

# Quotational Semantics: A New Ontology for Natural Language

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Argument Structure Across Modalities (ASAM), Amsterdam  
Feb 1-3

# Why We Need a New Ontology

- Cartography tells us that there are robust crosslinguistic generalizations about the ordering of meaning elements in an extended functional projection (cf Cinque 1999).
- At the bottom of every functional sequence, we find evidence for a kind of substantive, conceptual, rich, yet flexible kind of meaning, as denoted by open class items.
- Evidence for this kind of *layered meaning* are pervasive and exceptionless crosslinguistically, yet they currently look 'accidental', 'templatic' from the point of view of our formal ontologies.

# Interplanetary Travel, or Verbs in Zoggian

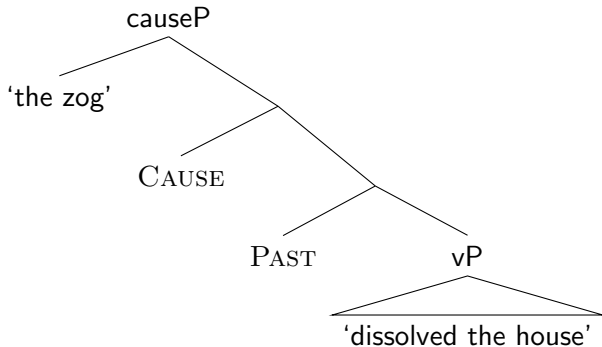
Some hypothetical sentences of Zoggian follow in (1).

- (1)    blixax      fub-ax  
          the.house dissolvegreen-PAST  
          'The house dissolved into a green slimy puddle.'
- (2)    blixax      marrg fub-ax-ilka  
          the.house the.zog dissolvegreen-PAST-CAUSE  
          The zog dissolved the house into a green slimy puddle.

# A Zoggian Tree Structure

The tree structure for the sentence in (2-b) is given below in (3)

(3)



# Zoggian Compositional Semantics

- (4) (i)  $[[ \text{vP} ]] = \lambda e[\text{fub}(e) \wedge \text{Undergoer}(e) = \text{'the house'}]$   
 (ii)  $[[ \text{PAST} ]] = \lambda e[ \tau(e) <_t \text{'now'} ]$  (where  $\tau$  is  $e$ 's temporal trace function)  
 (iii)  $[[ \text{CAUSE} ]] = \lambda x \lambda e[\text{Causer}(e) = x ]$

The vP combines with the PAST morpheme by argument identification to give:

$$\lambda e[\text{fub}(e) \wedge \text{Undergoer}(e) = \text{'the house'} \wedge \tau(e) <_t \text{'now'}]$$

This then combines with the cause morpheme, again by argument identification to give:

$$\lambda x \lambda e[\text{fub}(e) \wedge \text{Undergoer}(e) = \text{'the house'} \wedge \tau(e) <_t \text{'now'} \wedge \text{Causer}(e) = x]$$

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The Burning Question is: Can we do better than a stipulated template and get closer to an *explanation* for why the meaning orderings show up the way they do?

# Kinds vs. Particulars



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## The Morphosyntactician

But the functional sequence tells us that there is some notion of kind/property that resides lower down, close to the root and is the basis for the build up of reference to particulars. *In morphosyntax, particulars are built out of essences.*

# Empirical Phenomena in the Verbal Domain that require Essential/Non-Instantiation-Related Content

- Adjectival Participial meaning (Gehrke 2013, Gehrke 2015 etc.)
- Causative verbal meanings with defeasible actuality entailments of the caused state. Martin and Schäfer 2014, Kratzer 2004
- The progressive paradox (Dowty 1979, Landman 1992 etc.)
- Thematic Roles (generalizations over the 'type' of relationship between verb and any potential participant).

## Essences as Basic

You could do this all with possible worlds, and in fact, for the formal semanticist this has been seen as the only option, but there are dissenting voices.

*“Finally, it will be suggested that the identity of an object— what it is— is not, at bottom, a worldly matter; essence will precede existence in the sense that the identity of an object may be fixed by its unworldly features even before any question of its existence or other worldly features is considered.” (Kit Fine. Necessity and Non-Existence)*

Also event ‘properties’ as in recent work by McNally and Gehrke (Gehrke and McNally 2015, Gehrke 2015, Grimm and McNally 2015). These authors are very clear that they think of the notion of event essence as *preceding* information about instantiation in the verbal functional sequence.

# The Problem with Formalizing Essences Directly

If semantics is to follow morphosyntax in such a way that what is simple and underived in the one system corresponds to what is simple and underived in the other, then *essence* must precede *existence* in the cumulative building up of a natural language proposition.

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Fine's own technical implementation of the intuition involves relativizing the notion of truth for certain elements, so that in some instances the thing can be 'true' *by virtue of the essential properties of the object*.

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In Gehrke and McNally, 'event property' is a primitive which underwrites particulars, but the details of the compositionality are difficult to make precise.



# The Internalist vs. Externalist Question

## **The Externalist:**

“There is a crucial ‘aboutness’ to language, and that if we attempt to ground our theories in internalist notions then we are condemned to theories that make no sense of the intersubjectivity of language and which end up being at best unfalsifiable, and mystical at worst.

## **The Internalist:**

But what about the fact that language is represented in the mind-brain of actual individual speakers? What is it they have memorized? And how is it deployed?

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(News Flash: Formal Semanticists are externalists.)

# Barwise and Perry (1983)

Barwise and Perry (1983) were very clear about the properties of the symbolic primes of a natural language system and what they need to be able to do. Here, the emphasis is on reusability, and user perspective, rather than the more traditional formal semanticist fixation on 'aboutness' and 'intersubjectivity'.

## **Properties of the Symbolic Primes of an NL System**

- Re-usability
- Perspectival relativity
- Ambiguity
- Acquirable on the basis of immediate cognitive/sensory uptake

# Digression on Ideophones and Demonstrations

In terms of implementation, my inspiration has come from the apparently extreme and exotic case of 'ideophones'. Henderson (2015) states that work on the formal semantics of ideophones is scarce because of the 'difficulty in formalizing the distinction between descriptive meaning and depictive meaning, which ideophones seem to traffic in'. In giving his own account, Henderson explores a formal foundation for the notion of *demonstrations* from Davidson (2015) and extends it to account for the ideophonic data. *Intuitively, demonstrations are a special type of communicative event that stand in a similarity relation with the event demonstrated.*

# The Radical Move

**ALL linguistic symbol use is like this.  
(i.e. not just ideophonic elements)**

# Quotational Quantificational Semantics (QQS)

## Preview:

For human language to get off the ground, we need to have

- (i) common possession of symbols that are *abstractions over the different actual situations encountered in the learning phase*, and
- (ii) a speaker to deploy those symbols as a means of characterizing new situations in the world as she comes across them.
- (iii) The eventuality corresponding to the speech event explicitly represented in the build up of the propositional meaning.
- (iii) The 'meanings' of the symbols themselves devoid of temporal or worldly information. They form the hierarchically inner core which are clothed with the contingent information of time, place and world, to link descriptions to actual particulars.

# The Metalinguistic Turn

In order to do this we need to add to the usual model, a domain  $D_\mu$  which is the domain of well-formed linguistic entities of type  $\mu$ , after Potts (2007). These linguistic objects are triples, consisting of a `< phonological string, syntactic features, SEMANTICS >`.

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Full expressions of type  $\mu$  will be written in sans serif. So for example, the verb `run` might have the denotation:

$$[[ \text{run} ]] = \langle \text{run}, \langle \mathbf{init}, \mathbf{proc} \rangle, \lambda e[\text{run}(e)] \rangle$$

For convenience, we adopt the convention in Henderson (2015) which uses the bottom corner notation to pick out the semantic part of the triple denoted by something of type  $\mu$ . Thus,

$$\lfloor \text{run} \rfloor = \lambda e[\text{run}(e)]$$



# Language Symbols as Objects in the Ontology

- (a) Symbols of the language constitute the domain  $D_\mu$ , which are triples consisting of a  $\langle$  phonological string, **syntactic features**, SEMANTICS  $\rangle$
- (b) The semantics of a verbal LI are partial descriptions based on sensory and cognitive abstractions over experience.
- (c) The syntactic part of the information in a triple that is a member of  $D_\mu$ , is a subtree of the language. The merge of  $u_1 \in D_\mu$  and  $u_2 \in D_\mu$ , creates a derived element of  $D_\mu$ ,  $u_3$ , which has the syntactic representation built by merging the syn-rep of  $u_1$  with the syn-rep of  $u_2$ , and a semantics is composed by ordinary argument identification of  $\sqsubset u_1 \sqsupset$  and  $\sqsubset u_2 \sqsupset$ .

# Hendersonian Deployment (The Case of Ideophones)

This is Henderson (2015)'s denotation for the quotation meaning. TH ( $d$ ) =  $u$  says that the 'theme' of  $d$  is the linguistic object  $u$ , and  $d$  'demonstrates' or has certain structural properties in common with  $e$ .

$$(5) \quad \text{QUOTE} : \lambda u \lambda d \lambda e [\text{TH}_\delta(d) = u \wedge \text{DEMO}(d,e) ]$$

# Verbal Meanings

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This reusable essential symbolic content is the equivalent of Henderson's ideophone. A symbol is a conventionalized ideophone, used to invoke and describe and event.

# Deployment, Generalized

## Deployment of the Symbolic Content at EvtP

- (6) I.  $\text{EvtP} : \lambda d \lambda e [\text{UTTERANCE}(d) \wedge \text{TH}_\delta(d)=u \wedge \text{CONVEY}(d,e)]$

Property of of an utterance event  $d$  and event  $e$ , which has  $u$  as its theme, and where  $d$  deploys  $u$  ( $\in D_\mu$ ) to convey  $e$ .

II. In the case of purely conventional (i.e. non-depictive) LIs, uttered with sincerity and without metaphor or hyperbole,  
 $'\text{TH}_\delta(d)=u \wedge \text{CONVEY}(d,e)' \longrightarrow ' \llcorner u \lrcorner (e) '$

# Using Expressions with Intrinsic Semantic Properties

This is a representational encoding of the intuition that reference involves a speaker and a context in addition to the symbol she is deploying. But it is not just a matter of a speaker  $X$  using the symbol  $Y$  to refer to the object  $Z$ , we need to leave room also for the contextual circumstances and mode of deployment of the symbol in question. Once again Chomsky (1995) puts it well,

*" More generally, person  $X$  uses expression  $E$  with its intrinsic semantic properties to talk about the world from certain intricate perspectives, focusing attention on specific aspects of its, under circumstances  $C$ , with the "locality of content" they induce (in Bilgrami's sense). "*  
*Chomsky (1995), p. 43*



# Why Reify The Speech Event?

Semanticists understand very well the need for incorporating contextual information to build meanings that have actual truth conditions, so from a semantic point of view this is not new. But why put it in the representation in this literal fashion, instead of simply invoking it in the model or in the process of interpretation?

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Semanticists understand very well the need for incorporating contextual information to build meanings that have actual truth conditions, so from a semantic point of view this is not new. But why put it in the representation in this literal fashion, instead of simply invoking it in the model or in the process of interpretation? Why explicitly represent deployment? Isn't it an architectural mistake to treat the 'metalinguistic' reality in this linguistic representational way? Doesn't it lead to all kinds of philosophical horrors and specular infinities?

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**Closing the Commensurability Gap with Psycholinguistics:** We create a more algorithmic theory of how meaning is built up psycholinguistically with claims and predictions that are more commensurable with the primes being investigated by psycholinguists.

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**Underwriting NL Generalizations:** Small steps in the direction of explaining broad level templatic facts/generalizations ( $V < T < C$ ).

# Quantificational Quotational Semantics: Three Layers of Meaning

Intuitively, we build up a representation of the proposition in three stages:

- (i) The putting together of lexical items which encode certain event properties. This stage needs to be productive and compositional, but with no reference to temporal or world parameters. (The Interior)
- (ii) The assertion by the speaker of the existence of an event with those properties. (Deployment)
- (iii) Addition of temporal and world properties to the event. (Referential/Instantiational domain)
- (iv) Anchoring of the worldly and temporal properties via the Origo (the speaker and her contextual coordinates).

# Why is all this Relevant to the Present Workshop?

The deepest layer of linguistic layering is the domain of argument structure, it is enclosed by a deployment operator.

Neither the nature of the symbolic characterizing information, nor the mode of deployment is modality specific, but crucially *it leaves it open to express differences in this dimension because of the reification of d.*

- The internal structural principles for the first phase (causation, result, dynamic vs. stative) should be common to all human organization of verb meaning and argument structure.
- The differences emerge from the different sorts of properties encoded by the symbol, the different ways in which deployment works (in particular the different ways in which iconicity and deictic anchoring play out in the auditory vs. visual modalities).

# Deploying Across Modalities

(7)  $EV_{TP} : \lambda d \lambda e [\text{UTTERANCE}(d) \wedge \text{TH}_\delta(d)=u \wedge \text{CONVEY}(d,e)]$

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DEMONSTRATE (iconic/auditory): (the symbol used in )  $d$  demonstrates or has certain structural properties in common with  $e$  (onomatopeia).

DEMONSTRATE (iconic/visual): (the symbol used in )  $d$  demonstrates or has certain structural properties in common with  $e$  (spatial iconicity).

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(8) The water whooshed into the room.

$EV_{TP} : \lambda d \lambda e [\text{UTTERANCE}(d) \wedge \text{TH}_\delta(d) = \text{whoosh} \wedge \ulcorner \text{whoosh} \urcorner (e) \wedge \ulcorner \text{whoosh} \urcorner \text{ has properties in common with the sound of } e \urcorner]$

(Where I use top corner brackets by convention to pick out the phonological part of the triple corresponding to a symbol of  $D_\mu$ .)

# Languages in the Visual Modality

(9)

$EV_{TP} : \lambda d \lambda e [\text{UTTERANCE}(d) \wedge \text{TH}_\delta(d) = \Delta \wedge \text{'}\lrcorner \Delta \lrcorner \text{'}(e) \wedge$   
 'SHAPE( $\Delta$ ) has properties in common with the spatial trajectory  
 of e']

# Gesture in an Auditory Language

In both auditory and visual mode languages, gesture in a parallel dimension can be folded into the semantics by adding properties to the deployment event  $d$ .

- (10) The water whooshed into the room. (with wave-like hand gesture simultaneous with pronunciation of verb)
- $EV_{TP} : \lambda d \lambda e [UTTERANCE(d) \wedge TH_{\delta}(d) = \text{whoosh} \wedge \ulcorner \text{whoosh} \urcorner (e) \wedge \ulcorner \text{whoosh} \urcorner \text{ has properties in common with the sound of } e \urcorner \wedge \ulcorner \text{The Visual Performance of } d \text{ has properties in common with the spatial trajectory of } e \urcorner ]$

In the latter case, we can see that the deployment event  $d$  can in principle contain information in addition to the actual symbol being deployed.

# How Quotational Semantics is Different

- By reifying the symbol and the deployment event, QQS allows the symbol to denote partial descriptions of eventive particulars, without committing to the existence of those particulars until the event is existentially closed at the vP level.
- QQS allows a zone of compositional concept building which leaves it open that the inputs to concept building can come from a variety of different sources, including iconic input (both auditory and gestural).



# How Quotational Semantics is Different

- By reifying the symbol qua symbol, QQS offers a better way of integrating iconic and gestural content into the formal semantic representation. (we don't need to relegate it into a post-linguistic pragmatic component).
- The deployment event is integrated early in concept formation, potentially predicting a more central conceptual role for deictic information.

# Conclusion

Symbolic self consciousness and the *reusability* of open class items necessary for a generative meaning engine.

This is essentially a 'third factor' design aspect of language which does the work here. This is the crucial factor that motivated the quotational system in the first place, and implementing it with this quotational operator allowed us to begin to see how we can explain the cartographic generalizations.

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- The reification of the deployment event allows for the integrating of co-gestures, since the performance/demonstration event *d* is not *just* the deployment of a symbol, it can potentially be very complex.
- Differences across modality predicts different kinds of deictic/iconic effects.

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