

THE DEVELOPMENT OF PROSODIC GESTURES DURING PARENT-CHILD DISCOURSE INTERACTIONS

Mili Mathew¹, Ivan Yuen¹, Stefanie Shattuck-Hufnagel², Ada Ren² & Katherine Demuth¹
1 | Department of Linguistics, Macquarie University, Sydney, Australia 2 | Speech Communication Group, MIT, USA

Introduction

- Gestures and speech are hypothesized to:
 - Share the same **neuro-motor** mechanism (Bernadis & Gentilucci, 2006).
 - Form an **integrated** system satisfying semantic, pragmatic & phonological rules (McNeill, 1992).
- Co-speech gestures are reported to be tightly linked with the speech they accompany in adults
 - Both **referential and prosodic gestures** align with the relevant speech (McNeill, 1992).
 - Gestural prominences** align with **spoken prominences** (Loehr, 2004; Shattuck-Hufnagel & Ren, 2012; Tuite, 1993).
- However, young children are reported to produce **discursive gestures** ('prosodic beats') less frequently, especially in narration (Colletta et al., 2014).

Research Questions

- Do children produce prosodic gestures (i.e. beats)?
 - When? (At what age? In which discourse contexts?)
 - Where? (In which grammatical & prosodic contexts?)
- What are the characteristics of these gestures?

Predictions

- Prosodic gestures will be present in children by age 6.
- More prosodic gestures will be produced in an **explanatory** task, compared to a narrative task (Coletta et al., 2014).
- Prosodic gestures will co-occur with **pitch accented words** (Shattuck-Hufnagel & Ren, 2012).

Method

Participants

- 6 Australian English-speaking children (4 M, 2 F; Mean age = 6 yrs).

Procedure

- Narration task: child retold a story from a 2 minute video clip.
- Explanation task: mother & child planned a 'fantasy' family trip.
- Both mother & child were audio/video recorded during interactions.

Coding

- Orthographic transcriptions using Praat (Boersma & Weenink, 2014).
 - Speaker's turns, utterance units & pauses annotated
- Gesture annotation using ELAN (Lausberg & Sloetjes, 2009).
 - Non-prosodic gestures: Iconic, Metaphoric & Deictic** (McNeill, 1985)
 - Prosodic gestures: Beats** (McNeill, 1985)
 - Prosodic strokes: location of end points of prosodic gestures

Results

- Only 2 out of 6 children produced prosodic gestures:
 - The mean rates of occurrence (total number of gestures/total duration of sample) of prosodic gestures in narration and explanation were 1.
 - However, these children also used more gestures generally when compared to the other participants (Non-prosodic = 33 & Prosodic = 19)
- Two types of prosodic gestures were observed:
 - Beats that were **independent** (N = 8) and having non-propositional hand shape. E.g. open-relaxed fingers (Fig.3).
 - Beats that were **embedded** (N = 11) with a propositional hand shape. E.g. 'C' shaped fingers that represented iconic & beat gestures in the same speech segment (Fig. 4).
- Other features of prosodic gestures:
 - Discourse context & familiarity with the interlocutor influenced gesture production.
 - Beats occurred more in 'Explanation' than 'Narration' (Fig.1).
 - Beats frequently appeared in question-answer discourse exchanges.
 - 3 of these gestures had multiple strokes & 16 had single strokes.
 - Majority of prosodic strokes co-occurred with pitch accented words.
 - Prosodic strokes aligned most often with nouns (Fig. 2).

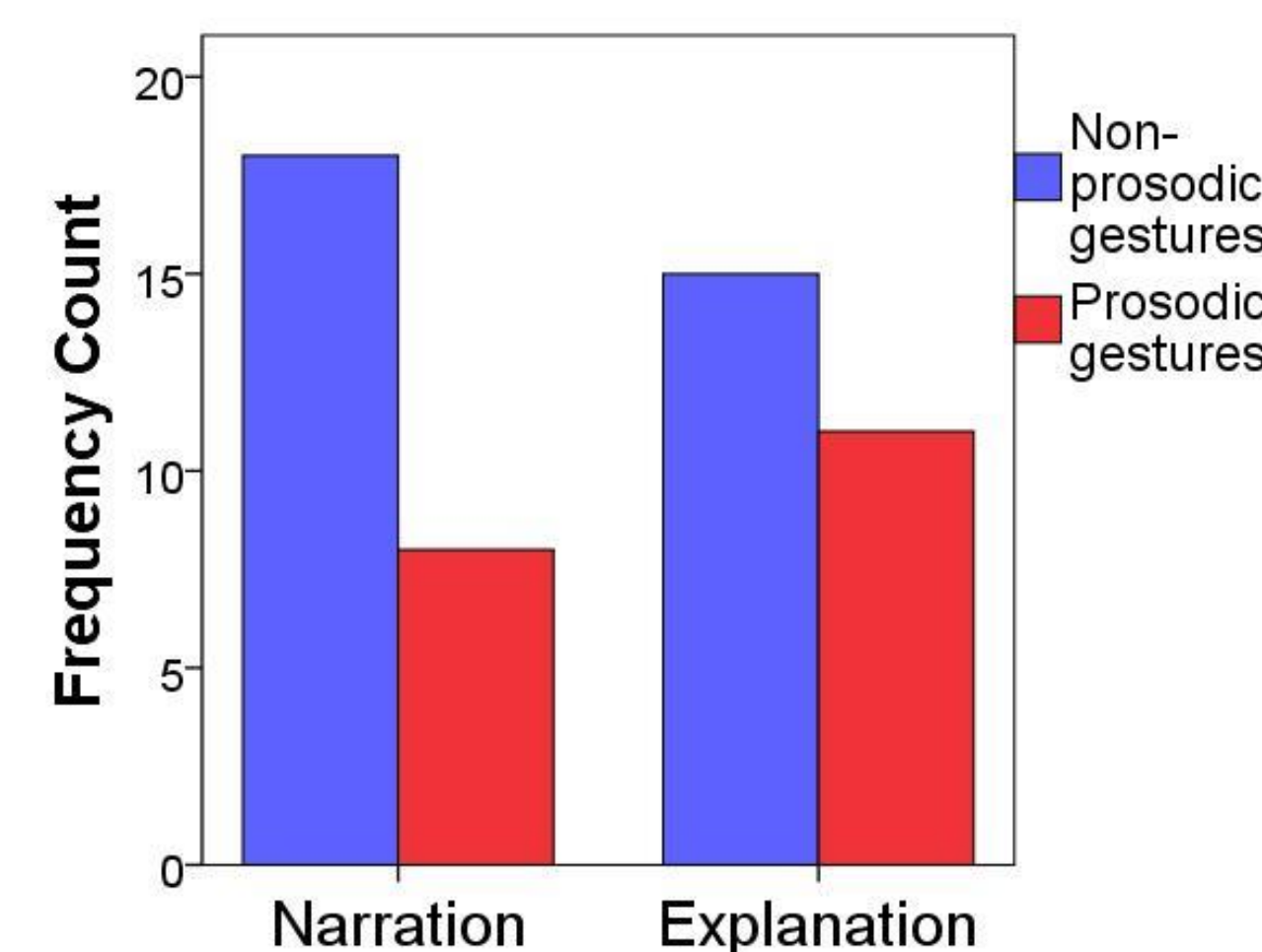


Figure 1: Number of different gesture types produced in different elicitation tasks

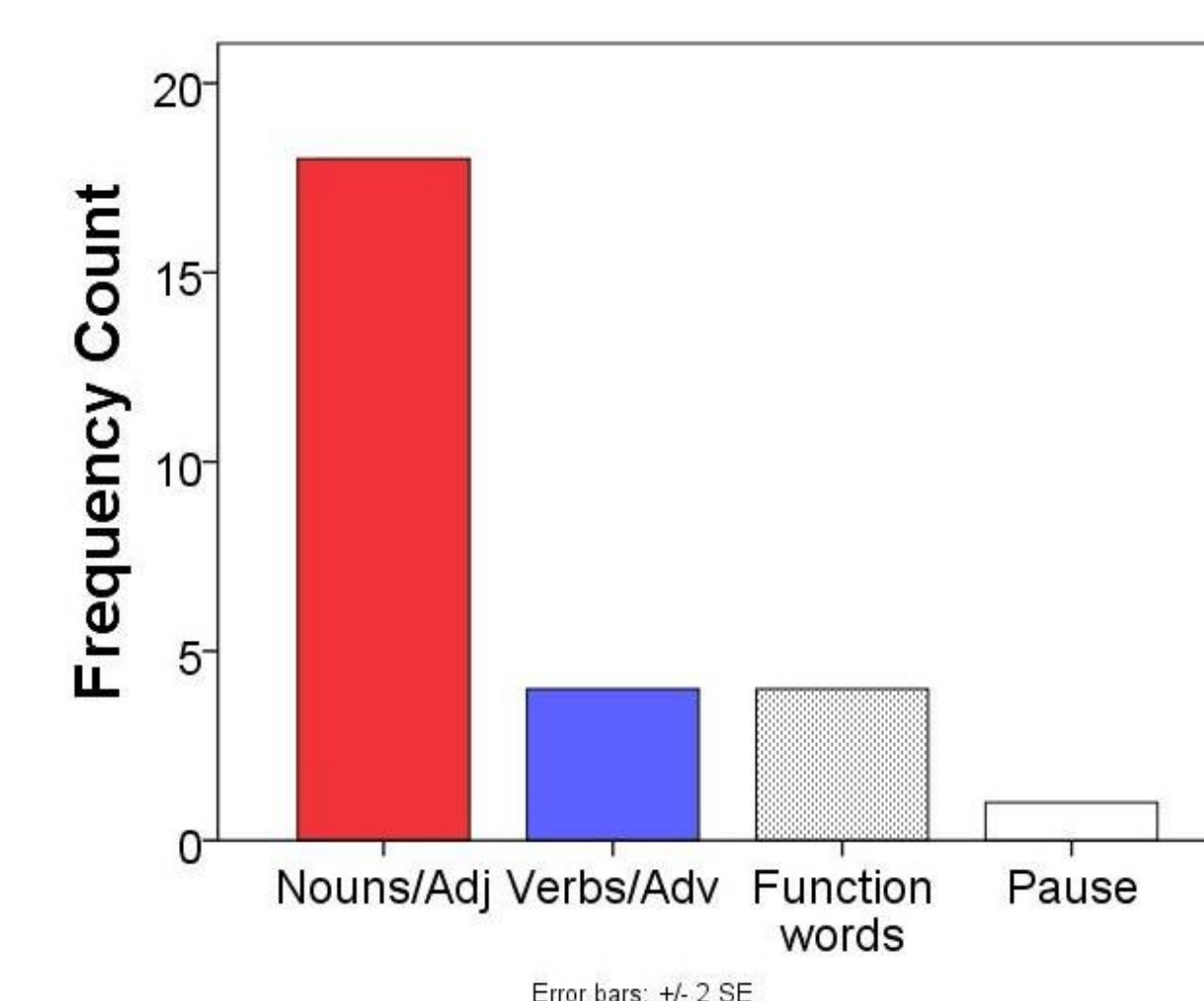


Figure 2: Pattern of co-occurrence of Prosodic gestures with speech and pause segments

Conclusions

- 6 yr old children can produce prosodic gestures in conversational discourse.
- Prosodic gestures tended to occur with pitch-accented words & frequently on nouns.
- Since nouns tend to occur in sentence-initial and sentence-final position, and carry pitch accents, this raises further questions about which of these factors govern the production and time alignment of prosodic gestures.

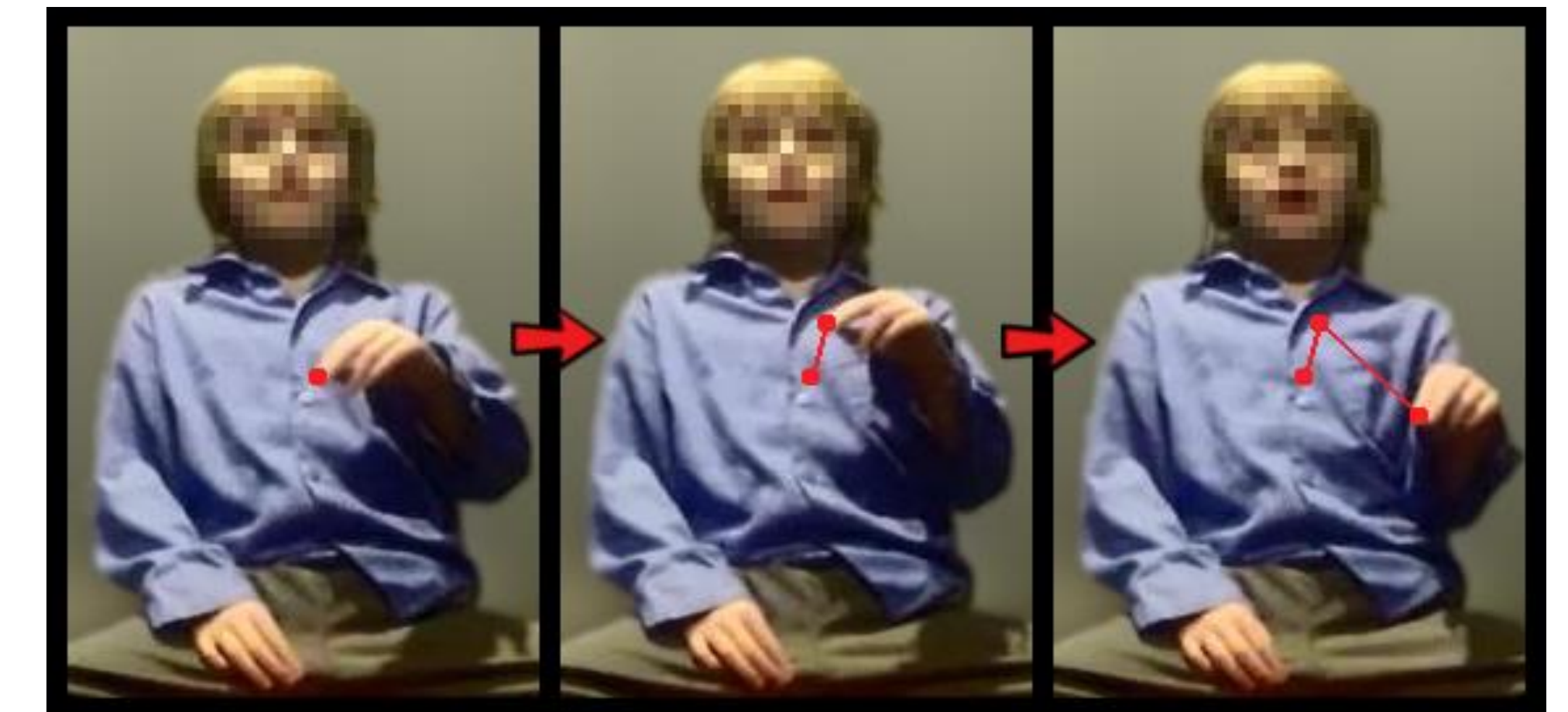


Figure 3: Phases of Independent prosodic stroke

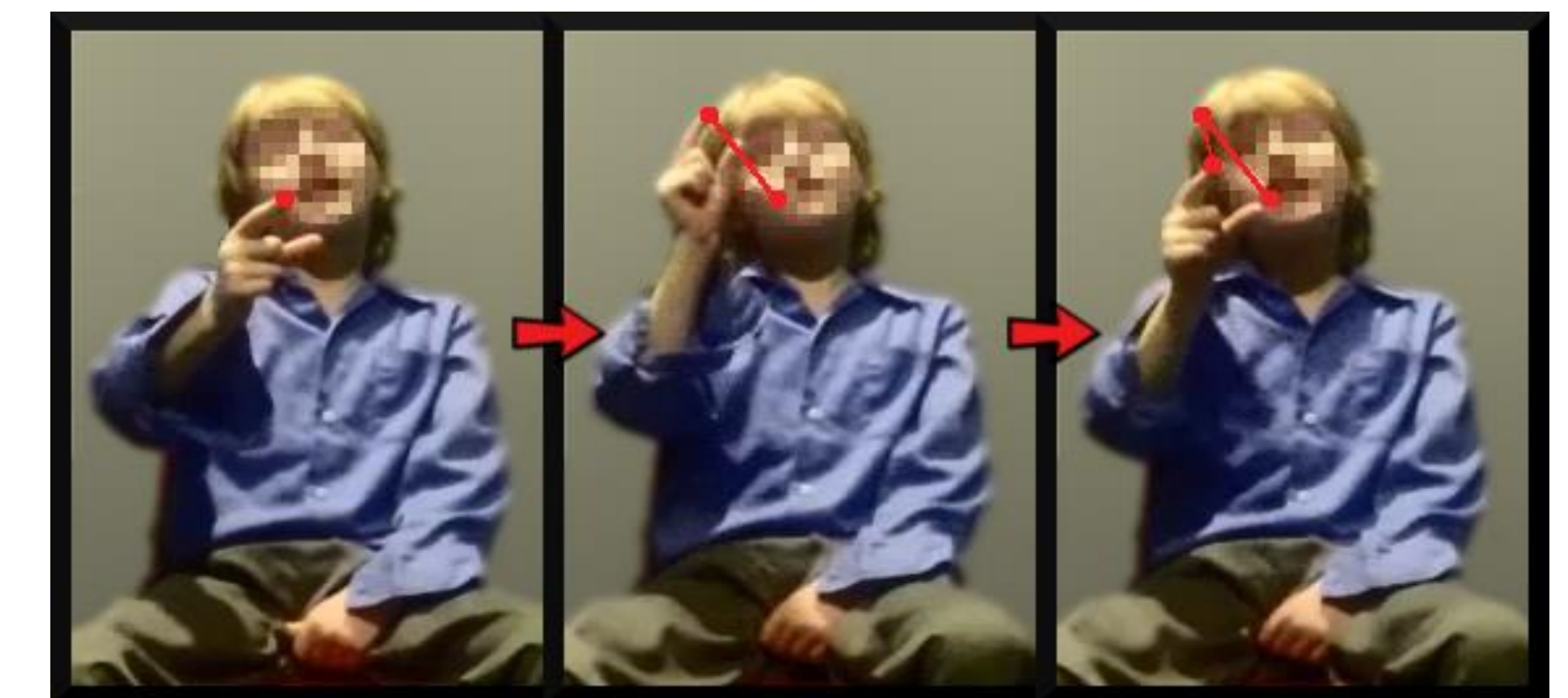


Figure 4: Phases of Embedded prosodic stroke

Sample discourses

[Gesture = **Bold**; Non-prosodic = *Italics*; Prosodic = Underlined]

I. **Independent Prosodic gesture** from the narrative task (Fig. 3).

C: And then [pause] they then started peeping and going around [pause]

C: That was funny [pause] yeah [pause]

C: And then they [pause] then one of the birds saw a [pause] cake [pause]

II. **Embedded Prosodic gesture** from the explanation task (Fig. 4).

C: Mom you don't do that in China [pause]

P: Why? [pause]

C: You use spears [pause]

P: I don't know if you use spears in China [pause]

C: You do use spears to catch fish

P: Oh, okay

References: (1) Bernadis, P., & Gentilucci, M. (2006). Speech and gesture share the same communication system. *Neuropsychologia*, 44, 178-190.; (2) Colletta, J. -M., Guidetti, M., Caprici, O., Cristilli, C., Demir, O. E., Kunene-Nicolas, R. N., & Levine, S. (2014). Effects of age and language on co-speech gesture production: an investigation of French, American, and Italian children's narratives. *Journal of Child Language*, FirstView Article, 1-24; (3) McNeill, D. (1992). *Hand and mind: what gestures reveal about thought*. Chicago: University of Chicago Press; (4) Shattuck-Hufnagel S., Ren P.L. (2012). Preliminaries to a Kinematics of Gestural Accents. Paper presented at the biannual conference of International Society for Gesture Studies, Lund, Sweden.

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