

If conditionals are causal, causation is not propositional

Linguistic Perspectives on Causation

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Theories of causation should inform linguistic theory and vice versa

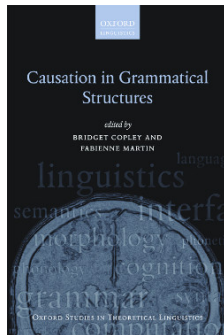
BRIDGET COPLEY AND PHILLIP WOLFF

2.1 Introduction

Linguistics has long recognized that causation plays an important role in meaning. Over the last few decades of the generative linguistic project, it has become clear that much of phrase structure is arranged around causal relationships between events (or event-like entities such as situations). Reference to causation in this tradition has most often taken the form of a relation CAUSE, with little further elucidation, in effect treating CAUSE as a primitive. This treatment of causation as a primitive relation has proved adequate to the task of developing grammatical structures that make reference to causation. But arguably, this hands-off approach to the meaning of causation has obscured potentially relevant details, impeding linguists' ability to consider hypotheses that might yield a more comprehensive analysis of the roles played by concepts of causation in language. Unpacking the notion of causation should, on this view, afford a deeper understanding of a range of linguistic phenomena, as well as their underpinnings in conceptual structure.*

In this chapter, we show how attention to the variety of existing theories of causation could advance the understanding of certain linguistic phenomena. In the first section, we review the two major categories of theories of causation, including some of the principal challenges that have been raised for and against each category. We identify in the second section a range of linguistic phenomena that we feel would benefit from a deeper investigation into causation—definiteness, agency and related concepts, and causal chains—and also speculate on how theories of causation might inform our understanding of these phenomena. Since the linguistic theories make testable claims about cognition, they give rise to potential connections between syntactic structure and cognition. In the concluding section, we express our hope that further investigations along these lines

* Thanks to Kevin Neebck and James Shapiro for helpful discussions.



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What do linguists need to know about causation?

A division between theories of causation that is of interest to linguists:

- ▶ Dependency theories seek to understand causation in terms of dependencies between propositions
- ▶ Production theories seek to understand causation in terms of energetic properties of events (force dynamics)

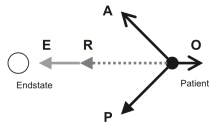
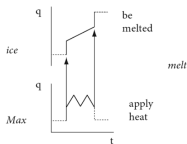
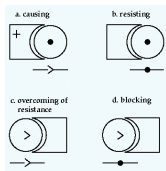
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One kind of dependency theory: Lewis 1973

Lewis seeks to explain causation by relating the truth of the proposition *A causes B* to the truth of the counterfactual proposition *If A hadn't occurred, B wouldn't have occurred*.

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Event-related/force-dynamic theories (see Copley, to appear for an overview) do not look outside the event for any explanation of causation. Rather, certain configurations of forces characterize different causal relations.



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Three nice things about forces:

- ▶ We seem to actually perceive forces (Robles-De-La-Torre & Hayward 2000, Runeson & Frykholm 1983)
- ▶ Force interaction can be modeled with a vector calculus
- ▶ The *ceteris paribus* property - the outcome of a force only occurs “all else being equal”

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- ▶ True vectors: Zwarts & Winters 2000, Zwarts 2010, Goldschmidt & Zwarts 2016
- ▶ Bleached vectors: van Lambalgen & Hamm 2008 (*Trajectory*), Copley & Harley 2015 (force functions)

What do linguists need to know about causation?

Copley & Wolff 2014: Several things key to the representation of causation in language must be stipulatively added to propositional dependency theories but come for free with the force-dynamic theories:

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- ▶ The importance of the directness/indirectness distinction (Shibatani & Pardeshi 2002, Wolff 2003 ...)
- ▶ The organization of argument structure (Langacker 1987, Croft 1991, Levin & Rappaport 1995 ...)
- ▶ Time in general, but especially the causally-derived temporal relation, i.e., the temporal relation between causes and effects

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- ▶ Conditionals are causal (!) ...

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- ▶ Conditionals are causal (!) . . .
- ▶ The kind of causal they are is not propositional (!) but event-related/force-dynamic

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Eventives shift forward, statives don't (at least not on their own)

- (1)
 - a. If it rains ...
 - b. If Mary is here ...

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- (1) a. If it rains ...
- b. If Mary is here ...

Consequent time depends on a time from the antecedent:

- (2) a. #If it rains, I hereby pronounce the party started.
 - b. If Mary is here, I hereby pronounce the party started.
-
- (3) a. #If it rains, why do you want to go out?
 - b. If Mary is here, why do you want to go out?

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Generalization: the time of consequent event begins only at or after the beginning of the time of the antecedent event.

- (4)
 - a. If I drop this cup it falls (#previously).
 - b. If I push this cup it moves (#previously).
 - c. If it rains, Juliet gets sick #(previously).
 - d. If Mary is here, Juliet gets sick #(previously).

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- (6) TAM consequents can escape the generalization
 - a. If this cup falls, I dropped it.
 - b. If this cup moves, I pushed it.
 - c. If it rains, Juliet has gotten sick/Juliet is getting sick/got sick/will have gotten sick/is going to get sick
 - ...

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- (7) a. If it rains (tomorrow) ... bare eventive
- b. If Mary gets sick (tomorrow) ... bare eventive
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The arguments of conditionals are heterogeneous

- (9)
- a. #If it's true that it rains (tomorrow)... bare eventive
 - b. #If it's true that Juliet gets sick (tomorrow) ... bare eventive
 - c. If it's true that it's rainy ... bare stative
 - d. If it's true that it's raining/it rained/it has been raining ... TAM

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Proposal:

- ▶ The assertables can be asserted and can be true or false precisely because they are propositions.
- ▶ Bare eventives can't be asserted or be true or false because they are syntactically too small to be propositions (Chierchia 1985, Ramchand & Svenonius 2014). Instead they are mere event descriptions.
- ▶ Let's suppose that there is a type difference between assertables as propositions/predicates of situations (type $\langle s,t \rangle$), and bare eventives as predicates of events (type $\langle v,t \rangle$).

Implementation

Recall: conditionals with a bare eventive consequent showed the causally-derived temporal relation, while those with an assertable consequent escaped that generalization.

- (10)
- a. If it rains/If Mary is here, Juliet gets sick
#(previously). bare eventives
 - b. If it rains, Juliet is sick. bare stative can escape generalization
 - c. If it rains, Mary's spell last night succeeded.
TAM can escape generalization

When writing a denotation for conditionals, how do we make sense of this fact, and how do we manage the two different types for assertables and bare eventives?

Implementation

- ▶ ~~Option 0: Four different types for $\llbracket if \rrbracket^c$: type $\langle vt, vt \rangle$, type $\langle st, st \rangle$, and the mixed types $\langle st, vt \rangle$ and $\langle vt, st \rangle$.~~
- ▶ Option 1: Conditionals take predicates of situations: $\llbracket if \rrbracket^c$ is type $\langle st, st \rangle$. Bare eventives get type-shifted from predicates of events to predicates of situations.
- ▶ Option 2: Conditionals take predicates of events: $\llbracket if \rrbracket^c$ is type $\langle vt, vt \rangle$. Assertables get type-shifted from predicates of situations to predicates of events.

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- ▶ Option 2 ✓

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The meaning of *if* has to involve events causing events. But will an event-related/force dynamic causal story be able to account for the modal meaning of conditionals?

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- ▶ “Inertia” or “normality” will come from the *ceteris paribus* property of forces: the result only obtains if nothing external to, and stronger than, the force intervenes to prevent the result.
- ▶ Relative weighting of factors in the ordering source (e.g., laws of society competing with circumstances) will come from the possibility of vector summation to model force interaction.

This is very handwavey for now. It's because we are keeping event arguments so we can't build the *ceteris paribus* property or force interaction into the formalism.

But, it shows us the possibility of defining a **causal accessibility relation** between events or courses of events. And recall, it should be possible to do this without recourse to propositions, since as we saw in the first part we can characterize causation without recourse to propositions.

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No time to get into it here but we're going to need to use causal accessibility twice for conditionals.

- (12) $\llbracket \text{if} \rrbracket^c = \lambda p_{vt} \lambda q_{vt} \cdot$
all causally accessible courses of events from e_C that
include an e' such that $p(e')$
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When used with our type-shifter ADD , assuming that ADD events are essentially instantaneous (Krifka 2014), the temporal relation between antecedent and consequent will look like the causally-derived temporal relation.

- (13) $\text{ADD}_C = \lambda p_{st} \lambda e \cdot e$ is an event of adding p to SC_C

Bare eventive antecedent, bare eventive consequent

- (14) a. If I throw this cup in the air, it lands.
b. If I push this cup, it moves.

All causally accessible courses of events from e_C that include an e' such that $\llbracket \text{I throw/push this cup} \rrbracket^c(e')$

are such that:

all causally accessible courses of events from e' include an e'' such that $\llbracket \text{it lands/moves} \rrbracket^c(e'')$.

Assertable antecedent, assertable consequent

- (15)
- a. If you're thirsty, there's beer in the fridge.
 - b. If this creature has a heart, it has a liver.
 - c. If Mary was here yesterday, John had been here earlier.

All causally accessible courses of events from e_C that include an e' such that $\text{ADD}(e')(\llbracket\text{you're thirsty}\rrbracket^c)$ are such that:

all causally accessible courses of events from e' include an e'' such that $\text{ADD}(e'')(\llbracket\text{there's beer in the fridge}\rrbracket^c)$.

Mixed conditionals: assertable antecedent, bare eventive consequent

(16) If Mary is here, I leave.

All causally accessible courses of events from e_C that include an e' such that $\text{ADD}(e'')(\llbracket \text{Mary is here} \rrbracket^c$

are such that:

all causally accessible courses of events from e' include an e'' such that $\llbracket \text{I leave} \rrbracket^c(e'')$.

Mixed conditionals: bare eventive antecedent, assertable consequent

(17) If it rains, Mary's spell last night succeeded.

All causally accessible courses of events from e_C that include an e' such that $\text{rain}(e')$

are such that:

all causally accessible courses of events from e' include an e'' such that $\text{ADD}(e'')(\llbracket \text{Mary's spell last night succeeded} \rrbracket^c)$.

Other speech acts:

- (18) a. If Mary is here, why do you want to go out?
b. If Mary is here, I hereby pronounce the party started.

All causally accessible courses of events from e_C that include an e' such that $\text{ADD}(e')(\llbracket \text{Mary is here} \rrbracket^c)$

are such that:

all causally accessible courses of events from e' include an e'' such that $\text{QUESTION/PERFORM}(e'')(\llbracket \dots \rrbracket^c)$.

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- ▶ So conditionals must be causal (!), and the kind of causal that they must be is not propositional (!) but event-related.
- ▶ Needed: a theory of “causally accessible course of events”.
- ▶ Force interaction and the *ceteris paribus* property to the rescue, eventually? To be continued!