Lila Gleitman: The Structural Sources of Verb Meanings

Introduction

- John Locke: “Word meanings are learned by noticing the real-world contingencies for their use.”
  Gleitman: self-evident statements are rarely proved—they deserve serious study.

- Main question: How does one decide which particular phonological object corresponds to which particular verb concept?

- Can we say that it is solely based on innate mechanisms?
  NO: 1. Relation between the two must be learned by exposure to a specific language.
       2. Not all phonological object and verb concept pairings are available through experience of words.

- Gleitman: “Children can induce the word meanings from their contexts” with her proposal of a procedure that focuses more on syntactic properties of words.

Part I: Some Difficulties of Learning by Observation

- Observational Hypothesis: Locke considered that blind people might not be able to acquire words that are derivable from other concepts, or available only to the eye.

- In contrast, Gleitman et al found that the blind and sighted children at age 3 showed much similarity in the representations of vision-related terms.

  “Touch but don’t look at...” vs “Now you can look at it”
  “look” = active, exploratory vs “see” = stative, achievement

- Verbs like look and see refer to different perceptions, due to extralinguistic context:
  Blind children—haptic perceptions
  Sighted children—visual perceptions

- Experiment: For blind children, look involves haptic exploration because only haptic exploration is possible?
  Experimental design: analyse videotaped interaction of mother with her blind child.
  child is at the learning stage for verbs – before producing any
  Experiment results: nearness of object (=availability for haptic exploration) does not correlate very well with “look” and “see”!

- The failure of the experiment raised a few concerns on observational learning:
  1. We must limit the space of observables in matching event to unknown verb.
  2. Richness of perception problem: a simple verb may encode multiple events like the unobservable interests, purposes, beliefs, and perspectives of the speaker.
     Thus meaning of verbs can’t be obtained merely from observing events.
- Possible techniques for children to solve ambiguity: cross-comparison and elimination
- However, there are some verb pairings that cannot be distinguished by cross-situational observation. i.e. flee/ chase These words are identical in all respects except the perspectives that they adopt toward events.
  3. Child and adult are not always attending to the same target.
  4. A whole class of constructions is reserved for saying things that mismatch the current situation.
  5. The Subset Problem
     - Learners who had to choose between two languages, one of which was a subset of the other, could receive no positive evidence.
- It is proposed that learners always hypothesize the smaller subset.
- Revised proposal: middle level of abstraction, step up or down depending on whether an entity already has
a known name.

6. Some words do not refer to the observable world. E.g. *think*
- Some sentences do not refer to here-and-now.
- Sometimes the action is done but the verb is not uttered. Caretaker speech is not a running commentary on scenes and events in view.
- If maintain word-to-world notion: low proportion of situational “hits” and large proportion of “misses”.

### Part II: New Approaches for Vocabulary Acquisition

- **Gleitman:** “Syntax acts as a kind of mental zoom lens for fixing on just the interpretation that the speaker is expressing.”
- **Sentence-to-world mapping**
  - Gleitman redoes the flawed experiment, pin-pointing that in the revised version:
    1. The typical syntactic environments for two verbs in a pair (e.g. *look* / *see*) are quite different.
    2. NEARbyness is re-examined – non-nearby cases all have very different syntax!
    - it becomes a more reliable real-world clue than previously.
    3. Here children pay attention to the subcategorization frames.

- **The Bootstrapping proposal**
  - For both bootstrapping proposals, there is a consensus that
    1. Structures in which verbs appear are projections from their meanings.
    2. Verbs that are related in meaning share similarity in their clausal syntax.
    3. Despite their distinct procedures, it is likely that they work hand-in-hand.

  - **Semantic bootstrapping:** emphasizes observation as the main source in deriving word meanings.
    1. Child first fixes the meaning of a verb by observing its real-world contingencies.
    2. Invokes linking rules to explain how the child discovers the structures licensed for the use of the verbs.
    3. Once the meanings are derived, child projects the structures from innate knowledge of the rules that map semantic structures onto syntactic structures.

  - **Syntactic bootstrapping:** procedure in which meanings are derived from a structure.
    The structure includes real-world situations and also conditions in which various words appear in the speech of the caretakers.
    - E.g.: Triad noun-phrases constructions – all “put”-like verbs include three properties:
      one who *verbs*, a thing *verbed*, and a place where it is *verbed*.
    - In the subcategorization frame, each verb is associated with several of the semantic elements like “cause”, “transfer”, “symmetry”, and “cognition”. This narrows down the choice of interpretations.

  - Potential virtues of syntactical verb-learning procedure:
    1. Nonmagical explanation of blind child’s acquisition of visual terms.
    2. Explain acquisition of verbs when observation fails.
    3. A way of learning from small data base.
    4. Date base is categorical rather than probabilistic.
    5. Knowing the subcategorization privileges for each verb \(\rightarrow\) know one’s language.

#### Questions on the Bootstrapping hypothesis
1. *Are the rules linking semantics and syntax strong and stable enough to support a learning procedure?*
   - Yes, even though syntactic bootstrapping alone cannot give learner information delicate and specific enough. Semantically close verbs need to be observed from the world of objects and events.
2. Are the Semantic/ Syntactic relations the same cross-linguistically?
   - Two features are stated as the universal principles of language design (Chomsky 1981):
     i. Every noun phrase must receive one thematic role, and it will hold that role in “surface syntax”.
     ii. Verbs encoding the relation between an agent and a proposition accept sentence complements.

3. Can the learner analyze the sound wave in a way that will support discovery of syntactic structure?
   - There’s a timing difference between the two bootstrapping proposals.
   - Some of the mapping rules have to be in place before the verb meanings are known.
   - Can infants parse? Infants are sensitive to universal markers of phrase boundaries.
     They parse sentences into (intonational?) phrases
   - Does the learner know the corresponding rules?  
   From the preferential looking procedure designed by Spelke, it is seen that  
   - children recognizes the order of phrases  
   - understand the semantic significance of the ordering for interpreting English speech.

Summary of syntactic bootstrapping:
1. languages exhibit strong and stable syntactic/semantic correlations
   \[\rightarrow\] predicts adult classificatory behavior.
2. infants in prelinguistic period can and do parse sentences to recover the analyses required for extracting subcategorization frame information.
3. children at a very young age understand the semantic values of at least some syntactic frames.
   *Big Bird is flexing (with) Cookie Monster* *(2-year-olds, 27mo = very good)*
   Moreover,
   - Syntax guides the choice of interpretive options in ambiguous observational circumstances.
     *The rabbit is gorping the duck* \[\text{vs}\] *The rabbit and the duck are gorping* *(mean age 24mo)*

Experimental stuff:
- Preferential looking procedure – one of the very few that works with toddlers
  - but still VERY difficult (with 2-year-olds): hard to set up, takes “hoards of infants” etc.
  - “Preschoolers will do just about anything to help out a puppet”

Fisher et al.
- feed/eat: *The elephant moaks* \[\text{vs}\] *The rabbit moaks the elephant*
- ride/carry: *The elephant moaks the rabbit*
- give/take: *The elephant moaks the ball from/to the rabbit*

Results: highly congruent responses; so frames must be available BEFORE verb meanings

The input
- Caretaker speech:
  - the 24 verbs most often used by mothers to infant has a distinctive syntactic distribution.
  - Maternal subcategorization pattern accounting for about 50% of the variance in the adult triad patterns (i.e. the three noun-phrases).
  - This is the strongest evidence in showing the power of syntactic bootstrapping.

Limitations
1. Not easy to decide which structures co-occurring with verbs should be considered as frame specifications or merely adjuncts.
2. Idiomatic verbs used in studies may be absent from the maternal input.
3. Largest problem: how learners acquire the semantic/ syntactic linking rules in the first place.
4. Neither one of the bootstrapping strategies works all the time, children have to utilize both imperfect procedures to derive the best fit between them.