Psych 56L/ Ling 51: Acquisition of Language

Lecture 9
Lexical Development I

Announcements

Midterm grades available on EEE

Review questions for lexical development available

HW2 due 2/21/13

Lexical Knowledge in Adults

We know a lot of words

Average English-speaking college student knows ~150,000

Average first grader knows ~14,000 (and has only been alive ~2000 days) - that's 7 new words a day, assuming that the child learns right from the first day s/he is born!

What we know

Mental dictionary of words = lexicon

Each entry for a word contains a lot of information, including what the word sounds like, how to use the word in combination with other words, what the word means, what other words that word is related to…

/gɑblɪn/

goblin

creature

the goblin is…, some goblins are…

So what exactly is a word, anyway?

A word (or morpheme) is an arbitrary symbol that stands for something in the real world (even if it's only a concept in someone else's mind): goblin, silliness, labyrinth

Some concepts/meanings are more abstract:

"doing something in the past", "continuing to do something"
(ex: -ed in English, *kissed*) (ex: -ing in English, *was kissing*)

So what exactly is a word, anyway?

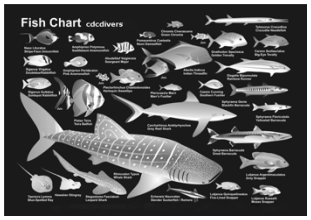
Important: words refer to things (referential). Not enough to simply have associations of sound with something (ex: saying "Eeek!" every time you see a spider)

Some greetings and social routines ("Hi!" "See ya!") might be considered non-referential language.

More about word meaning (one major part of the lexicon)

Hypothesis 1: Meaning as reference

- Meaning = Reference
- The meaning of a word (or phrase) is whatever it refers to in the world
  - George Washington = a particular person
  - Fish = a kind of animal
  - Red = property of objects

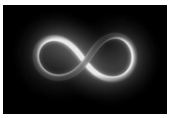


Hypothesis 1: Meaning as reference

Problems?

- Words can label non-existing real world referents
  - *The Crown Prince of Massachusetts*
  - *unicorn*

- Words can refer to abstract referents
  - *Infinity*
  - *Inevitability*



Hypothesis 1: Meaning as reference

Problems?

- Same referent, different meaning
  - *Morning star* (the last visible star in the eastern sky as dawn breaks)
  - *Evening star* (the first star visible in the western sky as sun sets)
  - *Creatures with a heart*
  - *Creatures with a kidney*
- Learning: Many non-encountered instances - how do we learn to extend meaning to include referents we haven't seen before?
  - *Fish*?

Hypothesis 2: Meaning as definition

The Classical Theory

- Word meanings are a set of properties that are **necessary** and **sufficient** for membership in the category.

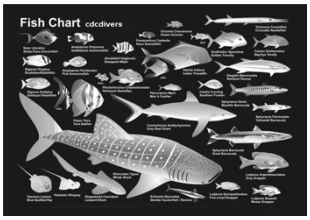
  - Meanings are analyzable into bundles of semantic primitives (features).
  - Triangle: a closed, three sided figure, whose angles add up to 180 degrees.

Hypothesis 2: Meaning as definition

Word meanings are a set of properties that are necessary and sufficient for membership in the category.

- Fish

[aquatic]
[water-breathing]
[cold-blooded]
[animal]
[chambered heart]



Hypothesis 2: Meaning as definition

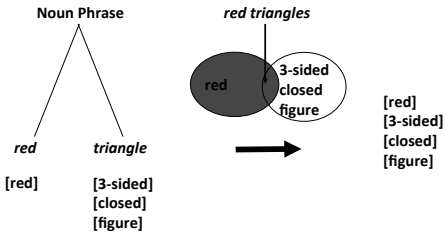
How do we come up with the right set of properties?

- Bachelor
  - # My husband is a bachelor.
    - Bachelor → UNMARRIED
  - # I met a two-year-old bachelor.
    - Bachelor → ADULT
  - # My sister is a bachelor.
    - Bachelor → MALE
  - # My dog Rex is a bachelor.
    - Bachelor → HUMAN

[UNMARRIED]
[ADULT]
[MALE]
[HUMAN]

Hypothesis 2: Meaning as definition

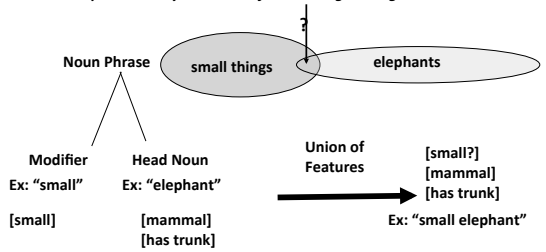
How do we create new meanings? Compositional semantics.



Hypothesis 2: Meaning as definition

- Composition doesn't always seem to work, though…

Are small elephants really in the set of small things to begin with?



Hypothesis 2: Meaning as definition

Also, necessary and sufficient features aren't always so easy to come up with.

What is a game?
(Wittgenstein, 1953)

Is it always amusing?

Is skill required?

Is it always competition?

Must luck play a role?

Hypothesis 2: Meaning as definition

Also, necessary and sufficient features aren't always so easy to come up with.

Bachelor (revisited)

[UNMARRIED]
[ADULT]
[MALE]
[HUMAN]

Alfred is an unmarried adult male, but he has been living with his girl-friend for the last 23 yrs. Their relationship is happy. Is Alfred a bachelor?

Hypothesis 2: Meaning as definition

Also, necessary and sufficient features aren't always so easy to come up with.

Bachelor (revisited)

[UNMARRIED]
[ADULT]
[MALE]
[HUMAN]

Bernard is an unmarried adult male, and he does not have a partner. Bernard is a monk living in a monastery. Is Bernard a bachelor?

Hypothesis 2: Meaning as definition

Also, necessary and sufficient features aren't always so easy to come up with.

Bachelor (revisited)

[UNMARRIED]
[ADULT]
[MALE]
[HUMAN]

Charles is a married adult male, but he has not seen his wife for many years. Charles is earnestly dating, hoping to find a new partner. Is Charles a bachelor?

Hypothesis 2: Meaning as definition

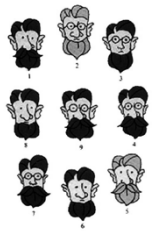
Also, necessary and sufficient features aren't always so easy to come up with.

Bachelor (revisited)

[UNMARRIED]
[ADULT]
[MALE]
[HUMAN]

Donald is a married adult male, but he lives in a culture that encourages men to take two wives. Donald is earnestly dating, hoping to find a new partner. Is Donald a bachelor?

Hypothesis 3: **Prototype Theory** Meaning as graded membership to a category



Hypothesis 3: **Prototype Theory** Meaning as graded membership to a category

- Categories have *graded membership:* Some members of a category are reliably rated as "better" members than others

Please rate the following in the category BIRD

Ostrich vs. Robin vs. Bat

1 2 3 4 5 6 7

Good member **Bad member**

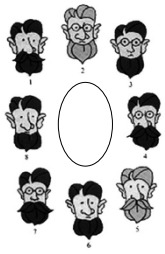
Hypothesis 3: **Prototype Theory** Meaning as graded membership to a category

- Categories have *graded membership:* Some members of a category are reliably rated as "better" members than others

- Robin: 1.1
- Eagle: 1.2
- Wren: 1.4
- Ostrich: 3.3
- Chicken: 3.8
- Bat: 5.8

Hypothesis 3: **Prototype Theory**
Meaning as graded membership to a category

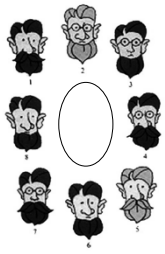
Family Resemblance Structure



- Smith Family
- **Degree of Category Membership ("Smithness") depends on**
  - **the number of features and**
  - **how central they are to "Smithness"**

Hypothesis 3: **Prototype Theory**
Meaning as graded membership to a category

Family Resemblance Structure

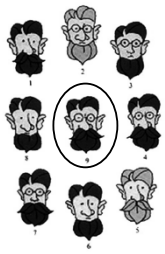


- Smith Family
- **Smith Features**
  - **Beard 8/8 = 1**
  - **Brown hair 6/8 = .75**
  - **Big nose 6/8 = .75**
  - **Big ears 6/8 = .75**
  - **Mustache 4/8 = .5**

(non-Smith features:
No beard = 0/8, blonde hair = 2/8, small nose = 2/8, small ears = 2/8, no mustache = 4/8)

Hypothesis 3: **Prototype Theory**
Meaning as graded membership to a category

Family Resemblance Structure



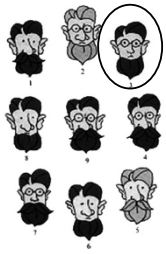
- Smith Family
- **Middle Smith has all features – calculate his score, based on other 8**

beard	**1 * 1.0 +**
brown hair	**1 *.75 +**
big nose	**1 * .75 +**
big ears	**1 * .75 +**
mustache	**1* .5**

	Total 3.75

Hypothesis 3: **Prototype Theory**
Meaning as graded membership to a category

Family Resemblance Structure



- Smith Family
- **Smith #3 has a few features**

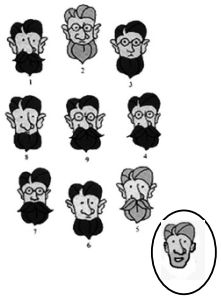
beard	**1* 1.0 +**
brown hair	**1* .75 +**
small nose	**1 * .25 +**
big ears	**1 * .75 +**
no mustache	**1 * .5**

	Total 3.25

poorer instance than middle Smith

Hypothesis 3: **Prototype Theory**
Meaning as graded membership to a category

Family Resemblance Structure



- **Item with too few features is not a member of the category**

no beard	**1 * 0 +**
blonde hair	**1 * .25 +**
big nose	**1 * .75 +**
small ears	**1 * .25 +**
no mustache	**1 * .5**

	Total 1.75
	– not a Smith

Hypothesis 3: **Prototype Theory**
Meaning as graded membership to a category

Family Resemblance Structure: One Formalization

- Features have associated probability
- These probabilities may be thought of as weights on the features for membership/identification purposes
- Category membership is based on a weighted sum of the features.

An important issue:
Words ≠ Concepts

Words ≠ Concepts

Words and concepts do not map one-to-one.

Lexical gaps: concepts that have no words associated with them

"couch hole" = gap between couch cushions child has to be careful to avoid when walking across the couch

Words ≠ Concepts

Words and concepts do not map one-to-one.

Lexical gaps: concepts that have no words associated with them

"couch hole" = gap between couch cushions child has to be careful to avoid when walking across the couch

"couch hole"

Words ≠ Concepts

Words and concepts do not map one-to-one.

Words pick out some, but not all, conceptually available distinctions

Ex:

vs.

Words ≠ Concepts

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English fingers toes

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Ex:

vs.

English — fingers — toes

digits

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Ex:

vs.

Limb is foot
Attached to end of limb
Limb is hand

Concepts

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fingers

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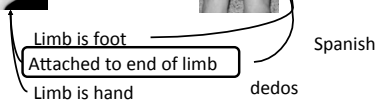

What about more abstract concepts/meanings?
(which often may be associated
with units smaller than whole words)
[from Wagner 2010]

Concepts associated with events

Tense: Locates an event in time

past:

Jack hugged Lily. *Jack did hug Lily.*
Jack was hugging Lily. *Jack had hugged Lily.*
Jack has hugged Lily.

present:

Jack hugs Lily. *Jack is hugging Lily.*

future:

Jack will hug Lily. *Jack will be hugging Lily.*
Jack will have hugged Lily by tomorrow.

Concepts associated with events

Aspect: signals the viewer's perspective of the event

completed ("perfective"):

Jack hugged Lily. *Jack did hug Lily.*
Jack has hugged Lily. *Jack had hugged Lily.*
Jack will have hugged Lily by tomorrow.

incomplete ("imperfective"):

Jack was hugging Lily. *Jack is hugging Lily.*
Jack will be hugging Lily.

Concepts associated with events

All languages mark either tense or aspect or both, but there is wide variation in their precise expression.

Tense-only: modern Hebrew

Aspect-only: Mandarin

English: both

Concepts associated with events

Another difficulty: These kinds of meanings can be naturally related to each other, which means it can be difficult to realize they're actually separate concepts

Class one: "the present moment"

present tense + imperfective aspect

(naturally incomplete because you're watching it happen)

ex: *Jack hugs Lily.*

Class two: "the completed past"

past tense + perfective aspect

(naturally in the past because you know it finished)

ex: *Jack hugged Lily.*

Concepts associated with events

Some final thoughts:

Our subjective experience of time passing may help identify that tense is a relevant concept. There may be a more perceptually grounded way to identify something as definitively "present" vs. "past" vs. "future" than there is to identify something as definitively a "game" or a "fruit" or a "Smith".

Our subjective experience of events happening may help identify that incomplete vs. complete is a relevant distinction. As with time, there may be a more perceptually grounded way to identify something as definitively "complete" vs. "incomplete".

Recap: Children's Lexical Development

Children must figure out the lexicon of their language, including the correspondence between sounds and meaning.

Referential meaning isn't necessarily so easy to define. A current theory that shows promise is a probabilistic implementation of prototype theory.

Different components of meaning may overlap, such as with tense and aspect. This shows us that the meaning we have for a word can involve many different logically separate concepts, even if we aren't explicitly aware of them.

Questions?

You should be able to do up through question 7 on HW2 and up through question 7 on the lexical development review questions.