

Causation and Coercion:

Towards a unified account of eventive and stative causal modifiers

Claudia Maienborn

Tübingen University

Based on joint work with Johanna Herdtfelder; s. Herdtfelder & Maienborn (2015), Maienborn & Herdtfelder (2015, 2017).

1. German causal *von*

➤ Two readings of causal *von*-modifiers

German causal *von*-PPs in combination with adjectival copula sentences based on the copula *sein* 'to be' may express an **eventive causal relation** as in (1) and a **stative causal relation** as in (2).

- | | | |
|-----|---|------------------|
| (1) | Paul ist müde von der Reise.
Paul is tired from the trip | eventive reading |
| (2) | Der Platz ist weiß von den Hagelkörnern.
The square is white from the hailstones | stative reading |
| (3) | Der Platz ist rot von den Blättern.
The square is red from the leaves | ambiguous |

✎ Our claim: The ambiguity of causal *von*-modifiers observed in (1) – (3) can be accounted for parsimoniously, if we develop an adequate notion of **stative causation** on a par with **eventive causation**.

✎ Formalization: Asher's (2011) TCL provides a suitable framework for modeling the observed **coercive meaning adaptations** within a **compositional setting** and for incorporating world knowledge into meaning constitution to the extent needed.

➤ German *von* ≠ English *from*

- | | | |
|-----|--|---|
| (4) | a. Paul ist müde von der Reise.
b. Sein Gesicht war schwarz von dem Staub.
c. Der Boden war schwarz von/*mit Ameisen.
d. Die Luft war schwer von/*mit Blütenduft.
e. Dieses Bild wurde von Paul gemalt. | Paul is tired from the trip.
His face was black from the dust.
The floor was black *from/with ants.
The air was thick *from/with blossom-scent.
This picture was painted by Paul. |
| (5) | a. The light was pink from my rose-colored glasses.
b. The square was blue from the nearby skyscraper.
c. The living room was cold from the hole in the basement door.
d. Paul was poor from bad investments. | |
| (5) | a. *Das Licht war rosa von meiner rosé-getönten Brille.
b. *Der Platz war blau von dem nahen Wolkenkratzer.
c. *Das Wohnzimmer war kalt von dem Loch in der Kellertür.
d. *Paul war arm von schlechten Geldanlagen. | ✓ wegen ('because of')
✓ wegen
✓ wegen
✓ wegen |

➤ *von*-modifiers ≠ *von*-arguments

- (6) a. Die Schüssel ist voll von / mit Kirschen.
The bowl is full of / with cherries
b. Unsere Früchte sind frei von Pestiziden.
Our fruits are free of pesticides
c. Paul ist beeindruckt / enttäuscht von Marias Vortrag.
Paul is impressed / disappointed by Maria's talk

2. Core observations

① Inference patterns

- a) Stative reading: Internal NP ref. is located on subject ref. at predication time, (7).
b) Stative reading: Main predicate holds also for internal NP ref. at pred. time, (8).
- (7) a. Der Platz ist weiß von den Hagelkörnern. → The hailstones are on the square.
The square is white from the hailstones
b. Die Bank ist dreckig von den Schuhen. ⇨ The shoes are on the bench.
The bench is dirty from the shoes.
- (8) a. Der Platz ist weiß von den Mimbeln. → The mimbles are white.
The square is white from the mimbles
b. Die Bank ist dreckig von den Schuhen. ⇨ The shoes are dirty.
The bench is dirty from the shoes.
- (9) Ihr Gesicht war bleich von Mehlstaub.
Her face was pale from flour-dust

② Holistic effect

Stative *von*'s internal NP referent is interpreted as being located all over (relevant parts of) the subject referent.

③ Direct causation

Causal *von*-PPs express non-agentive causal relations; cf. the notion of a "causer", e.g. in Rappaport Hovav & Levin (2000), Alexiadou & Schäfer (2006), Rothmayr (2009), Schäfer (2012); ad engl. *from* see Copley & Wolff (2015), ad causal *vor* as opposed to *von* see Laptieva (2014).

Moreover, causal *von* is restricted towards expressing a narrow notion of "**direct causation**": the causal chain is not interrupted by other causal factors (10); no transitivity (11)/(12)

- (10) a. Paul war müde von der Reise. → Paul took part in the trip vs. *wegen*
b. Der Boden war schwarz von Ameisen. → Ants were on the floor vs. *wegen*
- (11) a. Die Bank ist dreckig von den Schuhen. (bench dirty from shoes)
b. Die Schuhe sind dreckig von der Wanderung. (shoes dirty from hike)
c. ⇨ Die Bank ist dreckig von der Wanderung. (bench dirty from hike)
d. → Die Bank ist dreckig wegen der Wanderung. (bench dirty because of hike)
- (12) a. Der Platz ist schwarz von Flugblättern. (square black from flyers)
b. Die Flugblätter sind schwarz von Ruß. (flyers black from soot)
c. ⇨ Der Platz ist schwarz von Ruß. (square black from soot)
d. → Der Platz ist schwarz wegen des Rußes. (square black because of soot)

➤ **Direct causation**: is commonly understood as an immediate causal relation between a cause and an effect without intervening entities, whereas indirect causation allows cause and effect to be related via longer causal chains; e.g. Shibatani (1976), Talmy (1976), Dowty (1979: 98f), Wolff (2003), Vecchiato (2011), Copley & Wolff (2015).

No-intervening-cause criterion Wolff (2003: 4f)

Direct causation is present between the causer and the final causee in a causal chain (1) if there are no intermediate entities at the same level of granularity as either the initial causer or final causee, or (2) if any intermediate entities that are present can be construed as an enabling condition rather than an intervening causer.

In sum, causal *von*-modifiers express a narrow notion of direct causation in the sense of Wolff (2003), which is non-transitive and imposes particular conditions on spatiotemporal contiguity between the cause and its effect.

Event coercion

von's type requirements can be pragmatically accommodated

- (13) a. Paul war satt von der Pizza. ~ from eating the pizza
Paul was full from the pizza
b. Paul war müde von den Tabletten. ~ from the release of the ingredients of the pills (after taking them)
Paul was tired from the pills
c. Der Raum war feucht von vergangenen Waschtagen. ~ from the washing at past days
The room was damp from past wash-days
- (14) a. Павел был сонным от долгой поездки.
Paul was dozy.INSTR from long.GEN trip.GEN
b. Площадь была белой от снега.
Square was white.INSTR from snow.GEN
- (15) a. Павел был грязным от катания на велосипеде.
Paul was dirty.INSTR from driving.GEN on bike.PRP
b.*Павел был грязным от велосипеда.
Paul was dirty.INSTR from bike.GEN
- (16) a. Павел был больным от употребления наркотиков.
Paul was ill.INSTR from consuming.GEN drugs.GEN
b.*Павел был больным от наркотиков.
Paul was ill.INSTR from drugs.GEN
- (17) a. Руки Павла были клейкими от готовки.
hands Paul.GEN were sticky.INSTR from cooking.GEN
b.*Руки Павла были клейкими от пирога.
hands Paul.GEN were sticky.INSTR from cake.GEN

3. Corpus study see Herdtfelder & Maienborn (2015)

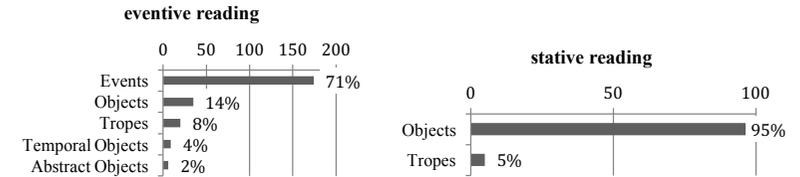
Corpora and tools:

- DeReKo (Deutsches Referenzkorpus); tool: COSMAS II
- dependency-parsed version of the web corpus SdeWaC; tool: Sketch Engine

Stative and eventive readings

- total number of sentences: 358
- eventive causal relation: 249
- stative causal relation: 109

Sortal category of the PP's internal argument



- Events: e.g. *Arbeit* 'work', *Laufen* 'running'
- (Physical) Objects: e.g. *Medikamente* 'drugs', *Pizza* 'pizza', *Staub* 'dust'
- Temporal Objects: e.g. *Tag* 'day', *Wochenende* 'weekend'
- Abstract Objects: e.g. *Politik* 'politics', *leere Worte* 'empty words'
- Tropes: concrete property manifestations, e.g. *Hitze* 'heat', *Schlaflosigkeit* 'sleeplessness' (Moltmann 2007, 2013; see below)

Referential properties of object-denoting internal *von*-arguments

- eventive reading: 50% mass nouns/bare plurals, 25% singular count nouns, 25% plural count nouns
- stative reading: 94% mass nouns/bare plurals, 6% plural count nouns

Semantic category of the adjectival predicate

[The categories are taken from the lexical-semantic net *GermaNet*; for more information see: <http://www.sfs.uni-tuebingen.de/GermaNet/index.shtml>]

- eventive reading: 69% body-specific: e.g. *müde* 'tired', *krank* 'ill', *heiser* 'hoarse'; 17% substance-specific: e.g. *staubig* 'dusty', *schmutzig* 'dirty', *nass* 'wet'; 9% perception-specific: e.g. *grau* 'grey', *rot* 'red', *dunkel* 'dark'; 5% other, e.g. *übertütig* 'jaunty', *sprachlos* 'speechless'
- stative reading: 50% perception-specific; 48% substance-specific; 2% other, e.g. *bleich* 'pale', *steif* 'stiff' => **sensoric predicates**

4. Ontology: events and tropes as causal relata

- Current linguistic theories generally take causation to be a relation that holds between events, e.g. Eckardt (2000), Hobbs (2005), Vecchiato (2011).
- Moltmann (2007, 2009, 2013, 2015) argues for the ontological category of **tropes** as concrete property manifestations in an individual. According to Moltmann, tropes, such as, e.g., the redness of an apple or Mary's paleness, share with events the property of being **causally efficacious**.

- (18) a. Mary is visibly / profoundly happy.
b. Mary is extremely / shockingly pale.

- Moltmann (2013: 300): "these modifiers represent precisely the kinds of properties that tropes are supposed to have, such as properties of causal effect, of perception, and of particular manifestation."

- (19) *white*: $\lambda x:\text{PHYS } \lambda r:\text{TROPE [whiteness (r, x)]}$

☞ **Causation holds either between events or between tropes.**

(20) a. cause (e_1, e_2) with e_1, e_2 as variables over events
 b. cause (r_1, r_2) with r_1, r_2 as variables over tropes

- **Tropes vs. K-states:** (Maienborn 2005, 2015; Bücking 2012b)
 Kimian states are abstract objects for the exemplification of a property P at a holder x and a time t. K-states are reified entities of thought and discourse, they can be located in time, but they have no location in space nor are they perceptible or causally efficacious.
- “tropes are concrete entities that overall instantiate the relevant property in one way or another; states, by contrast, are entities constituted just by the holding of the property (of some object)” Moltmann (2007: 370)

- (21) a. Die Betten waren nass von der Luftfeuchtigkeit.
 The beds were wet from the air-humidity
 b.*Die Betten waren nass vom Feucht-Sein der Luft
 The beds were wet from.the humid-be.inf of.the air
- (22) a. Wir waren perplex von der Härte des Polizeieinsatzes.
 We were puzzled from the hardness of.the police-action
 b.*Wir waren perplex vom Hart-Sein des Polizeieinsatzes
 We were puzzled from.the hard-be.inf of.the police-action

(23) **Spatiotemporal contiguity axioms for eventive causation** ☞ 3

a. $\forall e_1 \forall e_2 \text{ cause}(e_1, e_2) \rightarrow \tau(e_1) \supset \tau(e_2)$ ☞: temporal abutment
 b. $\forall e_1 \forall e_2 \text{ cause}(e_1, e_2) \rightarrow \sigma(e_1) \circ \sigma(e_2)$ ☞: spatial contact; σ : space function

(24) **Spatiotemporal contiguity axioms for stative causation**

a. $\forall r_1 \forall r_2 \text{ cause}(r_1, r_2) \rightarrow \tau(r_1) \supset \tau(r_2)$
 b. $\forall r_1 \forall r_2 \text{ cause}(r_1, r_2) \rightarrow \sigma(r_1) \supset \sigma(r_2)$ ☞ 1

☞ Löbner (2000): **Presupposition of Indivisibility:** “Whenever a predicate is applied to one of its arguments, it is true or false of the argument as a whole.” ☞ 2

5. Syntax

☞ Corpus data

- The two readings show significant differences wrt (i) adjacency of AP and PP and (ii) the order of AP and PP in the adjacent cases:

	adjacent	non-adjacent	
eventive	219 (88%)	30 (12%)	249
stative	106 (97%)	3 (3%)	109
	325	33	358

$$X^2(1) = 7.83, p < 0.05$$

	AP > PP	PP > AP	
eventive	164 (75%)	55 (25%)	219
stative	100 (94%)	6 (6%)	106
	264	61	325

$$X^2(1) = 17.73, p < 0.01$$

☞ Base order: Adj > PP
 ☞ 2 AP-internal base positions: eventive *von*: AP-adjunct, stative *von*: A-adjunct

☞ **Further evidence** [skipped here; but see Maienborn & Herdtfelder (2017)]

eventive and stative *von*-modifiers differ wrt. sentential negation, topicalization, pseudo-cleft formation, manner and degree modification and so on

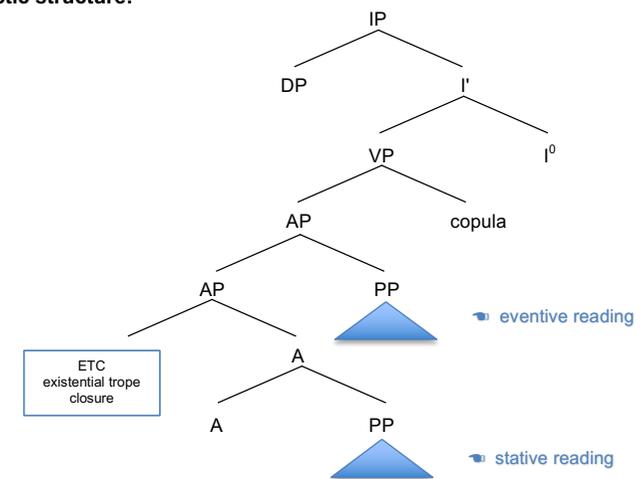
☞ concurring evidence for different syntactic status:

- Both types of modifiers are part of the AP.
- Stative *von* takes a base position close to the adjective. This enables stative *von* to specify further the quality of the trope that is introduced by the adjective, and it motivates *von*'s reluctance to leave the A-vicinity. Furthermore, degree modifiers may take scope over stative *von*.
- Eventive *von* takes a base position that is more distant to the adjective and lies outside the scope of degree modifiers.

☞ From a broader perspective, this conclusion fits well in a more general picture of modification according to which lexical categories with referential arguments systematically offer a head-adjacent and a peripheral adjunction site for (intersective) modifiers – with implications for the modifier's semantic contribution; see Maienborn (2001) for V and Bücking (2012b) for N.

Remark: If we assume a functional DegP shell above the AP, we could alternatively analyze stative *von* as AP-adjunct and eventive *von* as DegP-adjunct. For our purposes of developing a compositional semantics for causal *von*-modifiers it suffices to assume a simple AP-syntax with DegP in the specifier position of A. That is, we adopt, what Morzycki (2013: 148ff) calls, the “small DegP view”, instead of a “big DegP view”. But nothing really hinges on this point.

☞ **Syntactic structure:**



6. Compositional semantics with type accommodation

➤ Framework: Type Composition Logic (Asher 2011)

- **Internal and external semantics:** Natural language predication is guided by a rich system of types. Types can be understood as mental concepts; they have a proof-theoretic interpretation (= internal semantics). The level of Logical Form has the usual model-theoretic interpretation (= external semantics).
- **Type justification:** A predicate's type requirements have to be justified by its arguments.
- **Type accommodation:** Type conflicts may be resolved by means of so-called "polymorphic" types: $\alpha - \alpha (\beta)$
If a type requirement α cannot be met compositionally, α may be justified via β . That is, type accommodation licenses the introduction of a new variable of type α whose type value is further specified dependent on the compositionally supplied type β .
↳ **Coercion** is crucially a matter of lexical semantics, not of general pragmatics: Whether or not a potential type clash may be resolved is something that must be determined in advance in the lexicon; see also Bücking & Maienborn (2016).
- **Type specification:** Underspecified semantic material that is introduced in the course of type accommodation is pragmatically specified via defeasible rules.

Note: The following compositional set-up differs in certain respects from Asher (2011); see Bücking & Maienborn (2016) for details.

➤ Compositional ingredients:

- (25) a. *weiß* ('white'): $\lambda x:\text{PHYS } \lambda r:\text{TROPE} [\text{whiteness}(r, x)]$
 a'. *weiß* ('white'): $\lambda x \lambda r \lambda \pi [\text{whiteness}(r, x, \pi * \text{ARG}_1^{\text{whiteness}, \text{TROPE}} * \text{ARG}_2^{\text{whiteness}, \text{PHYS}})]$
 π : **context parameter** that keeps track of the selectional restrictions that are collected in the course of the composition
 Type restrictions are added to a contextual parameter π by means of concatenation '*'.

(26) ETC (existential trope closure):

$\lambda Q \lambda y \lambda s \lambda \pi \exists r':\text{TROPE} [\text{state}(s, r', \pi * \text{ARG}_1^{\text{state}, \text{K-STATE}}) \& Q(y)(r')(\pi)]$

(27) a. copula *sein* ('to be'): $\lambda P \lambda x \lambda s \lambda \pi [P(x)(s)(\pi * \text{ARG}_1^{\text{K-STATE}})]$

b. I^0 : $\lambda P \lambda x \lambda \pi \exists s:\text{EV} \sqcup \text{K-STATE} [P(x, s, \pi)]$

c. *der Platz* ('the square'): $\text{def-sq}:\text{PHYS} [\text{square}(sq)]$

➤ Stative reading:

(28) Der Platz ist weiß von den Hagelkörnern. 'The square is white from the hailstones.'

(29) causal *von*: stative reading

a. *von*: $\lambda c:\text{TROPE} - \tau Q O P E (\text{TY}^+(c) \sqsubseteq \text{PHYS}) \lambda P \lambda v \lambda c':\text{TROPE} [\text{cause}(c, c') \& P(v)(c')]$

a'. *von*: $\lambda c \lambda P \lambda v \lambda c' \lambda \pi [\text{cause}(c, c', \pi * \text{ARG}_1^{\text{cause}, \text{TROPE}} - \tau Q O P E (\text{TY}^+(c) \sqsubseteq \text{PHYS}) * \text{ARG}_2^{\text{cause}, \text{TROPE}} * \text{ARG}_1^{\text{pred}(c), \text{TY}^{\text{PS}}(c)} * \text{ARG}_1^{\text{P}, \text{TY}^{\text{PS}}(P)}) \& P(v)(c')(\pi)]$

$\text{TY}^+(c)$: **proffered type** of c ; its finegrained type; e.g. SQUARE for *der Platz*

$\text{TY}^{\text{PS}}(c)$: **presupposed type** for c ; its type presupposition; e.g. PHYS for *der Platz*

(30) [von den Hagelkörnern]:

a. $\lambda c \lambda P \lambda v \lambda c' \lambda \pi [\text{cause}(c, c', \pi * \text{ARG}_1^{\text{cause}, \text{TROPE}} - \tau Q O P E (\text{TY}^+(c) \sqsubseteq \text{PHYS}) * \text{ARG}_2^{\text{cause}, \text{TROPE}} * \text{ARG}_1^{\text{pred}(c), \text{TY}^{\text{PS}}(c)} * \text{ARG}_1^{\text{P}, \text{TY}^{\text{PS}}(P)}) \& P(v)(c')(\pi)]$ (def-h:PHYS [hailst(h)]) =

$\lambda P \lambda v \lambda c' \lambda \pi [\text{cause}(\text{def-h:PHYS} [\text{hailst}(h)], c', \pi * \text{ARG}_1^{\text{cause}, \text{TROPE}} - \tau Q O P E (\text{HAILST} \sqsubseteq \text{PHYS}) * \text{ARG}_2^{\text{cause}, \text{TROPE}} * \text{ARG}_1^{\text{hailst}, \text{PHYS}} * \text{ARG}_1^{\text{P}, \text{TY}^{\text{PS}}(P)}) \& P(v)(c')(\pi)]$ **type conflict**

b. Abstraction:

$\lambda x \lambda \pi' [\text{cause}(x, c', \pi')] (\text{def-h:PHYS} [\text{hailst}(h)])(\pi * \text{ARG}_1^{\text{cause}, \text{TROPE}} - \tau Q O P E (\text{HAILST} \sqsubseteq \text{PHYS}) * \text{ARG}_2^{\text{cause}, \text{TROPE}} * \text{ARG}_1^{\text{hailst}, \text{PHYS}} * \text{ARG}_1^{\text{P}, \text{TY}^{\text{PS}}(P)})$

c. Coercion functor for stative *von*: (see the generalized rule in Asher 2011: 225)

$\lambda P \lambda y \lambda \pi' \exists r:\text{TROPE}(\text{HAILST}) [P(r)(\pi') \& \phi_{\text{trope}(\text{HAILST})}(r, y, \pi')]$

d. Application of the functor to the abstracted part:

$\lambda P \lambda y \lambda \pi' \exists r:\text{TROPE}(\text{HAILST}) [P(r)(\pi') \& \phi_{\text{trope}(\text{HAILST})}(r, y, \pi')] (\lambda x \lambda \pi' [\text{cause}(x, c', \pi')]) =$

$\lambda y \lambda \pi' \exists r:\text{TROPE}(\text{HAILST}) [\lambda x \lambda \pi' [\text{cause}(x, c', \pi')](r)(\pi') \& \phi_{\text{trope}(\text{HAILST})}(r, y, \pi')] =$

$\lambda y \lambda \pi' \exists r:\text{TROPE}(\text{HAILST}) [\text{cause}(r, c', \pi') \& \phi_{\text{trope}(\text{HAILST})}(r, y, \pi')]$

e. (30b) with type accommodation:

$\lambda y \lambda \pi' \exists r:\text{TROPE}(\text{HAILST}) [\text{cause}(r, c', \pi') \& \phi_{\text{trope}(\text{HAILST})}(r, y, \pi')] (\text{def-h:PHYS} [\text{hailst}(h)]) =$

$(\pi * \text{ARG}_1^{\text{cause}, \text{TROPE}} - \tau Q O P E (\text{HAILST} \sqsubseteq \text{PHYS}) * \text{ARG}_2^{\text{cause}, \text{TROPE}} * \text{ARG}_1^{\text{hailst}, \text{PHYS}} * \text{ARG}_1^{\text{P}, \text{TY}^{\text{PS}}(P)}) =$

$\exists r:\text{TROPE}(\text{HAILST}) [\text{cause}(r, c', \pi * \text{ARG}_2^{\text{cause}, \text{TROPE}} * \text{ARG}_1^{\text{P}, \text{TY}^{\text{PS}}(P)}) \& \phi_{\text{trope}(\text{HAILST})}(r, \text{def-h:PHYS} [\text{hailst}(h)], \pi)]$

f. (30a) with type accommodation:

$\lambda P \lambda v \lambda c' \lambda \pi \exists r:\text{TROPE}(\text{HAILST}) [\text{cause}(r, c', \pi * \text{ARG}_2^{\text{cause}, \text{TROPE}} * \text{ARG}_1^{\text{P}, \text{TY}^{\text{PS}}(P)}) \& \phi_{\text{trope}(\text{HAILST})}(r, \text{def-h:PHYS} [\text{hailst}(h)], \pi) \& P(v)(c')(\pi)]$

(31) [weiß von den Hagelkörnern]_A:

$\lambda P \lambda v \lambda c' \lambda \pi \exists r:\text{TROPE}(\text{HAILST}) [\text{cause}(r, c', \pi * \text{ARG}_2^{\text{cause}, \text{TROPE}} * \text{ARG}_1^{\text{P}, \text{TY}^{\text{PS}}(P)}) \& \phi_{\text{trope}(\text{HAILST})}(r, \text{def-h:PHYS} [\text{hailst}(h)], \pi) \& P(v)(c')(\pi)]$

$(\lambda x \lambda r \lambda \pi [\text{whiteness}(r, x, \pi * \text{ARG}_1^{\text{whiteness}, \text{TROPE}} * \text{ARG}_2^{\text{whiteness}, \text{PHYS}})]) =$

$\lambda v \lambda c' \lambda \pi \exists r:\text{TROPE}(\text{HAILST}) [\text{cause}(r, c', \pi * \text{ARG}_2^{\text{cause}, \text{TROPE}} * \text{ARG}_1^{\text{P}, \text{TY}^{\text{PS}}(P)}) \& \phi_{\text{trope}(\text{HAILST})}(r, \text{def-h:PHYS} [\text{hailst}(h)], \pi) \& \lambda x \lambda r \lambda \pi [\text{whiteness}(r, x, \pi * \text{ARG}_1^{\text{whiteness}, \text{TROPE}} * \text{ARG}_2^{\text{whiteness}, \text{PHYS}})](v)(c')(\pi)] =$

$\lambda v \lambda c' \lambda \pi \exists r:\text{TROPE}(\text{HAILST}) [\text{cause}(r, c', \pi * \text{ARG}_2^{\text{cause}, \text{TROPE}} * \text{ARG}_1^{\text{whiteness}, \text{TROPE}}) \& \phi_{\text{trope}(\text{HAILST})}(r, \text{def-h:PHYS} [\text{hailst}(h)], \pi) \& \text{whiteness}(c', v, \pi * \text{ARG}_1^{\text{whiteness}, \text{TROPE}} * \text{ARG}_2^{\text{whiteness}, \text{PHYS}})]$

(32) [weiß von den Hagelkörnern]_{AP}:

$\lambda Q \lambda y \lambda s \lambda \pi \exists r':\text{TROPE} [\text{state}(s, r', \pi * \text{ARG}_1^{\text{state}, \text{K-STATE}}) \& Q(y)(r')(\pi)]$

$(\lambda v \lambda c' \lambda \pi \exists r:\text{TROPE}(\text{HAILST}) [\text{cause}(r, c', \pi * \text{ARG}_2^{\text{cause}, \text{TROPE}} * \text{ARG}_1^{\text{whiteness}, \text{TROPE}}) \& \phi_{\text{trope}(\text{HAILST})}(r, \text{def-h:PHYS} [\text{hailst}(h)], \pi) \& \text{whiteness}(c', v, \pi * \text{ARG}_1^{\text{whiteness}, \text{TROPE}} * \text{ARG}_2^{\text{whiteness}, \text{PHYS}})]) =$

$\lambda y \lambda s \lambda \pi \exists r':\text{TROPE} \exists r:\text{TROPE}(\text{HAILST}) [\text{cause}(r, r', \pi) \& \phi_{\text{trope}(\text{HAILST})}(r, \text{def-h:PHYS} [\text{hailst}(h)], \pi) \& \text{state}(s, r', \pi * \text{ARG}_1^{\text{state}, \text{K-STATE}}) \& \text{whiteness}(r', y, \pi * \text{ARG}_2^{\text{whiteness}, \text{PHYS}})]$

(33) [Der Platz ist weiß von den Hagelkörnern]_{IP}: **compositional semantics**

$\lambda \pi' \exists s:\text{K-STATE} \exists r':\text{TROPE} \exists r:\text{TROPE}(\text{HAILST}) [\text{CAUSE}(r, r', \pi') \& \phi_{\text{trope}(\text{HAILST})}(r, \text{def-h:PHYS} [\text{hailst}(h)], \pi') \& \text{state}(s, r', \pi') \& \text{whiteness}(r', \text{def-sq:PHYS} [\text{square}(sq)], \pi')]$

➤ **Eventive reading:**

- (34) a. Cleopatra starb von einem Schlangenbiss.
Cleopatra died from a snake-bite
b. Paul wachte von Anjas Lachen auf.
Paul woke from Anja's laughing up
c. Anna wurde vom Laufen müde.
Anna became from.the running tired

(35) Paul ist müde von der Reise. 'Paul is tired from the trip.'

(36) **causal von: eventive reading**

- a. *von*: $\lambda c:EV-\varepsilon v(TY^+(c)\sqsubseteq PHYS)\lambda P\lambda v\lambda c':EV-\varepsilon v_{BECOME}(TY^+(P)\sqsubseteq K-STATE)[\text{cause}(c, c') \& P(v)(c')]$
a'. *von*: $\lambda c\lambda P\lambda v\lambda c'\lambda \pi[\text{cause}(c, c', \pi * ARG_1^{CAUSE}:EV-\varepsilon v(TY^+(c)\sqsubseteq PHYS) * ARG_2^{CAUSE}:EV-\varepsilon v_{BECOME}(TY^+(P)\sqsubseteq K-STATE) * ARG_1^{PRED(C)}:TY^{PS}(c) * ARG_1^P:TY^{PS}(P)) \& P(v)(c')(\pi)]$

(37) [von der Reise]:

- $\lambda c\lambda P\lambda v\lambda c'\lambda \pi[\text{cause}(c, c', \pi * ARG_1^{CAUSE}:EV-\varepsilon v(TY^+(c)\sqsubseteq PHYS) * ARG_2^{CAUSE}:EV-\varepsilon v_{BECOME}(TY^+(P)\sqsubseteq K-STATE * ARG_1^{PRED(C)}:TY^{PS}(c) * ARG_1^P:TY^{PS}(P)) \& P(v)(c')(\pi)](\text{def-j:EV}[\text{journey}(j)]) =$
 $\lambda P\lambda v\lambda c'\lambda \pi[\text{cause}(\text{def-j:EV}[\text{journey}(j)], c', \pi * ARG_1^{CAUSE}:EV-\varepsilon v(\text{JOURNEY}\sqsubseteq PHYS) * ARG_2^{CAUSE}:EV-\varepsilon v_{BECOME}(TY^+(P)\sqsubseteq K-STATE) * ARG_1^{JOURNEY}:EV * ARG_1^P:TY^{PS}(P)) \& P(v)(c')(\pi)]$
type compatibility

(38) [müde]_{AP}:

- $\lambda Q\lambda y\lambda s\lambda r'\lambda \pi[\text{state}(s, r', \pi * ARG_1^{STATE}:K-STATE) \& Q(y)(r')(\pi)]$
 $(\lambda x\lambda r\lambda \pi[\text{tiredness}(r, x, \pi * ARG_1^{TIREDNES}:TROPE * ARG_2^{TIREDNES}:ANIMATE)]) =$
 $\lambda y\lambda s\lambda r'\lambda \pi[\text{state}(s, r', \pi * ARG_1^{STATE}:K-STATE) \& \text{tiredness}(r', y, \pi * ARG_2^{TIREDNES}:ANIMATE)]$

(39) [müde von der Reise]_{AP}:

- a. $\lambda P\lambda v\lambda c'\lambda \pi[\text{cause}(\text{def-j:EV}[\text{journey}(j)], c', \pi * ARG_2^{CAUSE}:EV-\varepsilon v_{BECOME}(TY^+(P)\sqsubseteq K-STATE) * ARG_1^P:TY^{PS}(P)) \& P(v)(c')(\pi)](\lambda y\lambda s\lambda r'\lambda \pi[\text{state}(s, r', \pi * ARG_1^{STATE}:K-STATE) \& \text{tiredness}(r', y, \pi * ARG_2^{TIREDNES}:ANIMATE)]) =$
 $\lambda v\lambda c'\lambda \pi[\text{cause}(\text{def-j:EV}[\text{journey}(j)], c', \pi * ARG_2^{CAUSE}:EV-\varepsilon v_{BECOME}(\text{TIREDNES-STATE}) * ARG_1^{STATE}:K-STATE) \& \text{state}(c', r', \pi * ARG_1^{STATE}:K-STATE) \& \text{tiredness}(r', v, \pi * ARG_2^{TIREDNES}:ANIMATE)]$
type conflict

b. Abstraction:

$\lambda y\lambda \pi[\text{cause}(\text{def-j:EV}[\text{journey}(j)], y, \pi)](c')(\pi * ARG_2^{CAUSE}:EV-\varepsilon v_{BECOME}(\text{TIREDNES-STATE}) * ARG_1^{STATE}:K-STATE)$

c. Coercion functor for eventive *von*:

$\lambda P\lambda z\lambda \pi' \exists e:\text{BECOME}(\text{TIREDNES-STATE})[P(e)(\pi') \& \phi_{\text{become}(\text{TIREDNES-STATE})}(e, z, \pi')]$

d. Application of the functor to the abstracted part:

$\lambda P\lambda z\lambda \pi' \exists e:\text{BECOME}(\text{TIREDNES-STATE})[P(e)(\pi') \& \phi_{\text{become}(\text{TIREDNES-STATE})}(e, z, \pi')](\lambda y\lambda \pi[\text{cause}(\text{def-j:EV}[\text{journey}(j)], y, \pi)]) =$

$\lambda z\lambda \pi' \exists e:\text{BECOME}(\text{TIREDNES-STATE})[\lambda y\lambda \pi[\text{cause}(\text{def-j:EV}[\text{journey}(j)], y, \pi)](e)(\pi') \& \phi_{\text{become}(\text{TIREDNES-STATE})}(e, z, \pi')]$

$\lambda z\lambda \pi' \exists e:\text{BECOME}(\text{TIREDNES-STATE})[\text{cause}(\text{def-j:EV}[\text{journey}(j)], e, \pi') \& \phi_{\text{become}(\text{TIREDNES-STATE})}(e, z, \pi')]$

e. (39b) with type accommodation:

$\lambda z\lambda \pi' \exists e:\text{BECOME}(\text{TIREDNES-STATE})[\text{cause}(\text{def-j:EV}[\text{journey}(j)], e, \pi') \& \phi_{\text{become}(\text{TIREDNES-STATE})}(e, z, \pi')](c')(\pi * ARG_2^{CAUSE}:EV-\varepsilon v_{BECOME}(\text{TIREDNES-STATE}) * ARG_1^{STATE}:K-STATE) =$
 $\exists e:\text{BECOME}(\text{TIREDNES-STATE})[\text{cause}(\text{def-j:EV}[\text{journey}(j)], e, \pi) \& \phi_{\text{become}(\text{TIREDNES-STATE})}(e, c', \pi * ARG_1^{STATE}:K-STATE)]$

f. (39a) with type accommodation:

$\lambda v\lambda c'\lambda \pi \exists r':\text{TROPE} \exists e:\text{BECOME}(\text{TIREDNES-STATE})[\text{cause}(\text{def-j:EV}[\text{journey}(j)], e, \pi) \& \phi_{\text{become}(\text{TIREDNES-STATE})}(e, c', \pi * ARG_1^{STATE}:K-STATE) \& \text{state}(c', r', \pi * ARG_1^{STATE}:K-STATE) \& \text{tiredness}(r', v, \pi * ARG_2^{TIREDNES}:ANIMATE)]$

(40) [Paul ist müde von der Reise]_{IP}: **compositional semantics**
 $\lambda \pi \exists c':K-STATE \exists r':\text{TROPE} \exists e:\text{BECOME}(\text{TIREDNES-STATE})[\text{cause}(\text{def-j:EV}[\text{journey}(j)], e, \pi) \& \phi_{\text{become}(\text{TIREDNES-STATE})}(e, c', \pi) \& \text{state}(c', r', \pi) \& \text{tiredness}(r', \text{paul}, \pi)]$

(41) Paul ist satt von der Pizza. 'Paul is full from the pizza.'
 $\lambda \pi \exists c':K-STATE \exists r':\text{TROPE} \exists e:\text{BECOME}(\text{FULLNESS-STATE}) \exists e':\text{EV}(\text{PIZZA})[\text{cause}(e', e, \pi) \& \phi_{\text{become}(\text{FULLNESS-STATE})}(e, c', \pi) \& \text{state}(c', r', \pi) \& \text{fullness}(r', \text{paul}, \pi') \& \phi_{\text{ev}(\text{PIZZA})}(e', \text{def-p:PHYS}[\text{pizza}(p)], \pi)]$

➤ **Lexical entry for causal von: stative and eventive reading**
 $\lambda c\lambda P\lambda v\lambda c'\lambda \pi[\text{cause}(c, c', \pi * ARG_1^{CAUSE}:EV\perp\text{TROPE} - \text{ev}\perp\text{TROPE}(TY^+(c)\sqsubseteq PHYS) * ARG_2^{CAUSE}:EV\perp\text{TROPE} - \varepsilon v_{BECOME}(TY^+(P)\sqsubseteq K-STATE) * ARG_1^{PRED(C)}:TY^{PS}(c) * ARG_1^P:TY^{PS}(P)) \& P(v)(c')(\pi)]$

(42) **Russian causal OT:**

$\lambda c\lambda P\lambda v\lambda c'\lambda \pi[\text{cause}(c, c', \pi * ARG_1^{CAUSE}:EV\perp\text{TROPE} - \text{TROPE}(TY^+(c)\sqsubseteq PHYS) * ARG_2^{CAUSE}:EV\perp\text{TROPE} - \varepsilon v_{BECOME}(TY^+(P)\sqsubseteq K-STATE) * ARG_1^{PRED(C)}:TY^{PS}(c) * ARG_1^P:TY^{PS}(P)) \& P(v)(c')(\pi)]$

➤ **Pragmatic type specification**

Underspecified predicates that were introduced to solve a type conflict require a type specification process that is modeled in TCL in terms of a modal logic with a weak conditional operator '>'; see Asher (2011: 227ff).

Only if there is a sensible type specification for those underspecified predicates that were introduced in the course of type accommodation, the coercive intervention is pragmatically legitimated.

(43) Defeasible type specification rules ('>': weak conditional)

- a. $\alpha \sqsubseteq \text{FOOD} \& \beta \sqsubseteq \text{ANIMATE} \& \text{cause}(\text{EV}(\beta, \alpha), \text{BECOME}(K-STATE(\text{FULLNESS}(\beta)))) > \text{EV}(\beta, \alpha) = \text{EAT}(\beta, \alpha)$
b. $\alpha \sqsubseteq \text{PHYS} \& \gamma \sqsubseteq \text{PHYS} \& \beta(\gamma) \sqsubseteq \text{SENSORIC_TROPE}(\gamma) \& \text{cause}(\text{TROPE}(\alpha), \beta(\gamma)) > \text{TROPE}(\alpha) = \beta(\alpha)$ 

For a more detailed version s. Bücking & Maienborn (2016).

8. Conclusion

- Parsimonious lexical semantic solution for the observed meaning variability of causal *von*-modifiers
 - ↳ **One lexical entry for causal *von***
- All differences between the two readings follow from
 - (a) the type of *von*'s internal argument: EVENT vs. TROPE,
 - (b) spatiotemporal contiguity conditions on direct causation,
 - (c) two AP-internal integration sites.
- **Adaptive mechanisms for interpretation**
 - exploit lexically built-in tolerance range for the resolution of type conflicts (polymorphic types)
 - have access to rich conceptual knowledge resources
- **Causation:** The presented analysis makes a strong case for
 - direct causation as a linguistically relevant notion
 - a stative variant of causation on a par with eventive causation

References

- Alexiadou, Artemis and Florian Schäfer (2006), Instrument subjects are agents or causers. In D. Baumer, D. Montero and M. Scanlon (eds.), *Proceedings of the 25th West Coast Conference on Formal Linguistics*. Somerville, MA: Cascadilla Proceedings Project, 40-48.
- Asher, Nicholas (2011), *Lexical Meaning in Context. A Web of Words*. CUP: Cambridge.
- Bücking, Sebastian (2012a), *Kompositional flexibel. Partizipanten und Modifikatoren in der Nominaldomäne*. Tübingen: Stauffenburg.
- Bücking, Sebastian (2012b), *Müdigkeit und Müde-Sein: Zur Semantik adjektivbasierter Zustandsnominalisierungen*. *Linguistische Berichte* 232: 361-397.
- Bücking, Sebastian and Claudia Maienborn (2016), On coercion by modification – A case study on the adaptive capacities of event-sensitive adnominal modifiers. Ms, University of Tübingen.
- Copley, Bridget and Philip Wolff (2015), Theories of causation should inform linguistic theory and vice versa. In B. Copley and F. Martin (eds.), *Causation in Grammatical Structures*. OUP: Oxford, 11-57.
- Dowty, David R. (1979), *Word Meaning and Montague Grammar*. Reidel: Dordrecht.
- Eckardt, Regine (2000), Causation, contexts, and event individuation. In J. Higginbotham, F. Pianesi and A.C. Varzi (eds.), *Speaking of Events*. New York, Oxford: Oxford University Press, 105-121.
- Herdtfelder, Johanna and Claudia Maienborn (2015), Causal modification of adjectival predicates: Insights from a corpus study on German causal *von* ('from'). In N. Melnik (ed.), *Proceedings of IATL 30. MIT Working Papers in Linguistics*, 39-56.
- Hobbs, Jerry R. (2005), Toward a useful concept of causality for lexical semantics. *Journal of Semantics* 22: 181-209.
- Laptieva, Ekaterina (2014), *Syntax und Semantik kausaler vor-Phrasen: Eine korpusbasierte Untersuchung*. MA-Thesis, University of Tübingen.
- Lewis, David (1973), Causation. *The Journal of Philosophy* 70: 556-567.
- Löbner, Sebastian (2000), Polarity in natural language: predication, quantification and negation in particular and characterizing sentences. *Linguistics and Philosophy* 23: 213-308.
- Maienborn, Claudia (2001), On the position and interpretation of locative modifiers. *Natural Language Semantics* 9: 191-240.
- Maienborn, Claudia (2005), On the limits of the Davidsonian Approach: The Case of Copula Sentences. *Theoretical Linguistics* 31: 275-316.
- Maienborn, Claudia (2015), Events and states. To appear in R. Truswell (ed.), *Oxford Handbook of Event Structure*. Oxford University Press. Oxford.
- Maienborn, Claudia and Johanna Herdtfelder (2015), A compositional account of the eventive/stative ambiguity of German causal *von*-modifiers. In S. D'Antonio, M. Moroney & C.R. Little (eds.), *Proceedings of SALT 25*, 163-183.
- Maienborn, Claudia and Johanna Herdtfelder (2017), Eventive vs. stative causation: The case of German causal *von*-modifiers. *Linguistics and Philosophy* 40(3): 279-320.
- Maienborn, Claudia and Martin Schäfer (2011), Adverbs and adverbials. In K. von Stechow, C. Maienborn and P. Portner (eds.), *Semantics. An International Handbook of Natural Language Meaning; Volume 2*, (HSK 33.2), Mouton de Gruyter. Berlin, New York. 1390-1420.
- Moltmann, Friederike (2007), Events, tropes and truthmaking. *Philosophical Studies* 134: 363-403.
- Moltmann, Friederike (2009), Degree structure as trope structure: A trope-based analysis of positive and comparative adjectives. *Linguistics and Philosophy* 32: 51-94.
- Moltmann, Friederike (2013), On the distinction between abstract states, concrete states, and tropes. In A. Mari, C. Beyssade and F. Del Prete (eds.), *Genericity*. Oxford University Press. Oxford. 292-311.
- Moltmann, Friederike (2015), States versus tropes. Comments on C. Anderson and M. Morzycki: 'Degrees as kinds'. *Natural Language and Linguistic Theory*, 33, 829-841.
- Morzycki, Marcin (2013), Modification. Unpublished Ms. Cambridge.
- Rappaport Hovav, Malka and Beth Levin (2000), Classifying single argument verbs. In M. Everaert, P. Coopmans and J. Grimshaw (eds.), *Lexical Specification and Insertion*. Benjamins. Amsterdam. 269-304.
- Rothmayr, Antonia (2009), *The Structure of Stative Verbs*. John Benjamins: Amsterdam, Philadelphia.
- Schäfer, Florian (2012), Two types of external argument licensing. The case of causers. *Studia Linguistica* 66: 1-53.
- Shibatani, Masayoshi (1976), The grammar of causative constructions: A conspectus. In M. Shibatani (ed.) *Syntax and Semantics Vol. 6: The Grammar of Causative Constructions*. Academic Press. New York, 5-41.
- Talmy, Leonard (1976), Semantic Causative Types. The Grammar of Causative Constructions. In M. Shibatani (ed.) *Syntax and Semantics Vol. 6: The Grammar of Causative Constructions*. Academic Press. New York. 43-116.
- Vecchiato, Antonella (2011), *Events in the grammar of direct and indirect causation*. PhD thesis. University of Southern California.
- Wolff, Philip (2003), Direct causation in the linguistic coding and individuation of causal events. *Cognition* 88: 1-48.