Lexical Semantics
Week 9: Arguments, alternations, and lexical decomposition

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What do we know when we know the meaning of a word?

- if it's concrete (a type of object – *pan*, or a property – *round*), we know how to pick out objects in the world that satisfy the description
- we also know how to use the word in a sentence
  - its grammatical category (verb, noun, adjective) and where to put it in the sentence
  - what other (kinds of) words can combine with it: selectional restrictions

Today, we'll focus on the meanings of verbs:

- what do verbs tell us about the situations they describe?
- what do they specify about the participants involved?
- how can we relate this kind of information to more 'grammatical' or compositional information that we have about the verb
- we'll focus on *break* (and similar verbs), and contrast it with other verbs to try and answer these questions

1 Semantic roles and argument structure

> "A grammatical description of a language is successful if it accounts for precisely the faculty that an ideal speaker of the language has in producing and understanding the grammatical sentences in his language."
>
> Fillmore 1970, p.121

Question: what are the **specific** things that a speaker knows that account for the ability to use *hit* and *break* correctly?

- as Fillmore notes, there's a way in which it seems weird to look at individual words of this sort: isn't this too specific to tell us anything about language overall?
- the case study shows that the answer is no – in fact, by comparing these two verbs, we learn a lot about the kinds of information that must be part of our lexicon!

Semantic roles vs. grammatical relations:

- it's intuitively obvious that verbs specify restrictions on their arguments: how many, and what kind
- but if all a verb like *break* does is specify the number of arguments it takes, or just the grammatical relations (e.g., subject, object), then we'll need multiple lexical entries:

  (1) a. *break-1:* The stick broke. SUBJ
  b. *break-2:* John broke the stick (with a rock). SUBJ, OBJ, (OBLIQUE)
  c. *break-3:* The rock broke the stick (#with a hammer) SUBJ, OBJ

- and for *hit* as well:

  (2) a. *hit-1:* John hit the tree (with a rock). SUBJ, OBJ, (OBLIQUE)
  b. *hit-2:* A rock hit the tree (#with a stick) SUBJ, OBJ

- proposing independent entries in this way makes it difficult to account for important generalizations:
  - the SUBJ that appears with *break-1* is the same type (in some way) as the OBJ of *break-2*
  - the SUBJ of *break-3* is the optional oblique of *break-2*
  - *hit-1* and *hit-2* are parallel to *break-2* and *break-3*
  - the animacy of the subject affects whether or not there can be an oblique argument
- across all of the 'versions' of these verbs, we see the same kinds of participants
- Fillmore's idea: verbs encode features of their arguments as they relate to the main event
  - i.e., the lexical specification of a verb includes information about **semantic roles**, not grammatical relations
  - there may be independent rules governing how semantic roles are realized as different grammatical relations, but this isn't part of the lexical content of a specific verb

1.1 The grammar of *hitting* and *breaking*

- in *break-2* and *hit-1*, the NP that appears in subject position has the same sort of relationship to the main event: a volitional entity that *does* the action that the verb denotes
  - both *break* and *hit* involve an AGENT semantic role: this argument has to be both animate and volitional
- similarly, the optional oblique in *break-2* and *hit-1* is something that the agent uses to perform the action
  - both *break* and *hit* are associated with a INSTRUMENT role: this argument has to be non-volitional (at least with respect to the action)
- finally, all of the versions of both verbs involve an object – Fillmore's X – which receives the agent's action
- we can state the required semantic roles of these verbs as follows:

  (3) *break:* (AGENT) (INSTRUMENT) X
  (4) *hit:* AGENT|INSTRUMENT X (borrowing from reg-ex notation)

- specifying this type of information about verbs is particularly useful because it picks out classes of verbs that behave in the same way:

(5) **Verbs of *breaking*:** *bend, fold, shatter, crack* **change of state verbs**
   a. The plate cracked.
   b. Leo cracked the plate (with a stone)
   c. The stone cracked the plate (#with a mallet)

(6) **Verbs of *hitting*:** *tap, strike, bump, stroke* **surface-contact verbs**
   a. The table tapped.
   b. Leo tapped the table (with a pen).
   c. The pen tapped the table (#with its cap)

What can we say about X?

- in the terms we introduced last class, both Xs are *Patient*s (in the broad sense)
- Fillmore argues for making a distinction between these two roles:
  1. **Argument 1:** entailments of *hitting* and *breaking* are different, with respect to X
     - in one case, X must be changed; in the other, it need not be

       (7) I broke the window with a hammer. #It didn't faze the window, but the hammer shattered. [contradictory]

       (8) I hit the window with a hammer. It didn't faze the window, but the hammer shattered.

     - for *break*, X is an object (that is changed); for *hit*, X is a place (of impact)
  2. **Argument 2:** Objects and Places have different syntactic consequences
     - possessed body parts:

       (9) a. I broke/bent his leg.
           b. *I broke/bent him on the leg.

       (10) a. I hit/touched his leg.
            b. I hit/touched him on the leg.

     - (10)a and b are paraphrases of one another, but (9)b is ungrammatical
- for an item to be changed, the whole object needs to be involved; but surface contact only affects the point of contact
- one way of thinking about our knowledge of semantic role specifications is that this aspect of verb meaning tells us the properties of particular arguments
  - the reason that *The stone broke the window with a hammer* is semantically bad is that *stone* doesn't have the right properties to appear in this configuration
  - we're forced to interpret the stone as animate, which doesn't make sense
- similarly, *hitting* and *breaking* tell us something about the X argument

(11) a. John broke the top of the twarge.

b. John broke the left side of the twarge.

(12) a. John hit the top of the twarge.

b. John hit the left side of the twarge.

- from (11), we infer that a *twarge* is something that has discrete (probably separable) parts
- (12) is compatible with this, but also with an interpretation on which a *twarge* is a single solid object (which need not even be hard)

- Note: Fillmore's OBJECT corresponds to our PATIENT, in the narrow sense, and PLACE corresponds to THEME

2 Argument structure and alternations

Updated semantic role specifications for *hit* and *break*:

(13) *break:* (AGENT) (INSTRUMENT) PATIENT

(14) *hit:* AGENT|INSTRUMENT THEME

- Fillmore uses the PATIENT/THEME difference to explain a particular syntactic difference between *hit* and *break*
- the specifications also capture the syntactic patterns associated with the three *breaks* and two *hits*
  - ...because we wrote the specification out specifically to do this
  - so far, we don't have an *explanation* of these syntactic patterns
- the contrast between (1) and (2) also has to do with the meanings of *hit* and *break* verbs

Can we use the PATIENT/THEME difference to explain the contrasting patterns in argument realization?

- if the difference between the three options for *break* and the two for *hit* are associated with patients vs. themes, we expect:
  - (i) verbs with arguments, instruments, and patients should behave like *break*
  - (ii) verbs with arguments, instruments, and themes should behave like *hit*
- these predictions don't seem to hold up:
  - there are patient-having **change of state** verbs which do not have the *break-1* realization:

(15) a. *The bread cut.

b. Eva cut the bread (with a knife).

c. The knife cut the bread (#with scissors).

- these verbs show the possessed-part pattern of *hit*

  (16) a. I cut the left side of the cloth.
  b. I cut the cloth on the left side.

- so the PATIENT/THEME difference (or the OBJECT/PLACE) difference may not fully account for the behavior of *hitting* and *breaking* verbs
- (we could pursue this to make an argument against distinguishing patients and themes)
- even if the difference doesn't follow from the argument options, it has something to do with the meanings of these verbs

2.1 The causative alternation

Let's take a closer look at **change of state** verbs to try and understand why there are differences in their argument realization patterns:

- special feature of *verbs of breaking*: both intransitive and transitive forms

  (17) a. The window broke.
  b. John broke the window.

  - (17)a describes a change of state: the window goes from being broken to unbroken
  - (17)b adds to this the information that John did something to bring about or *cause* this change of state

- there are many verbs involving changes of state which show this alternation:

  (18) a. The door opened.
  b. Sara opened the door.

  (19) a. The soup cooled.
  b. Ailsa cooled the soup.

  (20) a. The rice cooked.
  b. Geoff cooked the rice.

  - in each case, the (a) sentence describes an object undergoing a change of state: this is an **inchoative** reading (since it describes the beginning stage of being in a new state)
  - the (b) sentences add a cause or causer: this is the **causative** form of a change of state verb (and verbs like *break, open, cool, cook* are often referred to as 'causative' verbs)

It's starting to look like *break-2* might be different from *break-1* after all (although the two are obviously related):

- roughly, we get from *break-1* to *break-2* by adding a meaning component that introduces causation

- two questions to ask in trying to understand how this alternation comes about (and how it relates to the meaning of *break, open* and so on)
  1. Why don't all intransitive verbs have a causative (transitive) counterpart?

     (21) a. The children played.
          b. *The teacher played the children.

     (22) a. The actor spoke.
          b. *The director spoke the actor.

     (23) a. The daisies bloomed.
          b. *The gardener bloomed the daisies.

  2. Why don't all causative transitive verbs have an intransitive counterpart?

     (24) a. *Lincoln assassinated.
          b. Booth assassinated Lincoln.
             ∼ *Booth did something that caused Lincoln to go from being alive to being dead.*

     (25) a. *Mysteries wrote.
          b. Agatha Christie wrote mysteries.

     (26) a. *The cake cut.
          b. Lara cut the cake.

- we'll focus on question one

2.2 Question 1: non-alternating intransitives

- if we get from *break-1* to *break-2* by adding a causer and some idea of cause, why doesn't this process work for all intransitive verbs?
  - it's perfectly coherent to imagine a teacher doing something which causes the children to play, but there's no causative version of *play*
- to make things worse, it doesn't even work for all intransitive change of state verbs
  - (23a) describes flowers going from being closed to being open
- the difference between verbs that show the causative alternation (like *break*) and verbs which do not has to do with the type of event being described
  - this is part of what we know when we know the meaning of a verb
- verbs which alternate describe events which have been called *externally caused*; verbs which do not have a causative transitive form describe *internally caused* events

Externally caused events:

- necessarily involve a cause external to the patient argument, with immediate control over bringing the event about
  - *break*: objects don't break entirely on their own, but when some kind of force is applied – the force has to be external, and so breaking events inherently have to involve an external cause(r).

  - we can describe objects in terms of these properties: *breakable, openable, lockable* ∼ if the right force is applied, the object will break/open/lock
- verbs denoting externally caused events: verbs describing certain changes of state, and verbs describing changes of position (with the change applying to a patient argument)
  - (externally-caused) **change of state** verbs: *bake, blacken, break, close, cook, dry, freeze, melt, open, shatter, thicken, widen* (Levin 1993)
  - **change of position** verbs: *bounce, move, roll, spin*
- transitive causative uses specify the cause of the changing event
- intransitive uses just describe the change (but the external cause is still implicitly understood to exist)

Internally caused events:

- cannot be controlled by something external to the patient; the explanation for internally-caused events lies entirely in the properties of the patient
  - contrast this with *break*, where the object's properties are relevant but not the whole story
  - something can be *breakable* (capable of being broken), but things can't be *bloomable*
- so, if the addition of *cause* meaning to an intransitive verb involves necessarily introducing a causer external to the patient, this explains why internally caused events only have inchoative forms
- some internally-caused event types:
  - verbs like *play* and *speak*: these don't describe changes of state, but they do describe actions that originate within an (animate) entity (in fact, an agent). The agent has the 'final say' in whether or not the event occurs, whether or not s/he wants to – there's no way to give control entirely to an external cause.

    (22) a. The actor spoke.
    b. *The director spoke the actor.

    (27) a. Eliud Kipchoge ran.
    b. *Nike ran Eliud Kipchoge.
  - verbs that involve animates, but describe processes or nonverbal expression: often events that cannot be volitional. These events aren't even really under control of the entity experiencing them, so control certainly can't be handed over to an external force

    (28) a. Sandra blushed.
    b. *The compliment blushed Sandra.

    (29) a. Nathan coughed.
    b. *The spicy food coughed Nathan.
  - verbs that involve inanimates, but also describe internal properties: verbs of light and sound emission. Only certain objects have the right properties, and the processes can't be controlled externally.

    (23) a. The daisies bloomed.
    b. *The gardener bloomed the daisies.

(30) a. The embers glowed.
b. *The breeze glowed the embers

(31) a. The fire smoked.
b. *The damp smoked the fire.

Bringing about internally-caused events:

- of course, it's possible for something external to set off or start an internally-caused process: a comedian tells a joke, and the audience laughs as a result
  - we express these situations by adding an extra verb:

    (32) a. The director made the actor speak.
    b. The spicy food made Nathan cough.
    c. The damp made the fire smoke.

- a *maker* has some control over the chain of events leading to an internally-caused event, but this is different from controlling the internally caused event itself
  - causers of (transitive) externally-caused events have a direct contact with the patient: John must do something to the window to break it
  - causers of *make*-sentences don't need this kind of contact
  - in fact, we can add a *make* to an externally-caused event as well:

    (33) Jean made Joan break the window $\not\rightarrow$ Jean broke the window.

The externally-caused/internally-caused distinction predicts causative alternation patterns:

- consider the pair *shake* and *shudder*:
  - *shake* describes an externally-caused sort of motion
  - *shudder* describes a (largely involuntary) internal process of the same kind of motion

(34) a. Ana shook.
b. I shook Ana.

(35) a. Ana shuddered.
b. *The movie shuddered Ana.

2.3 Question 2: non-alternating transitives

(26) a. *The cake cut.
b. Lara cut the cake.

(36) a. *The ball hit.
b. The batsman hit the ball.

- *cutting* and *hitting* are externally-caused processes, so why do they differ from *breaking* and *opening*?
- in breaking and opening events, properties of the patients also play a role in the event: things that break have to be rigid, things that open have to have parts that move in a certain way relative to one another

- in principle, you can cut or hit any kind of object: the properties of the patient don't play an important role in the event
- this is related to Fillmore's observations about OBJECTS (patients) vs. PLACES (themes)

  (11) a. John broke the top of the twarge.
  b. John broke the left side of the twarge.

  (12) a. John hit the top of the twarge.
  b. John hit the left side of the twarge.

  – we infer certain properties about 'twarges' from (11)a, b: because these properties are relevant to how the event comes about
  – all we learn from (12) is that a twarge is a physical object: no other properties matter

3 Externally-caused events and lexical decomposition

We can express the link between *break-1* and *break-2* in terms of a lexical decomposition:

- causative transitives have a cause element, which links an external causer tightly to the main event denoted by a verb (expressing that the causer has control over the main event): call this CAUSE

  (37) a. John broke the window.
  b. The window broke.
  c. CAUSE (x, BREAK (y))
  d. CAUSE (x, BECOME (y, BROKEN))

  (38) a. Sheppard killed Ackroyd.
  b. Ackroyd died.*
  c. CAUSE (x, DIE (y))
  d. CAUSE (x, BECOME (y, DEAD))

- even though both *break* and *kill* clearly have a causative element, there's a difference between them
  – even in the intransitive form, we still know that breaking events are externally caused
  – the intransitive 'form' of *kill* – *die* – is not necessarily an externally-controlled event
  – this suggests that there's a closer lexical relationship between the two versions of *break* than between *kill* and *die*
- some of our location verbs are also causative in nature

  (39) a. The Lone Ranger saddled the horse.
  b. The horse had a saddle on (after the saddling).
  c. CAUSE (x, (HAVE-ON (y, z))) & SADDLE (z)

The lexical element CAUSE (probably) does not have the same meaning as English *cause*:

- compare:

  (40) a. Floyd caused the window to open on Sunday by hitting it on Saturday.

b. #Floyd opened the window on Sunday by hitting it on Saturday.
If you open something, then you open it when it opens

(41) a. John caused Bill to die on Sunday by giving him poison on Saturday.

b. #John killed Bill on Sunday by giving him poison on Saturday.

Arguments for a decompositional analysis:

- It's possible to modify the 'embedded' result state predicate in a causative transitive
- some temporal modifiers have a 'homogeneity' requirement; combining them with a non-homogeneous predicate produces a repetition interpretation

(42) a. She stayed at home for two hours.

b. #She drove home for two hours.

(43) a. She slept until noon.

b. #She woke up until noon. (okay: She woke up repeatedly until noon)

- we can combine transitive causatives with *for* and *until* phrases without the repetition interpretation arising

(44) The city closed the road for two months. → *The road was closed for two months*

(45) We drew the curtains until morning.
→ *The curtains were drawn until morning*

- modification with *again* can have either a repetitive or a restitutive (restoring a former state) reading
  - repetitive readings:

(46) He visited us again last week.

(47) John blamed me again for writing the letter to the president.

  - an additional restitutive reading arises with some transitive causatives, expressing that something returns (once) to a previous state

(48) The city opened the road again.
possible: *The road was open, then the city closed it, and then it became open again as a result of the city doing something*

(49) We emptied the office again.
possible: *The office was empty, then not empty, then empty again.*

- *almost* can target either the cause-meaning or the result state predicate:

(50) The city almost closed the road.

a. The city almost took action to close the road, but left it open in the end. CAUSE

b. The city took action that almost closed the road, but not completely. result state

(51) John almost killed Bill.

a. John almost took action to kill Bill.

b. John took action that almost killed Bill.

- the decompositional structure proposed in (37)-(38) predicts inference patterns:

(52) causative *close*:

a. Lexical decomposition: CAUSE (x, BECOME (y, CLOSED))

b. Change of state: BECOME (y, CLOSED)

c. Result state: CLOSED(y) (at time t_{after})

d. Previous state: NOT (CLOSED(y)) (at time t_{before})

– the causative description entails the change of state description: (52)a $\vdash$ (52)b

– the causative description and the change of state description both entail the result state: (52)a $\vdash$ (52)c, (52)b $\vdash$ (52)c

– the truth of the previous state predicate is presupposed by the change of state description:

(53) a. The window closed. → The window was open.

b. The window didn't close. → The window was (and still is) open.

– so the causative description also presupposes the previous state predicate:

(54) a. Jody closed the window. → The window was open.

b. Jody didn't close the window. → The window was (and still is) open.

4 References

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