On the Typology of Iconic Contributions*

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Abstract. As a complement to Barnes and Ebert 2023 ("The information status of iconic enrichments: Modelling gradient at-issueness", to appear in *Theoretical Linguistics*), we discuss the structure of a formal theory of iconic contributions. It should include an explicit iconic semantics, and a formal derivation of the pragmatic status of different iconic contributions. While QUDs (Questions Under Discussion) have a useful role to play, we argue that they do not replace the search for an explanatory analysis of the typology of iconic contributions. The behavior of gesture-bound demonstratives, pro-speech gestures and sign language classifier predicates should partly or entirely follow from their grammatical function and their iconic semantics, combined with general pragmatic algorithms. Co-speech gestures are better analyzed as triggering cosuppositions than supplements, but cosupposition theory needs further foundational work. Post-speech gestures (including post-speech vocal gestures, and thus some ideophones) are better analyzed as contributing supplements than cosuppositions, but there are various models that predict slightly different behaviors, depending on whether post-speech gestures are analogized to appositive relative clauses or to appositive gerunds. Throughout, there are diverse sources of apparently gradient at-issue behavior, but this gradience need not be specific to iconic contributions.

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Iconicity in general and iconic gestures in particular used to be relegated to the wastebasket of formal semantics and pragmatics. Not any more. Two successive movements radically changed the situation. First, the integration of gestures to discourse relations was analyzed in great formal detail within the tradition of DRT (e.g. Lascarides and Stone 2009a, b). Second, in a pioneering program, Ebert and Ebert 2014 specifically asked about the projection properties of co-speech gestures, thus integrating gesture studies to vibrant debates in formal semantics/pragmatics on the division of meanings among at-issue and non-at-issue contents[1]—in our view, a momentous achievement.

Barnes and Ebert 2023 (this volume) propose a typology of iconic contributions in which gradience plays a central role, and discuss experimental data that support their conclusions. As a complement to their discussion, we ask how iconicity *per se* should be treated in semantic theories; how the typology of iconic contributions can be derived; which sources of gradience there could be in it; and how the experimental results discussed by Barnes and Ebert could be explained.

1 Iconicity in Formal Semantics

Four types of phenomena suggest that formal semantics must be extended with an explicit iconic component.

(i) Some conventional words, such as *long*, can be modulated, with *looong* meaning in essence 'very long' (e.g. Okrent 2002). While this phenomenon is somewhat limited in spoken languages (but see Fuchs et al. 2019), it is rich in sign languages, where for instance a verb such as *GROW* in ASL can be realized faster and/or with broader endpoints to refer to a faster and/or greater growth process (e.g. Schlenker 2018a). In the case of repetition-based plurals and pluractionals in sign language (LSF and ASL), the iconic contribution of the repetitions is even more striking (Kuhn and Aristodemo 2017, Schlenker and Lamberton 2019, 2022).

(ii) In their various functions, iconic gestures obviously convey information by way of productive iconic rules.

(iii) Vocal gestures and ideophones can also make contributions through productive rules, as in: *Asterix hit the Roman soldier–ph ph ph ph ph ph!* Here the post-speech vocal gestures (a repetition-based pluractional) provides an iconic representation of the hitting events (and of their number).

(iv) Last, but not least, a distinguished category of words in sign language, called 'classifier predicates', have a conventional shape but can be positioned and moved freely in various parts of signing space, and convey meaning by way of depictions (e.g. Liddell 2003, Zwitserlood 2012, Zucchi 2017, 2018).

The conclusion is that natural language semantics is in essence the union of a logical semantics, as standardly conceived, and of an iconic semantics. The question is how the iconic component works, and how it is integrated with the logical component (as well as with the pragmatics). In the spirit of 'divide and conquer', it makes good sense to treat the iconic component in terms of a placeholder, analyzed for instance by way of a demonstrative semantics ('like this'), as is done in Zucchi 2011, 2017 and Davidson 2015, and to some extent in Barnes and Ebert 2023, following Henderson 2016. But in the long term, the semantic challenge is to offer systematic rules to derive truth conditions from the entire message, including its iconic component: the placeholder must be replaced with an explicit account.[2]

In ground-breaking work, Greenberg (e.g. 2013, 2021) and Abusch (e.g. 2013, 2020) proposed highly explicit rules to interpret pictures and pictorial sequences. Nobody would have thought that they had given an account of pictorial meaning if they had been content to say that pictures contain a demonstrative component pointing to their own form, and had left things at that; the issue is to explain how the iconic component works. Explicit proposals have recently been made for ASL classifier predicates and for some gestures on the basis of lightly or heavily modified versions of pictorial

[1] Some later contributions, such as Schlenker 2015, 2018b, were primarily responses to the seminal proposal in Ebert and Ebert 2014.

[2] It goes almost without saying that the resulting system will be modular, in the sense that the logico-grammatical component and the iconic component will have very different properties.

semantics (e.g. Schlenker et al., to appear, Schlenker and Lamberton, to appear). In the vocal domain, the problem of devising explicit semantic rules for iconic material such as onomatopoieas hasn't been (to our knowledge) tackled yet, but it is interesting and non-trivial.

In sign language repetition based-plurals (and probably pluractionals), there is a distinction between 'easy to count' (= punctuated) and 'hard to count' (= unpunctuated) repetitions; the former typically have precise 'exactly' readings; the latter often have vague 'at least' readings (Schlenker and Lamberton 2019, 2022, Kuhn and Aristodemo 2017). Vocal gestures arguably give rise to related distinctions, with 'exactly' readings obtained from punctuated repetitions as in (1), and possibly vague readings obtained from unpunctuated repetitions.

(1) *Context:* the addressee is playing a shooter video game.
In the next 10 seconds, you should [prh - prh - prh - prh]$_{\text{slow, pauses}}$. (Schlenker and Lamberton 2022)

It is clear that a proper iconic semantics and pragmatics for the vocal modality should in the end account for these distinctions; this would require a kind of auditory analogue of pictorial semantics.

2 QUDs and Projective Meanings

Contemporary linguistics has uncovered a rich typology of 'projective' meanings that includes presuppositions, scalar implicatures, supplements, expressives, homogeneity inferences, and more. Some authors have tried to reduce the typology to an interaction with explicit or implicit Questions Under Discussion (QUDs). Barnes and Ebert adopt QUDs but not the reductive approach—for excellent reason, we believe. To focus just on presuppositions, Simons et al. (2010) and Tonhauser et al. (2013) proposed that certain entailments project and may thus behave as if they were presupposed when they fail to address the QUD. Abrusán (2011) already objected to this line of investigation because it predicts that presuppositions should fail to be generated much more easily than is in fact the case: with a very open-ended QUD such as *What do you know about John?*, every fact about John should be relevant, and thus *He still didn't quit smoking* should fail to generate a presupposition, contrary to fact. In addition, this particular proposal was insufficiently predictive or made impossible predictions, as every entailment *p'* of a target expression *p* was predicted to project, a point discussed in Chemla 2006.[3]

Barnes and Ebert 2023 assume that different expressions come with different requirements of at-issueness, with the following condition: "an utterance is appropriate in context c, if the relevance of each proposition conveyed by some content component of u is at least as high as the minimal degree of at-issueness specified by that component." But as we understand it, this doesn't purport to *replace* rules of projection for different types of expressions. For instance, in Abrusán's example, everything uttered about John is relevant. Furthermore, one must certainly posit that the minimum degree of at-issueness for presuppositional expressions is very low (since presuppositions are by default not at-issue). So the presuppositional component of *quit smoking* (to the effect that John smoked before) could in principle be entirely at-issue, as this would trivially imply that its relevance is at least as high as the (low) degree of at-issueness required of presuppositional elements. But of course the presupposition is still a presupposition in this case, which was exactly Abrusán's point: we need a theory of projection for different inferential types.

The next question is thus to determine how iconic contents get distributed among the slots of the inferential typology, whether this distribution can be derived on principled grounds, and whether some of these types naturally come with a notion of gradience.

3 Gesture-bound Demonstratives, Pro-speech Gestures and Classifier Predicates

We start from three cases that should follow from general principles: gesture-bound demonstrative constructions, such as *like this* in English or *so* in Germany, accompanied with an iconic representation; pro-speech gestures; and sign language classifier predicates.

[3] For instance, as is discussed Schlenker 2021b (Appendix I), if the QUD is *Does Spain have a king?*, a simple answer *p* = *Spain has a king* should give rise to the presupposition that its entailment *p'* = *Spain has a monarch* is presupposed (and in fact the reasoning works if *p'* is just *p* itself).

3.1 Gesture-bound demonstratives

Barnes and Ebert 2023 give a special place in their hierarchy of at-issueness to demonstratives co-occurring with gestures or ideophones. The simplest theory, however, is that their status should follow from that of the demonstrative construction on its own. Compositionally, the meaning of *like this* should be oblivious to the way *this* gets its denotation, and thus the same result should be obtained whether *this* gets its denotation through pointing, through a gesture or through any other means. There are complexities involved in the pragmatic status of modifiers, but it is clear that in simple constructions *like this* is at-issue, and one might think that the same conclusion extends to German *so* (we come back in Section 6.1 to Barnes and Ebert's interesting data on *so*).

3.2 Pro-speech gestures and sign language classifier predicates

Barnes and Ebert 2023 posit that pro-speech gestures should be at least partly at-issue. This dovetails with other claims in the literature, but presumably the 'at-issue requirement' should follow from general principles about words that carry a certain function. Stalnaker 1978 proposed that "a speaker should not assert what he presupposes to be true, or what he presupposes to be false". When this non-triviality condition applies not just to the global context of an utterance but to the local context of a propositional or predicative expression, it gives rise to the condition in (2), which should constrain the contribution of pro-speech gestures just like it constrains everything else.

(2) **Stalnaker's non-triviality condition**
If relative to a context set C an expression *F* (of a type that 'ends in t') has a local context c', then conditions a. and b. should both be satisfied:
a. c' $\not\models$ F b. c' $\not\models$ not F

In addition, the truth-conditional contribution of pro-speech gestures is arguably divided 'on the fly' among different slots of the inferential typology (Schlenker 2019a), and this behavior extends to pro-speech visual animations and even pro-speech music (Tieu et al. 2019, Migotti and Guerrini, to appear).[4] This suggests that the detailed pragmatic behavior of pro-speech gestures follows from more general linguistic or cognitive algorithms, some of which might give rise to apparently gradient at-issue behavior on independent grounds.[5]

The same principles arguably apply to sign language classifier predicates. They too should be subject to Stalnaker's non-triviality condition. And one can expect their informational content to be productively divided among the slots of the inferential typology. For instance, classifier predicates can generate presuppositions just like pro-speech gestures (Schlenker 2021a), and one can at least try to derive this fact from a general presupposition-triggering mechanism (Schlenker 2021b).

As described by Barnes and Ebert, following Henderson 2016, some ideophones resemble classifier predicates in having both a lexical and an iconic component, and one might thus ask whether the division of their contribution among the slots of the inferential typology can be made to follow from general principles as well.

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[4] Barnes and Ebert 2023 write that they "diverge somewhat from Schlenker (2018b)" [= 'Iconic Pragmatics', 2018c for the present piece] in arguing "that in order for a sentence to be felicitous, an internal enrichment such as a pro-speech gesture or a predicative ideophone must be at least *partly* at-issue" (our emphasis): "while predicative ideophones or pro-speech gestures must be partly at-issue, they may still have a non-at-issue iconic component". In fact, the agreement might be complete, as the claim in 'Iconic Pragmatics' was that pro-speech gestures must have an at-issue component, but can also trigger other inferential types, such as presuppositions (Section 8.3) (see also Schlenker 2019a).

[5] In presupposition theory, it is accepted that there are different 'strengths' of triggers (e.g. weak vs. strong triggers). Attempts at devising explicit triggering algorithms (= algorithms that productively divide the content of any form among presuppositional vs. assertion) may thus yield gradient notions of presuppositions from the get-go (see for instance Schlenker 2021b for one attempt among many).

4 Co-speech Gestures

Co-speech gestures that modify verbal or propositional elements have been analyzed as triggering conditionalized cosuppositions (called 'cosuppositions', Schlenker 2018b, c), or (equivalently) as contributing redundant postposed conjuncts (Schlenker 2018b, 2021a), or (near-equivalently) as contributing redundant modifiers (Esipova 2019).[6] In different lines of research, co-speech gestures were argued instead to trigger supplements, just as appositive relative clauses do (Ebert and Ebert 2014), or to trigger different inferential types depending on the underlying discourse relations (Hunter 2019).

Somewhat theory-neutrally, the challenge for supplement-based theories of co-speech gestures is to distinguish them from post-speech gestures. The latter track the behavior of appositive constructions in being acceptable in positive but not in negative environments, as illustrated in (3)b, c, whereas co-speech gestures do not display the same contrast, as shown in (3)a.

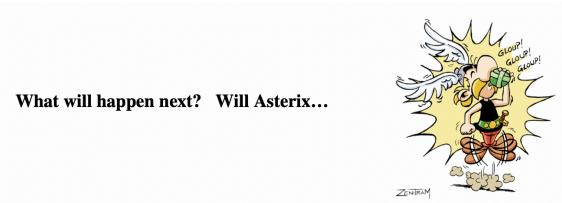
Notation: Gestures are glossed in CAPITALS, in a non-standard font. Co-speech gestures appear before the expressions they co-occur with; the latter are boldfaced.

(3) a. One/None of these 10 guys UP **helped** his son.
b. One/#None of these 10 guys helped his son, which he did by lifting him.
c. One/#None of these 10 guys helped his son – UP.
(Schlenker 2018c)

One might thus want to go with a version of the cosuppositional analysis, but the question is how it can be derived on principled grounds. Two findings have thickened the plot. First, cosuppositions are triggered in diverse modalities as soon as two heterogeneous forms are intuitively conjoined, and one is treated as more basic to the message than the other: the parasitic form tends to trigger a cosupposition. This is the case of some non-grammatical facial expressions co-occurring with a signed VP in ASL (Schlenker 2018c), of some co-speech sound effects (e.g. the sound of an explosion) co-occurring with a VP in English (Pasternak and Tieu 2022), of some pictures co-occurring with printed words (Schlenker 2022), and even of music co-occurring with cartoons embedded within sentences (Schlenker 2022). This suggests that a very general and possibly non-linguistic procedure is at work.

Second, cosuppositions are arguably triggered by some pro-speech gestures, by some ASL classifier predicates (Schlenker 2021a), possibly by some pro-speech images (as in (4)), and even by some pro-speech musical excerpts (Schlenker 2022). This raises the question whether these *pro*-speech inferences are the same kind of beast as *co*-speech cosuppositions.

(4) (There is an impending battle, but Asterix has magic potion with him.)[7]



=> if Asterix drinks the magic potion, he will do so with the effects depicted (Schlenker 2022)

A partial answer was sketched in Schlenker 2021a, to the effect that cosuppositions are triggered when a meaning component is presented as unimportant. This could be for different reasons: (i) for reasons of manner, notably in case *p*' is contributed by a co-speech or co-sign gesture (which is parasitic and thus should not make an essential contribution);

[6] Unlike a conjunction-based analysis, however, Esipova's modifier-based analysis allows for non-intersective modification. Esipova 2019 also notes that co-speech gestures that modify expressions of individual type (i.e. of type e) should contribute supplements and/or predicate modifiers in the scope of an overt or covert definite description operator. (The cosuppositional analysis can handle modification of elements of type <e, t> but not of type e.)

[7] The picture (which is not by Asterix's creator Uderzo, but by Zenitram) can be found at https://www.deviantart.com/zenitram-anth/art/Asterix-chez-les-freaks-472781613 (retrieved December 9, 2019).

(ii) for conceptual reasons, in case *p'* is understood not to matter given the context of the conversation. Case (ii) turned out to rely on QUDs: assuming that an inferred QUD in (4) is *whether Asterix will drink the magic potion,* the fact that he does so in the precise way depicted is irrelevant, and this contribution can be trivialized by presupposing that *if Asterix drinks the magic potion, he will do so with the effects depicted*.

If this QUD-related analysis of cosuppositions triggered by pro-speech elements is on the right track, it remains to ask whether the manner-related analysis of co-speech and co-sign cosuppositions (in (i) above) can be made precise. As far as we can tell, Barnes and Ebert accept a version of this manner-based analysis, and are thus faced with this question as well. One possibility would be to use (a dual of) Bergen's (2016) noise-based analysis of emphasis. In a nutshell, Bergen argued that in diverse cases, emphasis (which he calls 'stress') strengthens the truth conditions. In *NOBODY brought presents,* emphasis strengthens the truth conditions by enlarging the domain of quantification (= absolutely nobody). In *SOMEBODY brought presents,* emphasis does so by narrowing the domain (= somebody specific). In *Ann is TALL*, emphasis strengthens the truth conditions by increasing the threshold (= Ann is very tall). Bergen's leading idea is that, when any message is transmitted, there is a slight risk of corruption. The function of emphasis is to reduce this risk. Bergen then shows that, in simple cases at least, strengthening can be explained by positing that the speaker uses emphasis to reduce, at some cost, the risk of corruption of a certain part of a message. Doing so signals that this part carries a particularly important function, and this inference can be exploited for communicative purposes by way of recursive reasoning (the addressee reasons on the speaker's intentions, the speaker takes into account the addressee's reasoning, etc).

What is of interest for present purposes is that there could in principle be a dual of emphasis: by making a contribution as inconspicuous as possible, one could increase the risk of corruption and thus signal that this contribution is trivial relative to its local context. This might be what happens with elements that are produced at the same time as the main message. In essence, the reasoning could be as follows in the case of *help* co-occurring with a lifting gesture, as in (3)a:

–The naive addressee hears *help* accompanied with a lifting gesture. The vocal message is primary, hence there is a risk that the lifting gesture won't be perceived: this increases noise.

–The strategic speaker that takes into account the naive addressee's behavior will only use the secondary modality to convey information that is redundant.

–The strategic addressee that takes into account the speaker's behavior will infer that the contribution of the secondary modality is in fact redundant.

This is only a very rough sketch, but a Bergenian analysis might give some explanatory depth to the phenomenon of cosuppositions, and might do so across cases, including non-linguistic ones. It might also give rise to gradient effects. In the domain of emphasis, greater emphasis is arguably associated with greater strengthening of the truth conditions, as in: *Ann is tall, Bill is TALL, and Cat is TALL* (gradient intensification might exist with different heights of Brow Raise in ASL, although data are preliminary; see Schlenker and Lamberton 2021). Dual gradient effects might conceivably be found with cosuppositions.[8]

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[8] A separate question of explanatory depth pertains to the order of computation of redundancy in co-speech and co-sign cosuppositions. In Schlenker 2018b, it was noted that cosuppositions can be derived by taking a co-speech gesture *G* modifying a predicate *P* to contribute a conjunct that linearly *follows P*. This was crucial to explain why the presupposition is of the form *P => G*, rather than just *G*. The question was why an element that co-occurs with *P* should be computed after it. A potential solution was offered within a pragmatic theory of presupposition projection, *Be Articulate*, which posits that a presuppositional expression *pp'* (with presupposition *p*) is acceptable only in case its 'articulated' alternative *(p and pp')* is unacceptable because its first conjunct is redundant (Schlenker 2019b). It was proposed that for co-speech gestures, the articulated competitor is an adverbially modified VP: *Ann* UP ***helped*** *her son* competes with *Ann helped her son by lifting him*. The idea was that the co-speech gesture is unacceptable just in case the underlined adverbial is redundant, which happens precisely when there is a presupposition of the form: *if Ann helped her son, she did so by lifting him*. For a language like German, in which adverbials precede verbs in embedded environments, this predicted that *irrespective of linear order*, the adverbial is processed after the verb for purposes of redundancy computation. This seemed correct, as is illustrated in (i): 'with words' comes before 'spoken' but is computed after it for purposes of redundancy computation; structural position rather than linear position seems to be what matters.

5 Post-speech Gestures

Two properties constrain the analysis of post-speech gesture, including post-speech vocal gestures: they are degraded in some negative environments; and they give rise to projection effects under *likely* and in *if*-clauses.[9]

(5) a. (i) It's likely / (ii) #It's unlikely that Ann helped her son – UP.
(i) => if Ann helped her son, lifting was involved
b. If Asterix punishes his enemy – SLAP, I might scream.
=> if Asterix punishes his enemy, slapping will be involved
(modified from Schlenker 2018b)

(6) a. (i) It's likely /(ii) #It's unlikely that John will encounter an obstacle – phh [= sound of a crash].
(i) => if John encounters an obstacle, there will be a crash (Schlenker 2018c)
b. If Asterix punishes his enemy – phh phh phh, I might scream.
=> if Asterix punishes his enemy, repeated hitting will be involved

How can these properties be explained? Two main lines have been discussed in the literature: post-speech gestures could in principle be analyzed as cosupposition triggers (a direction that was excluded almost from the start); or they could trigger supplements (this is the standard view, including in Barnes and Ebert's proposal). As we'll see, the latter analysis could be ramified.

5.1 Post-speech gestures as cosupposition triggers?

In view of their projection properties, one might want to treat post-speech gestures as triggering cosuppositions, just as was proposed for co-speech gestures. But co-speech gestures seem to be more acceptable than post-speech gestures in negative environments, which suggests that there is an important distinction between the two constructions. One might want to posit that post-speech gestures just differ from co-speech gestures in depending on a proposition-denoting pronoun that must find an antecedent, but it's unclear why the propositional example in (5)a(ii) should be degraded (in view of the greater acceptability of: *It's unlikely that Ann helped her son and that **this** involved lifting him*: here the propositional pronoun has no real difficulty finding an antecedent).

5.2 Post-speech gestures as appositive relative clauses?

An alternative is that post-speech gestures should be analogized to appositive relative clauses, which are deviant in some negative environments and give rise to projection-like effects, as illustrated in (7)a, b. Projection effects are likely due to modal subordination, a phenomenon that also arises with independent clauses and clausal parentheticals, as illustrated in (7)a', b'.

(7) a. (i) It's likely / (ii) #It's unlikely that Ann will help her her son, which she will do by lifting him.
(i) => if Ann helps her son, lifting will be involved
b. If Asterix punishes his enemy, which will involve hitting him, I might scream.
=> if Asterix punishes his enemy, hitting will be involved
a'. It's likely that Ann will help her son. She will do so by lifting him.

(i) Merkel hat mit #(klaren) Worten gesprochen.
Merkel has with clear words spoken
'Merkel spoke with (clear) words.'

This dovetails with a related finding in the nominal domain: for purposes of redundancy computation, adjectives are computed after the noun, irrespective of their linear position (Ingason 2016, Schlenker 2020). If nominal and verbal modifiers are treated as redundant when their content follows from the noun or verb irrespective of their linear position, one expects that gestures that modify predicates (be they nouns or verbs) should behave in the same way; this is in particular compatible with Esipova's modification-based version of the cosuppositional analysis. (Note, however, that the question of the order of computation of redundancy remains open for non-linguistic representations, such as co-film music [Schlenker 2022].)

[9] Post-sign facial expressions arguably fall in the same category as post-speech gestures (Schlenker 2018c).

b'. If Asterix punishes his enemy (this will involve hitting him), I might scream.
=> if Asterix punishes his enemy, hitting will be involved

In addition, one could rely on Potts's 'comma intonation' (Potts 2005, followed by Schlenker 2018c) to explain why post-speech gestures behave like appositive relative clauses, or on more realistic properties of real intonation and syntax (Esipova 2019). Finally, as noted by Barnes and Ebert, various authors have argued that appositive relative clauses can have a gradient at-issue status in clause-final position (e.g. Koev 2012), and one might expect this gradience to extend to post-speech gestures.[10]

There are some respects in which the analogy with appositive relative clauses should be revisited, however. The general reason is that appositive relative clauses are tensed but post-speech gestures are not. By contrast, appositive gerunds might offer a better point of comparison for post-speech gestures: they are untensed but, like appositive relative clauses, they are deviant in some negative environments, and they give rise to projection effects.

5.3 Post-speech gestures as appositive gerunds?

To sketch the case for post-speech gestures as gerund-like constructions, we will rely on French examples because they offer a morphological distinction between gerunds used as at-issue modifiers and appositive gerunds: when they modify VPs, the former are preceded by *en* ('while'), the latter are not. The basic contrast is introduced in (8), which displays obligatory projection with appositive gerunds. Deviance in some negative environments is illustrated in (9)b. In addition, just like appositive relative clauses (Potts 2005), appositive gerunds are subject to an informativity (i.e. a non-triviality) requirement, as seen in (10)b.

(8) Uttered during the Covid pandemic:
a. Est-ce qu'Anne a rendu visite à ses parents en leur faisant prendre des risques?
Is-it that Anne has paid visit to her parents while to-them making take some risks
'Did Ann visit her parents while putting them at risk?'
≠> if Ann visited her parents, she put them at risk
b. Est-ce qu'Anne a rendu visite à ses parents, leur faisant prendre des risques?
Is-it that Anne has paid visit to her parents, to-them making take some risks
'Did Anne visit her parents, thus putting them at risk?'
=> if Ann visited her parents, she put them at risk
a'. Si Anne a rendu visite à ses parents en leur faisant prendre des risques,
If Anne has paid visit to her parents while to-them making take some risks,
nous le saurons.
we it will-know
'If Ann visited her parents while putting them at risk, we'll learn about it.'
≠> if Ann visited her parents, she put them at risk
b'. Si Anne a rendu visite à ses parents, leur faisant prendre des risques,
If Anne has paid visit to her parents, to-them making take some risks,
nous le saurons.
we it will-know
'If Anne visited her parents, thus putting them at risk, we'll learn about it.'
=> if Anne visited her parents, she put them at risk

(9) Uttered during the Covid pandemic:
a. Certains de mes amis ont rendu visite à leurs parents,
Some of my friends have paid visit to their parents,
leur faisant prendre des risques.
to-them making take some risks
'Some of my friends visited their parents, thus putting them at risk.'
b. ?? Aucun de mes amis n' a rendu visite à ses parents,
None of my friends NE has paid visit to their-sg parents,

[10] The analysis of the status of appositive relative clauses is complicated by the fact that (i) they arguably attach with matrix scope even when they seem to be embedded (McCawley 1981), (ii) when forced, they sometimes take narrow scope, and in such cases, they arguably give rise to weakened presuppositional effects (Schlenker 2023). This leads to a different kind of gradience, namely weak presupposition-like projection for narrow scope appositive relative clauses.

leur faisant prendre des risques.
to-them making take some risks

(10) Je vais inviter tes parents,
I am-going-to invite your parents,
'I am going to invite your parents,
a. te faisant plaisir.
to-you doing pleasure
thus pleasing you.'
b. #invitant ton père.
inviting your father
thus inviting your father.'

In these respects, appositive gerunds behave like appositive relative clauses. But there are interesting differences as well. Appositive relative clauses can take matrix scope even when they are embedded (e.g. Schlenker 2023); gerunds seem to be interpreted in their surface position.

(11) a. Anne sait que son fils est dehors, prenant des risques,
Anne knows that her son is outside, taking some risks,
et rentrera tard.
and will-come-back late
'Anne knows that her son is outside, taking some risks, and will return late.'
=> Anne knows that her son is taking risks
b. Anne sait que son fils est dehors,
Anne knows that her son is outside,
ce qui lui fait prendre des risks, et rentrera tard.
which to-him makes take some risks, and will-come-back late
'Anne knows that her son is outside, which puts him at risk, and will return late.'
Ambiguous: (i) Anne (and the speaker) know that Anne's son is taking risks; or (ii) the speaker knows that Ann's son is taking risks.

In view of these facts, the question is whether post-speech gestures behave like appositive gerunds or like appositive relative clauses. For instance, in (12), a repeated hitting gesture might suggest both that (i) Ann's son is engaged in fighting outside, and (ii) that Anne knows it; if part (ii) is obligatory, this mirrors the behavior of gerunds rather than appositive relative clauses. More empirical work is needed on this point.

(12) Anne sait que son fils est dehors – HIT-rep et rentrera tard.
Anne knows that her son is outside – HIT-rep and will-come-back late
'Anne knows that her son is outside—HIT-rep and will return late.'

The prohibition against negative environments is sometimes obviated with gerunds, with possible counterparts involving post-speech gestures. A future tense version of (9)b, as in (13)b, is more acceptable to my ear, with the clear implication that the reason none of my friends will visit their parents is that this would put them in harm's way; and I find (13)a acceptable.

(13) Uttered during the Covid pandemic:
a. Anne ne va quand même pas rendre visite à ses parents,
Anne NE is-going-to exclamative not pay visit to her parents,
leur faisant prendre des risques inutiles.
to-them having take some risks unnecessary
'I sure hope Anne isn't going to visit her parents, thus unnecessarily putting them at risk.'
b. ?Aucun de mes amis ne va rendre visite
None of my friends NE is-going-to pay visit
à ses parents, leur faisant prendre des risques inutiles.
to their-sg parents, to-tem having take some risks unnecessary
'None of my friends is going to visit their parents, thus unnecessarily putting them at risk.'

Interestingly, this relevance condition might also save some post-speech gestures in negative environments, as in (14), where *FALL* transcribes a gesture performed with the index and middle finger together representing a person falling off a cliff (here too, more empirical work is needed):

(14) *Context:* A photo shoot has been organized right next to a cliff.

a. Est-ce que le modèle va faire un pas de plus en arrière - FALL?
Is it that the model is-going-to do a step of more in back - FALL?
'Is the model going to take an additional step back—FALL?'

b. Le modèle ne va quand même pas faire un pas de plus en arrière - FALL.
The model NE is-going-to exclamative not do a step of more in back - FALL.
'I sure hope the model isn't going to take an additional step back—FALL.'

c. ?(?) Aucun modèle ne va faire un pas de plus en arrière - FALL.
No model NE is-going-to do a step of more in back - FALL
'No model is going to take an additional step back—FALL.'

An analysis based on covert appositive relative clauses could account for these gestural data, possibly by positing that the post-speech gesture has a covert conditional mood, as it might be more natural in this environment than the indicative, as seen in (15) (the data would require further investigation, however).

(15) a. Le modèle ne va quand même pas faire un pas de plus en arrière, ce qui le
The model NE is-going-to exclamative not do a step of more in back, which they-sg
'I sure hope the model won't take an additional step back, which
(i) ?fera tomber.
will-make fall
will make them fall off.'
(ii) ferait tomber.
would-make fall.
would make them fall off.'

c. Aucun modèle ne va faire un pas de plus en arrière, ce qui le
No model NE is-going-to do a step of more in back, which them-sg
'I hope no model will take an additional step back, which
(i) ?fera tomber.
will-make fall
will make them fall off.'
(ii) ferait tomber.
would-make fall.
would make them fall off.'

The problem is that if covert conditional mood is made available to post-speech gestures, it's unclear why any negative examples are deviant in the first place, as they can be saved by conditional mood—as in (16) for (7)a(ii):

(16) It's unlikely that Ann helped her son, which she would have done by lifting him.

The analogy with gerunds might have the advantage of deriving the right results without having to postulate an unrestricted mechanism of covert conditional mood. Whether this is a good model for post-speech gestures has yet to be investigated (the role of linear order on possibly gradient at-issue behavior should be explored as well; and the contrasts above should obviously be checked and refined).

6 Barnes and Ebert's Data

We briefly turn to the status of Barnes and Ebert's data within the typology of iconic contributions.

6.1 Co-speech manual gestures

As illustrated in (17), Barnes and Ebert 2023 summarize earlier results on the acceptability of three constructions in contexts that contradict their contribution: adjectival modifiers ('Adjective'), manual co-speech gestures ('Gestures'), and a gesture-bound demonstrative modifier, *so* ('like this') co-occurring with a gesture ('Dem+Gest'). Participants were "asked to rate how well the description given by the speaker in the video matched the image using a scale from 1-5 with 5 being the sentence perfectly matches the circumstances in the picture and 1 being that it does not match at all.".

(17) Items and results from Ebert et al. 2020
Exp. 2 involves a gesture-denoting demonstrative (= Dem+Gest)

Figure 1: Sample item (Ebert et al. 2020)

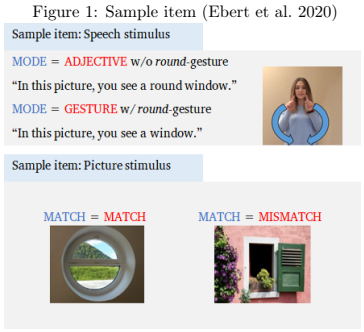


Figure 2: Results of experiment 1 (Ebert et al. 2020, p.173)

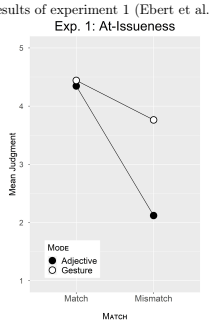
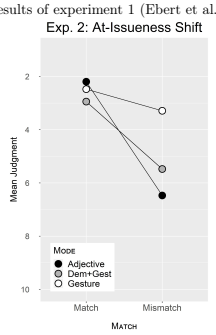


Figure 3: Results of experiment 1 (Ebert et al. 2020, p.174)



There are two main results to account for.

1. First, as seen in Fig. 2 in (17), mismatching co-speech gestures give rise to less 'mismatch' than adjectives. This could be for four conceivable reasons.
a. Co-speech gestures can be disregarded more easily than adjectives, notably because they appear in a different modality (one need only close one's eyes!). In fact, in the inferential experiments of Tieu et al. 2018, unembedded sentences with co-speech gestures (e.g. *The girl will* 𝕌𝔓***use the stairs***) gave rise to slightly lower endorsement of the target inference than control modifier structures (e.g. *The girl will use the stairs in* 𝕌𝔓***this*** *direction)*, possibly for this very reason.
b. Incorrect co-speech gestures might trigger a semantic failure rather than falsity, as is predicted by the cosuppositional analysis. And semantic failure usually gives rise to less rejection than falsity (e.g. Abrusán and Szendrői 2013, Zehr 2014, Križ and Chemla 2015). This seems to be compatible with Barnes and Ebert's preferred analysis.
c. The relation between co-speech gestures and the expressions they modify might be underspecified. For instance, proponents of the role of discourse relations could argue that a circular gesture accompanying *window* could mean something as weak as: *a window, the kind of object that's typically round*. By contrast, the meaning of adjectival modifiers is not negotiable in this way.
d. Iconic gestures *per se* could be less precise than control adjectives. For instance, for the circular gesture accompanying *window*, participants might think that the speaker aims to describe the window size rather than the window shape, in which case errors in the depiction might be easy to disregard.

2. Second, as seen in Fig. 3 in (17), gesture-bound demonstratives give rise to an intermediate effect, which leads Barnes and Ebert to propose that they have an intermediate at-issue status. As we argued above, on compositional grounds it seems difficult to treat gesture-bound demonstratives differently from other demonstratives, which makes this analysis non-trivial to develop. But reason 1d above (a possible imprecision of iconic gestures relative to control adjectives) might conceivably explain the finding as well.

6.2 Ideophones

Barnes and Ebert 2023 further discuss German adverbial-like ideophones, as in (18)a. Barnes and Ebert note that they are deviant under negation, as in (19), which might suggest that they contribute supplements. These ideophones appear to behave like post-speech vocal gestures, already illustrated in (6). If so, they could be analogized to appositive relative clauses, or to appositive gerunds (but this would require syntactic arguments).

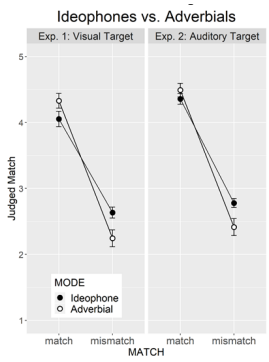
(18) a. Der Frosch geht plitsch-platsch die Treppe hoch.
the frog goes plitsch-platsch the stairs high
'The frog goes splish-splash up the stairs.'
b. Der Frosch geht mit einem platschenden Geräusch die Treppe hoch.
the frog goes with a splashing noise the stairs high

'The frog goes up the stairs with a splashing noise.'
(Barnes et al. 2022)

(19) ?? Der Frosch geht nicht plitsch-platsch die Treppe hoch.
the frog goes not plitsch-platsch the stairs high
'The frog does not go splish-splash up the stairs.'

The experimental results of Barnes et al. 2022 indicate that ideophones produce slightly less 'mismatch' judgments than control manner modifiers, as seen in (20), irrespective of whether the ideophones are presented visually or aurally.

(20) Results of audio and visual experiments (Barnes et al. 2022)



The authors take this result to argue for the non-at-issue (or less at-issue) status of ideophones. Here too, there are several possibilities to consider, corresponding to 1b, c, d in Section 6.1.
1. In line with the authors' view, a mismatching ideophone could give rise to a semantic failure of some sort (not necessarily of a presuppositional kind, as supplements can't just be reduced to presuppositions). This might account for the smaller effect of ideophones than at-issue modifiers.
2. A second possibility pertains to the underspecification of the relation between the ideophones and the verbal constructions they modify; this would be particularly relevant for analyses that give a central role to implicit discourse relations.
3. A third possibility is that ideophones, especially when they have a conventional meaning, happen to be less precise than the control modifiers that were used.

7 Conclusion

To summarize our main points:
(i) A complete account of gestures and ideophones will have to include an explicit iconic semantics (probably a version of pictorial semantics in the visual modality, and possibly a counterpart of it in the vocal modality); when focusing on other properties it is of course reasonable to take iconic truth conditions as given.
(ii) QUDs are a useful tool in the analysis of projection, but at this point they don't replace the search for an explanatory typology of inferential types, both in general and in the area of iconic contributions.
(iii) Once truth-conditional contributions have been determined by an iconic semantics, some or all of the behavior of gesture-bound demonstratives, pro-speech gestures and classifier predicates should follow. Gesture-bound demonstratives should behave like demonstratives in general. The behavior of pro-speech gestures and classifier predicates should follow from Stalnakerian conditions of non-triviality, combined with productive mechanisms that divide new contents among the slots of the inferential typology.
(iv) The supplemental analysis of co-speech gestures has difficulty distinguishing them from post-speech gestures, and cosuppositional analyses are preferable. But they should be given greater explanatory depth while retaining their applicability to linguistic and non-linguistic forms alike (e.g. co-film music).
(v) Symmetrically, the cosuppositional analysis of post-speech gestures has difficulty distinguishing them from co-speech gestures. Supplemental analyses are more promising, and may derive their behavior from the 'comma intonation' (Potts 2005, Esipova 2019). They will come in different varieties

depending on whether post-speech gestures are analogized to appositive relative clauses or to appositive gerunds.
(vi) There are diverse sources of gradient behavior in the phenomena under study, and thus it need not follow that gradient at-issueness should be a primitive property of iconic contributions.

References

Abrusán, Márta: 2011, Predicting the presuppositions of soft triggers. *Linguistics and Philosophy* 34(6). 491–535. DOI 10.1007/s10988-012-9108-y

Abrusán, Marta and Szendrői, Kriszta: 2013, Experimenting with the King of France: Topics, verifiability and definite descriptions. *Semantics and Pragmatics* Volume 6, Article 10: 1-43.

Abusch, Dorit: 2013, Applying discourse semantics and pragmatics to co-reference in picture sequences. In *Proceedings of Sinn und Bedeutung* 17, 19–25.

Abusch, Dorit: 2020, Possible worlds semantics for pictures. In L. Matthewson, C. Meier, H. Rullmann, and T. E. Zimmermann (eds.), *The Wiley Blackwell Companion to Semantics*, Wiley.

Barnes, Kathryn Rose; Ebert, Cornelia; Hörnig, Robin; and Stender, Theresa: 2022, The at-issue status of ideophones in German: An experimental approach'. *Glossa: a journal of general linguistics* 7. doi: 10.16995/glossa.5827.

Bergen, Leon: 2016, *Joint Inference in Pragmatic Reasoning*. PhD dissertation, MIT.

Chemla, Emmanuel: 2006, Recent Views on Presupposition. Manuscript, LSCP, Paris.

Davidson, Kathryn: 2015, Quotation, Demonstration, and Iconicity. *Linguistics and Philosophy* 38(6), 477-520.

Ebert, Cornelia and Ebert, Christian: 2014, Gestures, demonstratives, and the attributive / referential distinction. slides of talk at Semantics and Philosophy in Europe 7, ZAS, Berlin, http://www.semanticsarchive.net/Archive/GJjYzkwN/EbertEbert-SPE-2014-slides.pdf.

Ebert, Christian; Ebert, Cornelia; Hörnig, Robin: 2020, Demonstratives as dimension shifters. *Proceedings of Sinn und Bedeutung* 24. Ed. by Michael Franke, Nikola Kompa, Mingya Liu, Jutta L. Mueller & Juliane Schwab, 161–178. doi: 10.18148/sub/2020.v24i1.859.

Esipova, Maria: 2019, *Composition and projection in speech and gesture*. PhD thesis, New York University.

Fuchs, Susanne; Savin, Egor; Solt, Stefanie; Krifka, Manfred; and Ebert, Cornelia: 2019, Antonym adjective pairs and prosodic iconicity: Evidence from letter replications in an English blogger corpus. *Linguistics Vanguard*.

Greenberg, Gabriel: 2013. Beyond Resemblance. *Philosophical Review* 122:2, 2013

Greenberg, Gabriel: 2021, Semantics of Pictorial Space. *Review of Philosophy and Psychology*. https://doi.org/10.1007/s13164-020-00513-6

Henderson, Robert: 2016, A demonstration-based account of (pluractional) ideophones. In Mary Moroney, Carol-Rose Little, Jacob Collard & Dan Burgdorf (eds), *Proceedings of Semantics and Linguistic Theory 26*. doi: 10.3765/salt.v26i0.3786.

Hunter, Julie: 2019, Relating gesture to speech: reflections on the role of conditional presuppositions. *Linguistics and Philosophy* 42, 317–332.

Ingason, Anton Karl. 2016. Context updates are hierarchical. *Glossa: a journal of general linguistics* 1(1) 1–9.

Koev, Todor: 2012, On the Information Status of Appositive Relative Clauses. *Logic, Language and Meaning*. Lecture Notes in Computer Science Volume 7218, 2012, pp 401-410.

Križ, Manuel and Chemla, Emmanuel: 2015, Two Methods to Find Truth-value Gaps and their Application to the Projection Problem of Homogeneity. *Natural Language Semantics* 23, 205–248.

Kuhn, Jeremy and Aristodemo, Valentina: 2017, Pluractionality, iconicity, and scope in French Sign Language. *Semantics and Pragmatics*. https://doi.org/10.3765/sp.10.6

Lascarides, Alex and Stone, Matthew: 2009a, Discourse Coherence and Gesture Interpretation. *Gesture* 9(2), 147–180.

Lascarides, Alex and Stone, Matthew: 2009b, A Formal Semantic Analysis of gesture. *Journal of Semantics* 26(4), 393–449.

Liddell, Scott K.: 2003, Sources of Meaning in ASL Classifier Predicates. In Emmorey, Karen (ed.), *Perspectives on Classifiers in Sign Languages*. Mahwah, NJ: Lawrence Erlbaum, 199-220.

McCawley, James D.: 1981, The Syntax and Semantics of English Relative Clauses. *Lingua* 53, 99-149.

Migotti, Léo and Guerrini, Janek: to appear, Linguistic Inferences from Pro-speech Music. To appear in *Linguistics and Philosophy*.

Okrent, Arika: 2002. A modality-free notion of gesture and how it can help us with the morpheme vs. gesture question in sign language linguistics (or at least give us some criteria to work with). In R. P. Meier, K. Cormier, & D. Quintos-Pozos (eds.), *Modality and structure in signed and spoken languages*, pp. 175–198. Cambridge, UK: Cambridge University Press.

Pasternak, Robert and Tieu, Lyn: 2022, Co-linguistic content projection: From gestures to sound effects and emoji. *Quaterly Journal of Experimental Psychology* 75(10), 1828–1843.

Potts, Christopher: 2005, *The Logic of Conventional Implicatures*. Oxford University Press.

Schlenker, Philippe: 2015, Gestural Presuppositions. *Snippets*, Issue 30. doi: 10.7358/snip-2015-030-schl

Schlenker, Philippe: 2018a, Visible Meaning: Sign Language and the Foundations of Semantics. *Theoretical Linguistics* 44(3-4): 123–208

Schlenker, Philippe: 2018b, Gesture Projection and Cosuppositions. *Linguistics and Philosophy* 41, 3:295–365.

Schlenker, Philippe: 2018c, Iconic Pragmatics. *Natural Language and Linguistic Theory* 36, 3:877–936

Schlenker, Philippe: 2019a, Gestural Semantics: Replicating the typology of linguistic inferences with pro- and post-speech gestures. *Natural Language and Linguistic Theory* 37, 2: 735–784.

Schlenker, Philippe: 2019b, Gestural Cosuppositions within the Transparency Theory. *Linguistic Inquiry* 50, 4: 873-884

Schlenker, Philippe: 2020, Inside Out: a Note on the Hierarchical Update of Nominal Modifiers. *Glossa: a journal of general linguistics* 5(1): 60.

Schlenker, Philippe: 2021a, Iconic Presuppositions. *Natural Language and Linguistic Theory* 39:215–289.

Schlenker, Philippe: 2021b, Triggering Presuppositions. *Glossa: a journal of general linguistics* 6(1): 35. 1–28. DOI: https://doi.org/10.5334/gjgl.1352

Schlenker, Philippe: 2022, Musical Meaning within Super Semantics. *Linguistics and Philosophy* 45: 795–872.

Schlenker, Philippe: 2023, Supplements Without Bidimensionalism. *Linguistic Inquiry* 54 (2): 251–297.

Schlenker, Philippe; Bonnet, Marion; Lamberton, Jonathan; Lamberton, Jason; Chemla, Emmanuel; Santoro, Mirko; Geraci, Carlo: to appear, Iconic Syntax: Sign Language Classifier Predicates and Gesture Sequences. *Linguistics and Philosophy*

Schlenker, Philippe and Lamberton, Jonathan: 2019, Iconic Plurality. *Linguistics and Philosophy* 42: 45-108 https://doi.org/10.1007/s10988-018-9236-0

Schlenker, Philippe and Lamberton, Jonathan: 2021, Focus and Intensification in the Semantics of Brow Raise. *Glossa: a journal of general linguistics* 6(1). doi: https://doi.org/10.16995/glossa.5706

Schlenker, Philippe and Lamberton, Jonathan: 2022, Meaningful Blurs: the Sources of Repetition-based Plurals in ASL. *Linguistics and Philosophy* 45: 201–264.

Schlenker, Philippe and Lamberton, Jonathan: to appear, Iconological Semantics. Accepted with minor revisions in *Linguistics and Philosophy*.

Simons, Mandy, Judith Tonhauser, David Beaver, and Craige Roberts: 2010, What projects and why. In *Semantics and Linguistic Theory (SALT) 20,* eds. Nan Li and David Lutz, 309–327.

Stalnaker, Robert C.: 1978, Assertion. In Peter Cole (ed.), *Syntax and Semantics 9: Pragmatics* 315–322. Academic Press.

Tieu, Lyn; Pasternak, Robert; Schlenker, Philippe; Chemla, Emmanuel: 2018, Co-speech gesture projection: Evidence from inferential judgments. *Glossa: a journal of general linguistics*, 3(1): 109. 1–21, DOI: https://doi.org/10.5334/gjgl.580

Tieu, Lyn; Schlenker, Philippe; Chemla, Emmanuel: 2019, Linguistic Inferences Without Words. *Proceedings of the National Academy of Sciences* 116 (20) 9796-9801.

Tonhauser, Judith, David Beaver, Craige Roberts, and Mandy Simons: 2013, Toward a taxonomy of projective content. *Language* 89(1): 66–109.

Zehr, Jeremy: 2014, Vagueness, Presupposition and Truth-value judgments. Doctoral dissertation, École Normale Supérieure de Paris.

Zucchi, Sandro: 2011, Event descriptions and classifier predicates in sign languages. Presentation at FEAST (Formal and Experimental Advances in Sign language Theory) in Venice, June 21, 2011.

Zucchi, Sandro: 2017, Event Categorization in Sign Languages. In: Cohen H. and Lefebvre C. (eds.) *The Handbook of Categorization in Cognitive Science*, Elsevier. 2017, pp. 377-396

Zucchi, Sandro: 2018, Sign language iconicity and gradient effects. *Theoretical Linguistics* 44(3-4): 283–294.

Zwitserlood, Inge: 2012, Classifiers. In: Roland Pfau, Markus Steinbach and Bencie Woll (eds) *Sign Language: An International Handbook*. De Gruyter Mouton, pp. 158-186. https://doi.org/10.1515/9783110261325.158