Why do striped apples not look like zebras?

On concepts and overextension

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Intro

Why do striped apples not look like zebras?

Striped apple

- Complex composed NP
- Adjective *striped* + noun *apple*
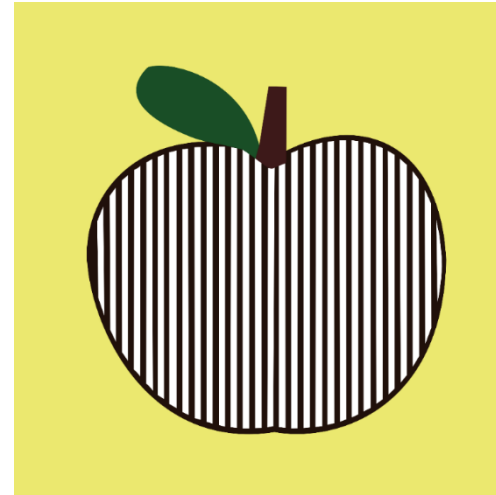- Typically refers to:

Intro

How can we explain that this is a typical *striped apple*, based on what's typical for its parts?

If we take a typical apple,

and combine it with a typical stripe pattern..

We should get something like:

Similar to what happens with an expression like *striped shirt*

Intro

Why this difference?
"Why does a *striped apple* not look like a zebra?"

What does it tell us about
… how concepts combine?
… the way concepts are represented in our minds?
… the relationship between typicality and categorization?
… the effects of typicality on truth values of sentences?
… the relevance of typicality effects for semanticists?

Overview of the talk

I. Concepts and typicality

II. Complex, composed concepts and the relationship between typicality and categorization

(Osherson & Smith vs. Hampton)

III. Overextension effects in categorization

(Hampton vs. Chater et al.)

IV. Some ideas for next steps in the ROCKY project

I. Concepts and typicality

❑ Concepts are mental representations that enable us to denote a class of things in the world

❑ Crucial for cognitive processes like categorization, memory and learning

❑ Classical theory of concepts
   ◦ Concepts have definitional structure: necessary and sufficient conditions (*bachelor*: male, adult, unmarried)
   ◦ Straightforward categorization (0 or 1)

Bird?

I. Concepts and typicality

But:

❑ Concepts give rise to **typicality effects**

Bird?

Distinction **categorization** (0 or 1) and **typicality** (a value between 0 and 1)

I. Concepts and typicality

But:

❑ Concepts give rise to **typicality effects**

❑ These effects are psychologically real

❑ Have been shown using a range of dependent variables: ranking; categorization speed; error rate (e.g. Rosch 1973; Smith, Shoben & Rips 1974; Rosch & Mervis 1975)

Prototype theory

❑ **Categorization** via similarity comparison between an entity and a concept's prototype

II. Complex concepts and the relationship between typicality and categorization

Now let's look at more complex concepts, composed of simpler ones:
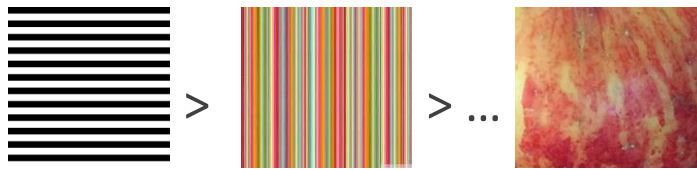
Striped apple

Pet fish

❑ For complex composed concepts, instances also vary in typicality

❑ No induced prototype for each composed concept on the basis of experience with exemplars

❑ Some means of "computing" the typicality of an instance in the complex concept based on what we know about the simpler concepts is necessary

❑ Question: how does such **conceptual combination** work?

II. Complex concepts and the relationship between typicality and categorization

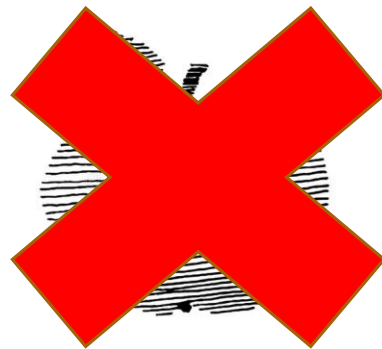There seems to be no *easy* solution..

Typicality structure of *striped*   typicality structure of *apple*

Typical *striped apple*?

II. Complex concepts and the relationship between typicality and categorization

Conclusion:

= more typical of the composed concept *striped apple* than of the constituent concepts *striped* or *apple*

= more typical of the composed concept *pet fish* than of the constituent concepts *pet* or *fish*

Puzzle: how can this be if we wish to derive an entity's typicality in a conjunction *AB* from that entity's typicality in the constituents *A* and *B*?

II. Complex concepts and the relationship between typicality and categorization

❑ 'Conjunction effects' in typicality (or 'guppy effects')

❑ There is no simple way to derive the typicality of an entity for a composed concept from the typicality of its constituent concepts

Two proposals:

❑ **Osherson & Smith**
   Specific solution for such typicality effects   binary view (typicality and categorization distinct)

❑ **Hampton**
   Solution that also affects categorization   unitary view (typicality and categorization directly related)

II. Complex concepts and the relationship between typicality and categorization

Osherson & Smith:

❑ Explanation for 'conjunction effects': complex model for computing typicality structures (representation-based analysis)

❑ Constructs new representation for a composed concept AB, based on the representation of simple concepts A and B

❑ Takes into account weight of relevant attributes and their values

❑ Claim that these effects are *independent* from categorization, which behaves purely logical

❑ **Sharp distinction between typicality and categorization** (**binary view**)

II. Complex concepts and the relationship between typicality and categorization

Hampton:

❑ Explanation for 'conjunction effects': when two concepts combine, a new prototype is construed (composite prototype hypothesis)

❑ Claims that **typicality effects relate to the same mental faculties as measures of categorization/acceptability** (**unitary view**)

❑ Concept membership is determined by placing a criterion on the similarity dimension

❑ As a result, we expect to see "non-logical" effects in categorization! -> Overextension

III. Overextension effects in categorization

Example composed concept AB: combining *game* + *sport*

1. Chess is a game   A

2. Chess is a sport   B

3. Chess is a sport that is a game   AB

❑ **Osherson & Smith** predict categorization according to logical conjunction rules: (3) is true iff (1) is true and (2) is true

❑ **Hampton** experimentally shows that sometimes (3) is judged true while (1) or (2) is judged false = **overextension**

> *"25% of games that were not sports, and 54% of sports that were not games were still given positive ratings for the conjunction" (Hampton 1988, p. 17)*
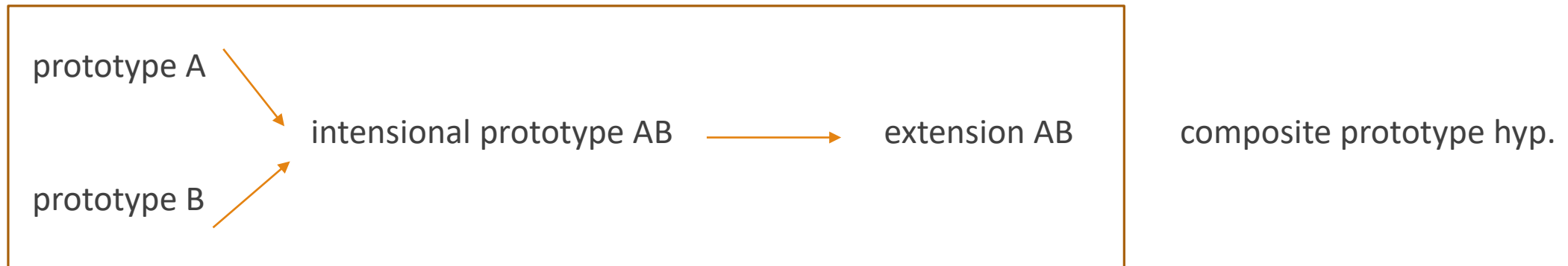
III. Overextension effects in categorization

Hampton's explanation for overextension:

❑ This is - again - a concept composition effect: when two concepts combine, a new prototype is construed (composite prototype hypothesis)

❑ Categorization in the composed concept can be explained directly from its prototype

III. Overextension effects in categorization

Hampton's explanation for overextension:

prototype A

prototype B

→ intensional prototype AB → extension AB

composite prototype hyp.

❑ Overextension occurs simply when an item has higher similarity to the prototype of the composed concept AB than to the prototype of the simple concept A or B

III. Overextension effects in categorization

Chater et al.'s alternative explanation of overextension:

❑ Overextension phenomena are (at least partly) due to compensation effects that have nothing to do with concept composition

❑ The more categories make up a conjunction, the more leniently membership is judged

❑ More general "best fit" strategy

❑ Experimental evidence with triple conjunctions

　　　　e.g. *X is a weapon, a tool and farm equipment*

Ideal apartment:
- *3 bedrooms*
- *large living room*
- *new kitchen*
- *garden*
- *lake view*
- *school nearby*
- *......*

IV. Some ideas for next steps

Questions:

➤ What causes overextension?

➤ Is it a concept composition effect (Hampton) or a general contextual effect (Chater et al.)?

➤ Can we experimentally distinguish Hampton's predictions from Chater et al.'s predictions?

➤General effects of context on categorization
➤Effects of different constructions on the existence/amount of overextension?

IV. Some ideas for next steps

Does context affect categorization?

Idea 1: experiment testing the effects of direct **context** in a simple categorization task, including borderline cases, such as "chess is a sport"

Tennis is a sport	yes / no
Baseball is a sport	yes / no
Soccer is a sport	yes / no
Curling is a sport	yes / no
Chess is a sport	yes / no

Cycling is a sport	yes / no
Cleaning is a sport	yes / no
Studying is a sport	yes / no
Walking is a sport	yes / no
Chess is a sport	yes / no

IV. Some ideas for next steps

Does context affect categorization?

Idea 1: experiment testing the effects of direct **context** in a simple categorization task, including borderline cases, such as "chess is a sport"

❑ Chater et al. would expect context to affect the judgements

❑ Hampton does not directly address this issue, but if we would find such effects, we would have to critically examine any theory based on his hypothesis

IV. Some ideas for next steps

Do we see a difference in the existence or amount of overextension in different constructions?

Idea 2: experiment testing overextension in phrasal vs. sentential constructions

1.	*Chess is a sport*	simple categorization A	
2.	*Chess is a game*	simple categorization B	

3.	*Chess is a sport and a game*	phrasal conjunction	concept composition AB
4.	*Chess is a sport and chess is a game*	sentential conjunction	no concept composition AB

IV. Some ideas for next steps

Do we see a difference in the existence or amount of overextension in different constructions?

Idea 2: experiment testing overextension in phrasal vs. sentential constructions

❑ Hampton would expect a difference: overextension only occurs in case of phrasal conjunction because it is a concept composition effect

❑ Chater et al. would predict overextension across sentence boundaries too, because it is a general contextual effect

IV. Some ideas for next steps

3.	*Chess is a sport and a game*	phrasal conjunction	concept composition AB
4.	*Chess is a sport and chess is a game*	sentential conjunction	no concept composition AB

Challenge: difference in stylistic status

Possible solution: compare the amount of overextension in the two constructions *indirectly*

➢ One experiment contains different cases of phrasal conjunctions; another experiment contains different cases of sentential conjunctions

➢ Hampton expects varying degrees of overextension between different cases of phrasal conjunction, but no overextension in cases of sentential conjunction

➢ Chater et al. expect the same variance in the amount of overextension for both phrasal and sentential conjunction

Wrapping up

➢ Studying concept composition can help us understand the relationship between typicality and categorization (Osherson & Smith's binary view vs. Hampton's unitary view)

➢ Hampton's overextension data support a unitary basis of typicality and categorization

➢ Critical questions in the ROCKY project concern the nature of overextension effects (Hampton's concept composition account vs. Chater et al.'s compensation account)

➢ And what all this means for semantic theory…

Thank you!

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