Downward Left Monotonicity in the Causal Domain

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TLLM 2020: Monotonicity in Logic and Language
18 December 2020

INSTITUTE FOR LOGIC,
LANGUAGE AND COMPUTATION

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OF AMSTERDAM

Plan

1. Introduction
2. Apparent counterexamples to DMC
3. The account
   - A false relevance implicature?
   - A false scalar implicature
4. Further arguments for a scalar implicature account
   - Focus-sensitivity
   - Metalinguistic negation
5. Applying the analysis to Halpern (2016)

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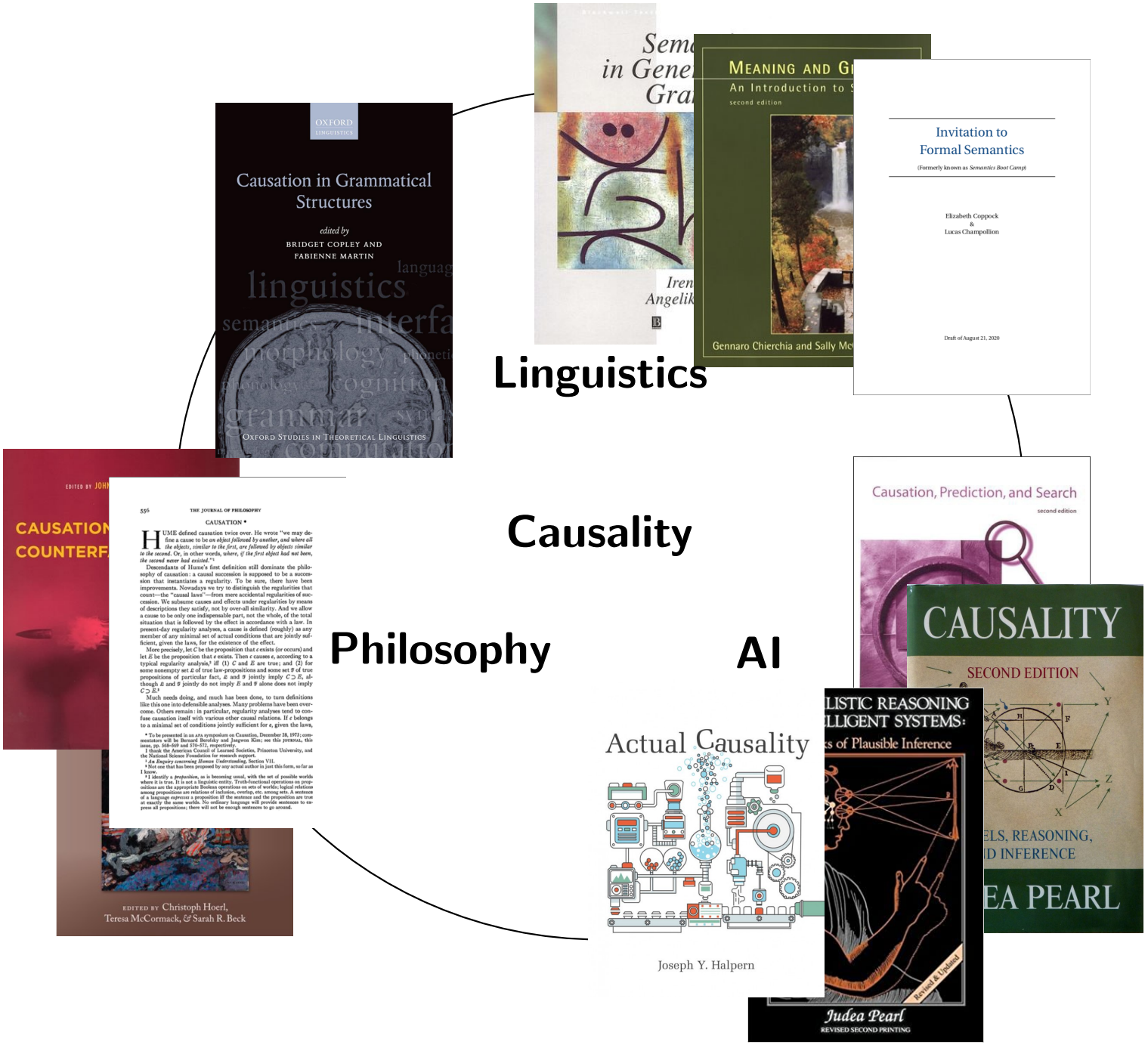
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Defining monotonicity for causal claims

Definition (Downward monotonicity in the cause (DMC))

Cause (respectively, *because*) is downward monotone in its cause (DMC) if and only if for any propositions C, C^+ and E: if

1. C^+ entails C,
2. C *cause* E (E *because* C) is true, and
3. C^+ is true

then C^+ *cause* E (E *because* C^+) is also true.

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If causal claims are not DMC, it means some true causal claim is made false by strengthening the cause (where the stronger cause also holds).

Motivation

1. Is monotonicity a universal for connectives?
   - The familiar connectives are monotonic: not $\downarrow$, $\uparrow$ and $\uparrow$, $\uparrow$ or $\uparrow$
   - What about *because*?
2. Interesting for the semantics of causal claims more generally
   - Cases where the cause is stronger than required are tricky

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An apparent counterexample to DMC

Figure: Alice flicked the switch and sneezed. The light turned on.

(1) a. The light turned on because Alice flicked the switch and sneezed.

b. Alice flicking the switch and sneezing caused the light to turn on.

(2) a. Reyna was born at Royal Bolton Hospital but received a Danish passport because her mother was born in Copenhagen.[1]

b. Renya's mother being born in Copenhagen caused Renya to have a Danish passport.

[1] *The Bolton News*, 12 February 2020. `https://www.theboltonnews.co.uk/news/18226923.bolton-born-woman-receives-british-passport-six-year-fight/`

Same logical relationship, different judgments

Flick the switch and sneeze

$\Rightarrow$ Flick the switch

(1) not assertable

Born in Copenhagen

$\Rightarrow$ Born in Denmark

(2) assertable

(1a) The light turned on because Alice flicked the switch and sneezed.

Hypothesis:

- (1a) is unassertable because it is false.
- (1a) is false because its cause is not minimal: it is stronger than required for the claim to be true (Halpern, 2016, p. 23)

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Problem:

(2a) Reyna was born at Royal Bolton Hospital but received a Danish passport because her mother was born in Copenhagen.

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Problem:

(2a) Reyna was born at Royal Bolton Hospital but received a Danish passport because her mother was born in Copenhagen.

Question remains: why is (2a) assertable (and hence, presumably, true)?

Maximally specific causes

If causal claims are not DMC, it means some true causal claim is made false by strengthening the cause (where the stronger cause also holds).

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Are causes ever too strong?

(3) a. Computers do an awful lot of deliberation, and yet their every decision is wholly caused by the state of the universe plus the laws of nature.

b. If anything is happening at this moment in time, it is completely dependent on, or caused by, the state of the universe, as the most complete description, at the previous moment.

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A false relevance implicature?

(1a) The light turned on because Alice flicked the switch and sneezed.

Initial idea:

- Alice sneezing is not relevant to the discourse.

$\Rightarrow$ (1a) is unacceptable because it violates the maxim of relevance.

A false relevance implicature?

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Initial idea:

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$\Rightarrow$ (1a) is unacceptable because it violates the maxim of relevance.

Challenge: need to explain why sneezing is not relevant.

- It is because sneezing is not causally relevant to the light turning on?
- How do we show this?

A false scalar implicature

(4) a. The light turned on because Alice flicked the switch and sneezed.

b. The light turned on because Alice flicked the switch.

(4b) is obligatorily an alternative to (4a), obtained by deletion (Katzir, 2007).

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Scalar implicatures are focus-sensitive

(5) How did the exam go? (Rooth, 1992, ex. 16-17)

a. Well, I $[\text{passed}]_F$. $\rightsquigarrow$ The speaker didn't ace the exam.

b. Well, $[\text{I}]_F$ passed. $\rightsquigarrow$ Someone else failed.

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(6) *Some first-generation Danish immigrants are at a meet-up.*

a. A: I have a Danish passport because my parents are Danish. Why do you have one?

b. B: Because my mom was born in Denmark.

c. C: I have one because my dad was born in $[\text{Copenhagen}]_F$.

If *Denmark* is an alternative to *Copenhagen* in (6c):

(7) a. I have a Danish passport because my dad was born in Copenhagen.

b. $\rightsquigarrow \neg$(I have a Danish passport because my dad was born in Denmark.)

Metalinguistic negation

(8) The light didn't turn on because Alice flicked the switch [and sneezed]$_F$. It turned on because she flicked the switch.

(9) You don't have a Danish passport because your mom was born in [Copenhagen]$_F$. You have one because she was born in Denmark.

Metalinguistic negation

(8) The light didn't turn on because Alice flicked the switch [and sneezed]$_F$. It turned on because she flicked the switch.

(9) You don't have a Danish passport because your mom was born in [Copenhagen]$_F$. You have one because she was born in Denmark.

- Metalinguistic negation applies when truth-functional negation cannot be applied Horn (1985, 1989); Burton-Roberts (1989).
- By DMC: $\neg(E \textit{ because } C^+) \Rightarrow \neg(E \textit{ because } C)$
- Truth-functional negation cannot apply when $(E \textit{ because } C)$ is known.

Metalinguistic negation II

- Negation can target an utterance's pragmatically enriched meaning (Carston, 1996, 2002; Noh, 1998, 2000; Moeschler, 2019):
- Metalinguistic negation via recursive exh (Fox and Spector, 2018)

(10) a. $exh_{A'} \neg exh_A(E \textit{ because } C^+)$

b. $A = \{E \textit{ because } C^+, E \textit{ because } C\}$

c. $A' = \{exh_A(E \textit{ because } C^+), E \textit{ because } C^+\}$

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c. $A' = \{exh_A(E \textit{ because } C^+), E \textit{ because } C^+\}$

If $exh_A(E \textit{ because } C^+)$ entails $\neg(E \textit{ because } C)$, then:

$$exh_{A'} \neg exh_A(E \textit{ because } C^+)$$
$$\Leftrightarrow \neg exh_A(E \textit{ because } C^+ \wedge \neg\neg(E \textit{ because } C^+)$$
$$\Leftrightarrow \neg((E \textit{ because } C^+) \wedge \neg(E \textit{ because } C)) \wedge (E \textit{ because } C^+)$$
$$\Leftrightarrow (\neg(E \textit{ because } C^+) \vee (E \textit{ because } C)) \wedge (E \textit{ because } C^+)$$
$$\Leftrightarrow (E \textit{ because } C)$$

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Halpern's truth conditionals of causal claims

Definition (Truth conditions for actual causal claims)

$X = x$ is an *actual cause* of φ iff

AC1 $X = x$ and φ are actually true

AC2 Fixing some (perhaps no) facts to their actual values, intervening on X makes φ false.

AC3 X is minimal; there is no variable X' such that X' is weaker than X $X' = x'$ satisfies conditions AC1 and AC2.

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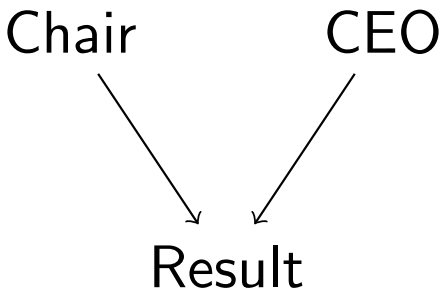
AC3 X is minimal; there is no variable X' such that X' is weaker than X $X' = x'$ satisfies conditions AC1 and AC2.

AC3 is a minimality condition, which ensures that only those elements of the conjunction $\vec{X} = \vec{x}$ that are essential are considered part of a cause; inessential elements are pruned. Without AC3, if dropping a lit match qualified as a cause of the forest fire, then dropping a match and sneezing would also pass the tests of AC1 and AC2. AC3 serves here to strip "sneezing" and other irrelevant, over-specific details from the cause. (Halpern, 2016, p. 23)

Independent evidence against minimality



$$\text{Result} = \text{Chair} \wedge \text{CEO}$$

Figure: A simple model of the voting scenario in (11)

(11) a. The fact that the Chairperson voted 'Yes' and CEO voted 'Yes' caused the proposal to pass.

b. The proposal passed because the Chairperson voted 'Yes' and the CEO voted 'Yes'.

Halpern: $\text{Chair} = 1 \wedge \text{CEO} = 1$ is not a cause (neither partial nor full) of the proposal passing.

Dropping minimality

Fact (Downward monotonicity of AC1 $\wedge$ AC2)

If $\vec{X} = \vec{x}$ satisfies AC1 and AC2 with respect to φ and $(M, \vec{u})$, then for any variables $\vec{Y}$ such that $(M, \vec{u}) \models \vec{Y} = \vec{y}$, the conjunction $\vec{X} = \vec{x} \wedge \vec{Y} = \vec{y}$ satisfies AC1 and AC2 with respect to φ and $(M, \vec{u})$.

Summary

- Apparent counterexamples to DMC are unacceptable...
  - not because they are false
  - but because they have a false scalar implicature
- Evidence for a scalar implicature account comes from
  - Focus-sensitivity of inference
  - Behaviour under metalinguistic negation

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