

DIALOGUE ACROSS THE LIFESPAN

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JONATHAN GINZBURG
ANDY LÜCKING

LABORATOIRE DE LINGUISTIQUE FORMELLE
UNIVERSITÉ PARIS CITÉ

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- Partiturs: multimodal input representations
- Gesture perception as type assignment (by example of manual co-speech gesture)
- Multimodal integration in multimodal grammar
- Head shake and 'No'

TODAY'S LECTURE

1. Laughter
2. Context in Memory
3. Memory in the Brain

THE MEANING OF LAUGHTER I

- Laughter has meaning akin to what words and phrases possess. (Ginzburg, Mazzocconi and Tian, 2020)
- It involves reference to external real world events, quite analogously to event anaphors (Plessner, 1970).
- It has stand alone meanings:
 - (1) a. (Context: Bayern München goalkeeper Manuel Neuer faces the press after his team's (*Dreierkette*) defense has proved highly problematic in the game just played (3-2 against Paderborn).)
 - b. Journalist: (smile): *Dreierkette* auch 'ne Option? (*Is the three-in-the-back also an option?*) Manuel Neuer: fuh fuh fuh (brief laugh) ~→ The three-in-the-back is not an option!

THE MEANING OF LAUGHTER II

- Laughter participates in semantic and pragmatic processes like scare quotation, repair, implicature, and irony:
- (2a-c) exemplifies intra-utterance laughter, where the laughter has the effect of scare-quoting ((Predelli, 2003) the sub-utterance it precedes.

- (2) a. A : well I I'm interested in it in a (. laughs)
((comfortably)) re:laxed way, you know, I mean I . I do keep, I have kept up with it (London Lund Corpus)
- b. (i) A: Jill is John's, (laugh) long-term friend. (ii) A: She is John's long-term (laugh) friend.
- c. (i) A: Jill is John's, (wink) long-term friend. (ii) A: She is John's long-term (wink) friend.

THE MEANING OF LAUGHTER III

- Two basic meanings for laughter (cf Kundera's devilish and angelic laughter in *The Book of Laughter and Forgetting*):
- (3) a. $\text{Pleasant}(p, \delta, \text{spkr})$ given: a context that supplies a laughable p and speaker spkr , content: the laughable is pleasant for the speaker to a contextually given degree δ .
- b. $\text{Incongr}(p, \delta, \tau)$ given: a context that supplies a laughable p and topos τ , content: the proposition that p is incongruous relative to τ (to extent δ).

- c. Conversational rule (inspired by (Morreall, 1983)):

Positive affect incrementation of Mood (the speaker's public emotion display): given the LatestMove being an incongruity proposition by the speaker, the speaker increments the (positive) pleasantness recorded in Mood to an extent determined by the laughter's arousal value.

THE MEANING OF LAUGHTER V

- From pleasantness, we can derive three functions of laughter: **affiliation**, **empathetic acknowledgement**, and **superiority**.
- Affiliative laughter arises by resolving the laughable as the state where the speaker and addressee are *co-present*.
- We abbreviate the laughable

$$\left[\begin{array}{l} \text{sit} = l \\ \\ \text{sit-type} = \left[\begin{array}{l} A:\text{Ind} \\ B:\text{Ind} \\ t:\text{TIME} \\ c1:\text{addressing}(A,B,t) \\ c2:\text{CoPresence}(\{A,B\},t) \end{array} \right] \end{array} \right] \text{ as CoPresence}(A,B).$$

- Affiliation then involves the following sequence:
 1. A laughs at B; content: $\text{Pleasant}(A, \delta, \text{CoPresence}(A, B))$ bringing about an update: A's $\text{Mood.pleasant.arousal}$ is positively incremented by δ .
 2. This can give rise to a similar Mood update for B, signalled by laughter at A with content $\text{Pleasant}(B, \delta', \text{CoPresence}(B, A))$.
- (Common in parent-child interaction)
- This does not rule out the possibility one would like to distinguish the two “functions” (expressing pleasure and affiliation) if there were systematic reasons for so doing—say, a laugh/smile incontrovertibly dedicated to the latter function and positing a “precompiled” lexical entry therefor (cf Ekman (1992) and Wood and Niedenthal (2018)).
- Nonetheless, absent such a demonstration, we need not assume affiliation *requires* a distinct laughter.

THE MEANING OF LAUGHTER VII

- Empathetic laughter: Empathetic acknowledgement of A's utterance by B laughing requires the defeasible assumption (more on this soon) *If it's pleasant for me that you said that p , then I agree that p* —A's utterance is the event pleasant for B.
- Superiority/mocking laughter: A observes an event e which affects B negatively. Laughter can then be taken to reflect A's appraisal of e as pleasant. If, in addition, A has control over the event, the added element of superiority or even sadism can emerge.

- We can now formulate a lexical entry for pleasant laughter, as in (1a): the content we posit is that the laughable is pleasant for the speaker to a contextually given degree δ .
- The *effect* of such laughter on the speaker is captured in terms of an update rule that increments the (positive) pleasantness recorded in Mood to an extent given by the weight ϵ , as described earlier.

A LEXICAL ENTRY FOR PLEASANT LAUGHTER II

$$\left[\begin{array}{l} \text{phon : laughterphontype} \\ \\ \text{dgb-params : } \left[\begin{array}{l} \text{spkr : Ind} \\ \text{addr : Ind} \\ \text{t : TIME} \\ \text{c1 : addressing(spkr,addr,t)} \\ \delta : \text{Int} \\ \text{c2 : Arousal}(\delta, \text{phon}) \\ \text{s : Rec} \\ \text{p} = \left[\begin{array}{l} \text{sit} = \text{l} \\ \text{sit-type} = \text{L} \end{array} \right] : \text{prop} \end{array} \right] \\ \\ \text{content} = \left[\begin{array}{l} \text{sit} = \text{s} \\ \text{sit-type} = \left[\text{c4 : Pleasant}(p, \delta, \text{spkr}) \right] \end{array} \right] : \text{Prop} \\ \\ \text{preconditions: } \left[\begin{array}{l} \text{LatestMove.cont} = \\ \text{Assert}(\text{spkr}, \text{Pleasant}(p, \delta, \text{spkr})) : \text{IllocProp} \end{array} \right] \\ \\ \text{effect : } \left[\text{PositivePleasantnessIncr}(\delta, \epsilon) \right] \end{array} \right]$$

- Building on work in humour theory (Raskin, 1985), we explicate incongruity as a notion that relates a contextually salient entity l with a defeasible rule (a *topos* (Breitholtz and Cooper, 2011)) in case there exists a contextually salient characterization of l that is incompatible with τ .
- The *topos* is not explicitly introduced into the context; the most plausible assumption is to assume it requires access from Long Term Memory.

THE MEANING OF LAUGHTER



Attrib.: Kremlin.ru, CC BY 4.0, https://commons.wikimedia.org/wiki/File:Vladimir_Putin_in_Kommunarka_hospital1.jpg

- So, such signals involve a context dependence of a form undescribed hitherto—combining reference to a wide variety of percepts (including visual, sentential or lexical, and arousing social situations) with common sense principles the deviation from which represents incongruity (e.g., *presidents wear formal suits*)

- A converse issue, showing the need for an explicit interface with LTM, is the phenomenon of resumed conversations, as in the constructed example (1):
 - (1) A: How can we solve the equation? B: I'll have to think about it, but now I have to run.
(3 days later) A: So? B: Right, yes,um I'd say just integrate three times and ...
- relevant for therapeutic genres, where apparently resolved issues can rearise indefinitely, for depression (Curry, 2014) and schizophrenia (Kennedy and Xyrichis, 2017)).

- All contemporary semantics for dialogue are *dynamic*: they view many aspects of meaning as emerging from context change.
- But whereas ‘context’ was an inert, abstract notion in early Montague semantics (Montague, 1974) and an eventuality in situation semantics (Barwise and Perry, 1983), dynamic semantics starting with Discourse Representation Theory (DRT) (Kamp, 1981) identified contexts with *information states*.
- Whereas originally such information states tracked discourse referents and presuppositions, in recent work on dialogue information states have become complex, as we have seen in this course.

- As a wide range of phenomena have been analyzed, including the visual field (Lücking, 2016) (for analyzing manual gesture), emotional structure (Ginzburg and Lücking, 2020) (for analyzing laughter), and defeasible common sense knowledge (*topoi/enthymemes* (Breitholtz, 2020) (for analyzing rhetorical relations) [not discussed in the course]
- While there seems little doubt that this range of information is used in dialogue interaction, it does raise the question what kind of entity encompasses all these diverse types of information.
- What is the *dialogue gameboard* (DGB) posited in frameworks like KoS (Ginzburg, 2012)?

- One is free to adopt a Cartesian perspective, as has often been the case in Chomskyan theoretical linguistics, though this is arguably an avenue that leads to untestable modelling (Poeppel and Embick, 2005).
- To this foundational question one can add a more concrete concern: all existing semantic frameworks for dialogue while designed to explain how meaning emerges from the ‘accumulation of information’, have no corresponding means of *eliminating* information.
- There are operations in DRT that make discourse referents inaccessible and KoS has notions of downdating questions, but long-term information established as accepted, is locked in for ever more.
- This leaves forgetting out in the cold...

- There is no natural way to deal with the fragility of memory, an intrinsic and concrete feature of human interaction, both involving neurotypicals and non-neurotypicals like dementia sufferers:
 - (2) a. A: When will you come? B: Not for a few weeks. A: Yes. B: So good night. A: So will you come tomorrow for lunch? B: I'm not in town. A: Yes. B: So good night. (patient B corpus)
 - b. Carol: Suddenly this means a lot to them. Yes? / Critical illness cover, that's great. Excuse me a minute. (Knocking at the door)
Unknown: Sorry to interrupt, I've come to collect the packet. / Carol: Oh right, it's the bag, sorry there isn't one tonight. / Unknown: See you then / Carol: Thanks for coming then, yes, bye. That's good, I forgot the post. **Erm, where was I? What was I talking about?** / Unknown: Single people. (BNC)
- Forgetting can trigger laughter.

- (3) a. NURSE: strain at a gnat and, (0.5 sec) PATIENT: (ah) (0.8 sec) *nothing else* [heh heh heh] NURSE: strain at a gnat and swallow a camel. ((Lindholm, 2008), ex. (2))
- b. Unknown1: Mind you, you haven't drunk for a long time and you were: Catherine: I haven't Unknown: knocking them back a bit Catherine: Yeah! Unknown: weren't you Catherine? Diamond White. Catherine: (laugh) (pause) Oh I forgot about that actually.

- We claim that *memory boundedness impacts dialogue coherence*.
- What this moves us to is an where one construes dialogue information states as properties of brain networks.
- This follows in the programme of brain-grounded semantics (Hagoort, 2020).

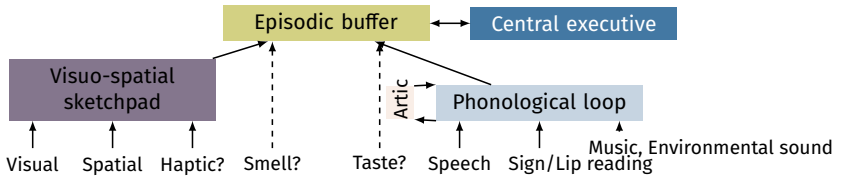
- Our strategy will be to take two recent framework for describing the dynamics of memory (Baddeley, 2012) (for short-term memory) (Bastin et al., 2019) (for long-term memory) as a basis for developing a suitable notion of cognitive state for dialogue interaction.

THE REQUIRED SYNTHESIS I

1. a theory of dialogue meaning and coherence (to explain the coherence requirement of the nurse's and patient's responses, and the content of self-repairs and laughs),
2. a theory of memory incorporating long-term and short-term/working memory (LTM, WM) distinctions (to explain forgetting by lack of consolidation (Wixted, 2004) or by time-dependent contextual drift (Sadeh and Pertzov, 2020), or by disease)

- (Neuro)Psychological Memory theories also help explain memory *failure* in terms of capacity limits—the episodic buffer, assumed to serve as a link to perception and to LTM and to hold multidimensional representations, is assumed to hold up to four chunks (Cowan, 2001).
- For (4) such theories can be used to explain the confusion evinced by the patient in terms of working memory capacity, but not the emergence of the clarification question:
 - (4) (Context: B (a dementia patient) is watching a concert on television featuring wind instruments while eating dessert consisting of cooked apples): How will the apples get through the pipes?(Patient B corpus)

- The LTM systems include:
 1. the relational episodic (hippocampus),
 2. entity (perirhinal and parahippocampal cortices),
 3. the procedural (striatum) subsystems.
- With respect to working memory (WM) [Baddeley \(2012\)](#) summarizes a model, Multicomponent Working Memory (M-WM), that has been highly influential in the last 40 years: on this view, M-WM has four components and informational flow.
 1. the phonological loop
 2. the visuo-spatial sketchpad
 3. Central Executive (focus/divide attention, switch tasks, interface with LTM)
 4. the episodic buffer (maintains information from several modalities that has been bound together by the central executive.)



- Both Baddeley's episodic buffer and Cowan's focus of attention are chunk limited buffer stores , and both models by and large agree on a capacity limit of four chunks.
- Alternative proposals suggest that, in fact, the correct generalisation is that one can maintain only *one* temporally extended *event* or *epoch* in focal attention (McElree and Doshier, 2001).

- how to ensure that while the mechanisms we use for dialogue states are individual memory states, they represent records of *interaction*?
- Proposal: view each conversation as an *episode*, one which gets initialized by the first move—typically a greeting—and concluded by the final move—often a (counter)-parting.
- Each conversation is a particular class of episode, which DGBs provide structure \mapsto within episodic memory:

DISTRIBUTING THE DGB BETWEEN WM AND LTM II

- how to partition the various components of the DGB across WM and LTM?
- Some aspects seem fairly straightforward:
 1. the Central Executive as mapping into an Agenda (Larsson, 2002)), specifying the next action
 2. *Pending* (M-WM: the phonological loop)
 3. *VisSit* (M-WM: the visuo-spatial sketchpad).
 4. current speaker ((Alberoni et al., 1992): Alzheimer Disease patients have difficulty tracking who is speaking, with a limit being attained at four participants.)
- The episodic buffer needs to be capacity limited \mapsto a single eventuality.

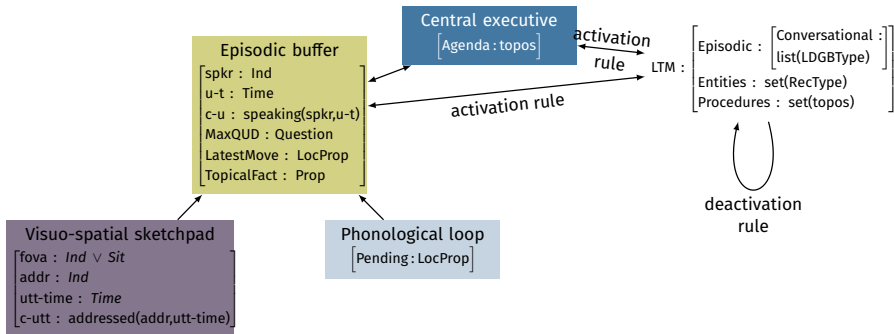
- (Takac and Knott, 2016):
 - ▶ events are experienced through sequentially structured sensorimotor routines, and similarly for the event's participants
 - ▶ mechanism for binding representations of individuals to semantic roles such as AGENT and PATIENT
 - ▶ Directly captures capacity constraints in terms of number of event argument roles

(5) EpisodicBuffer =_{def} [spkr : Ind
u-t : Time
c-u : speaking (spkr,u-t)
MaxQUD : Question
LatestMove : LocProp
TopicalFact : Prop]

■ Restrict attention to three fields of LTM:

(6) a. $LTM =_{def} \left[\begin{array}{l} \text{Episodic} : \left[\text{Conversational} : \text{list}(\text{LDGBType}) \right] \\ \text{Entities} : \text{set}(\text{RecType}) \\ \text{Procedures} : \text{set}(\text{topos}) \end{array} \right]$

b. $LDGBType =_{def} \left[\begin{array}{l} x,y : \text{IND} \\ \text{participants} = \{x,y\} \\ \text{Moves} : \text{List}(\text{LocProp}) \\ \text{Facts} : \text{Set}(\text{Prop}) \\ \text{QUD} : \text{Poset}(\text{Question}) \\ \text{Mood} : \text{Appraisal} \end{array} \right]$



LAUGHING AT PUTIN I



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- Context: A and B sitting on couch watching Putin on tv in a Hazmat suit. A laughs.
- The laugh updates B's phonological loop with a locutionary proposition:

LAUGHING AT PUTIN II

$$\left[\begin{array}{l} \text{sit} = \left[\begin{array}{l} \text{phon} = \text{hahaha} \\ \text{dgb-params} = [] \\ \text{cont} = \left[\begin{array}{l} \text{sit} = \text{so} \\ \text{sit-type} = \text{Assert}(A, \text{Incongruous}(l, \tau)) \end{array} \right] \end{array} \right] \\ \\ \text{sit-type} = \left[\begin{array}{l} \text{PHON} : \text{HaHahH} \\ \\ \text{DGB-PARAMS} : \left[\begin{array}{l} \text{so} : \text{SIT} \\ \text{to} : \text{TIME} \\ \text{c2} : \text{addressing}(\text{spkr}, \text{addr.to}) \\ \text{p} = \left[\begin{array}{l} \text{sit} = l \\ \text{sit-Type} = L \end{array} \right] : \text{Prop} \\ \tau = \lambda r : (T1) T2 : (\text{Rec}) \text{RecType} \\ \text{c2} : \text{SubType}(L, T1) \end{array} \right] \\ \\ \text{cont} = \left[\begin{array}{l} \text{sit} = \text{so} \\ \text{sit-type} = \text{Assert}(A, \text{Incongruous}(l, \tau)) \end{array} \right] : \text{Prop} \end{array} \right] \end{array} \right]$$

- The contextual parameters are A , the laughable l , and the topos τ .
- A and l can be instantiated from the EpisodicBuffer and the VisuoSpatialSP,
- τ involves a call on LTM.FACTS (e.g., the topos *Presidents wear formal suits*).
- Hence, the VSSP can be appraised as pleasant, thereby updating B's private Mood.
- CE—fed by LTM.procedures—updates Agenda with the action Accept(LatestMove).
- Given B's Private.Mood update \mapsto B's laugh \mapsto B.DGB.Mood.






Desiderata of dialogue competencies (modified Turing test; Lect. 1)

- **contents** actually talked about, ex. QNPs (Lect. 2)
- dialogical **relevance**, response space; constraining coherent behaviour (Lect. 3)
- **multimodality**; manual gesture; noetic head shake; non-verbal social signals: laughter; towards **expressivity** (Lect. 4)
- grammar and dialogical competency as ‘organic system’: **memory**, forgetting and the brain (Lect. 5)





All in a uniform formal framework (Lect. 1 and throughout)

THANKS!





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