

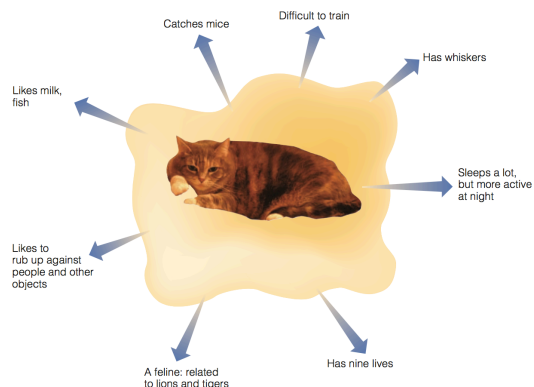
# Knowledge and Intelligence

PSYC 313 - Lecture 18  
Dr. J. Nicol

## Categorization

- **Concepts** are mental representations of a class or individual, or category of object, event, or abstract idea (Kiefer & Pulvermüller, 2012; Smith, 1989)
- Concepts provide rules for sorting objects into categories — a process called of **categorization**
- **Categorization** is the process of grouping items or ideas together and distinguishing them from other items or ideas (object recognition is essentially an act of categorization)

*Once you know that something is in a category, you know a lot of general things about it and can focus your thinking on what is special about this particular instance*



**The definitional approach:** we decide whether something is a member of a category by determining whether a particular object meets the definition of the category




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**Even when there are defining features for a category,** a violation of them often does not change the concept we use to define them




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**Graded membership:** large differences in typicality ratings despite all instances possessing "defining features" of the category

Fruit	Rating	Bird	Rating
Apple	6.25	Robin	6.89
Peach	5.81	Bluebird	6.42
Pear	5.25	Seagull	6.26
Grape	5.13	Swallow	6.16
Strawberry	5.00	Falcon	5.74
Lemon	4.86	Mockingbird	5.47
Blueberry	4.56	Starling	5.16
Watermelon	4.06	Owl	5.00
Raisin	3.75	Vulture	4.84
Fig	3.38	Sandpiper	4.47
Coconut	3.06	Chicken	3.95
Pomegranate	2.50	Flamingo	3.37
Avocado	2.38	Albatross	3.32
Pumpkin	2.31	Penguin	2.63
Olive	2.25	Bat	1.53

Ratings were made on a 7-point scale, with 7 corresponding to the highest typicality. Note also that the least "birdy" of the birds isn't (technically speaking) a bird at all! AFTER MALT & SMITH, 1984.

Malt & Smith (1984)

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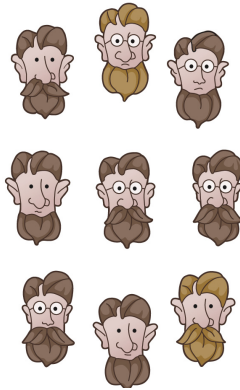
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**Family resemblance:** category members share characteristic features, but there is no defining feature common to all members




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**The prototype approach:** membership in a category is determined by comparing the candidate to the typical member of the category



The prototype is not an actual member of the category, it is the **average representation** of the members of a category

Rosch (1973)

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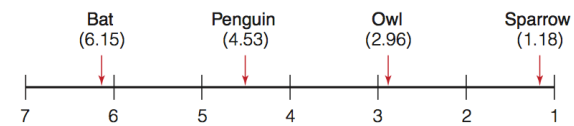
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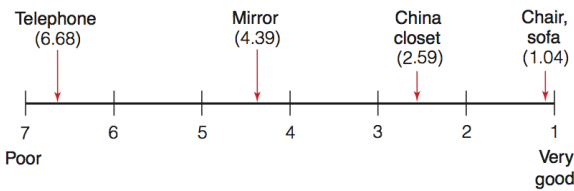
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(a) Category = birds



(b) Category = furniture

Rosch (1975)

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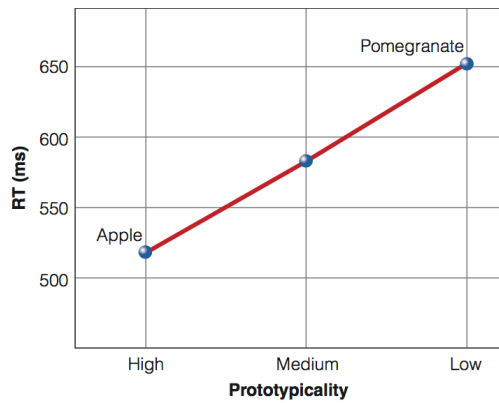
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Smith et al. (1974)

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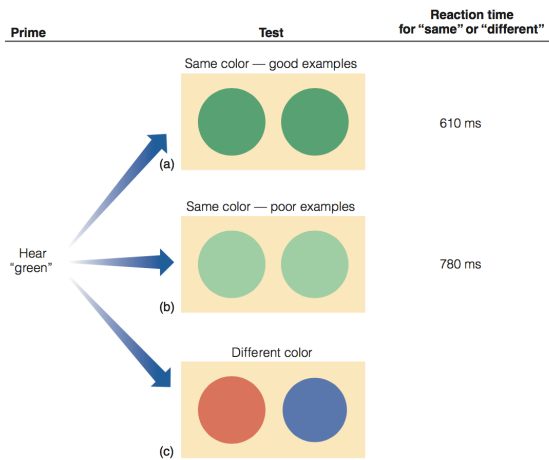
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Rosch (1975b)

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### Experimental effects of typicality on behaviour

Effect	Description	Experimental Result
Family resemblance	Things in a category resemble each other in a number of ways.	Higher ratings for high-prototypical items when people rate how "good" a member of the category it is (Rosch, 1975a).
Typicality	People react rapidly to members of a category that are "typical" of the category.	Faster reaction time to statements like "A _____ is a bird" for high-prototypical items (like robin) than for low-prototypical items (like ostrich) (Smith et al., 1974).
Naming	People are more likely to list some objects than others when asked to name objects in a category.	High-prototypical items are named first when people list examples of a category (Mervis et al., 1976).
Priming	Presentation of one stimulus affects responses to a stimulus that follows.	Faster same-different color judgments for high-prototypical items (Rosch, 1975b).

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# The Exemplar Approach

- Instead of relying on average instances or ideal prototypes, the exemplar approach appeals to actual examples of a category (Medin & Schaffer, 1978)
- Whereas prototype models propose that we store an average instance in our mind, exemplar models suggest that we store all the specific examples in our mind—and when a new instance is observed, our mind matches it against all the stored exemplars
- **Exemplars** are actual members of the category that a person has encountered in the past

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# The Exemplar Approach

- Critics of the exemplar approach to categorization question the number of exemplars that would be required to be stored for each category (Smith, 2005)
- But because the exemplar approach uses actual examples, it can more easily take into account atypical cases (i.e., outliers that deviate from typical category members)
- The exemplar approach can also deal more easily with variable categories

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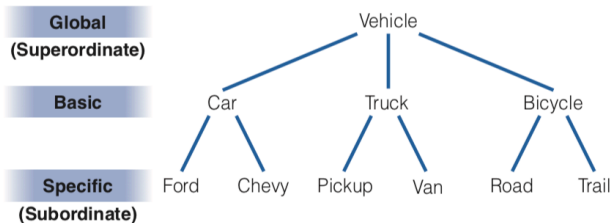
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**Hierarchical categorial organization:** larger, more general categories are divided into smaller, more specific categories, creating a number of hierarchically-arranged categories



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LEVEL	EXAMPLE	NUMBER OF COMMON FEATURES
Global	Furniture	3 ↑ Lose a lot of information.
Basic	Table	9 ↓
Specific	Kitchen table	10.3 ↓ Gain just a little information.

Rosch et al. (1976)

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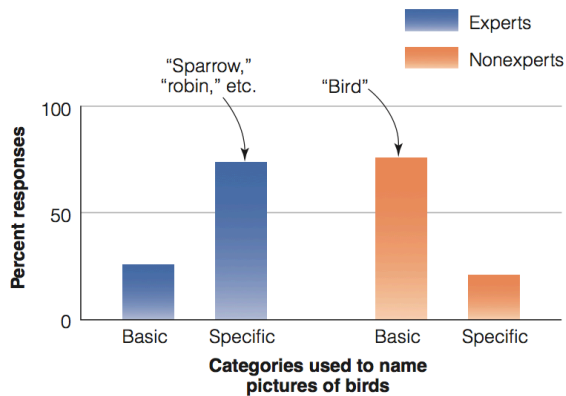
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Tanaka & Taylor (1991)

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## Categorization in the Brain

- Researchers also study how concepts are organized in the brain by observing categories that show selective impairments and specific patterns of brain activation
- Neuropsychological research has focused on patients with a condition called **category-specific knowledge impairment**, in which the patient has trouble recognizing objects in a specific category

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