

Silent Prosody

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Prosody is the melody and rhythm of speech

- * Every natural language has its own prosodic patterns.
- * Every speaker (with rare clinical exceptions) knows and uses those patterns, and hearers are responsive to them, mostly without thinking.
- * Some prosody is simply expressive (excitement, sadness, rebellion...); some serves no obvious purpose.
- * But sometimes prosody conveys sentence meaning (*It's late. It's late?*)
- * It also contributes to disambiguation of syntactic structure. (*John met Sue and Ted and I met Sam.*)

Prosody as a guide for syntactic parsing

- * In spoken language, the prosodic contour can disambiguate some syntactic ambiguities, but not all.
- * Many listening studies since Lehiste (1973):

They fed her dog biscuits.
They fed her dog biscuits.

- * BUT ALSO:

They are visiting relatives.

Two meanings, with no prosodic difference.

At CUNY, we study both audible & silent prosody

- * For readers, very few prosodic cues are provided in the written text. (Just some punctuation symbols ! ? .)
- * So in reading aloud, the reader has to do the work – mentally compute a prosodic contour (melody and rhythm) and impose it on the word string.
- * At CUNY, we claim this happens in silent reading too.
- * This is the **Implicit Prosody Hypothesis (IPH)**.
(Fodor 1998, 2002)
- * **How can we know this? Why does it matter?**

We know (and it matters) because comprehension can be mis-guided by mentally projected prosody

- ▶ For an ambiguous sentence, each of its meanings may be associated with a different prosodic melody - as we just saw (*dog biscuits*).
- ▶ A reader may mentally assign the wrong prosody (not as intended by the writer), and then may unwittingly treat it as if it were part of the written text.
 - **Misunderstanding!**
 - (Note to the baby-sitter: *Please feed her dog biscuits.*)
- ▶ Clearly, prosody contributes significantly to human language understanding – even in silent reading.

Implicit Prosody was first proposed to solve a puzzle about sentence parsing

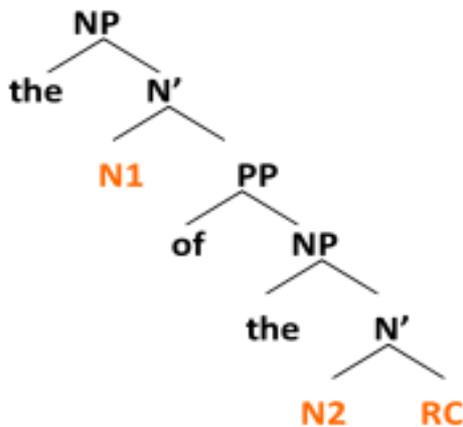
- * In both listening and reading, there is broad evidence of universal principles of syntactic parsing (e.g., how to attach an incoming word into the parse tree being built).
- * Universality is as would be expected if the language comprehension mechanisms are innate.
- * But a few counterexamples began to emerge, which **threatened the whole innateness hypothesis**.
- * Our proposal: Maybe they're due to the interaction of syntactic parsing universals with prosodic influences. Even in silent reading, which has no overt prosody!

An early puzzle solved by implicit prosody - a cross-language parsing difference

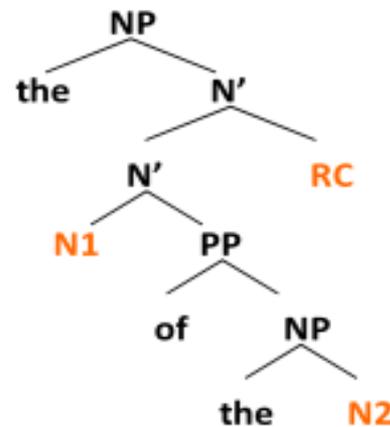
- * One between-language parsing difference was noted. (One is enough to falsify the innateness hypothesis!)
- * When a relative clause follows a sequence of 2 noun heads (e.g. *the servant of the actress*), the parser must choose which it modifies. (Cuetos & Mitchell 1988).
- * Different languages resolve the ambiguity differently:
 - Spanish** favors attaching RC to the **higher** noun (servant).
 - English** favors attaching RC to the **lower** noun (actress).
- * Unexplained: Why the parsing mechanism (assumed innate) would make different choices in different languages.

RC-attachment low (EN) or high (SP)

the servant of the actress who...



LOW ATTACHMENT
(adjacent words, adjacent structure)
English preference



HIGH ATTACHMENT
(structural discontinuity)
Spanish preference

A prosodic explanation of EN vs SP

- * Prosodic breaks are optimally aligned with syntactic phrase edges. (Selkirk 2000)
- * Prosodic patterns are not universal; e.g. **SP and EN differ.**
- * Prosodic phrasing patterns would influence the RC-attachment preference. In reading aloud or silently.
- * Specifically: A prosodic break generally reflects a syntactic discontinuity. In the present case:
 - SP** prosody N1 of N2 / RC → HIGH syntactic RC-attachmt
 - prosody N1 / of N2 RC → LOW syntactic RC-attachmt
 - EN** prosody N1 of N2 RC → LOW RC-attacht by default?

Our informal cross-language survey: High RC-attachment preference correlates with presence of a pre-RC prosodic break

LOW attacht NO PRE-RC BREAK

American English
British English
Egyptian Arabic
Norwegian
Romanian
Swedish

Does your
lg fit here?

HIGH attacht PRE-RC BREAK

Afrikaans
Croatian
Dutch
French
German
Portuguese (Brazil, Europe)
Russian
Scottish English?
Spanish

Note: This is for typical-length (= medium or long) RCs.
Very short RCs tend not to have a break, universally.

In Arabic: “Listening in” on silent prosody

Hala Abdelghany (CUNY dissertation 2010)

- * Arabic script generally omits short vowels, but can mark them (and others) with diacritics.
- * A common grade-school exercise: Insert the vowel diacritics, while silently reading a text.
- * Liaison between words occurs inside a prosodic phrase. So absence of liaison indicates a prosodic boundary.
- * So where a reader does/doesn't insert liaison vowels in this task reveals where the prosodic boundary locations are in her mental prosody!
- * Results: Liaison markings show bias for low RC-attachment in Egyptian Arabic, in silent reading as in reading aloud.

UNVOWELIZED

زار المحافظ مكتبة المدرسة التي

جددت

VOWELIZED (with a variety of diacritics)

زَارَ الْمُحَافِظُ مَكْتَبَةَ الْمَدْرَسَةِ الَّتِي

جُدِّدَتْ

zaara ʔal-muhaafith maktabatata l-madrasah ʔallatii gudidat .
visited the-governor library the-school which was renovated

“The governor visited the library of the school which was renovated.”

Summary so far: Silent prosody can be studied. It may offer explanations for otherwise puzzling parsing differences

- * Other explanations have been proposed in the literature, for why readers of different languages make different ambiguity resolution choices in some cases.
- * But growing evidence suggests the strong hypothesis that:
 - Syntactic parsing routines are **fully universal & innate**.
 - Any cross-language differences in parsing preferences are attributable to differences in their grammars.
 - A natural-language grammar includes **prosody/syntax interface principles**, which are applied in speaking, listening, reading aloud, and even in silent reading.

More cases of (+silent) prosody which may explain Ig-specific attachment preferences

- * Different constructions in the same language.
E.g, Croatian N1-N2-RC with/without a semantically empty preposition between the nouns. Lowers the RC attachment.
- * Different length variants of the same construction in the same language. E.g, long RC favors higher attachment.
- * Same construction in different contexts in same language.
E.g., Prosody differs between subject/object in Spanish.
So does high/low preference for RC-attachment.
- * Results available for several languages:
 - Japanese clause-boundary placement (Hirose)
 - Effects of focus particles in German (Bader; Stolterfoht)
 - Wh-scope interpretation in Japanese (Deguchi & Kitagawa)
 - PP-attachment in English questions (Bradley, Fodor & Shaham)
 - Not-because scope preference in English (Koizumi) →

The not-because scope ambiguity

Frazier & Clifton (1996, following Johnston 1994)

- ▶ Sue didn't cry because she realized that life is hard.
She did cry? Yes, but not because she... **NOT>BEC**
Or she didn't? No, because she realized... **BEC>NOT**
- ▶ The because-clause attaches to **VP** for NOT>BEC scope,
to **IP** for BEC>NOT scope.
- ▶ F&C found preference for **BEC>NOT**. Why? It's puzzling!
- ▶ It has high attachment of the BEC clause. So it would challenge the general tendency in English to prefer low attachment (Late Closure / Recency).
- ▶ **F&C concluded that the parsing theory must be revised.**
(They presented other evidence for this also.)

Frazier & Clifton's explanation of the unexpected preference for BEC>NOT over NOT>BEC

- ▶ A new theory: **The Construal Principle**. Attachment principles apply to arguments, not to adjuncts.
- ▶ Adjunct interpretation is open instead to other influences. Including: **Immediate Interpretation, Minimal Revisions**.
- ▶ These favor persistence = Stay with the initial interpretation.
- ▶ **NOT>BEC** would violate **Minimal Revisions**:
 - Sue didn't cry... (At first, Neg has scope over cry)
 - Sue cried but not because..(Now Neg scopes over because)
- ▶ So **NOT>BEC** is rejected; **BEC>NOT** is preferred instead.
- ▶ JDF: A plausible explanation, but a radical theoretical shift.

Instead, we propose: A prosodic explanation of the preference for BEC>NOT

- ▶ Koizumi (CUNY dissertn, 2009), following the work of Frazier & Clifton, explored the roles of pragmatics and prosody.
- ▶ Koizumi's hypothesis: The NOT>BEC reading is strongly dispreferred because it has extreme prosody.
- ▶ **NOT>BEC prosody**: Strong final rise-fall-rise.
Sue didn't cry because she realized that life is hard.
- ▶ Prediction: If the NOT>BEC prosody could be tamed, the BEC>NOT preference should disappear.
- ▶ We tested this in a grammaticality judgment task. (Troseth, Fodor, Koizumi & Fernández, 2004).

Does providing appropriate prosody help the NOT>BEC interpretation? YES!

- * We induced the **NOT>BEC** reading, by means of a negative polarity item. Now no strong rise-fall-rise prosody.

Sue didn't cry because she was mad at anyone.

- * Grammaticality judgment task results:

- **Readers** (no prosody provided) accepted only **14%**.
- **Listeners** (correct prosody provided) accepted **49%**.

- * **Conclusion:** The NOT>BEC reading is acceptable when it's not forced into an extreme prosody.

(But N>B sentences do sound better still with a follow-on.)

So now: Can we observe a benefit of NOT>BEC prosody in silent reading? How?

- ▶ Yes! The unusual prosody of NOT>BEC happens to be largely neutralized inside an *if*-clause. Compare:

**Sue didn't cry because she realized life is hard.
If Sue didn't cry because she realized life is hard.....**
- ▶ The *if*-clause context:
 - discourages a prosodic break before *because*;
 - induces a mild rise at the end of the *because*-clause.
- ▶ This is just like the prosody reported as typical of a **NOT>BEC** reading, by Hirschberg & Avesani (1997).
- ▶ Prediction: The usual **NOT>BEC** disadvantage will be reduced or even reversed by the compatible ***if*-clause** prosody. Even in silent reading.

The *if*-clause experiment, silent reading

- ▶ Main-clause versus *if*-clause context.
Disambiguated (by plausibility) to **Bec>Not** or **Not>Bec**.
 - Sue didn't cry because she was in public. Was she tearful later?**
 - If Sue didn't cry because she was in public, was she tearful later?**
 - Sue didn't cry because she felt lonely. What else was the matter?**
 - If Sue didn't cry because she felt lonely, what else was the matter?**
- ▶ Presented in two successive frames.
Silent reading.
Followed by comprehension task (Did Sue cry?).
- ▶ Results: Reading time for frame 1.
 - No *if*-clause: Reading is faster for **BEC>NOT**. (**a>c**)
 - With *if*-clause: **NOT>BEC** is equally fast. (**b=d**)

Conclusions to be drawn from *not-because*

- * The NOT>BEC interpretation is no longer difficult to process when its prosody is natural in context.
- * This is not compatible with purely parsing-based principles, like **Immediate Interpretation** and **Minimal Revisions**. These should apply in all contexts.
- * It is consistent with the Implicit Prosody Hypothesis for silent reading.
- * But: The *if*-construction also helps satisfy the pragmatic needs of NOT>BEC. (It guarantees a continuation.)
- * So the next step would be to distinguish between the relative contributions of prosody versus pragmatics.

To end: A ragbag of examples where syntactic parsing (even silent) is sensitive to prosodic phrase lengths.

- * Mary threw the apple she had been eating out. 😞
Mary threw the apple she had been eating out of the window and into the rosebush. 😊
- * He sent the photo and the memo to Meg.
He sent the note, the photo and the memo to Meg.
- * the divorced bishop's daughter Who is
the recently divorced bishop's daughter divorced?