

# Dynamic binding across modalities: some observations on German stressed and destressed pronouns

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# plan for today



- gestures trigger familiar inferential types (entailments, presuppositions or implicatures) (Ebert & Ebert 2014; Schlenker 2018; Esipova 2019; Ebert, Ebert & Hörnig 2020, ...)
- **today:**
  - we show that they display dynamic semantic behaviour as other linguistic items (e.g., as bound pronouns or presuppositions)
  - we discuss how modality affects the choice of pronoun in English and German (stressed vs. unstressed and ordinary vs. d-pronoun)

# in a nutshell



- pointing and iconic gestures introduce (existentially bound) discourse referents (DRs) (and propositions) that interact with speech (Ebert & Ebert 2014)
- these are available across sentence boundaries, dimensions, and modalities
- gestural material can dynamically bind and be bound across dimensions
- speech pronouns can be bound by gesture and gesture pronouns can be bound by speech
- modality and salience/prominence affects what pronoun has to be used and how it is realized



dynamic binding  
within and across dimensions

# dynamic binding



- The existential quantifier has been argued to bind variables across sentence boundaries which are not in its syntactic scope (Heim 1982; Kamp & Reyle 1993; Gronendijk & Stokhof 1991)

# dynamic binding: classic cases



(a) A man walks in the park. He whistles.

$\exists x[man(x) \wedge walk\_in\_the\_park(x)] \wedge whistle(x)$	DPL
$\exists x[man(x) \wedge walk\_in\_the\_park(x) \wedge whistle(x)]$	PL
$[x][man(x), walk\_in\_the\_park(x), whistle(x)]$	DRT

(b) If a farmer owns a donkey, he beats it.

$\exists x[farmer(x) \wedge \exists y[donkey(y) \wedge own(x, y)]] \rightarrow beat(x, y)$	DPL
$\forall x \forall y [farmer(x) \wedge \exists y[donkey(y) \wedge own(x, y)] \rightarrow beat(x, y)]$	PL
$[ ][[x, y][farmer(x), donkey(y), own(x, y)] \rightarrow [ ][beat(x, y)]]$	DRT

(c) Every farmer who owns a donkey, beats it.

$\forall x[farmer(x) \wedge \exists y[donkey(y) \wedge own(x, y)]] \rightarrow beat(x, y)$	DPL
$\forall x \forall y [farmer(x) \wedge \exists y[donkey(y) \wedge own(x, y)] \rightarrow beat(x, y)]$	PL
$[ ][[x, y][farmer(x), donkey(y), own(x, y)] \rightarrow [ ][beat(x, y)]]$	DRT

# dynamic binding across dimensions



- Furthermore, dynamic binding is possible even across dimensions: from the at-issue dimension into the non-at issue dimension and the other way around (Nouwen 2007; Potts et al. 2009; Anderbois et al. 2015)

# non-at-issueness



Potts (2005) argues that appositives and expressives are canonical cases of non-at-issue information

(1) *Your damn dog barked all night.*

(2a) *Ljubljana, one of the nicest cities of the world, is located in Slovenia.*

(2b) *Ljubljana, which is one of the nicest cities of the world, is located in Slovenia.*

## at-issue:

asserted content; main claim of the utterance; what the speaker wants to convey

## non-at-issue:

an aside that comes with the utterance; not towards what the speaker wants to drive the conversation



# dynamic binding across dimensions



- it has been suggested that non-at-issue information introduces a second dimension of semantic interpretation (Potts 2005; Gutzmann 2012)
  - but dynamic binding even takes place across the at-issue/non-at issue dimension (Nouwen 2007; Potts et al. 2009; Anderbois et al. 2015)
  - in two-dimensional approaches, the two dimensions cannot interact, binding facts cannot be accounted for
- we need a unidimensional dynamic semantic model (Anderbois et al. 2015)

# dynamic binding across dimensions



Examples from (Anderbois et al. 2015, pp. 94, 97, 98):

- (1) *John, who played tennis with a woman<sub>i</sub>, played golf with her<sub>i</sub>, too.*
- (4a) *John, who saw Mary, saw Susan, too.*
- (4b) *John saw Mary, who saw him, too.*
- (12a) *Mary, who courts a semanticist at every conference party, always dances with him.*
- (12b) *Mary courts a semanticist at every conference party, where she always dances with him.*

→ pronouns and presuppositions can be bound across dimensions – from within appositives and into appositives

# gestures pattern with appositives



Ebert & Ebert (2014) argue that speech-accompanying (iconic and pointing) gestures behave like appositives (in the default case)

- (1) *Ich habe [eine Flasche Wasser] zum Talk mitgebracht.*  
*I brought [a bottle of water] to the talk.*



at-issue

semantic content of the speech signal:

*The speaker brought a bottle of water to the talk*

non-  
at-issue

semantic content of the gesture (roughly):

*The bottle is big/looks like what is illustrated*



dynamic binding across modalities

# binding gestural material across dimensions



- gestures introduce discourse referents (DRs) (Ebert & Ebert 2014) and propositional variables
- gestures can represent anaphoric expressions and give rise to presuppositions themselves
- speech pronouns and presuppositions can be bound by gesture and gestural anaphoric items can be bound by speech

# gesture introduces a fresh referent

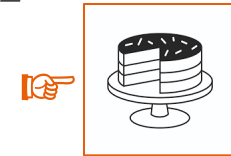


Gesture material can bind and be bound across dimensions (co-speech)

(1a) *I have already eaten.*

*#It was too sweet for me.*

(1b) *I have already [eaten].*



*It was too sweet for me.*

→ speech pronoun bound by gesture DR: gesture realizes an argument and introduces a DR, which can be picked up by a pronoun



# Linsky's mistaken identity case

Gesture material can bind and be bound across dimensions (co-speech)

Kripke (1977) (based on Linsky 1963) discusses this mismatch example:

A: *[Her<sub>y</sub> husband]<sub>x</sub> is kind to her<sub>y</sub>.*



B: *HE<sub>z</sub> is kind to her<sub>y</sub>.*

*But he<sub>z</sub> isn't her<sub>y</sub> husband.*

(Kripke 1977, p. 90, my emphasis)

→ speech pronoun bound by gesture DR: pronoun can pick up gestural/visual referent

# Einstein is not Chomsky



Gesture material can bind and be bound across dimensions (co-speech)

another mismatch example:

A: *[Albert Einstein] is a nobel prize laureate.*



B: *Yes, he is... but who you are pointing at / this / HE is not Albert Einstein.*

→ speech pronoun bound by gesture DR: pronoun can pick up gesture referent



# establishing a referent in the gesture space



Gesture material can bind and be bound across dimensions (pro-speech)

Schlenker (2020, p. 889) presents examples of where a gestural anaphoric expression - tied to a certain locus in the gesture space - is dynamically bound by what is introduced via speech and co-speech:

Whenever I can hire IX-hand-a [**a mathematician**] and IX-hand-b [**a sociologist**], I pick

a. IX-a. (= the mathematician)

b. IX-b. (= the sociologist)

→ gesture pronoun **bound** by speech (and gesture) DR

# gesture binding presupposition



Gesture material can bind and be bound across dimensions (presuppositions)

presuppositions bound by gesture:

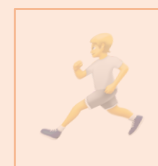
(1a) #*Paul, who I met yesterday, went jogging again today.*

(1b) *Paul, who [I met yesterday], went jogging again today.*



(2a) #*Paul met Peter yesterday and then went jogging, too.*

(2b) *Paul [met Peter yesterday], and then went jogging, too.*



→ speech presupposition **bound** by gesture proposition

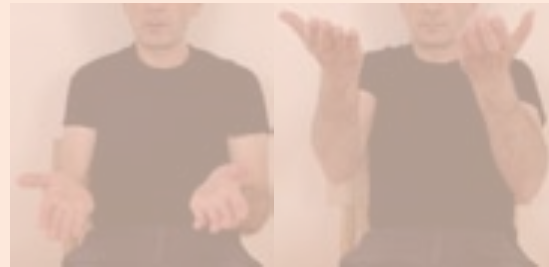
# gestural presuppositions



Gesture material can bind and be bound across dimensions (presuppositions)

- Schlenker (2021, p. 245) argues that gestures can contain presuppositions:

(35) This child, will you



- a. <sup>6</sup>LIFT\_?
- b. <sup>5.3</sup> LIFT-difficult?
- c. <sup>6.3</sup> :-/ LIFT-difficult?

- such a gesture presupposition can be bound by speech:

(1) *Even if this box is heavy, Mary will still [ lift ] it.*

+ :-/ LIFT-DIFF

*But maybe it is very light anyway.*

→ gesture presupposition bound by speech

# what we have seen



- gestures introduce discourse referents (DRs) (Ebert & Ebert 2014) and speech pronouns can be dynamically bound by these
- gestures can be anaphoric items and be bound by speech (+ gesture)
- iconic gestures can introduce propositions that interact with speech and gesturally introduced propositions can serve as binders for presuppositions
- speech pronouns can be bound by gesture and gestural anaphoric items can be bound by speech across syntactic borders, dimensions and modalities
- speech presuppositions can be bound by gesture and gesture presuppositions can be bound by speech across syntactic borders, dimensions and modalities



Ebert & Ebert 2014  
gestures as non-at-issue meaning contributors

# binding gestural material across dimensions



- One of the core features of Ebert & Ebert's (2014) account is the introduction of DRs via pointing and iconic gestures
- by this, we can handle all cases of where gesture introduces a DR and a speech pronoun is dynamically bound by it



# formal apparatus

- based on ideas of Koev (2013) and AnderBois et al. (2015)
- uni-dimensional and dynamic system  
→ accounts for anaphora/binding between different levels
- tracking of content via **propositional variables**  $p, p^*$ :

– at-issue proposal:  $p$

– non-at-issue imposition  $p^*$

- dynamically 'construct' these propositions
- rough approximation of pragmatic use (cf. Farkas & Bruce, 2010):
  - $p$  is on the table for discussion
  - $p^*$  is not for discussion and silently imposed

# formal apparatus



- discourse referents  $x, y, \dots$  are of type  $\langle s, e \rangle$ , i.e. they stand proxy for individual concepts

- dynamic DR introduction is noted as  $[x]$

- predicates come with a propositional index:

$$\llbracket \text{sleep}_p(x) \rrbracket^{\mathfrak{M}, \langle g, h \rangle} = \mathbf{true} \text{ iff } g = h \text{ and for all } w \in h(p) : h(x)(w) \in \mathfrak{I}_w(\text{sleep})$$

- our extension: also equality of DRs comes with a propositional index:


$$\llbracket x =_p y \rrbracket^{\mathfrak{M}, \langle g, h \rangle} = \mathbf{true} \text{ iff for all } w \in h(p) : h(x)(w) = h(y)(w)$$

→ allows for 'identity' of non-rigid concepts and rigid designators on  $p$



# meaning of pointing

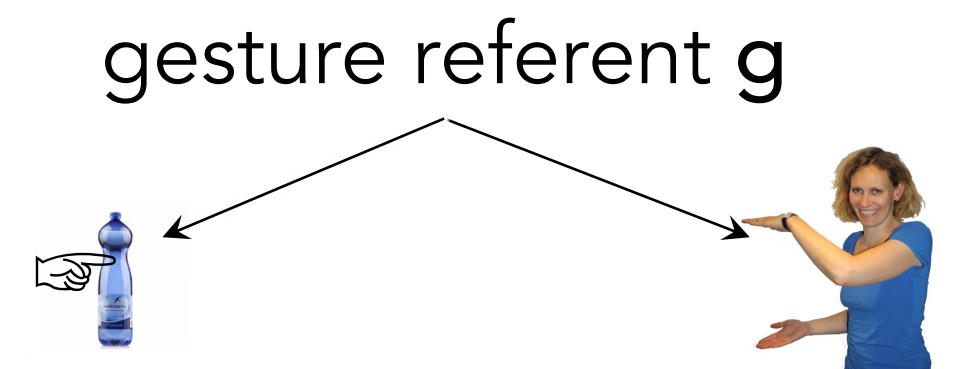


- pointing gestures refer to an individual  $g$  in a rigid way  
(cf. Roberts, 2002); deferred reference is possible (Nunberg, 1993)
- **basic 'lexical' gesture meaning of   $g$**   
direct reference to gesture referent  $g$   
intensional meaning: rigid designator, noted as  $I_g$

for all possible worlds  $w$ :  $\mathfrak{I}_w(I_g) = g$

- meaning of performance of gesture   $g$

$$[z] \wedge z = I_g$$



# meaning due to temporal alignment



'constructional' meaning contributions due to gesture speech alignment:

indefinite article  
+ gesture

*a*

$[x]$

similarity



$[z] \wedge z = I_g$

$SIM_{p^*}(x, z)$

name/definite article  
+ gesture

*the*

$[x]$

+ presuppositions  
(existence & uniqueness)

identity



$[z] \wedge z = I_g$

$x =_{p^*} z$

noun phrase +  
gesture

*bottle*

$bottle_p(x)$

exemplification



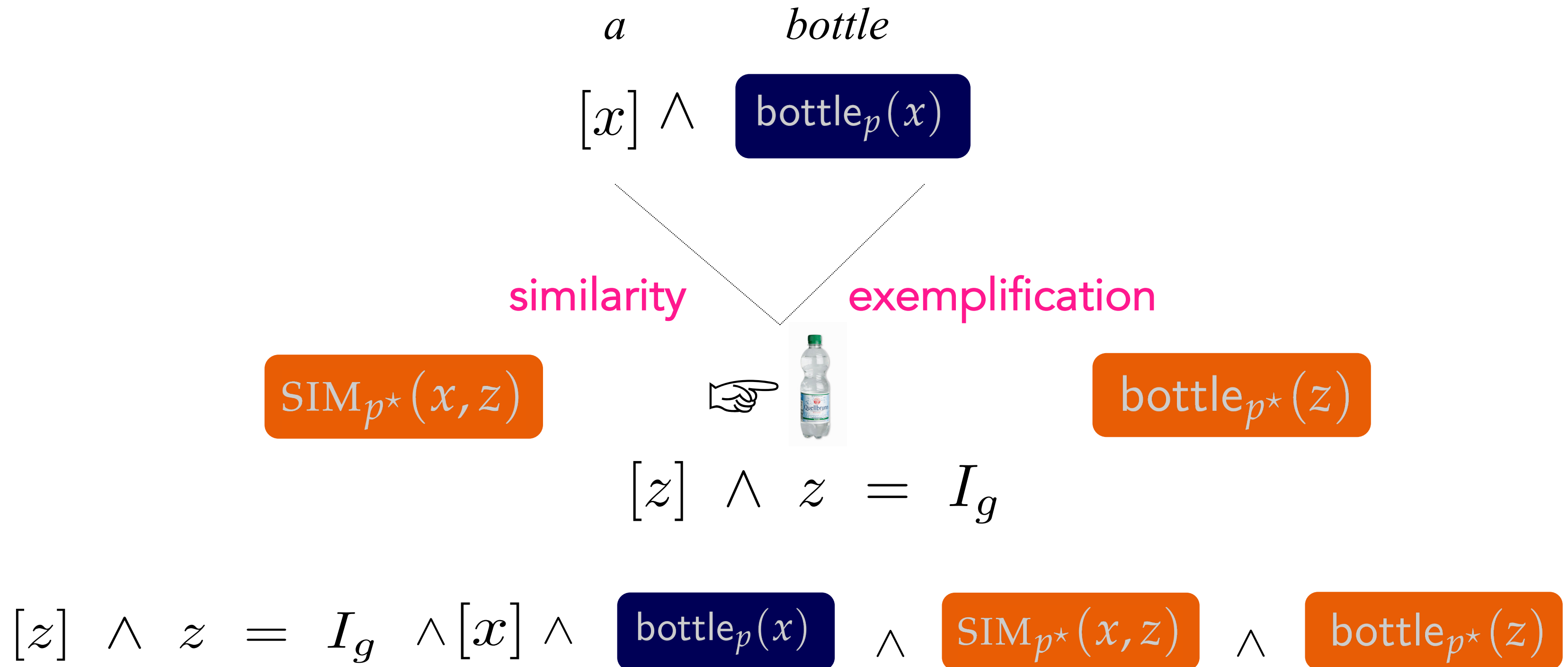
$[z] \wedge z = I_g$

$bottle_{p^*}(z)$

# sample derivation



combined meaning contributions of speech and gesture:



# sample derivation



(1) *Cornelia brought [a bottle].*



$$[z] \wedge z = I_g \wedge [x] \wedge \text{bottle}_p(x) \wedge \text{SIM}_{p^*}(x, z) \wedge \text{bottle}_{p^*}(z) \wedge \text{bring}_p(\text{cornelia}, x)$$

**at-issue**

there is a bottle that Cornelia brought

**non-at-issue**

the gesture referent is similar to this bottle

the gesture referent is itself a bottle



dynamic binding across modalities revisited

# binding gestural material across dimensions



- gestures introduce discourse referents (DRs) (Ebert & Ebert 2014)
  - speech pronouns can be bound by these across sentence boundaries and across modalities
- this accounts for the first three cases of speech pronoun binding to a gesturally introduced DR

# gesture introduces a fresh referent

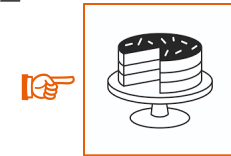


Gesture material can bind and be bound across dimensions (co-speech)

(1a) *I have already eaten.*

*#It was too sweet for me.*

(1a) *I have already [eaten].*



*It* *was too sweet for me.*

→ speech pronoun bound by gesture DR: gesture realizes an argument and introduces a DR, which can be picked up by a pronoun.



# gesture introduces a fresh referent

- meaning of performance of gesture:  $\text{point} \ g$   
 $[z] \wedge z = I_g$
- i.e., pointing to the cake introduces an existentially bound DR for the rigid concept of a concrete cake referent
- the pronoun *it* can be dynamically bound to this DR

$\text{eat}_p(\text{speaker}) \wedge [z] \wedge z = I_{\text{cake}} \wedge \text{too\_sweet}_p(z)$





# Linsky's mistaken identity case

Gesture material can bind and be bound across dimensions (co-speech)

Kripke (1977) (based on Linsky 1963) discusses this mismatch example:

A: *[Her<sub>y</sub> husband]<sub>x</sub> is kind to her<sub>y</sub>.*



B: *HE<sub>z</sub> is kind to her<sub>y</sub>.*

*But he<sub>z</sub> isn't her<sub>y</sub> husband.*

(Kripke 1977, p. 90, my emphasis)

→ speech pronoun bound by gesture DR: pronoun can pick up gestural/visual referent

# attributive vs. referential



*her husband* -----  $x$  ----->



👉 -----  $z$  ----->



- two distinct referential concepts: verbal and (possibly covert) gestural
- different interpretations depending on which is at-issue

at-issue verbal concept

at-issue gestural concept

$\text{husband}_p(x, y)$

$z =_{p^*} x$

$\text{husband}_{p^*}(x, y)$

$z =_p x$

attributive reading

referential reading



# meaning components

- recall: meaning of performance of gesture:  $\text{☞ } \mathbf{g}$   
 $[z] \wedge z = I_{\mathbf{g}}$
- additional 'constructional meaning' components arise due to this temporal alignment
- for definite descriptions/names + pointing gesture:  
identity of the two discourse referents
- name/definite +  $\text{☞ } \mathbf{g}$  :  $\mathbf{g}$  is identical to verbal referent  $x =_{p^*} z$

# Linsky's mistaken identity



'speaker's reference' (Kripke 1977)

gesture concept at-issue/referential interpretation

A: [*Her<sub>y</sub> husband*] is kind to *her<sub>y</sub>*.



B: *HE<sub>z</sub>* is kind to *her<sub>y</sub>*.

*But he<sub>z</sub> isn't her<sub>y</sub> husband* (Kripke 1977, p.90, our emphasis)

A:  $[x] \wedge \text{husband}_{p^*}(x, y) \wedge [z] \wedge z = I_{\text{man}} \wedge z =_{p^*} x \wedge \text{kind}_p(z, y)$

B:  $\text{kind}_p(z, y) \wedge \neg \text{husband}_p(z, y)$



*x*



# Einstein is not Chomsky



Gesture material can bind and be bound across dimensions (co-speech)

another mismatch example:

A: *[Albert Einstein] is a nobel prize laureate.*



B: *Yes... but who you are pointing at / this / HE is not Albert Einstein.*

→ speech pronoun **bound by gesture** DR: pronoun can pick up gesture referent

# Einstein is not Chomsky



combined meaning contributions of speech and gesture:

speech channel:

*Albert Einstein*

$$[x] \wedge x = I_{\text{einstein}}$$

verbal meaning

temporal alignment:

$$z =_{p^*} x$$

constructional  
meaning

gesture channel:



$$[z] \wedge z = I_{\text{chomsky}}$$

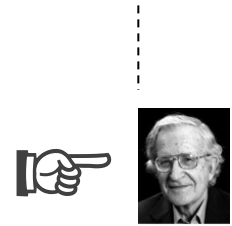
gesture meaning

$$[x] \wedge x = I_{\text{einstein}} \wedge [z] \wedge z = I_{\text{chomsky}} \wedge z =_{p^*} x$$

# Einstein is not Chomsky



A: *[Albert Einstein] is a nobel prize laureate.*



combined meaning of multi-modal utterance:

$$[x] \wedge x = I_{\text{einstein}} \wedge [z] \wedge z = I_{\text{chomsky}} \wedge z =_{p^*} x \wedge \text{nobel\_laureate}_p(x)$$

B: *Yes... but HE is not Albert Einstein.*

$$\neg z =_{p^*} x$$



dynamic binding across modalities revisited  
special focus on intonation in English



# introducing an argument in the gesture space



Gesture material can bind and be bound across dimensions (co-speech)

(1a) *I have already eaten.*

*#It was too sweet for me.*

(1b) *I have already [eaten].*



*It was too sweet for me.*

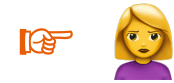
→ speech pronoun **bound by gesture DR**: gesture realizes an argument and introduces a DR, which can be picked up by a pronoun.

# introducing an argument in the gesture space



If there is only one DR that is introduced, pronoun remains unstressed

(1) *I just [phoned].*



Now *she*/*#SHE* is here.

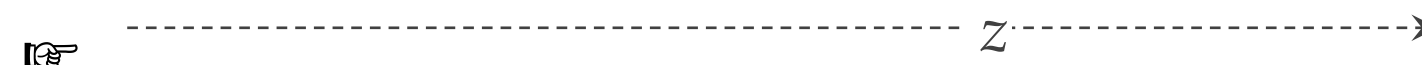


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B: *HE<sub>z</sub> is kind to her.*

*But he<sub>z</sub> isn't her husband.*

(Kripke 1977, p. 90, our emphasis)



B': *No, he<sub>x</sub> isn't.*

*The man you are referring to isn't her husband.*

(Kripke 1977, p. 90)

→ **speech pronoun bound by gesture DR: pronoun can pick up gestural/visual referent (B) or speech referent (B')**

# Linsky's mistaken identity



'speaker's reference' (Kripke 1977)

gesture concept at-issue/referential interpretation

A: [*Her<sub>y</sub> husband*] is kind to *her<sub>y</sub>*



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*But he<sub>z</sub> isn't her<sub>y</sub> husband* (Kripke 1977, p.90, our emphasis)

A:  $[x] \wedge \text{husband}_{p^*}(x, y) \wedge [z] \wedge z = I_{\text{man}} \wedge z =_{p^*} x \wedge \text{kind}_p(z, y)$

B:  $\text{kind}_p(z, y) \wedge \neg \text{husband}_p(z, y)$



*x*



# Linsky's mistaken identity



semantic reference (Kripke 1977)

verbal concept at-issue/attributional interpretation

A:  $[Her_y \text{ husband}]_x$  is kind to her<sub>y</sub>.



B': No, he<sub>x</sub> isn't.

*The man you are referring to<sub>z</sub> isn't her husband. (Kripke 1977, p.90)*



A:  $[x] \wedge \text{husband}_p(x, y) \wedge [z] \wedge z = I\text{man} \wedge z =_{p^*} x \wedge \text{kind}_p(z, y)$

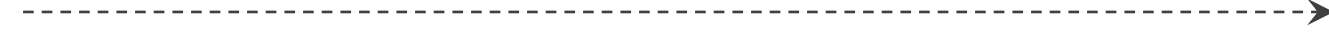
B:  $\neg \text{kind}_p(x, y) \wedge \neg z =_p x$

# Linsky's mistaken identity case



If there are speech and gestural DRs, speech DR prominent by default

A: [*Her<sub>y</sub> husband*]<sub>x</sub> is kind to her<sub>y</sub>.



B: *HE<sub>z</sub>* is kind to her<sub>y</sub>.  
But *he<sub>z</sub>* isn't her husband.



→ stress on pronoun: to change from prominent (speech) to non-prominent referent.

Then the gestural referent is the prominent one, hence no stress with second occurrence.

B': No, *he<sub>x</sub>* isn't.



*The man you are referring to<sub>z</sub>* isn't her husband.

→ No stress needed: prominent referent is picked up.

But needed to change to non-prominent gestural referent:

B'': No, *he<sub>x</sub>* isn't.



*HE<sub>z</sub>* actually isn't her husband.



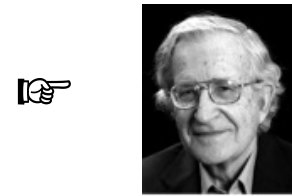
# Einstein is not Chomsky



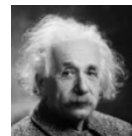
Gesture material can bind and be bound across dimensions (co-speech)

mismatch examples:

A: *[Albert Einstein] is a nobel prize laureate.*



B: *Yes, **he** is... but who you are pointing to / this / **HE** is not Albert Einstein.*



→ speech pronoun unstressed; stress to change to gesture concept



dynamic binding across modalities revisited  
special focus on intonation in German



# The general interpretative options of DPros



- Well-known that German DPros (*der/die/das*), have a strong tendency to avoid maximally prominent antecedents/binders
- (Maximal) Prominence has been defined in terms of **subjecthood** (Bosch et al. 2007), **topicality** (Bosch and Umbach 2007; Hinterwimmer 2015) **proto-agentivity** (Schumacher et al. 2016, 2017) and the status as perspectival center (Hinterwimmer and Bosch 2016, 2017)



# The general interpretative options of DPros

- In perspectivally neutral text segments, DPros avoid subjects (which are usually at the same time agents/experiencers and topics by default) as antecedents:

(1) Martha<sub>i</sub> wollte mit Elif<sub>j</sub> ins Theater gehen, aber sie<sub>i,j</sub>/die<sub>j</sub> war leider erkältet.

*Martha<sub>i</sub> wanted to go to the theatre with Elif<sub>j</sub>, but unfortunately she<sub>i,j</sub>/she(DPro)<sub>j</sub> had a cold.*



# The general interpretative options of DPro

- Case with two potential antecedents where one antecedent introduced in at-issue content of preceding sentence, while other antecedent introduced in non-at-issue content:
  - (2) Peter hat Elif<sub>i</sub>, [deren Schwester]<sub>j</sub> Physikerin ist, gefragt, ob sie<sub>i</sub>/die<sub>i,j</sub> ihr die Grundlagen der Quantenmechanik erklären kann.  
*Peter asked Elif<sub>i</sub>, [whose sister]<sub>j</sub> is a physicist, whether she<sub>i</sub>/she(DPro)<sub>j</sub> can explain to her the foundations of quantum mechanics.*
- PPro strongly prefers the former, while DPro can pick up both, with a preference for the latter

# The general interpretative options of DPros



- In cases of parallelism and contrast, strongly accented PPros (as well as DPros) can be used to signal switch to less prominent referent for first occurrence of PPro:

(2) Marco<sub>i</sub> hat Peter<sub>j</sub> als AfD-Anhänger bezeichnet und dann hat ER<sub>j</sub> IHN<sub>i</sub> beleidigt.

*Marco<sub>i</sub> called Peter<sub>j</sub> an AfD-supporter and then HE<sub>j</sub> insulted HIM<sub>i</sub>.*

# The general interpretative options of DPros



- Not generally the case, however, that strongly accented PPros instead of DPros can be used in German to signal that less prominent referent is picked up (independent of whether that referent has been introduced in the at-issue or the non-at-issue content):

(1') ??Martha<sub>i</sub> wollte mit Elif<sub>j</sub> ins Theater gehen, aber SIE<sub>j</sub> war leider erkältet.

Martha<sub>i</sub> wanted to go to the theatre with Elif<sub>j</sub>, but unfortunately SHE<sub>j</sub> had a cold.

# The general interpretative options of DPros



- Strong accent more acceptable in (2'), but still preference for PPro to pick up referent introduced in at-issue content:

(2') Peter hat Elif<sub>i</sub>, [deren Schwester]<sub>j</sub> Physikerin ist, gefragt, ob SIE<sub>i/?j</sub> ihr die Grundlagen der Quantenmechanik erklären kann.

*Peter asked Elif<sub>i</sub>, [whose sister]<sub>j</sub> is a physicist, whether SHE<sub>i/?j</sub> can explain to her the foundations of quantum mechanics.*

# The general interpretative options of DPros



- Given this state of affairs, it is thus predicted that (unaccented) DPros should be perfect for picking up gestural referent, assuming that gestural referents in virtue of having been introduced as non-at-issue content, are less prominent than linguistically introduced referents.
- Not borne out by the facts, however

## some first cautious claims



- the referential concept that is used at-issue is the more prominent/salient one
- this is usually the speech concept, except in (Donnellan-like) referential readings
- in these non-referential reading contexts, to pick up the less prominent DR in the gestural domain, one cannot use an unstressed pronoun, but has to use a stressed pronoun – both in English and in German (PPro or DPro)
- for German, in referential reading contexts, the gestural DR can be picked up by an unstressed DPro (but not an unstressed PPro)





## two puzzles for the German cases

- Why is it not possible to refer back to the less salient gestural DR with an unstressed d-pronoun in ordinary non-referential reading contexts?
- Why is it possible to use the d-pronoun, but not an ordinary unstressed pronoun when the gestural concept is at-issue?

# gesture DR with no competition



Gesture material can bind and be bound across dimensions (co-speech)

(1b-G) *Ich hab schon [gegessen].*



*?Er/Der/#ER/#DER war mir aber zu süß.*

→ no competition: unstressed pronoun (?PPro or DPro) for gesture DR

# gesture and speech DR in competition



Gesture material can bind and be bound across dimensions (co-speech)

(1b-G) *Peter<sub>i</sub> wollte seinen Laptop [verkaufen].*



*Aber #er<sub>i</sub>/#der<sub>i</sub>? ER<sub>i</sub>? DER<sub>j</sub> wollte den Preis nicht zahlen.*

→ competition: stressed pronoun (PPro DPro) for gesture DR

# gesture and speech DR in competition



Gesture material can bind and be bound across dimensions (co-speech)

(1b-G) *Peter<sub>i</sub> wollte seinen Laptop [verkaufen].*



*Aber ?sie<sub>j</sub>? ?die<sub>i</sub>/SIE<sub>j</sub>? DIE<sub>j</sub> wollte den Preis nicht zahlen.*

→ no real competition: unstressed DPro ok for gesture referent? Stressed pronoun ok, too

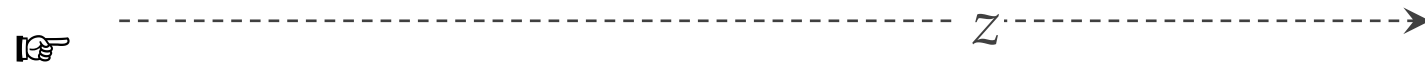


# Linsky's mistaken identity case

Gesture material can bind and be bound across dimensions (co-speech)

Kripke (1977) (based on Linsky 1963) discusses this mismatch example:

A: *[Ihr<sub>y</sub> Ehemann]<sub>x</sub> behandelt sie<sub>y</sub> gut.*



*x*



B: *Ja, #er<sub>z</sub> /<sup>?</sup>der<sub>z</sub>/ER<sub>z</sub>/DER<sub>z</sub> behandelt sie schon gut.  
Aber er<sub>z</sub> ist nicht ihr Ehemann.*

B': *Nein, tut er<sub>x</sub> nicht.*

*Der Typ, auf den du referierst, /ER<sub>z</sub> /DER<sub>z</sub> ist nicht ihr Ehemann.*

→ stressed pronoun (PPro and DPro) picks up the gesture DR in the attributive reading; unclear in the referential case.

# Einstein is not Chomsky



Gesture material can bind and be bound across dimensions (co-speech)

another mismatch example (attributive reading):

A: *[Albert Einstein]<sub>x</sub> ist Nobelpreisträger.*



B: *Ja ist er<sub>x</sub>. / Ja, der<sub>x</sub>/#ER<sub>x</sub>/#DER<sub>x</sub> ist schon Nobelpreisträger. Aber #er<sub>z</sub>/#der<sub>z</sub>/#Er<sub>z</sub>  
/?DER<sub>z</sub> ist nicht Albert Einstein.*

→ stressed PPro picks up the gesture DR in the attributive reading

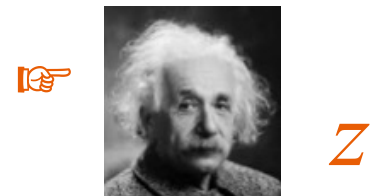
# Einstein is not Chomsky



Gesture material can bind and be bound across dimensions (co-speech)

another mismatch example (referential reading):

A: *[Der Begründer der Quantenmechanik]<sub>x</sub> ist Nobelpreisträger.*



B: *Ja, <sup>?</sup>er<sub>z</sub>/<sup>?</sup>der<sub>z</sub>/<sup>??</sup>ER<sub>z</sub>/<sup>??</sup>DER<sub>z</sub> hat schon einen Nobelpreis gewonnen. Aber er<sub>z</sub> ist nicht der Begründer der Quantenmechanik, sondern der Relativitätstheorie.*

→ **unstressed** DPro (and PPro?) can pick up the gesture DR in the referential reading



conclusion: dynamic binding across modalities



# conclusion



- gestures contribute meaning and interact with speech
- in particular, they show dynamic semantic behaviour as other linguistic items (i.e., as bound pronouns or presuppositions)
- pointing and iconic gestures can introduce (existentially bound) discourse referents (DRs) (and propositions) that interact with speech
- we need more work on how exactly these gestural DRs can be picked up (PPro, DPro, stressed, unstressed)



**THANK YOU**

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# appendix



# appendix



## Interpretation of symbols and variables.

for every predicate symbol  $P$ :  $\llbracket P \rrbracket^{w,g} = \mathcal{I}(P)(w)$

for every constant symbol  $c$ :  $\llbracket c \rrbracket^{w,g} = \mathcal{I}(c)(w)$

for every variable  $x_{\langle s,e \rangle}$ :  $\llbracket x \rrbracket^{w,g} = g(x)(w)$

## Interpretation of literals.

- a.  $\llbracket P_p(t_1, \dots, t_n) \rrbracket = \{ \langle g, h \rangle \mid g = h \text{ and for all worlds } w \in h(p) : \langle \llbracket t_1 \rrbracket^{w,h}, \dots, \llbracket t_n \rrbracket^{w,h} \rangle \in \llbracket P \rrbracket^{w,h} \}$
- b.  $\llbracket t_1 \Rightarrow_p t_2 \rrbracket = \{ \langle g, h \rangle \mid g = h \text{ and for all worlds } w \in h(p) : \llbracket t_1 \rrbracket^{w,h} = \llbracket t_2 \rrbracket^{w,h} \}$
- $\llbracket t_1 \neq_p t_2 \rrbracket = \{ \langle g, h \rangle \mid g = h \text{ and for all worlds } w \in h(p) : \llbracket t_1 \rrbracket^{w,h} \neq \llbracket t_2 \rrbracket^{w,h} \}$
- $\llbracket t_1 \doteq t_2 \rrbracket = \{ \langle g, h \rangle \mid g = h \text{ and for all worlds } w \in W : \llbracket t_1 \rrbracket^{w,h} = \llbracket t_2 \rrbracket^{w,h} \}$
- c.  $\llbracket \exists v \rrbracket = \{ \langle g, h \rangle \mid g[v]h \}$
- d.  $\llbracket \varphi \wedge \psi \rrbracket = \{ \langle g, h \rangle \mid \text{there is a } k \text{ such that } \langle g, k \rangle \in \llbracket \varphi \rrbracket \text{ and } \langle k, h \rangle \in \llbracket \psi \rrbracket \}$
- e.  $\llbracket \max^p(\varphi) \rrbracket = \{ \langle g, h \rangle \mid \langle g, h \rangle \in \llbracket \exists p \wedge \varphi \rrbracket \text{ and there is no } h' \text{ s.t. } \langle g, h' \rangle \in \llbracket \exists p \wedge \varphi \rrbracket \text{ and } h(p) \subsetneq h'(p) \}$
- f.  $\llbracket \text{MIGHT}_p^{p'}(\varphi) \rrbracket = \{ \langle g, h \rangle \mid \langle g, h \rangle \in \max^{p'}(\varphi) \text{ and for all worlds } w \in h(p) : \mathbf{MB}(w) \cap h(p') \neq \emptyset \}$   
(**MB** modal base of *might*)
- g.  $\llbracket \text{NOT}_p^{p'}(\varphi) \rrbracket = \{ \langle g, h \rangle \mid \langle g, h \rangle \in \max^{p'}(\varphi) \text{ and } h(p) \cap h(p') = \emptyset \}$

# German SO as dimension shifter



## the direct denial test

### speech & gesture

(1) *Ich habe [eine Flasche Wasser] mitgebracht.*



*I brought [a bottle of water].*

### Direct denial response:

(2) *#That's not true! You actually brought a small bottle.*

### Discourse interrupting protest:

(3) *Hey, wait a minute! Actually, the bottle is not as big.*

### speech & so + gesture

(4) *Ich habe [SO] eine*

*Flasche Wasser mitgebracht.*



*I brought a bottle of water like [that].*

### Direct denial response:

(5) *That's not true! You actually brought a small bottle.*

# German SO as dimension shifter



## the direct denial test

### speech & gesture

- (1) *Ich bringe niemals  
[eine Flasche Wasser] mit zu Vorträgen.*



*I never bring [a bottle of water] to talks.*

### Negation elaboration:

- (2) *#Eine kleine reicht mir nämlich.  
A small one is enough for me.*

### speech & so + gesture

- (3) *Ich bringe niemals  
[SO eine Flasche Wasser] mit zu  
Vorträgen.*



*I never bring [a bottle of water like that] to talks.*

### Negation elaboration.

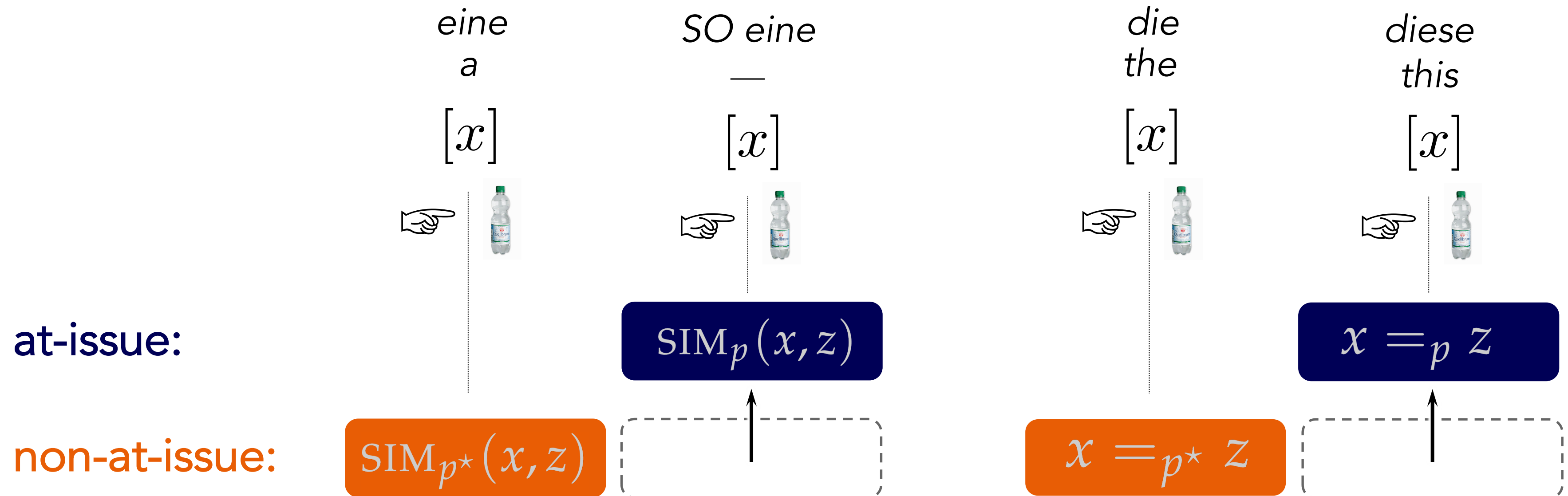
- (4) *Eine kleine reicht mir nämlich.  
A small one is enough for me.*

# Demonstratives as dimension shifters



- *diese/this* is the demonstrative version of the shifted definite article *die/the*, i.e.

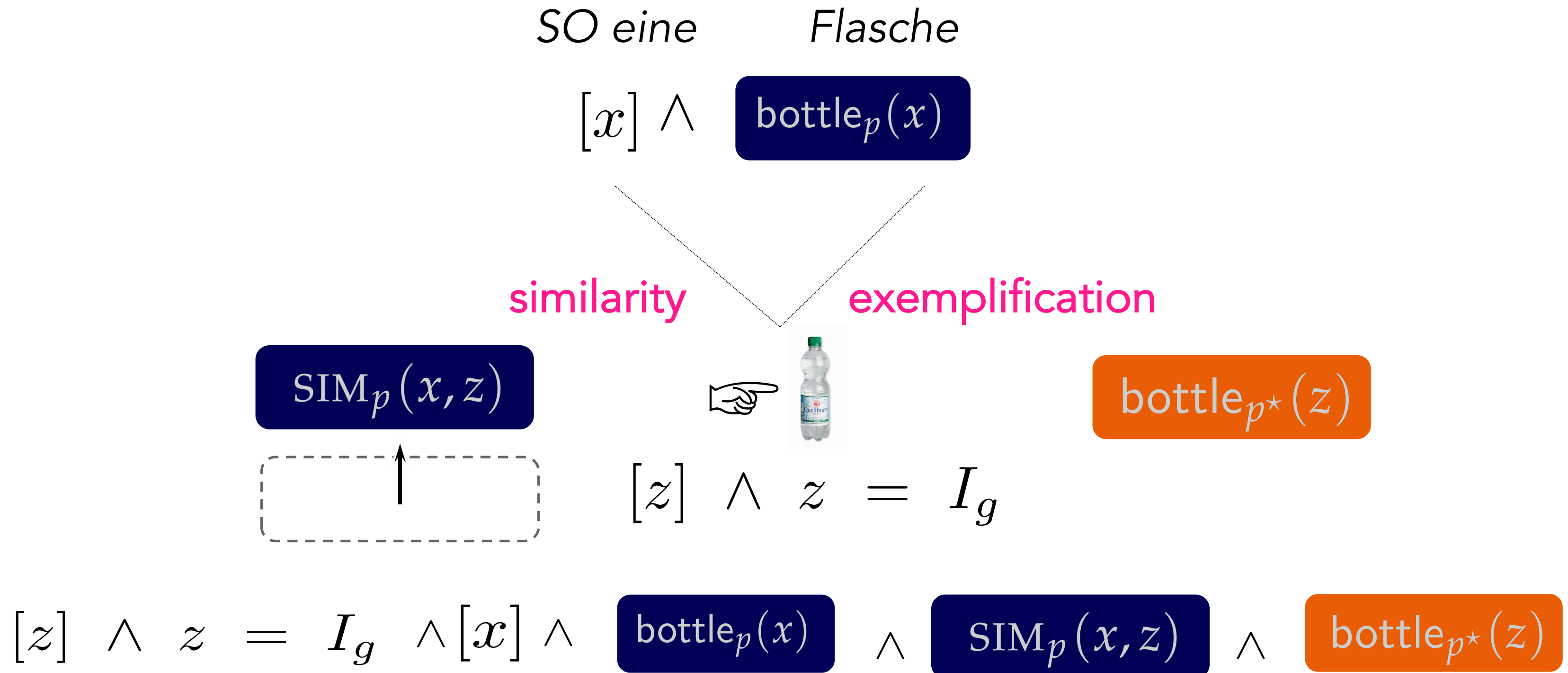
*diese* = *so* + *die*    (*this* = *so* + *the*, cf. German *der da*)



# example: SO + indefinite article



combined meaning contributions of speech and gesture:



# example: SO+ indefinite article



- (1) Cornelia hat [SO eine Flasche] mitgebracht.  
(*Cornelia brought [a bottle like that].*)



$$[z] \wedge z = I_g \wedge [x] \wedge \text{bottle}_p(x) \wedge \text{SIM}_p(x, z) \wedge \text{bottle}_{p^*}(z) \wedge \text{bring}_p(\text{cornelia}, x)$$

at-issue

there is a bottle **which is similar to the gesture referent** that Cornelia brought (cf. Umbach & Gust 2014)

non-at-issue

the gesture referent is itself a bottle

# non-at-issueness: speech



## the direct denial test

### protest to appositive

(1) *Ljubljana, one of the nicest cities of the world, is located in Croatia.*

Direct denial response:

(2) *#That's not true! It is not very nice at all.*

Discourse interrupting protest:

(3) *Hey, wait a minute! Actually, I don't think Ljubljana is such a nice city.*

### protest to main clause

(1) *Ljubljana, one of the nicest cities of the world, is located in Croatia.*

Direct denial response:

(4) *That's not true! It is located in Slovenia.*

# non-at-issueneess: speech



## the projection test

### negating the appositive

(1) *It is not true that Ljubljana, one of the nicest cities of the world, is located in Croatia.*

Negation elaboration:

(2) *#It is actually not very nice.*

### negating the main clause event

(1) *It is not true that Ljubljana, one of the nicest cities of the world, is located in Croatia.*

Negation elaboration:

(2) *It is actually located in Slovenia.*



# non-at-issueness: speech



## the ellipsis test

### expressives ignored under ellipsis

(Potts et al. 2009)

- (1) A: *I saw your f\*\*\*ing dog in the park.*  
B: *No, you didn't — you couldn't have.*  
*The poor thing passed away last week.*

### appositives ignored under ellipsis

(McCawley 1998)

- (2) A: *I met Peter, the best trumpeter in town,*  
*for lunch.*  
B: *Last week, I did, too. — But I don't think*  
*he is such a great trumpeter.*

# non-at-issueness: gesture



the direct denial test

## speech & gesture

(1) *I brought [a bottle of water].*



Direct denial response:

(2) *#That's not true! You actually brought a small bottle.*

Discourse interrupting protest:

(3) *Hey, wait a minute! Actually, the bottle is not as big.*

## speech only

(4) *I brought a big bottle of water.*

Direct denial response:

(5) *That's not true! You actually brought a small bottle.*

# non-at-issueness: gesture



## the projection test

### co-speech gesture

(1) *I did not bring [a bottle of water] to the talk.*



Negation elaboration:

(2) *#A small one is enough for me.*

### speech only

(3) *I did not bring a big bottle of water to the talk.*

Negation elaboration:

(4) *A small one is enough for me.*

# non-at-issueness: gesture



## the ellipsis test

### co-speech gesture

(1) *This helicopter will soon [take off],*



*and this plane, too.*

(from Schlenker & Chemla 2018)

### pro-speech gesture

(2) *#This helicopter will*

*soon*



*and this plane, too.*

pro-speech gestures are at issue: see Ebert 2014; Schlenker 2020; Ladewig 2012