

# LSci 51/Psych 56L: Acquisition of Language

## Lecture 3 Theoretical perspectives

# Announcements

Be working on the review questions and HW1

HW1 is due 10/1/21 at 3:50pm (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 10/4/21.)

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



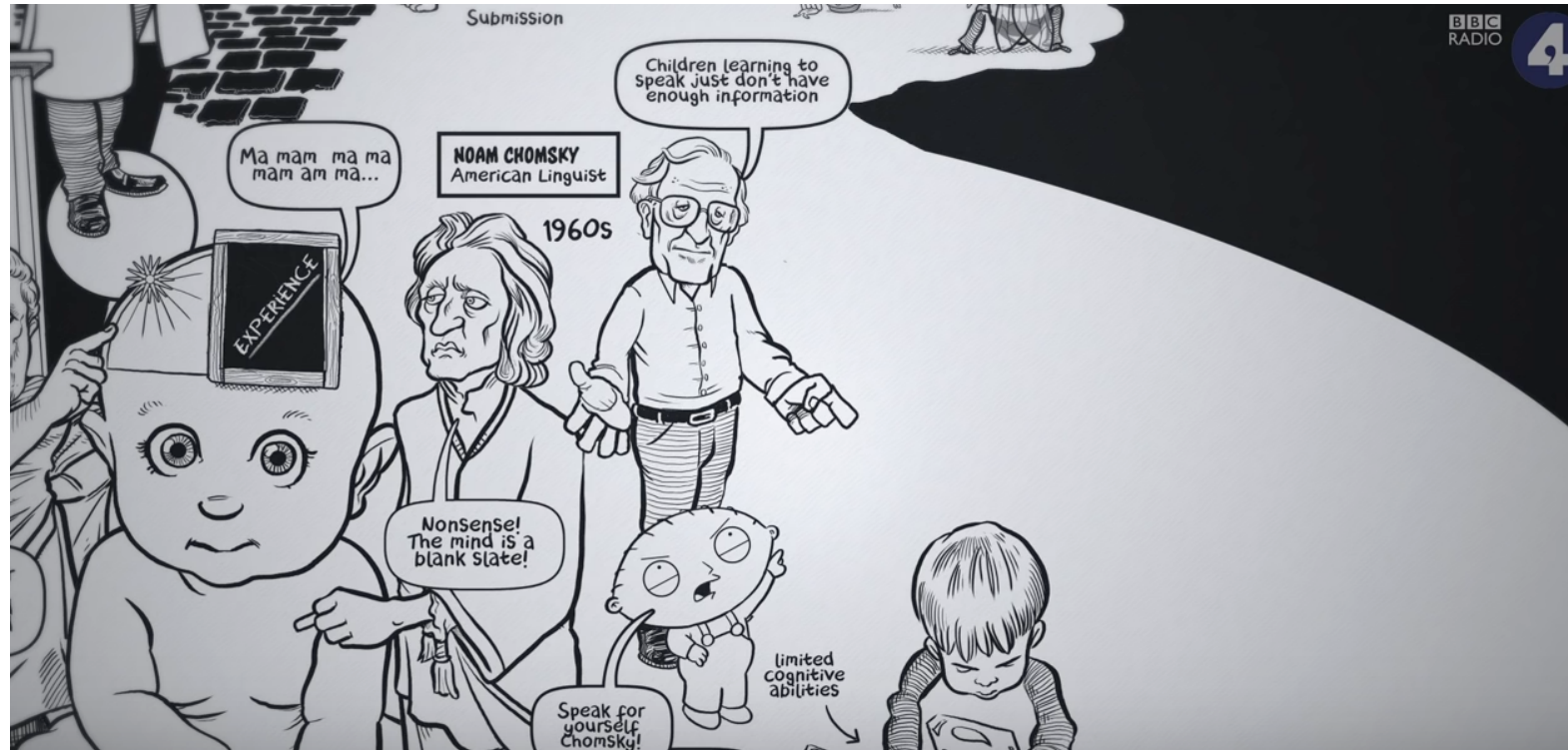
So, if adults have a mental grammar that explains what they do when they talk, children must have a mental grammar that explains what children do when they talk.

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 Acquisition Device**



# Some current approaches

Language as a complex cognitive system that maps sounds to meaning

One idea for the mechanism behind this process: **Language Acquisition Device**

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

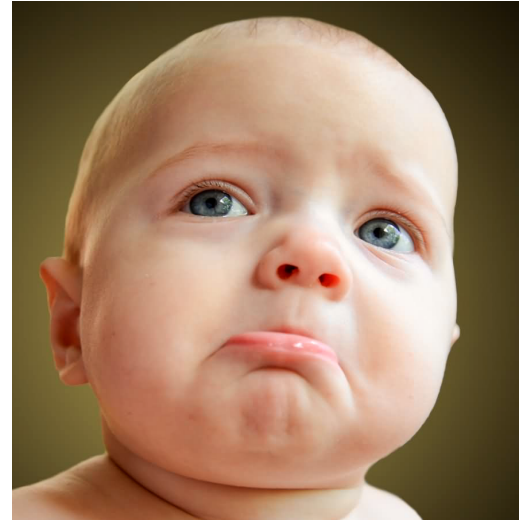
Basic premise: The language acquisition device provides a **little bit of knowledge about how human languages work to get the child started**. This allows the child to **use her language input more effectively** – to notice certain things more easily and to entertain only certain hypotheses about how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

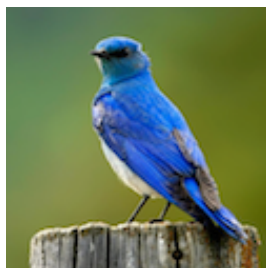
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# What does “impoverished” input for children mean?

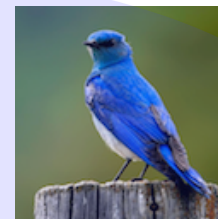
## What’s so hard about that?

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?

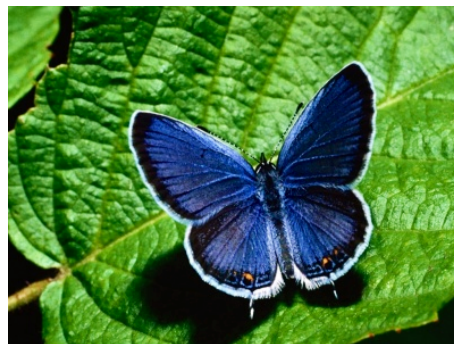
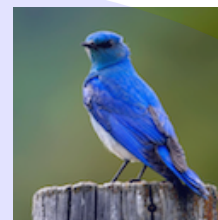
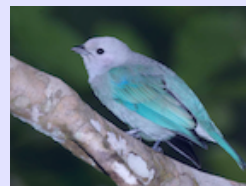
There are often **many ways to generalize beyond the input**, and most of them aren’t right.



## One hypothesis

**+blue**

“birdie”



# What does “impoverished” input for children mean?

## What’s so hard about that?

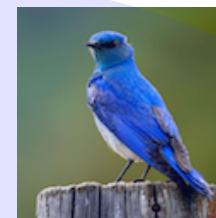
There are often **many ways to generalize beyond the input**, and most of them aren’t right.



## 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.

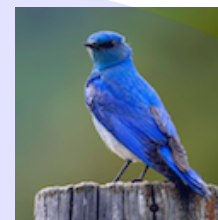


## The right hypothesis



**+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

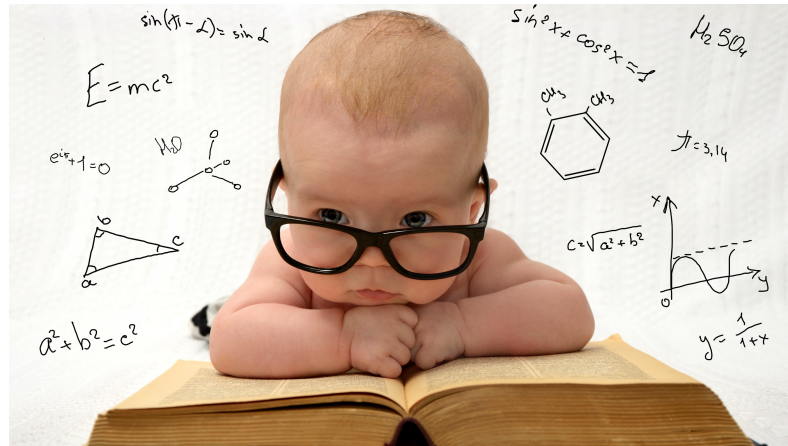
## Domain-general approach

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

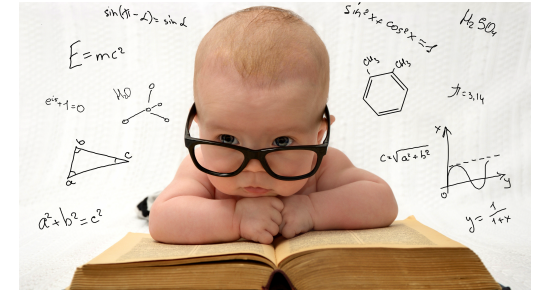
Maybe children don't need domain-specific knowledge to learn language. Maybe they just use the data available to them more cleverly than some researchers think they do.





# 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:

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

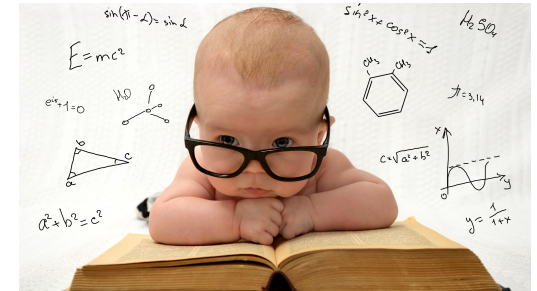
tu pi ro go la bu bi da ku pa do ti go la bu tu pi ro pa do ti...

Sample audio input

[http://whyfiles.org/058language/images/baby\\_stream.aiff](http://whyfiles.org/058language/images/baby_stream.aiff)

# 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:

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

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

**tu pi ro go la bu bi da ku pa do ti go la bu tu pi ro pa do ti...**

Sample audio input

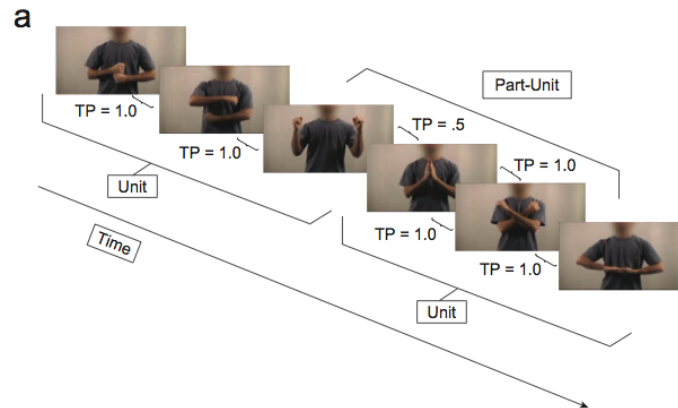
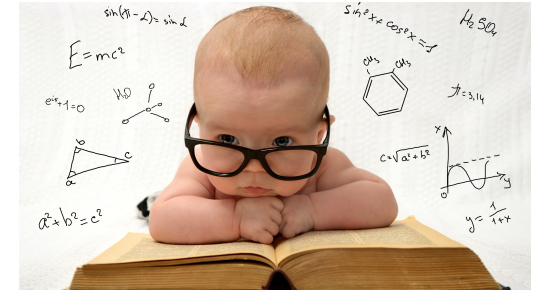
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# Domain-general response to Poverty of the Stimulus

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:

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.

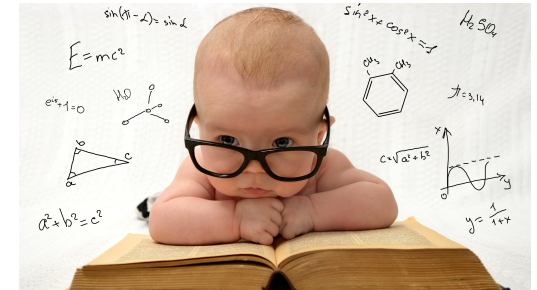


# Domain-general response to Poverty of the Stimulus

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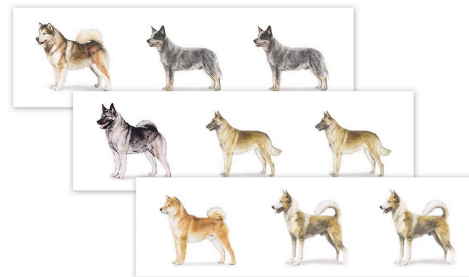
Example:

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.



## Habituation

ABB or ABA (between-subjects)

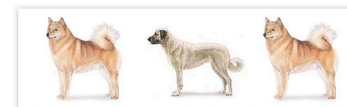


## Test

ABB (Familiar)

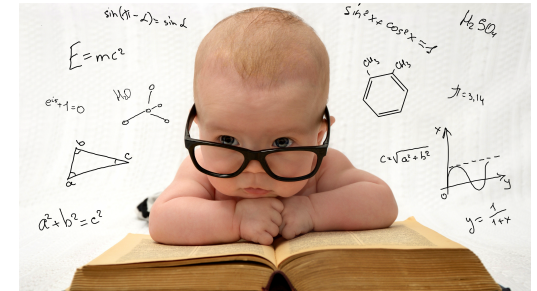


ABA (Novel)



# 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.**



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>

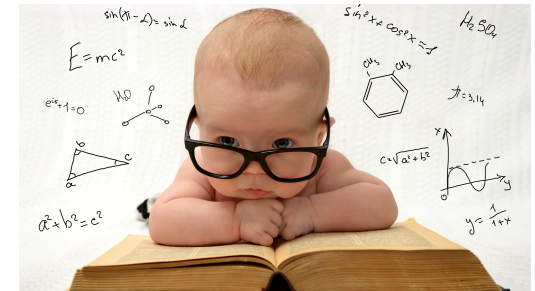
# Domain-general response to Poverty of the Stimulus

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:

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.**



Habituation to Same



Habituation to Different

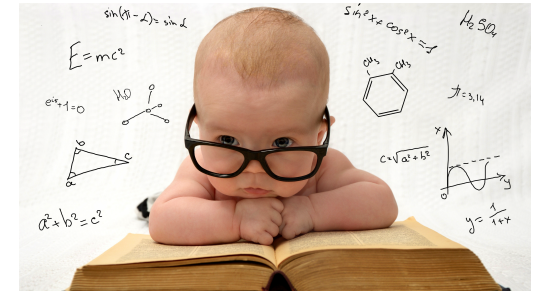


Test Trials **New features**



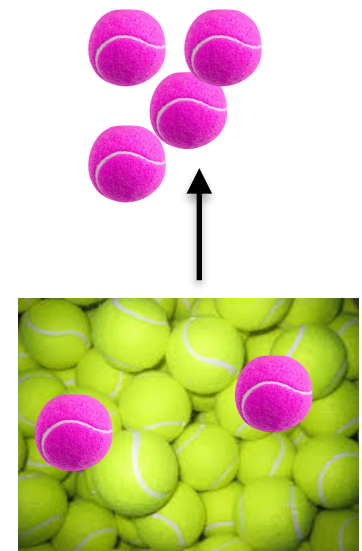
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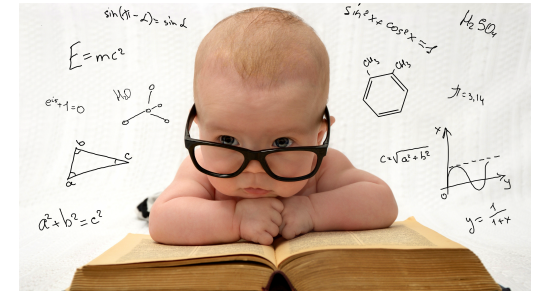
Example:

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.



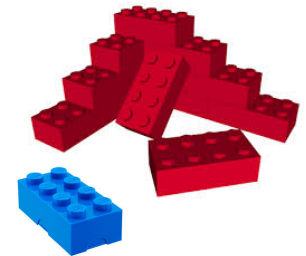
# Domain-general response to Poverty of the Stimulus

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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).





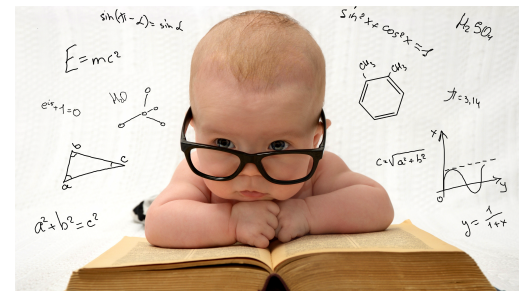
[Extra]

# 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.



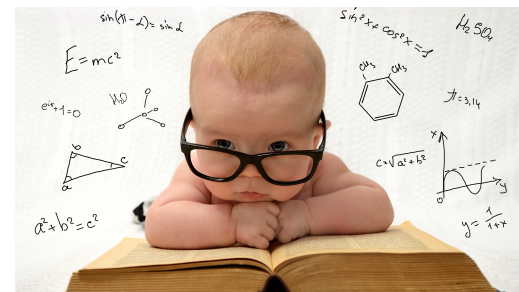
[Extra]

# 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:

Beretti, Havron, & Christophe (2020): 4- and 5-year-olds can select the correct interpretation of an utterance by **probabilistically weighting** semantic and syntactic cues. For example, when interpreting an utterance that like “She balls”, they base their answer on whether the person generally says semantically-sensible or syntactically-sensible things.



*elle balle* - “she ball(s)”



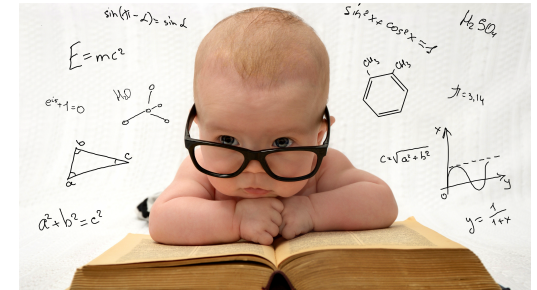
semantically  
sensible  
interpretation



? syntactically  
sensible  
interpretation

# Domain-general response to Poverty of the Stimulus

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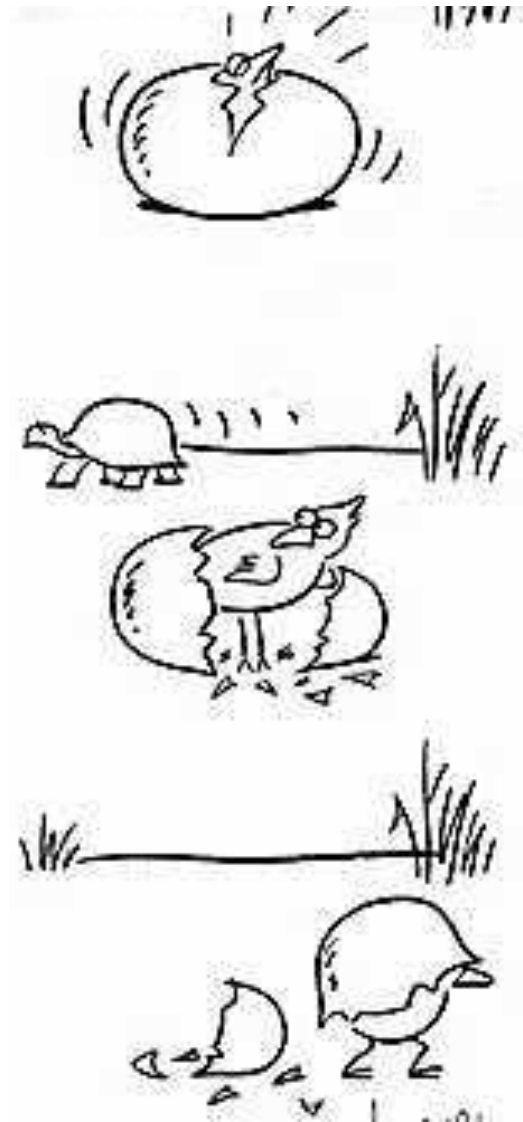


Example:

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

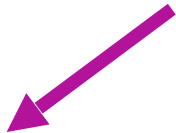


# The debate in a nutshell

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>

Babies go through the same stages in development no matter what language they are learning.

Infants master language way faster than they should if they're a blank slate.


2:28 / 9:16



# 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.

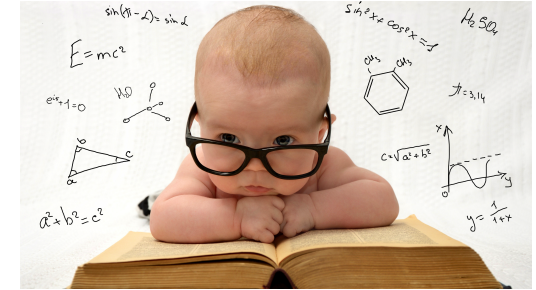
# Why do we think some learning procedures are innate?

## 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:

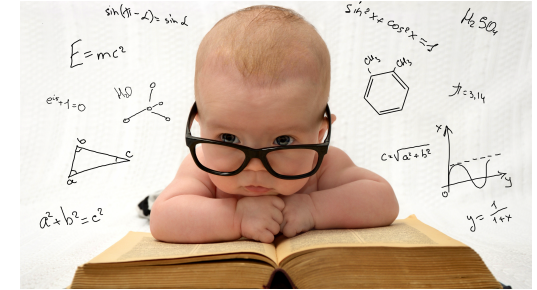
Saffran et al. 1996, Denison et al. 2011, Roseberry et al. 2012, Ferguson et al. 2018, Fló et al. 2019, Marino, Bernard, & Gervain 2020



# 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)

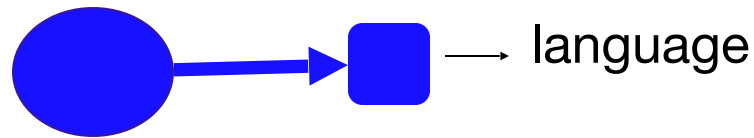


Denison et al. (2011): Infants can create probabilistic expectations about their environment (such as the color of balls in boxes), not just about language.

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

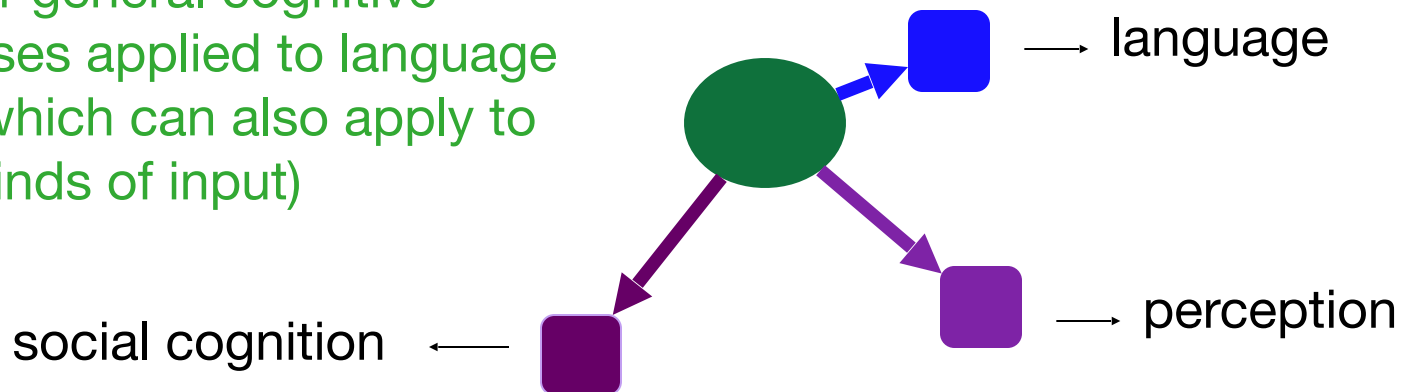
# Back to nativism: the nature of nature

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

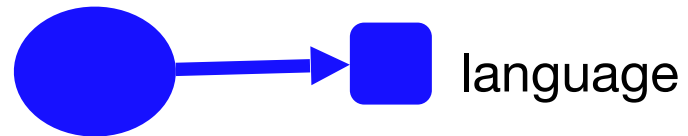
Generativist  
(linguistic nativist)

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)

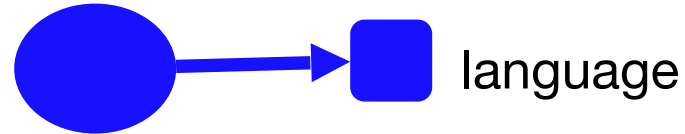


Constructionist  
(non-linguistic nativist)

One domain-specific module

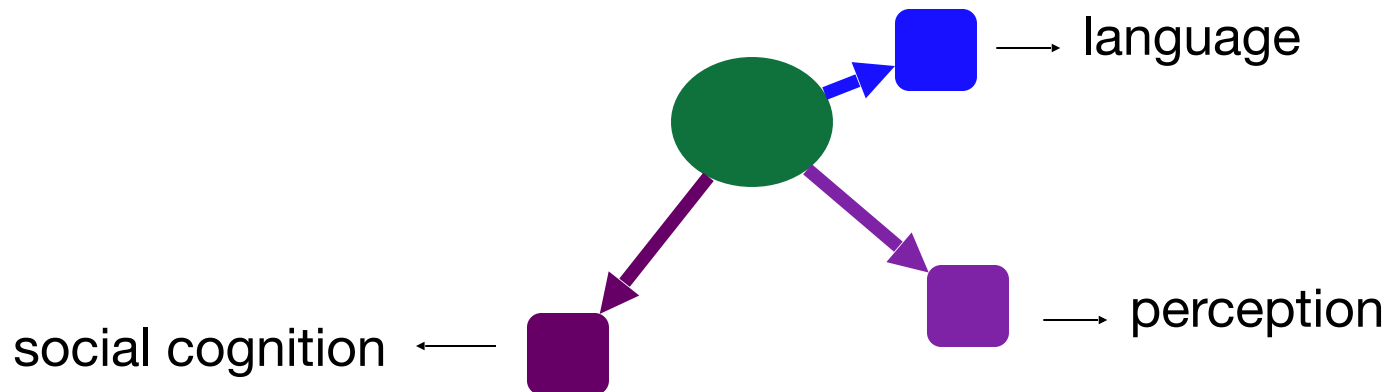
# Viewpoint comparison

Generativist  
(linguistic nativist)

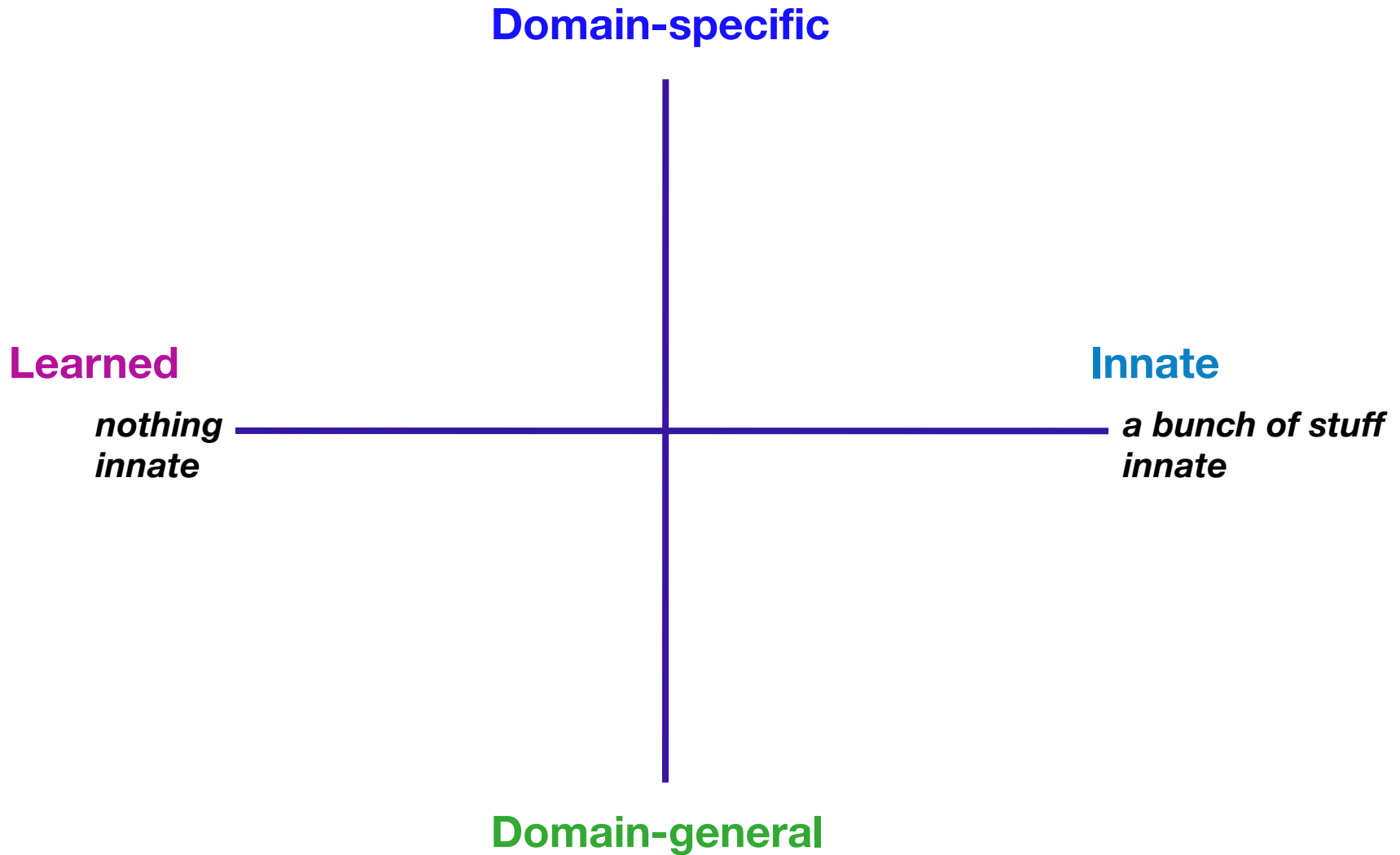


Constructionist  
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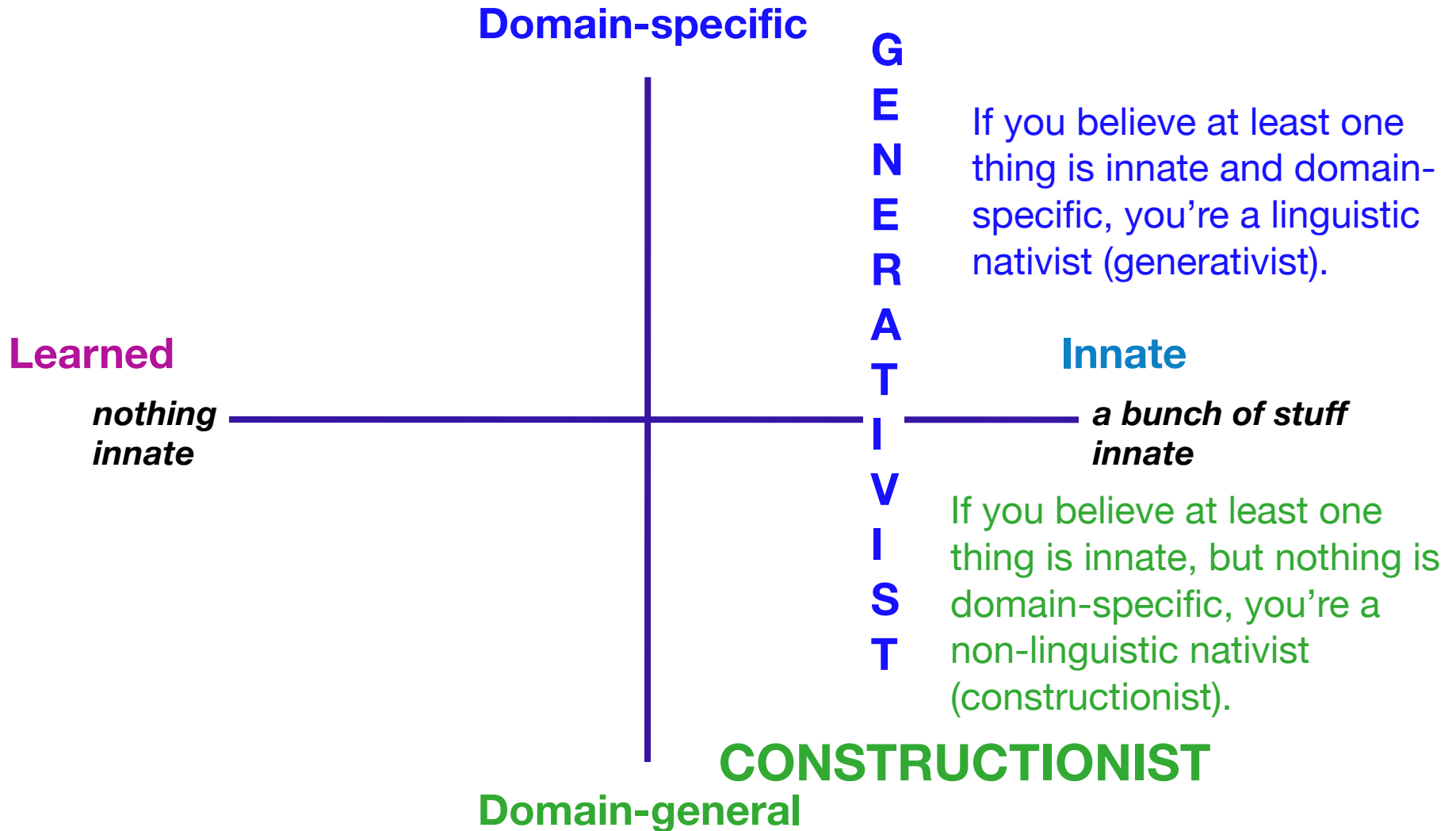
Language is constructed by the child using general cognitive learning procedures applied to language input. These are domain-general abilities used for language learning.



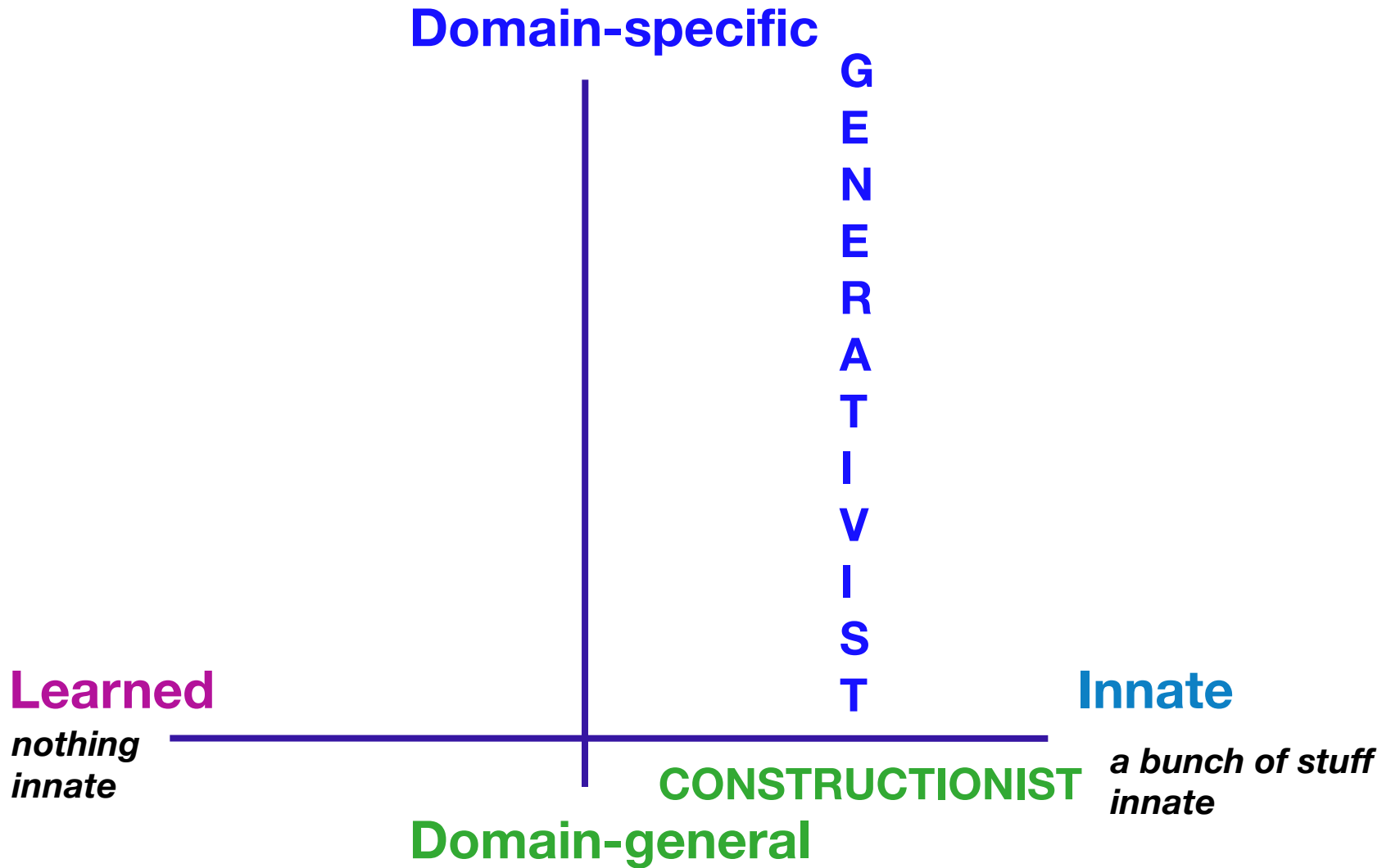
# An important division



# An important division



# An important division



# An important division

Domain-specific

G  
E  
N  
E  
R  
A  
T  
I  
V  
I  
S  
T

If you believe nothing is innate, you're an empiricist.

If you believe at least one thing is innate, you're a nativist.

Innate

E  
M  
P  
I  
R  
I  
C  
I  
S  
T

Learned

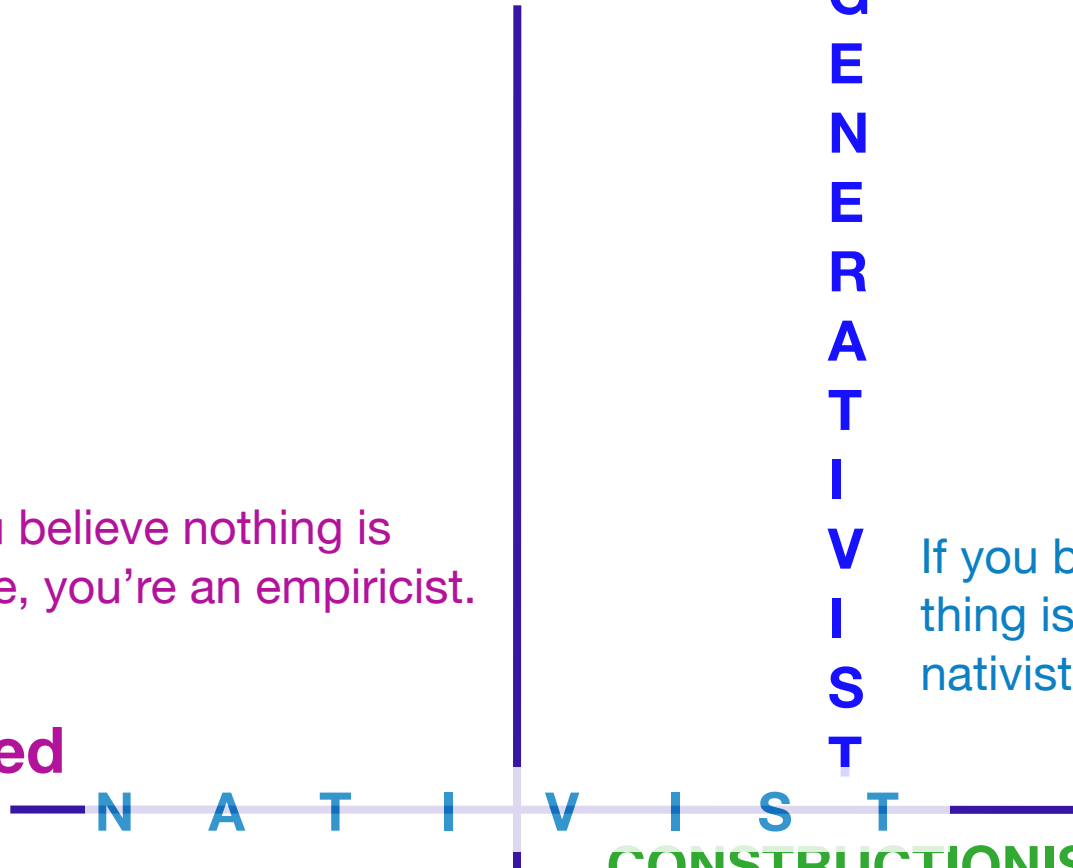
*nothing innate*

N A T I V I S T

CONSTRUCTIONIST

*a bunch of stuff innate*

Domain-general





# An important division

Domain-specific

GENERATIVIST

EMPIRICIST

Learned

*nothing  
innate*

N A T I V I S T

Innate

*a bunch of stuff  
innate*

CONSTRUCTIONIST

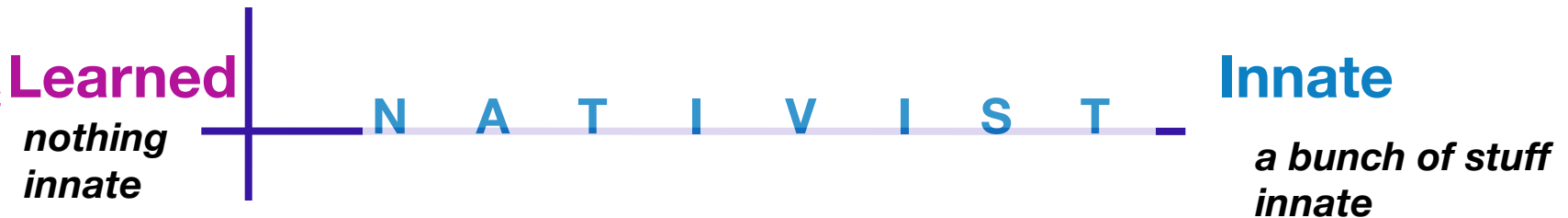
Domain-general

# Why nobody's an empiricist under this definition

“When [Chomsky] first proposed...that there was a genetically determined aspect of language acquisition...It challenged the dominant paradigm, called behaviorism. Behaviorists argued that all animal and human behaviors, including language, were acquired from the outside by the mind, which starts out as a blank slate. Today, scientists agree that behaviorism was wrong, and there is underlying, genetically encoded biological machinery for language learning. Many think the same biology responsible for language is also responsible for other aspects of cognition.”  
- Cameron Morin 2020 Ted Talk

[https://www.ted.com/talks/cameron\\_morin\\_what\\_do\\_all\\_languages\\_have\\_in\\_common/transcript?utm\\_campaign=tedsread&utm\\_medium=referral&utm\\_source=tedcomshare](https://www.ted.com/talks/cameron_morin_what_do_all_languages_have_in_common/transcript?utm_campaign=tedsread&utm_medium=referral&utm_source=tedcomshare)

E  
M  
P  
I  
R  
I  
C  
I  
S  
T



# Another way to think about it

*0 things innate*

*Empiricist*

*1+ things innate  
= nativist*

*1+ innate things  
domain-specific*      *generativist  
(= linguistic nativist)*

*0 innate things  
domain-specific*      *constructionist  
(= non-linguistic nativist)*

# Who believes in learned knowledge?

Everyone!

*0 things innate*

*everything learned*

*Empiricist*

*1+ things innate*

*= nativist*

*some things are learned*

*1+ innate things  
domain-specific*

*generativist  
(= linguistic nativist)*

*0 innate things  
domain-specific*

*constructionist  
(= non-linguistic nativist)*

Of the nativists,  
who believes in innate, domain-general knowledge?  
Everyone!

*0 things innate*

*Empiricist*

*1+ things innate  
= nativist*

*some innate things are domain-general*

*1+ innate things  
domain-specific*      *generativist  
(= linguistic nativist)*

*all innate things are domain-general*

*0 innate things  
domain-specific*      *constructionist  
(= non-linguistic nativist)*

# Recap

One of 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.