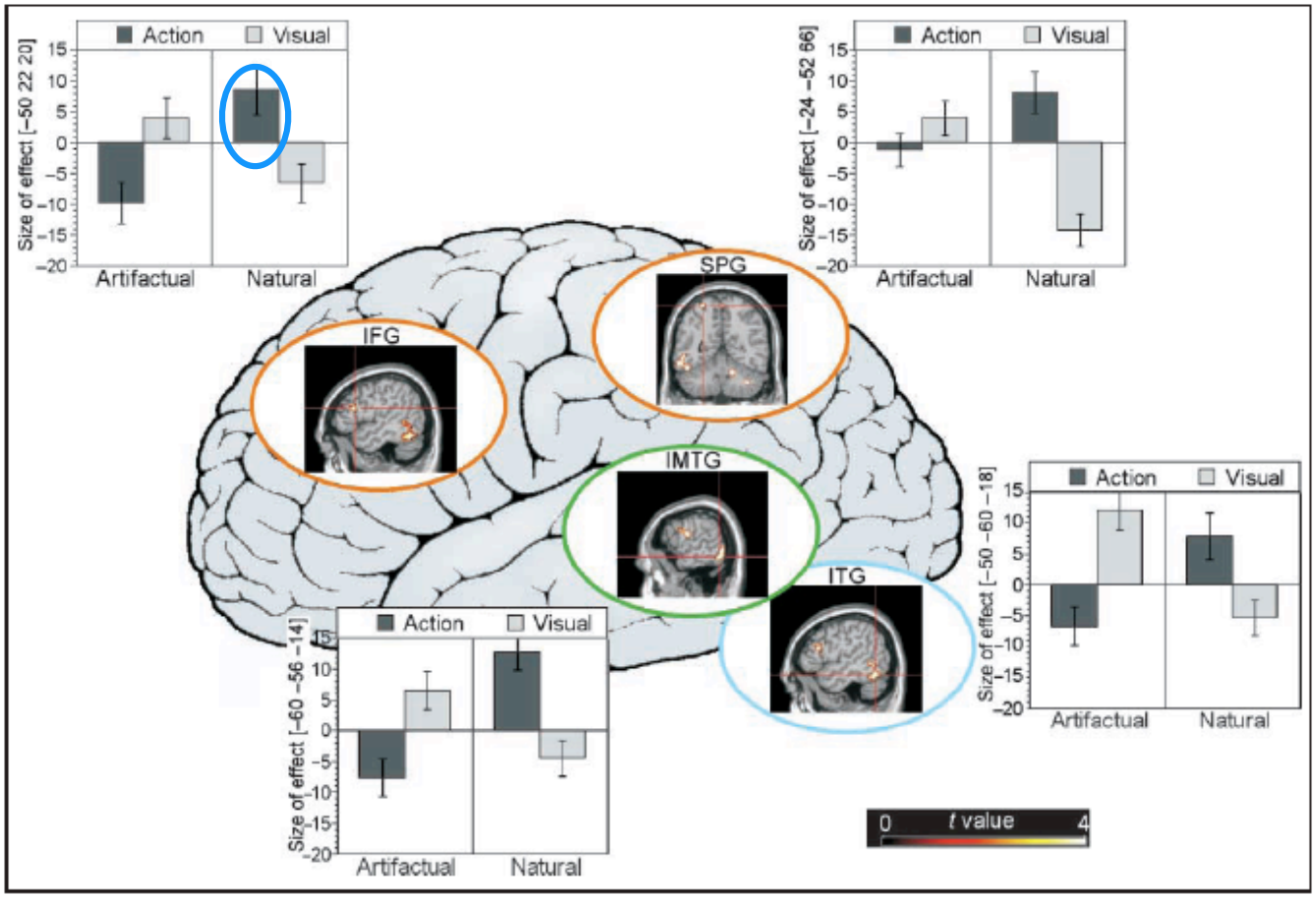


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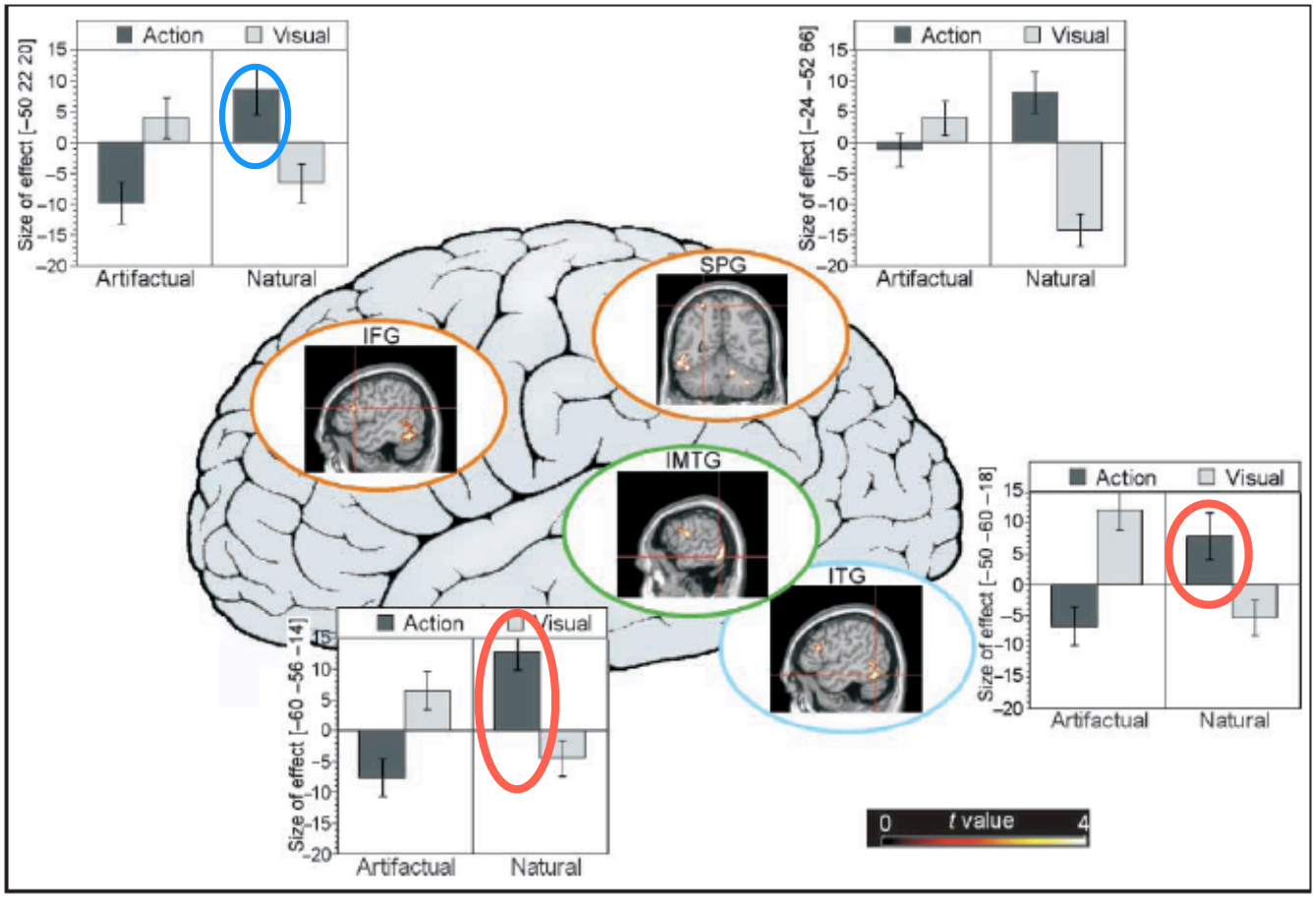



Hoenig et al. 2008

# Upshot

The contextualist approach to knowledge retrieval is probably false.

The enormous amount of information about each category (substance, event type...) in long-term memory is not a seamless whole from which we retrieve information in a purely contextual manner

Rather, there are bodies of information preferentially retrieved.

# Menu

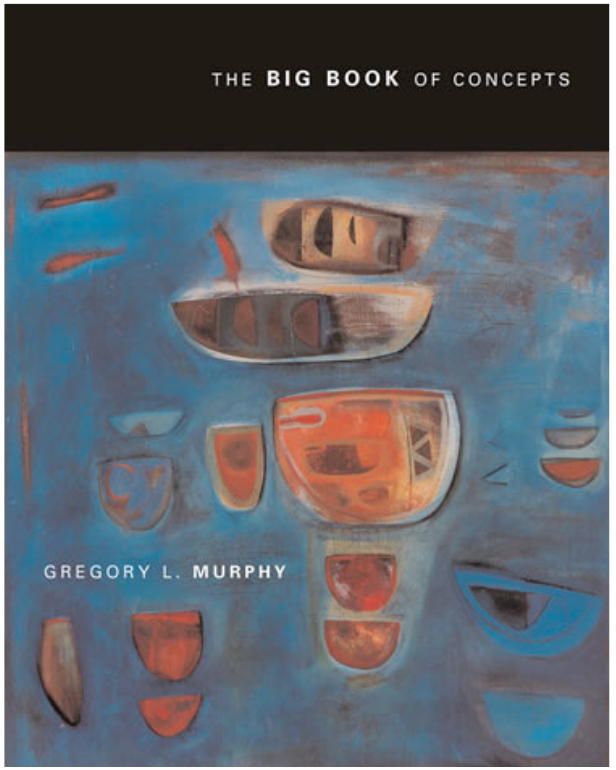
- Are there default bodies of knowledge?
- Are all default bodies of knowledge of the same kind?
- Are the coreferential bodies of knowledge really distinct concepts?
- Is the notion of concept useful for cognitive science?

# What are the Default Bodies of Knowledge?

Suppose that there are indeed default bodies of knowledge, what are they like?

# The Natural Kind Assumption

"The psychology of concepts cannot by itself provide a full explanation of the concepts of all the different domains that psychologists are interested in. (...) The details of each of these must be discovered by the specific disciplines that study them (…). *Nonetheless, the general processes of concept learning and representation may well be found in each of these domains*." Murphy 2002



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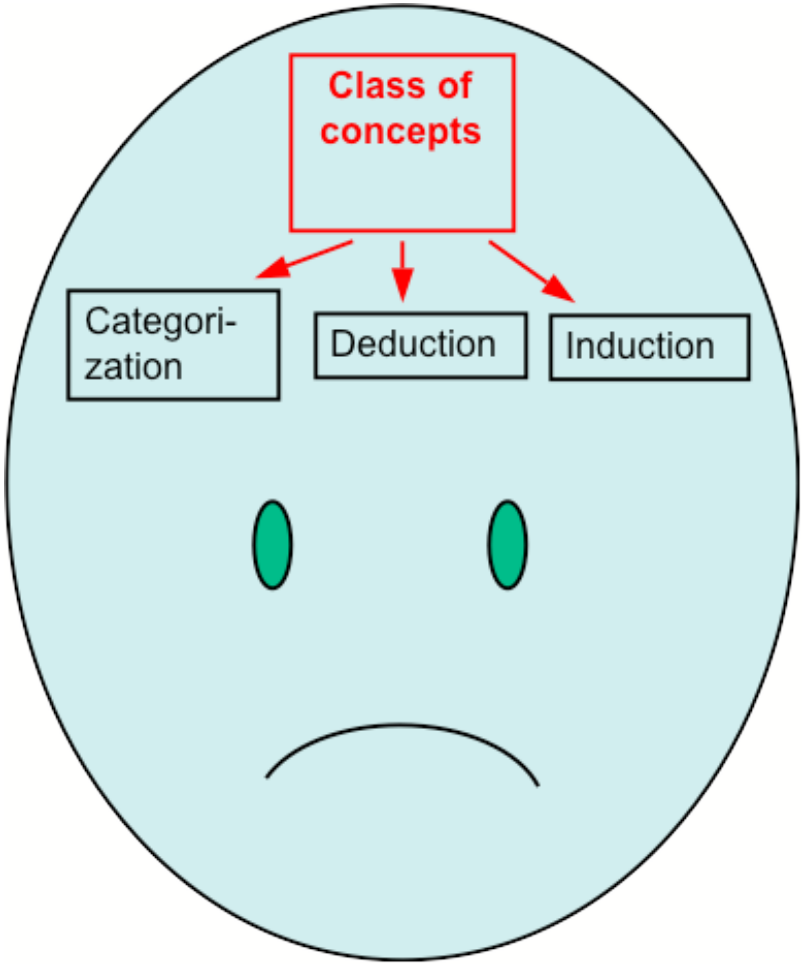
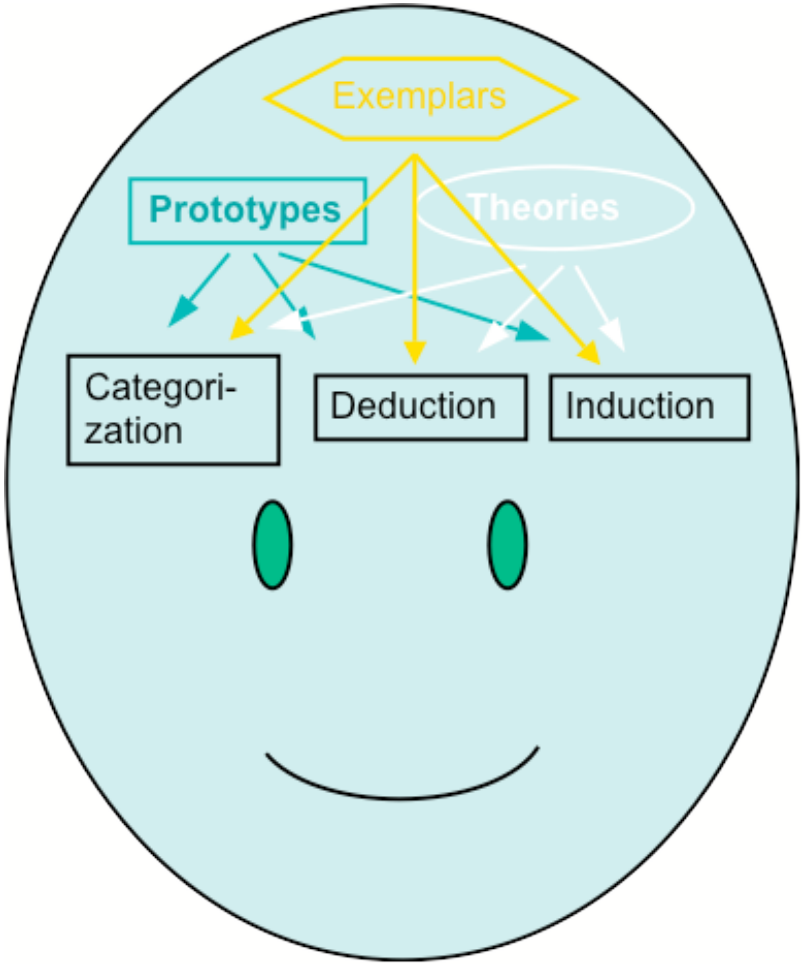


# The Heterogeneity Hypothesis



# In Detail

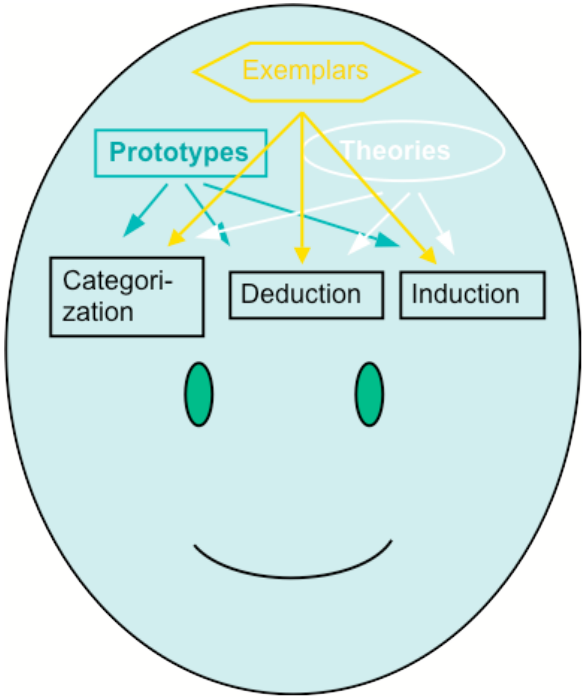
1. For each category (substance, event...), an individual typically has several coreferential concepts.

2. These co-referential concepts have very few properties in common: They store different types of knowledge and are used in different cognitive processes.

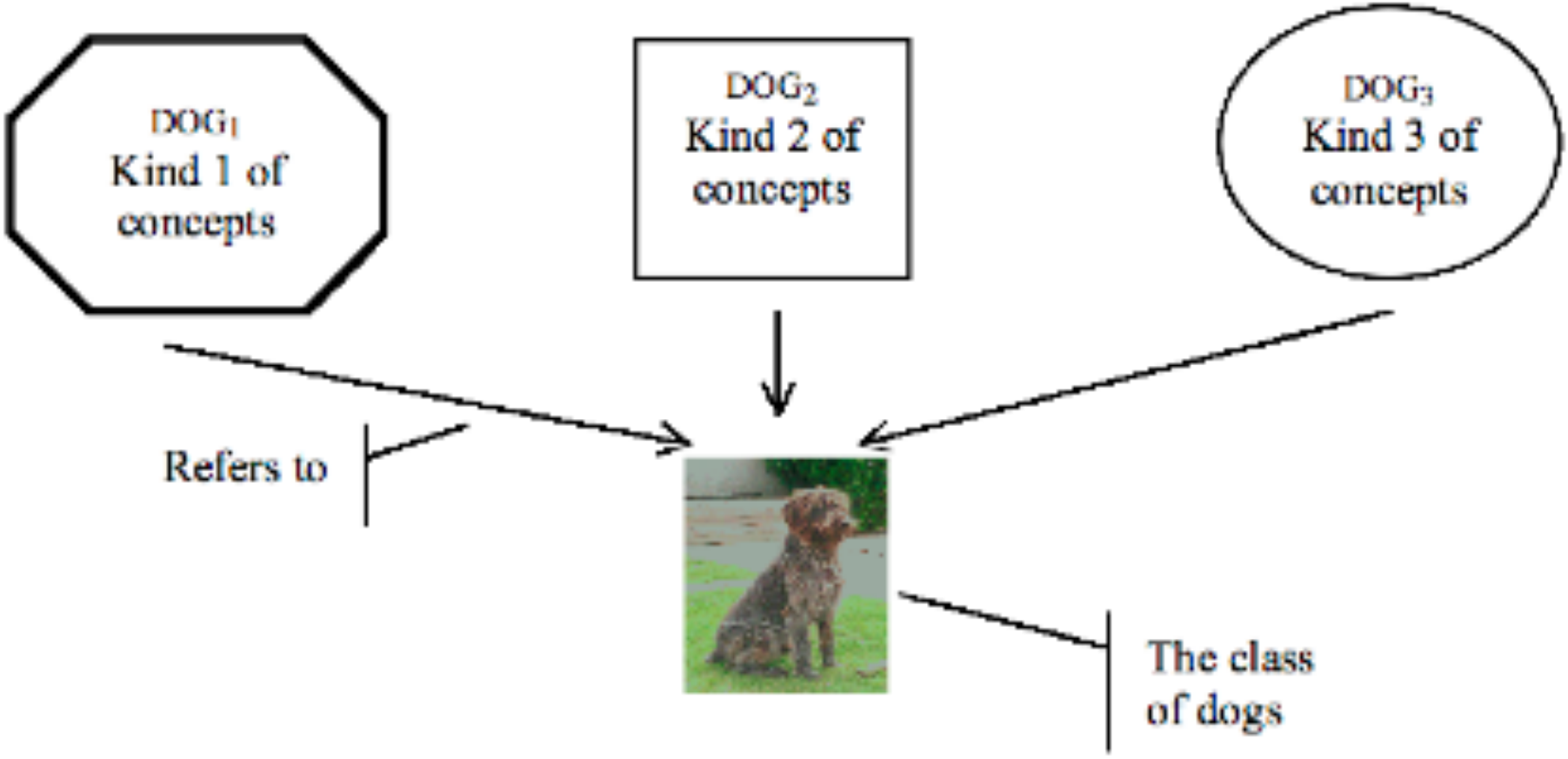
3. Prototypes, exemplars, and theories are among these different kinds of concepts.

4. Prototypes, exemplars, and theories are typically used in distinct cognitive processes.

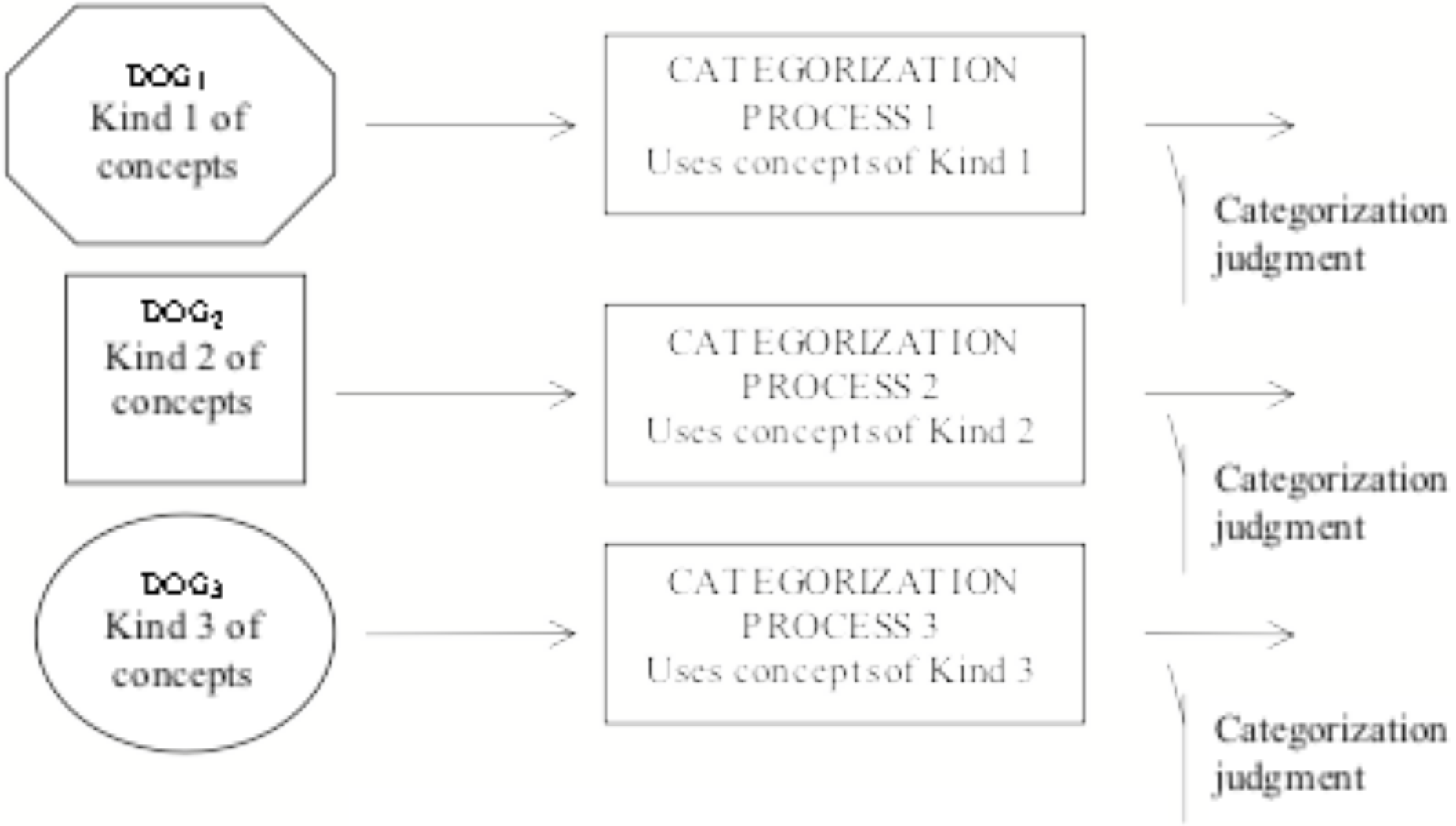
5. The notion of a "concept" ought to be eliminated from the theoretical vocabulary of psychology.



# Several Coreferential Concepts



# Used in Distinct Processes



# Very Few Properties in Common

Prototypes, exemplars, and theories are very different kinds of entities.

# Type of Evidence for the Heterogeneity Hypothesis

Some findings are best explained if some concepts are prototypes, other findings are best explained if some concepts are exemplars, and yet other concepts are best explained if some concepts are theories.

# Example: Induction

## The typicality effect

(1) Robins have sesamoid bones

Hence, birds have sesamoid bones

(2) Penguins have sesamoid bones

Hence, birds have sesamoid bones

## The causal asymmetry effect

(3) Gazelles contain retinum

Hence, lions contain retinum

(4) Lions contain retinum

Hence, gazelles contain retinum

# Emerging Consensus

"We believe that the bag of tricks describes most completely how people go about making inductive leaps. People seem to use a number of different sources of information for making inductive inferences." (Sloman and Lagnado 2005, 219)

# Pluralism vs. the Heterogeneity Hypothesis

While the heterogeneity hypothesis might be right that there are different kinds of concepts, *these share a large number of scientifically important properties*

**D. Weiskopf, 2009, *Synth:*** "we should not embrace concept nihilism. To say that there is no theoretical interest in concepts proper, but only in the narrower classes of prototypes, ideals, exemplars, causal models, etc., would be to ignore *the significant explanatory and functional commonalities that those entities have*."

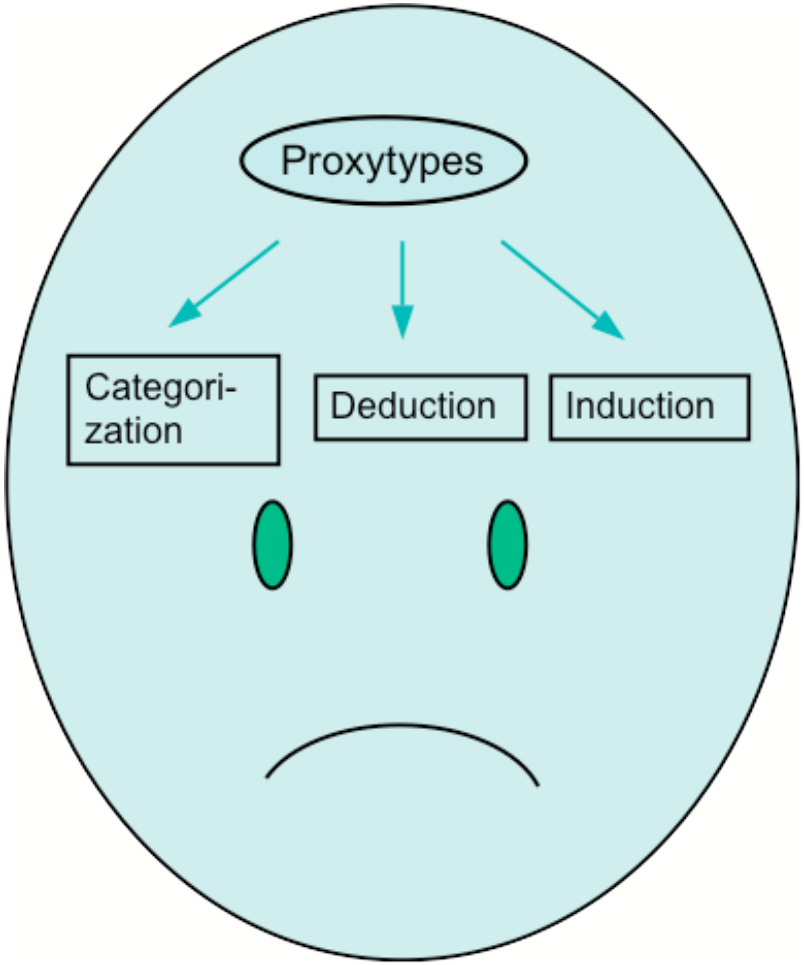
**D. Raffman, 2010, *Phil Stud.*:** A "case in which the notion of a concept seems to underwrite *a non-trivial scientific generalization*. The case concerns the formulation and testing of a psycholinguistic hypothesis about the competent use of vague words."

# The Empiricist Variant of Pluralism

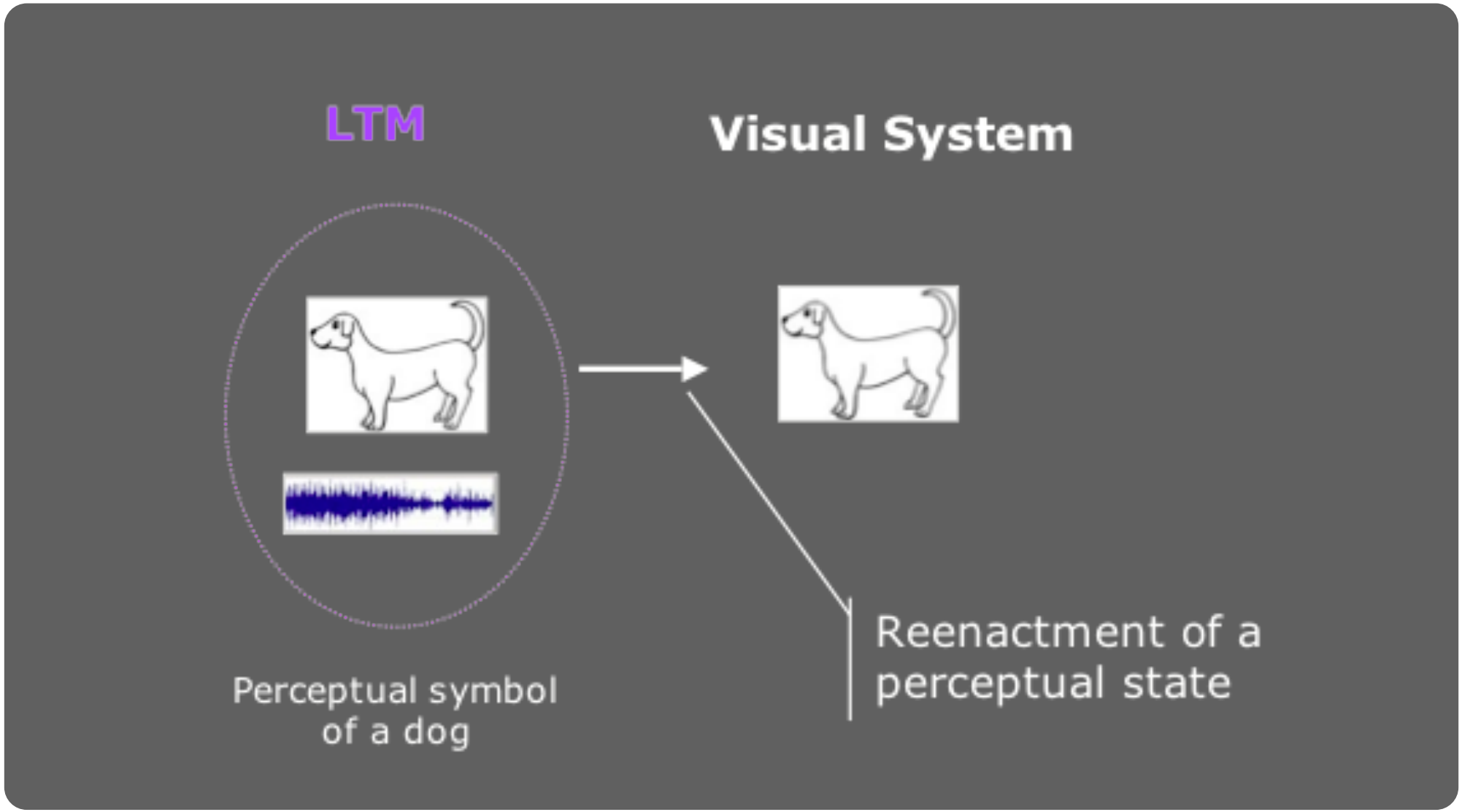
"To think about a category, empiricists will say, is to *simulate* an encounter with that category in a sensory way. Because categories look different in different circumstances, simulating an encounter requires drawing on a wealth of knowledge. Prototypes, exemplars, and theories may all be relevant depending on the constraints of the simulation. *These sources of information are all very different, but they share several things in common on an empiricist picture: they are all made up of sensory representations, they are all acquired through experience, and they are all drawn on to create temporary simulations in working memory.*"

**J. Prinz, 2010, *M&L***

# Prinz's Picture



# Neo-Empiricism
## (Barsalou, Prinz, Zwaan, Lakoff, Martin…)



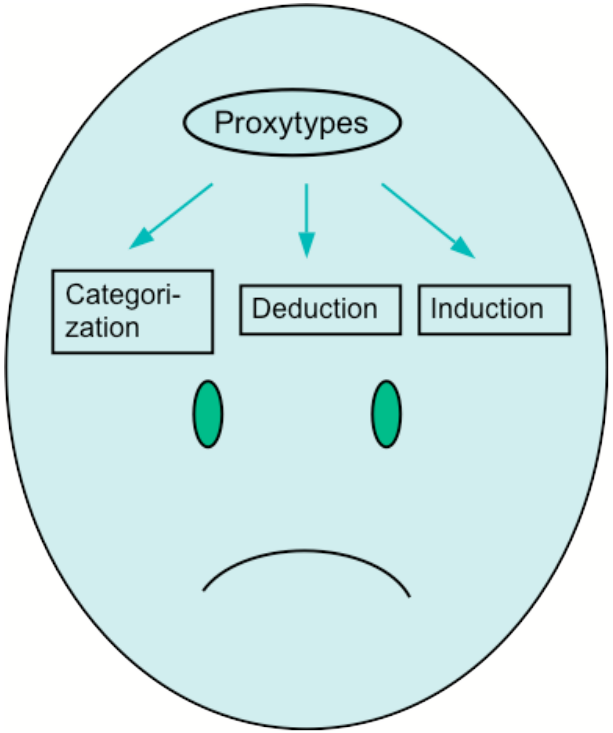
# A Two-Fold Reply

(Machery, 2006,2007, 2009; Mccaffrey and Machery, forthcoming)

Challenging the evidence for neo-empiricism

Providing some evidence that at least some concepts are not perceptual symbols

# 2. Abstract Concepts



# 2. The Failure of the Neo-Empiricist Work on Abstract Concepts

Perceptual representations are too *coarse* to be abstract concepts

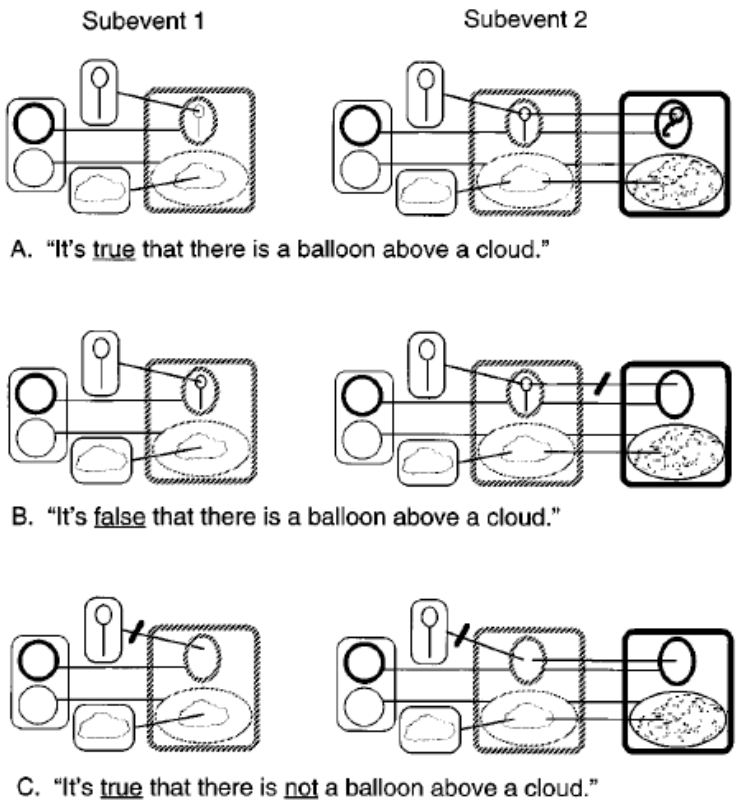
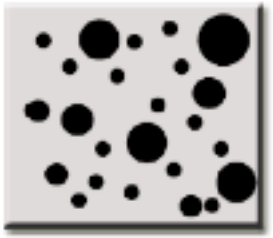


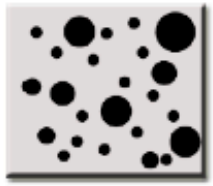

Figure 7. (A) Accounting for one sense of *truth* using perceptual symbols. (B) Accounting for one sense of *falsity* using perceptual symbols. (C) Accounting for one sense of *negation* using perceptual symbols. Boxes with thin solid lines represent simulators; boxes with thick dashed lines represent simulations; boxes with thick solid lines represent perceived situations.

Barsalou 1999 on TRUTH

# 2. Amodal Representations of Magnitudes

 = ?

Series of sounds =?

 +  = ?

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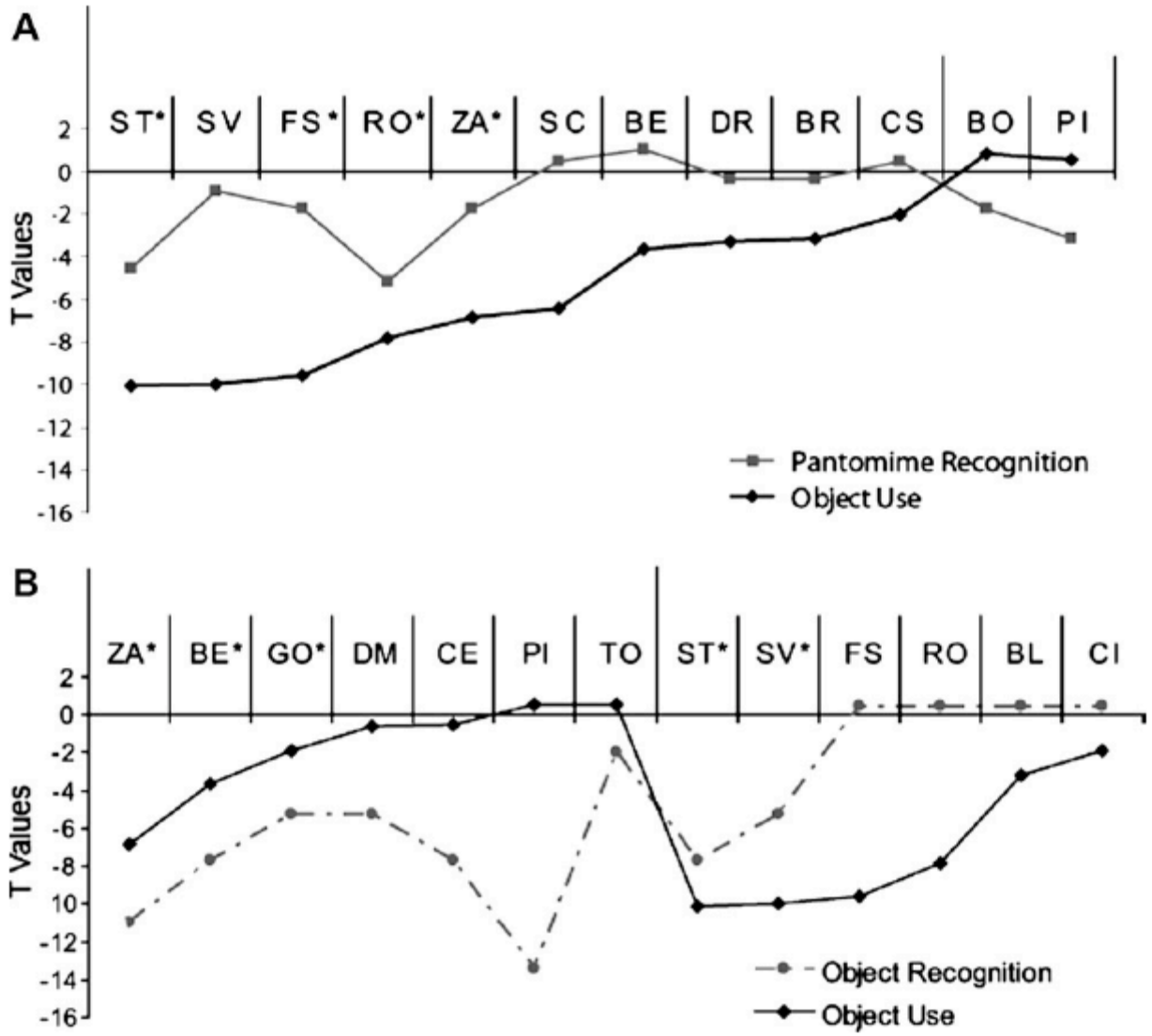
# 2. Neuropsychological Evidence

Apraxia
Negri et al. 2007



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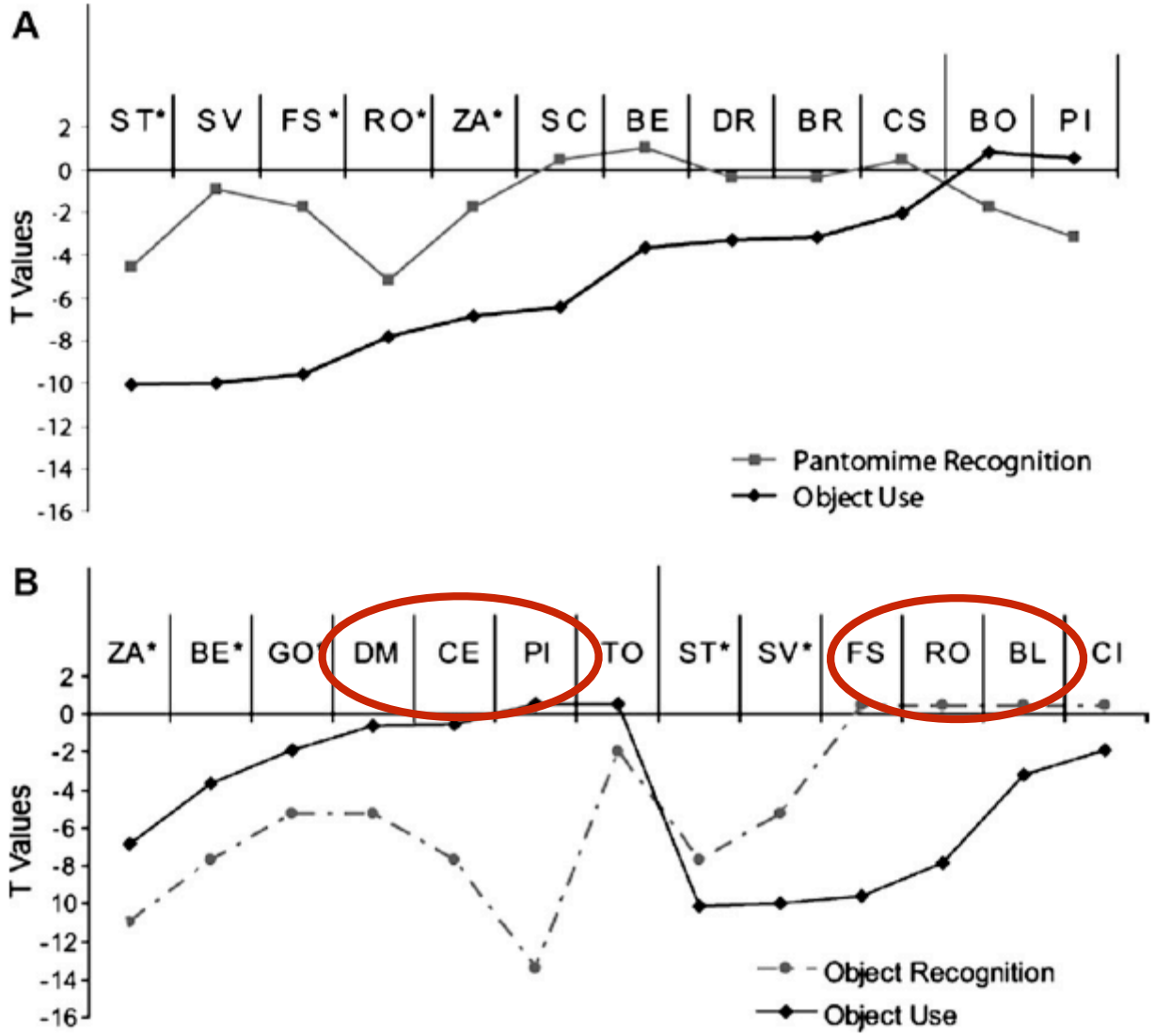


# 2. fMRI Evidence

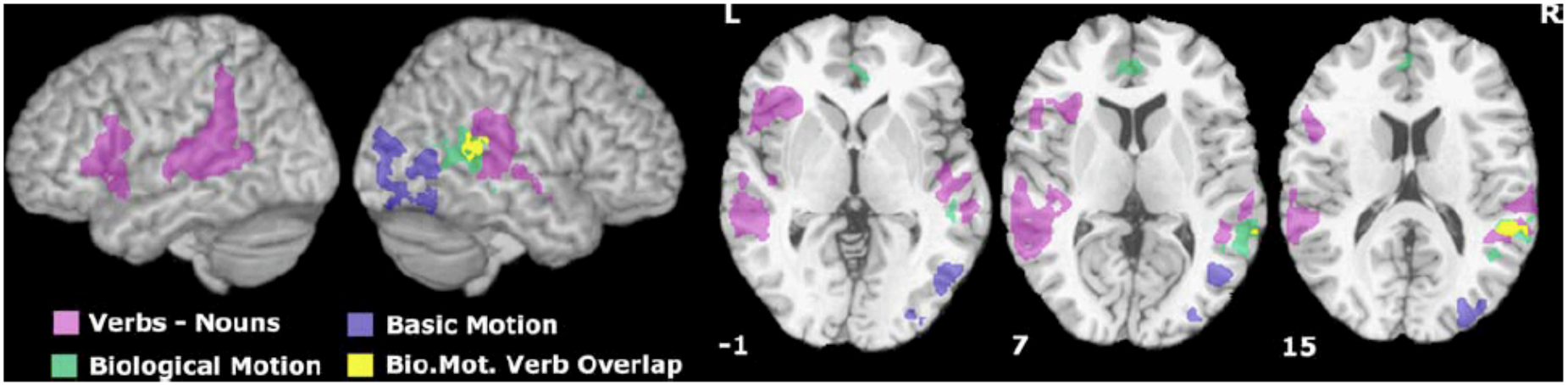



**Figure 2.** Results of the whole-brain analyses for verbs > nouns (pink), biological motion (biological > scrambled motion green), basic motion (motion > luminance, purple), and overlap of biological > scrambled motion and verbs > nouns (yellow). Results are thresholded at $p < 0.05$ (corrected for multiple comparisons) and displayed on a canonical brain.

Concepts of actions and motion perception
(Bedny et al. 2008 "Concepts are more than percepts")

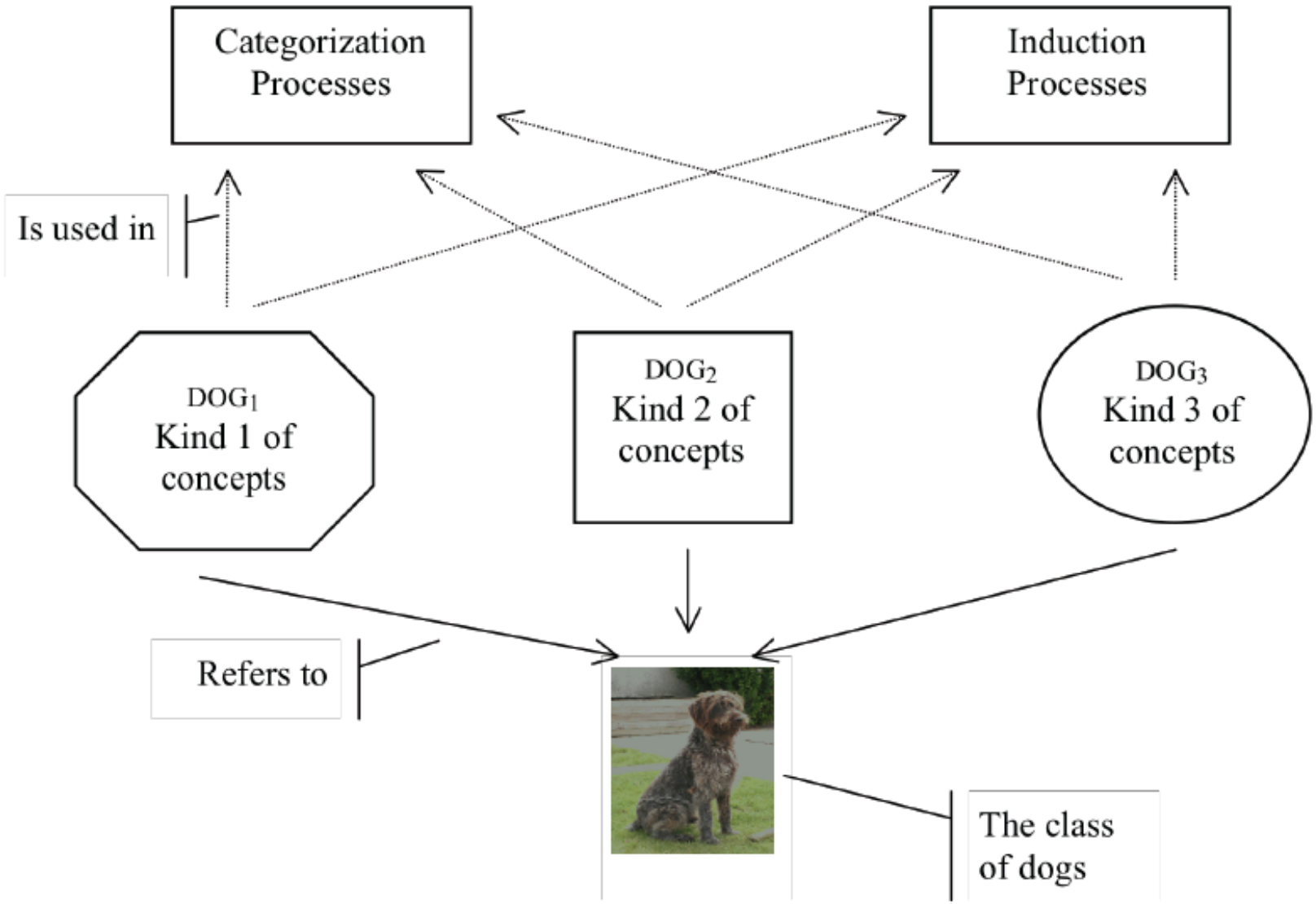
# Upshot

Although there might be numerous properties common to concepts, the neo-empiricist variant of pluralism is dubious.

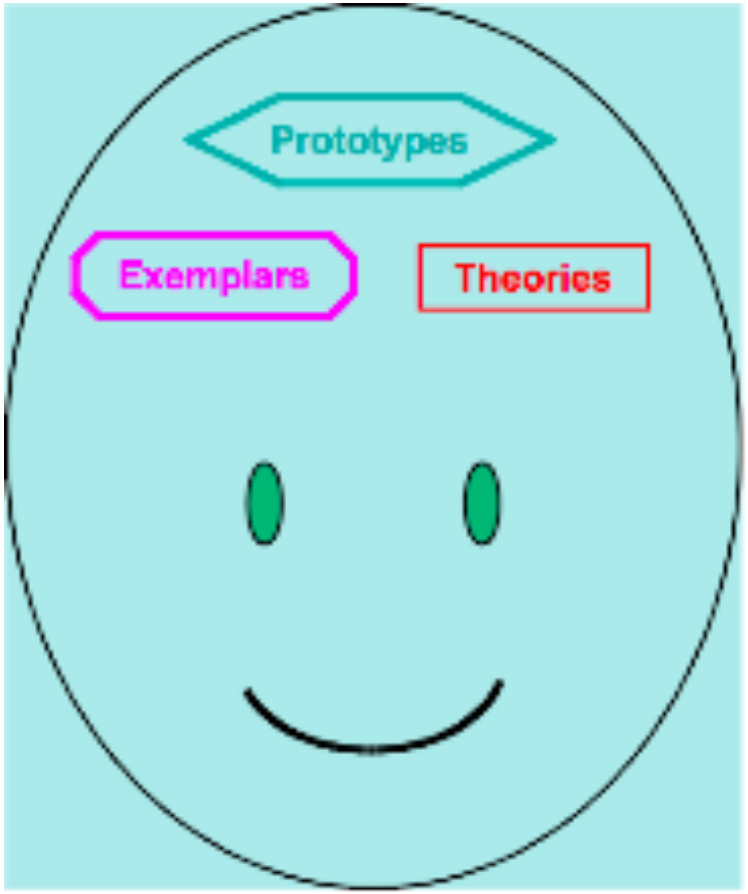
# Menu

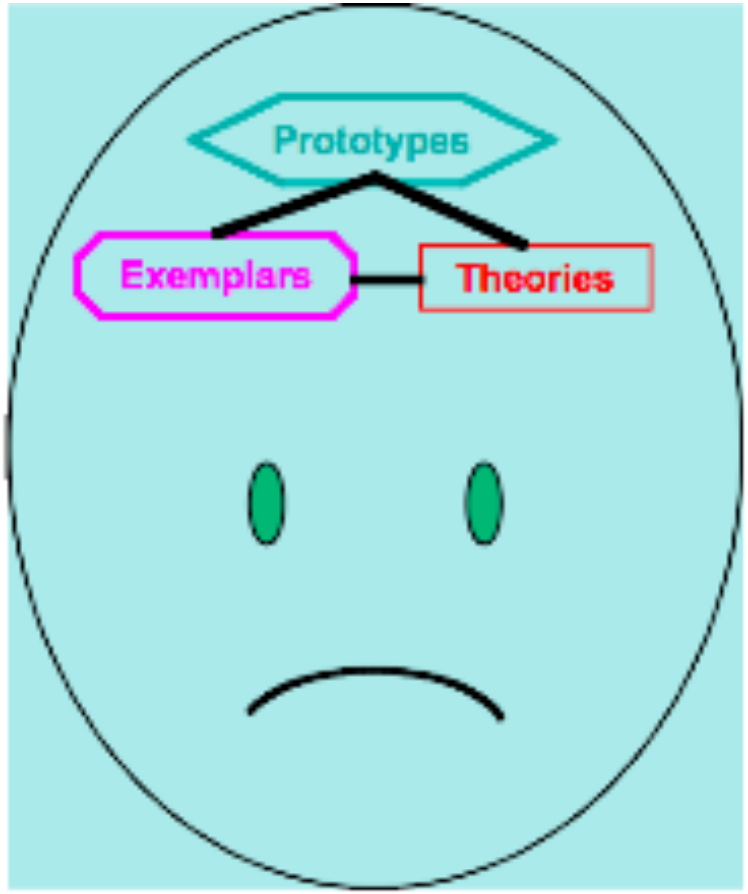
- Are there default bodies of knowledge?
- Are all default bodies of knowledge of the same kind?
- Are the coreferential bodies of knowledge really distinct concepts?
- Is the notion of concept useful for cognitive science?

# The Heterogeneity Hypothesis



# Hybrid Views



# Objection

"I am not convinced that evidence of how people store, retrieve, and use their knowledge about things in the world implies that we should consider the three types of information to constitute separate concepts. It seems more likely that they are *integrated in some shared form of representation*."

**B. Malt, 2010, *M&L***

# A Two-Fold Reply

Characterize the necessary conditions for several bodies of knowledge to be parts of the same concept.

Argue that prototypes, exemplars, and theories do not meet these conditions, and thus are not parts of the same concept, but distinct concepts.

# 1. What is a Part of a Concept? Two Necessary Conditions

1. **CONNECTION**: A (e.g., water is typically transparent) and B (water is made of molecules of $H_2O$) are parts of the same concept only if retrieving A from long-term memory and using it in a cognitive process (e.g., a categorization process) enables the agent to retrieve B from long-term memory.

2. **COORDINATION**: A and B are parts of the same concept only if when they yield conflicting judgments (e.g., the judgment that some liquid is water and the judgment that this very liquid is not water), the agent views one of these judgments as defeasible in light of the other judgment (i.e., if I do not hold both judgments to be equally authoritative).

# Coordination

The information that constitutes a concept should not give rise to contradictory judgments that one views as equally correct.

# 2. Intuitive Examples

1. Johnny Weir is a man
2. Johnny Weir is not a man
3. Lesbians are women
4. Lesbians are not women

| Pair | First sentence on a given page | Second sentence on a given page |
|---|---|---|
| A | In a sense, tomatoes are vegetables | *In a sense, tomatoes are not vegetables* |
| B | *In a sense, penguins are birds* | In a sense, penguins are not birds |
| C | In a sense, lions are animals | In a sense, lions are not animals |
| D | In a sense, whales are fish | *In a sense, whales are not fish* |
| E | In a sense, a piano is a piece of furniture | *In a sense, a piano is not a piece of furniture* |
| F | In a sense, a triangle is a geometric figure | In a sense, a triangle is not a geometric figure |
| G | *In a sense, chess is a sport* | In a sense, chess is not a sport |
| H | In a sense, zombies are alive | *In a sense, zombies are not alive* |
| I | In a sense, a hammer is a tool | In a sense, a hammer is not a tool |

**Table 1: Target and Control Sentences (Control Pairs in Grey Shading, Theoretical Sentences in Italics, Prototypical Sentences in Regular Fonts)**

# 2. Machery & Seppälä 2010

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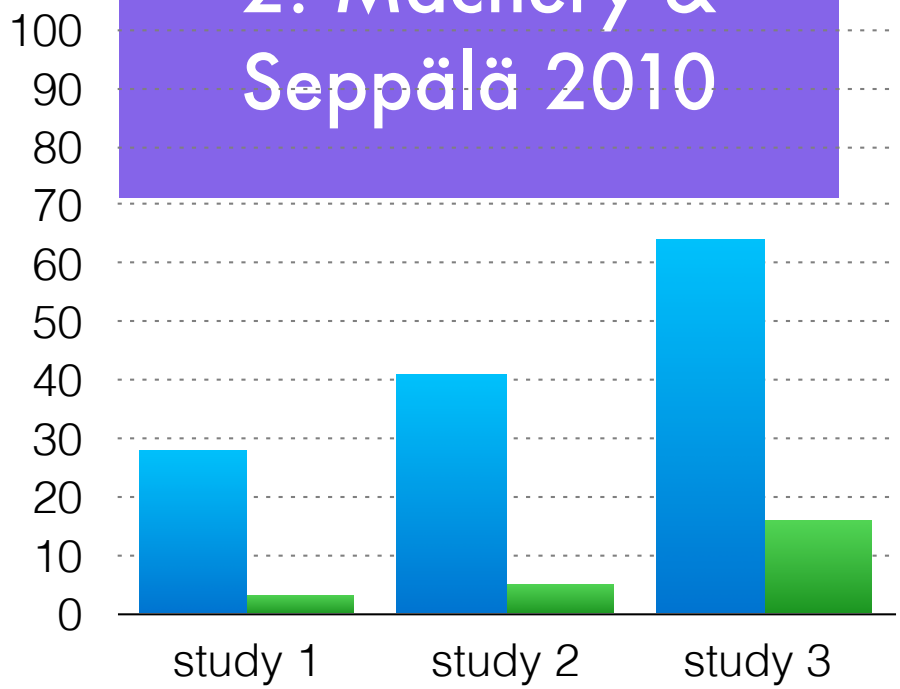

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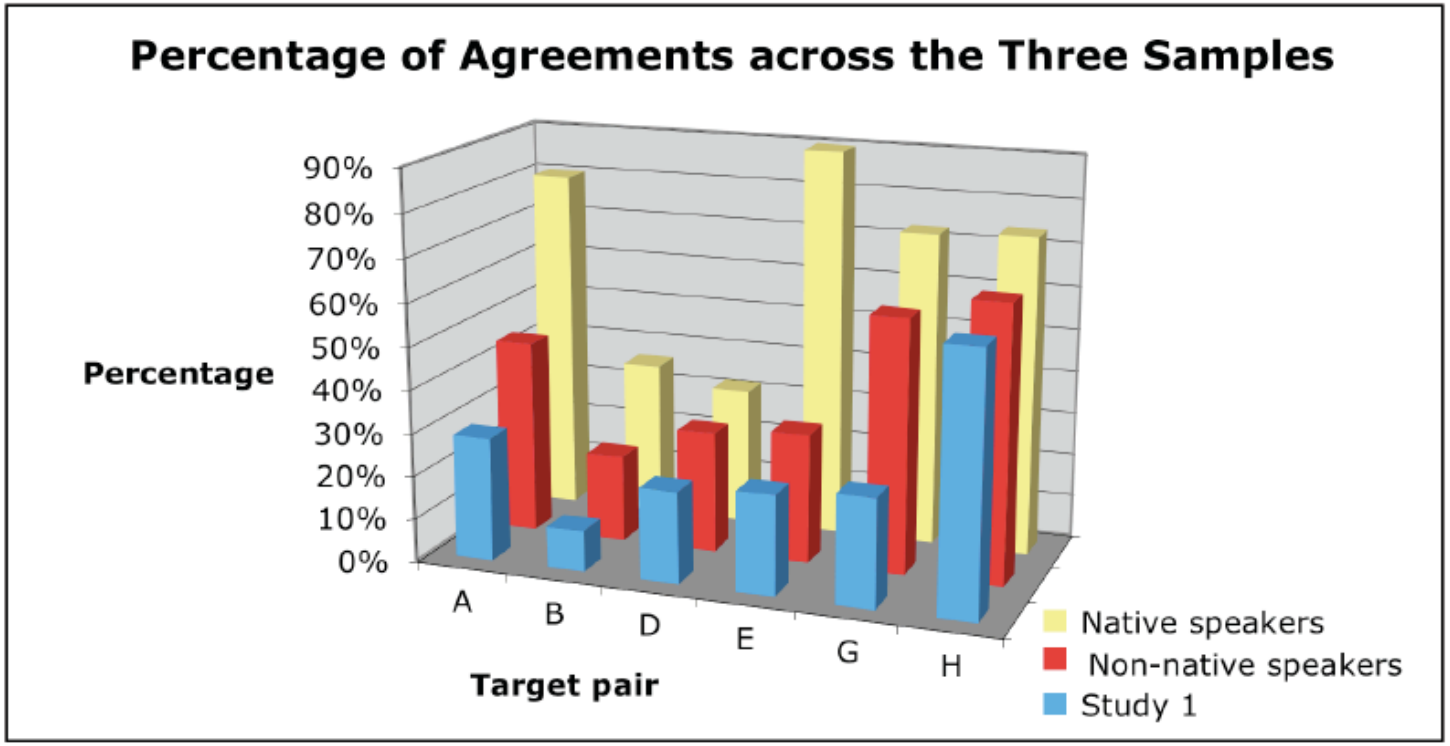

# Upshot

Tentative evidence against hybrid theories of concepts:

Prototypes, exemplars, and theories do form distinct concepts.

# Menu

- Are there default bodies of knowledge?
- Are all default bodies of knowledge of the same kind?
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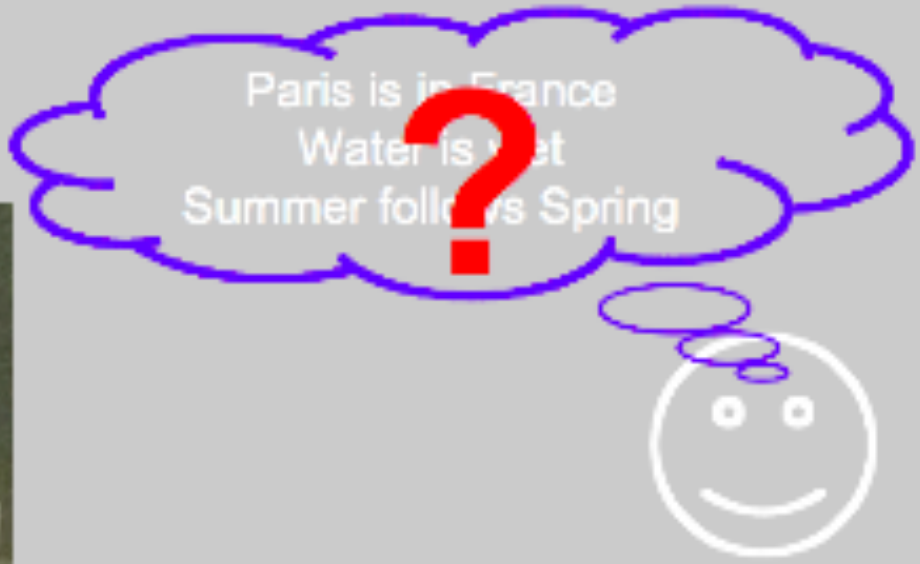
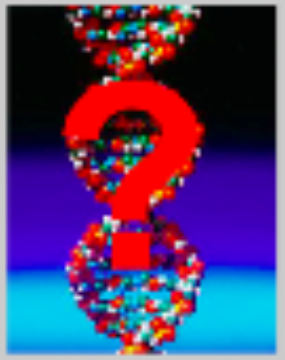
# Eliminating Scientific Notions

# Scientific Eliminativism

To determine whether '*t*' has a legitimate place in the vocabulary of a given science or whether it should be eliminated, one should examine whether using '*t*' helps fulfilling the goals of this science - particularly, whether it helps its classificatory purposes.

# Scientific Eliminativism and Natural Kinds

A crucial classificatory function of scientific terms is to single out natural kinds.

# Eliminating "concept"

1. "Concept" refers to the class of default bodies of knowledge.
2. The best available evidence suggests that for each category (substance, event, etc.), an individual typically has *several* concepts (at least, a prototype, an exemplar, and a theory).
3. Coreferential concepts have very *few properties in common*. Thus, coreferential concepts belong to very heterogeneous kinds of concept.
4. Thus, concepts do *not* form a natural kind and thus "concept" does not pick out a natural kind.
5. Keeping "concept" would impede progress in psychology.
6. "Concept" should be *eliminated* from the theoretical vocabulary of psychology.

# Conclusion
# Doing Psychology Without "Concept"

Psychologists and cognitive neuroscientists should stop using "concept" and they should replace it with terms that denote the kinds of bodies of knowledge retrieved from memory - viz. "prototype", "exemplar", and "theory".


APPLAUSE