

The logical form of lexical semantics

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ESSLI 2022, Session 2

Section 1

Manner/Result Complementarity

The kinds of puzzles we'll deal with:

- (1) a. Leila swept.
b. *Kelly broke.
- (2) a. Cinderella scrubbed her fingers to the bone.
b. *The clumsy child broke his knuckles to the bone.
- (3) a. The child rubbed the tiredness out of his eyes.
b. *The clumsy child broke the beauty out of the vase.

From Fillmore (1970), through Levin and Rappaport Hovav (1991), to Beavers and Koontz-Garboden (2020) and Ausensi (2021).

Basic patterns

- Let's start with a few verbs and see if we can drop the object.
- What's going on?

Result: Object deletion

✓ fine:

- (4) a. Chris swept the floor.
b. All last night, Chris swept.
- (5) a. Chris scrubbed the floor.
b. All last night, Chris scrubbed.

✗ nope:

- (6) a. Chris broke the vase.
b. *All last night, Chris broke.
- (7) a. Chris dimmed the lights.
b. *All last night, Chris dimmed.

Objects or Themes?

Reminder: syntax and semantics are not always *isomorphic*.

Some arguments are there in the syntax and not the semantics.

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Dummy pronouns vs implicit agent of passives.

What's going on in our examples?

Is this about:

- The syntactic *object*?
- The semantic *Theme*?
- Both at the same time?

What's your intuition? How can we test it?

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Objects or Themes?

Hypothesis: it's a semantic effect of the Theme.

Prediction: Result verbs wouldn't allow **unselected objects** but Manner verbs would be ok. (Ausensi 2019, 2021)

Resultatives (unselected objects)

(8) Manner, ok:

- a. Kim scrubbed **her fingers raw**.
- b. The joggers ran **the pavement thin**.
- c. The child rubbed **the tiredness out of his eyes**.

(9) Result, bad:

- a. *The robot broke **its arms oily**.
- b. *Kim dimmed **her eyes sore**.
- c. *We cooled **the people out of the room** with the air-conditioner on too high.

(Levin and Rappaport Hovav 1995; Rappaport Hovav and Levin 1998, 2010; Rappaport Hovav 2008; Beavers and Koontz-Garboden 2012)

Let's look at an entirely different kind of unselected object.

Out-prefixation

- (10) a. I danced.
b. *I danced Eryl.

- (11) a. *I out-danced.
b. I out-danced Eryl.

- ❶ What do these examples show about the **syntactic effect** of adding the *out*- prefix to a verb?
- ❷ What's the relation between the **meaning** of the verb with and without *out*-?

Out-prefixation

The following verbs seem to allow *out*-prefixation easily:

- (12) a. swim, dance, jump, eat.
b. I out-swam/out-danced/out-jumped/out-ate Eryl.

But these ones resist it (at least with the meanings they have when used with just a subject and no object).

- (13) a. appear, arrive, die.
b. *I out-appeared/out-arrived/out-died Eryl.

What's the difference?

Initial generalization on *Out*-prefixation

Out-prefixation attaches to verbs that don't *need* an object, and creates a standard of comparison out of the new object.

See Ahn (To appear).

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Bonus: do the following sentences change our description of the semantics of *out-* prefixation?

- (14)
- a. I out-ran the bus.
 - b. *The bus ran (progressed down the street)
 - c. I out-grew my pajamas.

Manner/Result and *out*-prefixation

What's our prediction?

The *out*-object is not selected by the lexical root, so it should be ok with Manner but not with Result.

(15) Manner:

- a. Cinderella outswept her stepsisters.
- b. Cinderella outscrubbed her stepsisters.

(16) Result:

- a. *Kim outbroke the other vase-smasher.
- b. *Our stage-hand outdimmed your stage-hand.

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More unselected objects

- If the result is encoded in the Result verb, we can't have other results.
- This is similar to unselected objects.
- Manner allow many kinds of resultatives (because you can get different results), but Result are more limited.

Result: Restricted resultatives

Manner:

- (17) a. Chris wiped the table clean/dry/shiny/spotless.
b. Chris ran their shoes ragged/threadbare.
c. Chris laughed themselves silly.

Result:

- (18) a. Amal broke the vase into pieces/in half.
b. *Amal broke the vase off the table/valueless.
c. *Amal broke her hands bloody.
- (19) a. Amal froze the soup solid.
b. *Amal froze the soup onto the table/tasteless.
c. *Amal froze herself tired.

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Diagnostics so far:

Test	Manner	Result
Theme deletion	OK	X
Unselected object	OK	X

Let's check out a few more!

Result diagnostics

Now let's move to semantic entailments.

Result: Denial of result

If the change is entailed, we can't deny it.

- (20)
- a. #Noah just broke the vase, but it is not broken.
 - b. #Noah just destroyed the city, but it is not destroyed.
 - c. #Noah just died, but he is not dead.

But this is almost tautological. So Beavers and Koontz-Garboden allow for different results:

- (21)
- a. #Noah just broke the vase, but nothing is different about it.
 - b. #Noah just destroyed the city, but nothing is different about it.
 - c. #Noah just shattered the glass, but nothing is different about it.
- (22)
- a. #Noah's tree just decayed, but nothing is different about it.
 - b. #Noah's cat just died, but nothing is different about it.
 - c. #Noah's flower just wilted, but nothing is different about it.

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Result diagnostics

Denial of result is ok with Manner verbs:

- (23) a. Alex just wiped the table, but nothing is different about it.
b. Alex just hit the wall, but nothing is different about it.
- (24) a. Alex just worked hard, but nothing is different about her.
b. Alex just swam quickly, but nothing is different about her.

I'm not aware of large-scale acceptability studies testing these entailments, or much crosslinguistic work (but I'll tell you about what I do know on Thursday).

How about:

- (25) a. Alex just swept the floor, but nothing is different about it.
b. Alex just exercised for hours, but nothing is different about her.

Diagnostics so far

Test	Manner	Result
Theme deletion (*)	OK	X
Unselected object (*)	OK	X
Resultatives (*)	OK	Restricted
Denial of result (#)	OK	X

- These were diagnostics probing the Result component.
 - Can think of them as three syntactic (acceptability/grammaticality) and one semantic (entailments).
 - Though not everyone would agree with this characterization.
 - We'll also look at diagnostics probing the Manner component.
- Vanishingly little work on these patterns in languages other than English!
 - Some diagnostics translate better than others.
 - Entailments should be universal, but *out*-prefixation isn't.
- Let's take a step back and try to conceptualize the difference.

Levin and Rappaport Hovav (2013) 50:

Manner and result meaning components are in complementary distribution: a verb lexicalizes only one.

Beavers and Koontz-Garboden (2012) 333; Ausensi (2021) 44:

- ① A simplex verb can only encode a manner of action or a result state, but never both.
- ② A single root is associated with the event structure as a modifier or as an argument, but never as both.

The logic of the two classes

We already have enough background to think about the distinction some more.

Manner

eat, bash, bellow, dance, flutter, hit, jog, jump, laugh, murmur, nibble, pour, roll, rub, run, scour, scream, scribble, scrub, shout, spin, sweep, swim, walk, whisper, wipe, yell

Result

admit, approach, arrive, break, clean, clear, come, cover, declare, destroy, devour, die, empty, enter, faint, fall, fill, freeze, go, increase, kill, melt, near, open, proclaim, propose, remove, rise, say

- 1 See if you can divide the Result verbs into sub-classifications.
- 2 Can you propose a generalization for what the difference between Manner and Result amounts to?
- 3 If you have time, try to divide the Manner ones as well.

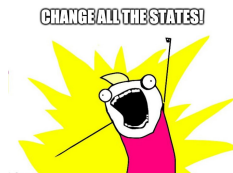
Result verbs:

- ① Change of state (COS): *break, clean, clear, cover, destroy, devour, die, empty, faint, fill, freeze, increase, kill, melt, open, remove*
- ② Directed motion: *approach, arrive, come, enter, fall, go, near, rise*
- ③ Speech act: *admit, declare, proclaim, propose, say*

Manner verbs:

- ① Manner of motion: *dance, flutter, jog, jump, run, spin, swim, walk*
- ② Manner of speaking: *bellow, laugh, murmur, scream, shout, whisper, yell*
- ③ Manner of hitting: *bash, hit*
- ④ Manner of displacement: *pour, roll, rub, scour, scrub, sweep, wipe*
- ⑤ And more: *eat, nibble, scribble*

How can you tell whether you've completed the action?



So far we've only looked at COS verbs among the Result ones really.

Non-COS Results

Directed motion as Result: (Beavers 2011)

- (26) a. John just descended (to the cave), #but he is not somewhere else.
- b. The rocket just fell (into the hole), #but it is not somewhere else.
- c. Sally just arrived (in the UK), #but she is not somewhere else.
- (27) a. John just jogged for hours, but he is not somewhere else.
- b. John just ran for hours, but he is not somewhere else.
- c. John just swam for hours, but he is not somewhere else.

Rationale:

- Levin (2017): to know whether there's COS you need to know whether a given entity is in that state.
- If you're **measuring out a scale**, you need to know what does the measuring out.
- In slogan form:
 - Result \leftrightarrow scalar change.
 - Manner \leftrightarrow non-scalar change.
- (But you can say *Chris ate* without a syntactic representation of what was eaten, and it's still ok)

Now let's return to diagnostics targeting Manner. What are we looking for?

Result can be targeted by denial of result, so Manner can be targeted by denial of *action*.

Manner: Denial of action

- (28) a. #Chris ran, but didn't move a muscle.
b. #Chris wiped the table, but didn't move a muscle.
c. #Chris worked, but didn't move a muscle.

What would this test look like for Result verbs?

Beavers and Koontz-Garboden (2012) suggest negligence:

- (29) a. Jim destroyed his car, but didn't move a muscle — rather, after he bought it he just let it sit on his neighbor's lawn on cinder blocks, untouched, until it disintegrated.
b. Kim broke my DVD player, but didn't move a muscle — rather, when I let her borrow it a disc was spinning in it, and she just let it run until the rotor gave out!

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Manner: Selectional restrictions on the subject

If a verb encodes manner of action, then it encodes how the action happens, so it encodes the subject.

Result:

- (30) a. The child accidentally broke/destroyed the vase.
b. The earthquake broke/destroyed the vase.
c. The hammer broke/destroyed the vase.

Manner:

- (31) a. *The wind wiped/swept the floor.
b. *The mop wiped/swept the floor
- (32) a. Morgan wiped/swept the floor.
b. *Morgan **accidentally** wiped/swept the floor.

Manner: Complexity of action

If actions are complex, then they're durative. See Beavers and Koontz-Garboden (2012).

Summary

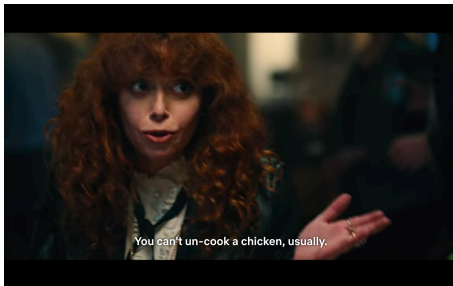
Manner/Result Complementarity: Manner and result meaning components are in complementary distribution; a verb lexicalizes only one.

Our diagnostics:

Test	Manner	Result
Theme deletion (*)	OK	X
Unselected object (*)	OK	X
Resultatives (*)	Free	Restricted
Denial of result (#)	OK	X
Denial of action (#)	X	OK
Subjects (*)	Restricted	Free
Complexity of action	Complex	Simple

These patterns make sense if we think of events as denoting changes on a scale.

Summary



Section 2

Formal tools

- We said that: (Rappaport Hovav and Levin 2010)
 - Result roots need something to measure out the change of state.
 - Manner roots are fine with activities that do not lead to change.
- Result = scalar change, manner = nonscalar change.
 - Scalar change: directed change in value of one attribute.
 - Nonscalar change: separate events that constitute an action, but don't add up to one single change along some dimension.
- Subclassification of Result:
 - COS and directed motion are the same event, except with a different scale.
 - Change of location vs change of state.
 - Both can be measured out (Dowty 1991).

In case you need a definition of a *scale*: (Beavers and Koontz-Garboden 2012)

- ① Some property or dimension δ .
- ② A set S of degrees or intervals for δ .
- ③ An ordering R for members of S .

Let's think next about the syntax we need.

Event structure templates

A lot of the “earlier” Levin and Rappaport-Hovav analysis was framed in terms of event structure *templates*.

Let’s look at the formalism directly and try to decode it: (Dowty 1979)

- (33) a. [x ACT <ROOT>]
b. [[x ACT] CAUSE [y BECOME <ROOT>]]

1 Architecture

- We have some lexico-syntactic primitives.
- We have some templates they can fit in.
- Roots can be in only one slot.

2 The lexicalization constraint: A root can only be associated with one primitive predicate in an event schema, as either an argument or as a modifier.

3 Evaluation

- How do you know which root goes with which template?
- What is the motivation for these primitives?

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Can probe the existence of a complex structure.

What's the evidence for having separate CAUSE and BECOME operators?

[Chris CAUSE [door BECOME open]]

again (Stechow 1996; Beck and Johnson 2004)

What are the possible readings for:

(34) Chris opened the door again.

- (35) a. The door had been open before. Maybe it was built open, then someone closed it, then Chris opened it. [*restitutive*]
b. Someone else opened the door, someone closed the door, and then Chris opened the door. [*repetitive*]
c. Chris had already opened the door once, then they opened it a second time. [*repetitive*]

Again can modify either becoming-open (restitutive, a), or causing-something (repetitive, b–c).

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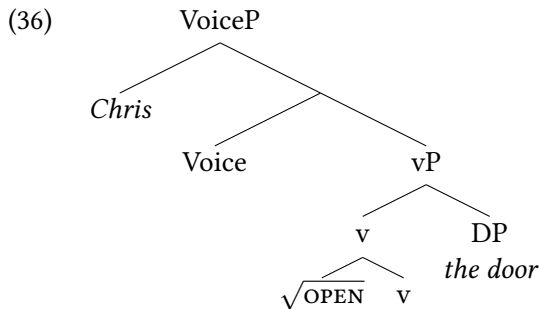
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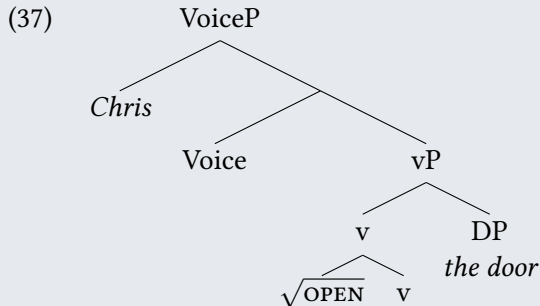
Event and argument structure

Contemporary work in generative syntax, usually combined with Distributed Morphology, usually assumes something like this:



(Kratzer 1996; Halle and Marantz 1993; Alexiadou, Anagnostopoulou, and Schäfer 2015; Kastner 2020)

Sublexical modification



(38) In such a structure, *again* could adjoin to:

- The root $\sqrt{\text{OPEN}}$ (restitutive).
- The vP or VoiceP (repetitive).

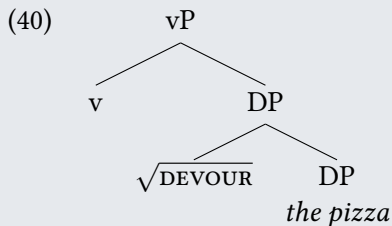
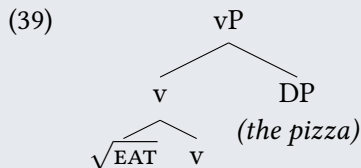
Incidentally, this is one of two strong arguments against First Phase Syntax (Ramchand 2008); the other is that only 2 of the 3 are ever lexicalized.

Event and argument structure

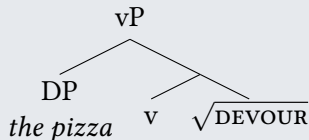
Combinations of roots and structure

Alternative to event structure templates:

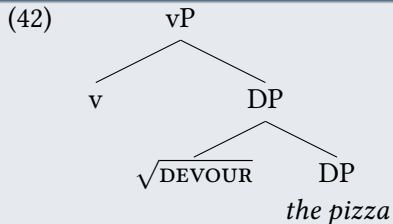
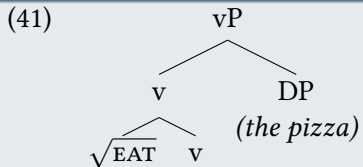
(based on Embick 2009; Irwin 2012; Marantz 2013; Ausensi 2021 but not an actual proposal of any of them)



or



Combinations of roots and structure



- ❶ Here we stipulate what element in the tree a given root can modify.
 - (or be a complement of, in some approaches)
- ❷ Manner/Result: is there some way to derive these restrictions?
 - Ausensi: only roots with an event component can modify v.
 - We need to return to the actual denotation - the logical form for our lexical semantics.
- ❸ Complementarity: a root can't be in two places at once.
 - (But what if it *moves*? Folli and Harley 2020)

The content of roots

What should the actual denotation of roots be? Suggest denotations for $\sqrt{\text{DANCE}}$ and $\sqrt{\text{OPEN}}$.

$$(43) \quad \llbracket \sqrt{\text{DANCE}} \rrbracket = \lambda e[\text{dance}(e)]$$

$$(44) \quad \llbracket \sqrt{\text{OPEN}} \rrbracket = \lambda x \lambda s[\text{open}(x, s)]$$

$$(45) \quad \llbracket \sqrt{\text{CRACK}} \rrbracket = \lambda x \lambda s[\text{cracked}(x, s) \wedge \exists e[\text{become}(s, e)]]$$

(Beavers and Koontz-Garboden 2020; Ausensi 2021)

- What do these explain?
- Can we derive the behaviour of the diagnostics?
- The semantics is doing a lot of work, which needs to be fleshed out!
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We'll need to modify the denotations for other kinds of roots. For example, some require intention: (Ausensi, Yu, and Smith 2021)

- (46) $\llbracket \sqrt{\text{MURDER}} \rrbracket: \lambda x. \lambda y. \lambda e [\text{causer}(e) = y \wedge \sqrt{\text{murder}}(e) \wedge \text{theme}(e) = x]$
where $\sqrt{\text{MURDER}}(e) = 1$ iff $\exists s [\text{cause}(e, s) \wedge \text{dead}(s) \wedge \text{holder}(s) = \text{theme}(e) \wedge \text{intend}(\text{causer}(e))(\exists z, e', s' [\text{cause}(e', s') \wedge \text{dead}(s') \wedge \text{holder}(s') = z])]$

A strongly constructionist alternative

- Mateu and Acedo-Matellán (2012) suggest that any root could attach anywhere. (Borer 2013; Acedo-Matellán and Mateu 2014)
- If a root attaches in modifier position, you get Manner. If it attaches in complement position, you get Result.

(47) He broke into the room. [root modifier, manner interpretation]

(48) The glass broke. [root complement, result interpretation]

- But is it true that it could attach anywhere?
 - Irwin and Kastner (2020): obviously not.
 - Oltra-Massuet et al. (2017): experimentally not.

- ① We need to write the right semantics into the roots.
- ② We need to set up the right syntax (to allow for e.g. sublexical modification).
- ③ We need to constrain how the roots and the syntax combine.
- ④ We need to show how the analysis derives the facts that motivate the division into verb classes in the first place.

I think we're only partway there for Manner/Result Complementarity.

Section 3

Manner and Result together after all?

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Manner and Result

- It's been argued that some roots/verbs encode both Manner and Result.
- Result with manner: *braise, sauté, poach*, etc.
- Also: verbs of killing (*poison, drown, hang, electrocute, crucify, guillotine*).
- Also: ditransitive verbs of directed motion (*lob, kick, flick, throw, toss*).
- Also: verbs of stealing (*steal, rob, snatch, seize, confiscate*).

Construct the relevant examples, apply the diagnostics and test the claim!

Test	Manner	Result
Theme deletion (*)	OK	X
Unselected object (*)	OK	X
Resultatives (*)	Free	Restricted
Denial of result (#)	OK	X
Denial of action (#)	X	OK
Subjects (*)	Restricted	Free

Obligatory Theme (+Result)

- (49)
- a. * All last night, Finley braised.
 - b. * All last night, Finley poached.
 - c. ?? All last night, Finley sautéed.

Denial of result (+Result)

- (50)
- a. #Finley just braised the chicken, but nothing is different about it.
 - b. #Finley just poached the egg, but nothing is different about it.
 - c. #Finley just sauteed the onions, but nothing is different about them.

Restricted resultatives (+Result)

- (51) a. #Finley braised the duck to the back of the oven. (e.g., if the temperature was so hot it somehow caused the pan to move)
b. #Finley poached the egg in half.
c. #Finley sauteed the onions straight.
- (52) a. *Finley braised the pan dry. (e.g., while braising duck)
b. *Finley poached the water bacteria-free. (e.g., while poaching an egg)
c. *Finley sauteed the seasoning off the pan. (e.g., while sautéing onions)

Denial of action (+Manner)

- (53) a. #Finley braised the chicken, but didn't move a muscle.
b. #Finley poached the egg, but didn't move a muscle.
c. #Finley sautéed the onions, but didn't move a muscle.
- (54) (A salmon fillet is in a pan waiting to be poached, and Riley is in charge of making sure nothing happens to it until dinnertime. Jessie turns up the heat in the apartment so high the water in the pan starts to simmer anyway, cooking the salmon.)
Riley poached the salmon, but didn't move a muscle—rather, they just sat there while the heat simmered the water.

Agent entailments? (+Manner)

- (55) Finley braised/sauteed the duck in a new Le Creuset pan.
- (56) a. ??Finley's Le Creuset pan braised/sautéed the duck perfectly.
b. ??The heatwave/even heat braised/sautéed the duck to perfection.

- The situation is very similar with verbs of killing - perhaps even clearer.
- *poison, drown, hang, electrocute, crucify, guillotine.*
- We'll go over the examples quickly. I'll leave the gruesome details (literally) in the slides for you to go through later.

Obligatory Theme (+Result)

- (57) a. * All last night, John murdered.
b. * All last night, John slew.
c. * All last night, John assassinated.
d. * All last night, John massacred.
e. * All last night, John slaughtered.
- (58) a. * All last night, John hanged.
b. * All last night, John crucified.
c. * All last night, John poisoned.

Verbs of killing

Result is entailed (+Result)

- (59) a. #Jane just drowned Joe, but nothing is different about him.
b. #Jane just hanged Joe, but nothing is different about him.
c. #Jane just crucified Joe, but nothing is different about him.
- (60) a. #The elf just murdered the gnome, but he is not dead.
b. #The wizard just slew the dragon, but it is not dead.
c. #The knight just assassinated the king, but he is not dead.
d. #The witch just massacred the monsters, but they are not dead.
e. #The archers just slaughtered the ogres, but they are not dead.
- (61) a. #The elf just murdered the gnome, but nothing is different about him.
b. #The wizard just slew the dragon, but nothing is different about it.
c. #The knight just assassinated the king, but nothing is different about him.
d. #The witch just massacred the monsters, but nothing is different about them.

Restricted resultatives (+Result)

- (62) a. #Spencer drowned Kit blue.
b. #Spencer hanged the prisoner thin.
c. #The Romans crucified Jesus to the tomb.
d. #Spencer drowned Kit's lungs full of water.
- (63) a. *The spy murdered his hands bloody. (cf. Kim scrubbed her fingers raw)
b. *The knight slew his sword bloody. (cf. John ran his shoes ragged)
c. *John assassinated himself tired. (cf. John laughed himself tired)
d. *John slaughtered his fingers raw. (cf. Kim scrubbed her fingers raw)
e. *John massacred himself into prison. (cf. He effectively talked himself into prison)

Agent entailments (+Manner)

- (64) a. #The wind hanged/crucified Jesus (by opening the trap door/raising his cross).
b. #The heavy wind guillotined the queen (by loosening the blade).
c. #The rusty blade guillotined the queen.
- (65) a. The elf killed the gnome unintentionally/by accident.
b. The elf killed the gnome intentionally/on purpose.
- (66) a. #The elf murdered the gnome unintentionally/by accident.
b. #The wizard slew the ogre unintentionally/by accident.
c. #The knight assassinated the king unintentionally/by accident.
d. #The witch massacred the monsters unintentionally/by accident.
e. #The archers slaughtered the ogres unintentionally/by accident.

Denial of action (+Manner)

- (67) a. #The governor crucified/electrocuted the prisoner, but didn't move a muscle. Rather, after taking office she failed to issue a pardon!
- b. #The governor drowned/hanged the prisoner, but didn't move a muscle. Rather, during the execution she just sat there, tacitly refusing to order a halt!

Out-prefixation (+Manner)

- (68) a. ?My executioner can outdrown your executioner's sorry ass any day.
b. ?My executioner can outhang your executioner's sorry ass any day.
c. ?My executioner can outcrucify your executioner's sorry ass any day.
- (69) a. Eventually he outmassacred all his rivals.
b. He outmurdered all the other dictators combined.

Discussion of counterexamples

Result with manner: *poison, drown, hang, electrocute, crucify, guillotine*

Are these true counterexamples?

Discussion of counterexamples

Result with manner: *poison, drown, hang, electrocute, crucify, guillotine*

Are these true counterexamples? We can divide them into three subclasses.

- Multimorphemic: *Electrocute, crucify*
 - Multimorphemic.
 - We're ok if Manner/Result Complementarity is a property of **roots**, not **verbs**.
 - So the affix can turn the verb into a result one, even if the root is Manner.
- Denominal:
 - Can explain *guillotine* in a similar fashion since it's clearly denominal.
 - We might then be ok with *poison* if we say it's also denominal.
- Rappaport Hovav (2017): detailed case study of *drown*.
 - Result of submerging, but no death is entailed - that's just an inference. You can also drown something in water while cooking it.
 - Not necessarily agentive (i.e. Manner) - can be natural forces.
 - One could propose something similar for *hang*.

So less like the Wildes and more like a Claddagh ring?



Section 4

Summary

Summary

- ❶ What are the most robust crosslinguistic generalizations regarding the interaction between lexicon and grammar?
 - Manner/Result Complementarity is a strong contender.
- ❷ What formal tools can account for these?
 - Combination of root denotations with event structure (syntax).
- ❸ Is it possible to reach a constrained inventory of lexical semantic primitives?
 - So far we've considered become(e,s) and possibly intend().
- ❹ (How can these claims be tested experimentally and modeled computationally?)

Other issues

- Other types of scalar change (Rappaport Hovav 2014; Beavers and Koontz-Garboden 2017, 2020).
- Which semantic primitives live only on functional elements and which only on roots (if any)?

Section 5

Further reading

- Levin and/or Rappaport-Hovav.
- Beavers and/or Koontz-Garboden.
- Ausensi, Smith and/or Yu.
- Bale (2007)
- Husband (2011)
- Glass (2021)
- Winter (To appear) on word classes (syntactic categories).

Section 6

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