Causation in Semantics and Grammatical Structure
Week 14: Force dynamics models and their applications

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- structural equation (network) models can define different 'configurations' of causal links which do a reasonably good job of capturing the empirical differences between *cause* and *make*
- (but, we also saw that the model needs some refinement w.r.t. how it deals with the will/intentions of participants)

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Today: force dynamics and defeasible causation

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  - **double prevention:** again, no transmission of energy between cause and effect

    (2) *Context:* A boy is protecting a town from flooding by keeping his finger on a leak in a dyke. Removing the finger involves a double prevention – he prevents himself from preventing the flood.

    a. The boy caused the flooding of the town

    - but, no direct link between the boy and the flood

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Production theories do better on these scenarios, because transmission occurs.

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- but in physical interaction cases, we model it as a process/transmission
- NB: this is a bit like the idea that light is sometimes a wave and sometimes a particle, depending on how we measure
- ...but we lack a principled theory of how to decide which phenomena should be modeled which way

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  - so, we can't pick a theory that solves the problem here

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- postulate the existence of basic 'causal links' that are arranged in different configurations in different situations
- looking ahead, the way that Wolff's force theory tries to solve the *cause/enable* problem is quite similar

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	Tendency of patient for the result	Opposition between affector and patient	Occurrence of a result
CAUSE	N	Y	Y
ENABLE	Y	N	Y
PREVENT	Y	Y	N

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- forces can be physical (gravity, momentum, friction), but also abstract (ripening, reddening, drying)
- forces have distance and direction: length of a 'resulting' vector indicates how close a patient gets to an **end state**

Force dynamics

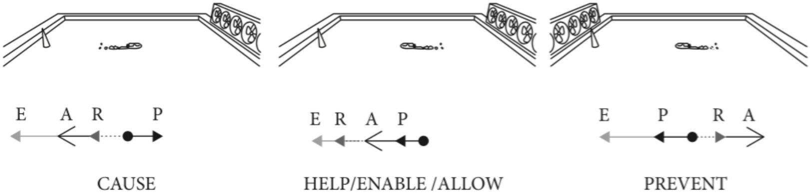
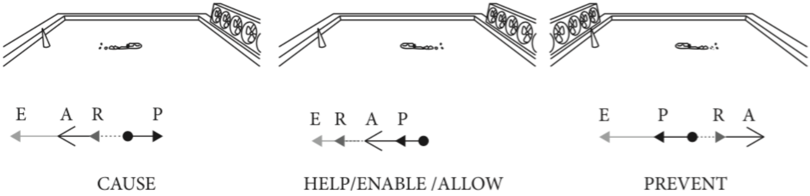


Fig. 5.1

Force dynamics



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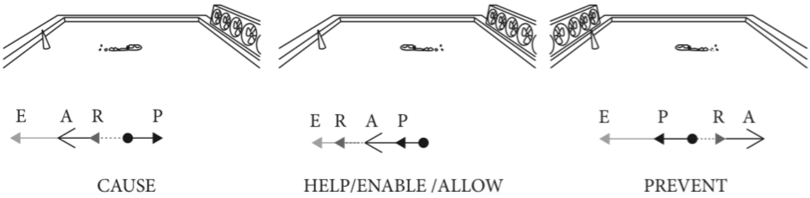

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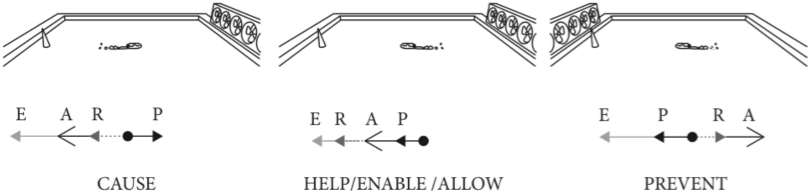

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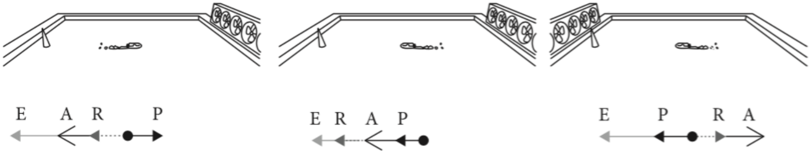

CAUSE HELP/ENABLE /ALLOW PREVENT

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  - with ENABLE, ALLOW, the affector's force is already a result of other interactions
- PREVENT: patient tends to end state, but affector opposes this tendency and moves it away from the end state

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- multiple-collision diagrams:

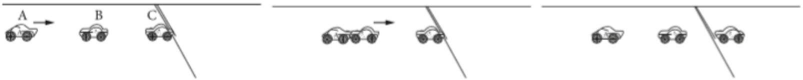

Fig. 5.2

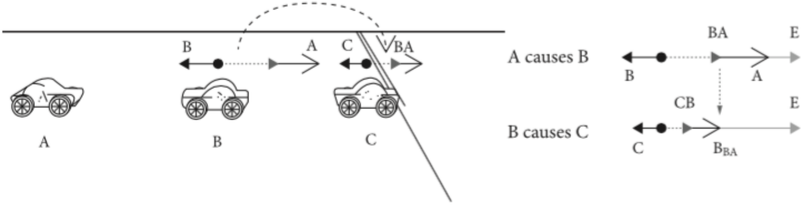

Fig. 5.3

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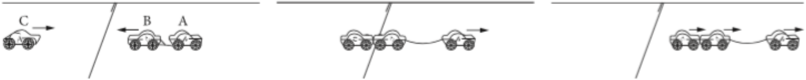
- plug (B) prevents water (C) from draining
- agent (A) prevents B by pulling the plug
- **result:** A pulls B, opposing the force associated with B, but also the force associated with C *as a result* of the interaction between B and C

Force dynamics: double prevention

With collision diagrams:



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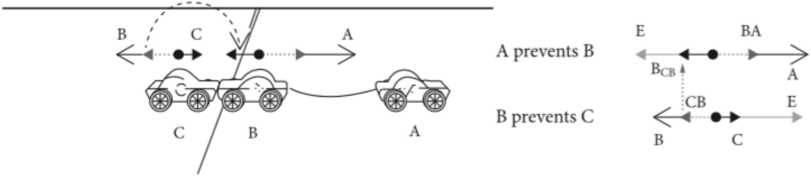

FIG. 5.5

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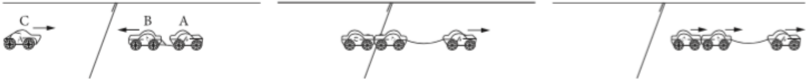

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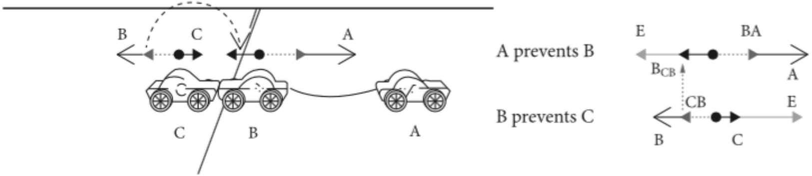

FIG. 5.5

- C approaches line, B opposes and prevents line-crossing

Force dynamics: double prevention

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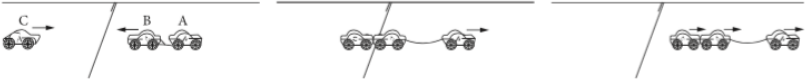

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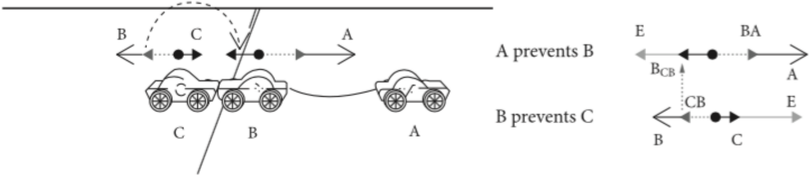

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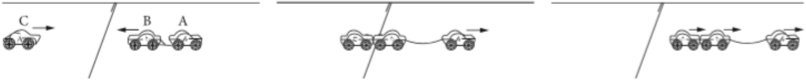

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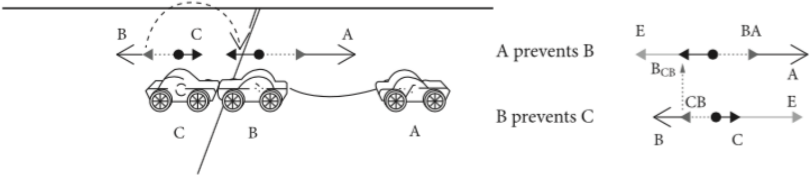

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- **net:** *C* crosses the line, due to *A*

Force dynamics: ALLOW, ENABLE

Proposal: ALLOW involves double prevention

- ALLOW relations look, at the net level, like HELP
- but, necessarily result from composition of forces in a causal chain
- in an ALLOW relation:
  1. the patient's tendency for a result is opposed by an interim affector (PREVENT$_1$
  2. this result tendency away from the end is opposed by the agent of the ALLOW relation, (PREVENT)$_2$
  3. so that ultimately the agent's force works in tandem with the patient's original tendency

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Proposal: causation by omission also involves double prevention, but of a different sort

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- the difference between (8a) and (8b) is what we focus on as the 'stated' cause/affector

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- *defeasible causation:* one event is asserted or presupposed to normally cause a second, but no entailment that the result occurs arises
- **proposal:** we can explain what's going on in these cases by replacing Davidsonian events with forces

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   - also Tagalog, Salish languages, Karachay-Balkar, and many others

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   - *roughly:* the forces Juan brought to bear on the door were inadequate to open it

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  - initial and final situations are related by the set of forces input to the initial situation

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- when we were wrong at the beginning and know this based on the result, this is when defeasible causal descriptions are relevant

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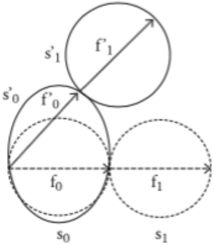

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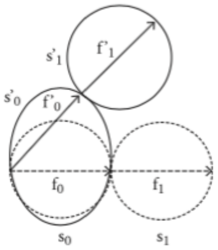

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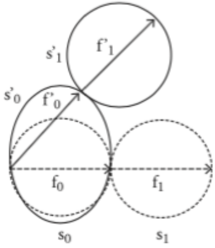

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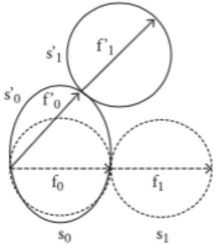

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- ... and in this picture, s_0 is not efficacious

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- . . . which has consequences for the entailments of the description

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- but this is defeasible, specifically by specifying either what made the initial state non-efficacious
- . . . or just explaining that it was not

Efficacy and frustratives

The frustrative particle *cem* has a variety of uses:

- combined with a state description, it can mean that the state did not continue
- or that some goal was not realized

(17) Cem 'añ ñ-na:tokc.
FRUS 1SG 1SG-ready
non-continuation: 'I was ready but now I'm no longer ready.'
unachieved-goal: 'I was ready but you weren't there.'

(Copley 2005a: 1)

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- with perfective (completed interpretation), it can indicate either the cessation of the result state or that the result state was not achieved

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- with an ongoing event, we expect that it continues on the basis of the initiating subevent
  - . . . so, in this case *cem* can be used if something interferes with this trajectory

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This isn't the only framework that could capture these notions, but by introducing forces as relations between situations, it gives us a setup where it's easy to comprehend and define the right kind of notion