LSci 51/Psych 56L: Acquisition of Language

Lecture 3

Theoretical perspectives

Announcements

Be working on the review questions and HW1

HW1 is due 10/9/20 at 2:50pm (remember not to submit the assignment until you've completed all the questions)

Reminder: The review questions (and any notes you take on them) can be used during the timed assessments. Electronic versions of these are fine (no need for hard copies).

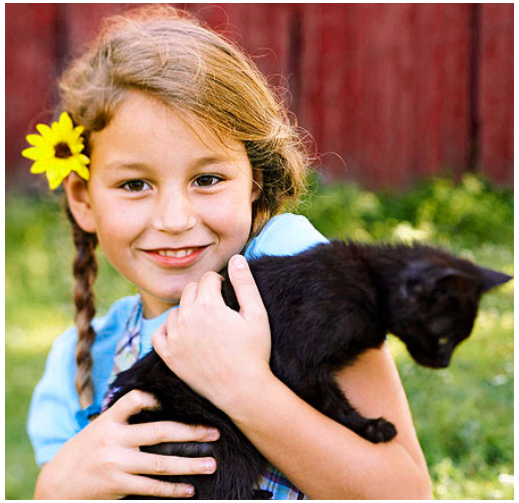
Post your questions & like other people's questions for discussion/review for next time. (After that, Timed Assessment 1 will be open to take until 10/12/20.)

TA office hours are now available and active (so come visit!)

Theoretical viewpoints

The question

"It is obvious that children have some quality of mind that explains why they learn to talk but kittens, for example, do not" – Hoff 2008, p.254



Not obvious what this quality is.

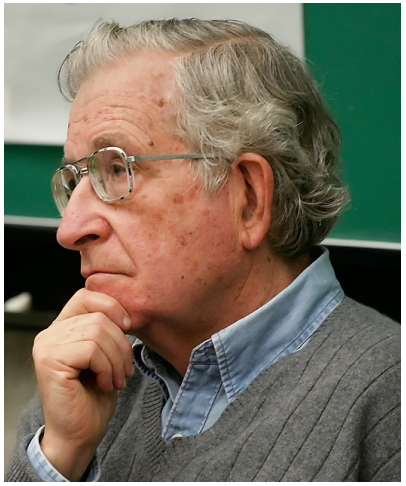
Idea 1: Children have specialized (domain-specific) knowledge about how language works.

Idea 2: Children's domain-general cognitive processes allow them to acquire language while a kitten's do not.

Chomskyan revolution

Chomsky 1957: *Syntactic Structures*

Innovation: What speakers do is not as interesting as the mental grammar that underlies what speakers do



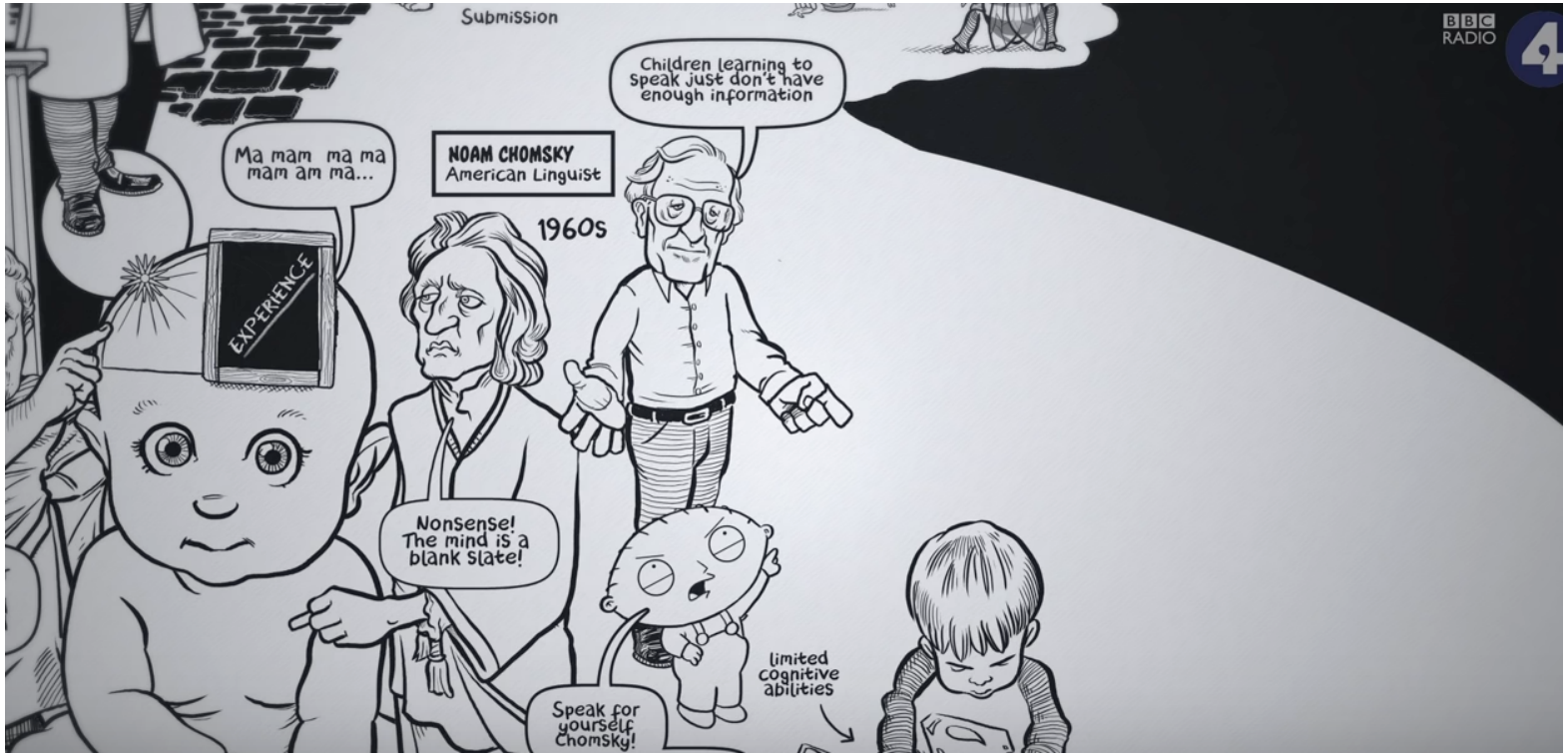
So, if adults have a mental grammar that explains what they do when they talk, children must have a mental grammar that explains what children do when they talk.

New formation of language development: What are children's grammars like and how do children eventually achieve adult grammars?

Chomskyan revolution

https://www.youtube.com/watch?v=7Cgpfw4z8cw

Especially 0:24-1:35



Some current approaches

Language as a complex cognitive system that maps sounds to meaning

One idea for the mechanism behind this process:

Language **A**cquisition **D**evice

Some current approaches

Language as a complex cognitive system that maps sounds to meaning

One idea for the mechanism behind this process: **L**anguage **A**cquisition **D**evice

Information from the environment →  → Language Acquisition

Language Acquisition Device
(unconscious process inside child's mind, used only for learning language)

LAD

Some current approaches

Linguistic nativist (generativist) approach

Premise: **LAD** contains some domain-specific knowledge about the structure of language (this is often called Universal Grammar).

Knowledge specifically about human language

Focus: description of children's prior (innate) linguistic knowledge and how that knowledge interacts with the data from the native language to produce knowledge of the native language

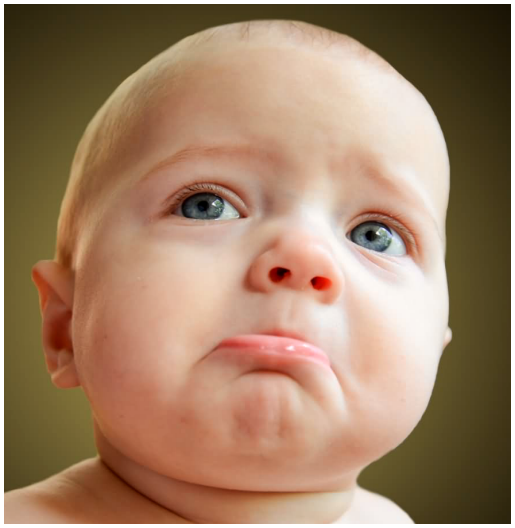
Some current approaches

LAD + information from the environment

Basic premise: The language acquisition device provides a little bit of knowledge about how human languages work to get the child started. This allows the child to use her language input more effectively – to notice certain things more easily and to entertain only certain hypotheses about how language works.

Innate linguistic knowledge?

Why do children need this kind of head start?



Proposal: Input is too impoverished for children to converge on the right language rules without it. This is sometimes called the Poverty of the Stimulus.

So, children need something else besides just the data in the input to help them decide what the right rules are.

What does “impoverished" input for children mean?

What they’re doing: **Extracting patterns** and **making generalizations** from the surrounding data mostly just by hearing examples of what’s allowed in the language.

What’s so hard about that?

What does “impoverished" input for children mean?

What’s so hard about that?

There are often many ways to generalize beyond the input, and most of them aren’t right.

???

“birdie”

“What a pretty birdie!”

What does “impoverished" input for children mean?

What’s so hard about that?

There are often many ways to generalize beyond the input, and most of them aren’t right.

???

“birdie”

“Look - a birdie!”

What does “impoverished" input for children mean?

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???

“birdie”

“Look at that birdie!”

What does “impoverished" input for children mean?

What’s so hard about that?

There are often many ways to generalize beyond the input, and most of them aren’t right.

How to generalize beyond the input?

???

“birdie”

What does “impoverished" input for children mean?

What’s so hard about that?

There are often many ways to generalize beyond the input, and most of them aren’t right.

One hypothesis

+blue

“birdie”

What does “impoverished" input for children mean?

What’s so hard about that?

There are often many ways to generalize beyond the input, and most of them aren’t right.

Another hypothesis

+on branch

“birdie”

What does “impoverished" input for children mean?

What’s so hard about that?

There are often many ways to generalize beyond the input, and most of them aren’t right.

The right hypothesis

+bird

“birdie”

What does “impoverished" input for children mean?

What’s so hard about that?

There are often many ways to generalize beyond the input, and most of them aren’t right.

speech segmentation

metrical phonology

syntactic categorization

syntax

syntax, semantics

pragmatics

These kind of **induction problems** are everywhere in cognitive development, including language acquisition.

Language acquisition = Solving a lot of induction problems.

Innate linguistic knowledge?

Proposal: Input is too impoverished for children to converge on the right language rules without it. This is sometimes called the Poverty of the Stimulus.

Language acquisition = Solving a lot of induction problems.

So, children need something else besides just the data in the input to help them decide what the right rules are.

Some current approaches

Another idea for the mechanism behind this process: general learning abilities

Domain-general approach

Premise: Language acquisition is no different from any other kind of knowledge acquisition; children can solve this problem in the same way that they solve other problems (such as perception)

Focus: description of domain-general learning capacities that serve language development, and the sources of input those capacities use

Useful for all kinds of learning (ex: grouping things together into larger units)

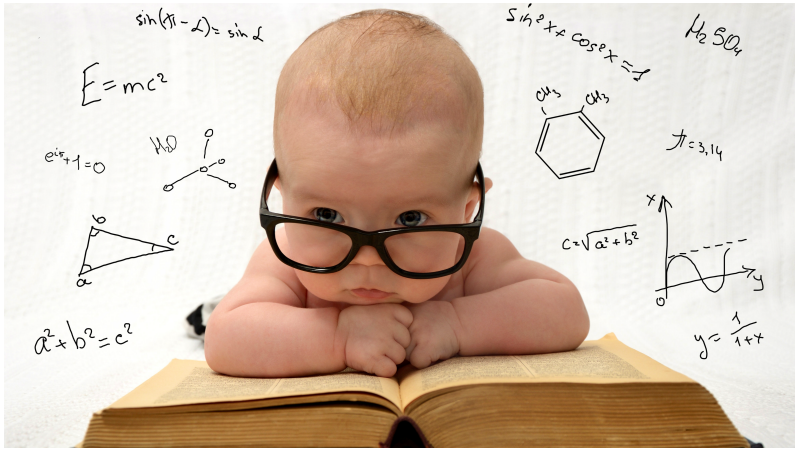
Some current approaches

Domain-general approach

Basic premise: Abilities that are useful for other kinds of input besides language input are used to learn language. There is no knowledge or ability that is unique to language learning.

Domain-general response to Poverty of the Stimulus

Maybe children don't need domain-specific knowledge to learn language. Maybe they just use the data available to them more cleverly than some researchers think they do.



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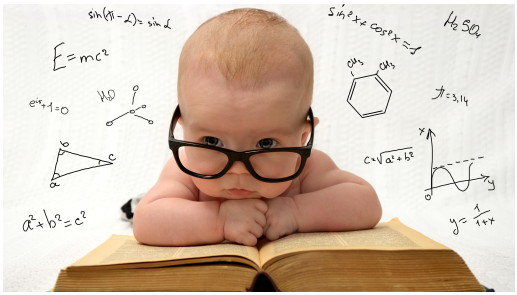

Example:

Saffran, Aslin, & Newport (1996): 8-month-olds can (unconsciously) track probabilities between syllables in order to identify words in fluent speech in an artificial language

Sample audio input

http://whyfiles.org/058language/images/baby_stream.aiff

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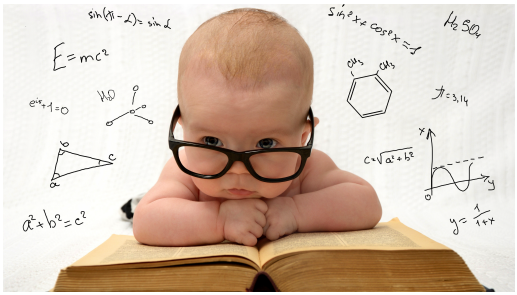

Example:

Fló, Brusini, Macagno, Nespor, Mehler, & Ferry (2019) found out that **3-day-olds** can do this, too.

https://www.sciencedaily.com/releases/2019/01/190129101912.htm

Sample audio input

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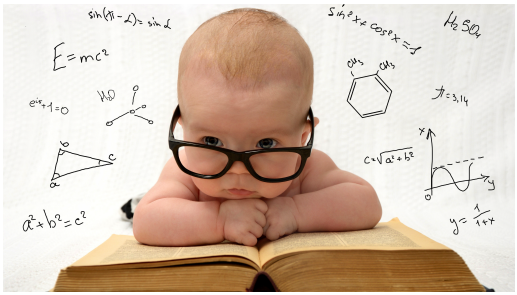
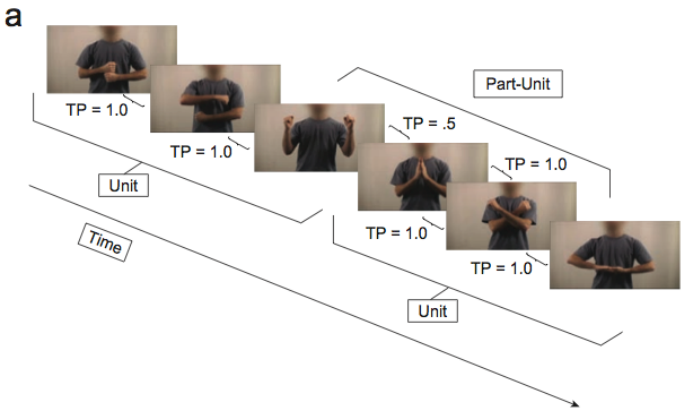


Example:

Roseberry, Richie, Hirsh-Pasek, Golinkoff, & Shipley (2012): 8-month-old infants are able to (unconsciously) track probabilities between dynamic events, such as a series of hand motions.



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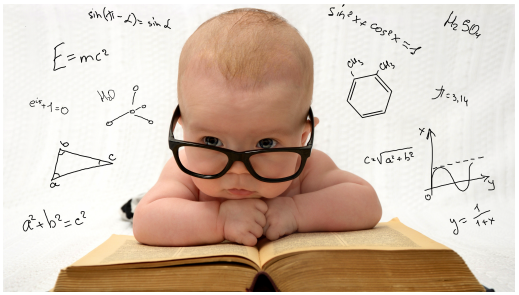
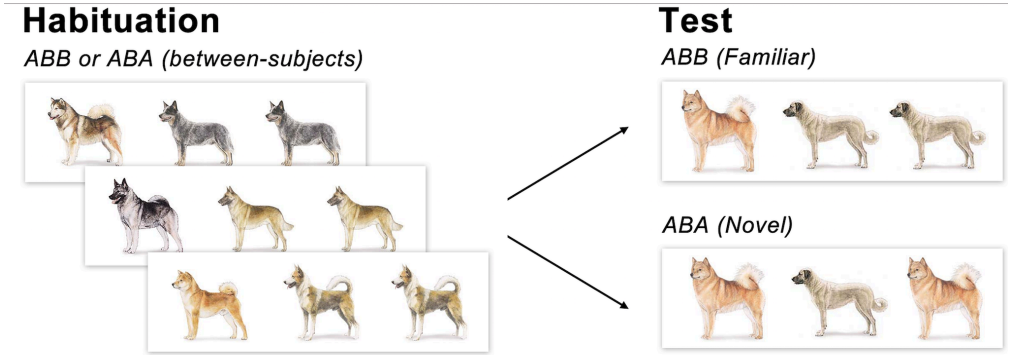


Example:

Ferguson, Franconeri, & Waxman 2018: 3 and 4-month-old infants are able to (unconsciously) track probabilities between visual objects, such as a series of dogs, to extract an abstract rule.



https://www.sciencedaily.com/releases/2018/02/180222162121.htm

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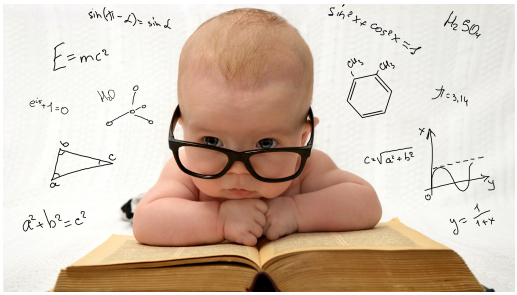

Supporting evidence for the importance of statistical learning for language

Kidd & Arciuli 2016: children's individual statistical learning proficiency is linked to their individual grammatical proficiency

https://www.sciencedaily.com/releases/2016/05/160505222938.htm

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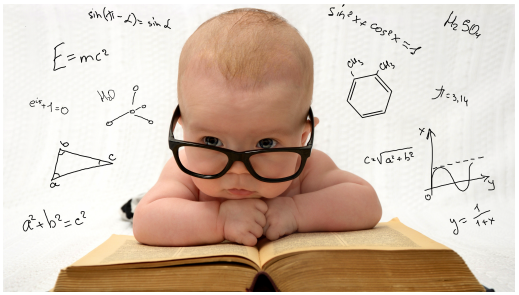
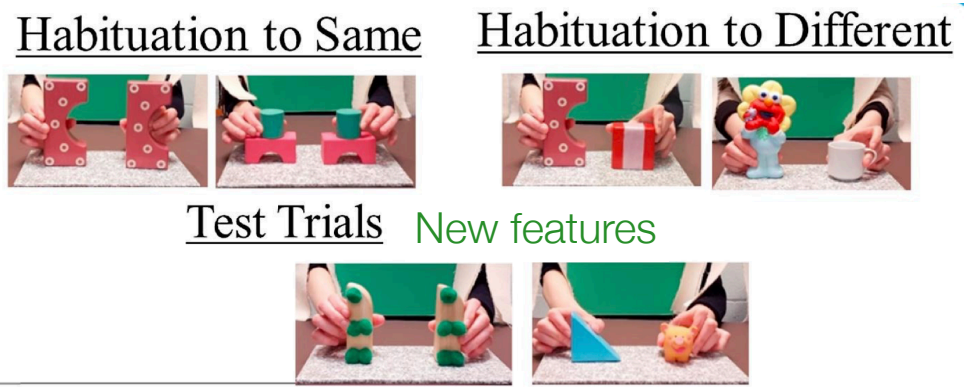


Example:

Anderson, Chang, Hespos, & Gentner 2018:

3-month-old infants are able to (unconsciously) track abstract relations such as "same" or "different" even when the specific features differ.



https://www.sciencedaily.com/releases/2018/04/180403171434.htm

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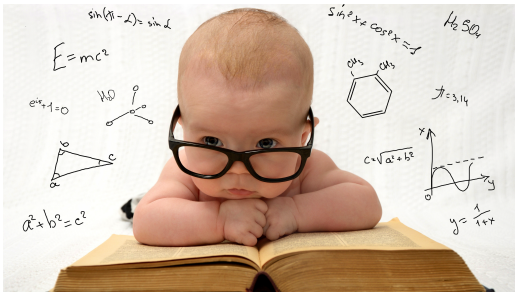
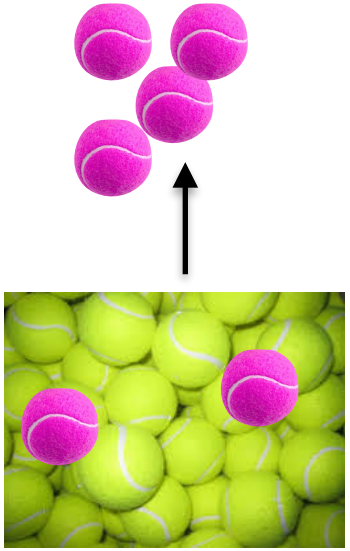


Example:

Denison, Reed, & Xu (2011): 6-month-old infants are able to create probabilistic expectations about their environment, based on their observations of their environment. For example, after seeing that a box is mostly filled with yellow balls, they are surprised when someone pulls four pink balls in a row out of the box.



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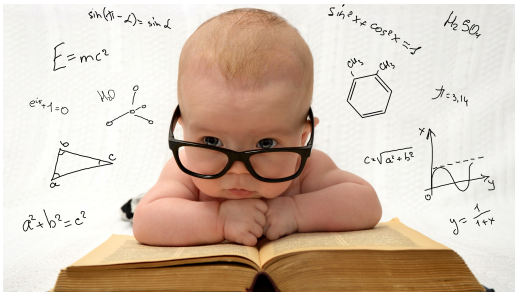
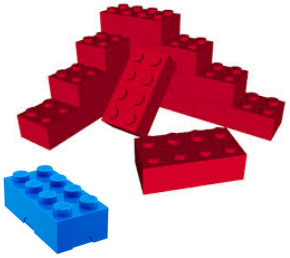


Example:

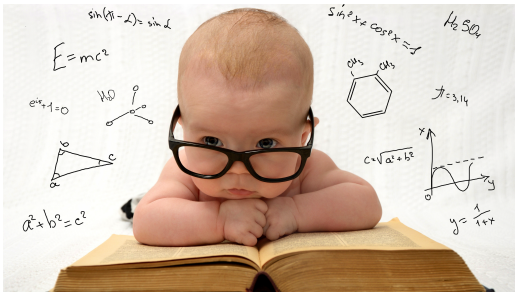
Denison, Bonawitz, Gopnik & Griffiths (2013): 4- and 5-year-olds select a hypothesis to evaluate against the data based on how probable a hypothesis is (called sampling a hypothesis). For example, when guessing which color block fell into a container from a box where 5 blue and 20 red blocks were, children guess blue 20% of the time (5/25) and red 80% of the time (20/25).



[Extra]

Domain-general response to Poverty of the Stimulus

Maybe children don't need domain-specific knowledge to learn language. Maybe they just use the data available to them more cleverly than some researchers think they do.



Example:

Yurovsky, Case, & Frank (2017): 4- and 5-year-olds can select the correct interpretation of an utterance by probabilistically weighting acoustic and pragmatic cues. For example, when interpreting an utterance that sounds like, "I ate carrots and bees", they base their answer on whether the person generally says plausible or implausible things.

Domain-general response to Poverty of the Stimulus

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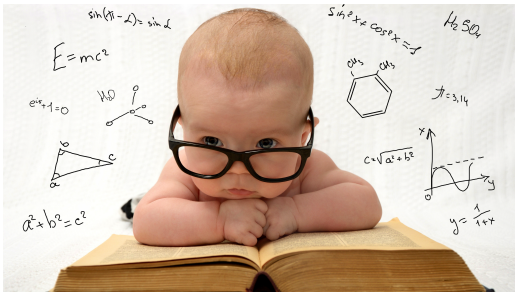
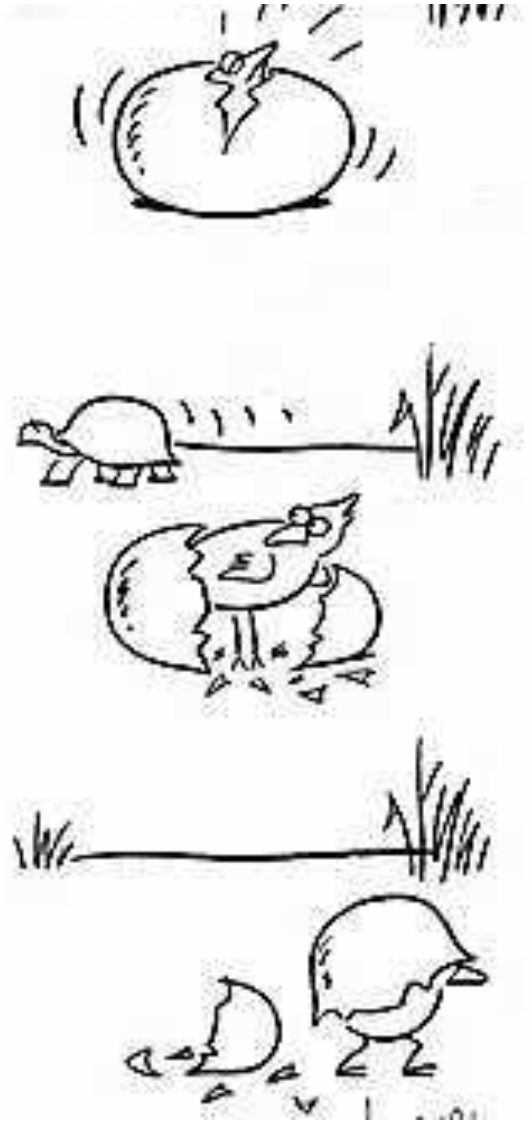


Example:

Kidd, Piantadosi, & Aslin (2012): 7- to 8-month-old infants have a tendency to learn only from data whose informational complexity is neither too high nor too low (the "Goldilocks Effect").

Nature vs. Nurture



The debate in a nutshell

Is the development of language in children the result of humans' innate endowment (like upright posture & bipedal locomotion)? Or is it the result of circumstances in which children are nurtured (like table manners and formal math, which depend on particular experiences)?

Empiricism: all knowledge and reason come from experience

Nativism: mind has some pre-existing structure it imposes to interpret experience

Nativism: Why believe it?

(1) Children acquire language rapidly

(2) Children acquire language with very little conscious effort

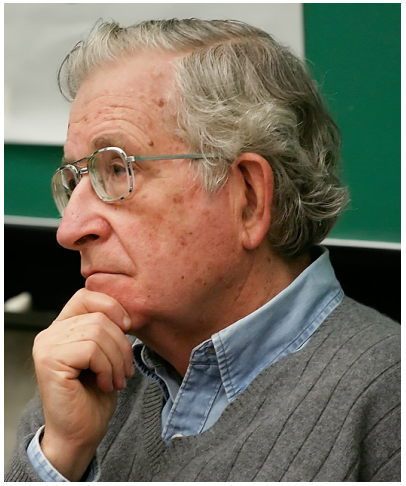
(3) Children acquire language without explicit instruction for most of it

Nativism: mind has some pre-existing structure it imposes to interpret experience

Nativism: Why believe it?

"Language learning is not really something that the child does; it is something that happens to a child placed in an appropriate environment, much as the child's body grows and matures in a predetermined way when provided with appropriate nutrition and environmental stimulation." - Chomsky, 1973

(linguistic nativist)



Nativism: mind has some pre-existing structure it imposes to interpret experience

Nativism: Why believe it?

Arguments for Nativism (and Universal Grammar in particular)
Up through ~2:36 for general intro, 7:37 - 8:34 for summary
http://www.thelingspace.com/episode-1
https://www.youtube.com/watch?v=MLNFGWJOXjA

Constructionist View

"We…think that learning language is a long slog, which requires from the child a lot of work. And the child is working as hard as he can, fifteen, sixteen hours a day. We think it requires a relationship with an adult, and a whole set of cognitive abilities." - Snow, 1993

(non-linguistic nativist = constructionist)

Constructionist: language is constructed by the child from experience, and the input is crucial - but there may still be some innate knowledge contributing. It's just not language-specific.

Back to nativism: the nature of nature

There are different ways for something to be innate:

Knowledge itself is innate

Procedures for learning are innate

(knowledge is the result from these procedures)

Back to nativism: the nature of nature

There are different ways for something to be innate:

Knowledge itself is innate: children have inborn knowledge of the general form of language (domain-specific knowledge)

Procedures for learning are innate

(knowledge is the result from these procedures)

Why do we think knowledge could be innate?

Common properties of human languages: all languages of the world share structural properties. This could be due to innate biases about how languages are structured.

Evolution has equipped the human mind with other useful knowledge (ex: world is 3D, even though retinas process only 2D) - why not prior knowledge about language?

Back to nativism: the nature of nature

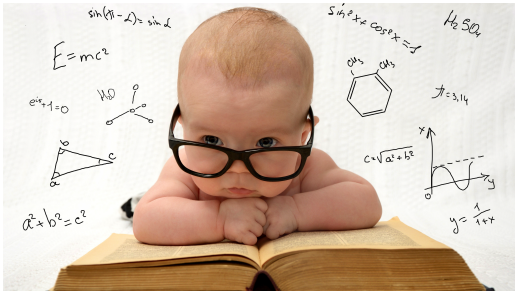
There are different ways for something to be innate:

Knowledge itself is innate

Procedures for learning are innate

(knowledge is the result from these procedures): children have domain-general capacities that all contribute to language acquisition, such as symbolic representation, memory, chunking input into smaller parts, and probabilistic analysis.

Why do we think some learning procedures are innate?



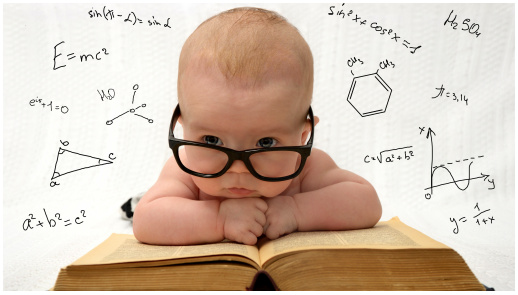
Babies as statistical learners

Statistical learning: keeping track of the relative frequency of two things (ex: how often they occur together)

Evidence that infants (3-day-olds, 3 & 4-month-olds, 6-month-olds, 8-month-olds) are capable of statistical learning and probabilistic reasoning abilities:

Saffran et al. 1996, Denison et al. 2011, Roseberry et al. 2012, Ferguson et al. 2018, Fló et al. 2019, Marino, Bernard, & Gervain 2020

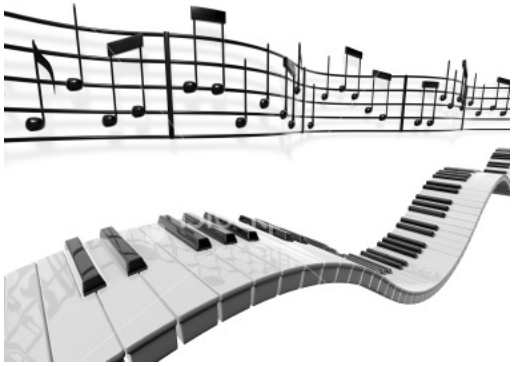
Why do we think some learning procedures are innate?



Babies as statistical learners

Statistical learning is domain-general.

Saffran, Johnson, Aslin, & Newport (1999): babies can track the probabilities between tones (not just between language stimuli like syllables)

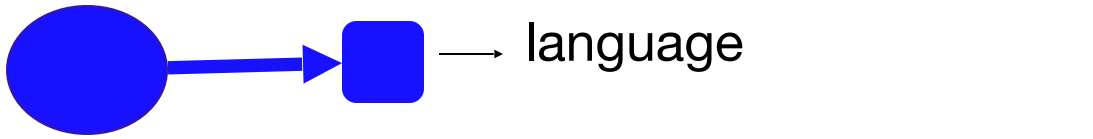


Denison et al. (2011): Infants can create probabilistic expectations about their environment (such as the color of balls in boxes), not just about language.

Roseberry et al. (2012): Infants can track probabilities between dynamic events.

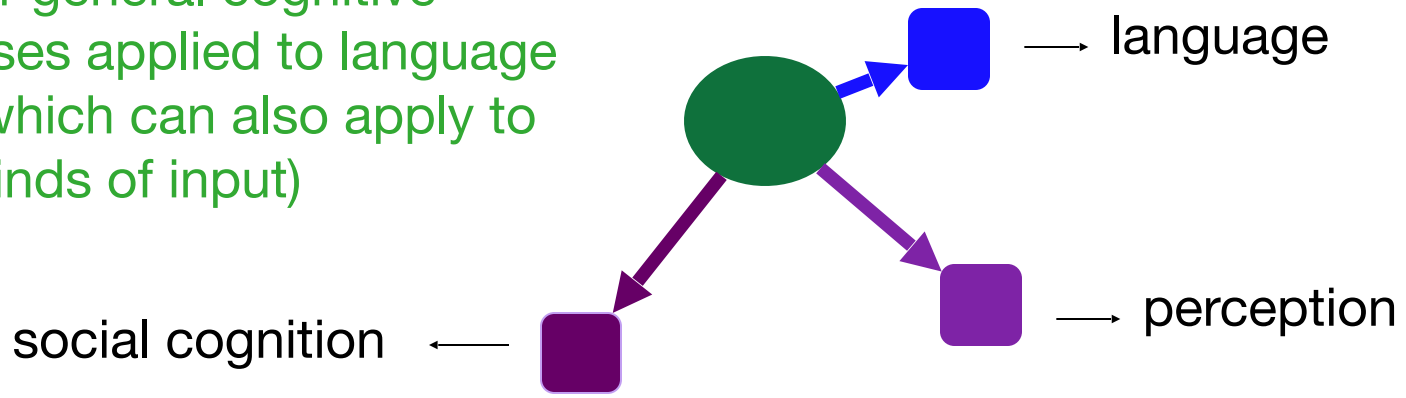
Back to nativism: the nature of nature

There are different ways for language acquisition to work:



One domain-specific module

Domain-general cognitive processes applied to language input (which can also apply to other kinds of input)



Back to nativism: the nature of nature

There are different ways for language acquisition to work:

Currently this debate between domain-specific and domain-general is going on for many areas of cognition, not just for language acquisition.

Viewpoint comparison

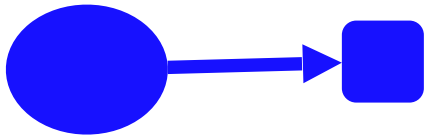
Generativist
(linguistic nativist)

Constructionist
(non-linguistic nativist)

Viewpoint comparison

Generativist
(linguistic nativist)

Universal Grammar, which contains biases for language structure, is innate. Language experience triggers prior knowledge and/or language-specific learning abilities (domain-specific)



One domain-specific module

Constructionist
(non-linguistic nativist)

Viewpoint comparison

Generativist
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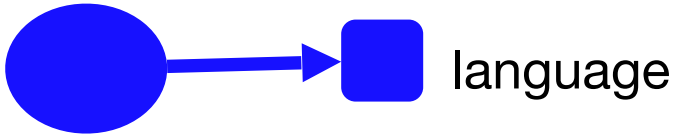
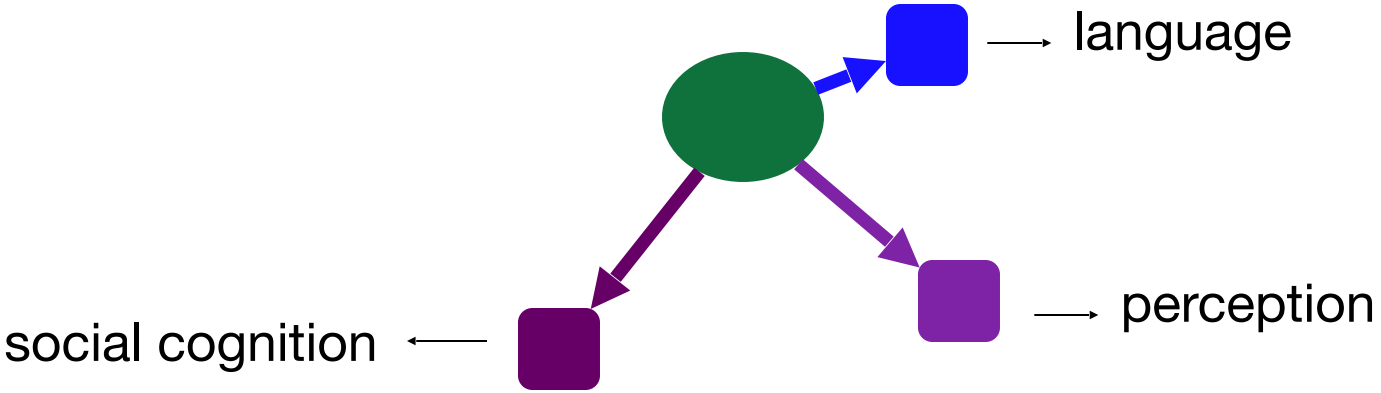
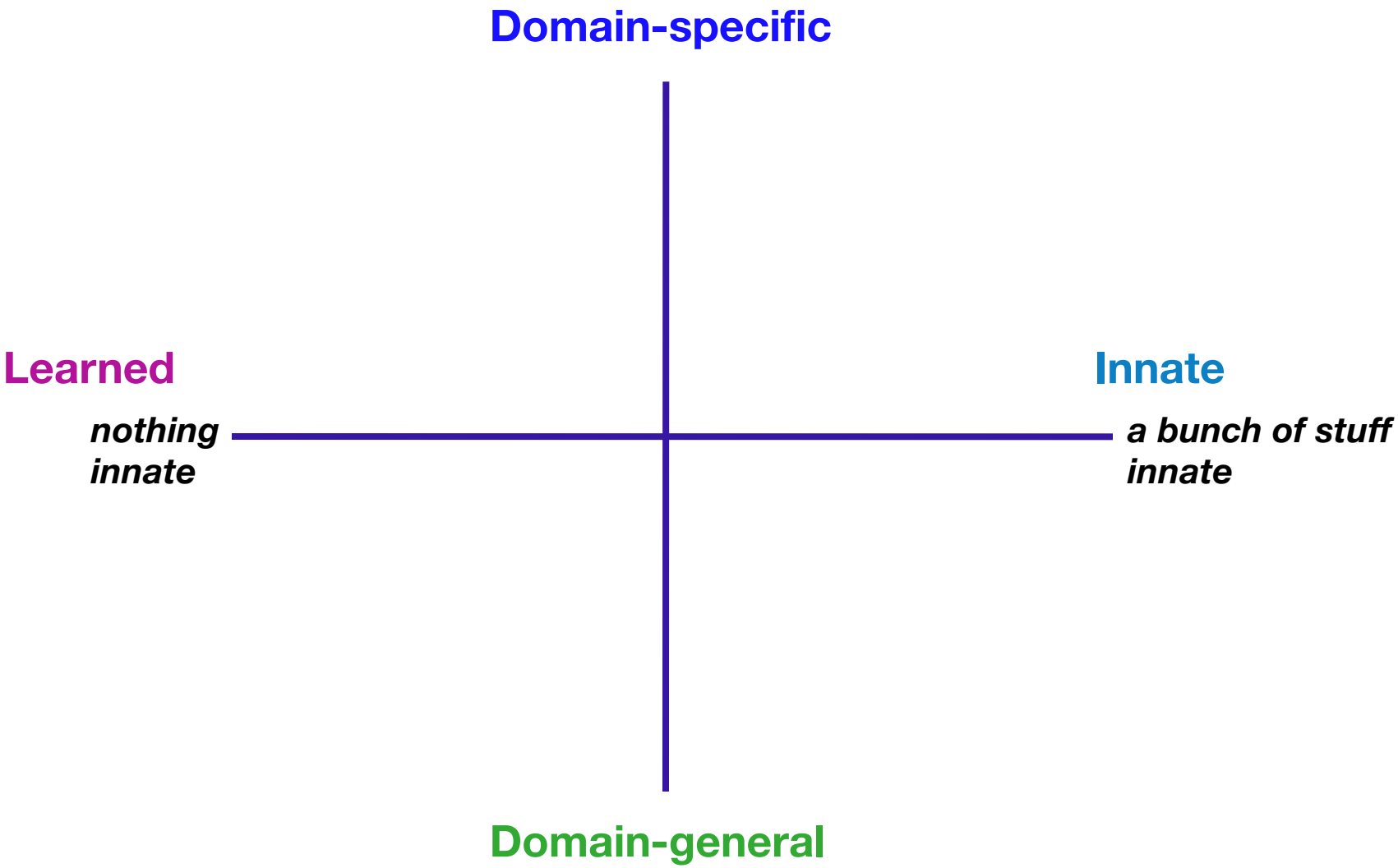


Constructionist
(non-linguistic nativist)

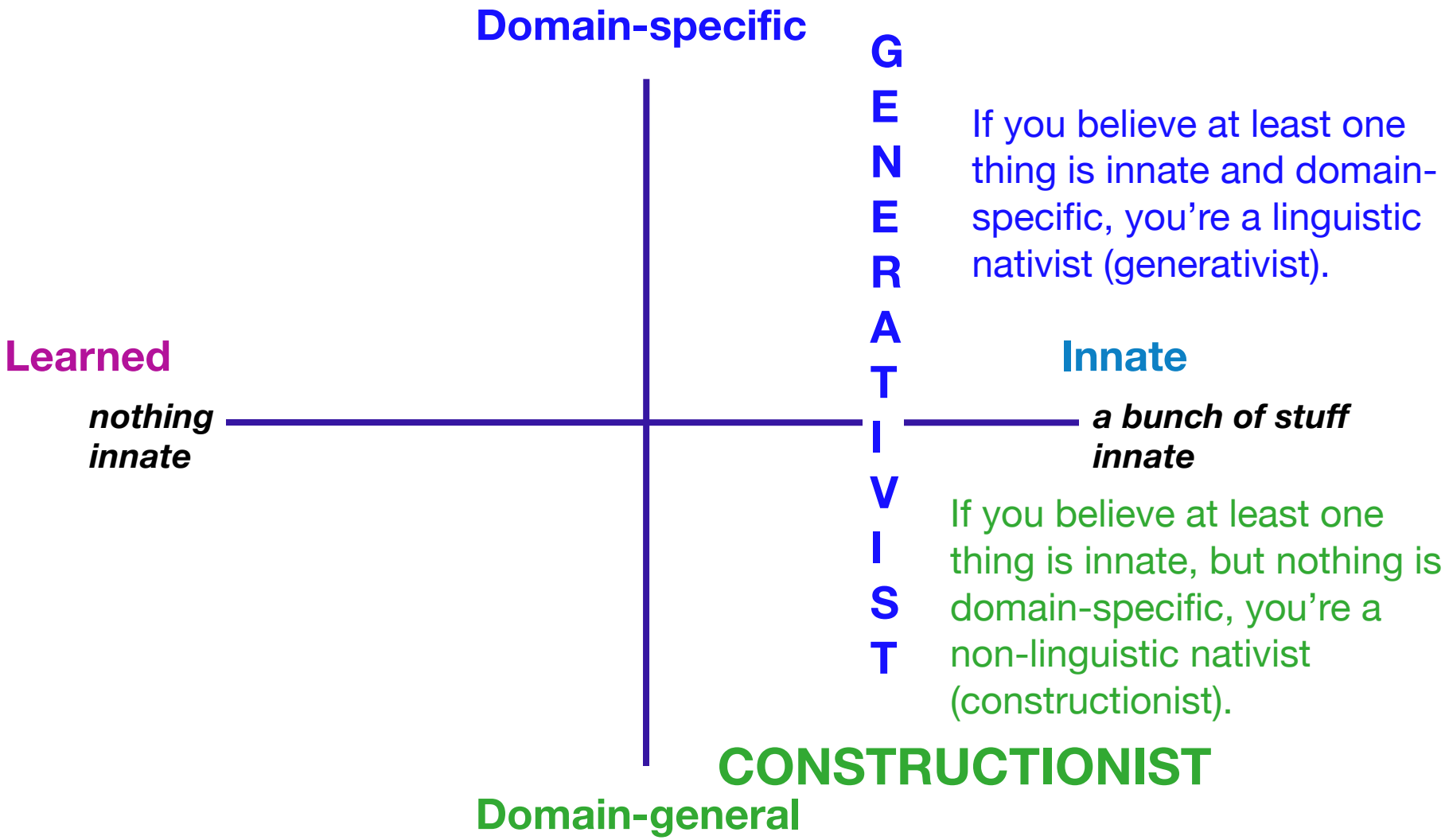
Language is constructed by the child using general cognitive learning procedures applied to language input. These are domain-general abilities used for language learning.



An important division



An important division



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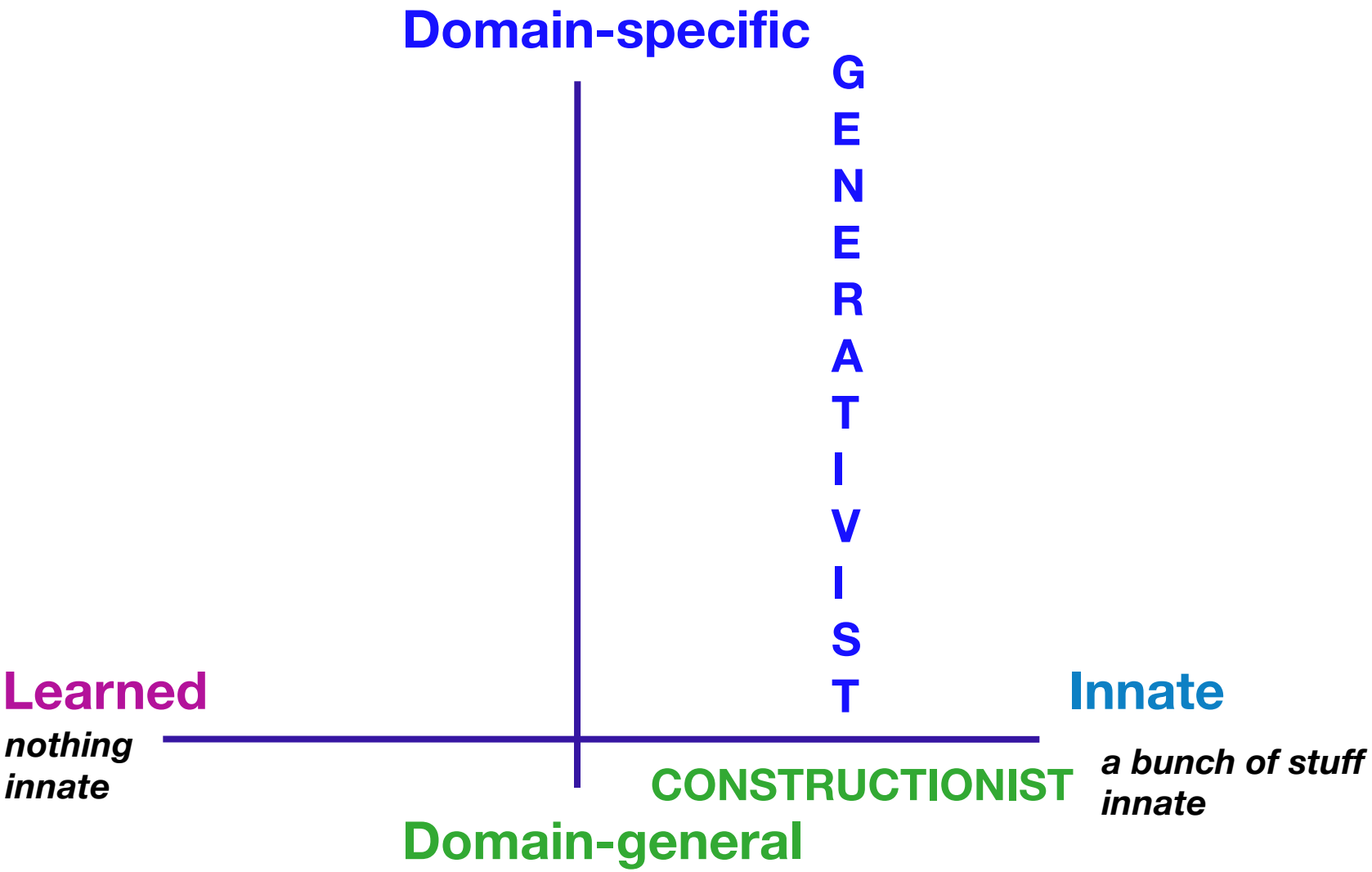

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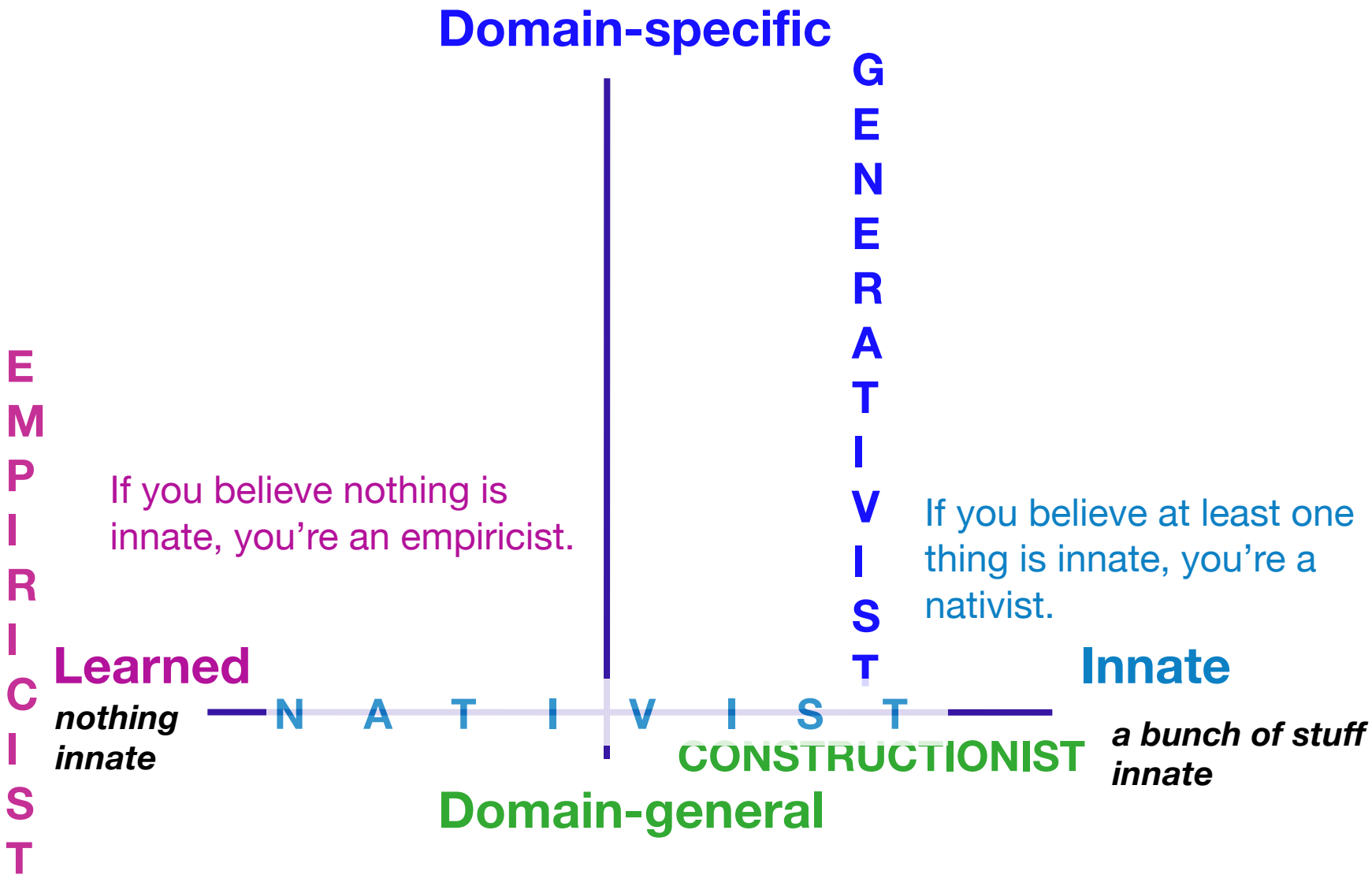

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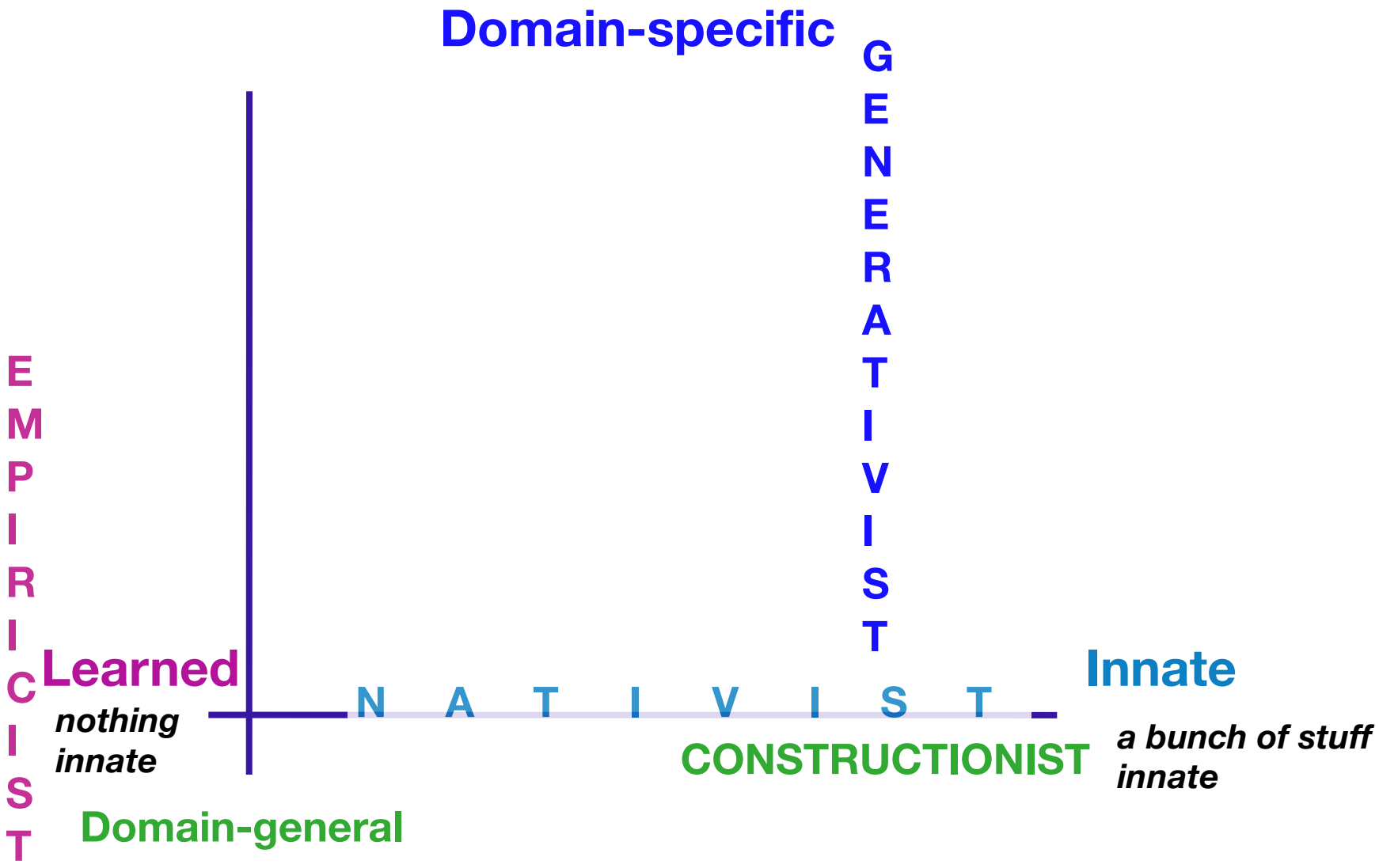

Another way to think about it

nothing innate	*at least one thing innate = nativist*	
empiricist	***at least one thing domain-specific***	***generativist (= linguistic nativist)***
empiricist	***nothing domain-specific***	***constructionist (= non-linguistic nativist)***

Recap

One the reasons most developmental linguistic researchers are nativists of some kind is because of all the induction problems in language acquisition — this makes the input “impoverished” in a crucial way.

Some current approaches to how language acquisition works include the **linguistic nativist (generativist)** approach and the **non-linguistic nativist (constructionist)** approach. Both believe in innate knowledge, though only the generativist approach believes at least some of that knowledge is domain-specific.

Questions?

You should now be able to answer all of the review questions for the introductory material, all of the questions on HW1.