

[Babies communicating](#)

[youtube clip](#)

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Where do languages come from and why do they look the way they do?

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- Universal Grammar Hypothesis
 - syntax is the “generative” engine of language
 - syntactically driven mechanisms drive parsing
 - syntactic module (“language organ”) is universal and genetically determined
 - syntax is qualitatively different than lexicon (words)

Chomsky, many traditional linguists:

"Language is no more a cultural invention...than upright posture". ...
 "people know how to talk in more or less the same way that spiders know how to spin webs"... children achieve language "not because they are taught, not because they are generally smart, not because it is useful to them, but because they just can't help it." (Pinker 1994, *The Language Instinct*)

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The Universal Grammar Hypothesis:

There exist domain-specific syntactic principles that are biologically determined (“innate”).

- 1) **Domain-specificity:** language acquisition is constrained by representations, principles, or cognitive mechanisms that are specific to language
- 2) **Universality:** these representations, principles or mechanisms are universal
- 3) **Innateness:** these representations, principles or mechanisms are not *learned*
- 4) **Autonomous Syntax:** these representations, principles or mechanisms depend on syntactic representations and not their functional correlates.

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Nativists (UGers) argue that the input is insufficient to learn language

Nativists have concluded there must exist

“Universal Grammar” and a
 “Language Acquisition Device”

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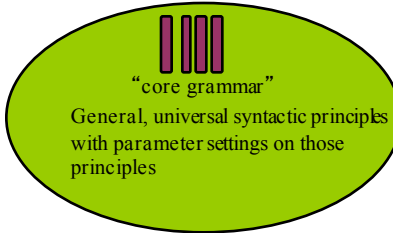
What is *most* striking about human communication as compared to animal communication is the *range of variation* across languages.

- Approx 7000 languages
- 400 language families (like Indo-European)

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syntax as autonomous, modular system of “innate” linguistic knowledge

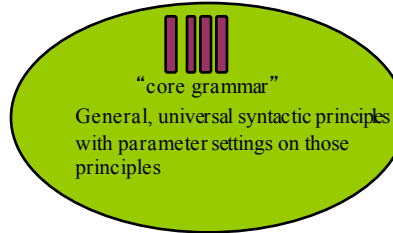


“core grammar”
General, universal syntactic principles
with parameter settings on those
principles

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syntax as autonomous, modular system of “innate” linguistic knowledge




“core grammar”
General, universal syntactic principles
with parameter settings on those
principles

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Universal grammar hypothesis

- Universal principles with language specific parameter settings on those principles.




- “Principles and Parameters approach (P&P)”

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Principles & Parameters (UG)

Language A will have PREpositions if and only if it has VO word order.




Input: **On** the table

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Principles & Parameters (UG)

Language A will have PREpositions if and only if it has VO word order.




Input: **the table ON**

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Principles & Parameters (UG)

Language A allows subject arguments to be omitted



Input: *Wants her to go.*

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why should you care?

- UG Hypothesis has been received wisdom for 50 years
 - Language is a key thing that makes humans special
 - It's assumed we understand how.
- Analogy to other domains is common (see Hauser's Universal Grammar for Morality)
- Parallel questions come up in other fields whether or not analogy is explicit (e.g. face recognition)

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“Duality of patterning”

Language combines a finite set of sounds into an open-ended set of words.

Why does every (spoken) language do this?
What would the alternative be?

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“Duality of patterning”

- Language combines a finite set of sounds into an open-ended set of words.
- **And a finite set of words into an infinite set of meanings.**

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“Duality of patterning”

- Language combines a finite set of sounds into an open-ended set of words.
- **And a finite set of words into an infinite set of meanings.**
- *Why* does every language do this?
- What would the alternative be?

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Using only gesture, tell your partner:

A lion killed a duck.
A duck killed a lion.

A woman who lived upstairs met a child who lived downstairs.

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- The reason for small set of sounds to combine to form an open-ended set of words is to allow us to name an open-ended set of concepts.
- The reason why words combine in a range of fixed ways to convey predictable interpretations is to allow us to convey an open-ended set of propositions.

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Hauser, Chomsky and Fitch (2002, *Science*): the only domain-specific linguistic universal is *recursion*.

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Glossary definition

Recursion
See "Recursion"

Recursion
If you still don't get it, see "Recursion"

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[She thinks that <sentence>]_{sentence}
e.g., *She thinks that he believed that she felt that he knew that ...the dog ran away.*

[The (adj)* N]_{noun phrase}
e.g., *the big, large,.... brown cow*

[X and X]_x
She left and then he left and then they left and then....

Allows sentences to be arbitrarily long

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- Does the human conceptual system involve recursion? yes
- Should we presume that all languages *necessarily* have recursive syntactic patterns?

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It's not clear all languages have recursion:

- Pirahã (Everett 2006)


"I think this. He believes that. She knows something. He left."
"Ko' oi came. Kohoi came (too)."

- Wálpiri (K. Hale 1976)

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Pirahã

Cf. *Cultural Anthropology* 2006;
New Yorker April '07: "The Interpreter":



The photograph shows a man in a small, dark boat on a river. He is shirtless and wearing blue shorts, holding a long wooden pole. Next to him, the head of another person is visible in the water, looking towards the camera. The background shows a lush green riverbank with trees.

Culture and Language

Pirahã appears to lack:

- (Creation) myths.
- Kinship terms for relationships that extend beyond normal life span (40 years there).
- Fixed numbers (Gordon 2004, *Science*)
- Fixed color terms (instead, “this looks like blood; this looks like certain berry.”)
- Quantifiers (“all” “some”)

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Elicitation Jan ‘07 by Gibson, Frank, Fedorenko, and Everett

Tried to elicit embedded possessives: “Kohoi’s spouse’s parent’s dog.”

→ None produced (possible task demand issue)

Embedded clauses:

“Hoagaixoxai said she is not giving birth”.

Hoagaixoxai spoke. Hoagaixoxai spoke. She is not giving birth.

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Piantadosi, Stearns, Everett, Gibson (2012):

- Analysis of corpus of stories collected by Sheldon and Everett.

Working with Pirahã:
 • Arlo Heinrichs: 1959-1966
 • Steve Sheldon: 1967-1976
 • Dan Everett: 1977-2007

- 15 stories (14 by Sheldon, 1 by Everett)
- Approx. 1000 sentences
- Transcribed morpheme by morpheme by Sheldon with overall glosses
- Tagged for part of speech

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Piantadosi, Stearns, Everett, Gibson (2012)

160 instances of *NP said/speaks* followed by clause.

E.g., Lit, “I speak-do He move on the ground Crying, TixohOI”

or Unclear whether best gloss is:

- “I said that TixohOI is crying on the ground”
- “I spoke. He is moving on the ground. TixohOI is crying.”

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Piantadosi, Stearns, Everett, Gibson (2012)

Compelling evidence for recursion would be to find subject relative clauses:

[Subj [embedded clause] main verb]

Tried to elicit: The man who killed the jaguar fell down.

→ Only non-embedded paraphrases produced (“The man killed the jaguar. He fell down.”)

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Piantadosi, Stearns, Everett, Gibson (2012)

- No conjunctions or disjunctions (“and” “or”)
- No clear relative clauses (“who lives upstairs”)
- No unambiguous embedded phrases
- No recursive possessives (“his mother’s sister’s”)

→ Looks like no clear evidence for recursion.
 (although very hard to prove non-existence)

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Perhaps *speech* is special and uniquely human

- But....

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Gestural communication:

Break up into pairs, decide which person is going to put their head down and which one will watch the [video](#)

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Sign Language



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Phonetics of Sign Language

Is this a contradiction in terms?

Signs can function like words in spoken language, so can we analyze their parts.

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Lip reading—an alternative?

Not really: phonemes are not all distinguished visually

- m—b—p
- n—d—t
- f—v
- k—g

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<http://www.youtube.com/watch?v=aFPtc8BVdJk>




McGurk effect

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Finger Spelling

- Used for borrowed English words
- Proper names
- Conventional fingerspelled words are treated like regular ASL signs:
- Forms are typically reduced and altered
- N-O vs #NO



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Features or parts combined together in different ways

Spoken language sound features:




- voicing
- place of articulation
- degree of closure

SIGN LANGUAGE sound features (“phonology”)

- hand configuration
- place of articulation
- movement

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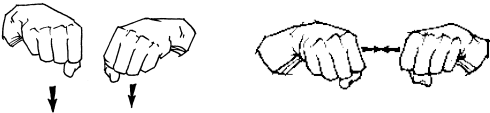
Sign Language	SUMMER	
	UGLY	
	DRY	

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Movement

Can vs. Shoes:

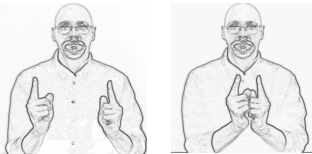


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Orientation


Orientation refers to the direction the palms are facing: side to side or front to back (relative to speaker)



“meet”

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“meet you”

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Facial Expression and ASL

- Parallel with spoken language INTONATION
- Can distinguish conditional, question...



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Questions are indicated with head forward and lowered eyebrows

Leaving these out leads to signing “with an accent” or the equivalent of mispronunciation

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Signing space: differs from language to language, although constrained by the human body

Smaller space = whispering
Larger space = shouting


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Sign Language Poetry and Song

- Signs rhyme if they share the same handshape or same movement
- Rhythm captured by parallel motion of hands, flow of motion between signs

• <http://www.youtube.com/watch?v=sj1t0Mw-0>




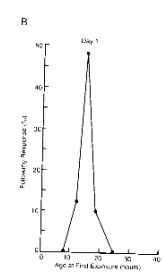
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Classic Critical Period: Imprinting

Konrad Lorenz, 1970; critical period for imprinting

Critical period for parental imprinting in ducklings

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Eric Lenneberg: Critical Period Hypothesis 1967:

Claimed that L1 had to be acquired within a certain a time frame; after critical period, L1 acquisition would be difficult or impossible.

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Critical period for L1 grammatical acquisition?

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- Critical period:
 - begins and ends abruptly
 - period beyond which a phenomenon will not appear
- Sensitive period:
 - begins and ends gradually
 - period of maximal sensitivity

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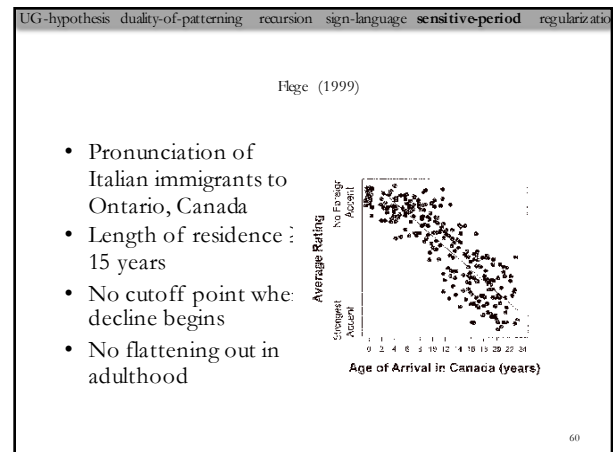
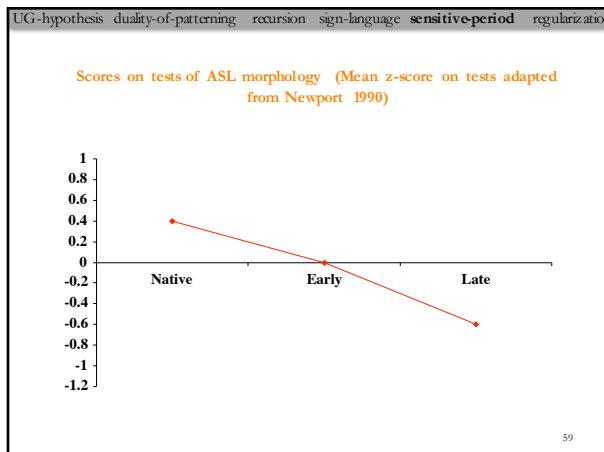
Newport (1990)

Subjects: 35-70 years old

- Native learners
- Early learners: learned from deaf peers at 4-6 years old
- Late learners: first exposed after age 12 (had first attended strict "oral schools", not exposed to ASL before)

- All had minimum of 30 years of daily exposure to ASL.
- Tested: complex morphology verbs of motion: agreement, classifiers, aspect, number (verbal inflections); morphology distinguishing Ns and Vs.
- Basic word order: all at ceiling.
- Morphological tests: decline with age.

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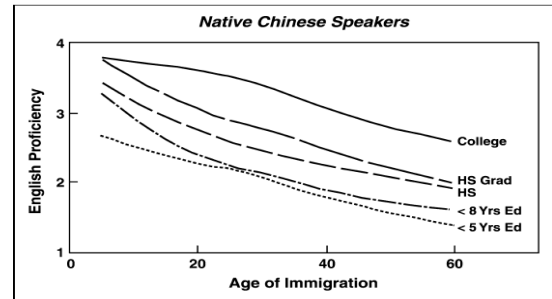


Hakuta, Bialystok & Wiley (2003)

- Self-assessed oral proficiency ratings of Chinese- and Spanish-speaking immigrants to U.S. (1990 U.S. Census)
- Length of residence ≥ 10 years
- 2.3 million responses
- No cutoff point where decline begins
- No flattening out in adulthood

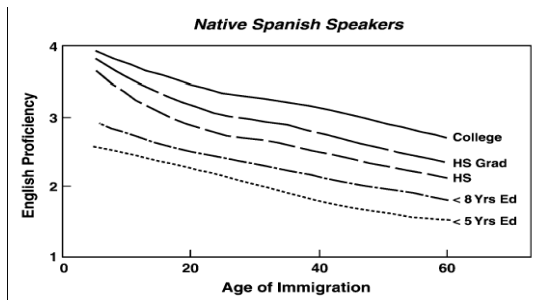
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English proficiency ratings: Chinese speakers



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English proficiency ratings: Spanish speakers



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Key point

There are *age*-effects.

But the pattern of decline is not marked by a discontinuity

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Can you think of any other skills that people learn better when they learn young?

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Explanations for sensitive period

General brain plasticity declines with age.

"Less is More" hypothesis (Newport 1990; Elman 1993): **constraints on working memory** may actually serve to simplify the data that children attempt to analyze....

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Children tend to regularize grammars (e.g. pidgins)


- Singleton and Newport (2004):
 - Simon witnessed obligatory morphemes that code movement only 70% of the time (from his late-learner parents).
 - He himself produced the obligatory morphemes 90% of the time.

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(domain-general) “probability matching”

Two lights **A** **B**:
A flashes 70% of the time.



Task: predict which light will flash:
 Subjects guess light **A** 70% of the time.


They “probability match”

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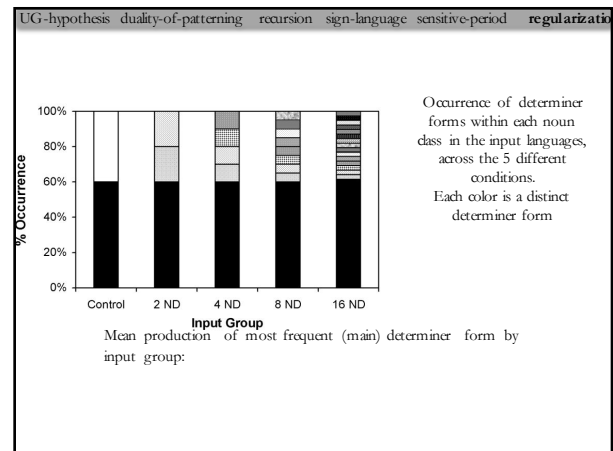
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- BUT**, if input is more complicated (e.g., lights **B** and **C** both flash 15% of the time),

subjects tend to **maximize**, choosing **A** 80-90% of the time (Gardner 1957; Wier 1964)

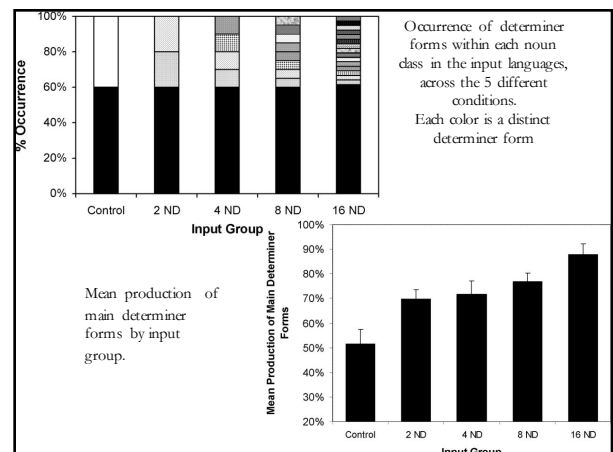


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In which case do you expect adult learners to overgeneralize the high frequency determiner (represented in black) the most?



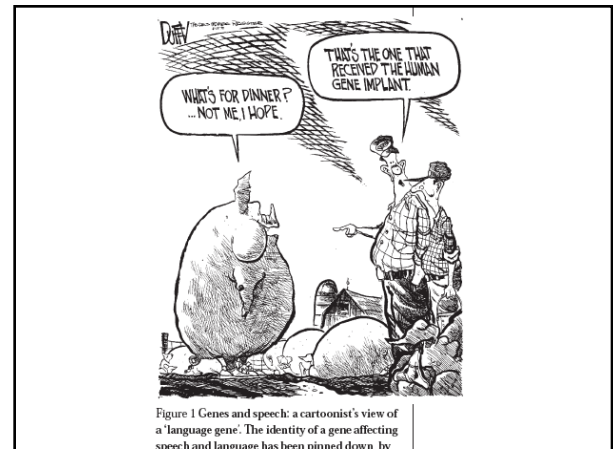
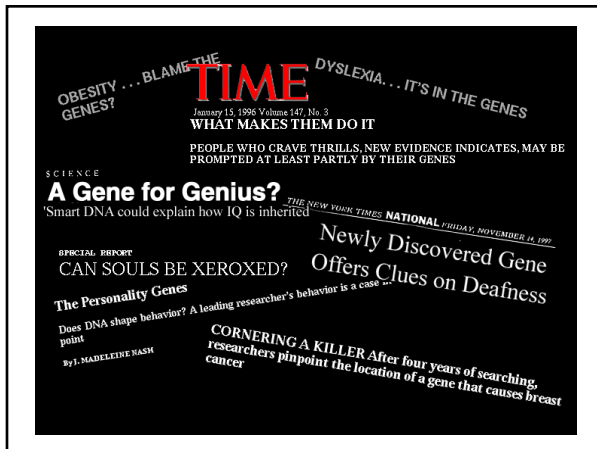
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Children are more likely to regularize than adults (Hudson Kam and Newport 2005).

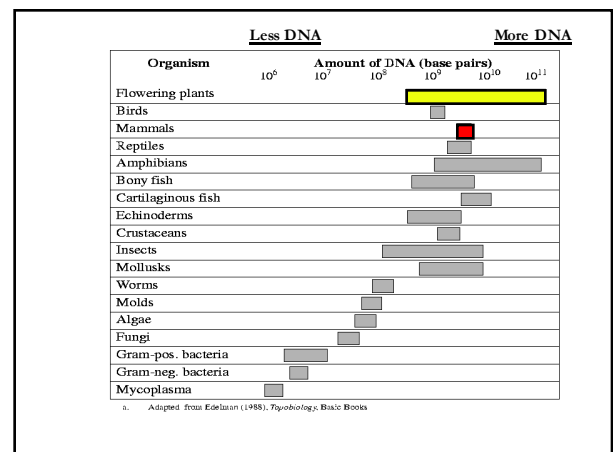
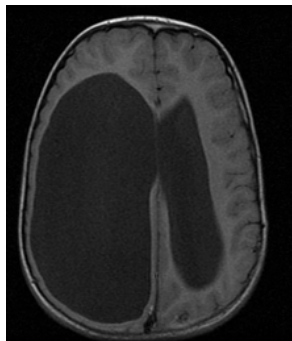
Recall “less is more” hypothesis....

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Universal grammar is an example of a “swiss army knife” view of the brain



Achilles' Heel of Modularity:
a child with marked hydrocephalus and normal language



Alternative to UGH: Language as meaningful, context-dependent, highly variable, emergent, cultural

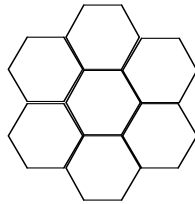
- Language is learnable on the basis of independently needed cognitive processes
- The lexicon and syntax form a continuum of varying levels of complexity
- Humans and other primates differ in terms of prerequisites for language (last lecture)
- Language consists of pairings of form *and* function (“constructions”)
- Processing mechanisms access representations that combine syntactic, semantic, pragmatic constraints & context

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Emergentism

- Not:
 - empiricism vs. nativism
- Instead:
 - emergentism vs. stipulation

Honeycomb



The queen honeybee and the worker bees are not genetically different.

Any female bee can become a queen if she is fed the crucial diet during early development; otherwise she will be a worker.

Basic Instinct

Mark Blumberg