Psych 156A/ Ling 150:
Acquisition of Language II

Lecture 15
Introduction to Structure 2: Parameters
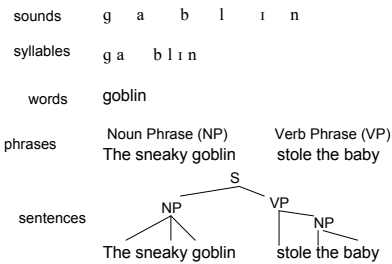

Announcements

Be working on structure review questions

HW3 returned on Tuesday June 1

Please fill out online evaluation forms for this class! :)

Universal Grammar: Principles & Parameters

Principles: Apply to all human languages.
Ex: Language has hierarchical structure.
Smaller units are chunked into larger units.

sounds	g a b l ɪ n
syllables	g a b l ɪ n
words	goblin
phrases	Noun Phrase (NP) Verb Phrase (VP)
	The sneaky goblin stole the baby

sentences

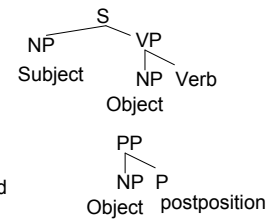## Universal Grammar: Principles & Parameters

Parameters: Constrained variation across languages. Children must learn which option their native language uses.

Japanese/Navajo

Basic word order:
Subject Object Verb

Postpositions:
Noun Phrase Postposition

Possessor before Possessed
Possessor Possession

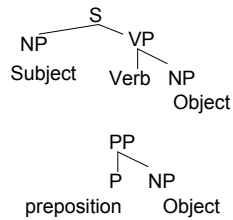## Universal Grammar: Principles & Parameters

Parameters: Constrained variation across languages. Children must learn which option their native language uses.

Edo/English

Basic word order:
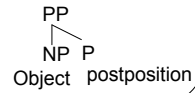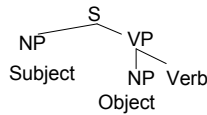Subject Verb Object

Prepositions:
Preposition Noun Phrase

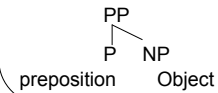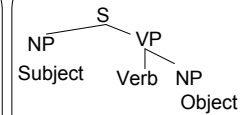Possessed before Possessor
Possession Possessor

```
        S
      /   \
    NP     VP
  Subject /  \
       Verb   NP
              Object

         PP
        /  \
       P    NP
  preposition  Object
```

Universal Grammar: Principles & Parameters

At this level of structural analysis (parameters), languages differ vary minimally from each other. This makes language structure much easier for children to learn. All they need to do is set the right parameters for their language, based on the data that are easy to observe.

Japanese/Navajo
```
        S
      /   \
    NP     VP
  Subject /  \
        NP   Verb
      Object

         PP
        /  \
      NP    P
    Object postposition
```

Edo/English
```
        S
      /   \
    NP     VP
  Subject /  \
       Verb   NP
              Object

         PP
        /  \
       P    NP
  preposition  Object
```

Language Variation: Summary

While languages may differ on many levels, they have many similarities at the level of language structure (syntax). Even languages with no shared history seem to share similar structural patterns.

One way for children to learn the complex structures of their language is to have them already be aware of the ways in which human languages can vary. Nativists believe this is knowledge contained in Universal Grammar. Then, children listen to their native language data to decide which patterns their native language follows.

Languages can be thought to vary structurally on a number of linguistic parameters. One purpose of parameters is to explain how children learn some hard-to-notice structural properties.

But what are linguistic parameters really? How do they work? What exactly are they supposed to do?

Parameters

A parameter is meant to be something that can account for multiple observations in some domain.

Parameter for a statistical model: determines what the model expects to observe in the world in a variety of situations

Parameter for our minds (and language): determines what *we* expect to observe in the world in a variety of situations

Statistical Parameters

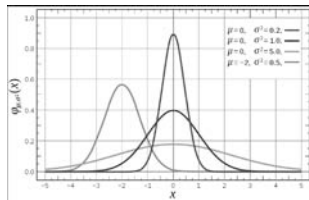The normal distribution is a statistical model that uses two parameters:
- μ for the mean
- σ for the standard deviation
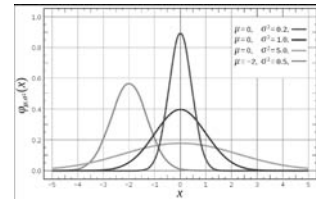
If we know the values of these parameters, we can make predictions about the likelihood of data we rarely or never see.

Statistical Parameters

Suppose this is a model of how many minutes late you'll be to class. Let's use the model with $\mu = 0$, and $\sigma^2 = 0.2$. (blue line)
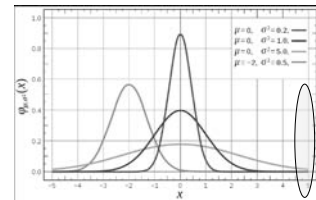

Statistical Parameters

Suppose this is a model of how many minutes late you'll be to class. Let's use the model with $\mu = 0$, and $\sigma^2 = 0.2$. (blue line)
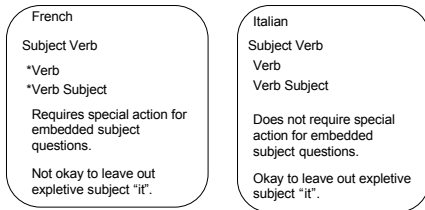

How likely are you to be 5 minutes late, given these parameters?

Not very likely! We can tell this just by knowing the values of the two statistical parameters. These parameter values allow us to infer the likelihood of some observed behavior.

Linguistic Parameters

Under the nativist perspective, a linguistic parameter is an innate, language-specific abstraction that connects to many structural properties about language.
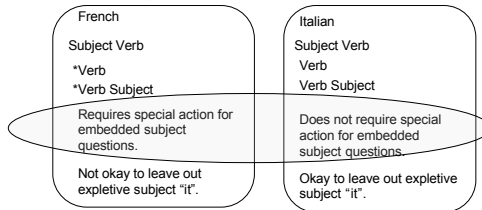
Example from last time: the "subject" parameter

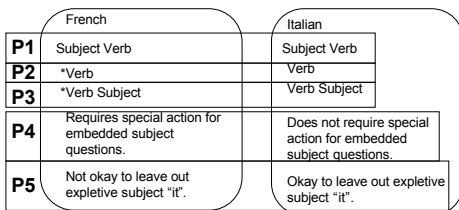| French	Italian
Subject Verb	Subject Verb
*Verb	Verb
*Verb Subject	Verb Subject
Requires special action for embedded subject questions.	Does not require special action for embedded subject questions.
Not okay to leave out expletive subject "it".	Okay to leave out expletive subject "it".

Linguistic Parameters: Useful

This is useful for acquisition because a child can learn a parameter's value by observing many different examples and many different structures.

This can be helpful for hard-to-learn structures.

French	Italian
Subject Verb	Subject Verb
*Verb	Verb
*Verb Subject	Verb Subject
Requires special action for embedded subject questions.	Does not require special action for embedded subject questions.
Not okay to leave out expletive subject "it".	Okay to leave out expletive subject "it".

Why Hard-To-Learn Structures Are Easier

Let's label these structural properties.

	French	Italian
P1	Subject Verb	Subject Verb
P2	*Verb	Verb
P3	*Verb Subject	Verb Subject
P4	Requires special action for embedded subject questions.	Does not require special action for embedded subject questions.
P5	Not okay to leave out expletive subject "it".	Okay to leave out expletive subject "it".

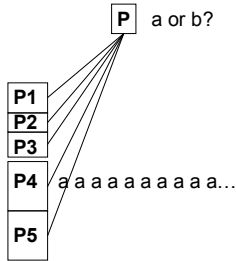## Why Hard-To-Learn Structures Are Easier

Let's assume they are all connected to parameter P, which can take one of two values: a or b.
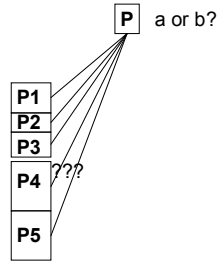
P   a or b?

P1
P2
P3

P4

P5
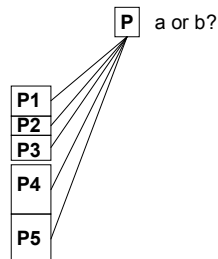
Why Hard-To-Learn Structures Are Easier

How do we learn whether P4 shows behavior a or b?
One way is to observe many instances of P4.

P a or b?

P1
P2
P3
P4 a a a a a a a a a a...
P5

Why Hard-To-Learn Structures Are Easier

But what if P4 occurs very rarely? We might never see any examples of P4.

P a or b?

P1
P2
P3
P4 ???
P5

Why Hard-To-Learn Structures Are Easier

Fortunately, if P4 is connected to P, we can learn the value for P4 by learning the value of P. Also fortunately, P is connected to P1, P2, P3, and P5.
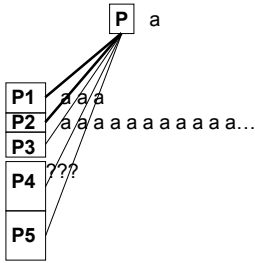
P a or b?

P1
P2
P3
P4 ???
P5
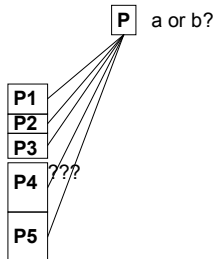
Why Hard-To-Learn Structures Are Easier

Step 1: Observe P1, P2, P3, *or* P5. In this case, all the observed examples of these structures are behavior a.

P a or b?

P1 a a a
P2 a a a a a a a a a a...
P3
P4 ???
P5
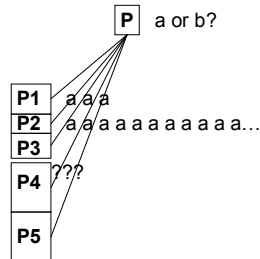
Why Hard-To-Learn Structures Are Easier

Step 2: Use this knowledge to set the value of parameter P to a.

P | a

P1 a a a
P2 a a a a a a a a a a a…
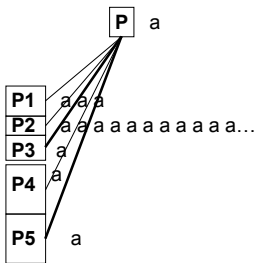P3
P4 ???
P5

Why Hard-To-Learn Structures Are Easier

Step 3: Since parameter P is connected to P4, we can predict that P4 will also show behavior a - even though we've never seen any examples of it! (We can also infer P3 and P5 the same way.)

P | a

P1 a a a
P2 a a a a a a a a a a a…
P3
P4 a
P5
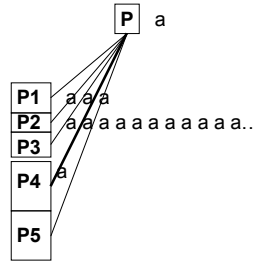
Why Acquisition Is Easier

P | a

P1 a a a
P2 a a a a a a a a a a a…
P3 a
P4 a
P5 a

This highlights another benefit of parameters - we don't have to learn the behavior of each structure individually. Instead, we can observe some structures (ex: P1 and P2) and infer the right behavior for the remaining structures (P3, P4, and P5).

That is, instead of having to make 5 decisions (one for P1, P2, P3, P4, and P5), we actually only need to make one decision - is P a or b?

What are some real parameters?

Morphology: the Compounding parameter (Snyder 1995, 2001, 2002)

English is +compounding:
  "banana box" = box that holds bananas

Spanish is -compounding:
  * *"caja banana", "banana caja"* ≠ box that holds bananas

What are some real parameters?

Morphology: the Compounding parameter (Snyder 1995, 2001, 2002)
- connected property: transitive resultative

English is allows transitive resultative constructions:
John beat the iron flat.

Spanish does not allow transition resultative constructions:
Juan golpeó el   hierro (*plano).
John beat   the iron   flat

What are some real parameters?

Morphology: the Compounding parameter (Snyder 1995, 2001, 2002)
- connected property: transitive resultative
- connected property: separable particle

English allows separable particle constructions:
Mary lifted the box up.

Spanish does not allow separable particle constructions:
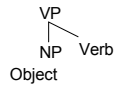María levantó la   caja (*arriba).
Mary lifted   the box   up

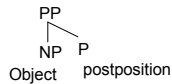## What are some real parameters?

Syntax: the Head Directionality parameter (Baker 2001, Cook & Newson 1996): heads of phrases (ex: Nouns of Noun Phrases, Verbs of Verb Phrases, Prepositions of Preposition Phrases) are consistently in either the leftmost or rightmost position

Japanese/Navajo: Head-Last

Verb Phrase:
Object Verb

```
        VP
       / \
     NP   Verb
   Object
```

Postpositions:
Noun Phrase Postposition

```
         PP
        / \
      NP    P
    Object  postposition
```
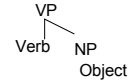
What are some real parameters?

Syntax: the Head Directionality parameter (Baker 2001, Cook & Newson 1996): heads of phrases (ex: Nouns of Noun Phrases, Verbs of Verb Phrases, Prepositions of Preposition Phrases) are consistently in either the leftmost or rightmost position

Edo/English: Head-First

Verb Phrase:
Verb Object

```
       VP
      / \
   Verb  NP
        Object
```

Prepositions:
Preposition Noun Phrase

```
        PP
       / \
      P    NP
  preposition  Object
```
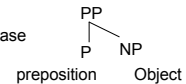
Remaining problems even if we have parameters

The observable data are often the result of a combination of parameters. That is, the observable data are the result of some unobservable process, and the child has to reverse engineer the observable data to figure out what parameter values might have produced the observable data - even if the child already knows what the parameters are!

????
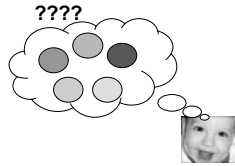
An example of the problem: metrical phonology

Metrical phonology:
What tells you to put the EMphasis on a particular SYLlable

Process speakers use:
  Basic input unit: syllables

  Larger units formed: metrical feet
    The way these are formed varies from language to language. Only syllables in metrical feet can be stressed.
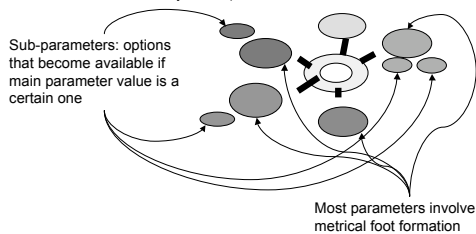
  Stress assigned within metrical feet
    The way this is done also varies from language to language.

Observable Data: stress contour of word

em pha sis

↓

(em pha) sis

↓

(EM pha) sis

↓

EMphasis

An example of the problem: metrical phonology

Metrical phonology system here: 5 main parameters, 4 sub-parameters
(adapted from Dresher 1999 and Hayes 1995)

Sub-parameters: options that become available if main parameter value is a certain one

Most parameters involve metrical foot formation

All combine to generate stress contour output

A Brief Tour of Parametric Metrical Phonology

Are syllables differentiated?

  No: system is quantity-insensitive (QI)

S	**S**	**S**
CVV	CV	CCVC
lu	di	crous

A Brief Tour of Parametric Metrical Phonology

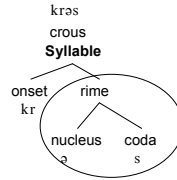Are syllables differentiated?

No: system is quantity-insensitive (QI)

S S S
CVV CV CCVC
lu di crous

Yes: system is quantity-sensitive (QS)

Only allowed method: differ by rime weight

krəs
crous
Syllable

onset rime
kr

nucleus coda
ə s

CVV CV CCVC
lu di crous

A Brief Tour of Parametric Metrical Phonology

Are syllables differentiated?

No: system is quantity-insensitive (QI)

S S S
CVV CV CCVC
lu di crous

Yes: system is quantity-sensitive (QS)

Only allowed method: differ by rime weight
Only allowed number of divisions: 2
Heavy vs. Light

VV always Heavy
V always Light

Option 1: VC Heavy (QS-VC-H)

H L H
CVV CV CCVC
lu di crous

Option 2: VC Light (QS-VC-L)

H L L
CVV CV CCVC
lu di crous

A Brief Tour of Parametric Metrical Phonology

Are all syllables included in metrical feet?

Yes: system has no extrametricality (Em-None)

(...)
L L H
VC VC VV
af ter **noon**

A Brief Tour of Parametric Metrical Phonology

Are all syllables included in metrical feet?

Yes: system has no extrametricality (Em-None)

(...)
L L H
VC VC VV
af ter **noon**

No: system has extrametricality (Em-Some)

Only allowed # of exclusions: 1
Only allowed exclusions:
Leftmost or Rightmost syllable

A Brief Tour of Parametric Metrical Phonology

Are all syllables included in metrical feet?

```
(        ...      )
L       L       H
VC      VC      VV
af      ter     noon
```

Yes: system has no extrametricality (Em-None)

No: system has extrametricality (Em-Some)

Only allowed # of exclusions: 1
Only allowed exclusions:
    Leftmost or Rightmost syllable

Leftmost syllable
excluded: Em-Left

```
(  ...  )
L    H    L
V    VC   V
a    gen  da
```

Rightmost syllable
excluded: Em-Right

```
(  ...  )
H    L    H
VV   V    VC
lu   di   crous
```

A Brief Tour of Parametric Metrical Phonology

What direction are metrical feet constructed?

Two logical options

From the left:
Metrical feet are constructed from the left edge of the word (Ft Dir Left)

```
(  ———→
H    L    H
VV   V    VC
lu   di   crous
```

From the right:
Metrical feet are constructed from the right edge of the word (Ft Dir Right)

```
   ←———  )
H    L    H
VV   V    VC
lu   di   crous
```

A Brief Tour of Parametric Metrical Phonology

Are metrical feet unrestricted in size?

Yes: Metrical feet are unrestricted, delimited only by Heavy syllables if there are any (Unbounded).

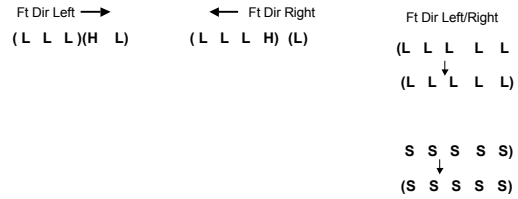## A Brief Tour of Parametric Metrical Phonology

Are metrical feet unrestricted in size?

Yes: Metrical feet are unrestricted, delimited only by Heavy syllables if there are any (Unbounded).

Ft Dir Left ———→

```
L  L  L   H   L
     ↓
(L  L  L   H   L
       ↓
(L  L  L)(H   L
       ↓
(L  L  L)(H   L)
```

A Brief Tour of Parametric Metrical Phonology

Are metrical feet unrestricted in size?

Yes: Metrical feet are unrestricted, delimited only by Heavy syllables if there are any (Unbounded).

Ft Dir Left ⟶   ⟵ Ft Dir Right

(L L L)(H L)

L L L H L
↓
L L L H L)
↓
L L L H) (L)
↓
(L L L H) (L)

A Brief Tour of Parametric Metrical Phonology

Are metrical feet unrestricted in size?

Yes: Metrical feet are unrestricted, delimited only by Heavy syllables if there are any (Unbounded).

Ft Dir Left ⟶   ⟵ Ft Dir Right

(L L L)(H L)   (L L L H) (L)

Ft Dir Left/Right

(L L L L L
↓
(L L L L L)

S S S S S)
↓
(S S S S S)

A Brief Tour of Parametric Metrical Phonology

Are metrical feet unrestricted in size?

Yes: Metrical feet are unrestricted, delimited only by Heavy syllables if there are any (Unbounded).

(L L L)(H L)
(L L L H) (L)
(L L L L L)
(S S S S S)

No: Metrical feet are restricted (Bounded).

The size is restricted to 2 options: 2 or 3.

A Brief Tour of Parametric Metrical Phonology

Are metrical feet unrestricted in size?

Yes: Metrical feet are unrestricted, delimited only by Heavy syllables if there are any (Unbounded).

(L L L)(H L)
(L L L H) (L)
(L L L L L)
(S S S S S)

No: Metrical feet are restricted (Bounded).

The size is restricted to 2 options: 2 or 3.

Ft Dir Left ⟶   2 units per foot (Bounded-2)   3 units per foot (Bounded-3)

x x x x   x x x x
↓   ↓
(x x) (x x   (x x x) (x
↓   ↓
(x x) (x x)   (x x x) (x)

A Brief Tour of Parametric Metrical Phonology

Are metrical feet unrestricted in size?

(L L L)(H L)

Yes: Metrical feet are unrestricted, delimited only by Heavy syllables if there are any (Unbounded).

(L L L H) (L)
(L L L L L)
(S S S S S)

No: Metrical feet are restricted (Bounded).
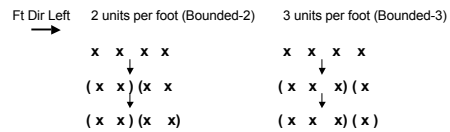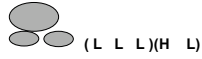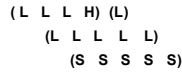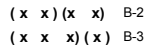
The size is restricted to 2 options: 2 or 3.
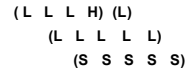The counting units are restricted to 2 options: syllables or moras.

(x x) (x x)   B-2
(x x x) (x)   B-3

A Brief Tour of Parametric Metrical Phonology

Are metrical feet unrestricted in size?

(L L L)(H L)

Yes: Metrical feet are unrestricted, delimited only by Heavy syllables if there are any (Unbounded).

(L L L H) (L)
(L L L L L)
(S S S S S)

No: Metrical feet are restricted (Bounded).

The size is restricted to 2 options: 2 or 3.
The counting units are restricted to 2 options: syllables or moras.

(x x) (x x)   B-2
(x x x) (x)   B-3

Ft Dir Left
Bounded-2
→
x x

(H   L)(L H)

(L   L) (L H) ← Count by syllables (Bounded-Syllabic)

(S   S) (S   S)

A Brief Tour of Parametric Metrical Phonology

Are metrical feet unrestricted in size?

(L L L)(H L)

Yes: Metrical feet are unrestricted, delimited only by Heavy syllables if there are any (Unbounded).

(L L L H) (L)
(L L L L L)
(S S S S S)

No: Metrical feet are restricted (Bounded).

The size is restricted to 2 options: 2 or 3.
The counting units are restricted to 2 options: syllables or moras.

(x x) (x x)   B-2
(x x x) (x)   B-3

Count by syllables   Ft Dir Left   Count by moras
(Bounded-Syllabic)   Bounded-2   (Bounded-Moraic)

(H   L)(L H)   →   xx   x   x   xx ← Moras (unit of weight):
                          x x   H   L   L   H   H = 2 moras xx
                                                 ↓   L = 1 mora   x
                                          (H) (L   L) (H)

A Brief Tour of Parametric Metrical Phonology
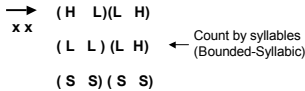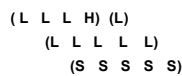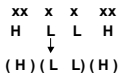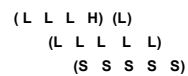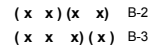
Are metrical feet unrestricted in size?

(L L L)(H L)

Yes: Metrical feet are unrestricted, delimited only by Heavy syllables if there are any (Unbounded).

(L L L H) (L)
(L L L L L)
(S S S S S)

No: Metrical feet are restricted (Bounded).

The size is restricted to 2 options: 2 or 3.
The counting units are restricted to 2 options: syllables or moras.

(x x) (x x)   B-2
(x x x) (x)   B-3

Count by syllables   Ft Dir Left   Count by moras
(Bounded-Syllabic)   Bounded-2   (Bounded-Moraic)

(H   L)(L H)   ←——————→   (H) (L   L) (H) ←
                 compare

A Brief Tour of Parametric Metrical Phonology

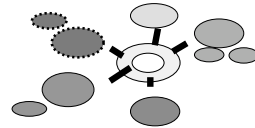Within a metrical foot, which syllable is stressed?

Leftmost:
Stress the leftmost syllable (Ft Hd Left)

(H)(L L)(H)

Rightmost:
Stress the rightmost syllable (Ft Hd Right)
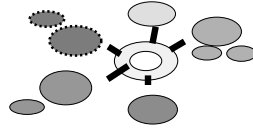
(H)(L L)(H)

(H)(L L)(H)

Generating a Stress Contour

Process speaker uses to generate stress contour

Generating a Stress Contour
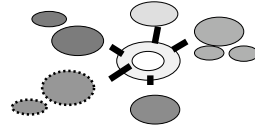
Process speaker uses to generate stress contour

Are syllables treated differently from one another?

Yes.

VC syllables are Heavy.

H	L	H
VC	CV	CVC
em	pha	sis

Generating a Stress Contour

Process speaker uses to generate stress contour

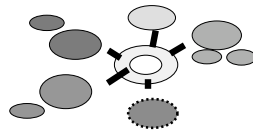Are any syllables not included in metrical feet?

Yes.

Rightmost syllable is not included in metrical foot.

(...)

H	L	H
VC	CV	CVC
em	pha	sis

Slide 1 (top left)

Generating a Stress Contour

Process speaker uses to generate stress contour

Which direction are feet constructed from?

From the right.

	H	L)	H
	VC	CV	CVC
	em	pha	sis

Slide 2 (top right)

Generating a Stress Contour

Process speaker uses to generate stress contour

Are feet unrestricted in size?

No.

2 syllables per foot.

	(H	L)	H
	VC	CV	CVC
	em	pha	sis

Slide 3 (bottom left)

Generating a Stress Contour

Process speaker uses to generate stress contour

Which syllable of the foot is stressed?

Leftmost.

	(H	L)	H
	VC	CV	CVC
	em	pha	sis

Slide 4 (bottom right)

Generating a Stress Contour

Process speaker uses to generate stress contour

Learner's task: Figure out which parameter values were used to generate this contour.

	(H	L)	H
	VC	CV	CVC
	EM	pha	sis

An example of the problem: metrical phonology

How big are metrical feet? Are all syllables included in metrical feet? Where does the stress go inside a metrical foot - probably on the leftmost side???…

VC   CV   CVC
EM   pha   sis

A possible solution (stay tuned for next time)

Maybe I should look for data that definitively pick out one parameter value over another… (Pearl 2008)

VC   CV   CVC
EM   pha   sis

Summary:
Linguistic Parameters

Linguistic parameters are similar to statistical parameters in that they are abstractions about the observable data. For linguistic parameters, the observable data are language data.

Parameters make acquisition easier because hard-to-learn structures can be learned by observing easy-to-learn structures that are connected to the same parameters.

Still, even with parameters, acquisition can be hard because a child has to figure out which parameter values produce the observable data, which isn't always easy.

Questions?

Be working on structure review questions