Cause/Effect vs. Effect/Cause

COCOA

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April 6, 2020

Event-Event sequence

(1) Justin fell down. Ava pushed him.

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(1) Justin fell down. Ava pushed him.   (Effect/Cause)

Event-Event sequence

(1) Justin fell down. Ava pushed him.   (Effect/Cause)
(2) Ava pushed Justin. He fell down.

Event-Event sequence: Causal symmetry

(1) Justin fell down. Ava pushed him.   (Effect/Cause)

(2) Ava pushed Justin. He fell down.   (Cause/Effect)

State-Event Sequence

(3) The barn was red. Ava painted it.

State-Event Sequence

(3) The barn was red. Ava painted it.   (Effect/Cause)

State-Event vs. Event-State Sequences

(3) The barn was red. Ava painted it.   (Effect/Cause)

(4) Ava painted the barn. It was red.

State-Event vs. Event-State Sequences: Causal Asymmetry

(3) The barn was red. Ava painted it.   (Effect/Cause)

(4) Ava painted the barn. It was red.   (??Cause/Effect)

Another example of the causal asymmetry

(5) Anna was a student at Oxford. She got the top score at the interview.

Another example of the causal asymmetry

(5) Anna was a student at Oxford. She got the top score at the interview.

(6) Anna got the top score at the interview. She was a student at Oxford.

- For more examples, see Altshuler, D. (2021), 'A puzzle about narrative progression and causal reasoning', in *The language of fiction*, E. Maier and A. Stokke (eds). OUP.

Causal asymmetry with negative data

Causal asymmetry with negative data

(7) Hans' shirt was wet. I threw a giant water balloon at him.

(8) I threw a giant water balloon at Hans. ?His shirt was wet.

Causal asymmetry with negative data

(7) Hans' shirt was wet. I threw a giant water balloon at him.

(8) I threw a giant water balloon at Hans. ?His shirt was wet.

(9) A mouse was dead. A cat bit into it while it was wiggling its tail.

(10) A cat bit into a mouse while it was wiggling its tail. ??It was dead.

Causal Asymmetry Generalization (CAG)

Cause/Effect descriptions, unlike Effect/Cause descriptions, are allergic to stative predicates, i.e., they require changes.

Roadmap

1. A discourse structural analysis of CAG based on some recent collaborative research with Julian J. Schlöder.

- Altshuler, D. & J. J. Schlöder (2021), 'If pictures are stative, what does this mean for discourse interpretation?' *Proceeding of Sinn und Bedeutung 25.*
- Altshuler, D. & J. J. Schlöder (2022), *'Super Pragmatics of (linguistic-)pictorial discourse'.* Manuscript.

2. Ongoing research with Kelsey Sasaki on causal asymmetry clause-internally (with deverbal adjectives).

- *My <u>drenched</u> neighbor was hit by a water balloon* vs. *A water balloon hit my <u>drenched</u> neighbor.*

A few theoretical assumptions about discourse coherence and discourse structure

- For more theoretical background, see slides from 'Anaphora and Ambiguity in Narratives' (Daniel Altshuler & Julian Schlöder, ESSLLI 2019): https://jjsch.github.io/teaching/esslli2019.html

Coherence relations

Theoretical primitives used to define how a discourse coheres (Hobbs 1979, 1985):

A discourse is coherent iff its discourse units are related by at least one coherence relation

"….coherence relations are instantiations in discourse comprehension of more general principles of coherence that we apply in attempting to make sense out of the world . . . " (Hobbs 1990)

Coherence relations

Specific connectives, particles, etc. can be thought of as signalling a **coherence relation** between *discourse units* (eventuality descriptions; Afantenos et al. 2012):

(11)   a. Max fell <u>because</u> John pushed him.   (**Explanation**)

          b. Max fell. <u>So</u> John helped him up.   (**Result**)

          c. Max fell. <u>Then</u> John pushed him.   (**Narration**)

          d. Max fell. John did <u>too</u>.   (**Parallel**)

          e. Max fell <u>while</u> wearing sandals.   (**Background**)

- For a recent overview of coherence relations, see Jasinskaja, Katja & Elena Karagjosova (2020), 'Rhetorical relations'. In Gutzmann et al (eds.), *Companion to semantics*, Wiley.

Coherence relations

Coherence relations have played an instrumental role in analyzing, e.g. anaphora/cataphora resolution, ellipsis, presupposition, tense/aspect/ temporal adverbs, intonation/focus, perspective shifting, etc…

- For a recent survey, see Kehler, A. (2022), 'Coherence Establishment as a Source of Explanation in Linguistic Theory'. *Annual Review of Linguistics* 8:123-42.

Discourse structure

- **Segmented Discourse Representation Theory** (Asher & Lascarides) models discourse structure as a **graph** over semantic representations (SDRSs) of **discourse units** (DUs), which are descriptions of eventualities (Afantenos et al. 2012).

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- The graph edges connecting DUs are **labelled** with coherence relations.

- The graph used to model discourse structure is **directed**.

  - A vertical edge represents a **subordinating** coherence relation
  - A horizontal edge represents a **coordinating** coherence relation.

Intuitive Distinction

○ Coordinating coherence relations change the scene, hence moving forward the narrative.

○ Subordinating coherence relations detail the scene, hence deepening the narrative.

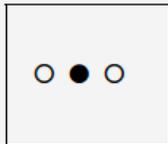*There were three circles.*   *Later, there were three squares.*

$\Rightarrow$

$\Downarrow$

One of them was filled.

Discourse structure and anaphora

- Since coordinating coherence relations change the scene while subordinating coherence relations detail the scene, only subordination keeps the things we talk about around, and hence available for anaphora.

- Put differently: We can't "detail" scenes that have been changed. Hence, coordinated discourse moves "block" anaphoric potential.

Right Frontier Constraint

The Right Frontier constraint governs which discourse units are available to attach new EDUs (Polanyi 1988):

The anaphora-accessible referents are on the right-most branch of the graphed narrative structure.

- For a recent overview of the Right Frontier, see Hunter, J. & K. Thompson. Forthcoming. 'On the Role of Relations and Structure in Discourse Interpretation'. In. D. Altshuler (ed.), *Linguistics meets Philosophy*. Cambridge University Press.

π_a: John dropped off his car for repairs.
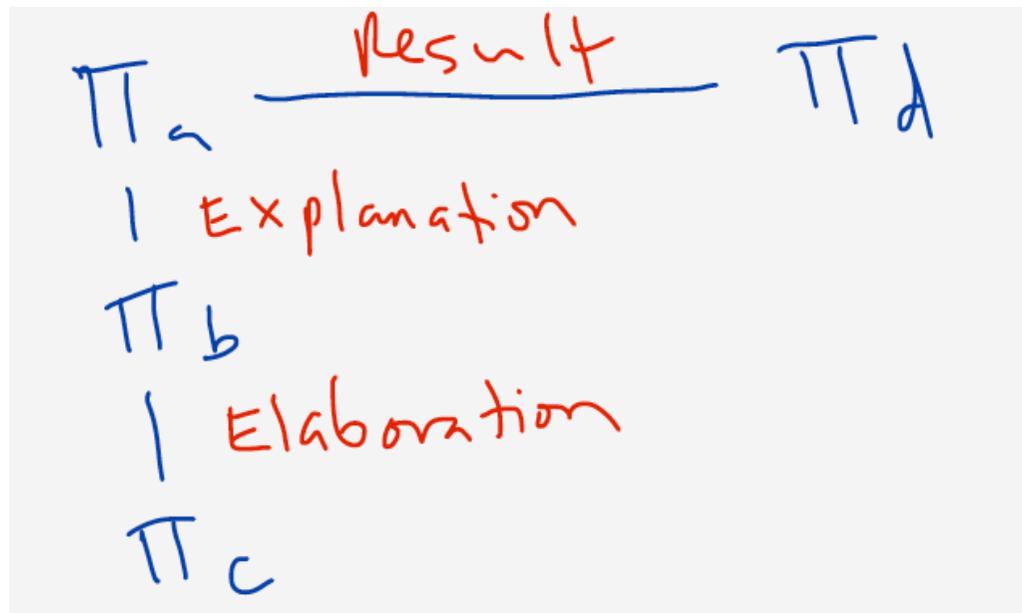π_b: Then he got a rental.
π_c: It had a broken fuel pump.

$$\pi_a \overset{\text{Narration}}{\rule{3cm}{0.4pt}} \pi_b$$

$$\text{Elaboration}$$

$$\pi_c$$
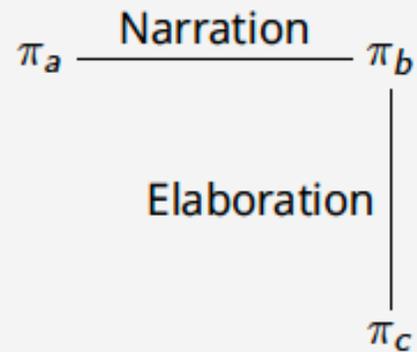
π_a: Arash doesn't trust Akna

π_b: because she lied to him once.

π_c: It was about something really important.

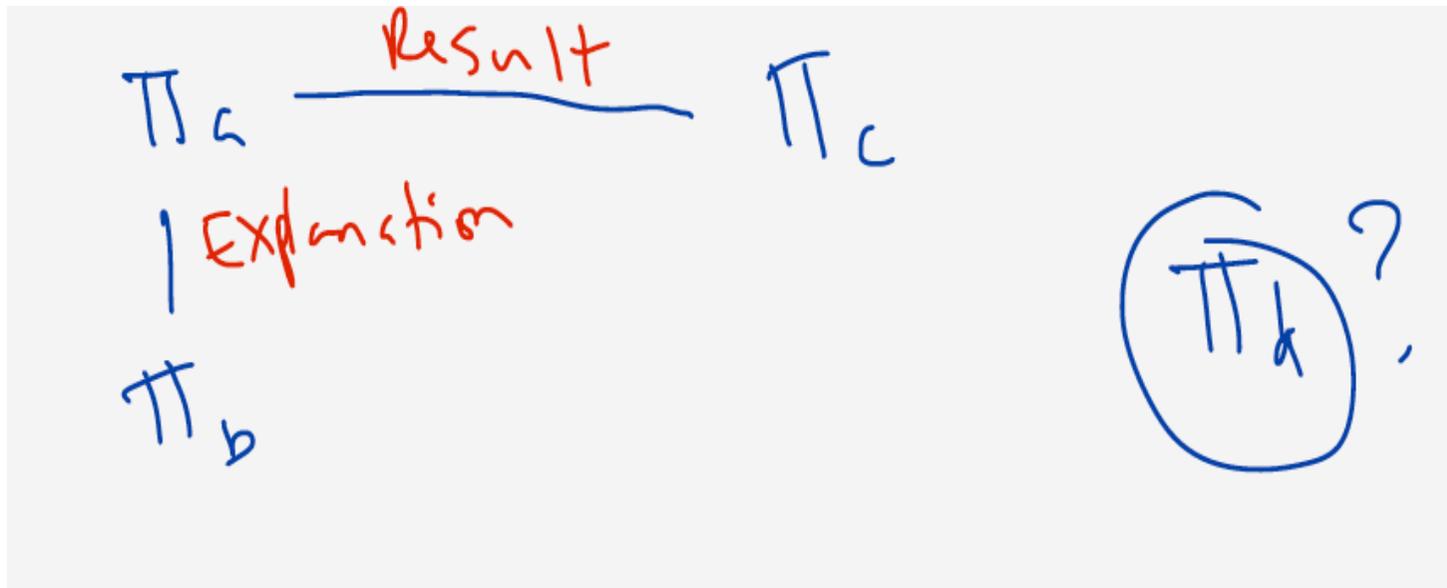π_d: So, he's not going to let her babysit his kids.

π_a: Arash doesn't trust Akna

π_b: because she lied to him once.

π_c: So, he's not going to let her babysit his kids.

π_d: ??It was about something really important.

Summary

SDRT proposes a hierarchically structured model of discourse in which discourse units are related by a set of coherence relations of two types:

Select coordinating relations: Result, Narration, Parallel, Contrast

Select subordinating relations: Explanation, Elaboration, Background

- For extensive discussion of subordinating vs. coordinating relations see: Asher, N. & L. Vieu (2005), 'Subordinating and coordinating discourse relations', *Lingua* 4: 591-610.

Causal default

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a. $R(\alpha, \beta) \wedge \Diamond cause(e_\beta, e_\alpha) > Explanation(\alpha, \beta).$

b. $R(\alpha, \beta) \wedge \Diamond cause(e_\alpha, e_\beta) > Result(\alpha, \beta).$

Explanation or Result, but not both

Two discourse units cannot be both arguments of a coordinating and subordinating discourse relation (Txurruka 2003)

$$\neg(R(\alpha, \beta) \land R'(\alpha, \beta) \land \textit{coord}(R) \land \textit{subord}(R'))$$

Two further axioms

a. $R(\alpha, \beta) \wedge \mathbf{ev}(\alpha) \wedge \mathbf{st}(\beta) > \mathbf{subord}(R).$

b. $R(\alpha, \beta) \wedge \mathbf{ev}(\alpha) \wedge \mathbf{st}(\beta) \wedge \Diamond \mathbf{cause}(e_\alpha, e_\beta) > \mathbf{subord}(R).$

- a. says that eventive-stative sequences are typically subordinating the state
- b. says that causal information cannot by itself override this default.

Applied to our examples

(1)
   a. $R(\alpha, \beta) \wedge \Diamond cause(e_\beta, e_\alpha) > Explanation(\alpha, \beta).$

   b. $R(\alpha, \beta) \wedge \Diamond cause(e_\alpha, e_\beta) > Result(\alpha, \beta).$

(2)
   a. $R(\alpha, \beta) \wedge ev(\alpha) \wedge st(\beta) > subord(R).$

   b. $R(\alpha, \beta) \wedge ev(\alpha) \wedge st(\beta) \wedge \Diamond cause(e_\alpha, e_\beta) > subord(R).$

(3) I painted the barn. It was red.

(4) I threw a water balloon at Hans. ?His shirt was wet.

(5) A cat bit a mouse while the mouse was wiggling its tail. ??It was dead.

Cancelling and defeating the defaults

(1)
a. $R(\alpha, \beta) \wedge \Diamond cause(e_\beta, e_\alpha) > Explanation(\alpha, \beta)$.
b. $R(\alpha, \beta) \wedge \Diamond cause(e_\alpha, e_\beta) > Result(\alpha, \beta)$.

(2)
a. $R(\alpha, \beta) \wedge ev(\alpha) \wedge st(\beta) > subord(R)$.
b. $R(\alpha, \beta) \wedge ev(\alpha) \wedge st(\beta) \wedge \Diamond cause(e_\alpha, e_\beta) > subord(R)$.

(5') A cat bit a mouse while the mouse was wiggling its tail. It died.

(5'') A cat bit a mouse while the mouse was wiggling its tail. As a result, it was dead.

Further data

Data Set 1: Exclamatives

(1) I painted the barn. (Voilà!) it was red.

(2) Anna got the top score at the interview. (Bam!) She was a student at Oxford.

(3) I threw a giant water balloon at Hans. (Splat!) his shirt was wet.

(4) A cat bit into a mouse while it was wiggling its tail. (Ooof!) It was dead.

- For discussion, see Altshuler, D. (2021), 'A puzzle about narrative progression and causal reasoning', in *The language of fiction*, E. Maier and A. Stokke (eds). OUP.

Data Set 2: Now

(5) I painted the barn. (Now) it was red.

(6) Anna got the top score at the interview. (Now) she was a student at Oxford.

(7) I threw a giant water balloon at Hans. (Now) his shirt was wet.

(8) A cat bit into a mouse while it was wiggling its tail. (Now) it was dead.

- For semantics of 'now', see Stojnić & Altshuler (2021), 'Formal properties of *now* revisited', *Semantics & Pragmatics* 14(3). https://doi.org/10.3765/sp.14.3

Data Set 3: Deverbals

(9) I threw a giant water balloon at Hans. He was drenched/terrified/frustrated.

Data Set 4: Perspectival?

(10) I painted the barn. It was a beautiful, glossy red.

(11) I painted the barn. It was an ugly, puke green.

(12) I gave my mom flowers. She was very happy .

- For discussion of perspectival expressions, see Bylinina, Lisa, McCready, Elin, and Sudo, Yasutada (2014), 'The landscape of perspective shifting'. http://web.mit.edu/ysudo/www/pdf/tubingen-handout.pdf

- For discussion of perspectival adjectives, see Kaiser, E. & Wang, C. (2021). 'Packaging Information as Fact Versus Opinion: Consequences of the (Information-)Structural Position of Subjective Adjectives'. *Discourse Processes.*

Clause Internal Coherence

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(13) A widow stuck a knife into her husband (Anscombe 1979)

- Explanation?

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- Explanation?

(14) a. A jogger was hit by a car. (Hobbs 2010)

- Narration?

    b. A teacher was hit by a car.

- Background?

Clause Internal Coherence

Very little work on clause-internal coherence exists (Kehler, 2019).

- We know little about the typology of such relations, how they are triggered, or how they compare to cross-clausal relations.

Current research with Kelsey Sasaki

Gauge the strength of the clause-internal inferences speakers draw between deverbal adjectives and verbs, compared to cross-sentential verb-verb inferences.

Offline Experiment 1

We crossed number of sentences {1, 2} with coherence relations {EXPLANATION, RESULT} for 40 experimental items. Participants (N=65) were recruited via Prolific. On a 1-4 scale, they responded to questions of the form, "How likely do you think it is that the child was drenched because she got hit by the water balloon?"

a. 2-SENT EXPLANATION: A child was drenched. She got hit by a water balloon.

b. 1-SENT EXPLANATION: A drenched child got hit by a water balloon.

c. 2-SENT RESULT: A water balloon hit a child. She was drenched.

d. 1-SENT RESULT: A water balloon hit a drenched child.

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d.   1-SENT RESULT: A water balloon hit a drenched child.

Further stimuli:
https://docs.google.com/spreadsheets/d/1DwEedYK_qSPAVCIYnAp881ZnX4EQlIsECIfYZx-kTYA/edit#gid=0

Experiment 1

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c. 2-SENT RESULT: A water balloon hit a child. She was drenched.

d. 1-SENT RESULT: A water balloon hit a drenched child.

Main effect: 2-SENT conditions were rated more likely than 1-SENT. This held for EXPLANATION and RESULT.

Interaction: Ratings were higher for 2-SENT RESULT than 2-SENT EXPLANATION, but the opposite in 1-SENT conditions, e.g. participants found a causal interpretation more likely in (c) than in (a), but less likely in (d) than in (b).

Discussion

- While the results suggest that deverbal adjectives may trigger clause-internal coherence inferences, they cannot be fully interpreted based solely on this study.

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- While the results suggest that deverbal adjectives may trigger clause-internal coherence inferences, they cannot be fully interpreted based solely on this study.

- Participants may have rated 1-SENT stimuli lower than 2-SENT stimuli because they did not infer any coherence relation, or because they inferred a Background, which holds when a described state is understood to be the background for (and therefore temporally overlaps) the described event (Lascarides & Asher, 1993).

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- Using the same design and stimuli as Expt. 1, we asked participants to choose between a causal interpretation and a (non-causal) Background interpretation, e.g., we asked participants to choose the most accurate description of what happened: *The child was drenched {because vs. when} she got hit by the water balloon.*

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- We hypothesized that this competition contributed to the main effect of Expt. 1, predicting that the Background interpretation would be chosen at a higher rate for 1-SENT vs. 2-SENT conditions.

Experiment 2

Main effect: Background was chosen at a higher rate for 1-SENT conditions than 2-SENT conditions. The difference held for both EXPLANATION and RESULT.

Interaction: Background was chosen at a lower rate for 2-SENT RESULT than 2-SENT EXPLANATION, but the reverse held in 1-SENT conditions.

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Interaction: Background was chosen at a lower rate for 2-SENT RESULT than 2-SENT EXPLANATION, but the reverse held in 1-SENT conditions.

- The main effect suggests that there can be a many-to-one correspondence between the relations inferred in deverbal adjective-verb contexts and verb-verb contexts.

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- The main effect suggests that there can be a many-to-one correspondence between the relations inferred in deverbal adjective-verb contexts and verb-verb contexts.
- The interactions points to an intriguing clausal asymmetry.
- How do we make sense of these results given the aforementioned interpretative default (infer a causal link between adjacent eventualities when possible)?

Asher & Lascarides (1998) analysis of presupposition applied to deverbal adjectives

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- A deverbal like *drenched* presupposes an event that leads to the described state, and this content constitutes a discourse unite π_1.

- π_1 is related via a coherence relation R to π_2, which characterizes the assertion of the utterance in which *drenched* appears.

Asher & Lascarides (1998) analysis of presupposition applied to deverbal adjectives

a. 2-SENT EXPLANATION: A child was drenched. She got hit by a water balloon.

b. 1-SENT EXPLANATION: A drenched child got hit by a water balloon.

c. 2-SENT RESULT: A water balloon hit a child. She was drenched.

d. 1-SENT RESULT: A water balloon hit a drenched child.

- In b. the causal default is respected and R is pragmatically enriched to Explanation.

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c. 2-SENT RESULT: A water balloon hit a child. She was drenched.

d. 1-SENT RESULT: A water balloon hit a drenched child.

- In d. the causal default leads to Result, which, unlike Background, is coordinating.

- Assuming that presuppositions require subordinating relations (Asher et al, 2007), we explain why the causal default is blocked here.

Asher & Lascarides (1998) analysis of presupposition applied to deverbal adjectives

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c. 2-SENT RESULT: A water balloon hit a child. She was drenched.

d. 1-SENT RESULT: A water balloon hit a drenched child.

- Assuming further that, in a. and c., coherence is established by each verb contributing to an EDU, the causal default isn't overridden.

Future research

- While our SDRT analysis may explain the differences between RESULT conditions in both experiments, it doesn't explain why the same differences held between EXPLANATION conditions. What semantic and pragmatic factors account for this?

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- The analysis crucially assumes that the presuppositional properties of deverbal adjectives enable them to serve as EDU cores, even from within DPs. If this is the case, we would expect deverbal adjective-verb relations to affect discourse structure in the same way as verb-verb relations.

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- For instance, the adjectival EDU in a clause-internal Explanation, as the first argument in a subordinating relation, should be accessible to subsequent discourse units, as in *A drenched child got hit by a water balloon. There was even water inside her shoes*.

- Moreover, we expect that a (non-presuppositional) a clause-internal Result, i.e., the first argument in a coordinating relation, would shift the Right Frontier and be inaccessible to subsequent discourse units, as in *A water balloon hit a drenched child. It caught her square between the shoulders.*

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Conclusion

- There is a causal asymmetry, i.e. cause/effect and effect/cause inferences are subject to various constraints.

- I argued that some of these constraints are aspectual. I assumed a basic event/state distinction, but the key notion is *change*, which is fundamental in any causal model.

- I also argued that some of the constraints are discourse structural. The key notion is discourse *coordination vs. subordination* (as defined in SDRT), which is a property of *coherence relations*. I would argue that these notions are also necessary for any realistic causal model.