Localizing the Phonology Interface for Alternative Semantics

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1. Semantics-phonology isomomorphy for F and F+WH

(1) he earns more than I earn

| phonology | [ay] “I” has highest prominence in phonological interval $\phi$. |
| semantics | $x_2$ earns $d$ much and ‘spkr earns $d$ much’ are substitution alternatives, with substitution in the $y$ position of ‘$y$ earns $d$ much’. |

(2) an American farmer told a Canadian farmer a joke

| phonology | Second syllable of Canadian has highest prominence in phonological interval $\phi$. |
| semantics | $\lambda P \exists x [\text{american}(x) \land \text{farmer}(x)]$ are substitution alternatives, with substitution in the position $Y$ of $\lambda P \exists x [Y(x) \land \text{farmer}(x)]$. |

(3) Hokenzyo-wa [ syokutyuu-doku-kanzya-zen’in-ga NA ni-o tabeta-ka ] ma da kakunin-dekinai-no↑?
Is the Department of Health yet to be able to confirm [ what all of those who suffered from food poisoning ate ]?

This example and the next one are quoted from Kitagawa (2007).

(4) Hokenzyo-wa [ syokutyuu-doku-kanzya-zen’in-ga
NA ni-o tabeta-ka ] kakunin-siyoo-tositeiru-no↑?
What, is such that the Department of Health is trying to confirm [ whether all of those who suffered from food poisoning ate it, ]?
Recursion for F/SOF and F+WH/F+WH

(5) You used to earn a little bit more than I did. Now you earn much more than I do.

Narrower-scope focus

| phonology | [ay] “I” has highest prominence in phonological interval φ. |
| semantics | ‘hearer earns d much’ and ‘spkr earns d much’ are substitution alternatives, with substitution in the y position of ‘y earns d much’.

Wider-scope focus

| phonology | NOW and much have more prominence than anything else in phonological interval ψ. |
| semantics | ‘then hearer earned a little bit more than spkr earned’ and ‘now heared earns much more than spkr earns’ are substitution alternatives, with substitution in the t and x positions of ‘at t hearer earns x much more than spkr earns’.

(6) Amy-wa [DA re-ga asokode nani-o katta-ka] sonnani siritagatteiru-no ↑? -TOP who-NOM there what-ACC bought-COMPWh that.much want.to.know-COMPWHO

Who is such that Amy wants to know so eagerly [ what he bought there ]?'

Quoted from Kitagawa 2005.

(7) Happy picture

A. WH in Japanese is literally focused.
B. WH/WH in Japanese is isomorphic to F/SOF in English
   This is stated explicitly in Ishihara (2006).
C. Pretty good accounts of the recursive effects, either stress F or cyclic spellout.

Rooth 2010—some SOF cases that are not covered by basic Stress F.

(8) Stress F

Let β be an F-marked phrase with scope φ. Then the strongest stress in the phonological realization of φ falls within the realization of β.

(9) You know what? You only introduced Mona to BobbyF yesterday.
You also only introduced AshleyF to BobbySOF yesterday.

(10) What foods did you only find in New JerseyF last year?
I only found Gouda and CaviarF in New JerseySOF last year.

(11) A. F drives movement
B. F has a phonological interpretation that is sensitive to LF scope.
F-marked phrase is spelled out in a cycle later than its scope, with interpretation of greater prominence or specific intonational profile.

C. F+WH and F-WH have semantic interpretations that are sensitive to LF scope, like anything.

2. Why WH subclassifies F

(12) Syntax
UG feature geometry says that WH subclassifies F.
+F+WH so-called WH
+F-WH so-called F

(13) Semantics of exhaustivity
Focus and wh-questions share a semantics of exhaustive answerhood (Haida 2008).
I’m not going to do justice to that analysis in this talk.

(14) Alternative semantics
F and WH both use alternative semantics—they have a common meaning component, an ‘alternative semantic value’.

The phonology interface that is relevant for F and F+WH is the recursive phonology interface for alternative semantic values.

3. Alternative semantics architecture

(15) Hamblin
[vpMary-o aisiteiru] {λx.ʃ(x,m)}
[vp*dare-o aisiteiru] {λx.ʃ(x,y)|person(y)}
[vpMary-oʃlove] not analyzed

(16) Rooth
[vpMary-o aisiteiru] ordinary λx.ʃ(x,m)
focus {λx.ʃ(x,m)}
[vp*dare-o aisiteiru] ordinary {λx.ʃ(x,y)|person(y)}
focus {{λx.ʃ(x,m)|person(x)}}
[vpMary-oʃlove] ordinary λx.ʃ(x,m)
focus {λx.ʃ(x,m)}

(17) Beck
[vpMary-o aisiteiru] ordinary λx.ʃ(x,m)
focus λx.ʃ(x,m)
[vp*dare-o aisiteiru] ordinary undefined
focus λx.ʃ(x,y)
[vpMary-oʃlove] ordinary λx.ʃ(x,m)
focus λx.ʃ(x,y)

In the focus semantic values, \( y \) is a distinguished focus variable. Or really, meanings are functions from assignments to semantic values, with
a focus variables distinguished in the domain of assignment functions (Wold 1996).

\[ \lambda g \lambda x. \text{if } \text{person}(g(y)) \text{ then } \text{love}(x, g(y)) \text{ else undefined} \]

(18) Same, but with alternatives at recursive levels.

- \([\text{VP-Mary-o ailestoneiru}] \text{ ordinary } \lambda x. \text{love}(x, m)\)  
  - focus \{\lambda x. \text{love}(x, m)\}
- \([\text{VP-dare-o ailestoneiru}] \text{ ordinary } \text{undefined}\)  
  - focus \{\lambda x. \text{love}(x, y) | \text{person}(y)\}
- \([\text{VP-Mary-oF ailestoneiru}] \text{ ordinary } \lambda x. \text{love}(x, m)\)  
  - focus \{\lambda x. \text{love}(x, y) | y \in D\}

(19) Program

A. \([\text{VP-dare-o ailestoneiru}] \text{ and } [\text{VP-Mary-oF ailestoneiru}] \text{ have an identical meaning component, the focus semantic value.}\)

B. Than meaning component is obtained by recursively projecting alternatives.

C. The alternatives can project from the left in \([\alpha, \beta]\) only if \(\alpha\) is phonologically stronger than \(\beta\).

D. Factor both the semantics and the phonology locally

   (a) Semantics: recursive projection of alternatives

   (b) Phonology: local comparision of prominence in binary tree

4. **Local homomorphy system**

Phonology-semantics homomorphy for F is stated locally. There is a correspondence between local two-place operators. The semantic ones project alternatives. The phonological ones constuct metrical grids recursively (or recursively construct constraints on metrical grids).

(20) Standardly, alternatives are projected automatically, using an image construction. The alternative set for a complex phrase \([\alpha, \beta]\) is the image of the normal semantic-combination function acting on the alternative sets for \(\alpha\) and \(\beta\).

\[
\begin{align*}
[\text{dare-o}]^f & \quad \{x|\text{person}(y)\} \\
[\text{aisiteiru}]^f & \quad \{\text{love}\} \\
\text{semantic op} & \quad \lambda ab. b(a) \text{ (leftward function application)} \\
[\text{dare-o ailestoneiru}]^f & \quad \{b(a)|a \in [\text{dare-o}]^f \land b \in [\text{aisiteiru}]^f\} \\
& \quad = \{\text{love}(y)|\text{person}(y)\}
\end{align*}
\]
Instead, four local operators that project alternatives differently.

10 project alternatives from left child
01 project alternatives from right child
11 project alternatives from both
00 don’t project alternatives

Let $h$ be the ordinary semantic operation, e.g. leftward function application or rightward function application.

\[
\begin{align*}
[[10\alpha\beta]]^f &= \{h(a, [\beta]^o)|ae[\alpha]^f\} \\
[[01\alpha\beta]]^f &= \{h([\alpha]^o, b)|be[\beta]^f\} \\
[[11\alpha\beta]]^f &= \{h(a, b)|ae[\alpha]^f \land be[\beta]^f\} \\
[[00\alpha\beta]]^f &= \{h([\alpha]^o, [\beta]^o)\}
\end{align*}
\]

A binary node embedding WH on the left has to be labeled 1x if the alternative-scope is to project. A binary node embedding WH on the right has to be labeled x1 if the alternative-scope is to project. Since $[\text{dare}]^o$ is undefined, if this condition is not met $[.]^o$ and $[.]^f$ are both undefined.

(23) Phonology (constraint version)

Given a node $[10\alpha\beta]$, there is a grid column in the phonological interval corresponding to $\alpha$ that is higher than every grid column in the phonological interval corresponding to $\beta$.

Given a node $[01\alpha\beta]$, there is a grid column in the phonological interval corresponding to $\beta$ that is higher than every grid column in the phonological interval corresponding to $\alpha$.

00 no constraint
11 maximal heights are equal, or no constraint?

These rules are similar to ones for realizing sw trees in the grid. They also enforce that an F is more prominent than anything else, within its scope, such as novel but non-focused phrases (Selkirk and Katz ms.)

*This system is joint work with Hongyuan Dong. Some clauses are given in Dong (2009). See also the local-operator system in Rooth (2010).*
5. Advantages of stress-first architecture

Pitch is not the only correlate of F

... or even the most useful and reliable one.

Howell and Rooth (2009a, 2009b): web-derived corpus of comparatives with than I did in the than-clause.

(24)a. She did more than I did.
b. I wish I had done more than I did.
c. I did more than I did before.

The features that are useful an SVM binary classifier for focusing of subject “I” include pitch, but also vowel duration and vowel-quality.

(25) Classification experiment (Howell and Rooth 2009)

A. Sample of 91, 40 with subject focus and 51 with focus on did or later.

B. Hand labeling of intervals in signal.

C. Extract 308 acoustic parameters, including values for duration, intensity, energy, amplitude, f0, vowel formants, measures of spectral tilt or balance.

D. One-held out crossvalidation—in each run use 90 items for training, one for testing.

E. Train SVM binary classifier, and use it to classify the test item; pool classifications of test items.

Models without pitch do about as well:

89.0% just duration of V1
92.3% duration of V1, distance between F1 and F2 40% into V1, duration of [d] closure

Phonetic parameter extraction, optimization and feature selection for SVM classifier: Jonathan Howell.

SOF in English

(26) Slides/audio—than-clauses in data from web focus corpus.
(These data: Jonathan Howell and Mats Rooth)

Non-anaphoric F/F in English

(27) Slides/audio—main clauses in the same comparatives.

Japanese and Korean dialects with different tunes for F and WH

H.K. Hwang (in prep.) argues that in in South Kyeongsang Korean WH and ordinary F have completely different pitch shapes, and the same for Fukuoka
Japanese. This is a direct challenge to the hypothesis of an invariant focus phonology for WH and F.

In the stress-first architecture, one can hypothesize a common *metrical* representation, with different pitch features overlaid.

6. Wagner’s local alternative semantics

(28) Alternative semantics and Givenness semantics: a focus can be separated by other vertices from a scope for the focus

Sister alternatives: the scope of a focus is one step up the tree from the focus. If trees are binary branching, there are two possibilities.

\[
\begin{array}{ccc}
  k \sim a & \quad & k \sim a \\
  \downarrow & \quad & \downarrow \\
  \cdot \text{F} & \quad & \cdot \text{F} \\
\end{array}
\]

(29) Sis: collapse F and \(\sim\) can.

A. Wagner (2006) — sister-givenness operator G which modifies the non-focused child. Because the scope is one step up, \(\sim\) a can be packed into the semantics of G. [Does this work if the semantic operation is not function application?]

B. Similar sister-focusing operator combining F and \(\sim\) a.

C. Modifiers of semantic operator o used for the parent.

\[
\begin{array}{ccc}
  k\varphi a & \quad & k\gamma a \\
  \downarrow & \quad & \downarrow \\
  (\text{focused}) & \quad & (\text{given}) \\
\end{array}
\]

\[
\begin{array}{ccc}
  a & \quad & a \\
  \text{antecedent} & \quad & \text{antecedent} \\
  o & \quad & o \\
  \text{semantic operation for parent, e.g} & \quad & \text{semantic operation for parent, e.g} \\
  \text{leftward function application or} & \quad & \text{rightward function application} \\
  b & \quad & b \\
  \text{semantic value of left child} & \quad & \text{semantic value of left child} \\
  c & \quad & c \\
  \text{semantic value of right child} & \quad & \text{semantic value of right child} \\
\end{array}
\]

\[
[\varphi] = \lambda a \lambda o \lambda b \lambda c [\partial \exists b'[A(b', b) \land a = o(b')(c)] \land o(b, c)]
\]

\[
[\gamma] = \lambda a \lambda o \lambda b \lambda c [\partial \exists c'[A(c', c) \land a = o(b)(c')] \land o(b, c)]
\]
They sell 1 expensive cameras and 2 cheap cameras

\[
\begin{align*}
(30) & \\
& \lambda x. \text{expensive}(x) \land \text{camera}(x) \\
& \lambda P \lambda Q \lambda x. P(x) \land Q(x) \\
& \text{cheap} \\
& \text{expensive} \\
& \text{camera} \\
& \text{parent} \lambda x. \text{cheap}(x) \land \text{camera}(x) \\
& \lambda x. \text{expensive}(x) \land \text{camera}(x)
\end{align*}
\]

Alt and Giv need a mechanism for interpreting F.
A. Recursive definition of focus semantic values (Rooth 1985).
Sis doesn’t need it, because there is no F and alternatives are introduced by \( \sim \) and \( \sim^* \).

\( \sim^* \) and \( \sim \).

Standardly analyzed with deeply-embedded focus
A: [You said John left],
B: [I [said [Bill F left]]] \( \sim 3 \)

Who danced with John’s mother?
[[HER F] mother] \( g \) did.
(35) who danced with John’s mother

(36) This shop sells expensive binoculars, and it sells cameras. That includes very expensive cameras.

(37) This shop sells expensive binoculars, and it sells cameras. That includes [very F expensive cameras].

(38) They sell expensive cameras and cheap cameras.
(39) Use split antecedents for examples standardly analyzed as deeply embedded focus.
1. Mary’s uncle, who produces high-end convertibles, is coming to her wedding. I wonder what he brought as a present.
   a. He brought a [cheap convertible].
   b. ?? He brought a [red convertible].
   c. He brought a [red CONVERTIBLE].
   (Wagner 2006)

2. Where is the photo of the desk we looked at in the antique store?
   a. ?It’s on my desk.
      (Seems to brings up an irrelevant contrast, or perhaps suggestion of paradox.)
   b. It’s on my desk.
      (neutral)

3. a. After the workmen carried Mary’s piano into her studio, SHE touched it. She ran her fingers over the fine mahogany and down to the keyboard.
      (Brings up the question ‘who has touched the piano’.)
   b. After the workmen carried Mary’s piano into her studio, she touched it. She ran her fingers over the fine mahogany and down to the keyboard.
      (neutral)

4. a. We (only) spoke to Bill about his problems.
   b. We (only) spoke to Bill’s mother about his problems.

   • These are covariant (bound variable or sloppy) readings for pronouns with focused antecedents.
   • Since Jacobson (1972), covariant readings considered an argument for a scope-like representation of focus (Chomsky 1973, Rooth 1985, etc.).
   • So far no way of generating these readings in sister-alternative semantics.