



# Pointing: From reference to attention and back

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# Ways of pointing<sup>1</sup>

→ *demonstrating*



*“then the house is like this”*

→ *indicating*



*“Can you jump over this spout?”*

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<sup>1</sup>H. H. Clark (1996). *Using Language*. Cambridge: Cambridge University Press.

# Uses of Demonstratives

## Exophoric (deictic, perceptual)<sup>2</sup>

*This painting [nodding towards a canvas] is by Chagall.*

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<sup>3</sup>J. C. King (2001). *Complex Demonstratives: A Quantificational Account*. Contemporary Philosophical Monographs 2. Cambridge, MA: MIT Press.

<sup>4</sup>W. V. O. Quine (1968). “Ontological Relativity”. In: *The Journal of Philosophy* 65.7, pp. 185–212; G. Nunberg (1993). “Indexicality and Deixis”. In: *Linguistics and Philosophy* 16.1, pp. 1–43.

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## Endophoric (anaphoric, cataphoric)<sup>3</sup>

Städel has a new painting<sub>*i*</sub>. *This painting<sub>*i*</sub>* is by Chagall.

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## Endophoric (anaphoric, cataphoric)<sup>3</sup>

Städel has a new painting<sub>*i*</sub>. *This painting<sub>*i*</sub>* is by Chagall.

## Deferred reference<sup>4</sup>

*This painter* [nodding towards a canvas] is the most expensive one.

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# Unified Semantics<sup>5</sup>

- ▶ Configuration:  $[\text{DemNP}[[\text{that } i]R]\text{NP}]$ 
  - ▶  $i$ : contextually given index,  $g(i)$ .
  - ▶  $R$ : salient relation (eventually bridging between  $g(i)$  and  $[[\text{NP}]]$ , defaults to identity).
  - ▶ The relation variable  $R$  can be *bound*, capturing endophoric uses.

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  - ▶ The relation variable  $R$  can be *bound*, capturing endophoric uses.
- ▶ **Problems:**
  - ▶ **No index** in case of endophoric uses.
  - ▶ **Directly referential** assignment  $g(i)$  is too simplistic.
  - ▶ No representation of **demonstration act**.

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# Claims

- ▶ Real word referents and discourse referents have *different identification conditions*.
- ▶ This difference becomes effective in *indirect reference (bridging vs. deference)* and *clarification*.
- ▶ Simple unified theories of demonstratives make incomplete or false predictions wrt. such cases.
- ▶ TODO: provide better account (→ DemNPs as processing instructions).



# Outline

1. Bridging demonstratives, clarifying indices
2. Pointing and deferred reference
3. DemNPs as processing instructions

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Bridging demonstratives, clarifying  
indices

# Indirect reference

- ▶ Indirect reference happens iff index  $\neq$  referent.
- ▶ Endophoric indirect reference is known as *bridging*<sup>6</sup>, exophoric indirect reference is known as *deferred reference*<sup>7</sup>.
- ▶ If unified approaches are correct, then endophorically and exophorically used demonstratives should behave similar.


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<sup>6</sup>H. H. Clark (1975). “Bridging”. In: *Proceedings of the 1975 Workshop on Theoretical Issues in Natural Language Processing*. TINLAP '75. Cambridge, Massachusetts: Association for Computational Linguistics, pp. 169–174.

<sup>7</sup>W. V. O. Quine (1968). “Ontological Relativity”. In: *The Journal of Philosophy* 65.7, pp. 185–212; G. Nunberg (1993). “Indexicality and Deixis”. In: *Linguistics and Philosophy* 16.1, pp. 1–43.

# Asymmetry in indirect reference

- ▶ Deferring from painting to painter:

(1) That  : *demonstrating a painting*] painter is my favorite one.

- ▶ Corresponding bridging is not possible, however:

(2) I saw a beautiful *painting* in the museum.

- ? *That painter* is my favorite one.
- That painting is my favorite one.
- The painter is my favorite one.

# Contrast

- ▶ Demonstrative bridging is possible if a contrast is exploited, as is argued by Wolter<sup>8</sup> by example of the following sentences:

- (3)
- a. A car drove by. The horn was honking. Then another car drove by. *That horn* was honking even louder.
  - b. A car drove by. The horn was honking. Then another car drove by. ?*The horn* was honking even louder.
  - c. ?A car drove by. *That horn* was honking.

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  - b. A car drove by. The horn was honking. Then another car drove by. *?The horn* was honking even louder. [not unique]
  - c. *?A car* drove by. *That horn* was honking. [no contrast]


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<sup>8</sup>L. Wolter (Jan. 2006). *Bridging Demonstratives at the Semantics-Pragmatics Interface*. Talk presented at the LSA Annual Meeting.


# No problem for deference

(3) [Context: *One car is driving by.*] That[] horn is honking.

This also works for the contrastive set of two cars:

(4) [Context: *Two cars are driving by.*] That[] horn is honking.

# Rephrasing

- ▶ Indirect reference is licensed by a formula like *the X of that Y*, where *X* is the inferred referent and *Y* the demonstratum.
- ▶ Rephrasing the examples according to that matrix:
  - (5) a. A car drove by. The engine stuttered. Then another car drove by. The engine of that/?the car stuttered, too.
  - b. A car drove by. The engine of that/the car stuttered. **[no contrast needed any more!]**
  - c. [Context: *A car is driving by.*] The engine of that[] car stutters.



# Identification by repetition

- (8) a. A car drove by. The engine stuttered. Then another car drove by. The engine of that car stuttered, too.
- b. A car drove by. The engine of that car stuttered.
- ▶ Commonality: *re-use* of expression: “car”.
  - ▶ Clue to identification requirement of demonstratives?

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## Identification by repetition

Discourse referents are identified by a *repetition* of the linguistic material associated with them.

# Uptake of bridge

- ▶ Reconsidering bridging with “identification by repetition”-view.
  - ▶ Bridging is licensed only if the bridging demonstrative takes up a canonical bridge:
- (6) a. A car drove by. **The engine** stuttered. Then another car drove by. *That engine* stuttered, too.
- b. A car drove by. **The engine** stuttered. Then another car drove by. *?That horn* was honking.



# Inferential base

- ▶ The “inferential bases” have to be sufficient similar even in case of an uptake of the canonical bridge:



- (7) a. A *car* drove by. The horn was honking. Then a **gnu** walked by. ?That horn was scuffed.
- b. A *car* drove by. The horn was honking. Then a **motorbike** drove by. That horn was honking, too.

# Free base for deferring

- ▶ No uptake of bridge required:

- (8) a. [Context: *A car is driving by.*] That[] engine stutters.
- b. [Context: *Another car is driving by.*] That[] horn is honking.

- ▶ No similar inference base required:

- (9) a. [Context: *A car is driving by.*] That[] horn is honking.
- b. [Context: *Then a gnu is walking by.*] That[] horn is scuffed.

# Semantic parallelism

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Bridging demonstratives require a *canonical bridge* from *similar antecedents*.

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Bridging demonstratives require a *canonical bridge* from *similar antecedents*.

- ▶ Deferrings do not underlie semantic parallelism.
- ▶ If this view is broadly correct, then bridging demonstratives involve a kind of co-text look-up for finding matching expressions.
- ▶ This is as expected in light of the “identification by repetition” constraint.

# Summary

## Identification by repetition

Discourse referents are identified by a *repetition* of the linguistic material associated with them. (*Modulo* hypernyms.)

## Semantic parallelism

Bridging demonstratives require a *canonical bridge* from *similar antecedents*.



# Identity conditions

- ▶ Discourse referents are distinguished *numerically*, they can be identified by sameness of description or counting.
- ▶ Real world referents are identified *perceptually*, they allow for a plurality of classifications (any classification which is perceptually grounded).

# Reprise Content Hypothesis


## **Reprise Content Hypothesis (strong version; Purver & Ginzburg 2004<sup>9</sup>)**

A nominal fragment reprise question queries exactly the standard semantic content of the fragment being reprised.

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<sup>9</sup>M. Purver and J. Ginzburg (2004). “Clarifying Noun Phrase Semantics”. In: *Journal of Semantics* 21.3, pp. 283–339.

# Clarification potential of exophoric DemNPs

(10) A. This [] painting is by Chagall.

B. This [] painting?

~> *The object over there?*

~> ?? *What do you mean 'painting'?*


~> ?? *Which one?*

A. Right, this painting. / No, the one to the left.

?? Well, maybe it's a drawing.

- ▶ *Ceteris paribus* (intonation!), the reprise fragment DemNPs is restricted to the **identity of the index**.

# Skipping CN

(11) A. This[] painting is by Chagall.

B. This[] painting?

This[] one?

This[]?

- ▶ The head noun can be skipped, emphasizing the index-related clarifying potential of exophoric DemNPs.

# Clarifying deferrings

Likewise, the clarification potential of deferred reference concerns only the index:

(12) [Context: *A and B are looking at some painting.*]

A. This[] painter died at an early age.

B. This[] painter?

~> ?? *What do you mean 'painter'?* (CN)

~> ?? *Wouldn't be 'drawer' a better classification?* (bridge)

~> *The painter of this painting?* (index)

~> ?? *Which one?* (index or referent)

~> ?? *There is no painter, there is just a painting* (referent)

A. ?? Well, the painter of this painting.

?? Well, this drawer.

Yes, this one. / No, that one.

# No index reachable for endophoric DemNPs ...

In case of anaphoric uses, requesting an index seems not to be feasible:

- (13) A. I saw a painting yesterday. This painting was shocking.
- B. This painting?  
    ~> *Which one?*  
    ~> ?? *The object over there?*  
    ~> ?? *What do you mean 'painting'?*
- A. The painting I saw yesterday. / The painting I just mentioned.  
    ?? This one.

## ...and bridging demonstratives

(14) A. Mary talked to no senator before that senator was lobbied.

B. That senator?

~> *Which senator?*

~> **??** *What do you mean 'senator'?*

A. (i) (?) The group of senators Mary talked to.

(ii) The one from the (group of) senators Mary talked to.

- ▶ Note that A's first answer (i) corresponds to the "Elbourne index" for bound DemNPs, which does not seem to provide a smooth answer to the request.

## Even no skipping

(15) A. I saw a painting yesterday. This painting was shocking.

B. This painting?

?? This one?

?? This?



# Conclusion

- ▶ Exophoric DemNPs are identified with reference to their (perceptual) indices.
- ▶ Endophoric DemNPs involve just an abstract discourse referent, which is not accessible as demonstratum.
- ▶ Unified approaches resting on “discourse deixis” makes false predictions with regard to this differences. (No unification possible *via* index.)

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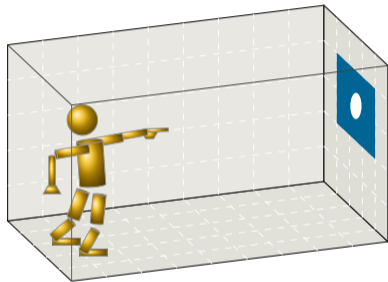
# Pointing and deferred reference

# Deferred reference

“This painter is great!”

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<sup>o</sup>G. Nunberg (1993). “Indexicality and Deixis”. In:  
*Linguistics and Philosophy* 16.1, pp. 1–43.



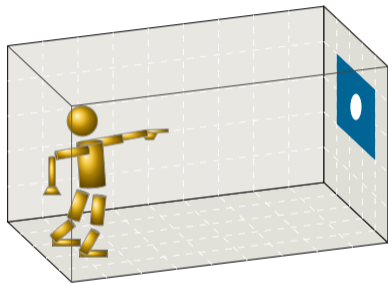
# Deferred reference

“This painter is great!”

- ▶ index  $\neq$  referent
- ▶ Two stage process:<sup>a</sup>
  1. Identify index
  2. Identify referent by means of a *salient relation*

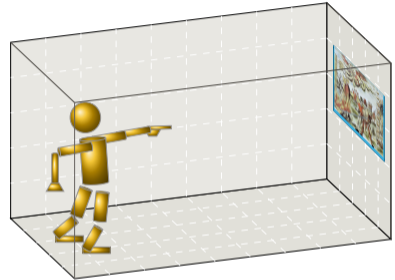
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# Double deference

- ▶ “This era was a dark one.”  
Image source: *Wikimedia Commons*, drawing from the *Wickiana*, a collection of news reports from the 16th century



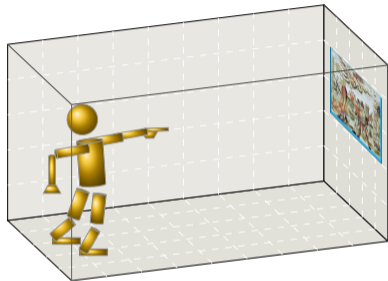
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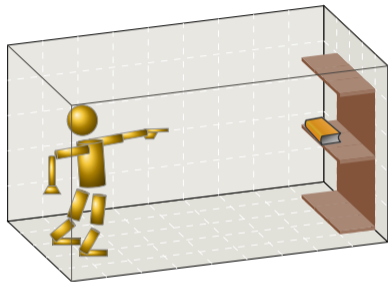
- ▶ Three stage process:

1. Identify index
2. Identify intermediate referent (subject)
3. Identify referent by means of a *salient relation* (historic epoche of subject)



# At home with George<sup>10</sup>

- ▶ George pointing at a copy of Wallace Stegner's novel *Angle of Repose* which lies on a bookshelf
- ▶ Assumption: index = book

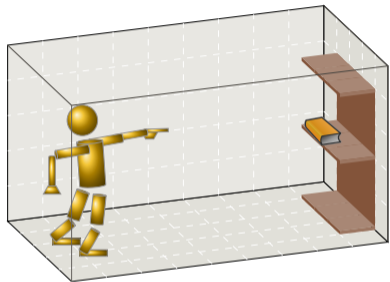


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## concrete deixis

“That book is mine.”

## deferred reference

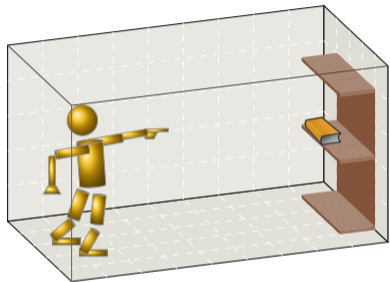
“That publisher is a good one.”

<sup>10</sup>H. H. Clark (1996). *Using Language*. Cambridge: Cambridge University Press.



# At home with George

- ▶ George pointing at a copy of Wallace Stegner's novel *Angle of Repose* which lies on a bookshelf
- ▶ **Assumption: index = book**



**not: concrete deixis**

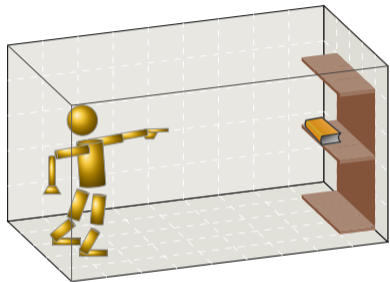
“That shelf is mine.”

**not: deferred reference**

“That craftsman is a good one.”

# At home with George

- ▶ George pointing at a copy of Wallace Stegner's novel *Angle of Repose* which lies on a bookshelf
- ▶ **Assumption: index = book**



## deferred reference

“That shelf is mine.”

## double deferred

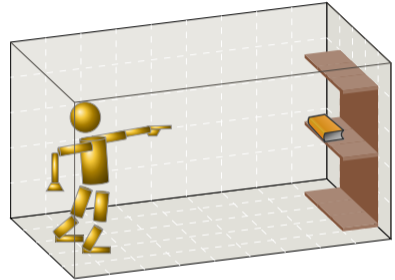
“That craftsman is a good one.”

“salient functional relation”:

1. factual *lies-on* relation.
2. 1. + *producer* relation.

# At home with George

- ▶ George pointing at a copy of Wallace Stegner's novel *Angle of Repose* which lies on a bookshelf
- ▶ Analogous for index = bookshelf

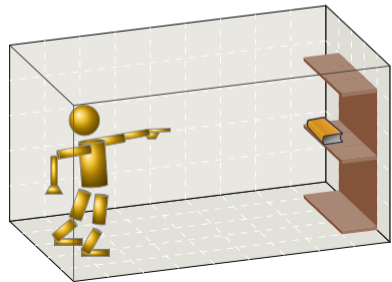


# At home with George



- Contra-intuitive
- Four meanings (two deferrings, two double deferrings) more than necessary: violation of a variant of *Modified Occam's Razor*<sup>a</sup>: **Do not multiply deferrings beyond necessity!**

<sup>a</sup>H. P. Grice (1978). "Further Notes on Logic and Conversation". In: *Pragmatics*. Ed. by P. Cole. Syntax and Semantics 9. New York, San Francisco, and London: Academic Press. pp. 113–127



# Underlying assumptions

1. A pointing gesture is **referential** in the sense that it picks out an object.
2. A pointing gesture is **autonomous** in the sense that it demonstrates its index independently from accompanying speech (Kaplanian autonomy of demonstrations).
3. The **index need not be the referent**.

# Underlying assumptions

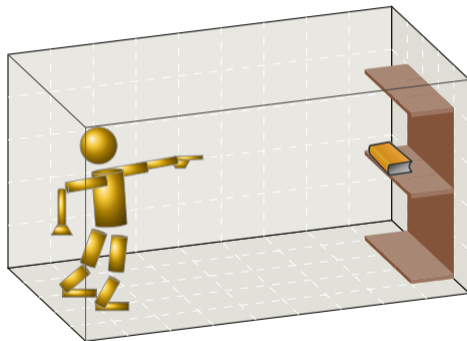
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# Re-analysis

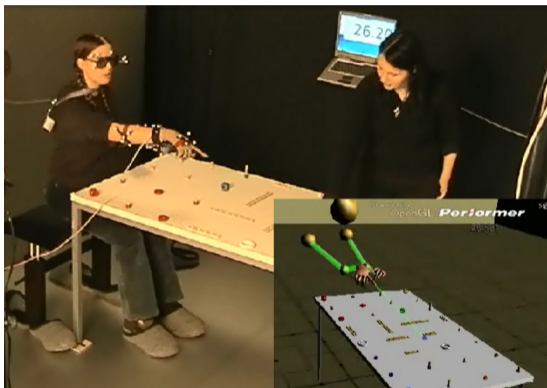
- ▶ Depending on George saying
  - ▶ “That book”
  - ▶ “That shelf”

the index is understood to be the book or the bookshelf, respectively.

- ▶ Contradicting the autonomy of demonstration.
- ▶ Empirical support: Pointing cone studies speak against direct reference.



## Direct Reference?<sup>11</sup>

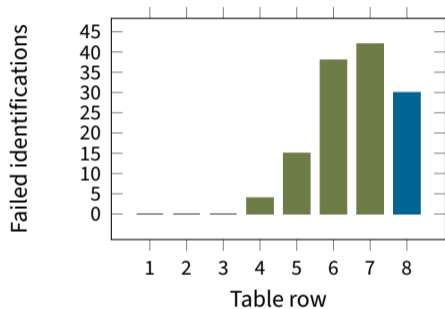


- ▶ *Experimental pragmatics study.*
- ▶ *Tracking of pointer: simulate and “measure” pointing.*

<sup>11</sup>A. Lücking, T. Pfeiffer, and H. Rieser (2015). “Pointing and Reference Reconsidered”. In: *Journal of Pragmatics* 77, pp. 56–79.



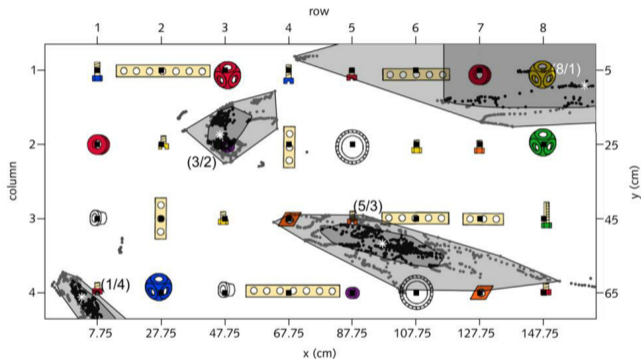
# Identification Failures<sup>12</sup>



- ▶ For the addressee, the identifying force of pointings ceases in distal area.
- ▶ Note: decrease in row 8 due to “gestural hyperbole”.

<sup>12</sup>A. Lücking, T. Pfeiffer, and H. Rieser (2015). “Pointing and Reference Reconsidered”. In: *Journal of Pragmatics* 77, pp. 56–79.

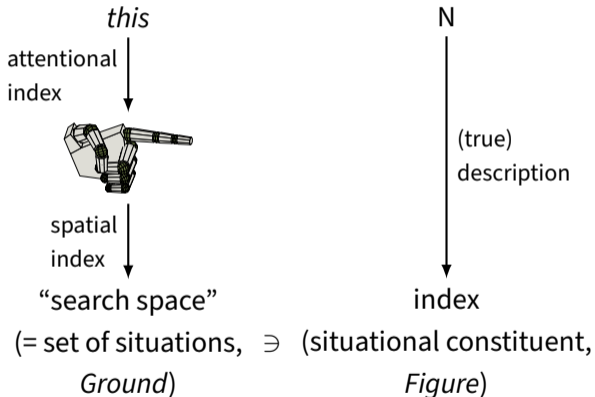
# Pointing Cone<sup>13</sup>



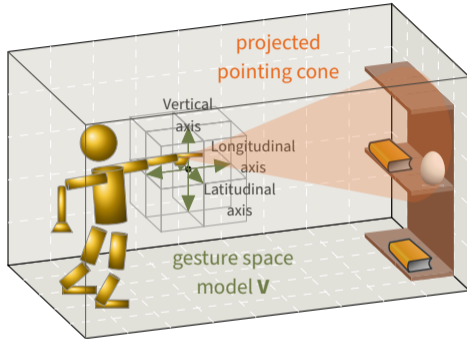
- ▶ Even in proximal area pointings do not hit their targets.
- ➔ Demonstrative reference rests on a *pre-semantic pragmatic inference*.

<sup>13</sup> A. Lücking, T. Pfeiffer, and H. Rieser (2015). “Pointing and Reference Reconsidered”. In: *Journal of Pragmatics* 77, pp. 56–79.

# New proposal: figure-ground model



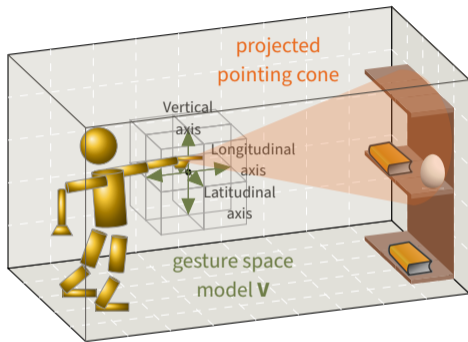
# Spatial Semantics (Lücking, still not published...)



## Spatial Semantics:

Demonstrations *constrain* situation variables.

# Spatial Semantics (Lücking, still not published...)



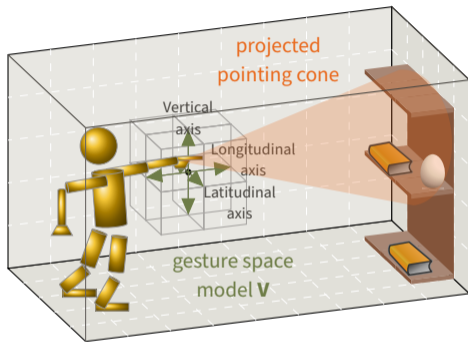
## Spatial Semantics:

Demonstrations *constrain* situation variables.

► Pointing's character at  $u$ :  $\llbracket \text{pointing} \rrbracket^u = \lambda s. \text{region}(s) \cap \text{cone}(\text{pointing})(u) \mapsto \text{relmax}$

*In short:*  $\text{pointing}(s) \mapsto \max_j$

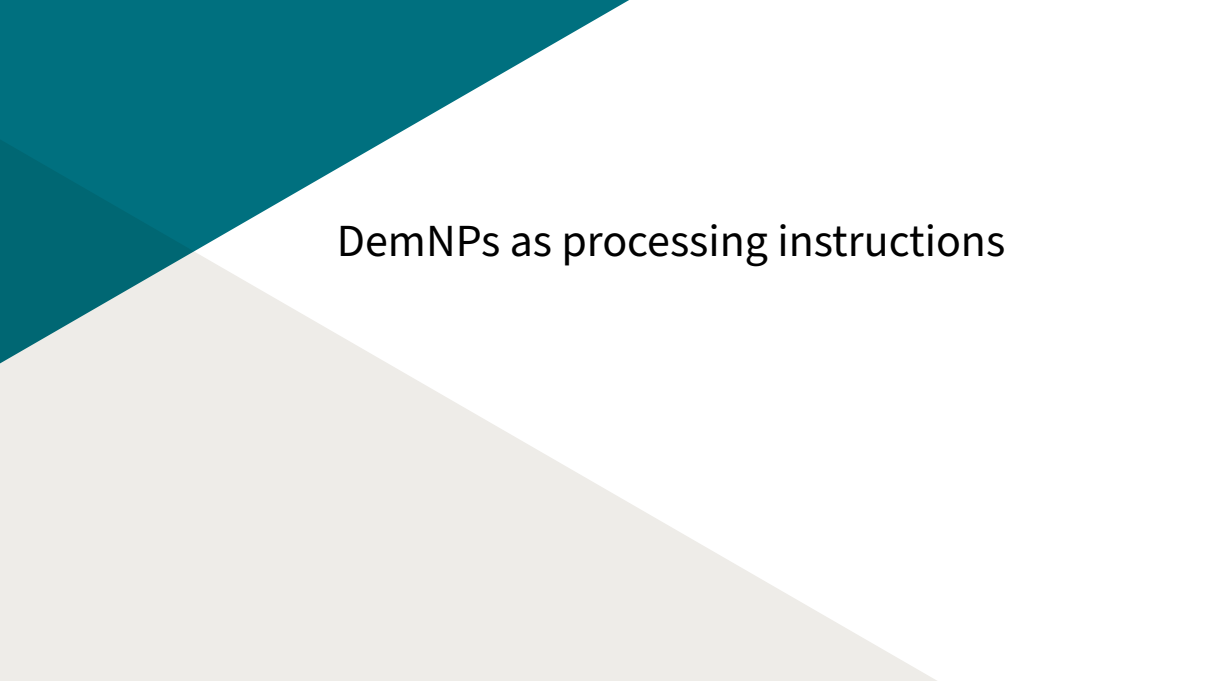
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*In short:*  $\llbracket \text{pointing} \rrbracket(s) \mapsto \max_i$
- ▶ This  $\llbracket \text{pointing} \rrbracket$  book is great:  $\lambda s. \iota x x$  is a book in  $s'$  &  $\llbracket \text{pointing} \rrbracket(s') \mapsto \max_i$  is great in  $s$ .  
 using Elbourne's situation semantics system

The background consists of two large, overlapping geometric shapes. A teal-colored shape is in the upper-left corner, and a light gray shape is in the lower-left corner. The rest of the background is white.

DemNPs as processing instructions

# Processing semantics of DemNPs

The dynamic semantics of DemNPs in dialog is governed by the following three-fold processing rule: “Where to find the referent?”

## Processing instructions for DemNPs

1. If there is a demonstration act, then the DemNP contributes to *dgb*-params and is witness-loaded in the focus of attention (*via* pointing cone).
2. If there is no demonstration, but a repetition of a constituent, the DemNP is interpreted anaphorically (also in *dgb*-params).
3. Otherwise, the DemNP contributes to *q*-params (but not to FoA).



# TTR

*Type Theory with Records*—a cognitively construable formalism grounded in set theory<sup>14</sup>

- ▶ *Basic types* (*BType*; 0-place; *Ind*, *Loc*, *Time*, ...);
- ▶ *Predicate types* (*PType*;  $n$ -place; *lion*( $x$ ), *carry*( $x,y$ ), ...), constructed out of a predicate and objects which are arguments of the predicate;
- ▶ *Set and list types* (*Set*( $T$ ) and *List*( $T$ )).
- ▶ *Function types*. ( $T_1 \mapsto T_2$ ) is the type of functions from type  $T_1$  to type  $T_2$ ;
- ▶ *Records*: entities corresponding to **situations**,
- ▶ *Record types*: structured representations classifying records, **situation types**;

---

<sup>14</sup>R. Cooper (2021). *From perception to communication: An analysis of meaning and action using a theory of types with records (TTR)*. <https://github.com/robincooper/tt1>. Unpublished book draft.

# TTR

- ▶ A key notion in TTR is a *judgement*, a classification that object  $o$  is of type  $T$ , notated as  $o : T$ .
- ▶ If the judgement is true, than the extension  $[\vee T]$  of  $T$  is non-empty
- ▶ Judgements between records and record types, that is classifications such that a record  $r$  being of a record type  $RT$ ,  $r : RT$ , give rise to **witnessing** between situations and situation types.

$$r = \left[ \begin{array}{l} x = a \\ c_{\text{lion}} = e1 \end{array} \right]$$

$$T_{\text{lion}} = \left[ \begin{array}{l} x : \text{Ind} \\ c_{\text{lion}} : \text{lion}(x) \end{array} \right]$$

$r : T_{\text{lion}}$  just in case  $a : \text{Ind}$   
and  $e1 : \text{lion}(a)$

# Propositions

Following Austin (1950) and Barwise & Etchemendy (1987), propositions are individuated in terms of a situation and a situation type.<sup>15</sup>

$$\blacktriangleright \text{Prop} := \left[ \begin{array}{l} \text{sit} \quad : \text{Rec} \\ \text{sit-type} : \text{RecType} \end{array} \right]$$

$$\blacktriangleright \text{A proposition } p = \left[ \begin{array}{l} \text{sit} \quad = s_0 \\ \text{sit-type} = ST_0 \end{array} \right] \text{ is true iff } s_0 : ST_0$$

---

<sup>15</sup> J. L. Austin (1950). "Truth". In: *Proceedings of the Aristotelian Society. Supplementary*. Vol. xxiv. Reprinted in John L. Austin: *Philosophical Papers*. 2. ed. Oxford: Clarendon Press, 1970., pp. 111–128; J. Barwise and J. Etchemendy (1987). *The Liar: An Essay on Truth and Circularity*. Oxford: Oxford University Press.

# Locutionary and illocutionary propositions<sup>16</sup>

► *Sign* :=

phon	: List( <i>Phonform</i> )
cat	: [head : <i>PoS</i> ]
dgb-params	: <i>RecType</i>
q-params	: <i>RecType</i>
cont	: <i>SemObj</i>

(grammatical type in HPSG<sub>TTR</sub>, with  
interface to context)

► *LocProp* :=  $\left[ \begin{array}{l} \text{sit} \quad : \text{Rec} \\ \text{sit-type} : \text{Sign} \end{array} \right]$

(grammatical type classifying speech event *via* phon)

► *IllocProp* :=  $\left[ \begin{array}{l} \text{sit} \quad : \text{Rec} \\ x \quad : \text{Ind} \\ y \quad : \text{Ind} \\ a \quad : \text{Prop} \vee \text{Question} \vee \text{Outcome} \\ R \quad : \text{IllocRel} \\ \text{sit-type} = \left[ \text{c1} : R(x,y,a) \right] : \text{RecType} \end{array} \right]$

(dialogue move)

---

<sup>16</sup> J. Ginzburg (2012). *The Interactive Stance: Meaning for Conversation*. Oxford, UK: Oxford University Press.

# Context for signs: dialogue gameboards<sup>17</sup>

*DGBType* :=

spkr	: <i>Ind</i>
addr	: <i>Ind</i>
utt-time	: <i>Time</i>
c-utt	: <i>addressing</i> (spkr,addr,utt-time)
facts	: <i>Set</i> ( <i>Prop</i> )
vis-sit	= $[foa : Ind \vee Rec]$ : <i>RecType</i>
pending	: <i>List</i> ( <i>LocProp</i> )
moves	: <i>List</i> ( <i>IllocProp</i> )
qud	: <i>poset</i> ( <i>Question</i> )
mood	: <i>Appraisal</i>

- ▶ *facts* represents shared assumptions
- ▶ *vis-sit* represents the visual situation of an agent
- ▶ dialogue moves that are in the process of being grounded or under clarification are the elements of the *pending* list
- ▶ grounded moves make up the *moves* list.
- ▶ *qud*: the current question under discussion
- ▶ *mood*: a participant's public display of emotion

<sup>17</sup> J. Ginzburg (2012). *The Interactive Stance: Meaning for Conversation*. Oxford, UK: Oxford University Press.

# Evolution of context in interaction

- ▶ *Conversational rules* regiment dialogue progress: given a dialogue gameboard (DGB) that satisfies *pre*(conditions), the DGB can be updated by *effects*.
- ▶ Example: *Assert QUD-incrementation*: given a proposition  $p$  and  $\text{Assert}(A,B,p)$  being the LatestMove, QUD is updated with  $p?$  as MaxQUD.

$$\left[ \begin{array}{l} \text{pre} : \left[ \begin{array}{l} p : \text{Prop} \\ \text{LatestMove} = \text{Assert}(\text{spkr}, \text{addr}, p) : \text{IllocProp} \end{array} \right] \\ \text{effects} : \left[ \text{QUD} = \langle p?, \text{pre.QUD} \rangle : \text{poset}(\text{Question}) \right] \end{array} \right]$$

- ▶ DGB structures might seem like an overly rich notion for interlocutors to keep track of, but they can be mapped to memory structures<sup>18</sup>

<sup>18</sup> J. Ginzburg and A. Lücking (2020). “On Laughter and Forgetting and Reconversing: A neurologically-inspired model of conversational context”. In: *Proceedings of the 24th Workshop on the Semantics and Pragmatics of Dialogue*. SemDial/WatchDial. Brandeis University, Waltham, New Jersey (Online).

# Lexical resource for pointing

The pointing device gives rise to a direction vector which indicates the direction into which the addressee of the pointing should turn its attention.

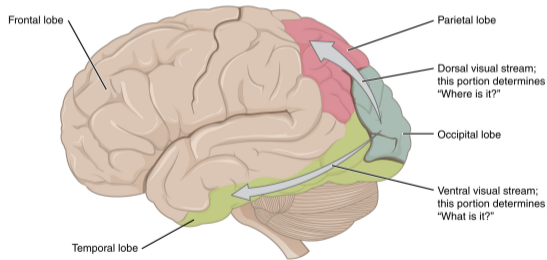
(16) 
$$\left[ \begin{array}{l} \text{shape} : \text{pointing} \\ \text{dir} = \text{Vector}(\text{shape}) : \text{Direction} \\ \text{dgb-params} : \left[ \begin{array}{l} \text{spkr} \quad : \text{Ind} \\ \text{addr} \quad : \text{Ind} \\ \text{utt-time} : \text{Time} \\ \text{c-utt} \quad : \text{addressing}(\text{spkr}, \text{addr}, \text{utt-time}, \text{shape}) \end{array} \right] \\ \text{content} = \text{Instruct}(\text{skpr}, \text{addr}, \text{turn}(\text{addr.e}_{\text{gaze}}, \text{dir})) : \text{IllocProp} \end{array} \right]$$

# Two processing streams

- ▶ Vision proceeds along a dorsal “where” and a ventral “what” processing stream<sup>a</sup>.
- ▶ Broadly, the dorsal pathway runs from the occipital lobe to the parietal lobe, the ventral one from the occipital lobe to the temporal lobe.

---

<sup>a</sup>M. Mishkin, L. G. Ungerleider, and K. A. Macko (1983). “Object vision and spatial vision: Two cortical pathways”. In: *Trends in Neurosciences* 6, pp. 414–417; D. A. Westwood and M. A. Goodale (2011). “Converging evidence for diverging pathways: Neuropsychology and psychophysics tell the same story”. In: *Vision Research* 51 8. Perception and Action: Part II



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# Subsystems

- ▶ The dorsal “where” stream may be differentiated into two pathways, a “Grasp” and a “Use” system<sup>19</sup>.
- ▶ The “Grasp” system is responsible for prehensile actions to be executed at currently-viewed objects; the “Use” system is a long-term storage for action patterns associated with familiar objects.

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<sup>19</sup>F. Binkofski and L. J. Buxbaum (2013). “Two action systems in the human brain”. In: *Brain and Language* 127.2, pp. 222–229.

# Pointing and visual processing

- ▶ On the spatial view unfolded in this section, pointing (as demonstration acts in general) is a “dorsal mechanism”: it contributes *where* information.
- ▶ But this leaves the follow-up question of how to account for the intuitively strong impression that we are pointing *at something*?
- ▶ The *what*, that is, the object to be indicated is contributed by vision—strongly mediated by the descriptive information from speech.
- ▶ The object in the visual field is provided by visual object perception, which among others rests on visual salience<sup>20</sup>—which in semantics and pragmatics is captured in terms of pointing cones and *pre-semantic pragmatic inference*

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<sup>20</sup>C. O’Callaghan (2008). “Object Perception: Vision and Audition”. In: *Philosophy Compass* 3.4, pp. 803–829.

# From attention to reference

- ▶ Establishing pragmatic reference—that is filling the value of *foa* within the addressee's vis-sit—is brought about by combining the ventral and dorsal processing streams<sup>21</sup> such that an object becomes the unit of attention<sup>22</sup>.
- ▶ We conjecture that **the mechanism for deictic reference** is to be deduced from shared attention—not the other way round.
- ▶ Computationally, deictic reference is modeled in terms of a spatial semantics; procedurally, it employs two pathways of visual processing.

---

<sup>21</sup>C. E. Connor and J. J. Knierim (2017). “Integration of objects and space in perception and memory”. In: *Nature Neuroscience* 20.11, pp. 1493–1503.

<sup>22</sup>B. J. Scholl (2001). “Objects and Attention: The State of the Art”. In: *Cognition* 80.1-2, pp. 1–46.

# Not: From reference to attention

In *Conversation Analysis* (CA) attention is derived from reference:

- ▶ “[...] a speaker introduces a new object by pointing at it and establishes the joint attention of the co-participants towards it” (Mondada 2014:95<sup>23</sup>)
- ▶ “In perhaps its barest form, referring consists of literally pointing to something in order for two people to share attention on that thing [...]” (Enfield 2013:433<sup>24</sup>)

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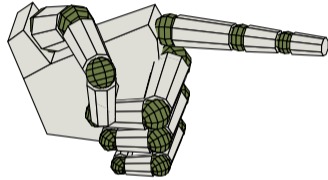
<sup>23</sup>L. Mondada (2014). “Pointing, talk, and the bodies. Essays in honor of Adam Kendon”. In: *From gesture in conversation to visible action as utterance*. Ed. by M. Seyfeddinipur and M. Gullberg. Amsterdam and Philadelphia: John Benjamins, pp. 95–124.

<sup>24</sup>N. J. Enfield (2013). “Reference in Conversation”. In: ed. by J. Sidnell and T. Stivers, pp. 433–454.

# Conclusions

## Take-home message

A proper understanding of deictic reference needs a cooperation of theoretical linguistics and cognitive science.



Encores

Tiger Woods

Discourse pointing

The background consists of two large, overlapping geometric shapes. A teal-colored shape is in the upper-left corner, and a light gray shape is in the lower-left corner. The rest of the background is white. The text 'Tiger Woods' is centered in the white area.

Tiger Woods

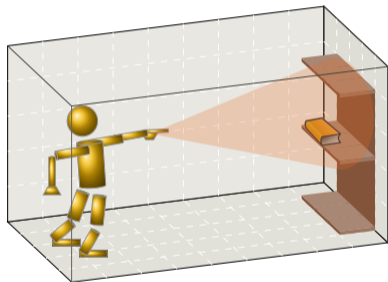


# Reconsidering the re-analysis

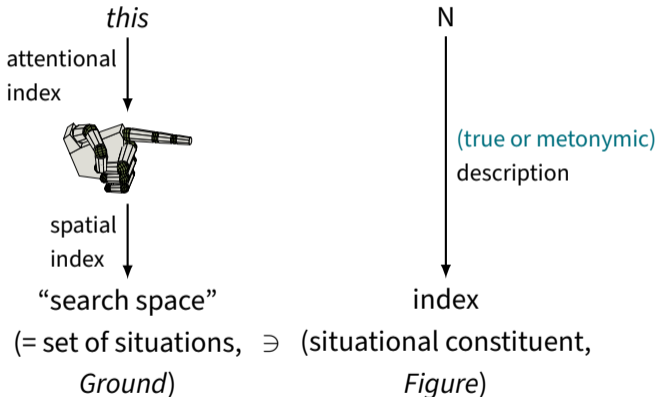
- ▶ Depending on George saying
  - ▶ “That book/**publisher**”
  - ▶ “That shelf/**craftsman**”

the **index** is understood to be the book or the bookshelf, respectively.

- ▶ Contradicting the true description requirement of Figure-Ground model.

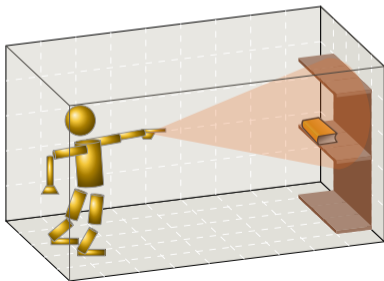


# New proposal: figure-ground model, modified



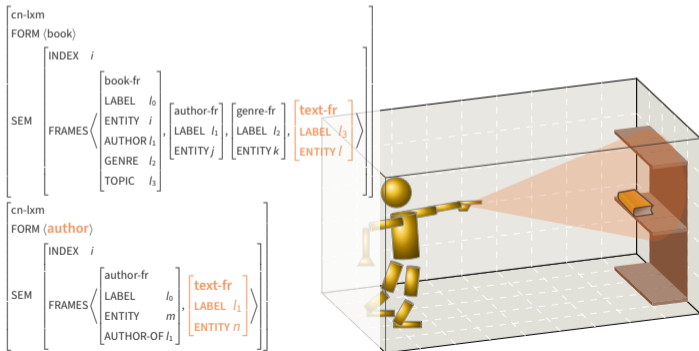
# Frames [\(<http://framenet.icsi.berkeley.edu>\)](http://framenet.icsi.berkeley.edu)

- ▶ “This author is a genius.”
- ▶ **Co-determination**:  $s$  is such that  $s \in \text{cone}(v)$  and  $s$  supports  $\text{author}(x)$ .
- ▶ Making it work with **frame knowledge** (excerpt):



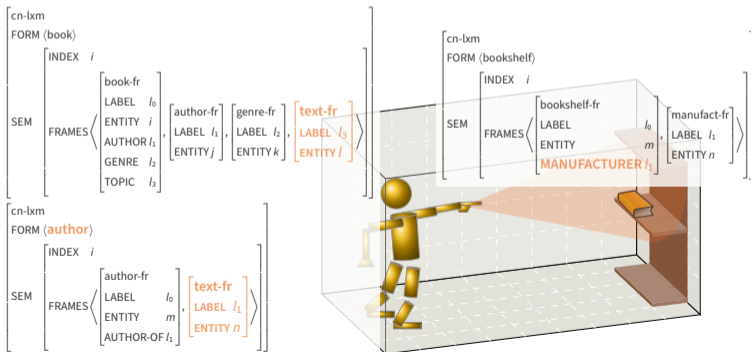
# Frames [\(<http://framenet.icsi.berkeley.edu>\)](http://framenet.icsi.berkeley.edu)

- ▶ “This author is a genius.”
- ▶ **Co-determination**:  $s$  is such that  $s \in \text{cone}(w)$  and  $s$  supports  $\text{author}(x)$ .
- ▶ Making it work with **frame knowledge** (excerpt):



# Frames [\(<http://framenet.icsi.berkeley.edu>\)](http://framenet.icsi.berkeley.edu)

- ▶ “This author is a genius.”
- ▶ **Co-determination**:  $s$  is such that  $s \in \text{cone}(w)$  and  $s$  supports  $\text{author}(x)$ .
- ▶ Making it work with **frame knowledge** (excerpt):



# Extended judgments

- ▶ Let  $Fr(\phi)$  be the frame elements of a type  $\phi$ .
- ▶ A situation  $s$  extendedly exemplifies a type  $T$ ,  $s ::: T$ , iff
  - ▶  $s : T$ , or
  - ▶ there is a type  $T'$  such that  $Fr(T) \cap Fr(T') \neq \emptyset$  and  $s : T'$  (indirect classification).

# Wrong prediction for anaphoric uses?

Nunberg<sup>25</sup> argues that metonymic uses of demonstratives do not extend to discourse.

## Nunberg's example

I can point at Tiger Woods and say (25):

(25) That's what I want to take lessons in.

But this use of the demonstrative doesn't have a parallel in (26):

(26) ?Whenever Mary sees Tiger Woods on TV, she wants to take lessons in that.

---

<sup>25</sup>G. Nunberg (2004). "Descriptive Indexicals and Indexical Descriptions". In: *Descriptions and Beyond*. Ed. by M. Reimer and A. Bezuidenhout. Oxford: Clarendon Press. Chap. 6, pp. 261–279, p. 271.

# Tiger Woods (internet image search results, no permission!)

## Example

I can point at Tiger Woods and say  
“That’s what I want to take lessons in.”



# Tiger Woods (internet image search results, no permission!)

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## Example

I can point at Tiger Woods and say  
“That’s what I want to take lessons in.”



# Tiger Woods (internet image search results, no permission!)

What Nunberg probably means:

## Example

I can point at Tiger Woods **playing golf** and say  
“That’s what I want to take lessons in.”



# Tiger Woods (internet image search results, no permission!)

What Nunberg probably means:

## Example

I can point at Tiger Woods **playing golf** and say  
“That’s what I want to take lessons in.”



But this perfectly extends to discourse:

(26) Whenever Mary sees Tiger Woods on TV **playing golf**, she wants to take lessons in that.

# Thin or thick Tiger Woods (internet image search results, no permission!)

## Example

Can I point at Tiger Woods **neutral** and say  
“That’s what I want to take lessons in.” **[?]**



# Thin or thick Tiger Woods (internet image search results, no permission!)

## Example

Can I point at Tiger Woods **neutral** and say  
“That’s what I want to take lessons in.” **[?]**



## Upshot

Exophoric reference differs from endophoric reference: the former provides **thick particulars** while discourse referents are **thin particulars**.

The background consists of two large, overlapping geometric shapes. A teal-colored shape is in the upper-left corner, and a light beige shape is in the lower-left corner. The rest of the background is white. The text "Discourse pointing" is centered in the white area.

Discourse pointing



## Uses of pointing gestures: spatial proxy



“then you do not exit here [*index finger downwards*] (but there).”

(taken from SaGA V9, 6:56<sup>a</sup>)

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<sup>a</sup>A. Lücking, K. Bergmann, et al. (2010). “The Bielefeld Speech and Gesture Alignment Corpus

also called *abstract deixis*<sup>a</sup>; projection from gesture space into described situation (cf. function  $\vec{v}$  of<sup>b</sup>)

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<sup>a</sup>D. McNeill, J. Cassell, and E. T. Levy (1993). “Abstract deixis”. In: *Semiotica* 95.1-2, pp. 5–19.

<sup>b</sup>A. Lascarides and M. Stone (2009). “A Formal Semantic Analysis of Gesture”. In: *Journal of Semantics*

# Pointing at addressee

(context: *F [on the right] recaps route direction, hesitates*)

F: da steht die (.) die / T: there is  
the the

R: die SKULptur ((pointing at F)) / T:  
the sculpture



F: die skulptur drauf / T: the sculpture  
on top

(SaGA V5, 13:58)

# Pointing at addressee

(context:  $F$  [on the right] recaps route direction,  
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F: da steht die (.) die / T: there is  
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R: die SKULptur ((pointing at  $F$ )) / T:  
the sculpture



F: die skulptur drauf / T: the sculpture  
on top

(SaGA V5, 13:58)

R is **pointing at the addressee** ( $F$ ),  
but:

- ▶ not locating addressee  $F$
- ▶ no metonymic relation between  $F$  and the sculpture
- ▶ no spatial projection from  $F$
- ➔ what to do with the pointing gesture?

# Rude pointing

As the proverb has it...

“Man zeigt nicht mit nacktem Finger auf angezogene Leute!”

*(It is bad manners to point at dressed people with naked fingers!)*

# Informal analysis

Context of example:

- ▶ *F* recaps a route direction he got from *R*
- ▶ *F* has difficulties to recall a certain landmark
- ▶ *R* jumps in and supplies the landmark (i.e. “sculpture”)
- the gesture emphasizes known material

## Shared information gestures ...

“[...] mark material that the addressee probably already knows—information that is part of their common ground. They mean, essentially, ‘As you know.’” (Bavelas, Chovil, Lawrie & Wade 1992:397)<sup>26</sup>

cf.: marker of common ground<sup>27</sup>

<sup>26</sup> J. B. Bavelas et al. (1992). “Interactive Gestures”. In: *Discourse Processes* 15.4, pp. 469–489.

<sup>27</sup> J. Holler (2010). “Speakers’ Use of Interactive Gestures as Markers of Common Ground”. In: *Proceedings of*

# Representing shared information

- ▶ Needed: notion of addressee and known material
- ▶ Systematic framework: KoS<sup>28</sup>, formal dialogue semantics

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<sup>28</sup> J. Ginzburg (2012). *The Interactive Stance: Meaning for Conversation*. Oxford, UK: Oxford University Press.

# Lexicalizing CG pointing

Using KoS, the informal analysis of *common ground pointing* or *shared information gesture* can be made more precise in the following way:

$$\left[ \begin{array}{l} \text{Preconds:} \\ \text{Effects} \end{array} \left[ \begin{array}{l} \text{Pending} : \text{LocProp} \\ u : \text{sign} \\ c1 : \text{In}(u, \text{Pending.constits}) \\ \text{R} : \text{Rel} \\ p = \text{R}(c) : \text{Prop} \\ c = \text{Preconds.u.cont} \\ c1 : \text{In}(\text{FACTS}, p) \end{array} \right] \right]$$

allows for *compositional multimodal integration*

**Note that CG pointing is lexicalized on the dialogical level, relating PENDING and FACTS.**

# Further examples

F: ok\_nochmal beim anfang dieses <<pointing at R> mit den säulen scheint ja irgendwie was komplizierter zu sein ja? (-)>



ok back to the start, the thing (CG pointing) with the pillars seems to be a bit more complicated, isn't it?  
(SaGA V2, 9:16)

F: auf jeden fall (.) DANN ((pointing at R)) muss ich in den park gehen?



anyhow, then (CG pointing) I have to go into the park?

(SaGA V4, 9:43)



# Corpus survey

Survey of six SaGA dialogues: 13 instances of CG pointing.

But also other classes:

- ▶ UTT (*utterance anaphora*), 20
- ▶ SCTM (*something's coming to mind*), 9
- ▶ GrabTurn, 2

# UTT

## Utt (utterance anaphora)

indicating a DR of the actual utterance (difference to CG, which relates to grounded DR); occurs with topic (DR) introduction, affirmation of utterance of the other interlocutor, request clarification, or corrections; formally pointing at R/F, or index finger raising

R: °hh und dann kommen halt äh (-) die ((pointing at F)) BÄUme / **and then there will just eh be the (UTT pointing) trees**



(SaGA V2, 7:30)

# SCTM

## SCTM (something's coming to mind)

pointing gesture associated with having an idea or recollection (in this case it is also CG); usually affiliated to expressives

R: da gehst du rein (-) °h da kommt n SEE: / there you enter, and there is a lake

R: ah gut ((pointing at F)) (.) ich glaub



es kam doch erst der park

well (SCTM pointing) I guess there was the park first

# SCTM discourse meaning

Preconds :	$\left[ \begin{array}{l} \text{spkr} : \text{Ind} \\ \text{addr} : \text{Ind} \\ \text{Pending.cont} : \text{IllocProp} \\ \text{q} : \text{Question} \\ \text{c1} : \text{About}(\text{Pending.cont}, \text{q}) \end{array} \right]$
Effects :	$\left[ \begin{array}{l} \text{spkr} = \text{pre.spkr} : \text{Ind} \\ \text{addr} = \text{pre.addr} : \text{Ind} \\ \text{Pending.cont} : \text{IllocProp} \\ \text{c2} : \neg \text{About}(\text{Pending.cont}, \text{Preconds.q}) \end{array} \right]$

≈ “actual utterance  
pertains to a different  
question than the previous  
one”

# GrabTurn

## Grab turn

usually index finger raising; affiliated to turn-taking expressions

R: du bleibst auf jeden fall auf der straÙe wo du bist und gehst geradeaus  
°h / in any case you stay on the street where you are and go straight  
ahead

F: <<index raised, repeated>ich frage nochmal kurz was nach> (.) also ähm  
/ I have abrief clarification request ehm



(SaGA V4, 4:28)

# GrabTurn discourse meaning

$$\left[ \begin{array}{l} \text{Preconds:} \\ \text{Effects} \end{array} : \left[ \begin{array}{l} \text{spkr} : \text{Ind} \\ \text{addr} : \text{Ind} \\ \text{spkr} = \text{pre.addr} : \text{Ind} \\ \text{addr} = \text{pre.spkr} : \text{Ind} \end{array} \right] \right]$$

- ▶ speaker change
- ▶ can be realised by finger-raising instead of addressee pointing