# Formal Approaches to Second Language Acquisition

1

## Formal Approaches to SLA

- Universal Grammar
  - The initial state
  - UG principles
  - UG parameters
  - -Falsification
- Transfer: The UG Perspective
  - Levels of representation
  - Clustering
  - Learnability

2

## Formal Approaches to SLA

- Phonology
  - The Markedness Differential Hypothesis
  - Similarity/Dissimilarity: The Speech Learning Model
  - Optimality Theory
  - The Ontogeny Phylogeny Model

3

Formal Approaches to SLA

## UNIVERSAL GRAMMAR

## Definition of UG

- A set of principles and parameters that constrain all human languages.
- UG is part of the human genetic endowment and is encoded in the Language Acquisition Faculty (LAF).

5

## And what is the LAF?

- "An innate component of the human mind that yields a particular language through interaction with presented experience, a device that converts experience into a system of knowledge attained: knowledge of one or another language."

Chomsky (1986)

6

## Principles and Parameters of UG

- A principle of UG is a statement that is true for all human languages.
  For example:
  The principle of structure dependency
- A parameter must be set according to the requirements of the language being acquired. For example:
  The null subject parameter

7

## Principle of Structural Dependency

- Grammatical rules do not depend on the linear ordering of the words in the sentence, but on how these words are structured within constituents of specific types.

8

## Principle of Structural Dependency

- Subject-auxiliary inversion in English
  - She will laugh.

9

## Principle of Structural Dependency

- Subject-auxiliary inversion in English
  - She will laugh.
  - Will she laugh?

10

## Principle of Structural Dependency

- Subject-auxiliary inversion in English
  - She will laugh.
  - Will she laugh?
  - The student who is taking good notes will get an A.

11

## Principle of Structural Dependency

- Subject-auxiliary inversion in English
  - She will laugh.
  - Will she laugh?
  - The student who is taking good notes will get an A.
  - Is the student who taking good notes will get an A?

12

## Principle of Structural Dependency

- Subject-auxiliary inversion in English
  - She will laugh.
  - Will she laugh?
  - The student who is taking good notes will get an A.
  - Is the student who taking good notes will get an A?

13

## Principle of Structural Dependency

- Subject-auxiliary inversion in English
  - [$_{NP}$She] will laugh.
  - Will [$_{NP}$she] laugh?
  - [$_{NP}$The student who is taking good notes] will get an A.

14

## Principle of Structural Dependency

- Subject-auxiliary inversion in English
  - [$_{NP}$She] will laugh.
  - Will [$_{NP}$she] laugh?
  - [$_{NP}$The student who is taking good notes] will get an A.
  - Will [$_{NP}$the student who is taking good notes] get an A?

15

## The Null (Ø) Subject Parameter

1. I ate shepherds pie.
2. Ho mangiato il risotto alla milanese.
3. Mary speaks English very well
4. because she was born in the US.
5. Rosanna parla l'italiano molto bene
6. perché è nata in Italia.

16

## The Null (Ø) Subject Parameter

1. I ate shepherds pie.
2. Ø Ho mangiato il risotto alla milanese.
3. Mary speaks English very well
4. because she was born in the US.
5. Rossana parla l'italiano molto bene
6. perché Ø è nata in Italia.

17

## Principles and Parameters of UG

- A principle of UG is a statement that is true for all human languages.
  For example:
  The principle of structure dependency
- A parameter must be set according to the requirements of the language being acquired. For example:
  The null subject parameter

18

## The Logical Problem of Language Acquisition

- The linguistic input available to children under-determines the linguistic competence of adults.
- Thus children acquire properties of language that are not immediately obvious and that are not explicitly taught.
- If the child possesses only some general cognitive ability to make generalizations from input, many features of the adult language cannot be acquired.

19



20



21

## Co-occurrence of NPs and Pronouns

- $\text{Jane}_i$ washed $\text{her}_j$.
- $\text{She}_i$ washed $\text{Jane}_j$.
- $\text{She}_i$ washed $\text{her}_j$.
- $\text{She}_i$ washed $\text{herself}_i$.
- $\text{Jane}_i$ watched television before $\text{she}_{i/j}$ had her dinner.

- *$\text{Jane}_i$ washed $\text{her}_i$.
- *$\text{She}_i$ washed $\text{Jane}_i$.
- *$\text{She}_i$ washed $\text{her}_i$.
- *$\text{She}_i$ washed $\text{herself}_j$.
- *$\text{She}_i$ watched television before $\text{Jane}_i$ had her dinner.

22

## Binding Theory

- Binding: The association between a pronoun and an antecedent.
- Anaphoric: A term to describe an element (e.g. a pronoun) that derives its interpretation from some other expression in the discourse.
- Antecedent: The expression from which an anaphoric expression derives its interpretation.
- Anaphora: The relationship between an anaphoric expression and its antecedent.

23

## Binding Theory

- **Principle A** states that reflexives (and reciprocals, such as "each other") must always be bound in their domains.
- **Principle B** states that a pronoun must never be bound within its domain.
- **Principle C** states that R-expressions must never be bound. R-expressions are referential expressions: non-pronoun, uniquely identifiable entities, such as "the dog", or proper names such as "John".

24

## Binding Theory

- What is a binding domain?
  - In English, the binding domain is the clause (IP)
  - What is the binding domain in other languages that you know?

25

## Binding Theory

- $Jane_i$ washed $her_j$.
- $She_i$ washed $Jane_j$.
- $She_i$ washed $her_j$.
- $She_i$ washed $herself_i$.
- $Jane_i$ watched television before $she_{i/j}$ had her dinner.
- *$Jane_i$ washed $her_i$.
- *$She_i$ washed $Jane_i$.
- *$She_i$ washed $her_i$.
- *$She_i$ washed $herself_j$.
- *$She_i$ watched television before $Jane_i$ had her dinner.

26



27

## The Logical Problem of Language Acquisition

- If the child comes to the acquisition task solely equipped with abilities to make generalizations from the input data, it would seem impossible to arrive at the correct generalizations without a great many errors, if at all.
- In addition, the child appears to get little or no negative evidence because adults react to meaning and sociolinguistic appropriateness not to errors of form.
- The UG solution: Knowledge about what is and is not possible in adult language stems in part from an innate universal grammar, containing principles and parameters which constrain grammars in various ways.

28

## UG and SLA

- Are L1 and L2 acquisition comparable?
- What would constitute evidence for UG in SLA?
  - A learners' knowledge of L2 goes beyond what could be induced from the input.
  - A learners' knowledge of L2 goes beyond what could be reconstructed from the L1 (e.g., resetting parameters).
  - There are no violations of UG in interlanguage (no "wild grammars").

29

## A Test for the Availability of UG in Adult SLA

- Schachter, J. (1989). "Testing a proposed universal." In S. M. Gass & J. Schachter (Eds.), *Linguistic perspectives on second language acquisition* (pp. 73-88). New York: Cambridge University Press.

30

## Subjacency

- The Principle of Subjacency is a constraint on movement:
- *Movement of wh- elements is cyclical. It may not take place over more than one bounding node at a time.*

31

## *Wh*- movement in English

1. What did he say that he was reading?
2. What does she believe that he said that he was reading?
3. What are they claiming that she believes that he said that he was reading?
4. What do you think that they are claiming that she believes that he said that he was reading?

32

## Derivation of w*h*- movement

Two theories:

1. Cyclic: Each successively higher clause (=CP) forms a separate cycle in the derivation of the question. Each cycle leaves an intermediate trace.

   What$_i$ did he say [$t_i$ that he was reading $t_i$?]

2. Noncyclic: Derivation occurs in one fell swoop.

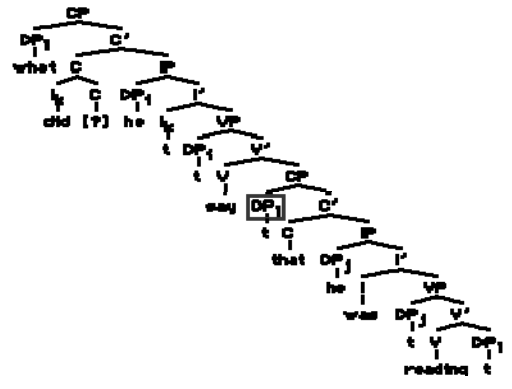
   What$_i$ did he say that he was reading $t_i$?

33

## Cyclic derivation of w*h*- movement

1. What$_i$ did he say [$t_i$ that he was reading $t_i$?]
2. What$_i$ does she believe [$t_i$ that he said [$t_i$ that he was reading $t_i$?]]
3. What$_i$ are they claiming [$t_i$ that she believes [$t_i$ that he said [$t_i$ that he was reading $t_i$?]]]
4. What$_i$ do you think [$t_i$ that they are claiming [$t_i$ that she believes [$t_i$ that he said [$t_i$ that he was reading $t_i$?]]]]

34




35

The fact that there are barriers to *wh*-movement shows that derivation must be cyclic.

36

## Barriers to *wh-* movement

- Sentential subject (DP)
- Noun complement (IP)
- Relative clause (DP)
- Embedded question (IP)

37

## Barriers to *wh-* movement: Sentential subject

That Tom got an 'A' on his first exam pleased him.

That Tom got an 'A' on his first exam pleased him.

*What did that he got on his first exam please Tom?

38

## Barriers to *wh-* movement: Noun complement

The fact that you didn't send your resume shows your lack of interest.

The fact that you didn't send your resume shows your lack of interest.

*What does the fact that you didn't send prove your lack of interest?

39

## Barriers to *wh-* movement: Relative clause

Bill found a principle that solves the problem of equilibrium.

Bill found a principle that solves the problem of equilibrium.

*Which problem did Bill find a principle that solves?

40

## Barriers to *wh-* movement: Embedded question

They don't know why Sue tolerates Larry.

They don't know why Sue tolerates Larry.

*Who don't they know why Sue tolerates?

41

## Subjacency

- The Principle of Subjacency is a constraint on movement:
  - *Movement of wh- elements is cyclical. It may not take place over more than one bounding node at a time.*
- In English, bounding nodes are IP and DP.

42

## A test for the availability of the principle of subjacency in adult SLA

- Do SL learners know about subjacency constraints on wh- movement in English?
- If so, where does this knowledge come from?
  - Transfer from learners' L1
  - If there is no movement in L1, then the knowledge of adult second language learners must be innate. That is, adult second language learners have access to UG.

43

## Schachter's Method

- A syntax test e.g.,
  - That oil prices will rise again is nearly certain.
  - There is a possibility that we can obtain the information elsewhere.
  - Vicki doesn't like deserts that have cream in them.
  - The police didn't discover who the murderer was.

44

## Schachter's Method

- A subjacency test e.g.,
  - What did that he got on his midterm please Andy?
  - What does the fact that you didn't send prove your lack of interest?
  - What did Marian visit the store that had in stock?
  - What can't you remember that you ate three days ago?

45

## Schachter's Method

| | | Syntax Test | |
|---|---|---|---|
| | | Pass | Fail |
| Subjacency Test | Pass | A | B |
| | Fail | C | D |

46

## Availability of the UG Principle of Subjacency

- Subjacency is a constraint on movement.
  - English has wh-movement in questions.
  - Indonesian has movement.
  - Chinese has no wh-movement but it has movement in other areas.
  - Korean has no movement in any part of the grammar.

47

## Native Speaker Results

| | | Syntax Test | |
|---|---|---|---|
| | | Pass | Fail |
| Subjacency Test | Pass | 14 | 1.8 |
| | Fail | 2.8 | 0.5 |

48

## Results from Indonesian Learners

| | | Syntax Test | |
|---|---|---|---|
| | | Pass | Fail |
| Subjacency Test | Pass | 7 | 0.8 |
| | Fail | 9.3 | 3 |

49

## Results from Chinese Learners

| | | Syntax Test | |
|---|---|---|---|
| | | Pass | Fail |
| Subjacency Test | Pass | 8.8 | 1.8 |
| | Fail | 7.8 | 1.8 |

50

## Results from Korean Learners

| | | Syntax Test | |
|---|---|---|---|
| | | Pass | Fail |
| Subjacency Test | Pass | 3.3 | 0.5 |
| | Fail | 10.8 | 6.5 |

51

## Results are Mixed

- Schachter (1989) concluded that UG is unavailable or of limited access in SLA.
- Bley-Vroman, Felix & Ioup (1988) also tested L2 learners' knowledge of subjacency violations. They concluded that UG must still be active.
- White (1988) investigated whether NSs of French acquire knowledge of the boundary status of the *IP*-node in English. Low-intermediate group had not reset the parameter, while a high-intermediate group did.

52

## UG and SLA

- Complete access
- No access (the Fundamental Difference Hypothesis)
- Partial access
- Dual access

53

## UG and SLA

- Complete access
  - L2 learners have full access to UG principles.
  - L1 provides learners with a 'quick setting' for the L2 parameter if the value is the same, otherwise the L2 learner proceeds in the same way as the L1 learner.

54

## UG and SLA

- No access (the Fundamental Difference Hypothesis)
  - L2 learners no longer have access to the principles and parameters of UG.
  - General learning principles replace UG.

55

## UG and SLA

- Partial access
  - L2 learners have access to UG through their L1.
  - They may be able to reset L1 parameters by means of general learning strategies.
  - UG is accessible but the learning principles are not.

56

## UG and SLA

- Dual access
  - L2 learners have access to UG but this is partly blocked by the use of general learning strategies.

57

## Problems with UG as a theory of SLA

1. There is no learning theory in UG. How does the learner identify particular bits of language as relevant to the setting of certain parameters?

58

## Problems with UG as a theory of SLA

2. UG only applies to "core" grammar, but there is much more grammar to be learned than just the core. And what about the learning of lexicon, phonology, semantics, sociolinguistic competence, discourse structures, etc?

59

## Problems with UG as a theory of SLA

3. In order to test UG in SLA we must find extremely rare grammatical structures.

60

## Problems with UG as a theory of SLA

4. Even if we concede that the solution to the logical problem of language acquisition requires innate knowledge, need that knowledge be in the specific form of UG? Consider universal operating principles of language acquisition such as those of Slobin or Andersen.

61

## Problems with UG as a theory of SLA

5. Evidence in UG studies is obtained from grammaticality judgments, since these are supposed to reflect competence. But there are many problems with grammaticality judgments: they are just another kind of performance, learner's judgments are unstable, and individual differences among learners are ignored.

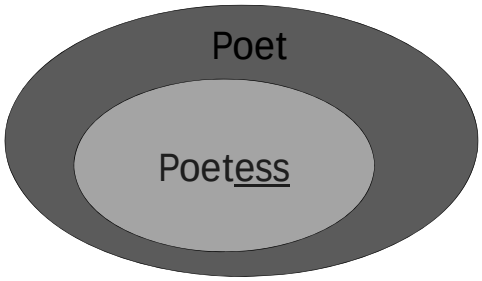
62

Formal Approaches to SLA

**PHONOLOGY**

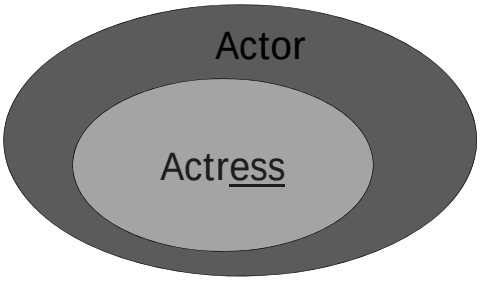
63

## Markedness



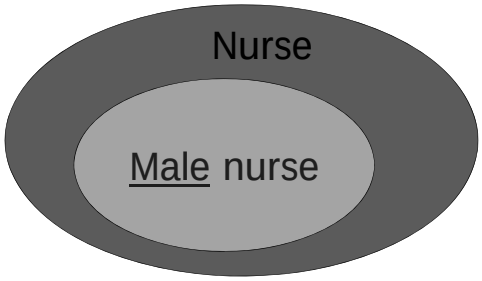

64

## Markedness




65

## Markedness




66

## Identify the markedness relationships between these pairs of propositions

1. Huimin is a poetess. / Huimin is a poet.
2. Kayla is a student. / Kayla is a junior.
3. Liu Yang lives in Madison. / Liu Yang lives in Wisconsin.
4. Mandeep speaks Russian. / Mandeep loves hot food.
5. Ae Ree takes the bus to school. / Ae Ree doesn't walk to school.
6. Richard drove to the Northwoods. / Richard got gas in Wausau.

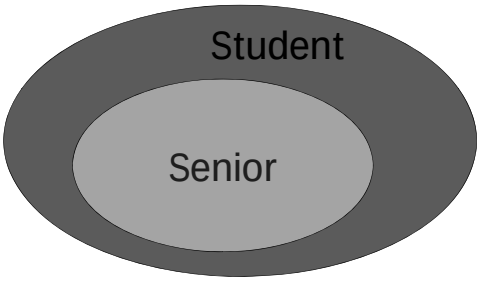
67

## Marked or unmarked?

- If Erin is a senior, then she must be a student.
- If Erin is a student, then she may be a senior, but we don't know.
- Erin is a senior is marked, and Erin is a student is unmarked.

68

## Markedness




69

Formal Approaches to SLA

## THE MARKEDNESS DIFFERENTIAL HYPOTHESIS

70

## Sonorants and Obstruents

- **Sonorants:**
  - **Vowels**
  - **Glides**
  - **Liquids**
  - **Nasals**
- **Obstruents**
  - **Voiced fricatives**
  - **Voiceless fricatives**
  - **Voiced stops**
  - **Voiceless stops**
  - ***/s/***

71

## Voicing of Obstruents

- Imagine a word with consonants in three different positions. C = consonant. V = vowel.
- Initial Position: CV
- Medial Position: VCV
- Final Position: VC

72

## Identify the position of consonants in these words. Are they obstruents? Are they voiced?

- Jess
- Sara
- Meredith
- Haley
- Erin
- Kyle
- Tammy
- Shenika
- Minetta
- Margaret
- Stephanie
- Rebecca
- Desiree
- Alyssa
- Cassie
- Lesley

73

## Voicing of Obstruents

- Type A languages: CVCVC
- Languages which maintain a voice contrast between obstruents in initial, medial, and final positions
- Examples:
  - English, Arabic, Swedish

74

## Voicing of Obstruents

- Type B languages: CVCVC
- Languages that maintain a voice contrast between obstruents in initial and medial positions but *not* in final position
- Examples:
  - German, Polish, Greek, Japanese, Catalan

75

## Voicing of Obstruents

- Type C languages: CVCVC
- Languages that maintain a voice contrast between obstruents in initial position, but *not* in medial or final positions.
- Examples:
  - Corsican, Sardinian

76

## Voicing of Obstruents

- Type D languages: CVCVC
- Languages that maintain no voice contrasts in initial, medial or final positions
- Example:
  - Korean

77

## Markedness Differential Hypothesis

- L2 difficulty can be predicted on the basis of the markedness relationships that hold among the differences between the NL and TL.
- Those structures in the TL that are different and more marked than the corresponding structures in the NL will be difficult:
  - The degree of difficulty corresponds directly to the degree of markedness.
- Those structures that are different, but not more marked than the corresponding NL structures will not be more difficult.

78

## What is the difference between the MDH and the CAH?

## Predictions of the MDH

- Voiced obstruent ⊃ Voiceless obstruent
- Markedness hierarchy of voicing contrasts
- Final ⊃ Medial ⊃ Initial ⊃ None
- What predictions can be made about the relative learning difficulties for voiced obstruents?
  - NSs of English learning German
  - NSs of German learning English

80

## Find the word-final voiced obstruents in English

- *Please call Stella. Ask her to bring these things with her from the store: Six spoons of fresh snow peas, five thick slabs of blue cheese, and maybe a snack for her brother Bob. We also need a small plastic snake and a big toy frog for the kids. She can scoop these things into three red bags, and we will go meet her Wednesday at the train station.*

81

## Here are the word-final voiced obstruents in English

- *Please call Stella. Ask her to bring these things with her from the store: Six spoons of fresh snow peas, five thick slabs of blue cheese, and maybe a snack for her brother Bob. We also need a small plastic snake and a big toy frog for the kids. She can scoop these things into three red bags, and we will go meet her Wednesday at the train station.*

82

## German L1 – English L2

[plis kɔl stɛlɝ æsk hɝ tʰŭ bɹĩŋ ðis̪
θĩŋz̥ v̪ɪθ hʲɝ fɹɑm ðə stœɹ sɪks
spũns ʌf fɹɛʃ sno pʰis faɪf θɪkθ
ʌm slæps ʌf blu tʃiz̥ ǽn meɪbi ĕ
snæk foɹ hɚ bɹʌðə bɑb v̪i alzo
nid ə s̪mal plæstɪk snɐ̪ɪk ǽn ə bɪk
tʰɔɪ fɹɔk foɹ ðə kɪd̥s v̪i kʰɛ̃n skup
d̪ɪs θĩŋz̥ ɪntʰŭ θɹi ɹɛt bægz̥ ǽn ɱi
wɪl go mit hɝ wɛnsdeɪ ǽt ðə tɹẽn
steʃɪn]

83

## Phonetic Alternations & Underlying Forms of Final Consonants

- L1 Spanish (from Venezuela)

[ pl̥is kol ɛstɛl̪a æks hɛɹ tu brĩŋ d̪is
θĩŋs wiθ hɛɹ frãm d̪ɛ stoɹ siks
ɛspũns oɹ fɹɛʃ ɛsno pis faɪf θik
ɛslæf of blu tʃis ãm mebi ɛ snæk¬
foɹ hɛɹ broðɛɹ bap¬ wi also nid ɛ̃
smol pl̥æstik¬ ɛ̃snek æ̃n ʌ bik¬ toɪ
frak foɹ də kis ʃi kæn ɛskup¬ ðis
θĩŋs ĩntu tɹi rɛt bæks æ̃ŋ wi wil go
mit¬ hɛɹ wɛ̃zde æ̃d̪ə tɹẽn ɛsteʃə̃n ]

84

## Phonetic Alternations & Underlying Forms of Final Consonants

- L1 Mandarin Chinese (from Beijing)

[pli:s kɔlˠ stɛla as xɚ tʊ b̥ɹɪŋ d̪is
s̪ĩ:nz̥ vɪz̪ hɚ fɹʷʌm stɔ:ɹ s̪ɪks
spʰɹʊn̪z ə̆spʰũ:nz̥ ɔv̥ə fɹɛʃ snoʊ pis
faɪv̥ s̪t̪ik slæ:ps ɔv̥ə blu tʃi:s ænə
meɪbi ɛ snæk fɔ xɜɹ b̥ɹʌðə̆ bɔ:b vi
ɔlˠsoʊ nid̪ə smɔlˠ plæstɪx sneɪk
ænd ʌ bɪɣə̆ tɔɪ fɹɔ:g fɔ d̪ə ki:s ʃi kẽn
skɹu: d̪is s̪ɪns ɪntu s̪ɹɪ ɹaɪt bæ:g̊s ɛnʌ
vi vɪl go mit˺ xɚ vɛ̞nsde: ætə tɹe̞ɪn
steɪʃən]

85