

# Gestures at the interfaces

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- 1 Introduction
- 2 What are “post-speech” gestures?
- 3 Restrictive modifier gestures in English
- 4 Restrictive modifier gestures in French
- 5 Restrictive modifier gestures in Russian
- 6 Conclusion

# Schlenker's classification of gestures

- Schlenker (2017, 2018a,b) proposes a three-way classification of gestures based on their linear position and (more implicitly) syntactic role:

- co-speech gestures: gestural adjuncts co-occurring with the spoken expressions they adjoin to; behave like presuppositions

(1) (<sub>PrP</sub> Hagrid brought his dog<sup>LARGE</sup> ).

- post-speech gestures: gestural adjuncts following the spoken expressions they adjoin to; behave like supplements/appositives

(2) (<sub>PrP</sub> Hagrid brought his dog) (<sub>PrP</sub> LARGE).

- pro-speech gestures: gestures replacing spoken arguments or predicates; behave like at-issue material

(3) (<sub>PrP</sub> Hagrid's dog is LARGE).

# Big question

- But how does the mapping between a gesture's configurational properties and its semantics/pragmatics work?
- To answer that question we need to know how gestures get integrated into speech at various levels of representation and their interfaces, and how that constrains their interpretation.

## Take-home message


- The three-way classification is not justified.
- All prosodically independent gestures, adjuncts or not, integrate into the rest of the utterance like spoken material, in a way consistent with a given language's syntax and prosody.
- This integration is further constrained by universal articulatory considerations of combining spoken and gestural material.
- “Post-speech” gestures are thus not a natural class; they tend to be interpreted as appositives in English because their definitional configuration resembles that of spoken English appositives.

- 1 Introduction
- 2 What are “post-speech” gestures?
- 3 Restrictive modifier gestures in English
- 4 Restrictive modifier gestures in French
- 5 Restrictive modifier gestures in Russian
- 6 Conclusion

## What are “post-speech” gestures?

- Schlenker’s “post-speech” gestures are adjuncts that follow the constituent they adjoin to. E.g., the gesture in (4) is a “post-speech” gesture in his terms, but (5) isn’t (it’s an independent utterance).

(4) (PrP Hermione bought a new wand) (PrP LARGE).

(5) (PrP Hermione can’t afford a new wand). (PrP MONEY ).

(Most natural interpretation of the gesture: ‘It’s a money issue.’)

- There is also an implicit assumption that “post-speech” gestures are packaged into their own prosodic phrases (PrPs; intermediate or intonational phrases in ToBI (Beckman & Ayers 1997) terms).
- Thus, it is not surprising that in English “post-speech” gestures are likely to be interpreted as appositives, because their definitional configuration is that of English appositives.
- Other languages may allow other interpretations of this configuration.


- 1 Introduction
- 2 What are “post-speech” gestures?
- 3 Restrictive modifier gestures in English**
- 4 Restrictive modifier gestures in French
- 5 Restrictive modifier gestures in Russian
- 6 Conclusion



# Restrictive modifier gestures in English

- In Esipova 2018a,b I claim that prosodically dependent (i.e., anchored to some vocal prosodic event) gestures can be interpreted as restrictive modifiers under pressure, e.g.:

(6) *Context: Hagrid has two dogs and will bring one of them to the Yule ball.*

(<sub>PrP</sub> If Hagrid brings his **dog**<sup>SMALL</sup> ) , (<sub>PrP</sub> it's gonna be OK),

(<sub>PrP</sub> but if he brings his **dog**<sup>LARGE</sup> ) , (<sub>PrP</sub> it's gonna be a mess).  
 ≈ 'If Hagrid brings his **<small, large>** dog...'

- In English it is hard for prosodically independent (i.e., not anchored to any vocal prosodic event), post-nominal gestural adjuncts to be interpreted as restrictive modifiers.

- The classical “post-speech” gesture configuration is especially bad:

(7) #<sub>(PrP</sub> If Hagrid brings his dog) <sub>(PrP</sub> **SMALL**), <sub>(PrP</sub> it's gonna be OK), <sub>(PrP</sub> but if he brings his dog) <sub>(PrP</sub> **LARGE**), <sub>(PrP</sub> it's gonna be a mess).

- English restrictive modifiers like to be in the same PrP as the constituent they modify (unlike appositives). Assuming adnominal restrictive modifiers adjoin at the NP level, this can be captured via a narrow version of Truckenbrodt's (1999) WRAPXP constraint on syntax/prosody mapping:

(8) WRAPNP: Assign \* for each PrP boundary inside an NP.

- Also, the configuration in (7) forces given material (Schwarzschild 1999) to bear a nuclear pitch accent, making it undesirably prominent. I will not formalize this intuition here, however.
- Packaging prosodically independent gestures into the same PrP as some spoken material is articulatorily hard; try uttering the following:


(9) ??<sub>(PrP</sub> If Hagrid brings his dog **SMALL**), <sub>(PrP</sub> it's gonna be OK), <sub>(PrP</sub> but if he brings his dog **LARGE**), <sub>(PrP</sub> it's gonna be a mess).

- We can capture this awkwardness by positing a family of articulatory constraints on prosodically independent gestures:
- (10) ALIGN<RIGHT, LEFT>: Assign \* for each instance of spoken material occurring between the <right, left> edge of a prosodically independent gesture and the <right, left> boundary of a PrP containing it.
- But even if you're able to articulate (9), the gestures will then likely be perceived as adjectives, and in English post-nominal adjectives are very restricted (Erik Zyman, p.c.), which we can capture by positing a linearization constraint against post-nominal adjectives:
- (11) \*RIGHTADJ: Assign \* for each attributive adjective linearized on the right of the NP it adjoins to.
- Pre-nominal gestures are more natural in this respect, but being PrP-medial, they are especially hard to prosodically integrate into PrPs with spoken material:
- (12) ??(PrP If Hagrid brings his **SMALL** dog), (PrP it's gonna be OK), (PrP but if he brings his **LARGE** dog), (PrP it's gonna be a mess).

## Restrictive modifier gestures in English: summary

- The pseudo-OT tableau below shows how linearizing restrictive modifier gestures as prosodically dependent is the preferred option in English (assuming no cost for at-issue prosodically dependent gestures or given material co-occurring with prominence marking):

(13)

[D [NP G]]	WRAPNP	ALIGNGR	ALIGNGL	*RIGHTADJ
 a. (PrP...D NP <sup>G</sup> )				
b. (PrP...D NP) (PrP G)	*			*
c. (PrP...D NP G)			*	*
d. (PrP...D G NP)		*	*	

- Note that in reality the constraints above apply at different levels and can in principle be either categorical or violable. The latter can be weighted, allowing us to capture gradience and variation.
- Constraints on syntax/prosody mapping and linearization are language-specific; articulatory constraints should be universal (their weight can vary across speakers), but only play a role in constraining interpretation in conjunction with other properties of a language.

- 1 Introduction
- 2 What are “post-speech” gestures?
- 3 Restrictive modifier gestures in English
- 4 Restrictive modifier gestures in French**
- 5 Restrictive modifier gestures in Russian
- 6 Conclusion

## Restrictive modifier gestures in French

- French adjectives are typically linearized as post-nominal.
- They are still packaged into the same PrPs as the NPs they modify. Post-nominal adjectives can occupy their own accentual phrases, but being in one's own AP likely doesn't help prosodic integration of a gesture into speech (see Delais-Roussarie et al. 2015 for an overview of French prosody).

(14) (PrP Si Hagrid amène son chien **minuscule**), (PrP ça ira), (PrP mais s'  
 if Hagrid brings his dog tiny it will-go but if  
 il amène son chien **géant**), (PrP ce sera un problème).  
 he brings his dog gigantic it will-be a problem

- Thus, replacing the adjectives in (14) with gestures should be better than in English, although still not great. Some preliminary data (from three speakers) suggest that's indeed the case (thanks to Isabelle Charnavel for help with the preliminary fieldwork).

- 1 Introduction
- 2 What are “post-speech” gestures?
- 3 Restrictive modifier gestures in English
- 4 Restrictive modifier gestures in French
- 5 Restrictive modifier gestures in Russian**
- 6 Conclusion

## Restrictive modifier gestures in Russian

- Russian adjectives are typically linearized as pre-nominal, but Russian allows movement outside of DPs for various discourse-related reasons, e.g. (no ToBI-like system exists for Russian, so take my prosodic marking with a grain of salt):

(15) Neutral word order.

(<sub>PrP</sub> Ja zakazala malen'kij kofe) (<sub>PrP</sub> i bol'šoj čaj).  
 I ordered small coffee and big tea


'I ordered a small coffee and a large tea.'

(16) CT+F configuration with movement.

(<sub>PrP</sub> [**Kofe**]<sub>CT</sub> ja zakazala) (<sub>PrP</sub> [**malen'kij**]<sub>F</sub>) (<sub>PrP</sub> a [čaj]<sub>CT</sub>) (<sub>PrP</sub> [**bol'šoj**]<sub>F</sub>).  
 coffee I ordered small and/but tea  
 big



- The spoken adjectives in (16) can be replaced with gestures without any changes in interpretation, even though the surface configuration of such gestures would correspond to the “post-speech” gesture configuration. There is no difference in acceptability between such PrP-independent attributive gestures in (17) and PrP-independent predicative gestures in (18) (the judgements are mine).

(17) (PrP **Kofe** ja zakazala) (PrP **SMALL** ) (PrP a **čaj**) (PrP and/but tea

**LARGE** ) .

(18) (PrP **Kofe** dolžen byt') (PrP **SMALL**) (PrP a **čaj**) (PrP **LARGE**) .  
 coffee must be and/but tea  
 ≈ '(The) coffee must be small, and (the) tea must be large.'

- 1 Introduction
- 2 What are “post-speech” gestures?
- 3 Restrictive modifier gestures in English
- 4 Restrictive modifier gestures in French
- 5 Restrictive modifier gestures in Russian
- 6 Conclusion**

## Conclusion

- If we want to learn more about what gestures mean, we should think in a more rigorous and systematic way about how they integrate into speech at various levels of representation and their interfaces.
- In general, prosodically independent gestures are integrated into a sentence's syntactic and prosodic structure in a way similar to spoken material. There exist additional articulatory constraints on prosodic integration of gestures into the speech stream, which constrain their prosodic grouping, which in turn constrain their syntactic integration.
- “Post-speech” gestures are not a natural class; they are gestural adjuncts, whose linearization and prosodic grouping typically resemble those of spoken appositives in English, so a speaker of English is likely to posit the corresponding structure and, consequently, interpretation for them. Other options are available in other languages.
- Question: what about prosodically dependent (“co-speech”) gestures? Their prosodic integration seems to be less constrained, but what about their syntactic integration?

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## *One*-appositives

- Wang et al. 2005 give examples of the following kind, claiming that *one*-appositives don't project:

(19) If a professor, a famous one, publishes a book, they will make a lot of money.

- Gestural appositives seem to allow for similar uses to some extent:

(20) a. Bring me a beer, a small one.

b. Bring me a beer, SMALL



- I agree with AnderBois et al. 2013 that the appositives above are more like corrections. Crucially, they are not bona fide restrictive modifiers:

(21) #If a professor, a **famous** one, publishes a book, they will make a lot of money, but if a professor, an **unknown** one, publishes a book, they will make nothing.

## Predicative vs. propositional interpretations

- Co-speech gestures tend to project from embedded environments (Schlenker 2018b; see also Tieu et al. 2017a,b for experimental results):

(22) If Hagrid brings his dog<sup>LARGE</sup>, it's gonna be a mess.  
 → Hagrid's dog is large.

- As shown before, if co-nominal gestures are interpreted as predicative modifiers, they can be interpreted locally under pressure:

(23) *Context: Hagrid has two dogs and will bring one of them to the Yule ball.*  
 (<sub>PrP</sub> If Hagrid brings his **dog**<sup>SMALL</sup>), (<sub>PrP</sub> it's gonna be OK), (<sub>PrP</sub> but if he brings his **dog**<sup>LARGE</sup>), (<sub>PrP</sub> it's gonna be a mess).  
 ≈ 'If Hagrid brings his ⟨small, large⟩ dog...'



- However, if the same gestures are interpreted as propositions, they cannot be interpreted locally even under pressure. In this respect propositional co-speech gestures are no different from appositives, gestural or spoken (which are always propositional).

(24) *Context: Hagrid has a unique dog of unknown size and is planning to bring it to the Yule ball.*

- a. #<sub>(PrP</sub> If Hagrid brings his **dog**<sup>SMALL</sup>), (<sub>(PrP</sub> it's gonna be OK), (<sub>(PrP</sub> but if he brings his **dog**<sup>LARGE</sup>), (<sub>(PrP</sub> it's gonna be a mess).
- b. #<sub>(PrP</sub> If Hagrid brings his dog) (<sub>(PrP</sub> **SMALL**), ..., (<sub>(PrP</sub> but if he brings his dog) (<sub>(PrP</sub> **LARGE**), ...
- c. #<sub>(PrP</sub> If Hagrid brings his dog), (<sub>(PrP</sub> who's **small**), ..., (<sub>(PrP</sub> but if he brings his dog), (<sub>(PrP</sub> who's **large**), ...
- d. #<sub>(PrP</sub> If Hagrid brings his dog), (<sub>(PrP</sub> a **small** beast), ..., (<sub>(PrP</sub> but if he brings his dog), (<sub>(PrP</sub> a **large** beast), ...  
Intended: 'If (Hagrid brings his unique dog and it is <small, large>))...'

- This suggests that linearization alone doesn't determine whether a gesture can have a local interpretation or not.

## Schlenker's cosuppositions

- Schlenker (2018b) argues that co-speech gestures trigger assertion-dependent presuppositions he calls *cosuppositions*:
  - A gestural cosupposition triggered by a configuration  $[[S]^G]$  has the form  $S \Rightarrow G$ , where  $S$  is the spoken expression the gesture adjoins to,  $G$  is the gesture's content, and  $\Rightarrow$  is generalized entailment.
  - Projection: the local context  $c'$  of  $[[S]^G]$  has to entail the cosupposition:  $c' \Rightarrow (S \Rightarrow G)$ .
  - Local interpretation: the requirement above is lifted, and the cosupposition is interpreted as conjoined to  $S$ :  $S \& (S \Rightarrow G)$ , equivalent to  $S \& G$ , where  $\&$  is generalized conjunction.
- Note that for Schlenker's cosuppositional mechanism to apply, it is crucial that the denotations of  $S$ ,  $G$ , and  $c'$  are all of the same semantic type, so it matters at which level the gesture adjoins.
- A lot also hinges on how we compute local contexts; I'll be making some liberal assumptions about that.

## Cosuppositions for NP-level gestures

- Given the right set of assumptions, the cosuppositional mechanism yields a pretty decent result for NP-level gestures:

(25) Hagrid brought his  $[[\text{dog}]^{\text{LARGE}}]$ .

$S : \lambda x.\text{dog}(x)$

$G : \lambda x.\text{large}(x)$

*cosupposition* :  $\lambda x.\text{dog}(x) \rightarrow \text{large}(x)$

$c' : \lambda x.\text{brought}(h, x) \wedge \text{poss}(h, x)$

*projection* :  $\forall x.(\text{brought}(h, x) \wedge \text{poss}(h, x)) \rightarrow (\text{dog}(x) \rightarrow \text{large}(x))$

'For all  $x$ : if Hagrid brought  $x$  and  $x$  belongs to him, then if  $x$  is a dog,  $x$  is large.'

*local interpretation of*  $[[\underline{S}]^G] : \lambda x.\text{dog}(x) \wedge \text{large}(x)$

## Cosuppositions for DP-level gestures

- If we assume that DP-level gestures can be of the same type as DPs they adjoin to, we predict unattested local interpretations regardless of what exact denotation we assume for the gesture.
- Reasonable assumptions, weird results:

(26) Hagrid brought  $[[\text{his dog}]^{\text{LARGE}}]$ .

$S : \lambda P.P(\iota x.\text{dog}(x) \wedge \text{poss}(h, x))$

$G : \lambda P.\exists x.P(x) \wedge \text{large}(x)$

*cosupposition* :  $\lambda P.P(\iota x.\text{dog}(x) \wedge \text{poss}(h, x)) \rightarrow \exists x.P(x) \wedge \text{large}(x)$

$c' : \lambda P.\exists x.\text{brought}(h, x) \wedge P(x)$

*projection* (works here but not for other DPs) :

$\forall P.(\exists x.\text{brought}(h, x) \wedge P(x)) \rightarrow (P(\iota x.\text{dog}(x) \wedge \text{poss}(h, x)) \rightarrow \exists x.P(x) \wedge \text{large}(x))$

‘For all properties  $P$ : if Hagrid brought something that has  $P$ , then if Hagrid’s dog has  $P$ , there is a large object that has  $P$ .’

*local interpretation of  $[[S]^G]$  (unattested) :*

$\lambda P.P(\iota x.\text{dog}(x) \wedge \text{poss}(h, x)) \wedge \exists x.P(x) \wedge \text{large}(x)$

- Controversial assumptions, reasonable but unattested results:

(27) Hagrid brought  $[[\text{his dog}]_i^{\text{LARGE}}]$ .

$S : \lambda P.P(\iota x.\text{dog}(x) \wedge \text{poss}(h, x))$

$G : \lambda P.P(i) \wedge \text{large}(i)$

*cosupposition* :  $\lambda P.P(\iota x.\text{dog}(x) \wedge \text{poss}(h, x)) \rightarrow (P(i) \wedge \text{large}(i))$

$c' : \lambda P.\text{brought}(h, i) \wedge P(i)$

*projection* :

$\forall P.(\text{brought}(h, i) \wedge P(i)) \rightarrow (\lambda P.P(\iota x.\text{dog}(x) \wedge \text{poss}(h, x)) \rightarrow (P(i) \wedge \text{large}(i)))$ ;

$\forall P.(\text{brought}(h, \iota x.\text{dog}(x) \wedge \text{poss}(h, x)) \wedge P(\iota x.\text{dog}(x) \wedge \text{poss}(h, x))) \rightarrow \text{large}(\iota x.\text{dog}(x) \wedge \text{poss}(h, x))$

'For all properties  $P$ : if Hagrid brought his dog and his dog has  $P$ , then Hagrid's dog is large.'

*local interpretation of  $[[S]^G]$  (unattested) :*

$\lambda P.P(\iota x.\text{dog}(x) \wedge \text{poss}(h, x)) \wedge P(i) \wedge \text{large}(i)$ ;

$\lambda P.P(\iota x.\text{dog}(x) \wedge \text{poss}(h, x)) \wedge \text{large}(\iota x.\text{dog}(x) \wedge \text{poss}(h, x))$

- Verdict: we don't want the cosuppositional mechanism to apply to DP-level co-speech gestures at all.

## How do we interpret DP-level gestures then?

- DP-level co-speech gestures have to be of a non-DP type to block the application of the cosuppositional mechanism, e.g., they can be:
  - predicates, saturated by the DP they adjoin to, and returning propositions of a special, conventional implicature type (Potts 2005), or
  - propositions with a pronoun anaphoric to the DP the gesture adjoins to + additional assumptions to assure projection from all environments ( $\approx$  Schlenker 2013), or
  - speech acts asserting such propositions ( $\approx$  Koev 2013; AnderBois et al. 2013).
- Whichever option we choose, it can be a general strategy to interpret all DP-level adjuncts, be it co-nominal gestures or adnominal appositives, gestural or spoken.

## Broader implications

- Adjunction:

- Modification is possible up to a certain level; after that another strategy, yielding propositional readings, is required—a strategy applying to gestural and spoken material alike.
- For adnominal adjuncts it's reasonable to assume the distinction to be at the NP vs. DP level; what about adverbial adjuncts?

- Local interpretations:

- We block local interpretations via local accommodation of cosuppositions for DP-level co-nominal gestures: one can't even form a cosupposition if the gesture doesn't match in type the spoken expression it adjoins to.
- Can we generalize this story to lexical presuppositions (“weak” vs. “strong” triggers)? Schlenker (2009) discusses two potential sources of local interpretations: the “suspension” mechanism and the “strengthening” mechanism. The former should in principle only yield local interpretations for presuppositions that match in type the trigger.

# Conclusion

- If we want to learn more about what gestures mean, we should think in a more rigorous and systematic way about how they integrate into speech at various levels of representation and their interfaces.
- Studying gestures from this perspective can also provide insights into how certain natural language phenomena (such as syntax/prosody mapping, adjunction, projection and local interpretations of content, etc.) work, regardless of modality.