

# Necessity and Sufficiency in the Semantics of English Periphrastic Causatives

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## The Basic puzzle

What does causative *make* mean?

- (1)
    - a. John made the children dance.
    - b. John caused the children to dance.
- Both sentences: John 'brought about' the dancing of the children.
  - (1a) says more.
  - But what?
  - **Preliminary answer:** that the children did not have a say in the matter, that the will of the children was immaterial.
  - This is what I call the COERCIVE IMPLICATION of *make*.

## The Basic Puzzle (cont'd)

What does causative *make* mean?

- (2)  $make(S, O, P) = cause(S, O, P)$  & if  $O$  had not wanted  $P(O)$  to come about, it still would have.
  - Done.
  - Not so fast!
  - *Make* can take non-volitional, even inanimate surface objects (= 'causees').
- (3) The sun made the flowers wilt.

### Problem

- We want to predict the coercive implication.
- We cannot make reference to the causee's volitional state.

## The Basic Puzzle (summary)

What does causative *make* mean?

### Wanted:

- A **unified** semantics for *make*, ...
- that predicts the coercive implication with volitional causees, ...
- but also applies to non-volitional causees.

- 1 *make* is not a hyponym of *cause*
- 2 *make* as predicating sufficiency
- 3 Characterizing sufficiency
- 4 Conclusion

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## A misleading intuition

*make* is not a hyponym of *cause*

(2)  $make(S, O, P) = cause(S, O, P) \ \& \ \dots$

- Plausible, widely shared intuition (Lewis 1973, and many after him):
  - *cause* entails 'counterfactual necessity'
  - i.e. (4) entails (5):

(4) The recession caused John to lose his house.

(5) (Other things being equal,) If the recession had not happened, John would not have lost his house.

## A misleading intuition

*make* is not a hyponym of *cause*

**Claim:** *make* does **not** entail counterfactual necessity.

- i.e., despite appearances, (6) does not entail (7):

(6) Society made me kill.

(7) If society had not been the way it was, I would not have killed.

### Example (Failure of necessity-entailment)

(8) Last year, I was not sure if I should go to band camp, but then my mother insisted that I go. **I am so happy she made me go:** I had the best summer ever.

*Does not entail:* If the mother of the speaker had not insisted, the speaker would not have gone to band camp.

### Summary

- *make* does not entail counterfactual necessity.
- New questions:
  - How do we characterize the 'bringing about' component of *make*?
  - Why does it often **seem** as if *make* entailed counterfactual necessity?

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## Introducing sufficiency

- Idea: *make* predicates SUFFICIENCY (as opposed to necessity)
- Let us assume that (9), roughly, means (10):
  - (9) The thunderstorm made the children scream.
  - (10) The thunderstorm was sufficient for the screaming of the children.
- What does (10) amount to?
- Preliminary characterization: An event being sufficient for another means that the first **ensures** that the second happens.
  - (11) The thunderstorm ensured that the children screamed.
  - (12) Given the thunderstorm, the children could not but scream.

## Introducing sufficiency

Benefit 1: The coercive implication comes for free

### Assumption:

$A \text{ made } B \text{ VP} \simeq A \text{ ensured that } B \text{ VPed.}$

- We have not encoded the coercive implication directly.
- Yet, it arises directly **when the embedded eventuality is a volitional action.**
  - (1a) John made the children dance.  
⇒ What John did ensured that the children would dance.
- Given sufficiency, the children cannot have acted freely.
  - Suppose they did.
  - Then they could have decided to do otherwise.
  - But then, it is not appropriate to say that John **ensured** that the children would dance.

## Introducing sufficiency

Benefit 2: Causal Perfection

### Assumption:

$A$  made  $B$  VP  $\simeq$   $A$  was sufficient for  $B$ 's VPing.

- There is a strong tendency to interpret statements of sufficiency as asserting necessity, as well.
- This is known as **CONDITIONAL PERFECTION** (Geis and Zwicky 1971, van der Auwera 1997, Horn 2000, von Fintel Ms., Franke 2009)

- (13) If you study for the exam, you will get an A.  
     $\rightsquigarrow$  If you don't study for the exam, you will not get an A.
- (14) If you study for the exam, you will get an A. Actually, even if you don't study you might get an A.

## Introducing sufficiency

Benefit 2: Causal Perfection

### Claim

*make* predicates sufficiency, the necessity implications come about pragmatically through perfection.

- Challenge: There should be contexts where the necessity can be coherently denied.
- And there are:  

(15) My husband's arrest (finally) made me get a divorce.  
    ... Even if his arrest had not made me do it, I might have gotten a divorce anyways, given the way he treated me.

## Introducing sufficiency (Summary)

### Summary

Assuming that *make* predicates sufficiency ...

- ... allows to capture the coercive implication without hard-coding it.
- ... gives us a handle on the perceived necessity implications of *make*, explaining them as instances of perfection.

## Outline

- 1 *make* is not a hyponym of *cause*
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## Characterizing sufficiency

- First shot: If  $C$  was sufficient for  $E$ , then **nothing other than  $C$  was necessary for  $E$** .
- Too strong: This way, nothing would ever be sufficient.
- Second shot: If  $C$  was sufficient for  $E$ , then **nothing that happened after  $C$  was necessary for  $E$** .
- We use a Thomason (1984)-style forward-branching model of time.
- $make$  quantifies over worlds that **were possible futures of the actual world at the time of the cause**.

## Characterizing sufficiency

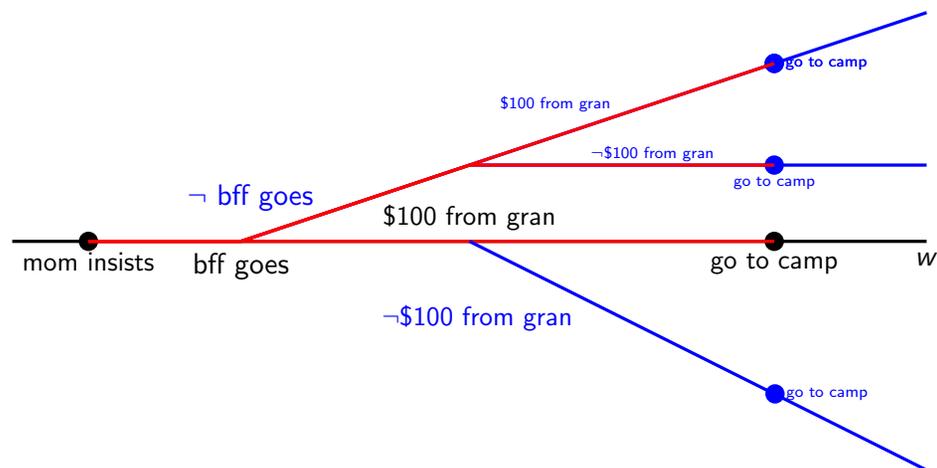
The basic idea

- $make$  quantifies over worlds that **were possible futures of the actual world at the time of the cause**.
- **All** such worlds? Again, too strong:  
(1a) John made the children dance.
- (1a) clearly does not say that **nothing could have happened** to prevent the children from dancing.
- Idea: We look only at the futures **in which arbitrary sets of events that occurred after the cause did not happen**.

## Characterizing sufficiency

An illustration

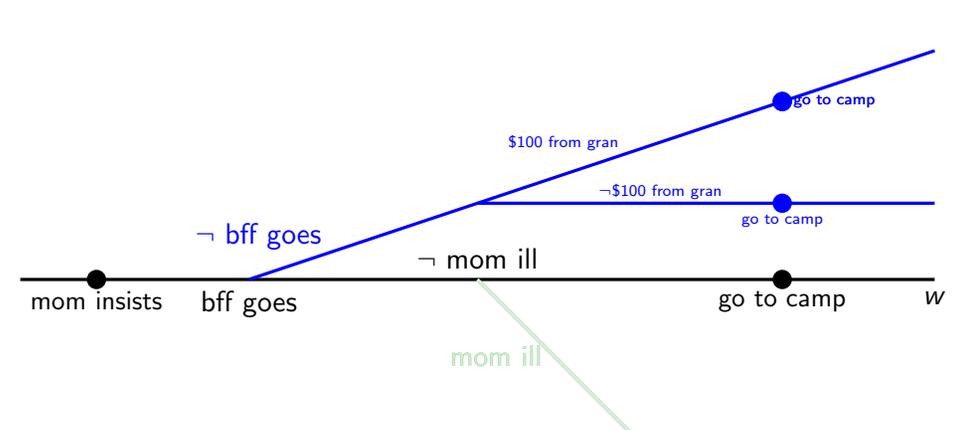
Leah's mom made her go to band camp (by insisting that she go).



## Characterizing sufficiency

An illustration

Leah's mom made her go to band camp (by insisting that she go).



## Characterizing sufficiency

The upshot

- $make(S, O, P) = \forall w' \in Fut_{w,S} : w' \models P(O)$   
where  $Fut_{w,S} :=$  the continuations of  $w$  at the time of  $S$  in which any set of events occurring in  $w$  did not occur.
- See Jayez and Dagnat (2009) for a characterization of 'automaticity' that is based on a very similar analytic intuition.
  - Pseudo-imperatives
    - (16) Come one step closer and I kiss/kill you.
  - von Fintel and Iatridou (2007): Sufficiency Modal Constructions
    - (17) To get good cheese, you only have to go to the North End!

## Characterizing Sufficiency

Two refinements

- Relative similarity.
  - We cannot always just 'kick out' certain events without introducing new ones.
  - For an event that actually occurred may have prevented another event from happening.
  - So we really have to look at worlds that are **maximally similar to the actual world** in which some actual events did not happen.
- Non-triviality.
  - As characterized so far, **every event subsequent to a sufficient cause counts as a sufficient cause**.
  - To exclude these spurious sufficient causes, we need to add a condition saying that **if the cause had not happened, the effect might not have happened**.

## Outline

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## Previous Accounts

Wierzbicka (1998) & Stefanowitsch (2001)

- Wierzbicka (1998): Characterizes a number of *make*-constructions.
- Each characterization includes a claim of necessity.
- Both Wierzbicka and Stefanowitsch: Ambiguity / contribution of various 'constructions' to the meaning of *make*.
- Even in a construction grammar framework, a solution that predicts the range of meanings based on a single invariant meaning of the verb is more parsimonious.

## The present analysis ...

- ... applies uniformly to all occurrences of causative *make*.
- ... derives the coercive implication where appropriate.
- ... puts the notion of sufficiency center-stage.
- ... and can explain putative necessity implications through perfection.

- Causal necessity & sufficiency cross-linguistically
  - A uniform(ish) analysis of Japanese *-sase-*, German *lassen*?
- *let* : *allow* :: *make* : *cause*
- 'Direct causation' as causation that is both necessary and sufficient?
- Causal necessity as a general way to capture the notion of a **result**, e.g. in resultatives:

(18) John hammered the metal flat.  
 ≈ John hammered the metal and this hammering was sufficient for the metal to become flat.

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## A A (preliminary) formal implementation

I assume a propositional language which includes, besides propositional constants, a set  $E$  of event constants, whose members will be denoted by  $e, e_1, e_2, \dots$ . Unlike propositional constants, such event constants do not form formulas on their own, but only when combined with the logical constant  $Occ$ .

**Definition 1.** A **eventive assignment function**  $h_E$  is the union of an assignment function  $h$  as in Thomason’s definition 7 with a function  $o_E : E \mapsto W \times T$ . The restrictions on  $h_E$  are as in Thomason (ensuring that  $o_E$  respects  $\approx_t$  in that worlds that are  $\approx$ -equivalent have the same events happen before  $t$ ), and we require further that if  $w_1 \approx_t w_2$  and, for some  $t' > t$ ,  $w_1 \not\approx_{t'} w_2$ , then  $\exists t'' : t < t'' \leq t'$  such that there is  $e \in E : \langle w_1, t'' \rangle \in h(e) \not\equiv \langle w_2, t'' \rangle$  or  $\langle w_2, t'' \rangle \in h(e) \not\equiv \langle w_1, t'' \rangle$ .<sup>1</sup>

Interpretation is as again as in Thomason, with the interpretation of  $Occ$  given by the following clause<sup>2</sup>: For  $e \in E$ ,

$$(1) \quad \|Occ(e)\|_{w,t}^{h_E} = 1 \text{ iff } \langle w, t \rangle \in h_E(e)$$

We define the *set of historical alternatives* of  $w$  at  $t$  as

$$(2) \quad Hist_t(w) = \{v \in W \mid w \approx_t v\}$$

In the spirit of a Kratzer (1981)-style analysis of modals, we define an order on a set of worlds relative to a world  $w$ , mediated through a set of propositions, given as follows:

$$(3) \quad g(w) := \{p \in \wp(W) \mid \exists e \in E, t \in T : p = \{v \in W \mid \|Occ(e)\|_{w,t} = \|Occ(e)\|_{v,t} = 0\}\}$$

That is, when used as a Kratzerian ordering source,  $g(w)$  will rank a world  $v$  higher *the fewer events that do not occur in  $w$  occur in  $v$* .

Writing  $Opt_w(MB, OS)$  for the set of worlds that are optimal according to the usual Kratzerian metric with modal base<sup>3</sup>  $MB$  and ordering source  $OS$ , we let, for an arbitrary set  $E' \subseteq E \times t$ ,

$$(4) \quad Opt_w(E') = Opt(\downarrow_{E'} Hist_t(w), g(w))$$

where for any set of worlds  $W'$

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<sup>1</sup>That is, if two worlds with the same history diverge, there must be an event that happened in one of them, but not in the other. This is not strictly necessary for our purposes here, but it seems like a plausible principle for a branching time model with events, and it constrains models in a way that may make them easier to conceptualize.

Note that if I would have made the stronger requirement that two worlds are only different if they differ in the occurrence of some events, the current model would be very similar to that of Jayez and Dargnat (2009), who simply treat worlds as sets of events. In the current set-up this would amount to the claim that all worlds have a common ancestor.

<sup>2</sup>That is, event constants (which would be better called ‘event type constants’) are treated entirely parallel as propositional letters. In a more complete treatment, we surely would want to make event types first-class objects of our models, and allow event types to have structure (e.g. an event of type ‘drinking coffee’ is also an event of ‘drinking’, etc. To get the idea across here, we do not need this complication. Event constants should really be seen as parallel to propositional constants in that, when moving from a propositional language to, say, a first-order language, what previously was an atomic formula with no direct correlate in the model now becomes a complex formula involving individuals and predicates, which do have direct correlates in the model.)

<sup>3</sup>In a fairly common departure from Kratzer’s original proposal, I take  $MB(w)$  to be a set of worlds rather than a set of proposition whose intersection serves as the input to the ordering.

$$(5) \quad \downarrow_{E'} W' = \{w \in W' \mid \forall \langle e, t \rangle \in E' : \|Occ(e)\|_{w,t} = 0\}$$

Thinking of the members of  $E'$  as events located in time,  $\downarrow_{E'} W'$  is the set of world in  $W'$  in which none of the given events happen at the given times.

A final ingredient is the *set of temporally located events that occur in  $w$  between  $t$  and  $t'$* :

$$(6) \quad OccEv_w(t, t') = \{\langle e, t^* \rangle \in E \times T \mid t < t^* \leq t' \ \& \ \|Occ(e)\|_{w,t^*}\}$$

With this, we can state the semantic clause for *make* as:

$$(7) \quad \begin{aligned} \|make(e_1, e_2)\|_{w,t} = 1 \text{ iff } \exists t_1, t_2 \in T : \\ \|Occ(e_1)\|_{wt_1} = \|Occ(e_2)\|_{w,t_2} = 1 \ \& \\ \forall v \in \bigcup_{Ev \subseteq OccEv_w(t_1, t_2)} Opt_w(Ev) : \|Occ(e_2)\|_{v,t_2} = 1 \end{aligned}$$

That is, *make*( $e_1, e_2$ ) is true at  $w$  iff  $e_2$  occurs in all those historical alternatives of  $w$  (at the time of occurrence of  $e_1$ ) that lack an arbitrary subset of event occurrences between the two event times that  $w$  has, but among those only the ones which include the fewest event occurrences that do not happen in  $w$ .