

# Intonation and meaning

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## Yesterday:

Assuming that syntactic structure is a good predictor of prosodic structure, one way of deriving the latter from the former.

## Today:

- ✧ Wrapping this up.
- ✧ Moving on to interpretation.

# Outline

Adding focus to our syntax to prosody mapping

Interpreting intonation

Focus semantics (“Possibility #2”)

We've seen examples that deviated from default intonation, e.g., where constituents were focused.

- (1) a. Who loves Massachusetts?
- b. VINCENT loves Massachusetts.

The OT constraints from yesterday are not designed to push the NPA onto the focused constituent.

They might (incorrectly) prefer candidates with an NPA on Massachusetts, or that have other subtly undesirable features.

To remedy this situation we can assume a syntactic diacritic  $F$  that marks constituents that are focused.

(2) Vincent <sub>$F$</sub>  loves Massachusetts.

With this, we can formulate mapping constraints that refer to  $F$ , and interpret  $F$  marked constituents in different ways.

(3) FOCUS REALIZATION:

The highest stress within a F-domain  $D$  falls on a focus of  $D$ .

“In a F-domain  $D$ , assign one violation mark per beat column that is as high as or higher than the one on the focus of  $D$ .”

If you want to practice: Assume F-domain = the sentence, and that the ranking of FOCUS REALIZATION is tied with STRESS TO ACCENT.

## F-marking

- (4) a. Who loves Massachusetts?  
b. Vincent<sub>F</sub> loves Massachusetts.
- (5) a. Rajesh loves Massachusetts.  
b. No. Vincent<sub>F</sub> loves Massachusetts.

Sentences with focus need there to be a contextually salient and congruent sentence to be acceptable: the focus antecedent.

## Focus sizes

- (6) a. What did Mary buy a book about?  
b. Mary bought a book about [bats]<sub>F</sub> “narrow” DP-focus
- (7) a. What did Mary buy?  
b. Mary bought [a book about bats]<sub>F</sub> “narrow” DP-focus
- (8) a. What did Mary do?  
b. Mary [bought a book about bats]<sub>F</sub> VP-focus
- (9) a. What happened?  
b. [Mary bought a book about bats]<sub>F</sub> “broad”/sentence focus

## Focus projection

Prominence on a constituent in a default position may correspond to focus sizes larger than that constituent.

- (10) What happened?
- a. Mary bought a book about BATS.
  - b. #MARY bought a book about bats.

This isn't specific to verb phrases/objects.

- (11) Who bought a book about bats?
- a. MARY bought a book about bats.
  - b. Mary's aunt's best FRIEND bought a book about bats.
  - c. #Mary's AUNT'S best friend bought a book about bats.



## Do postnuclear *phrase boundaries* survive?

In the following pair, the NPA is on “enemies.”

A pre-nuclear phrase break disambiguates between a. and b.

- (12) The Vikings won over their enemies.
- a. Heartless violence led to a bloody victory.  
The Vikings (won) (over their ENEMIES).
  - b. Gentle persuasion led to a friendly settlement.  
The Vikings (won over) (their ENEMIES).

## Do postnuclear *phrase boundaries* survive?

In the following pair, in A's utterance, the NPA is on "vikings."  
A disambiguating phrase break may survive post-nuclearly.

(12) A: Heartless violence led to a bloody victory.

B: So the Romans won over their enemies?

A: No, the VIKINGS won over their enemies

(13) A: Gentle persuasion led to a friendly settlement.

B: So the Romans won over their enemies?

A: No, the VIKINGS won over their enemies

⇒ **No (obligatory) post-nuclear dephrasing.**

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Intonational contrasts lead to meaning contrasts.

As far as I can tell, there are three ways that intonation and meaning interact.

## Possibility #1

Prosody is not interpreted at all.

Some prosodic contrasts arise as a consequence of structural differences.

- (14) a. I (saw the man with a telescope)<sub>φ</sub>  
b. I (saw the man)<sub>φ</sub> (with a telescope)<sub>φ</sub>

The syntax-prosody mapping should prefer candidates without a phonological phrase boundary between *man* and *with*.

[see [the [man [with the telescope]]]] PP complement

( x )  
[see [the [man [with the telescope]]]]

This incurs no violations of Stress-XP or Wrap-XP.

( x ) ( x )  
[see [[the man] [with the telescope]]]

This violates Wrap-XP twice.



I mean *interpreted* in a technical sense: Do we put the intonational contour/prosodic phenomenon inside  $[\cdot]$ .

There is a second sense: Whether people make use of the break above to disambiguate the sentence, for example.



## Possibility #2

A constituent **XP** is marked prosodically.

This has an interpretive effect.

**Elements** in a sentence other than XP make use of that effect.

(15) Tessa **only** eats **BEANS**.

F-marking on **beans** gives rise to...

- ✧ acoustic prominence,
- ✧ and an interpretive effect: It evokes alternatives.

**Only** asserts **beans** and negates its alternatives.

(16) Tessa eats beans and not fish and not bananas and not...

Rooth (1985, 1992), a.o.

### **Possibility #3** (tonal morphemes)

Intonational contours are directly interpreted.

✧ Constant (2014):

The contrastive topic contour “L+H\* L-H%” gets interpreted in a way that captures the discourse effects of contrastive topic.

(17) Persephone<sub>CT</sub> brought the beans<sub>F</sub>

↪ For each person, what did they bring?

✧ Özyıldız & Demirok (2023):

Turkish has a universal quantifier realized by a tonal contour.

With this in mind, I'm not sure which possibility the rising intonation in (18b) falls under.

- (18) a. Marianna made the marmelade.  
b. Marianna made the marmelade?

# Outline

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# Ordinary semantics

## Assume

- ✧ a set of individuals

$$D_e = \{nadine, mike, samson\}$$

- ✧ a set of truth values

$$D_t = \{0, 1\}$$

- ✧ a set of possible worlds

$$D_s = \{w_0, w_1, \dots\}$$

- ✧ a denotation function  $\llbracket \cdot \rrbracket^o$  from syntactic objects to individuals, functions, truth values.

superscript “o” for “ordinary,”


to be contrasted with superscript “f” for “focus.”

# Ordinary semantics

- ✧  $[[\text{Nadine}]]^o = \textit{nadine}$
- ✧  $[[\text{biked}]]^o = \lambda x_e. \lambda w_s. \begin{cases} 1 & \text{if } x \text{ biked in } w \\ 0 & \text{if } x \text{ didn't bike in } w \end{cases}$
- ✧  $[[\text{fed}]]^o = \lambda y_e. \lambda x_e. \lambda w_s. \begin{cases} 1 & \text{if } x \text{ fed } y \text{ in } w \\ 0 & \text{if } x \text{ didn't feed } y \text{ in } w \end{cases}$

## Ordinary semantics

$$\begin{aligned} \llbracket \text{Nadine biked} \rrbracket^o &= \llbracket \text{biked} \rrbracket^o(\llbracket \text{Nadine} \rrbracket^o) \\ &= \lambda w_s.1 \text{ iff } n \text{ biked in } w \end{aligned}$$



Nadine                      biked

$$\llbracket \text{Nadine} \rrbracket^o = n \quad \llbracket \text{biked} \rrbracket^o = \lambda x_e. \lambda w_s.1 \text{ iff } x \text{ biked in } w$$

## Alternative semantics

### Key intuition:

One thing that might happen when you focus “Nadine”

(19) *Nadine* biked.

is that you will mean

- (20) a. Nadine biked.  
b. Mike didn't bike.  
c. Samson didn't bike.

You *could have said* “Mike biked,” but you didn't.

You *could have said* “Samson biked,” but you didn't.



# Alternative semantics

## Key intuition:

Some sentences are uttered against a set of *alternative* sentences: Things that you could have said instead.

- (19) a. Sentence:  
Nadine biked.
- b. Alternative sentences:  
{Mike biked,  
Samson biked,  
Nadine biked}

- ✧  $X$  is always an alternative to  $X$ .
- ✧ Alternatives to  $X$  are of the same type as  $X$ .

## Alternative semantics

Natural language expressions also have *focus semantic values*.

✧ Delivered by  $\llbracket \cdot \rrbracket^f$

A function from syntactic objects to sets of ordinary semantic values.

✧ If an expression is not focused

▶  $\llbracket \text{Nadine} \rrbracket^o = \text{nadine}$

▶  $\llbracket \text{Nadine} \rrbracket^f = \{\text{nadine}\}$

✧ If an expression *is* focused

▶  $\llbracket \text{Nadine} \rrbracket^o = \text{nadine}$

▶  $\llbracket \text{Nadine}_F \rrbracket^f = \{\text{nadine}, \text{mike}, \text{samson}\}$

✧ Focus on, e.g., intransitive verbs: sets of functions

▶  $\llbracket \text{biked}_F \rrbracket^f = \{\lambda x_e. x \text{ biked}, \lambda x_e. x \text{ rode the train}, \lambda x. x \text{ fell}, \dots\}$

## Alternative semantics

Just like ordinary ones, focus semantic values compose.

### ✧ **Function application**

Take a function  $f$ , an argument  $x$ , apply  $f$  to  $x$ .

$$\llbracket \text{Nadine}_F \text{ biked} \rrbracket^o = \llbracket \text{bike} \rrbracket^o(\llbracket \text{Nadine} \rrbracket^o)$$

### ✧ **Pointwise function application**

Take a set of functions  $f$ , a set of arguments  $x$ , apply all the  $f$ s to all the  $x$ s, collect them in a set.

$$\llbracket \text{Nadine}_F \text{ biked} \rrbracket^f = \{ \llbracket \text{bike} \rrbracket^o(\llbracket \text{Nadine} \rrbracket^o), \\ \llbracket \text{bike} \rrbracket^o(\llbracket \text{Mike} \rrbracket^o), \\ \llbracket \text{bike} \rrbracket^o(\llbracket \text{Samson} \rrbracket^o) \}$$

## Alternative semantics

$\llbracket \text{Nadine biked} \rrbracket^o = \lambda w_s.1$  iff  $n$  biked in  $w$

$\llbracket \text{Nadine biked} \rrbracket^f = \{ \lambda w_s.1$  iff  $n$  biked in  $w$ ,  
 $\lambda w_s.1$  iff  $m$  biked in  $w$ ,  
 $\lambda w_s.1$  iff  $s$  biked in  $w$  }

Nadine<sub>F</sub>

$\llbracket \text{Nadine}_F \rrbracket^o = n$

$\llbracket \text{Nadine}_F \rrbracket^f = \{n, m, s\}$

biked

$\llbracket \text{biked} \rrbracket^o = \lambda x_e. \lambda w_s.1$  iff  $x$  biked in  $w$

$\llbracket \text{biked} \rrbracket^f = \{ \lambda x_e. \lambda w_s.1$  iff  $x$  biked in  $w$  }

## Alternative semantics

For legibility, let's write:

$$(19) \quad \llbracket \text{Nadine}_F \text{ bikes} \rrbracket^f = \{ \text{Nadine bikes, Mike bikes, Samson bikes} \}$$

## Alternative semantics

What would the focus semantic value of “Nadine biked<sub>F</sub>” be?

# The meaning of questions

Alternatives allow us to model a lot of things.

- ✧ To know the meaning of a declarative is to know what it takes for it to be true or false.
- ✧ To know the meaning of a question is to know what it takes to answer the question.

(19)  $\llbracket \text{Who biked} \rrbracket^o =$   
 $\{\text{Nadine biked, Mike biked, Samson biked}\}$

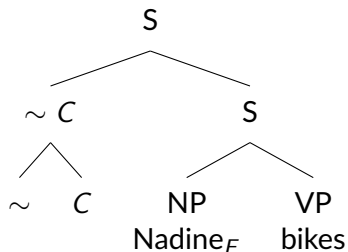
# Squiggle

How to account for:

- (20) a. Who biked?  
b. Nadine<sub>F</sub> biked.
- (21) a. What did Nadine do?  
b. #Nadine<sub>F</sub> biked.



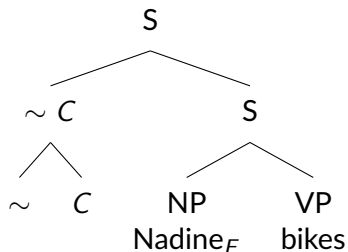
# Squiggle



Assume an operator  $\sim$  that combines:

- ✧ with a contextually determined set of propositions  $C$ ,
- ✧ and then with a sentence.

# Squiggle

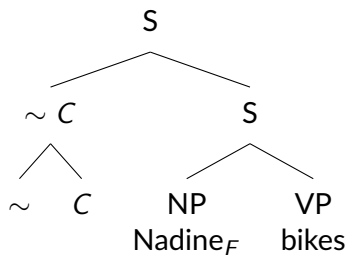


$[[\sim C \text{ Nadine}_F \text{ bikes}]]^\circ$  is defined only if...

- ✧  $C \subseteq [[\text{Nadine}_F \text{ bikes}]]^f$
- ✧  $[[\text{Nadine}_F \text{ bikes}]]^\circ \in C$
- ✧  $\exists p : p \neq [[\text{Nadine}_F \text{ bikes}]]^\circ \wedge p \in C$

when defined,  $[[\sim C \text{ Nadine}_F \text{ bikes}]]^\circ = [[\text{Nadine}_F \text{ bikes}]]^\circ$

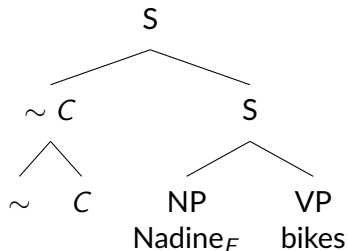
# Squiggle



Let's take  $C = \llbracket \text{Who bikes?} \rrbracket^o = \{n \text{ bikes}, m \text{ bikes}, s \text{ bikes}\}$

- ✧  $C \subseteq \llbracket \text{Nadine}_F \text{ bikes} \rrbracket^f$
- ✧  $\llbracket \text{Nadine}_F \text{ bikes} \rrbracket^o \in C$
- ✧  $\exists p : p \neq \llbracket \text{Nadine}_F \text{ bikes} \rrbracket^o \wedge p \in C$

# Squiggle



Let's take

$C = \llbracket \text{What does Nadine do?} \rrbracket^o = \{n \text{ bikes, } n \text{ runs, } n \text{ jumps}\}$

- ✧  $C \not\subseteq \llbracket \text{Nadine}_F \text{ bikes} \rrbracket^f$
- ✧  $\llbracket \text{Nadine}_F \text{ bikes} \rrbracket^o \in C$
- ✧  $\exists p : p \neq \llbracket \text{Nadine}_F \text{ bikes} \rrbracket^o \wedge p \in C$

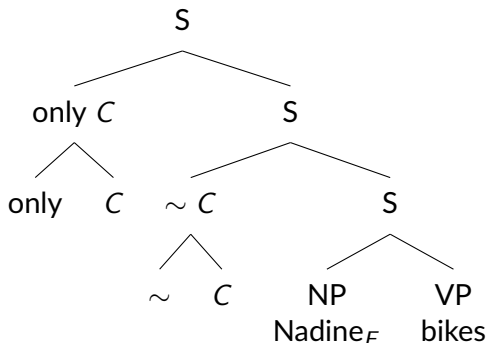
# Only

## Key intuition:

- (22) Only Nadine<sub>F</sub> bikes.
- a. Nadine bikes.
  - b. Mike doesn't bike.  
Samson doesn't bike.

“Only S” asserts S and negates all of S's alternatives.

# Only



- (23)  $\llbracket \text{Only Nadine}_F \text{ bikes} \rrbracket^o$  is true iff  
Nadine bikes and  $\forall p \in C$  if  $p \neq \text{Nadine bikes}$ , then  $p$  is false

But what is  $C$ ?

It has to be something that satisfies  $\sim$ , so, e.g.,

- (24)  $C = \{\text{Nadine bikes, Mike bikes, Samson bikes}\}$