UG as a postulate

CRISSP, March 2025

Charles Reiss
Concordia University, Montréal

Outline

In a nutshell

- Lots of people say Chomsky(an linguists) can't be bothered with 'facts'
- Those people are wrong
  - and they themselves ignore the facts
- Chomskyan linguistics is empirically grounded

In a nutshell

- Lots of people say Chomsky(an linguists) can't be bothered with 'facts'
- Those people are wrong
  - and they themselves ignore the facts
- Chomskyan linguistics is empirically grounded

In a nutshell

- Lots of people say Chomsky(an linguists) can't be bothered with 'facts'
- Those people are wrong
  - and they themselves ignore the facts
- Chomskyan linguistics is empirically grounded

In a nutshell

- Lots of people say Chomsky(an linguists) can't be bothered with 'facts'
- Those people are wrong
  - and they themselves ignore the facts
- Chomskyan linguistics is empirically grounded

My favorite quotation

Because evidence from Japanese can evidently bear on the correctness of a theory of S_0, it can have indirect—but very powerful—bearing on the choice of the grammar that attempts to characterize the I-language attained by a speaker of English.

Chomsky, *Knowledge of Language (1986:38)*

Is the search for Universal Grammar empirical science?

- Sure, if UG exists.
- There are conceptual arguments.
- This talk focuses on some recurring "research methods" for making fairly specific claims.
- Much work can be done 'ex cathedra'

Is the search for Universal Grammar empirical science?

- Sure, if UG exists.
- There are conceptual arguments.
- This talk focuses on some recurring "research methods" for making fairly specific claims.
- Much work can be done 'ex cathedra'

Is the search for Universal Grammar empirical science?

- Sure, if UG exists.
- There are conceptual arguments.
- This talk focuses on some recurring "research methods" for making fairly specific claims.
- Much work can be done 'ex cathedra'

Is the search for Universal Grammar empirical science?

- Sure, if UG exists.
- There are conceptual arguments.
- This talk focuses on some recurring "research methods" for making fairly specific claims.
- Much work can be done 'ex cathedra'

Conceptual arguments for Universal Grammar

e.g. Gallistel (1999):

One cannot use a hemoglobin molecule [for] light transduction and one cannot use a rhodopsin molecule as an oxygen carrier, any more than one can see with an ear or hear with an eye. Adaptive specialization of mechanism is so ubiquitous and so obvious in biology, at every level of analysis, and for every kind of function, that no one thinks it necessary to call attention to it as a general principle about biological mechanisms.
In this light, it is odd but true that most past and contemporary theorizing about learning does not assume that learning mechanisms are adaptively specialized for the solution of particular kinds of problems.

Outline

UG doesn't need to be big.

Benefits of combinatoric explosion

- "The less attributed to genetic information . . . the more feasible the study of its evolution"—Chomsky (2007)
- and its neural implementation

Turkish singular / plural pairs

singular	plural	meaning
dev	devler	giant
kek	kekler	cake
can	canlar	soul
cep	cepler	pocket
tarz	tarzlar	type
kap	kaplar	recipient
çek	çekler	check
saç	saçlar	hair
şey	şeyler	thing
ters	tersler	contrary
aşk	aşklar	love

- What are the two forms of the plural suffix?
- What determines where you find each suffiix?

Turkish singular / plural pairs

singular	plural	meaning
dev	devler	giant
kek	kekler	cake
can	canlar	soul
cep	cepler	pocket
tarz	tarzlar	type
kap	kaplar	recipient
çek	çekler	check
saç	saçlar	hair
şey	şeyler	thing
ters	tersler	contrary
aşk	aşklar	love

- What are the two forms of the plural suffix?
- What determines where you find each suffiix?
  - Suffix *ler* occurs . . . when root contains *e*
  - Suffix *lar* occurs . . . when root contains *a*

Turkish singular / plural pairs

singular	plural	meaning
dev	devler	giant
kek	kekler	cake
can	canlar	soul
cep	cepler	pocket
tarz	tarzlar	type
kap	kaplar	recipient
çek	çekler	check
saç	saçlar	hair
şey	şeyler	thing
ters	tersler	contrary
aşk	aşklar	love

- What are the two forms of the plural suffix?
- What determines where you find each suffiix?
  - Suffix *ler* occurs . . . when root contains *e*
  - Suffix *lar* occurs . . . when root contains *a*

Turkish singular / plural pairs

singular	plural	meaning
dev	devler	giant
kek	kekler	cake
can	canlar	soul
cep	cepler	pocket
tarz	tarzlar	type
kap	kaplar	recipient
çek	çekler	check
saç	saçlar	hair
şey	şeyler	thing
ters	tersler	contrary
aşk	aşklar	love

- What are the two forms of the plural suffix?
- What determines where you find each suffiix?
  - Suffix *ler* occurs . . . when root contains *e*
  - Suffix *lar* occurs . . . when root contains *a*

Turkish singular / plural pairs

singular	plural	meaning
dev	devler	giant
kek	kekler	cake
can	canlar	soul
cep	cepler	pocket
tarz	tarzlar	type
kap	kaplar	recipient
çek	çekler	check
saç	saçlar	hair
şey	şeyler	thing
ters	tersler	contrary
aşk	aşklar	love

- What are the two forms of the plural suffix?
- What determines where you find each suffiix?
  - Suffix *ler* occurs . . . when root contains *e*
  - Suffix *lar* occurs . . . when root contains *a*

Identity/agreement/harmony/concord/assimilation

More Turkish singular / plural pairs

singular	plural	meaning
ip	ipler	rope
kıl	kıllar	body hair
sap	saplar	stalk
uç	uçlar	edge
son	sonlar	end
öç	öçler	vengeance
gül	güller	rose
ek	ekler	junction

- What are the two forms of the plural suffix?
- What determines where you find each suffiix?
  - Suffix *ler* occurs . . . when root contains . . .
  - Suffix *lar* occurs . . . when root contains . . .

Describing Vowels

	−Back		+Back	
	−Round	+Round	−Round	+Round
+High	i	ü	ɪ	u
−High	e	ö	a	o

http://linguistics.concordia.ca/turkishvowels/

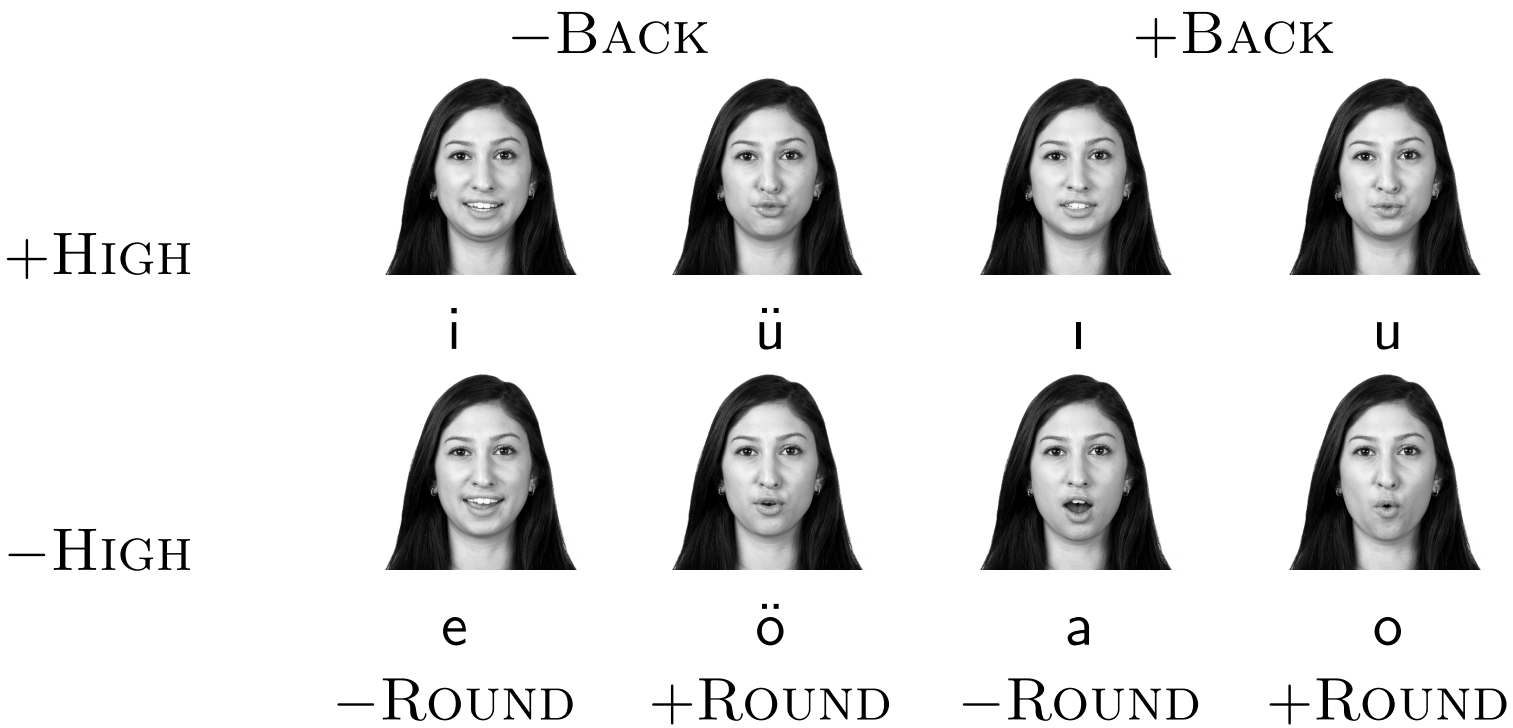


Figure: Eight vowels described with 3 binary features.

More Turkish singular / plural pairs

singular	plural	meaning
ip	ipler	rope
kıl	kıllar	body hair
sap	saplar	stalk
uç	uçlar	edge
son	sonlar	end
öç	öçler	vengeance
gül	güller	rose
ek	ekler	junction

- What are the two forms of the plural suffix?
- What determines where you find each suffiix?
  - Suffix *ler* occurs . . . when root contains $-$BACK vowels
  - Suffix *lar* occurs . . . when root contains $+$BACK vowels

Intuitions fail with combinatorics

- Tiny Model of UG:

  $\{+, -\}$

  $\{\text{Hi}, \text{Bk}, \text{Rd}, \text{Nasal}, \text{Voiced}, \text{F}_6, \text{F}_7, \text{F}_8, \text{F}_9, \text{F}_{10}, \text{F}_{11}, \text{F}_{12}, \text{F}_{13}, \text{F}_{14}, \text{F}_{15}, \text{F}_{16}, \text{F}_{17}, \text{F}_{18}, \text{F}_{19}, \text{Sonorant}\}$

- Against UG: To have a model with innate features learners "need a (very large) *a priori* set of possible features to choose from" (Cowper and Hall, 2014).
- In fact, with 20 features, the number of segments that UG intensionally defines is $2^{20} = 1,048,576$
- Huge number of languages (segment inventories) that UG intensionally defines is $2^{1,048,576}$
  - "Essentially infinite": # of particles in universe $\approx 2^{285}$ (Gallistel and King, 2009)
  - Underspecification makes the numbers even better/worse

Intuitions fail with combinatorics

- Tiny Model of UG:

  $\{+, -\}$

  $\{\text{Hi}, \text{Bk}, \text{Rd}, \text{Nasal}, \text{Voiced}, \text{F}_6, \text{F}_7, \text{F}_8, \text{F}_9, \text{F}_{10}, \text{F}_{11}, \text{F}_{12}, \text{F}_{13}, \text{F}_{14}, \text{F}_{15}, \text{F}_{16}, \text{F}_{17}, \text{F}_{18}, \text{F}_{19}, \text{Sonorant}\}$

- Against UG: To have a model with innate features learners "need a (very large) *a priori* set of possible features to choose from" (Cowper and Hall, 2014).
- In fact, with 20 features, the number of segments that UG intensionally defines is $2^{20} = 1,048,576$
- Huge number of languages (segment inventories) that UG intensionally defines is $2^{1,048,576}$
  - "Essentially infinite": # of particles in universe $\approx 2^{285}$ (Gallistel and King, 2009)
  - Underspecification makes the numbers even better/worse

Intuitions fail with combinatorics

- Tiny Model of UG:

  $\{+, -\}$

  $\{\textsc{Hi}, \textsc{Bk}, \textsc{Rd}, \textsc{Nasal}, \textsc{Voiced}, \mathrm{F}_6, \mathrm{F}_7, \mathrm{F}_8, \mathrm{F}_9, \mathrm{F}_{10},$
  $\mathrm{F}_{11}, \mathrm{F}_{12}, \mathrm{F}_{13}, \mathrm{F}_{14}, \mathrm{F}_{15}, \mathrm{F}_{16}, \mathrm{F}_{17}, \mathrm{F}_{18}, \mathrm{F}_{19}, \textsc{Sonorant}\}$

- Against UG: To have a model with innate features learners "need a (very large) *a priori* set of possible features to choose from" (Cowper and Hall, 2014).
- In fact, with 20 features, the number of segments that UG intensionally defines is $2^{20} = 1,048,576$
- Huge number of languages (segment inventories) that UG intensionally defines is $2^{1,048,576}$
  - "Essentially infinite": # of particles in universe $\approx 2^{285}$ (Gallistel and King, 2009)
  - Underspecification makes the numbers even better/worse

Intuitions fail with combinatorics

- Tiny Model of UG:

  $\{+, -\}$

  $\{\text{Hi}, \text{Bk}, \text{Rd}, \text{Nasal}, \text{Voiced}, \text{F}_6, \text{F}_7, \text{F}_8, \text{F}_9, \text{F}_{10},$
  $\text{F}_{11}, \text{F}_{12}, \text{F}_{13}, \text{F}_{14}, \text{F}_{15}, \text{F}_{16}, \text{F}_{17}, \text{F}_{18}, \text{F}_{19}, \text{Sonorant}\}$

- Against UG: To have a model with innate features learners "need a (very large) *a priori* set of possible features to choose from" (Cowper and Hall, 2014).
- In fact, with 20 features, the number of segments that UG intensionally defines is $2^{20} = 1,048,576$
- Huge number of languages (segment inventories) that UG intensionally defines is $2^{1,048,576}$
  - "Essentially infinite": # of particles in universe $\approx 2^{285}$ (Gallistel and King, 2009)
  - Underspecification makes the numbers even better/worse

Intuitions fail with combinatorics

- Tiny Model of UG:

  $\{+, -\}$
  $\{\text{Hi}, \text{Bk}, \text{Rd}, \text{Nasal}, \text{Voiced}, \text{F}_6, \text{F}_7, \text{F}_8, \text{F}_9, \text{F}_{10},$
  $\text{F}_{11}, \text{F}_{12}, \text{F}_{13}, \text{F}_{14}, \text{F}_{15}, \text{F}_{16}, \text{F}_{17}, \text{F}_{18}, \text{F}_{19}, \text{Sonorant}\}$

- Against UG: To have a model with innate features learners "need a (very large) *a priori* set of possible features to choose from" (Cowper and Hall, 2014).
- In fact, with 20 features, the number of segments that UG intensionally defines is $2^{20} = 1,048,576$
- Huge number of languages (segment inventories) that UG intensionally defines is $2^{1,048,576}$
  - "Essentially infinite": # of particles in universe $\approx 2^{285}$ (Gallistel and King, 2009)
  - Underspecification makes the numbers even better/worse

Intuitions fail with combinatorics

- Tiny Model of UG:

  $\{+, -\}$
  $\{\text{Hi}, \text{Bk}, \text{Rd}, \text{Nasal}, \text{Voiced}, \text{F}_6, \text{F}_7, \text{F}_8, \text{F}_9, \text{F}_{10},$
  $\text{F}_{11}, \text{F}_{12}, \text{F}_{13}, \text{F}_{14}, \text{F}_{15}, \text{F}_{16}, \text{F}_{17}, \text{F}_{18}, \text{F}_{19}, \text{Sonorant}\}$

- Against UG: To have a model with innate features learners "need a (very large) *a priori* set of possible features to choose from" (Cowper and Hall, 2014).
- In fact, with 20 features, the number of segments that UG intensionally defines is $2^{20} = 1,048,576$
- Huge number of languages (segment inventories) that UG intensionally defines is $2^{1,048,576}$
  - "Essentially infinite": # of particles in universe $\approx 2^{285}$ (Gallistel and King, 2009)
  - Underspecification makes the numbers even better/worse

Intuitions fail with combinatorics

- Tiny Model of UG:

  $\{+, -\}$
  $\{\text{Hi}, \text{Bk}, \text{Rd}, \text{Nasal}, \text{Voiced}, \text{F}_6, \text{F}_7, \text{F}_8, \text{F}_9, \text{F}_{10},$
  $\text{F}_{11}, \text{F}_{12}, \text{F}_{13}, \text{F}_{14}, \text{F}_{15}, \text{F}_{16}, \text{F}_{17}, \text{F}_{18}, \text{F}_{19}, \text{Sonorant}\}$

- Against UG: To have a model with innate features learners "need a (very large) *a priori* set of possible features to choose from" (Cowper and Hall, 2014).
- In fact, with 20 features, the number of segments that UG intensionally defines is $2^{20} = 1,048,576$
- Huge number of languages (segment inventories) that UG intensionally defines is $2^{1,048,576}$
  - "Essentially infinite": # of particles in universe $\approx 2^{285}$ (Gallistel and King, 2009)
  - Underspecification makes the numbers even better/worse

Intuitions fail with combinatorics

- Tiny Model of UG:

  $\{+, -\}$
  $\{\text{Hi}, \text{Bk}, \text{Rd}, \text{Nasal}, \text{Voiced}, \text{F}_6, \text{F}_7, \text{F}_8, \text{F}_9, \text{F}_{10},$
  $\text{F}_{11}, \text{F}_{12}, \text{F}_{13}, \text{F}_{14}, \text{F}_{15}, \text{F}_{16}, \text{F}_{17}, \text{F}_{18}, \text{F}_{19}, \text{Sonorant}\}$

- Against UG: To have a model with innate features learners "need a (very large) *a priori* set of possible features to choose from" (Cowper and Hall, 2014).
- In fact, with 20 features, the number of segments that UG intensionally defines is $2^{20} = 1,048,576$
- **Huge** number of languages (segment inventories) that UG intensionally defines is $2^{1,048,576}$
  - "Essentially infinite": # of particles in universe $\approx 2^{285}$ (Gallistel and King, 2009)
  - Underspecification makes the numbers even better/worse

Intuitions fail with combinatorics

- Tiny Model of UG:

  $\{+, -\}$
  $\{\text{Hi}, \text{Bk}, \text{Rd}, \text{Nasal}, \text{Voiced}, \text{F}_6, \text{F}_7, \text{F}_8, \text{F}_9, \text{F}_{10},$
  $\text{F}_{11}, \text{F}_{12}, \text{F}_{13}, \text{F}_{14}, \text{F}_{15}, \text{F}_{16}, \text{F}_{17}, \text{F}_{18}, \text{F}_{19}, \text{Sonorant}\}$

- Against UG: To have a model with innate features learners "need a (very large) *a priori* set of possible features to choose from" (Cowper and Hall, 2014).
- In fact, with 20 features, the number of segments that UG intensionally defines is $2^{20} = 1,048,576$
- Huge number of languages (segment inventories) that UG intensionally defines is $2^{1,048,576}$
  - "Essentially infinite": # of particles in universe $\approx 2^{285}$ (Gallistel and King, 2009)
  - Underspecification makes the numbers even better/worse

This is a good model!

Gallistel & King (2009:136): Memory and the Computational Brain

What is needed is an architecture that combats combinatoric explosions with combinatorics. The key to that architecture is a read/write memory. It must be possible to store sequences that actually occur in a memory capable of storing a great many [. . .] sequences, drawn from the essentially infinite number of possible such sequences, and to compare those stored sequences to whatever sequences may prove to be relevant. This architecture uses memory and combinatorics to cope with the finitude of the actual."

- We've just *rejected* an argument *against* UG.
- Can we be more positive?
- What's the null hypothesis?

Outline

There IS a lot of skepticism about UG and linguistics in general.

Some people can get really annoyed...

Auberon Waugh 1988. From *Oxymoron to boiled egg* [a review of Chomsky (1987)]. *The Independent* (26 March)

Linguistics [has been] reduced by Chomsky and his disciples to a positively mind-boggling level of stupidity and insignificance. If ever Mrs. Thatcher wants an excuse to close down a university, she has only to look at its department of linguistics.

"Mr. Wolfe . . . tars and feathers Mr. Chomsky before sticking a clown nose on his face and rolling him in a baby stroller off a cliff."

Comments from *New Yorker* blog

- *highbrow*
- *elite*
- *prestigious*

Comments from *New Yorker* blog

- *highbrow*
- *elite*
- *prestigious*

Comments from *New Yorker* blog

- *highbrow*
- *elite*
- *prestigious*

New Yorker blog commenter BARBARA_WELSH:

Psychoanalysis and Generative linguistics have been debunked since they arose in the Freudian manner out of one man's hubris [—] thinking [that] 'thinking' through a problem is enough without empirical, unbiased [. . .] research.

New Yorker blog commenter MIKET33

Chomsky subscribes to the Continental notion that if you're smart and you think hard enough about something, you can figure out how the world works, facts be damned. Unfortunately, that approach to science just doesn't work, and it has led Chomsky down the wrong paths in both linguistics and in politics.

New Yorker blog commenter HOGZILLA

Not being a professional linguist, I can't truly evaluate his lasting contributions. However, I think he will end up like Freud and Marx - influential, but at the end completely wrong and discarded in the dustbin of history. I am a physicist, and went to one of his lectures at MIT after having heard what a great intellect he was. WHAT A MORON. I have never heard two plus hours of such illogical verbal diarrhea in my life. One unsupported assumption piled upon another with no context for evaluating the possible truth of the statements nor whether the entire thesis was even plausible. Sorry - what passes for God-like in linguistics would be smoked to a charred nubbin in real science. I am sure he, and his antiquated ideas, will be undiscussed 100 years from now. Overrated in the extreme.

From Peter Norvig—Google Director of Research

"Finally, one more reason why Chomsky dislikes statistical models is that they tend to make linguistics an empirical science (a science about how people actually use language) rather than a mathematical science (an investigation of the mathematical properties of models of formal language). Chomsky prefers the latter, as evidenced by his statement in *Aspects of the Theory of Syntax* (1965):

> *Linguistic theory is mentalistic, since it is concerned with discovering a mental reality underlying actual behavior. Observed use of language . . . may provide evidence . . . but surely cannot constitute the subject-matter of linguistics, if this is to be a serious discipline.*

I can't imagine Laplace saying that observations of the planets cannot constitute the subject-matter of orbital mechanics . . ."

What's going on?

Confusion 1

Source of evidence $\neq$ object of inquiry

in linguistics

or anywhere else.

Think of litmus paper

Confusion 2

anti-empiricist $\neq$ anti-empirical

What's going on?

Confusion 1

Source of evidence $\neq$ object of inquiry
in linguistics
or anywhere else.
Think of litmus paper

Confusion 2

anti-empiricist $\neq$ anti-empirical

What's going on?

Confusion 1

Source of evidence $\neq$ object of inquiry
in linguistics
or anywhere else.
Think of litmus paper

Confusion 2

anti-empiricist $\neq$ anti-empirical

What's going on?

Confusion 1

Source of evidence $\neq$ object of inquiry
in linguistics
or anywhere else.
Think of litmus paper

Confusion 2

anti-empiricist $\neq$ anti-empirical

What's going on?

Confusion 1

Source of evidence $\neq$ object of inquiry
in linguistics
or anywhere else.
Think of litmus paper

Confusion 2

anti-empiricist $\neq$ anti-empirical

Really?

Pullum & Scholz, 2010: Recursion and the infinitude claim

"discrete infinity" (which we take to mean denumerable infinity in sets of discrete elements such as symbol strings) is claimed [by Epstein and Hornstein, 2005] to be a feature of "EVERY human language", as if one by one they had all been examined by scientists and checked for discrete infinitude.

Apply this to the mass and charge of EVERY electron!

Pullum and Scholz on I-language

- Pullum and Scholz (2001) want linguists should study things like Standard English, "the ordinary, common-sense notion of a language under which we can say that *The Times* in the UK, *The New York Times* in the USA, *The Sydney Morning Herald* in Australia, and other newspapers around the world, all publish in the same language."
- Rather than a "stipulated technical concept" like I-language, they favor "the common-sense concept of a language, the one under which millions of different people may be correctly described as speakers of the same language."

Pullum and Scholz on I-language

- Pullum and Scholz (2001) want linguists should study things like Standard English, "the ordinary, common-sense notion of a language under which we can say that *The Times* in the UK, *The New York Times* in the USA, *The Sydney Morning Herald* in Australia, and other newspapers around the world, all publish in the same language."
- Rather than a "stipulated technical concept" like I-language, they favor "the common-sense concept of a language, the one under which millions of different people may be correctly described as speakers of the same language."

President of the LSA!: Emmon Bach in 1996

Linguistic theory must account not just for the core of universal grammar, but also for the periphery of particular grammars. Children do in fact learn languages, real languages, and not what Chomsky has called I-languages, idealized systems that are nowhere completely instantiated. These real languages, we might call them R-languages, are presented more or less immediately to the mind of the native speaker, and form the basis for the creative work that goes into language development. . .

Paul Ibbotson and Michael Tomasello in *Scientific American*, 2016

- *But evidence has overtaken Chomsky's theory, which has been* **inching toward a slow death** *for years. It is dying so slowly because, as physicist Max Planck once noted , older scholars tend to hang on to the old ways: "Science progresses one funeral at a time."*
- *As with the retreat from the cross-linguistic data and the tool-kit argument, the idea of performance masking competence is also pretty much* **unfalsifiable**. *Retreats to this type of claim are common in* **declining scientific paradigms** *that lack a strong empirical base—consider, for instance,* **Freudian psychology and Marxist interpretations of history**.
- *Moreover, many modern researchers are also unhappy with* **armchair theoretical analyses**, *when there are large corpora of linguistic data—many now available online—that can be analyzed to test a theory.*

  The paradigm shift is certainly not complete, but to many it seems that a breath of fresh air has entered the field of linguistics.

Paul Ibbotson and Michael Tomasello in *Scientific American*, 2016

- *But evidence has overtaken Chomsky's theory, which has been* **inching toward a slow death** *for years. It is dying so slowly because, as physicist Max Planck once noted , older scholars tend to hang on to the old ways: "Science progresses one funeral at a time."*
- *As with the retreat from the cross-linguistic data and the tool-kit argument, the idea of performance masking competence is also pretty much* **unfalsifiable**. *Retreats to this type of claim are common in* **declining scientific paradigms** *that lack a strong empirical base—consider, for instance,* **Freudian psychology and Marxist interpretations of history**.
- *Moreover, many modern researchers are also unhappy with* **armchair theoretical analyses**, *when there are large corpora of linguistic data—many now available online—that can be analyzed to test a theory.*

  The paradigm shift is certainly not complete, but to many it seems that a breath of fresh air has entered the field of linguistics.

Paul Ibbotson and Michael Tomasello in *Scientific American*, 2016

- *But evidence has overtaken Chomsky's theory, which has been* **inching toward a slow death** *for years. It is dying so slowly because, as physicist Max Planck once noted , older scholars tend to hang on to the old ways: "Science progresses one funeral at a time."*
- *As with the retreat from the cross-linguistic data and the tool-kit argument, the idea of performance masking competence is also pretty much* **unfalsifiable**. *Retreats to this type of claim are common in* **declining scientific paradigms** *that lack a strong empirical base—consider, for instance,* **Freudian psychology and Marxist interpretations of history**.
- *Moreover, many modern researchers are also unhappy with* **armchair theoretical analyses**, *when there are large corpora of linguistic data—many now available online—that can be analyzed to test a theory.*

  The paradigm shift is certainly not complete, but to many it seems that a breath of fresh air has entered the field of linguistics.

Outline

Empirical Argumentation Devices for Universal Grammar

Two aspects of UG theorizing:

- Positing primitives
- Distinguishing extensionally equivalent proposals

- EAD 1: Demonstration of Lower Bound of Complexity
- EAD 2: Recurrence of useless categories
- EAD 3: Universal building blocks
- EAD 4: Untaught and unlearned knowledge
- (EAD 5: Biolinguistic considerations—evolution, development, neuroscience)

Empirical Argumentation Devices for Universal Grammar

Two aspects of UG theorizing:

- Positing primitives
- Distinguishing extensionally equivalent proposals

- EAD 1: Demonstration of Lower Bound of Complexity
- EAD 2: Recurrence of useless categories
- EAD 3: Universal building blocks
- EAD 4: Untaught and unlearned knowledge
- (EAD 5: Biolinguistic considerations—evolution, development, neuroscience)

Empirical Argumentation Devices for Universal Grammar

Two aspects of UG theorizing:

- Positing primitives
- Distinguishing extensionally equivalent proposals

- EAD 1: Demonstration of Lower Bound of Complexity
- EAD 2: Recurrence of useless categories
- EAD 3: Universal building blocks
- EAD 4: Untaught and unlearned knowledge
- (EAD 5: Biolinguistic considerations—evolution, development, neuroscience)

Empirical Argumentation Devices for Universal Grammar

Two aspects of UG theorizing:

- Positing primitives
- Distinguishing extensionally equivalent proposals

- EAD 1: Demonstration of Lower Bound of Complexity
- EAD 2: Recurrence of useless categories
- EAD 3: Universal building blocks
- EAD 4: Untaught and unlearned knowledge
- (EAD 5: Biolinguistic considerations—evolution, development, neuroscience)

Empirical Argumentation Devices for Universal Grammar

Two aspects of UG theorizing:

- Positing primitives
- Distinguishing extensionally equivalent proposals

- EAD 1: Demonstration of Lower Bound of Complexity
- EAD 2: Recurrence of useless categories
- EAD 3: Universal building blocks
- EAD 4: Untaught and unlearned knowledge
- (EAD 5: Biolinguistic considerations—evolution, development, neuroscience)

Empirical Argumentation Devices for Universal Grammar

Two aspects of UG theorizing:

- Positing primitives
- Distinguishing extensionally equivalent proposals

- EAD 1: Demonstration of Lower Bound of Complexity
- EAD 2: Recurrence of useless categories
- EAD 3: Universal building blocks
- EAD 4: Untaught and unlearned knowledge
- (EAD 5: Biolinguistic considerations—evolution, development, neuroscience)

Empirical Argumentation Devices for Universal Grammar

Two aspects of UG theorizing:

- Positing primitives
- Distinguishing extensionally equivalent proposals

- EAD 1: Demonstration of Lower Bound of Complexity
- EAD 2: Recurrence of useless categories
- EAD 3: Universal building blocks
- EAD 4: Untaught and unlearned knowledge
- (EAD 5: Biolinguistic considerations—evolution, development, neuroscience)

These are all *empirical* arguments (more or less)

Today's strategy

UG as a background assumption

- Newton's strategy–assume that celestial and terrestrial bodies are subject to same forces
- See what it gets you
- UG makes empirical work possible

Today's strategy

UG as a background assumption

- Newton's strategy–assume that celestial and terrestrial bodies are subject to same forces
- See what it gets you
- UG makes empirical work possible

Today's strategy

UG as a background assumption

- Newton's strategy–assume that celestial and terrestrial bodies are subject to same forces
- See what it gets you
- UG makes empirical work possible

The big leap

Bertrand Russell, 'Insanity and Insight' (1934)

In science, a new theory is first invented, then disputed, and then perhaps generally accepted. But the man who invents it, while it is new, has no rational grounds for believing it; he discovers the grounds afterwards. Thus he differs from a lunatic only in the fortunate accident that his originally irrational belief turns out to be capable of rational defence.

UG as Postulate 1

- Newton's postulate of the uniformity of gravity seems obvious to us with hindsight, but the issue is not trivial. As physicist Sean Carroll (2022) puts it "We take this for granted now, but back in the day it was a dramatic leap to connect planetary motion to everyday occurrences in the local orchard."
- In 1676, a decade before the publication of Newton's *Principia*, the Italian scholar Geminiano Montanari implicitly rejects the Newtonian postulate, warning that "we all mislead ourselves when we want to discuss things that take place far from us, applying to them the same concepts we use for terrestrial things that we have in our hands" (quoted and discussed by Heilbron 2022).

UG as Postulate 1

- Newton's postulate of the uniformity of gravity seems obvious to us with hindsight, but the issue is not trivial. As physicist Sean Carroll (2022) puts it "We take this for granted now, but back in the day it was a dramatic leap to connect planetary motion to everyday occurrences in the local orchard."
- In 1676, a decade before the publication of Newton's *Principia*, the Italian scholar Geminiano Montanari implicitly rejects the Newtonian postulate, warning that "we all mislead ourselves when we want to discuss things that take place far from us, applying to them the same concepts we use for terrestrial things that we have in our hands" (quoted and discussed by Heilbron 2022).

UG as Postulate 2

- "Galileo's views on sunspots, along with a body of other observations and theorizing, profoundly questioned a fundamental Aristotelian distinction between the physics of the heavens and that of the earth. Orthodox thinking, from antiquity to Galileo's time, had it that the physical nature and principles of heavenly bodies differed in character from those that obtained on earth. . . . [B]y asserting the similarity of heavenly and terrestrial bodies, Galileo implied that studying the properties and motions of ordinary earthly bodies could afford understanding of what nature was like universally. . . . The motion of a cannonball could serve as a model for the motion of Venus. (Shapin, 2018, 17-19)"
- the mathematical biologist J.B.S. Haldane remarked about the significance of the first spacecraft to reach the surface of the Moon, the 1959 Soviet Luna 2 lunar impactor mission, that "it is scientifically important to have hit the moon. It is a

UG as Postulate 2

- "Galileo's views on sunspots, along with a body of other observations and theorizing, profoundly questioned a fundamental Aristotelian distinction between the physics of the heavens and that of the earth. Orthodox thinking, from antiquity to Galileo's time, had it that the physical nature and principles of heavenly bodies differed in character from those that obtained on earth. . . . [B]y asserting the similarity of heavenly and terrestrial bodies, Galileo implied that studying the properties and motions of ordinary earthly bodies could afford understanding of what nature was like universally. . . . The motion of a cannonball could serve as a model for the motion of Venus. (Shapin, 2018, 17-19)"
- the mathematical biologist J.B.S. Haldane remarked about the significance of the first spacecraft to reach the surface of the Moon, the 1959 Soviet Luna 2 lunar impactor mission, that "it is scientifically important to have hit the moon. It is a

Outline

Some general questions about language

- What do we use it for?
- How is it acquired? Learning/innateness? Analogy? Imitation?
- How is it instantiated in the brain?
- Are some more complex than others?

Some general questions about language

- What do we use it for?
- How is it acquired? Learning/innateness? Analogy? Imitation?
- How is it instantiated in the brain?
- Are some more complex than others?

Some general questions about language

- What do we use it for?
- How is it acquired? Learning/innateness? Analogy? Imitation?
- How is it instantiated in the brain?
- Are some more complex than others?

Some general questions about language

- What do we use it for?
- How is it acquired? Learning/innateness? Analogy? Imitation?
- How is it instantiated in the brain?
- Are some more complex than others?

A prior question:

What *is* language?

vowel harmony, reduplication, anaphor binding, ergativity, wh-movement, stress computation, quantifier floating, clitic climbing, neutralization, sandhi, noun incorporation, inverse marking, applicatives, anti-passivization, negative polarity items, ...

- If you don't know this stuff, you can't do (or evaluate) *empirical* work on language.
- Think of me at CERN

What *is* language?

vowel harmony, reduplication, anaphor binding, ergativity, wh-movement, stress computation, quantifier floating, clitic climbing, neutralization, sandhi, noun incorporation, inverse marking, applicatives, anti-passivization, negative polarity items, ...

- If you don't know this stuff, you can't do (or evaluate) *empirical* work on language.
- Think of me at CERN

A prior question:

What *is* language?

vowel harmony, reduplication, anaphor binding, ergativity, wh-movement, stress computation, quantifier floating, clitic climbing, neutralization, sandhi, noun incorporation, inverse marking, applicatives, anti-passivization, negative polarity items, ...

- If you don't know this stuff, you can't do (or evaluate) *empirical* work on language.
- Think of me at CERN

A prior question:

What *is* language?

vowel harmony, reduplication, anaphor binding, ergativity, wh-movement, stress computation, quantifier floating, clitic climbing, neutralization, sandhi, noun incorporation, inverse marking, applicatives, anti-passivization, negative polarity items, ...

- If you don't know this stuff, you can't do (or evaluate) *empirical* work on language.
- Think of me at CERN

The object of study

I-language

- Internal
- Individual
- Intensional

The object of study

I-language

- Internal
- Individual
- Intensional

The object of study

I-language

- Internal
- Individual
- Intensional

Outline

Some data . . .

Warlpiri plurals

Where's Warlpiri spoken?

Figure: There are about 3000 Warlpiri speakers

Warlpiri plurals

Find the pattern

SINGULAR	PLURAL	gloss
kurdu	kurdukurdu	*child/children*
kamina	kaminakamina	*girl/girls*
mardukuja	mardukujamardukuja	*woman/women*

Warlpiri plurals

Find the pattern

SINGULAR	PLURAL	gloss
kurdu	kurdukurdu	*child/children*
kamina	kaminakamina	*girl/girls*
mardukuja	mardukujamardukuja	*woman/women*

Warlpiri plurals

Find the pattern

SINGULAR	PLURAL	gloss
kurdu	kurdukurdu	*child/children*
kamina	kaminakamina	*girl/girls*
mardukuja	mardukujamardukuja	*woman/women*

Warlpiri plurals

Find the pattern

SINGULAR	PLURAL	gloss
kurdu	kurdukurdu	*child/children*
kamina	kaminakamina	*girl/girls*
mardukuja	mardukujamardukuja	*woman/women*

Warlpiri plurals

Find the pattern

SINGULAR	PLURAL	gloss
kurdu	kurdukurdu	*child/children*
kamina	kaminakamina	*girl/girls*
mardukuja	mardukujamardukuja	*woman/women*

Warlpiri plurals

Find the pattern

SINGULAR	PLURAL	gloss
kurdu	kurdukurdu	*child/children*
kamina	kaminakamina	*girl/girls*
mardukuja	mardukujamardukuja	*woman/women*

Warlpiri plurals

Find the pattern

SINGULAR	PLURAL	gloss
kurdu	kurdukurdu	*child/children*
kamina	kaminakamina	*girl/girls*
mardukuja	mardukujamardukuja	*woman/women*

What is the Warlpiri plural rule?

- What is the sound of the Warlpiri plural?
- It is a **variable** x, such that x has the same form as the Noun it is added to.

What is the Warlpiri plural rule?

- What is the sound of the Warlpiri plural?
- It is a **variable** x, such that x has the same form as the Noun it is added to.

Empirical Argumentation Device 1: Demonstration of Lower Bound on Complexity

Copy and Concatenate

- If at least one language needs to be able to be able to copy and concatenate, then the Human Language Faculty must have this capacity
- This is an empirical argument, but **no new data** can bear on this claim
- Simple analog of Chomsky's (1957) demonstration that Human Language is of greater than Finite State Complexity
- Also seems like standard scientific practice

Empirical Argumentation Device 1: Demonstration of Lower Bound on Complexity

Copy and Concatenate

- If at least one language needs to be able to be able to copy and concatenate, then the Human Language Faculty must have this capacity
- This is an empirical argument, but **no new data** can bear on this claim
- Simple analog of Chomsky's (1957) demonstration that Human Language is of greater than Finite State Complexity
- Also seems like standard scientific practice

Empirical Argumentation Device 1: Demonstration of Lower Bound on Complexity

Copy and Concatenate

- If at least one language needs to be able to be able to copy and concatenate, then the Human Language Faculty must have this capacity
- This is an empirical argument, but **no new data** can bear on this claim
- Simple analog of Chomsky's (1957) demonstration that Human Language is of greater than Finite State Complexity
- Also seems like standard scientific practice

Empirical Argumentation Device 1: Demonstration of Lower Bound on Complexity

Copy and Concatenate

- If at least one language needs to be able to be able to copy and concatenate, then the Human Language Faculty must have this capacity
- This is an empirical argument, but **no new data** can bear on this claim
- Simple analog of Chomsky's (1957) demonstration that Human Language is of greater than Finite State Complexity
- Also seems like standard scientific practice

Languages do vary

Fieldwork conditions in Samoa

Samoan verbs: sg-pl

Hypothesis formation and testing—good empirical science:

Sg	Pl		
nofo	nonofo	'sit'	What is the rule?
moe	momoe	'sleep'	What is the rule?
alofa	alolofa	'love'	What is the rule?
savali	savavali	'walk'	
maliu	maliliu	'die'	

Samoan verbs: sg-pl

Hypothesis formation and testing—good empirical science:

Sg	Pl		
nofo	nonofo	‘sit’	What is the rule?
moe	momoe	‘sleep’	What is the rule?
alofa	alolofa	‘love’	What is the rule?
savali	savavali	‘walk’	
maliu	maliliu	‘die’	

Samoan verbs: sg-pl

Hypothesis formation and testing—good empirical science:

Sg	Pl		
nofo	nonofo	‘sit’	What is the rule?
moe	momoe	‘sleep’	What is the rule?
alofa	alolofa	‘love’	What is the rule?
savali	savavali	‘walk’	
maliu	maliliu	‘die’	

Samoan verbs: sg-pl

Hypothesis formation and testing—good empirical science:

Sg	Pl		
nofo	nonofo	‘sit’	What is the rule?
moe	momoe	‘sleep’	What is the rule?
alofa	alolofa	‘love’	What is the rule?
savali	savavali	‘walk’	
maliu	maliliu	‘die’	

Samoan verbs: sg-pl

Hypothesis formation and testing—good empirical science:

Sg	Pl		
nofo	nonofo	‘sit’	What is the rule?
moe	momoe	‘sleep’	What is the rule?
alofa	alolofa	‘love’	What is the rule?
savali	savavali	‘walk’	
maliu	maliliu	‘die’	

Samoan verbs: sg-pl

Hypothesis formation and testing—good empirical science:

Sg	Pl		
nofo	nonofo	‘sit’	What is the rule?
moe	momoe	‘sleep’	What is the rule?
alofa	alolofa	‘love’	What is the rule?
savali	savavali	‘walk’	
maliu	maliliu	‘die’	

Samoan verbs: sg-pl

Hypothesis formation and testing—good empirical science:

Sg	Pl		
nofo	nonofo	‘sit’	What is the rule?
moe	momoe	‘sleep’	What is the rule?
alofa	alolofa	‘love’	What is the rule?
savali	savavali	‘walk’	
maliu	maliliu	‘die’	

Samoan verbs: sg-pl

Hypothesis formation and testing—good empirical science:

Sg	Pl		
nofo	nonofo	‘sit’	What is the rule?
moe	momoe	‘sleep’	What is the rule?
alofa	alolofa	‘love’	What is the rule?
savali	savavali	‘walk’	
maliu	maliliu	‘die’	

Samoan Rule

Representing syllable sequences

a. $\sigma_2\ \sigma_1$

b. $\sigma_3\ \sigma_2\ \sigma_1$

c. $\sigma_n\ \ldots\sigma_2\ \sigma_1$

Rule (tentative)

If $\sigma_n\ \ldots\sigma_2\ \sigma_1$ is a $\textsc{Sg}$, then the $\textsc{Pl}$ is $\sigma_n\ \ldots\sigma_2\ \sigma_2\ \sigma_1$

So, what IS language?

The language faculty can copy and concatenate

- Reduplication: $x \to x^\frown x$

So, what IS language?

The language faculty can copy and concatenate

- Reduplication: $x \rightarrow x^\frown x$
  - Warlpiri: x is a SINGULAR
  - Samoan: x is second to last syllable of a SINGULAR
  - Madurese has non-contiguous copies *garadus* / *dusgaradus*

So, what IS language?

The language faculty can copy and concatenate

- Reduplication: $x \rightarrow x^\frown x$
  - Warlpiri: x is a SINGULAR
  - Samoan: x is second to last syllable of a SINGULAR
  - Madurese has non-contiguous copies *garadus* / *dusgaradus*

So, what IS language?

The language faculty can copy and concatenate

- Reduplication: $x \rightarrow x^\frown x$
  - Warlpiri: x is a SINGULAR
  - Samoan: x is second to last syllable of a SINGULAR
  - Madurese has non-contiguous copies *garadus* / *dusgaradus*

So, what IS language?

The language faculty can copy and concatenate

- Reduplication: $x \rightarrow x^\frown x$
  - Warlpiri: x is a SINGULAR
  - Samoan: x is second to last syllable of a SINGULAR
  - Madurese has non-contiguous copies *garadus* / *dusgaradus*

The goal

Chomsky 2000:122, 'Language as a natural object'

> *. . . to abstract from the welter of descriptive complexity certain general principles governing computation that would allow the rules of a particular language to be given in very simple forms*

This is the whole point of empirical science—we don't have gravity for rocks, gravity for rain, gravity of planets, gravity of books, . . .

The goal

Chomsky 2000:122, 'Language as a natural object'

> *. . . to abstract from the welter of descriptive complexity certain general principles governing computation that would allow the rules of a particular language to be given in very simple forms*

This is the whole point of empirical science—we don't have gravity for rocks, gravity for rain, gravity of planets, gravity of books, . . .

Some questions

What kind of thing is the Warlpiri rule?

- Invented or discovered?
- Where is it? What is it a property of?

Some questions

What kind of thing is the Warlpiri rule?

- Invented or discovered?
- Where is it? What is it a property of?

Language as a natural object

- A *realist* vs. *instrumentalist* view
  - Is chemistry just for calculation?
  - Is the Warlpiri reduplication rule real?
- Language as a natural object: Rules are properties of people (their minds/brains)
- Naturalism, internalism, individualism, etc

Language as a natural object

- A *realist* vs. *instrumentalist* view
  - Is chemistry just for calculation?
  - Is the Warlpiri reduplication rule real?
- Language as a natural object: Rules are properties of people (their minds/brains)
- Naturalism, internalism, individualism, etc

Language as a natural object

- A *realist* vs. *instrumentalist* view
  - Is chemistry just for calculation?
  - Is the Warlpiri reduplication rule real?
- Language as a natural object: Rules are properties of people (their minds/brains)
- Naturalism, internalism, individualism, etc

Language as a natural object

- A *realist* vs. *instrumentalist* view
  - Is chemistry just for calculation?
  - Is the Warlpiri reduplication rule real?
- Language as a natural object: Rules are properties of people (their minds/brains)
- Naturalism, internalism, individualism, etc

Language as a natural object

- A *realist* vs. *instrumentalist* view
  - Is chemistry just for calculation?
  - Is the Warlpiri reduplication rule real?
- Language as a natural object: Rules are properties of people (their minds/brains)
- Naturalism, internalism, individualism, etc

This is all very empirical-science oriented, whether or not you agree with the analyses.

References I

Carroll, Sean. 2022. *The biggest ideas in the universe: Space, time, and motion*. Penguin.

Haldane, John Burdon Sanderson, and Krishna Dronamraju. 2009. *What I require from life: writings on science and life from JBS Haldane*. Oxford University Press, USA.

Heilbron, John L. 2022. *The incomparable monsignor: Francesco Bianchini's world of science, history, and court intrigue*. Oxford University Press.

Pullum, Geoffrey K., and Barbara C. Scholz. 2001. On the distinction between model-theoretic and generative-enumerative syntactic frameworks. In *Logical Aspects of Computational Linguistics*, ed. Glyn Morrill Philippe de Groot and Christian Retoré, Lecture Notes in Artificial Intelligence, 17–43. Berlin: Springer Verlag.

References II

Shapin, Steven. 2018. *The scientific revolution*. University of Chicago Press.

CRISSP Cards

March 2025

C. Reiss

Concordia University

[I]f you believe P, and you believe that P entails Q, then even if Q seems more than a little odd, you have some intellectual obligations to take seriously that possiblity that Q may be true, nonetheless

[Zenon Pylyshyn, *Computation and Cognition*, xxii]

Outline

Outline

How does a survey of, say, syntax relate to the search for *UG*?

C-command

We have to answer *KoL*'s Question 1–What is knowledge of language?–before we answer Question 2–how is this knowledge acquired? / Is it all acquired?

How does our survey of syntax relate to the search for *UG*?

C-command

Do languages "vary without limit" or are there parameters of variation? Note that we were able to apply and extend ideas we developed for one language, English, to understand the behaviour of another, say, Icelandic. This is not a logical necessity.

How does our survey of syntax relate to the search for *UG*?

C-command

Icelandic *sig* is like English *ever*! Japanese NPIs are like *herself*!

How does our survey of syntax relate to the search for *UG*?

C-command

We have been approaching UG empirically (with abstractions, of course)

Recall this from *KoL*:38

KoL:38

"Because evidence from Japanese can evidently bear on the correctness of a theory of S_0, it can have indirect—but very powerful– bearing on the choice of the grammar that attempts to characterize the I-language attained by a speaker of English."

Apply this to c-command.

Recall this from *KoL*:38

KoL:38

"Because evidence from Japanese can evidently bear on the correctness of a theory of S_0, it can have indirect—but very powerful– bearing on the choice of the grammar that attempts to characterize the I-language attained by a speaker of English."

Apply this to c-command.

Arguing for UG based on logic—a rationalist argument

Let's approach the problem of UG from a different perspective: demonstrate the logical necessity of **a common core of innate primitives** (UG).

Outline

Innateness Hypothesis

- A plausible source for those aspects of Mental Grammars which are either universal or unlearnable is genetic inheritance.
- Human linguistic systems are constrained and partially determined by our genes.
- The same is true for whales, dogs, birds, cockroaches.
  - Net-casting spiders,
  - Communication and human face recognition by North American crows
  - Tools to get tools to get food by New Caledonian crows

Innateness Hypothesis

- A plausible source for those aspects of Mental Grammars which are either universal or unlearnable is genetic inheritance.
- Human linguistic systems are constrained and partially determined by our genes.
- The same is true for whales, dogs, birds, cockroaches.
  - Net-casting spiders,
  - Communication and human face recognition by North American crows
  - Tools to get tools to get food by New Caledonian crows

Innateness Hypothesis

- A plausible source for those aspects of Mental Grammars which are either universal or unlearnable is genetic inheritance.
- Human linguistic systems are constrained and partially determined by our genes.
- The same is true for whales, dogs, birds, cockroaches.
  - Net-casting spiders,
  - Communication and human face recognition by North American crows
  - Tools to get tools to get food by New Caledonian crows

Innateness Hypothesis

- A plausible source for those aspects of Mental Grammars which are either universal or unlearnable is genetic inheritance.
- Human linguistic systems are constrained and partially determined by our genes.
- The same is true for whales, dogs, birds, cockroaches.
  - Net-casting spiders,
  - Communication and human face recognition by North American crows
  - Tools to get tools to get food by New Caledonian crows

Innateness Hypothesis

- A plausible source for those aspects of Mental Grammars which are either universal or unlearnable is genetic inheritance.
- Human linguistic systems are constrained and partially determined by our genes.
- The same is true for whales, dogs, birds, cockroaches.
  - Net-casting spiders,
  - Communication and human face recognition by North American crows
  - Tools to get tools to get food by New Caledonian crows

Innateness Hypothesis

- A plausible source for those aspects of Mental Grammars which are either universal or unlearnable is genetic inheritance.
- Human linguistic systems are constrained and partially determined by our genes.
- The same is true for whales, dogs, birds, cockroaches.
  - Net-casting spiders,
  - Communication and human face recognition by North American crows
  - Tools to get tools to get food by New Caledonian crows

All human languages are not the same—

Mental Grammar $=UG$ + Experience
(Nature + Nurture)

The BIG question:

How much UG do we need?

"the less attributed to genetic information (in our case, the topic of UG) for determining the development of an organism, the more feasible the study of its evolution" [Chomsky 2007]

Auditory input goes into . . .

(at least) four independent channels:

- General purpose audition (e.g. your muffler)
- Voice recognition (who is talking to you?)
- Affect recognition (are they mad?)
- Phonological recognition (what are they saying?)

Auditory input goes into . . .

(at least) four independent channels:

- General purpose audition (e.g. your muffler)
- Voice recognition (who is talking to you?)
- Affect recognition (are they mad?)
- Phonological recognition (what are they saying?)

Auditory input goes into . . .

(at least) four independent channels:

- General purpose audition (e.g. your muffler)
- Voice recognition (who is talking to you?)
- Affect recognition (are they mad?)
- Phonological recognition (what are they saying?)

Auditory input goes into . . .

(at least) four independent channels:

- General purpose audition (e.g. your muffler)
- Voice recognition (who is talking to you?)
- Affect recognition (are they mad?)
- Phonological recognition (what are they saying?)

Auditory input goes into . . .

(at least) four independent channels:

- General purpose audition (e.g. your muffler)
- Voice recognition (who is talking to you?)
- Affect recognition (are they mad?)
- Phonological recognition (what are they saying?)

What we experience . . .

Sounds don't sound how you think they sound. The relationship between physical reality and experience is not straightforward. Our minds interact with sensory input to **construct experience**. This gives us the equivalence classes.

Physical sounds are continuous / gradient;
Language is discrete / categorical.

Information Processing Systems (IPS) and 'data'

'The cooked and the raw' [Hammarberg(1981)]

Matters not representable are not accessible, and matters accessible are so only in virtue of being presented in the language of the IPS. Thus from the point of view of any IPS, its data are going to appear ultimate to it—not because of any inherent qualities of its 'perceptions', but simply because it cannot 'see things' in any other way. The fact of these matters seems to be that an IPS—any IPS, including one that is a sentient being —is a prisoner of its own representational processes: We can never escape a point of view.

What ‘learning’ requires . . .

Intelligence requires construction of symbolic representations. Interacting with the world requires the ability to **parse** input (=assign it a representation). Learning is a form of intelligent interaction with the world.

So . . .

Learning requires **Parsing** requires **Representation**.

Outline

Acquisition

Acquisition studies the learning path that a child goes through, including a characterisation of the initial state (S_0 or UG), and the final state consisting of an adult grammar.

Learnability

- Learnability theory is a branch of mathematics that is concerened with a formal analysis of learning algorithms and the computational power of learners (computer programs, children, rats, *etc.*)
- Characterize the learner, the evidence, the domain being learned (grammar) and a success criterion.

Negative evidence

- Negative evidence is explicit evidence that something is ungrammatical.
- Positive evidence merely consists of tokens of grammatical speech.
- It appears to be the case that children:
  - don't get much reinforcement (positive or negative) on structure of their speech, but instead are reinforced for content AND
  - ignore negative evidence when it is supplied.

Negative evidence

- Negative evidence is explicit evidence that something is ungrammatical.
- Positive evidence merely consists of tokens of grammatical speech.
- It appears to be the case that children:
  - don't get much reinforcement (positive or negative) on structure of their speech, but instead are reinforced for content AND
  - ignore negative evidence when it is supplied.

Negative evidence

- Negative evidence is explicit evidence that something is ungrammatical.
- Positive evidence merely consists of tokens of grammatical speech.
- It appears to be the case that children:
  - don't get much reinforcement (positive or negative) on structure of their speech, but instead are reinforced for content AND
  - ignore negative evidence when it is supplied.

Negative evidence

- Negative evidence is explicit evidence that something is ungrammatical.
- Positive evidence merely consists of tokens of grammatical speech.
- It appears to be the case that children:
  - don't get much reinforcement (positive or negative) on structure of their speech, but instead are reinforced for content AND
  - ignore negative evidence when it is supplied.

Negative evidence

- Negative evidence is explicit evidence that something is ungrammatical.
- Positive evidence merely consists of tokens of grammatical speech.
- It appears to be the case that children:
  - don't get much reinforcement (positive or negative) on structure of their speech, but instead are reinforced for content AND
  - ignore negative evidence when it is supplied.

Negative evidence

- Negative evidence is explicit evidence that something is ungrammatical.
- Positive evidence merely consists of tokens of grammatical speech.
- It appears to be the case that children:
  - don't get much reinforcement (positive or negative) on structure of their speech, but instead are reinforced for content AND
  - ignore negative evidence when it is supplied.

Child: Want other one spoon, Daddy.
Father: You mean, you want the other spoon.
Child: Yes, I want other one spoon, please Daddy.
Father: Can you say "the other spoon"?
Child: Other . . . one . . . spoon.
Father: Say "other".
Child: "Other".
Father:"Spoon."
Child: Spoon.
Father: "Other spoon."
Child: Other . . . spoon. Now give me other one spoon?

Child: Nobody don't like me.
Mother: No, say "Nobody likes me."
Child: Nobody don't like me.
Mother: No, say "Nobody likes me."
Child: Nobody don't like me.
Mother: No, say "Nobody likes me."
Child: Nobody don't like me.
Mother: No, say "Nobody likes me."
Child: Nobody don't like me.
Mother: No, say "Nobody likes me."
Child: Nobody don't like me.
Mother: No, say "Nobody likes me."
Child: Nobody don't like me.
Mother: No, say "Nobody likes me."
Child: Nobody don't like me.
Mother: No, say "Nobody likes me."
Child: Nobody don't like me.
Mother: Now, listen carefully, say "*Nobody likes me.*"
Child: Oh, nobody don't likes me.

Negative evidence

Important!

- Negative evidence would be additional evidence.
- Linguists attempt to model the path of acquisition under the assumption that the learner does not get negative evidence.
- In other words, we are potentially making our job harder than it need be.
- However, if we can successfully model language acquisition assuming 'no negative evidence', then it is a logical necessity that our model will work with negative evidence in addition to positive evidence.

Negative evidence

Important!

- Negative evidence would be additional evidence.
- Linguists attempt to model the path of acquisition under the assumption that the learner does not get negative evidence.
- In other words, we are potentially making our job harder than it need be.
- However, if we can successfully model language acquisition assuming 'no negative evidence', then it is a logical necessity that our model will work with negative evidence in addition to positive evidence.

Negative evidence

Important!

- Negative evidence would be additional evidence.
- Linguists attempt to model the path of acquisition under the assumption that the learner does not get negative evidence.
- In other words, we are potentially making our job harder than it need be.
- However, if we can successfully model language acquisition assuming 'no negative evidence', then it is a logical necessity that our model will work with negative evidence in addition to positive evidence.

Negative evidence

Important!

- Negative evidence would be additional evidence.
- Linguists attempt to model the path of acquisition under the assumption that the learner does not get negative evidence.
- In other words, we are potentially making our job harder than it need be.
- However, if we can successfully model language acquisition assuming 'no negative evidence', then it is a logical necessity that our model will work with negative evidence in addition to positive evidence.

Implications of No Negative Evidence

The Subset Principle

- $\mathcal{L}_1 = a$
- $\mathcal{L}_2 = a, aa$
- $\mathcal{L}_3 = a, aa, aaa$
- $\ldots$
- $\mathcal{L}_n = a, aa, \ldots a^n$

How does the learner converge on correct $\mathcal{L}_i$?
When you have to figure out what language is spoken in your environment, which $\mathcal{L}$ should you start with (=initial state), $\mathcal{L}_1$ or $\mathcal{L}_\infty$?

Implications of No Negative Evidence

The Subset Principle

- $\mathcal{L}_1 = a$
- $\mathcal{L}_2 = a, aa$
- $\mathcal{L}_3 = a, aa, aaa$
- $\ldots$
- $\mathcal{L}_n = a, aa, \ldots a^n$

How does the learner converge on correct $\mathcal{L}_i$?
When you have to figure out what language is spoken in your environment, which $\mathcal{L}$ should you start with (=initial state), $\mathcal{L}_1$ or $\mathcal{L}_\infty$?

Implications of No Negative Evidence

The Subset Principle

- $\mathcal{L}_1 = a$
- $\mathcal{L}_2 = a, aa$
- $\mathcal{L}_3 = a, aa, aaa$
- $\ldots$
- $\mathcal{L}_n = a, aa, \ldots a^n$

How does the learner converge on correct $\mathcal{L}_i$?
When you have to figure out what language is spoken in your environment, which $\mathcal{L}$ should you start with (=initial state), $\mathcal{L}_1$ or $\mathcal{L}_\infty$?

Implications of No Negative Evidence

The Subset Principle

- $\mathcal{L}_1 = a$
- $\mathcal{L}_2 = a, aa$
- $\mathcal{L}_3 = a, aa, aaa$
- $\ldots$
- $\mathcal{L}_n = a, aa, \ldots a^n$

How does the learner converge on correct $\mathcal{L}_i$?
When you have to figure out what language is spoken in your environment, which $\mathcal{L}$ should you start with (=initial state), $\mathcal{L}_1$ or $\mathcal{L}_\infty$?

Implications of No Negative Evidence

The Subset Principle

- $\mathcal{L}_1 = a$
- $\mathcal{L}_2 = a, aa$
- $\mathcal{L}_3 = a, aa, aaa$
- $\ldots$
- $\mathcal{L}_n = a, aa, \ldots a^n$

How does the learner converge on correct $\mathcal{L}_i$?
When you have to figure out what language is spoken in your environment, which $\mathcal{L}$ should you start with (=initial state), $\mathcal{L}_1$ or $\mathcal{L}_\infty$?

Implications of No Negative Evidence

The Subset Principle

- $\mathcal{L}_1 = a$
- $\mathcal{L}_2 = a, aa$
- $\mathcal{L}_3 = a, aa, aaa$
- $\ldots$
- $\mathcal{L}_n = a, aa, \ldots a^n$

How does the learner converge on correct $\mathcal{L}_i$?
When you have to figure out what language is spoken in your environment, which $\mathcal{L}$ should you start with (=initial state), $\mathcal{L}_1$ or $\mathcal{L}_\infty$?

Implications of No Negative Evidence

The Subset Principle

- $\mathcal{L}_1 = a$
- $\mathcal{L}_2 = a, aa$
- $\mathcal{L}_3 = a, aa, aaa$
- $\ldots$
- $\mathcal{L}_n = a, aa, \ldots a^n$

How does the learner converge on correct $\mathcal{L}_i$?

When you have to figure out what language is spoken in your environment, which $\mathcal{L}$ should you start with (=initial state), $\mathcal{L}_1$ or $\mathcal{L}_\infty$?

Implications of No Negative Evidence

The Subset Principle

- $\mathcal{L}_1 = a$
- $\mathcal{L}_2 = a, aa$
- $\mathcal{L}_3 = a, aa, aaa$
- $\ldots$
- $\mathcal{L}_n = a, aa, \ldots a^n$

How does the learner converge on correct $\mathcal{L}_i$?
When you have to figure out what language is spoken in your environment, which $\mathcal{L}$ should you start with (=initial state), $\mathcal{L}_1$ or $\mathcal{L}_\infty$?

- How can this abstract idea be applied to real language data?
- Do children assume they are born in an English or an Icelandic environment?
  i. Sigga$_i$ segir að Maria$_j$ elski sig$_{i/j}$
  ii. Sigga$_i$ says that Maria$_j$ loves herself$_{*i/j}$

- How can this abstract idea be applied to real language data?
- Do children assume they are born in an English or an Icelandic environment?
  i. Sigga$_i$ segir að Maria$_j$ elski sig$_{i/j}$
  ii. Sigga$_i$ says that Maria$_j$ loves herself$_{*i/j}$

- How can this abstract idea be applied to real language data?
- Do children assume they are born in an English or an Icelandic environment?
  i. Sigga$_i$ segir að Maria$_j$ elski sig$_{i/j}$
  ii. Sigga$_i$ says that Maria$_j$ loves herself$_{*i/j}$

- How can this abstract idea be applied to real language data?
- Do children assume they are born in an English or an Icelandic environment?
  i. Sigga$_i$ segir að Maria$_j$ elski sig$_{i/j}$
  ii. Sigga$_i$ says that Maria$_j$ loves herself$_{*i/j}$

Conclusion on Subset Principle

- Initial hypotheses must be narrow.
- What does it take to make narrow hypotheses?

Outline

General Principles:

- Each card is a grammatical "sentence", ungrammatical "sentence" or neither
- A language = set of sentences *or* conditions on sentences
- UG = set of primitives *or* set of languages definable using these primitives:
  - types of symbols (features)
  - logical operators for symbols: AND, OR

- Features:
  - NUMBERCARD
  - ♣, ♢, ♡, ♠
- Operators: AND

Some **Possible** Languages given UG1:

- G_1 = [NUMBERCARD]
  "A sentence/card is in G_1 if and only if it is a numbercard." *[K♢].
- G_2 = [NUMBERCARD AND ♢]
  "A sentence/card is in G_2 if and only if it is a diamond numbercard."
- G_3=[♠]
  "A sentence/card is in G_3 if and only if it is a spade."
  What is the representation of 5♠? K♠? 5♣
- G_4=[ ]
  "Every sentence/card is in G_4." Is this completely true?

Some **Possible** Languages given UG1:

- G_1 = [NUMBERCARD]
  "A sentence/card is in G_1 if and only if it is a numbercard." *[K♢].
- G_2 = [NUMBERCARD AND ♢]
  "A sentence/card is in G_2 if and only if it is a diamond numbercard."
- G_3=[♠]
  "A sentence/card is in G_3 if and only if it is a spade."
  What is the representation of 5♠? K♠? 5♣
- G_4=[ ]
  "Every sentence/card is in G_4." Is this completely true?

Some **Possible** Languages given UG1:

- G_1 = [NUMBERCARD]
  "A sentence/card is in G_1 if and only if it is a numbercard." *[K♢].
- G_2 = [NUMBERCARD AND ♢]
  "A sentence/card is in G_2 if and only if it is a diamond numbercard."
- G_3=[♠]
  "A sentence/card is in G_3 if and only if it is a spade."
  What is the representation of 5♠? K♠? 5♣
- G_4=[ ]
  "Every sentence/card is in G_4." Is this completely true?

Some **Possible** Languages given UG1:

- G_1 = [NUMBERCARD]
  "A sentence/card is in G_1 if and only if it is a numbercard." *[K♢].
- G_2 = [NUMBERCARD AND ♢]
  "A sentence/card is in G_2 if and only if it is a diamond numbercard."
- G_3=[♠]
  "A sentence/card is in G_3 if and only if it is a spade."
  What is the representation of 5♠? K♠? 5♣
- G_4=[ ]
  "Every sentence/card is in G_4." Is this completely true?

Some **Possible** Languages given UG1:

- G_1 = [NUMBERCARD]
  "A sentence/card is in G_1 if and only if it is a numbercard." *[K♢].
- G_2 = [NUMBERCARD AND ♢]
  "A sentence/card is in G_2 if and only if it is a diamond numbercard."
- G_3=[♠]
  "A sentence/card is in G_3 if and only if it is a spade."
  What is the representation of 5♠? K♠? 5♣
- G_4=[ ]
  "Every sentence/card is in G_4." Is this completely true?

Some **Impossible** Languages given UG1:

- F_1 = [PICTURECARD]
  "A sentence/card is in F_1 if and only if it is a picturecard."
- F_2 = [NUMBERCARD OR $\diamondsuit$]
  "A sentence/card is in F_2 if and only if it is a numbercard or a diamond (or both)."
- F_3=[6$\spadesuit$]
  "A sentence/card is in F_3 if and only if it is the six of spades."

Some **Impossible** Languages given UG1:

- F_1 = [PICTURECARD]
  "A sentence/card is in F_1 if and only if it is a picturecard."
- F_2 = [NUMBERCARD OR ♢]
  "A sentence/card is in F_2 if and only if it is a numbercard or a diamond (or both)."
- F_3=[6♠]
  "A sentence/card is in F_3 if and only if it is the six of spades."

Some **Impossible** Languages given UG1:

- F_1 = [PICTURECARD]
  "A sentence/card is in F_1 if and only if it is a picturecard."
- F_2 = [NUMBERCARD OR $\diamondsuit$]
  "A sentence/card is in F_2 if and only if it is a numbercard or a diamond (or both)."
- F_3=[6$\spadesuit$]
  "A sentence/card is in F_3 if and only if it is the six of spades."

Some **Impossible** Languages given UG1:

- F_1 = [PICTURECARD]
  "A sentence/card is in F_1 if and only if it is a picturecard."
- F_2 = [NUMBERCARD OR $\diamondsuit$]
  "A sentence/card is in F_2 if and only if it is a numbercard or a diamond (or both)."
- F_3=[6$\spadesuit$]
  "A sentence/card is in F_3 if and only if it is the six of spades."

UG2

- Features:
  - NUMBERCARD, PICTURECARD= [± PICTURE]
  - RED, BLACK = [± RED]
- Operators: AND

Some **Possible** Languages given UG2:

- G_5 = [+RED AND -PICTURE]
  "A sentence/card is in G_5 if and only if it is a red numbercard." What is representation of 7♢? 7♡? 7♠?
- G_6 = [+RED]
  "A sentence/card is in G_6 if and only if it is a red card."

Some **Possible** Languages given UG2:

- $G_5 = [+\text{RED AND -PICTURE}]$
  "A sentence/card is in G_5 if and only if it is a red numbercard." What is representation of 7♢? 7♡? 7♠?
- $G_6 = [+\text{RED}]$
  "A sentence/card is in G_6 if and only if it is a red card."

Some **Possible** Languages given UG2:

- $G_5 = [+\text{RED AND -PICTURE}]$
  "A sentence/card is in G_5 if and only if it is a red numbercard." What is representation of 7♢? 7♡? 7♠?
- $G_6 = [+\text{RED}]$
  "A sentence/card is in G_6 if and only if it is a red card."

Some **Impossible** Languages given UG2:

- $F_4 = [\spadesuit]$
  "A sentence/card is in F_4 if and only if it is a spade."
- $F_5 = [+\text{PICTURE OR } -\text{RED}]$
  "A sentence/card is in F_5 if and only if it is a picture card or a black card (or both)."

Some **Impossible** Languages given UG2:

- $F_4 = [\spadesuit]$
  "A sentence/card is in F_4 if and only if it is a spade."
- $F_5 = [+\text{PICTURE OR } -\text{RED}]$
  "A sentence/card is in F_5 if and only if it is a picture card or a black card (or both)."

Some **Impossible** Languages given UG2:

- $F_4 = [\spadesuit]$
  "A sentence/card is in F_4 if and only if it is a spade."
- $F_5 = [+\text{PICTURE OR } -\text{RED}]$
  "A sentence/card is in F_5 if and only if it is a picture card or a black card (or both)."

UG3

- Features:
  - [PICTURE]
  - [2,3,4,5,6,7,8,9,10]
  - [±RED]
- Operators: AND, OR

Some **Possible** Languages given UG3:

- $G_7 = [+\text{RED AND } 9]$
  "A sentence/card is in G_7 if and only if it is a red nine."
- $G_8 = [\text{-RED AND PICTURE}]$
  "A sentence/card is in G_8 if and only if it is a black picture card."
- $G_9 = [\text{PICTURE OR } +\text{RED}]$. "A sentence/card is in G_9 if and only if it is a red card or a picture card (or both)."

Some **Possible** Languages given UG3:

- $G_7 = [+\text{RED AND } 9]$
  "A sentence/card is in G_7 if and only if it is a red nine."
- $G_8 = [\text{-RED AND PICTURE}]$
  "A sentence/card is in G_8 if and only if it is a black picture card."
- $G_9 = [\text{PICTURE OR } +\text{RED}]$. "A sentence/card is in G_9 if and only if it is a red card or a picture card (or both)."

Some **Possible** Languages given UG3:

- $G_7 = [+\text{RED AND } 9]$
  "A sentence/card is in G_7 if and only if it is a red nine."
- $G_8 = [\text{-RED AND PICTURE}]$
  "A sentence/card is in G_8 if and only if it is a black picture card."
- $G_9 = [\text{PICTURE OR } +\text{RED}]$. "A sentence/card is in G_9 if and only if it is a red card or a picture card (or both)."

Some **Possible** Languages given UG3:

- G_7 = [+RED AND 9]
  "A sentence/card is in G_7 if and only if it is a red nine."
- G_8 = [-RED AND PICTURE]
  "A sentence/card is in G_8 if and only if it is a black picture card."
- G_9 = [PICTURE OR +RED]. "A sentence/card is in G_9 if and only if it is a red card or a picture card (or both)."

Some **Impossible** Languages given UG3:

- $F_6 = [\spadesuit]$
  "A sentence/card is in F_6 if and only if it is a spade."
- $F_7 = [\text{NUMBERCARD}]$
  "A sentence/card is in F_7 if and only if it is a numbercard."
- $F_8 = [\text{-RED AND Q}]$
  "A sentence/card is in F_8 if and only if it is a black queen."

Some **Impossible** Languages given UG3:

- $F_6 = [\spadesuit]$
  "A sentence/card is in F_6 if and only if it is a spade."
- $F_7 = [\text{NUMBERCARD}]$
  "A sentence/card is in F_7 if and only if it is a numbercard."
- $F_8 = [\text{-RED AND Q}]$
  "A sentence/card is in F_8 if and only if it is a black queen."

Some **Impossible** Languages given UG3:

- $F_6 = [\spadesuit]$
  "A sentence/card is in F_6 if and only if it is a spade."
- $F_7 = [\textsc{numbercard}]$
  "A sentence/card is in F_7 if and only if it is a numbercard."
- $F_8 = [\textsc{-red and Q}]$
  "A sentence/card is in F_8 if and only if it is a black queen."

Some **Impossible** Languages given UG3:

- $F_6 = [\spadesuit]$
  "A sentence/card is in F_6 if and only if it is a spade."
- $F_7 = [\text{NUMBERCARD}]$
  "A sentence/card is in F_7 if and only if it is a numbercard."
- $F_8 = [\text{-RED AND Q}]$
  "A sentence/card is in F_8 if and only if it is a black queen."

Conclusion:

The set of primitives supplied by UG determines the set of possible grammars that can be described.

Conclusion:

The set of primitives supplied by UG determines the set of possible grammars that can be described.

Outline

An impoverished UG4:

- Features: [♢]
  - Expose learner to "**5**♢". Learner parses (=constructs a representation for) "♢". The **5** is unparsable. It is not **linguistic** information.
  - Expose a learner to "**6**♡". The learner parses nothing! there is no **linguistic** information in the input.

A *really* impoverished UG5:

- Features: [ ]
  - Expose leaner to anything. Learner parses nothing!
  - "Without Mental Grammar, there's no language perception—just noise" [Jackendoff *PIM*].

A *really* impoverished UG5:

- Features: [ ]
  - Expose leaner to anything. Learner parses nothing!
  - "Without Mental Grammar, there's no language perception—just noise" [Jackendoff *PIM*].

A *really* impoverished UG5:

- Features: [ ]
  - Expose leaner to anything. Learner parses nothing!
  - "Without Mental Grammar, there's no language perception—just noise" [Jackendoff *PIM*].

Conclusions:

There must be *something* at the initial state.

Possible objections:

Maybe there are more basic primitives at initial state. For example, if we are sensitive to the difference between straight and curved lines, we could discover the distinction between $\diamondsuit$ and $\heartsuit$.

Response:

Then ‘straight’ *vs.* ‘curved’ are the innate primitives. But **you gotta start with something!** That something is Universal Grammar.

Outline

Innateness...

- Children are born knowing the set of features used in the languages of the world.
- They are born with equivalence classes.

Innateness of Primitives Principle (IofP)

"In any computational theory, 'learning' can consist only of creating novel combination of primitives already innately available" (Jackendoff 1991:40)

Learning = Forgetting?

Language acquisition involves the **loss** of the ability to make distinction. We are 'deafened' by our experience.

Is this possible?

- Psycholinguistic experiments show that even newborns can distinguish sounds that constitute possible phonetic contrasts in the languages of the world.
- Even at 10 months children have lost some of their power of discrimination.

Is this possible?

- You can't go by what comes out of kids' mouths:
  . . . they appear, in many respects, to have adult-like representations, which are reflected, among other things, in their vociferous rejections of adult imitations of their phonologically impoverished productions (Faber and Best 1994: 266-7).
- We'll look at this more. . .

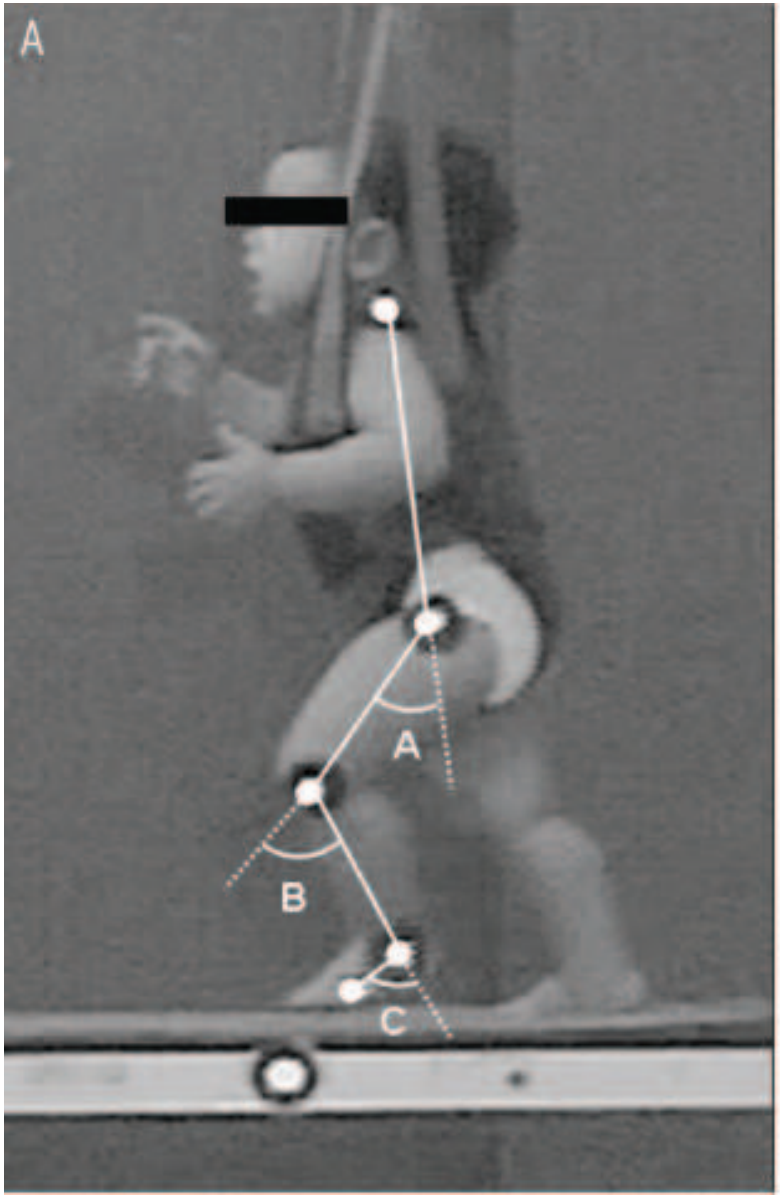
Two arguments for innate primitives

- You can't parse without representations
- You can't obey the Subset Principle without innate primitives to specify, say, locality

The Innateness Hypothesis is a misnomer. *IofP* is a logical necessity.

Outline

Babies *know* how to walk



Competence-Performance in another domain:

Faber and Best 1994 (following Thelen and Ulrich 1991)

"if the needs for balance and for ankle extension are removed, by holding infants with their feet touching a backward-moving treadmill, some infants as young as one month old will stay in place by stepping forward in the alternating pattern characteristic of adult walking.'

Babies *know* how to walk

Apparently, manipulation of their production system allowed for closer observation of their competence as walkers. In a sense, these babies *knew* how to walk like adults, but their performance was hindered by factors including physiological considerations like the relative weight of their heads to their bodies and the state of their musculature, as well as their cognitive inability to synchronize 'input from the visual and vestibular systems.' As the relative weight of head and body approaches that of adults, and as other cognitive and physiological systems mature, the child's performance system catches up with the innate knowledge of how to walk. We propose that learning to talk follows a parallel path.

Outline

What is UG about?

Sets of languages

Attested?

- Reflects accidents of history, graduate school funding, etc.
- 'English', 'Cree', 'French'

What is UG about?

Sets of languages

Attested?

- Reflects accidents of history, graduate school funding, etc.
- 'English', 'Cree', 'French'

What is UG about?

Sets of languages

Attested?

- Reflects accidents of history, graduate school funding, etc.
- 'English', 'Cree', 'French'

What is UG about?

Sets of languages

Attested $\subset$ Attestable? $\subset$ Statable

- What factors determine attestability in principle?
- English in 200 years, Joe's Japanese

What is UG about?

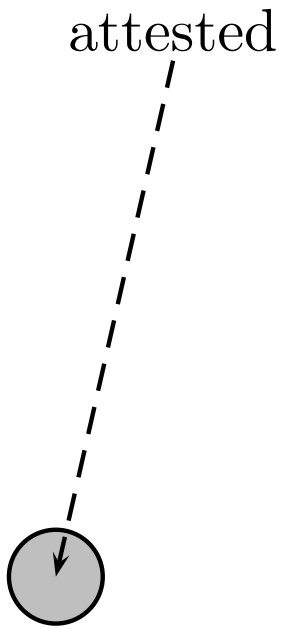
Sets of languages

Attested $\subset$ Attestable? $\subset$ Statable

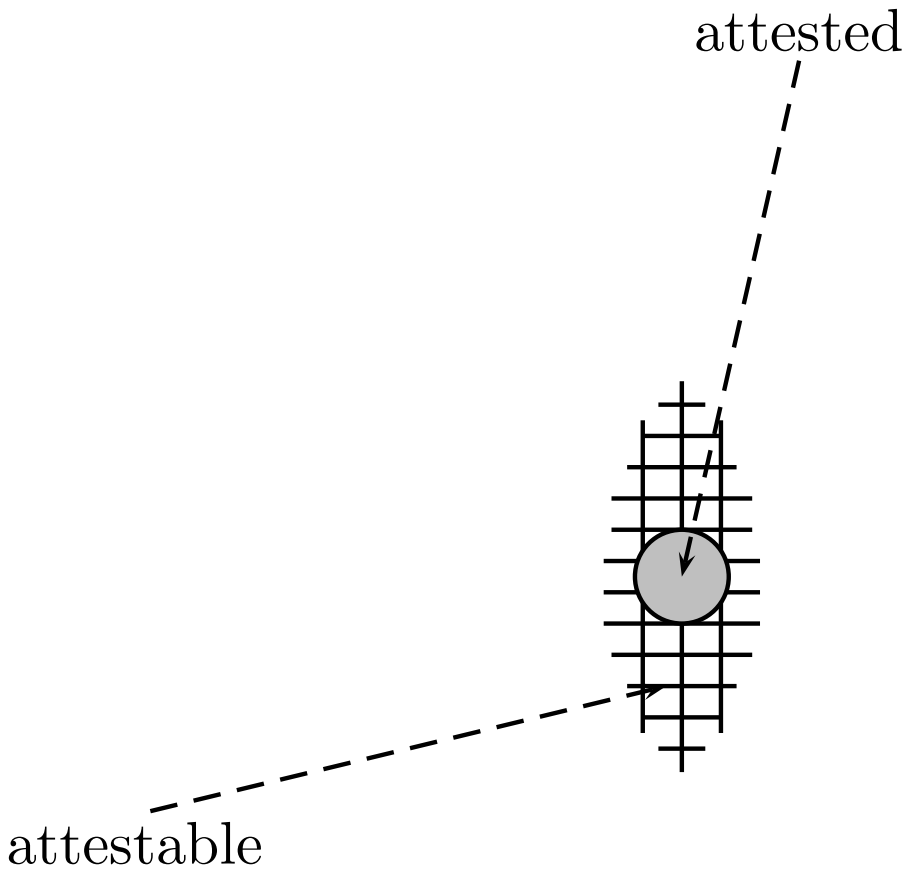
- What factors determine attestability in principle?
- English in 200 years, Joe's Japanese

What is UG about?

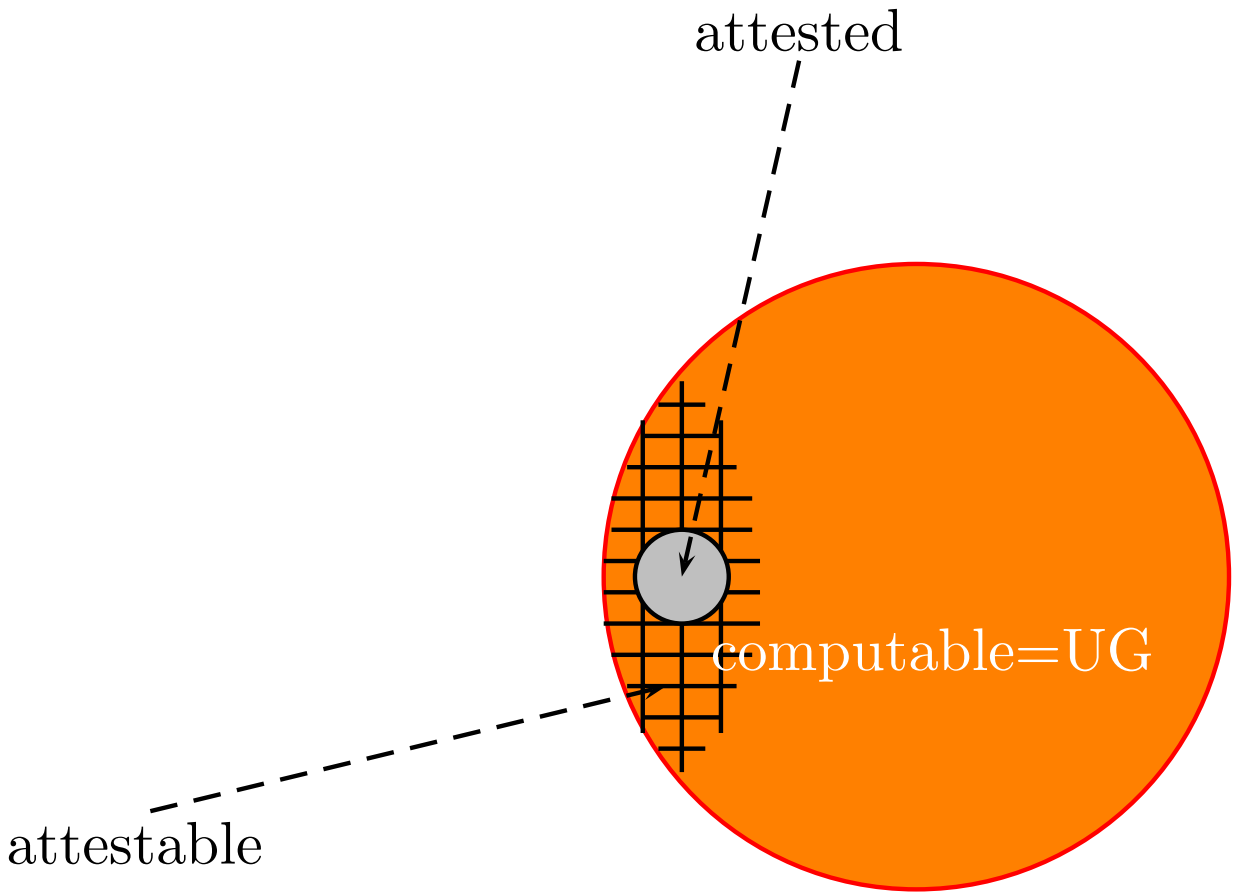
What is UG about? Attested?



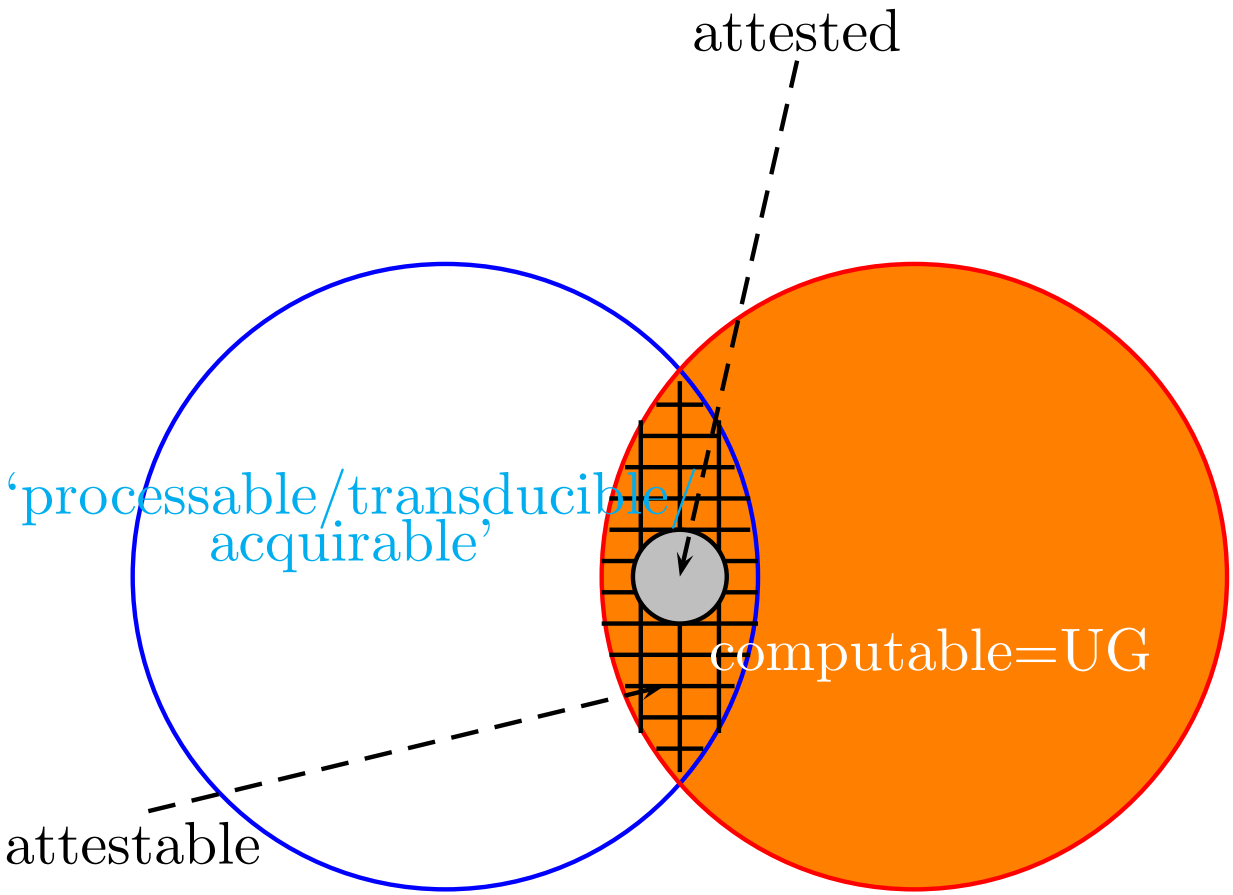
What is UG about? Attested, attestable



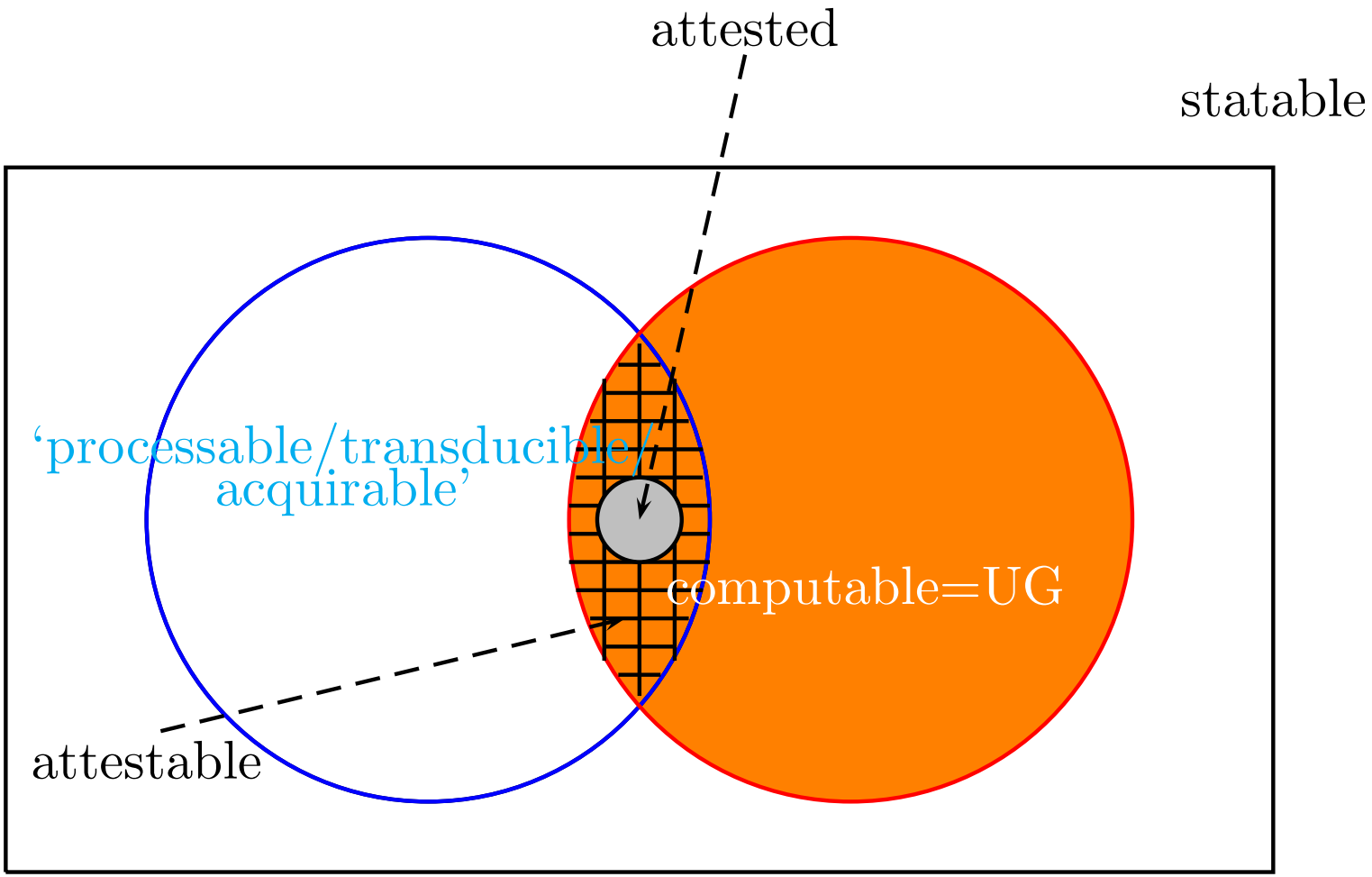
What is UG about? Attested, attestable, computable



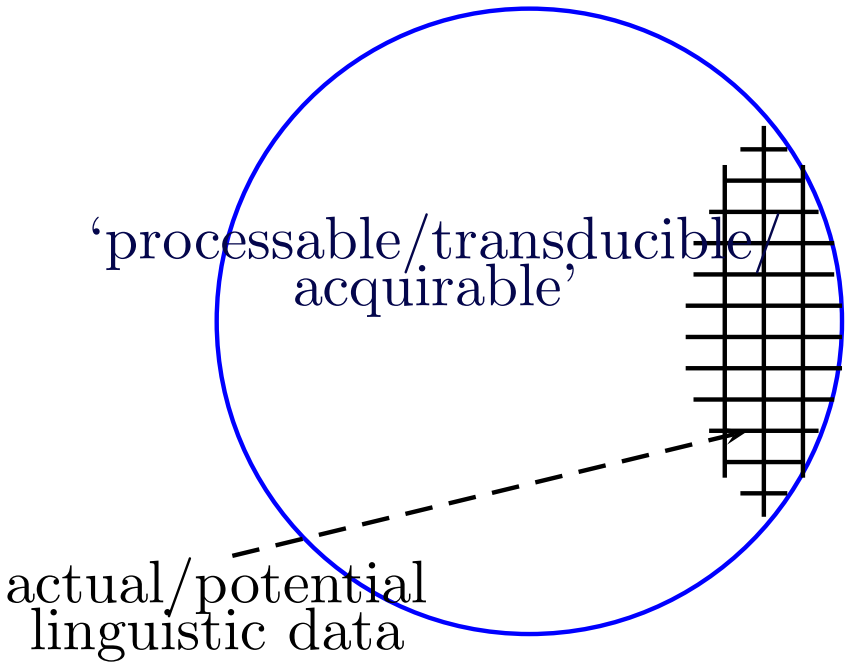
Attested, attestable, computable, X-able



. . . and statable

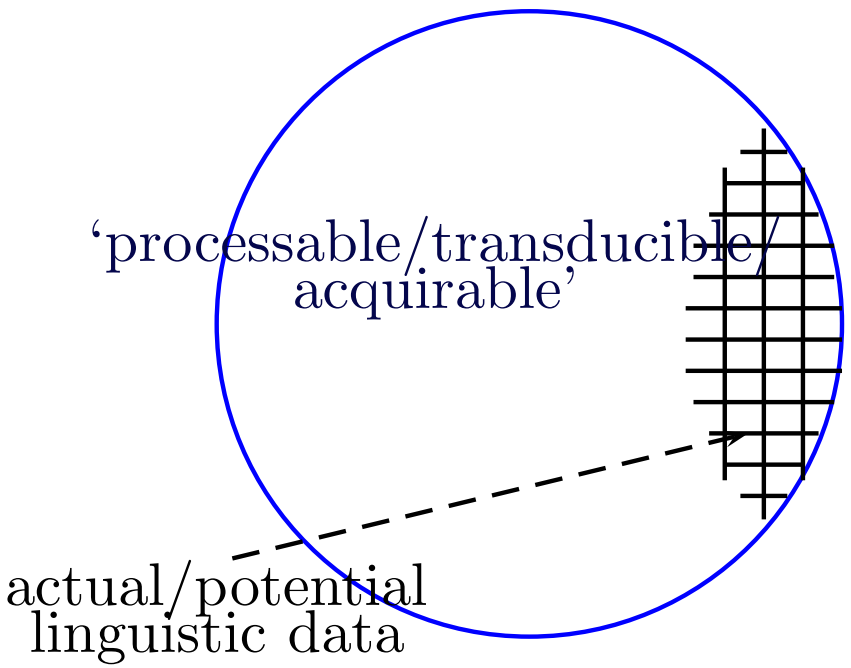


X-able stuff


‘processable/transducible/
acquirable’
actual/potential
linguistic data

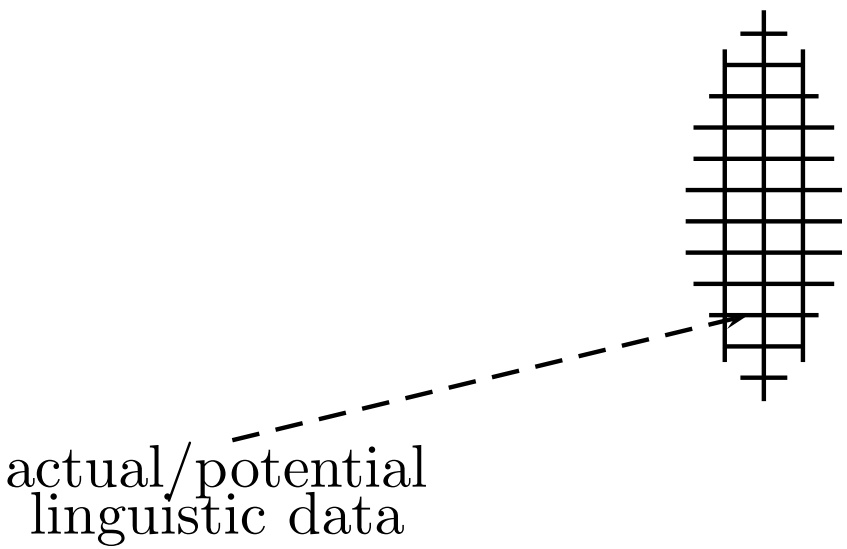
X-able stuff

Important and interesting, but not grammar



Attestable is *emergent*

We don't want a single model of "attestable", since its explanation results from the interaction of several simple(r) models



UG is the theory of one of those components.

We have failed to be convincing. Can we make it more palatable?

An analogy

A grammar : A set of sentences ::
A theory of UG : A set of languages

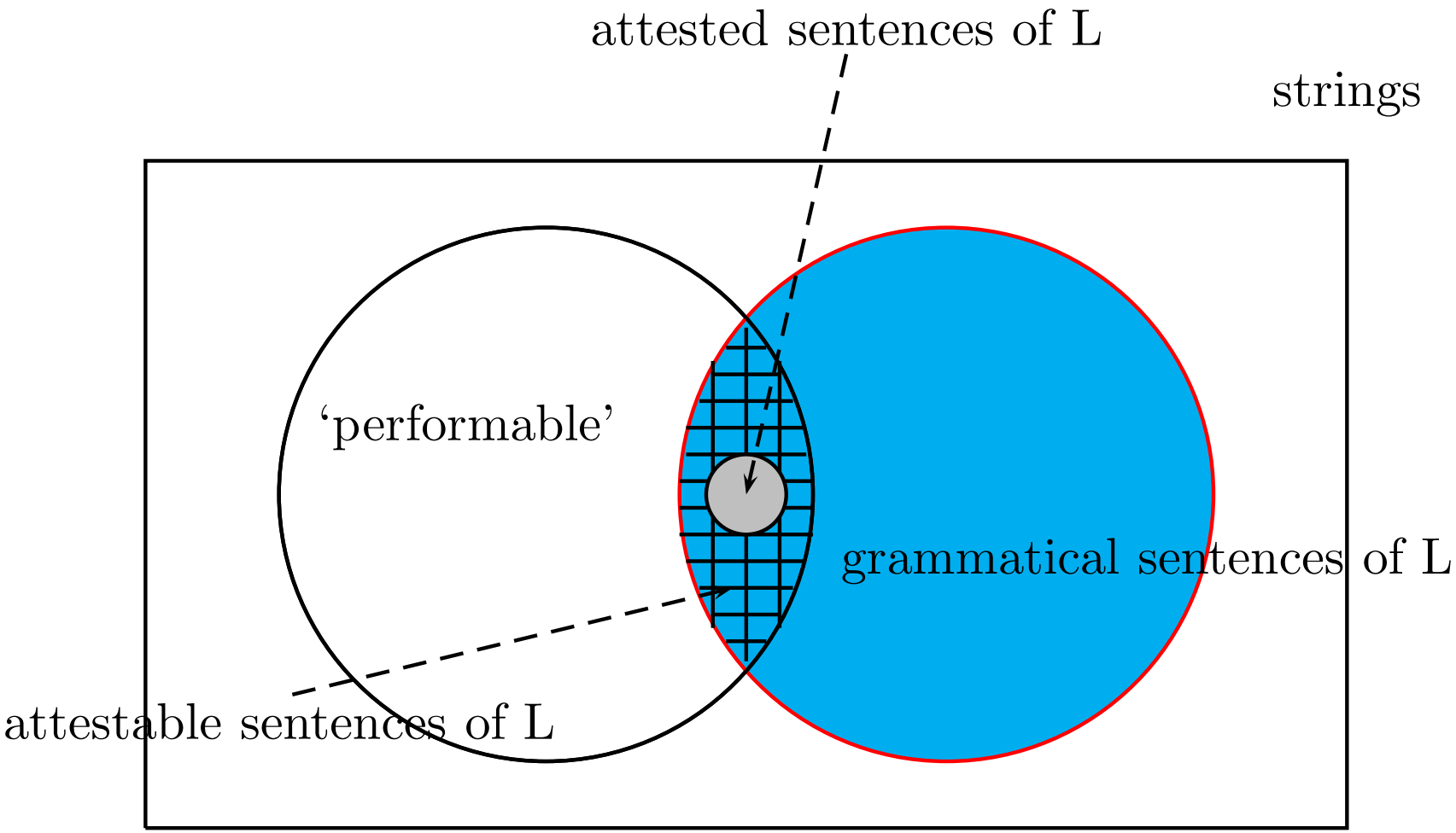
- A grammar generates ALL AND ONLY grammatical sentences
- UG models the set of ALL AND ONLY 'possible' languages

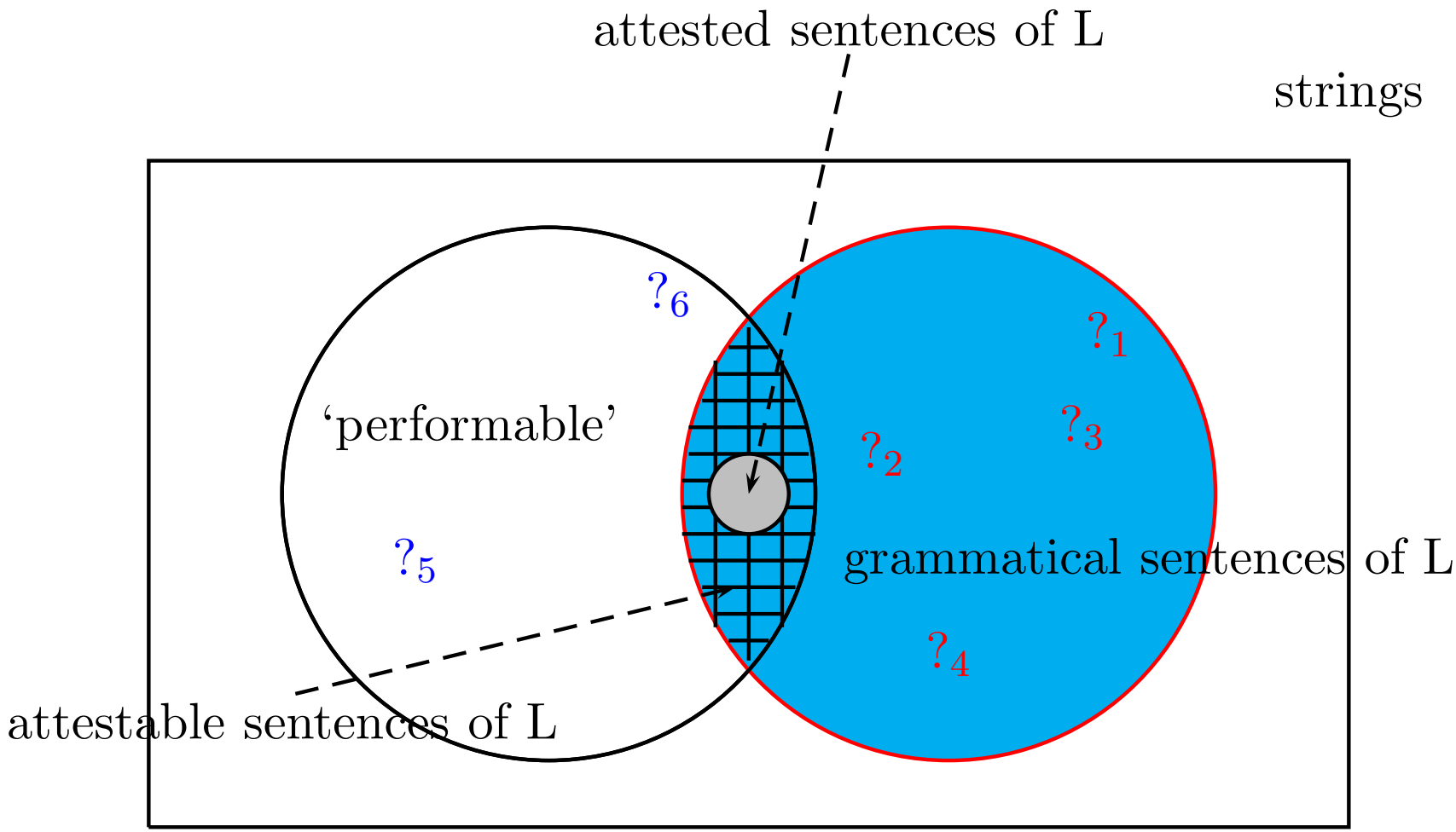
An analogy

A grammar : A set of sentences ::
A theory of UG : A set of languages

- A grammar generates ALL AND ONLY grammatical sentences
- UG models the set of ALL AND ONLY 'possible' languages

Strings and a Grammar L




attested sentences of L
strings
?6
?1
‘performable’
?3
?2
?5
grammatical sentences of L
?4
attestable sentences of L

Grammatical but unperformable

?$_1$: *The cat the dog the mouse bit chased purred.*

?$_2$: *John saw the boy . . .* [995 words] *. . . yesterday.*

?$_3$: *It never happens that nobody is not unhappy.*

?$_4$: 'I quite agree with you,' said the Duchess; 'and the moral of that is—"Be what you would seem to be"—or if you'd like it put more simply—"Never imagine yourself not to be otherwise than what it might appear to others that what you were or might have been was not otherwise than what you had been would have appeared to them to be otherwise." ' [*Alice in Wonderland*]

Grammatical but unperformable

?$_1$: *The cat the dog the mouse bit chased purred.*

?$_2$: *John saw the boy . . .* [995 words] *. . . yesterday.*

?$_3$: *It never happens that nobody is not unhappy.*

?$_4$: 'I quite agree with you,' said the Duchess; 'and the moral of that is—"Be what you would seem to be"—or if you'd like it put more simply—"Never imagine yourself not to be otherwise than what it might appear to others that what you were or might have been was not otherwise than what you had been would have appeared to them to be otherwise." ' [*Alice in Wonderland*]

Grammatical but unperformable

$?_1$: *The cat the dog the mouse bit chased purred.*

$?_2$: *John saw the boy . . .* [995 words] *. . . yesterday.*

$?_3$: *It never happens that nobody is not unhappy.*

$?_4$: 'I quite agree with you,' said the Duchess; 'and the moral of that is—"Be what you would seem to be"—or if you'd like it put more simply—"Never imagine yourself not to be otherwise than what it might appear to others that what you were or might have been was not otherwise than what you had been would have appeared to them to be otherwise." ' [*Alice in Wonderland*]

Grammatical but unperformable

?$_1$: *The cat the dog the mouse bit chased purred.*

?$_2$: *John saw the boy* . . . [995 words] . . . *yesterday.*

?$_3$: *It never happens that nobody is not unhappy.*

?$_4$: 'I quite agree with you,' said the Duchess; 'and the moral of that is—"Be what you would seem to be"—or if you'd like it put more simply—"Never imagine yourself not to be otherwise than what it might appear to others that what you were or might have been was not otherwise than what you had been would have appeared to them to be otherwise." ' [*Alice in Wonderland*]

Performable but ungrammatical

$?_5$: **Me like you.*

$?_6$: **John is allowed running here* (Unless you are Canadian)

Unacquirable, but computable

Modeling stress with Halle-Idsardi Edge-marking rules:

Three binary parameters yield eight rules:

1. Edge:RRR * * * *)
   Insert a R parenthesis to the R of the R-most *
2. Edge:RLR * * *) *
   Insert a R parenthesis to the L of the R-most *
3. Edge:RRL *) * * *
4. ?Edge:RLL)* * * *
5. Edge:LLL (* * * *
6. Edge:LRL *(* * *
7. Edge:LLR * * * (*
8. ?Edge:LRR * * * *(

Unacquirable, but computable

Modeling stress with Halle-Idsardi Edge-marking rules:

Three binary parameters yield eight rules:

1. Edge:RRR * * * *)
   Insert a R parenthesis to the R of the R-most *
2. Edge:RLR * * *) *
   Insert a R parenthesis to the L of the R-most *
3. Edge:RRL *) * * *
4. ?Edge:RLL)* * * *
5. Edge:LLL (* * * *
6. Edge:LRL *(* * *
7. Edge:LLR * * * (*
8. ?Edge:LRR * * * *(

Unacquirable, but computable

Modeling stress with Halle-Idsardi Edge-marking rules:

Three binary parameters yield eight rules:

1. Edge:RRR * * * *)
   Insert a R parenthesis to the R of the R-most *
2. Edge:RLR * * *) *
   Insert a R parenthesis to the L of the R-most *
3. Edge:RRL *) * * *
4. ?Edge:RLL)* * * *
5. Edge:LLL (* * * *
6. Edge:LRL *(* * *
7. Edge:LLR * * * (*
8. ?Edge:LRR * * * *(

Unacquirable, but computable

Modeling stress with Halle-Idsardi Edge-marking rules:

Three binary parameters yield eight rules:

1. Edge:RRR * * * *)
   Insert a R parenthesis to the R of the R-most *
2. Edge:RLR * * *) *
   Insert a R parenthesis to the L of the R-most *
3. Edge:RRL *) * * *
4. ?Edge:RLL)* * * *
5. Edge:LLL (* * * *
6. Edge:LRL *(* * *
7. Edge:LLR * * * (*
8. ?Edge:LRR * * * *(

Unacquirable, but computable

Modeling stress with Halle-Idsardi Edge-marking rules:

Three binary parameters yield eight rules:

1. Edge:RRR * * * *)
   Insert a R parenthesis to the R of the R-most *
2. Edge:RLR * * *) *
   Insert a R parenthesis to the L of the R-most *
3. Edge:RRL *) * * *
4. ?Edge:RLL)* * * *
5. Edge:LLL (* * * *
6. Edge:LRL *(* * *
7. Edge:LLR * * * (*
8. ?Edge:LRR * * * *(

Unacquirable, but computable

Modeling stress with Halle-Idsardi Edge-marking rules:

Three binary parameters yield eight rules:

1. Edge:RRR * * * *)
   Insert a R parenthesis to the R of the R-most *
2. Edge:RLR * * *) *
   Insert a R parenthesis to the L of the R-most *
3. Edge:RRL *) * * *
4. ?Edge:RLL)* * * *
5. Edge:LLL (* * * *
6. Edge:LRL *(* * *
7. Edge:LLR * * * (*
8. ?Edge:LRR * * * *(

Unacquirable, but computable

Modeling stress with Halle-Idsardi Edge-marking rules:

Three binary parameters yield eight rules:

1. Edge:RRR * * * *)
   Insert a R parenthesis to the R of the R-most *
2. Edge:RLR * * *) *
   Insert a R parenthesis to the L of the R-most *
3. Edge:RRL *) * * *
4. ?Edge:RLL)* * * *
5. Edge:LLL (* * * *
6. Edge:LRL *(* * *
7. Edge:LLR * * * (*
8. ?Edge:LRR * * * *(

Unacquirable, but computable

Modeling stress with Halle-Idsardi Edge-marking rules:

Three binary parameters yield eight rules:

1. Edge:RRR * * * *)
   Insert a R parenthesis to the R of the R-most *
2. Edge:RLR * * *) *
   Insert a R parenthesis to the L of the R-most *
3. Edge:RRL *) * * *
4. ?Edge:RLL)* * * *
5. Edge:LLL (* * * *
6. Edge:LRL *(* * *
7. Edge:LLR * * * (*
8. ?Edge:LRR * * * *(

RRR, RRL, RLR, ?RLL, LLL, LLR, LRL, ?LRR:
?=unacquirable

Seduction of substance

Don't be seduced into doing this:

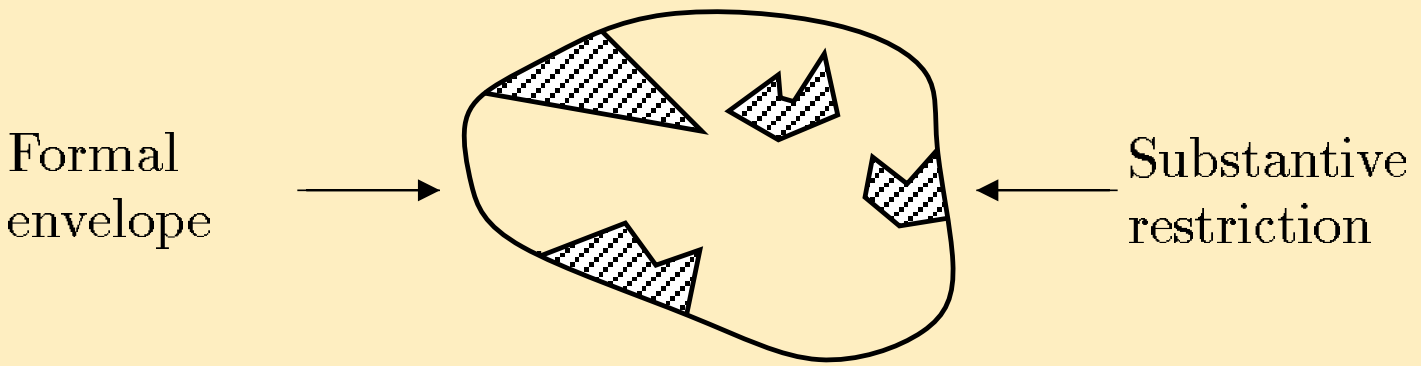
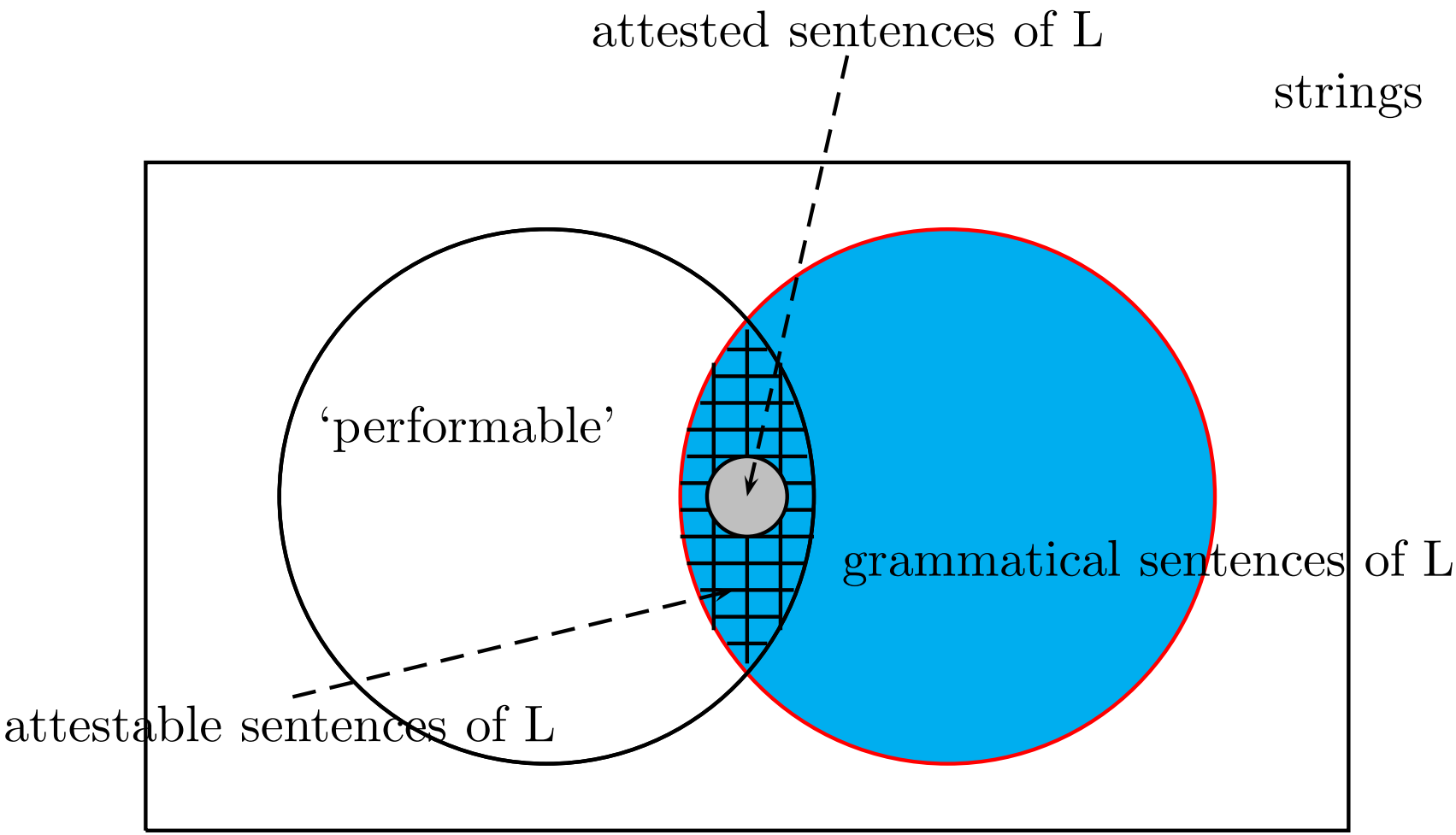


FIGURE 2 The shape of a linguistic theory

Ronald Kaplan (1987/1995:346-7)

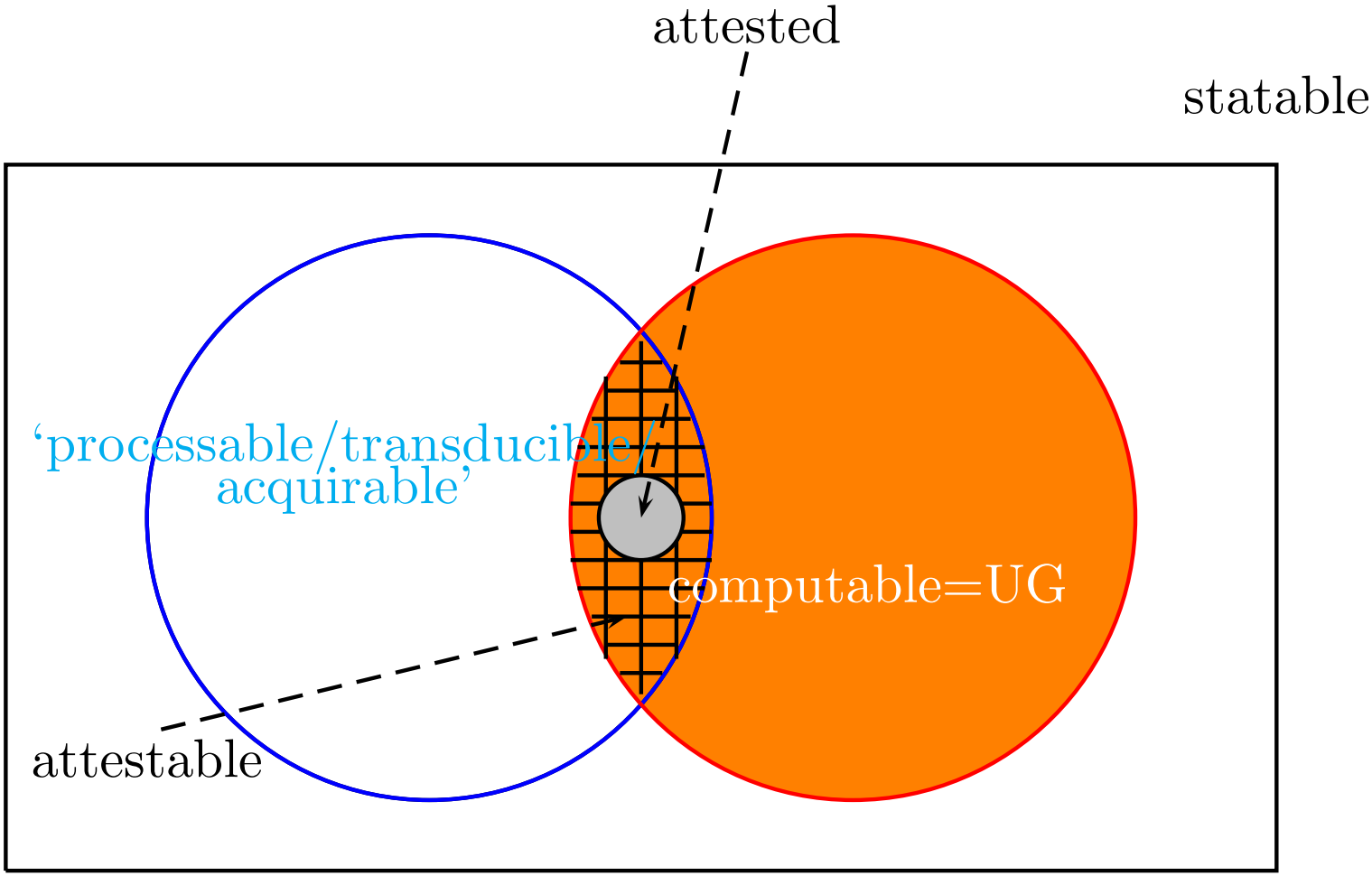
A formal theory may have a relatively smooth outline . . . [t]hen you start taking chunks out of it . . . because you claim that no human language or grammar has such and such a property. . . . It's a mistake to carry premature and unjustified substantive hypotheses into our computational and mathematical work, especially if it leads to mathematically complex, even if more restrictive, theories. . . . [W]e should be wary of the seduction of substance.

The analogy again: possible sentences



Note the nice round blue theory of grammar of L

The analogy again: possible languages



Note the nice round orange theory of UG

- Don't take out chunks of your nice theory of UG (Human Language Faculty) because of properties of Memory, Audition, Learning, etc.
- We expect this effect from a modular theory

- Don't take out chunks of your nice theory of UG (Human Language Faculty) because of properties of Memory, Audition, Learning, etc.
- We expect this effect from a modular theory

References I


Hammarberg, Robert. 1981.
The cooked and the raw.
Journal of Information Science 3:261–267.