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: goblin
- syllables: goblin
- words: goblin
- phrases: Noun Phrase (NP), Verb Phrase (VP)
- sentences: The sneaky goblin stole the baby

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 Possession

Diagram:

- S
- NP
- VP
- Subject
- Object
- PP
- P
- Postposition
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:
- $\mu$ for the mean
- $\sigma$ 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)

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

<table>
<thead>
<tr>
<th>French</th>
<th>Italian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject Verb</td>
<td>Subject Verb</td>
</tr>
<tr>
<td>&quot;Verb&quot;</td>
<td>&quot;Verb&quot;</td>
</tr>
<tr>
<td>Requires special action for embedded subject questions.</td>
<td>Requires special action for embedded subject questions.</td>
</tr>
<tr>
<td>Not okay to leave out expletive subject &quot;it&quot;.</td>
<td>Okay to leave out expletive subject &quot;it&quot;.</td>
</tr>
</tbody>
</table>

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.

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.

<table>
<thead>
<tr>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
<th>P5</th>
</tr>
</thead>
<tbody>
<tr>
<td>French</td>
<td>Subject Verb</td>
<td>Subject Verb</td>
<td>&quot;Verb&quot;</td>
<td>&quot;Verb Subject&quot;</td>
</tr>
<tr>
<td>Italian</td>
<td>Subject Verb</td>
<td>Verb</td>
<td>Verb Subject</td>
<td>Requires special action for embedded subject questions.</td>
</tr>
<tr>
<td>Requires special action for embedded subject questions.</td>
<td>Does not require special action for embedded subject questions.</td>
<td>Not okay to leave out expletive subject &quot;it&quot;.</td>
<td>Okay to leave out expletive subject &quot;it&quot;.</td>
<td></td>
</tr>
</tbody>
</table>
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.

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

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.

Step 1: Observe P1, P2, P3, or P5. In this case, all the observed examples of these structures are behavior a.
Why Hard-To-Learn Structures Are Easier

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

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.)

Why Acquisition Is Easier

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?


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?

- 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

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

Object

Verb

NP

Postpositions:
Noun Phrase Postposition

PP

NP

P

Object

Postposition

Edo/English: Head-First

Verb Phrase: Object Verb

Verb

NP

Object

Prepositions:
Preposition Noun Phrase

PP

NP

P

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
 Emphasis

A Brief Tour of Parametric Metrical Phonology

Are syllables differentiated?
No: system is quantity-insensitive (QI)

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)

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)

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

Are all syllables included in metrical feet?

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
A Brief Tour of Parametric Metrical Phonology

Are all syllables included in metrical feet?

Yes: system has no extrametricality (Em-None)  
VC VC VV  
af ter noon

No: system has extrametricality (Em-Some)

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

Leftmost syllable excluded: Em-Left  
Rightmost syllable excluded: Em-Right  
( ... )  
L H L  
V VC V  
a gen da

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

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).

Ft Dir Left  
L L L H L  
( L L L H L  
( L L H  
( L L H |H L  
( L L H |H L)
Are metrical feet unrestricted in size?

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

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).

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.

Count by syllables (Bounded-Syllabic)

Count by moras (Bounded-Moraic)

Moras (unit of weight):

\[ H = 2 \text{ moras} \]

\[ L = 1 \text{ mora} \]
A Brief Tour of Parametric Metrical Phonology

Within a metrical foot, which syllable is stressed?

Leftmost:
Stress the leftmost syllable (Ft Hd Left)

\[
(\text{H})(\text{L})(\text{L})(\text{H})
\]

Rightmost:
Stress the rightmost syllable (Ft Hd Right)

\[
(\text{H})(\text{L})(\text{L})\]

Generating a Stress Contour

Process speaker uses to generate stress contour

Are syllables treated differently from one another?

Yes.

VC syllables are Heavy.

\[
\begin{align*}
\text{H} & \quad \text{L} & \quad \text{H} \\
\text{VC} & \quad \text{CV} & \quad \text{CVC} \\
\text{em} & \quad \text{pha} & \quad \text{sis}
\end{align*}
\]

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.

\[
\begin{align*}
\text{H} & \quad \text{L} & \quad \text{H} \\
\text{VC} & \quad \text{CV} & \quad \text{CVC} \\
\text{em} & \quad \text{pha} & \quad \text{sis}
\end{align*}
\]
Generating a Stress Contour

Which direction are feet constructed from?
From the right.

Are feet unrestricted in size?
No.

Which syllable of the foot is stressed?
Leftmost.

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

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)

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.