What can you say without syntax?
A grammatical hierarchy

Ray Jackendoff and Eva Wittenberg
Tufts University
Introduction

Old question: How much of the distribution of forms in a language can be predicted by semantics, and how much is a consequence of syntax?

Answering this question was one of the motivations behind *Simpler Syntax* (Culicover and Jackendoff 2005).
A sentence is a triple of well-formed phonological, syntactic, and conceptual structures, with well-formed links through the interfaces.
What would a language of this sort be like?
Introduction

How much thought and what kind of thought can you express without the tools of fully complex syntax?
How far can you get based on semantics alone?
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How far can you get based on semantics alone?

A hierarchy of grammars

• Not a hierarchy of formal languages, like the Chomsky hierarchy
• A hierarchy of grammars that map meanings to sounds – useful for communicating ideas
Introduction

Assumption: System of meaning/thought remains constant across hierarchy
Grammars in the hierarchy offer different resources for expressing thought
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Grammars in the hierarchy offer different resources for expressing thought
Methodology: Assume as little syntax as possible to describe the facts.
Introduction

Guiding intuition: Simpler grammars put more responsibility for understanding on pragmatics and use of context. More complex grammars reduce ambiguity and dependence on context.
Introduction

Two ways to understand the hierarchy

Weaker way: It is a formal tool for describing communication systems with a continuum of possibilities.
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Weaker way: It is a formal tool for describing communication systems with a continuum of possibilities.

Stronger way: An empirical claim about the language faculty: It contains layers of varying degrees of complexity.

This may show up in acquisition, and may give clues about evolution of language.
The hierarchy

One-word grammar:

\[ \text{Utterance} \rightarrow \text{Word} \quad (\text{or} \quad [\text{Utterance} \ \text{Word}]) \]
The hierarchy

One-word grammar:
\[ \text{Utterance} \rightarrow \text{Word} \quad (\text{or} \quad [\text{Utterance} \ \text{Word}]) \]

Two-word grammar:
\[ \text{Utterance} \rightarrow \text{Word} \ (\text{Word}) \quad (\text{or} \quad [\text{Utterance} \ \text{Word} \ \text{Word}]) \]
The hierarchy

One-word grammar:
\[
\text{Utterance} \rightarrow \text{Word} \quad \text{(or } [\text{Utterance Word}] \text{)}
\]

Two-word grammar:
\[
\text{Utterance} \rightarrow \text{Word (Word)} \quad \text{(or } [\text{Utterance Word Word}] \text{)}
\]

Linear grammar:
\[
\text{Utterance} \rightarrow \text{Word}^* \quad \text{(or } [\text{Utterance Word}^*] \text{)}
\]
The hierarchy

One-word grammar:
\[ \text{Utterance} \rightarrow \text{Word} \quad \text{(or} \quad [\text{Utterance Word}] \quad \text{)} \]

Two-word grammar:
\[ \text{Utterance} \rightarrow \text{Word} \text{(Word)} \quad \text{(or} \quad [\text{Utterance Word Word}] \quad \text{)} \]

Linear grammar:
\[ \text{Utterance} \rightarrow \text{Word}^* \quad \text{(or} \quad [\text{Utterance Word}^*] \quad \text{)} \]

Note: No parts of speech or morphology!
Interpretation driven by semantics alone.
The hierarchy

Simple phrase grammar:

Utterance → [Word/Phrase]*
Phrase → Word*

One level of embedding only!
Phrases may be either prosodic
  or (if there are parts of speech) syntactic.
The hierarchy

Simple phrase grammar:

Utterance \[\rightarrow\] [Word/Phrase]*
Phrase \[\rightarrow\] Word*

One level of embedding only!
Phrases may be either prosodic
or (if there are parts of speech) syntactic.

Recursive phrase grammar:

Utterance \[\rightarrow\] [Word/Phrase]*
Phrase \[\rightarrow\] [Word/Phrase]*
The hierarchy

**Morphology**

**Compounding:**

Word \(\rightarrow\) Word Word

**Affixation:**

Word \(\rightarrow\) \{Word/Stem, Affix\} (either order)
The hierarchy

Morphology

Compounding:
Word → Word Word

Affixation:
Word → \{Word/Stem, Affix\} (either order)

Other elaborations: functional categories, long-distance dependencies, binding of anaphors, …
The hierarchy

Many phenomena in the literature described as having:

- No subordination (i.e. no recursion)
- No functional categories
- Little or no morphology
- Semantically-driven word order
The hierarchy

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• No functional categories
• Little or no morphology
• Semantically-driven word order

In the hierarchy, these phenomena can be described by either linear grammar or simple phrase grammar
The hierarchy

Summing up:

• One-word grammar
• Two-word grammar
• Linear grammar
• Simple phrase grammar with prosodic phrases
• Simple phrase grammar with syntactic phrases
• Recursive phrase grammar

Morphology and syntactic categories are possible from about linear grammar on.
Interface rules

A *word* is an interface rule that connects a piece of phonology to a piece of meaning and to syntactic features.

Phonology:  /kæt/
Syntax:  N
Semantics:  FELINE, PET, etc.
Interface rules

Combinatorial interface rules: How the meanings of the parts of a constituent are combined into its meaning.
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Combinatorial interface rules: How the meanings of the parts of a constituent are combined into its meaning.

A significant result: Many of the same general interface rules apply whether the constituent is an Utterance, a Phrase, or a Word, and whether its parts are Phrases, Words, or morphemes.
Interface rules for one-word grammar

Simplest interface rule for one-word grammar:

Meaning of word = meaning of utterance

Phonology-syntax: $[\text{Utterance } \text{Word}_1]_2$

Semantics: $X_{1,2}$
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Phonology/syntax: \([\text{Utterance } \text{Word}_1]_2\)
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Even simpler (degenerate form):

Phonology: \(\text{Utterance}_1\)
Semantics: \(X_1\)
Interface rules for one-word grammar

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Semantics: $X_1$

This is the grammar for primate calls and for hello, ouch, upsey-daisy, abracadabra
Interface rules for one-word grammar

One-word grammar with pragmatics:

Phonology/syntax: \([\text{Utterance Word}_1]_2\)
Semantics: \([F (X_1)]_2\)

The function \(F\) is unexpressed; may be derived from linguistic or nonlinguistic context.
Interface rules for one-word grammar

One-word grammar with pragmatics:

Phonology/syntax: \([\text{Utterance } \text{Word}_1]_2\)
Semantics: \([F (X_1)]_2\)

The function \(F\) is unexpressed; may be derived from linguistic or linguistic context.

Example: Interpretation of child’s one-word stage.
Interface rules for one-word grammar

Enrichment schema for one-phrase utterances:

Phonology/syntax: \[ [\text{Utterance Phrase}_1]_2 \]

Semantics: \[ [F (X_1)]_2 \]

Examples:

An eagle!!
Some scotch?
[What kind of pizza do you want?] – Pepperoni.
Interface rules for one-word grammar

Enrichment schema for coercions:

Phonology/syntax: \([\text{Phrase Phrase}_1 \text{ }_2]\)
Semantics: \([F (X_1)]_2\)

Examples:

Plato \([= \text{ 'book by Plato'}]\) is on the top shelf, next to Chomsky.
The ham sandwich \([= \text{ 'person with ham sandwich'}]\) wants more coffee.
(Sluicing) Joe ate something, but I don’t know what \([= \text{ 'what he ate'}]\).
Interface rules for two-word grammars

The new problem: Specifying relation between the meanings of the two words.

Sample system: English N-N compounds

1. Function-argument schema
2. Modification schema
3. Co-argument schema
Interface rules for two-word grammars

Function-argument schema

  Morphosyntax:  \([_N N_1 N_2 ]_3\)
  Semantics:    \([F_2 (X_1)]_3\)

Examples:

  union member [= ‘member of a union’]
  helicopter attack [= ‘attack by helicopter’]

No need for further syntax!
Interface rules for two-word grammars

Modification schema

Morphosyntax: \([_N A/N_1 N_2 \ ]_3\)
Semantics: \([X_2; Y_1]_3\)

Examples:

blackbird [= ‘bird that is black’]
chocolate cake [= ‘cake that is chocolate’]
Interface rules for two-word grammars

Modification schema

Morphosyntax: \([_{N} A/N_1 N_2 ]_3\)
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Examples:

blackbird \([= \text{‘bird that is black’}]\)
chocolate cake \([= \text{‘cake that is chocolate’}]\)

Modification schema plus enrichment:

snowman \([= \text{‘simulation of man that is made of snow’}]\)
garbage man \([= \text{‘man who takes away garbage’}]\)
Interface rules for two-word grammars

**Co-argument schema**

Morphosyntax: \([N \ N_1 \ N_2]_3\)

Semantics: \([F (X_1, \ Y_2)]_3\)

**Example (with enrichment)**

seahorse [= ‘something that looks like a horse and lives in the sea’]
Interface rules for two-word grammars

In two-word child language:

- **Phonology/syntax:** $[\text{Utterance Word Word}]$
- **Function-argument schema:**
  - *Mommy fix* [= ‘Mommy should fix it’]
- **Modification schema + enrichment:**
  - *Big house* [= ‘that’s a big house’]
- **Co-argument schema:**
  - *Mommy pumpkin* [= ‘Mommy cuts the pumpkin’]
Interface rules for two-word grammars

In two-word child language:

Phonology/syntax: \([\text{Utterance Word Word}]\)

\(\text{Mommy sock} = \text{‘Mommy’s sock’} \text{ (Modification)}\)

\(\text{Mommy sock} = \text{‘Mommy’s putting a sock on me’} \text{ (Co-argument)}\)
Interface rules for two-word grammars

Scaling up to phenomena in full languages:

**Function-argument schema:** Principles for integrating syntactic heads and complements

**Modification schema:** Principles for integrating syntactic heads with adjuncts
Interface rules for two-word grammars

Scaling up to phenomena in full languages:

Co-argument schema:

Paratactic conditional

You shoot a cop, you go to jail.

Implicit copula (small clause)

Everyone out of the car!

John at a baseball game?! (Mad Magazine sentences)

[John at a baseball game] is hard to imagine.

No dogs allowed. Refreshments in the kitchen. (signage)
Word order and thematic roles

*chicken eat*: Is chicken eating or being eaten?

*cow horse*: Is cow doing something to horse, or vice versa?
Word order and thematic roles

*chicken eat*” Is chicken eating or being eaten?

cow horse: Is cow doing something to horse, or vice versa?

cow big horse: Is the cow big, or the horse?

Strategies for dealing with this are found in many languages of the world.
Word order and thematic roles

Agent > Patient:
   (special case of the Co-Argument schema)

Phonology/syntax: \([\text{Utterance} \ \ldots \text{Word}_1 \ \ldots \ \text{Word}_2 \ldots]_3\)
Semantics: \([F (\text{Agent: } X_1, \ \text{Patient: } Y_2, \ \ldots)]_3\)
Word order and thematic roles

Agent > Action
(special case of the Function-argument schema)

Phonology/syntax: \[[\text{Utterance} \ldots \text{Word}_1 \ldots \text{Word}_2 \ldots]_3\]
Semantics: \[[F_2 (\text{Agent}: X_1, \ldots)]_3\]
Word order and thematic roles

**Action > Patient** (Prototype for VO order)

- **Phonology/syntax:** \([\text{Utterance} \ldots \text{Word}_1 \ldots \text{Word}_2\ldots]_3\)
- **Semantics:** \([F_1 (\ldots, \text{Patient: } X_2, \ldots)]_3\)

**Patient > Action** (Prototype for OV order)

- **Phonology/syntax:** \([\text{Utterance} \ldots \text{Word}_1 \ldots \text{Word}_2\ldots]_3\)
- **Semantics:** \([F_2 (\ldots, \text{Patient: } X_1, \ldots)]_3\)
Word order and thematic roles

Linear order and information structure:

**Topic first**

Phonology/syntax: \([\text{Utterance Word}_1 \ldots]_2\)

Information structure: \(\text{Topic}_1\)

**Focus last**

Phonology/syntax: \([\text{Utterance} \ldots \text{Word}_1]_2\)

Information structure: \(\text{Focus}_1\)
Word order and thematic roles

*chicken eat*

= ‘chicken is eating’  (Agent > Action)
= ‘someone is eating chicken’

(Patient > Action, if language has it)

*eat chicken*  = ‘chicken is eating’

(Focus Last, if language has it)
= ‘someone is eating chicken’

(Action > Patient, if language has it)
Scaling up to more complex languages

Agent > Action, Agent > Patient, Action > Patient, Patient > Action are prototypes for SVO and SOV order. Topic often marked by initial position.
Focus often marked by final or near-final position.
Conclusion: Simpler principles don’t go away as we move up the hierarchy!
Phenomena from lower in the hierarchy

• Pidgins: Described as having
  No subordination
  No morphology
  No functional categories
  Free omission of arguments
  Unstable word order with bias toward Agent First, Focus Last.
  Any evidence for parts of speech? phrasal categories?
Phenomena from lower in the hierarchy

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  No functional categories
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Conclusion: Perhaps linear grammars or simple phrase grammars
Phenomena from lower in the hierarchy

- Late second language acquisition (Klein and Perdue):
  All learners go through a stage they call Basic Variety. Some improve, some don’t.
  No inflectional morphology
  No sentential subordination
  Arguments freely omitted.
  Word order based on semantic roles: Agent first, Focus last.
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Conjecture: Linear or simple phrase grammar.
Phenomena from lower in the hierarchy

- Home Sign (Goldin-Meadow):
  - Children invent rudimentary morphology
  - Arguments freely omitted
  - Word order probabilistic, semantically biased
  - No parts of speech, no embedding (on our analysis)
Phenomena from lower in the hierarchy

• Home Sign (Goldin-Meadow):
  Children invent rudimentary morphology
  Arguments freely omitted
  Word order probabilistic, semantically biased
  No parts of speech, no embedding (on our analysis)

Conjecture: Linear grammar with small amount of morphology.
Phenomena from lower in the hierarchy

• Al-Sayyid Bedouin Sign Language (Aronoff, Meir, Sandler, Padden)
  First generation signers: One-word grammar with small amount of two-word.
Phenomena from lower in the hierarchy

- Al-Sayyid Bedouin Sign Language (Aronoff, Meir, Sandler, Padden)
  First generation signers: One-word grammar with small amount of two-word.
  Older second-generation: Linear grammar with no/little prosodic support.
  Younger second generation: Simple phrase grammar with prosodic phrases.
Phenomena from lower in the hierarchy

- Central Taurus Sign Language (CTSL: Rabia Ergin, Naomi Caselli, et al.)
  - Morphology: Compounding, verb modulation by classifiers and spatial agreement
  - No evidence for sentential embedding
  - Possibly iterated possessives
  - SV order in 1-argument sentences
  - Unreliable word order in 2- and 3-argument sentences with two animate arguments
  - Tendency to omit all but one argument
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Conclusion: Linear grammar plus morphology
Phenomena from lower in the hierarchy

- Central Taurus Sign Language (CTSL: Rabia Ergin, Naomi Caselli, et al.)
  Morphology: Compounding, verb modulation by classifiers, spatial agreement
  SV order in 1-argument sentences
  Unreliable word order in 2- and 3-argument sentences
  Strong preference for sentences to be limited to 2 words

Conclusion: linear grammar, preference for 2-word grammar, considerable morphology
Phenomena from lower in the hierarchy

• Processing strategies (Townsend & Bever, Ferreira): People use “strategies” – semantic principles of word order such as Agent > Patient. Similar behavior in Broca’s aphasics and in normals under stress.
Phenomena from lower in the hierarchy

• Processing strategies (Townsend & Bever, Ferreira): People use “strategies” – semantic principles of word order such as Agent > Patient. Similar behavior in Broca’s aphasics and in normals under stress.

• Our conjecture: Language processor has multiple pathways: full grammar and linear grammar. Latter is still present when former breaks down.
Languages that fall lower on the hierarchy

• **Riau Indonesian** (David Gil):
  - No syntactic parts of speech
  - Small amount of morphology
  - No inflectional morphology
  - Only evidence for constituent structure comes from prosody
  - Effects expressed in English by subordination are expressed in Riau Indonesian by parataxis and pragmatics
  - Mostly free word order, but semantic biases
Languages that fall lower on the hierarchy

Freedom of interpretation in Riau Indonesian: *ayam makan, ‘chicken eat’ can mean*

- {a/the} chicken(s) {is/are eating/ate/will eat} {something/it}
- {something/l/you/he/she/they} {is/are eating/ate/will eat} {a/the} chicken
- {a/the} chicken that {is/was} eating
- {a/the} chicken that {is/was} being eaten
- someone is eating with/for the chicken
- where/when the chicken is eating
Languages that fall lower on the hierarchy

Conclusion: Riau Indonesian is a simple phrase grammar with only prosodic constituency, with a small amount of morphology, and an enormous amount of pragmatics and enrichment.
Languages that fall lower on the hierarchy

• Pirahã (Dan Everett):

  Lots of morphology, a noun-verb distinction.
  No definite and indefinite articles, no plural marker,
    no inflectional morphology.
  Free omission of arguments; fairly fixed SOV order
Languages that fall lower on the hierarchy

- Pirahã (Dan Everett):
  
  Lots of morphology, a noun-verb distinction.
  No definite and indefinite articles, no plural marker, no inflectional morphology.
  Free omission of arguments; fairly fixed SOV order
  A possible NP constituent – exactly one level of embedding, only two words possible, whatever their semantics.
  
  *my house; house many (= ‘many houses’); house big
  *my house many; *my house big; *house big many
Languages that fall lower on the hierarchy

• Pirahã (Dan Everett):

Recursion? We don’t think so.
No evidence for more than one level of embedding, even in Nevins/Pesetsky/Rodrigues critique. And even that is arguably paratactic.

Conclusion: Simple phrase grammar or linear grammar, plus NPs plus morphology
Language evolution?

Lower points in hierarchy could have existed in hominids prior to emergence of modern full language (Bickerton’s protolanguage hypothesis) – corresponds to linear grammar.

An alternative to one-step emergence of fully complex language.

Earlier steps are not replaced, just elaborated upon.
Conclusions

Grammatical hierarchy and its interface rules allow us to describe:

• Child language acquisition
• Late second language acquisition
• Language emergence
• Pidgins
• Language processing
• Language deficits
Conclusions

Full languages still display many symptoms of lower levels of hierarchy:

• Word order
• Compounding
• Marginal constructions (e.g. paratactic conditional)
Conclusions

Full languages still display many symptoms of lower levels of hierarchy:

• Word order
• Compounding
• More marginal constructions (e.g. paratactic conditional)

There are full languages that make little or no use of upper layers of hierarchy.
Conclusions

Question: How much might this approach affect our accounts of more developed languages?

Thank you!
Pivot grammars

Entering 2-word stage, some children use “pivot schemas”: individual words that freely combine with other words (Braine, Tomasello)

more car, more cereal, more cookie, more fish, etc.
no bed, no down, no fix, etc.
see baby, see pretty, etc.
Pivot grammars

Entering 2-word stage, some children use “pivot schemas”: individual words that freely combine with other words (Braine, Tomasello)

- more car, more cereal, more cookie, more fish, etc.
- no bed, no down, no fix, etc.
- see baby, see pretty, etc.

Pivot as an interface rule (here, function-argument schema)

Phonology: \([\text{Utterance } [\text{Word } \text{more}] \text{ Word}_i ]_j\]

Semantics: \([\text{GREATER-QUANTITY-OF } Y_i ]_j\)
Pivot grammars

Pivot schemas in complex language:
Directed epithets:
  - Fuck/Damn/The hell with/Hooray for NP!
Forms of address:
  - Mr. X, Ms. Y, Governor Z, Rabbi W, etc.
Complementizers?
  - [that S], [to VP]
Affixal morphology?
  - V-ing, un-A