

LSci 51/CogS 56L: Acquisition of Language

Lecture 3
Theoretical perspectives

Announcements

Be working on the review questions and HW1

HW1 is due 8/8/25 at 12:50pm (remember not to submit the assignment until you've completed all the questions)

Discussion Post 1 is due 8/8/25 at 11am (before our review session)

Theoretical perspectives



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

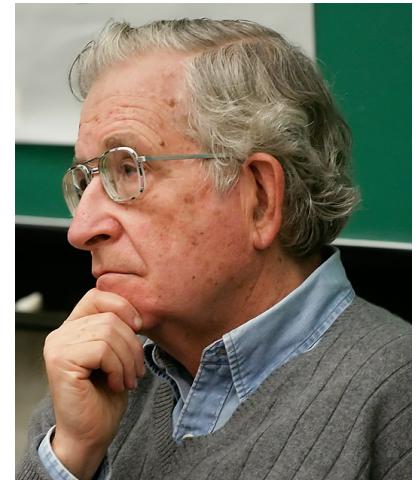


Not obvious what this quality is.

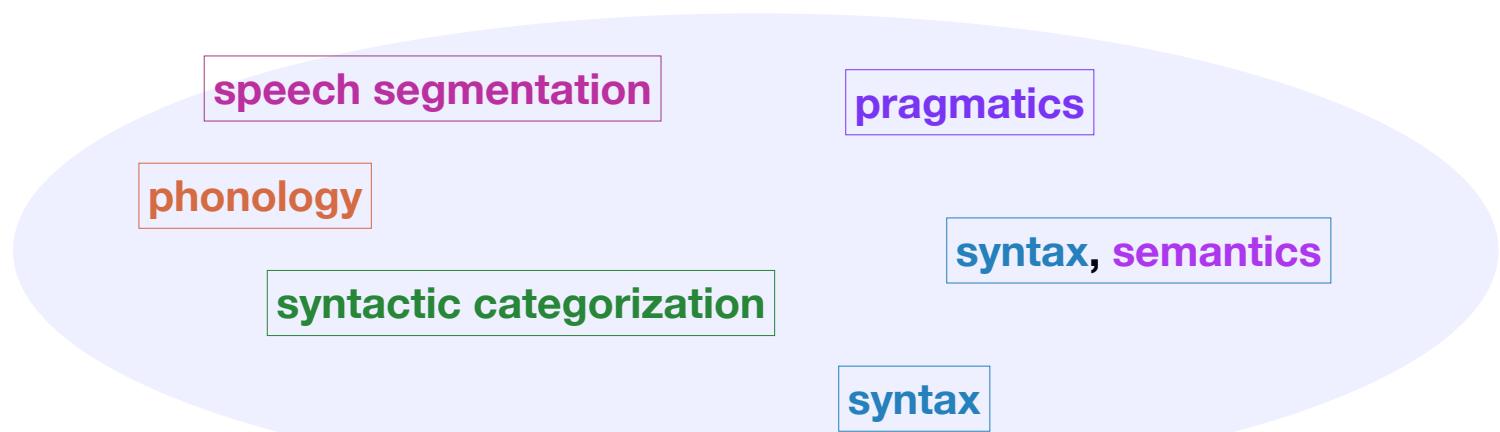
Chomskyan revolution

Chomsky 1957: *Syntactic Structures*

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



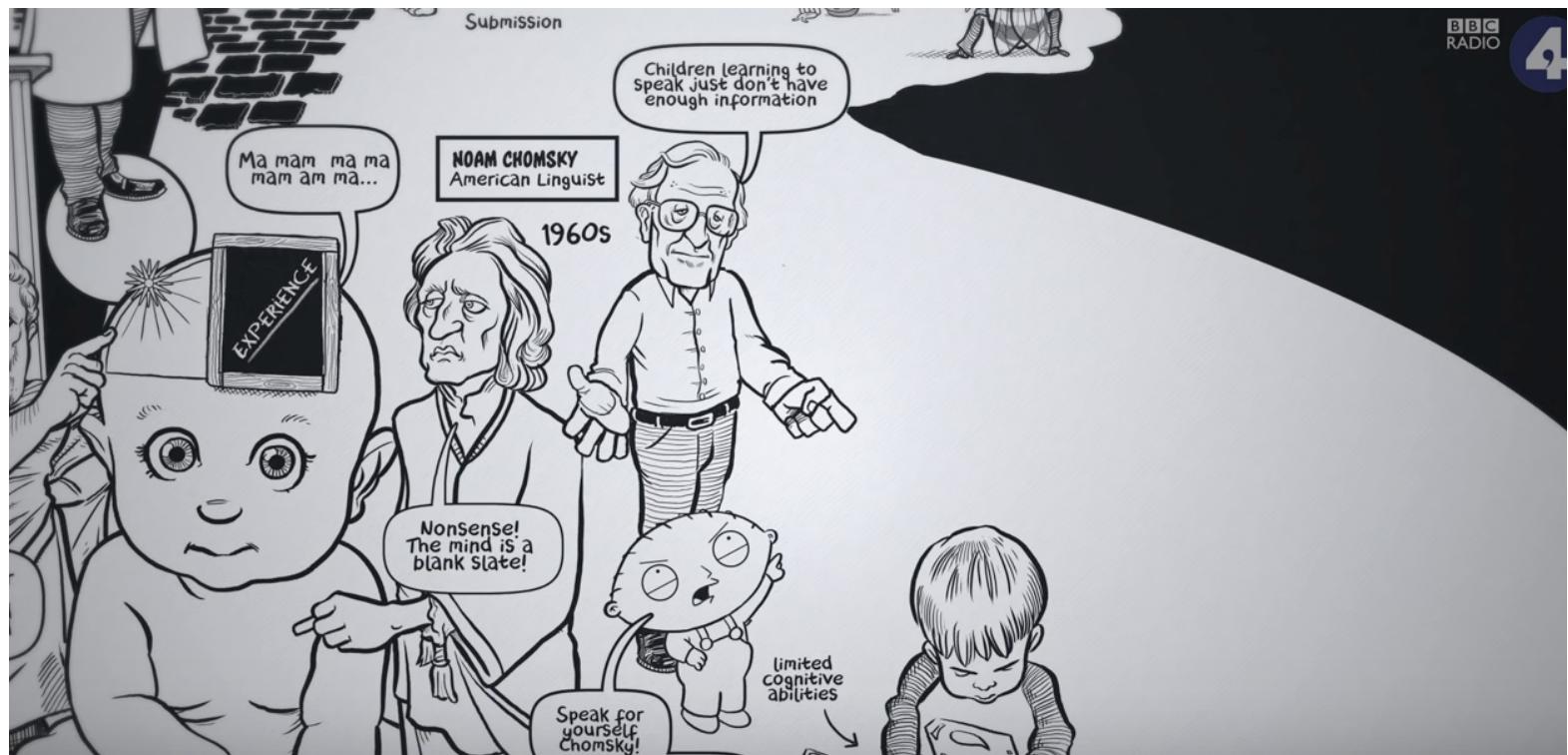
mental grammar: system of implicit rules for how we “do” language (produce or comprehend)



Chomskyan revolution

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

Especially 0:24-1:35



The growth of grammar

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?



The growth of grammar

What children are doing: Extracting patterns and making generalizations from the surrounding data mostly just by hearing examples of what's allowed in the language.



The growth of grammar

This is actually pretty hard to do without some help. Why?



Why it's hard



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

Let's look at a few examples.

Why it's hard



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

“birdie”

Why it's hard



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

“birdie”



“What a pretty birdie!”

Why it's hard



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



“birdie”



“Look - a birdie!”

Why it's hard



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

“birdie”



“Look at that **birdie**!”

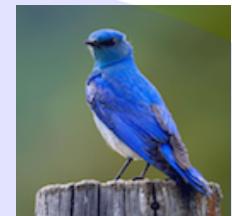
Why it's hard



What's the “rule” for
“birdie”? What's a “birdie”?

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

“birdie”



Why it's hard

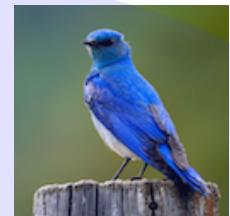


There are often many ways to generalize beyond the input, and most of them aren't right.

One hypothesis

+blue

“birdie”



X



X



Why it's hard

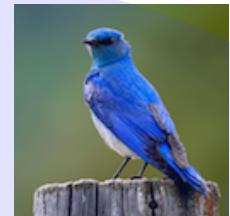


There are often many ways to generalize beyond the input, and most of them aren't right.

Another hypothesis

+on branch

“birdie”



Why it's hard

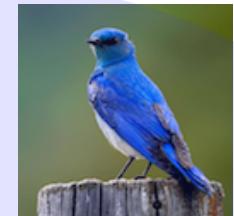


There are often many ways to generalize beyond the input, and most of them aren't right.

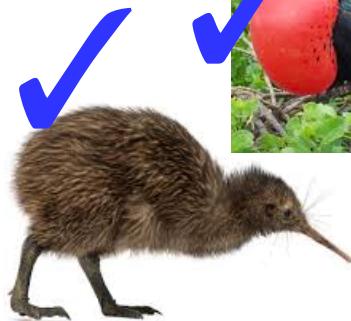
The right hypothesis

+bird

(maybe + feathers, + 2 feet, + beak, etc.)



“birdie”



Why it's hard



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

A numerical example:

Guess the rule for the “numbers someone can say”



Why it's hard



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

“numbers someone can say”

3 5 7



What's the rule? What other numbers can someone say?

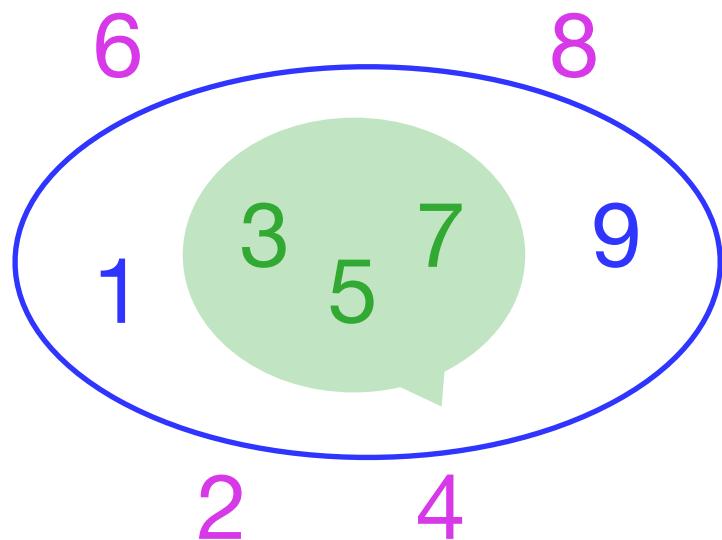
Why it's hard



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

“numbers someone can say”

odd numbers less than 10?



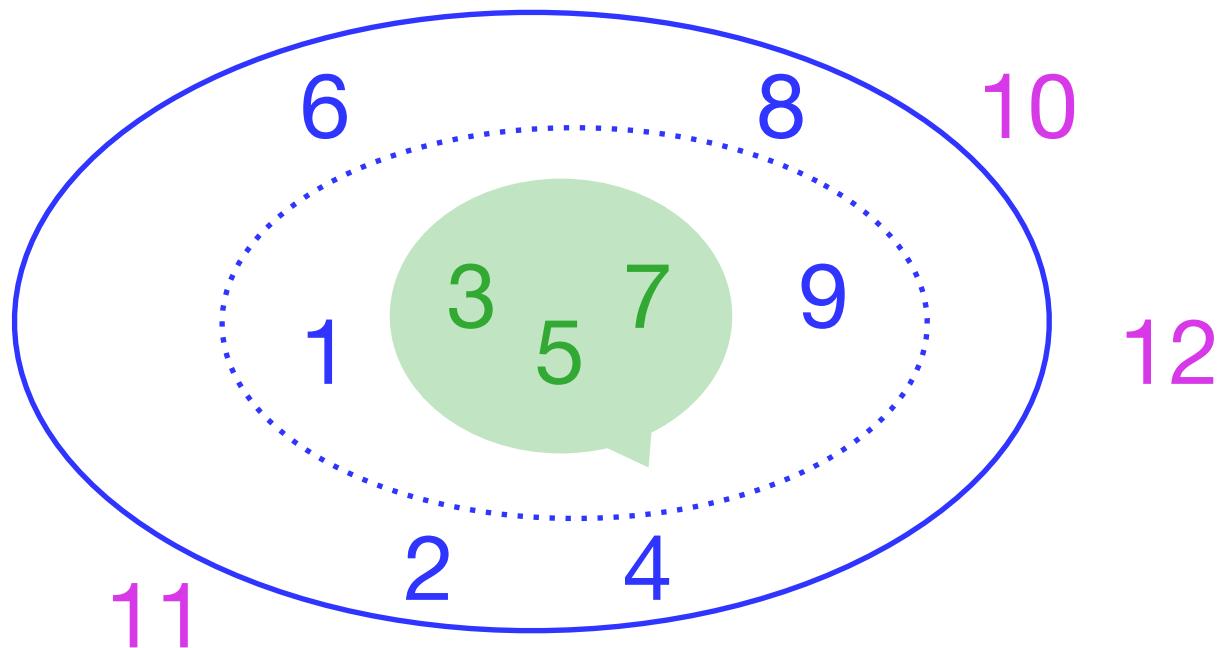
Why it's hard



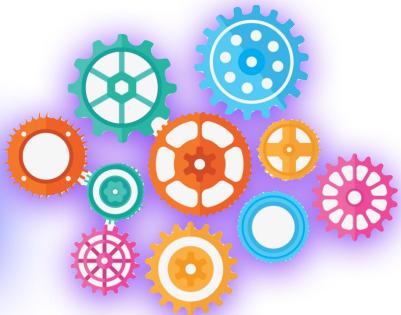
There are often many ways to generalize beyond the input, and most of them aren't right.

“numbers someone can say”

all numbers less than 10?



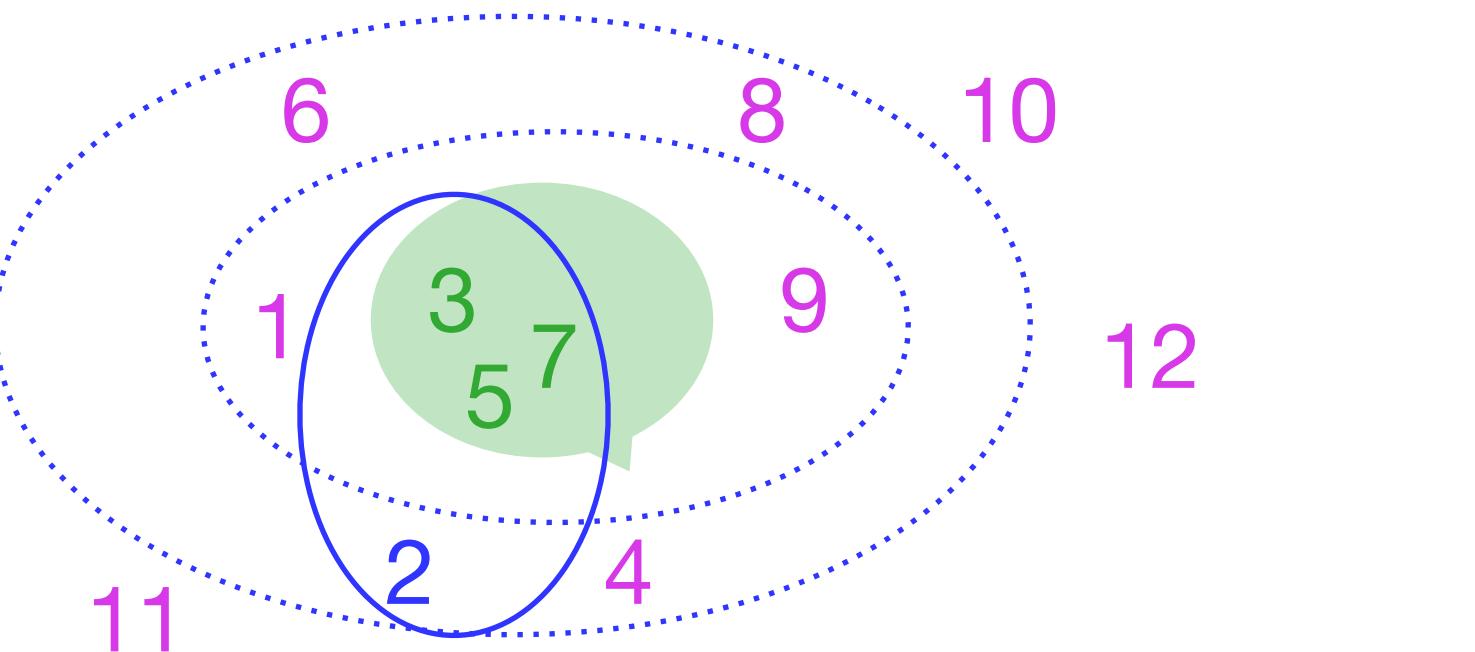
Why it's hard



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

“numbers someone can say”

prime numbers less than 10?



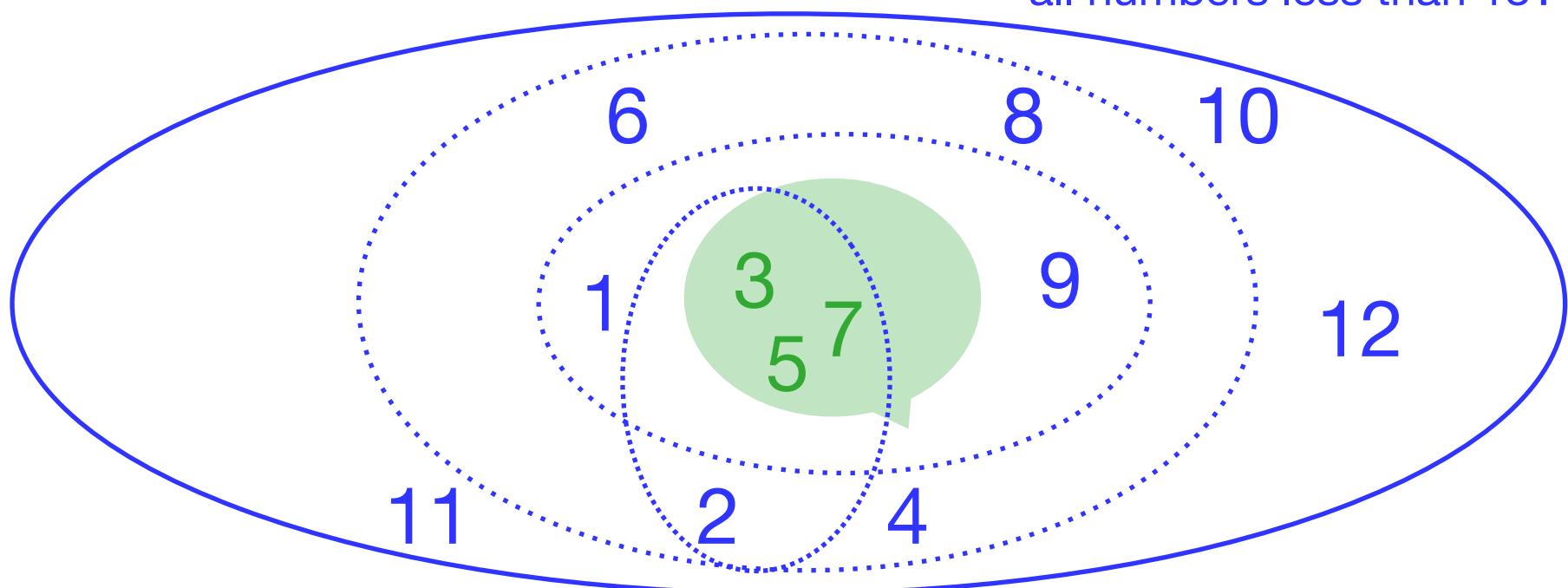
Why it's hard



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

“numbers someone can say”

all numbers less than 13?



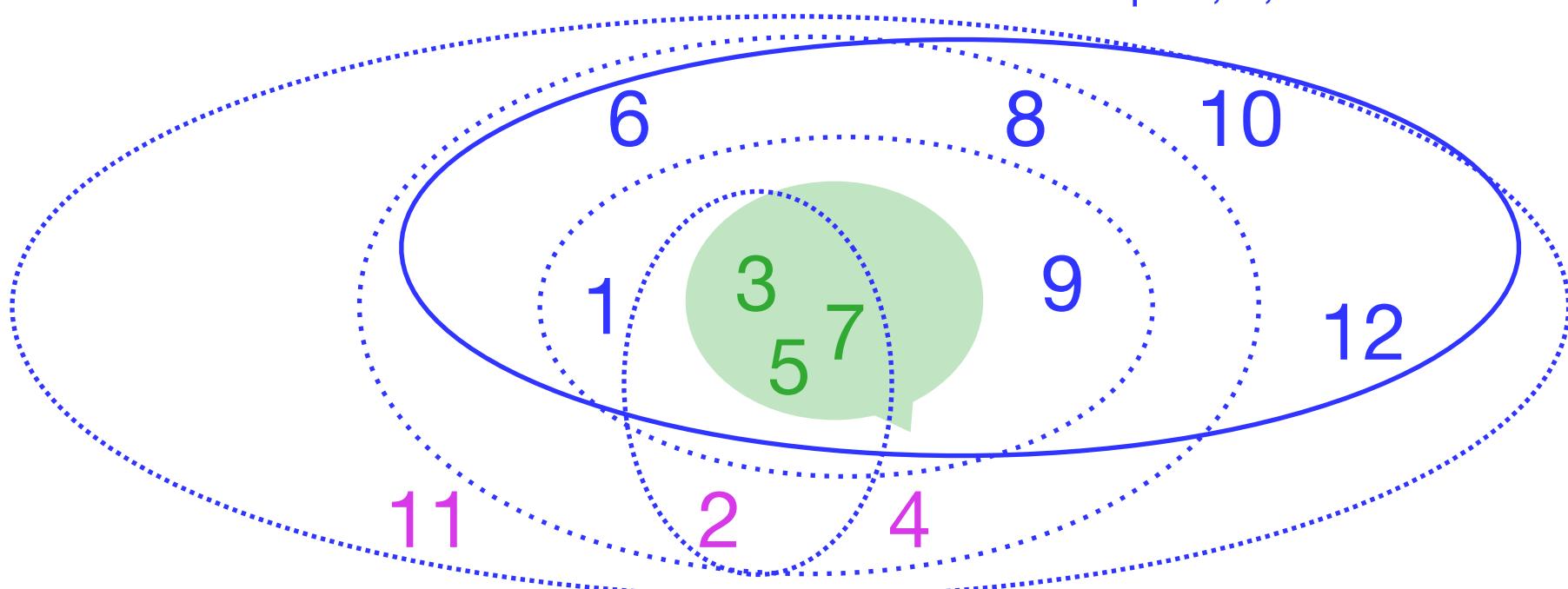
Why it's hard



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

“numbers someone can say”

all numbers less than 13
except 2, 4, and 11?



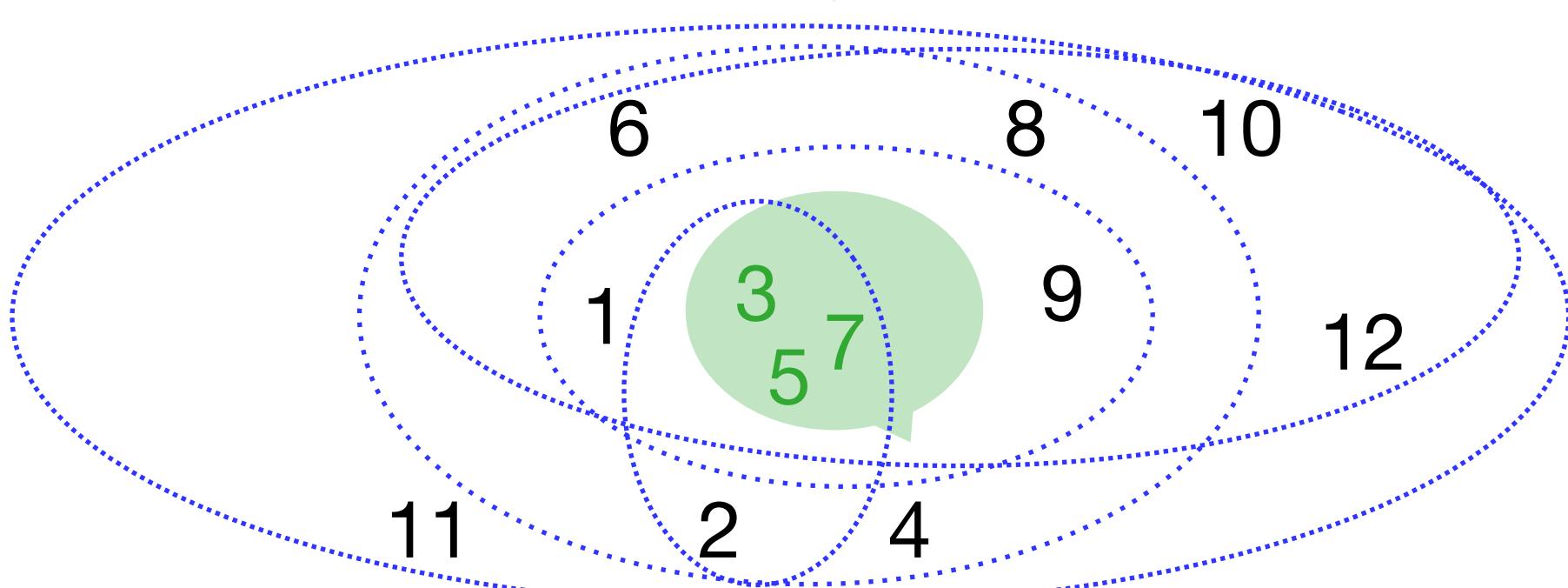
Why it's hard



“numbers someone can say”

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

All these rules are compatible with the input. How do we know which is right?



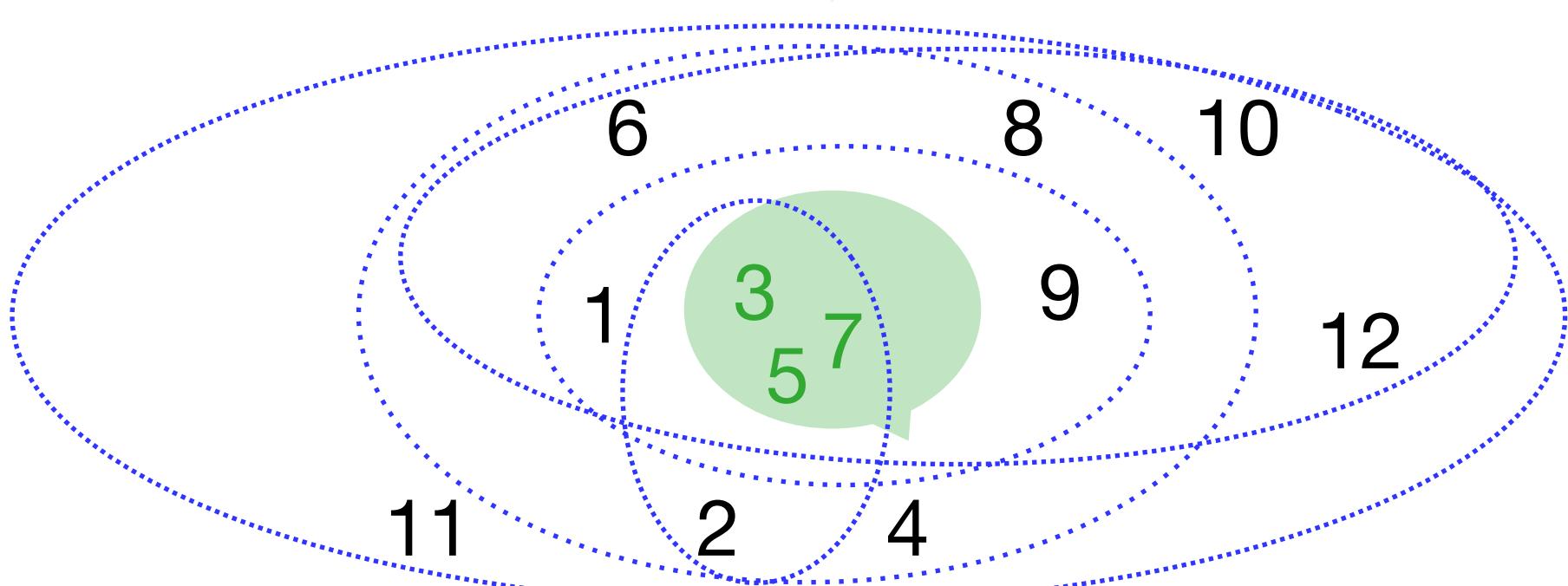
Why it's hard



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

“numbers someone can say”

This is a problem.

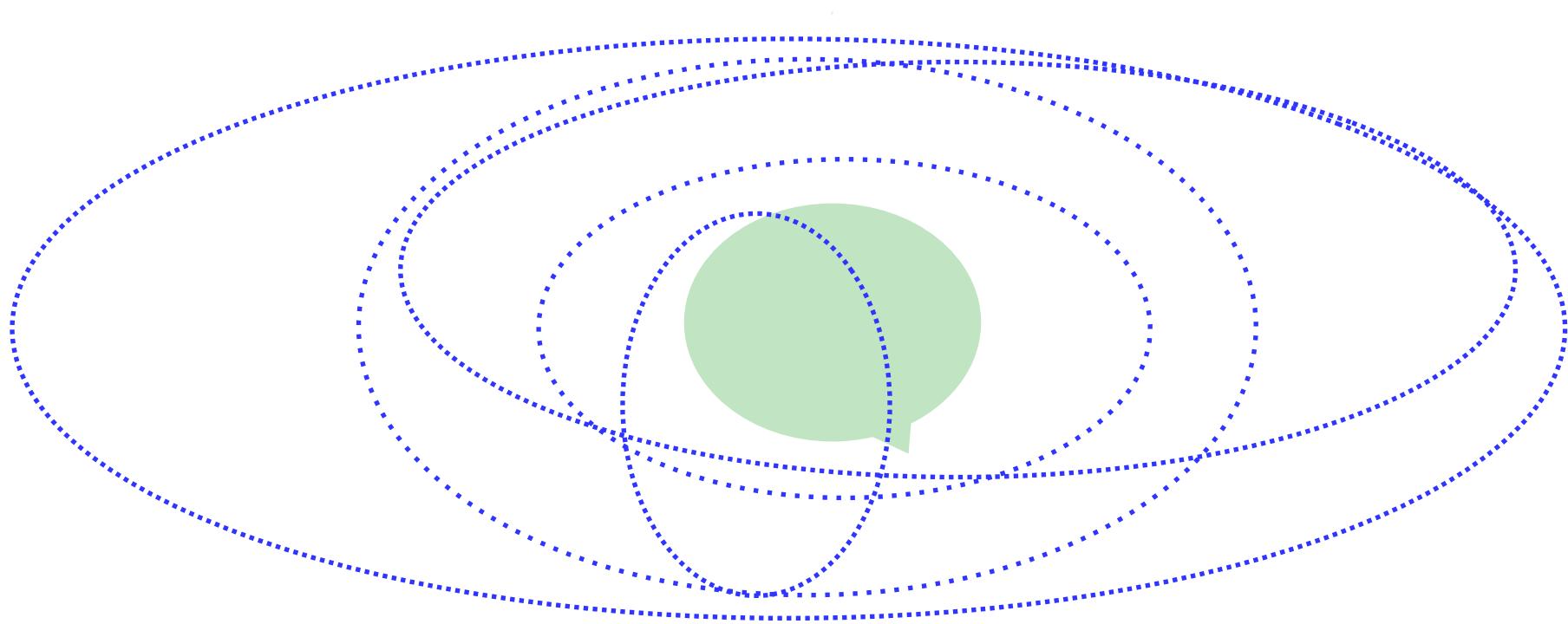


Why it's hard



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

It's called an “induction problem” or “poverty of the stimulus”.

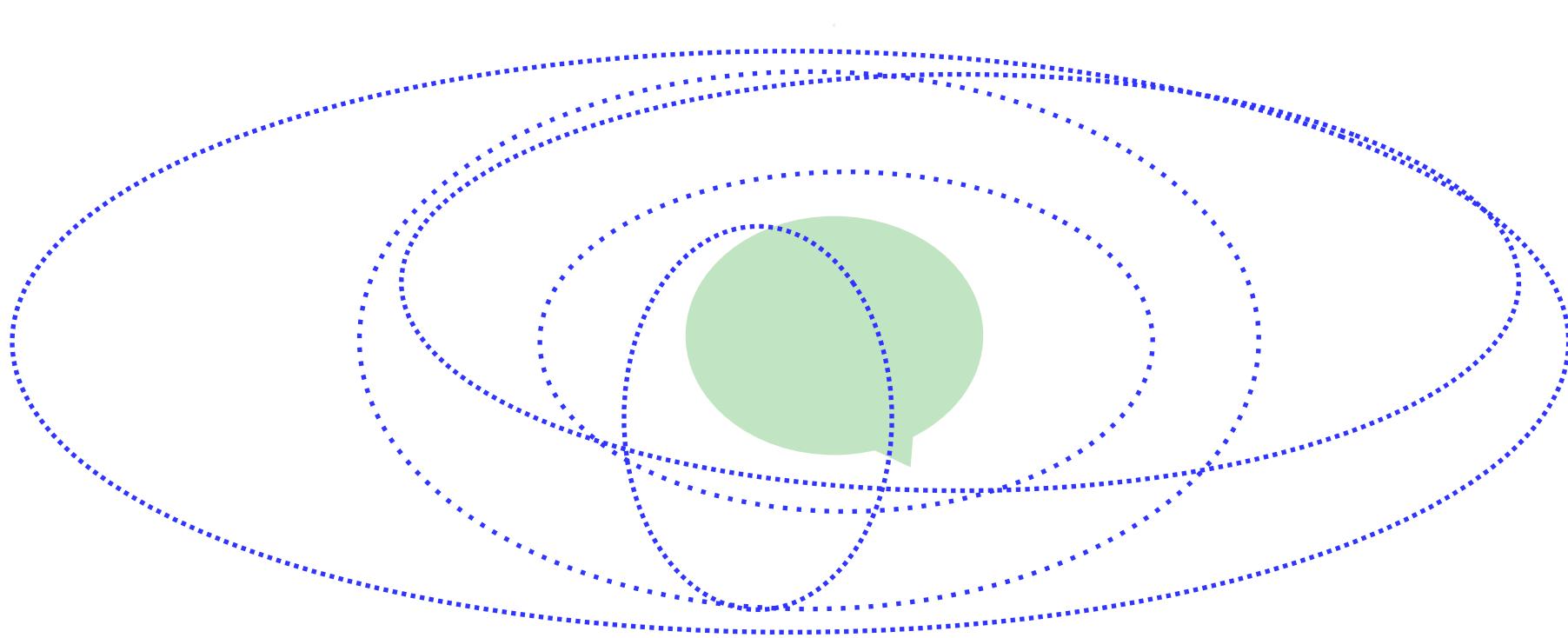


Why it's hard



Poverty of the stimulus:

The data are compatible with multiple generalizations or rules. In this sense, the data (stimulus) encountered are impoverished.

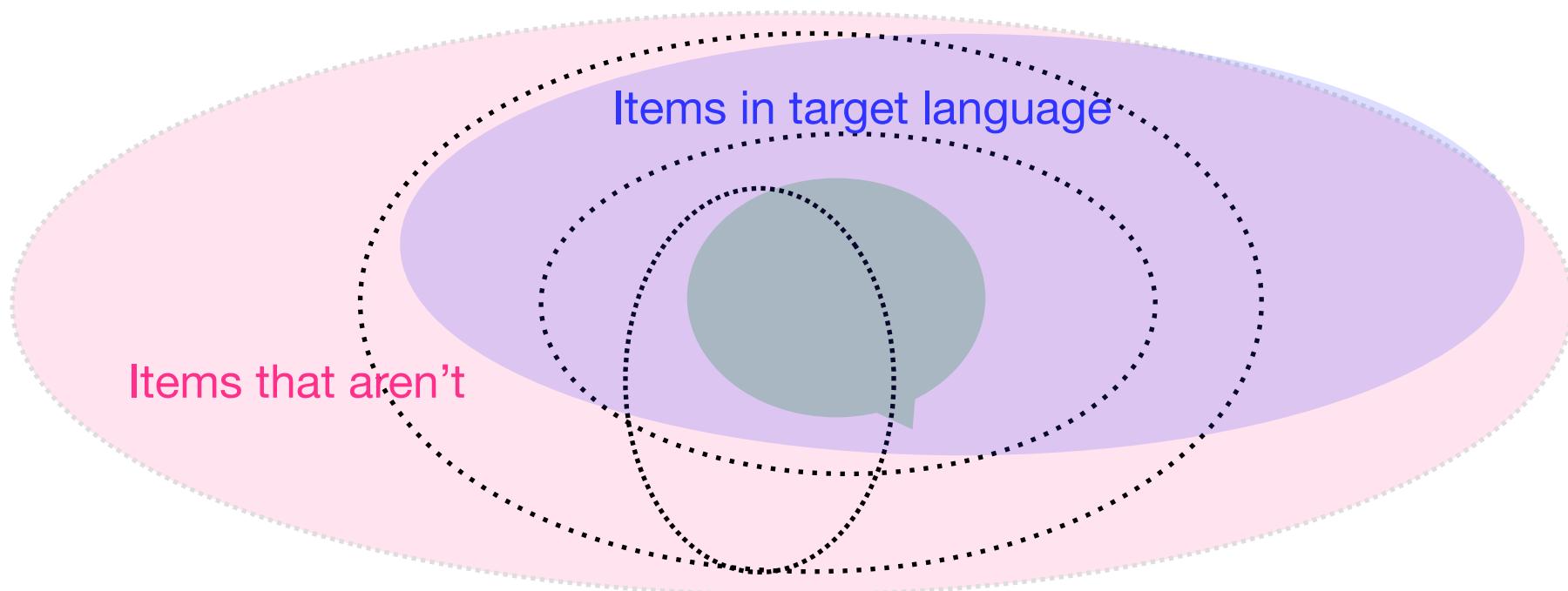


Why it's hard



Poverty of the stimulus:

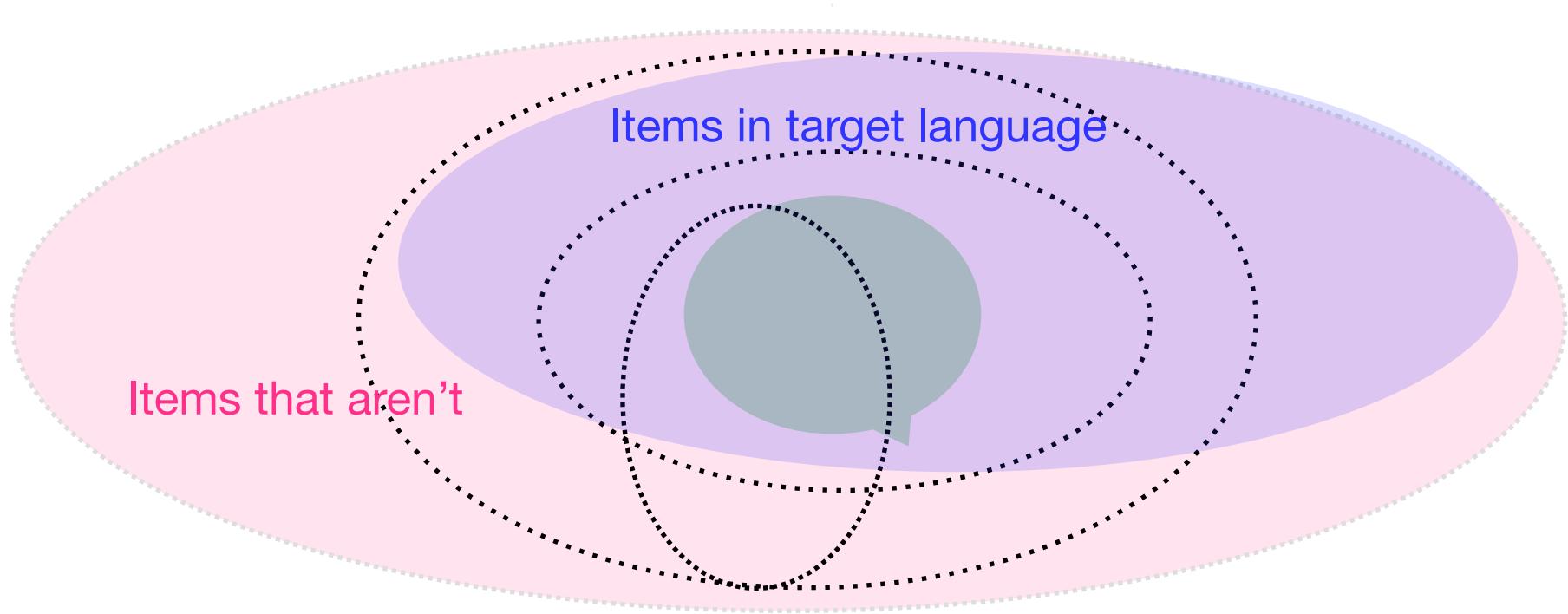
This happens in language acquisition all the time. And children **still acquire the correct grammar for their language** (e.g., English). It's magical.



Why it's hard



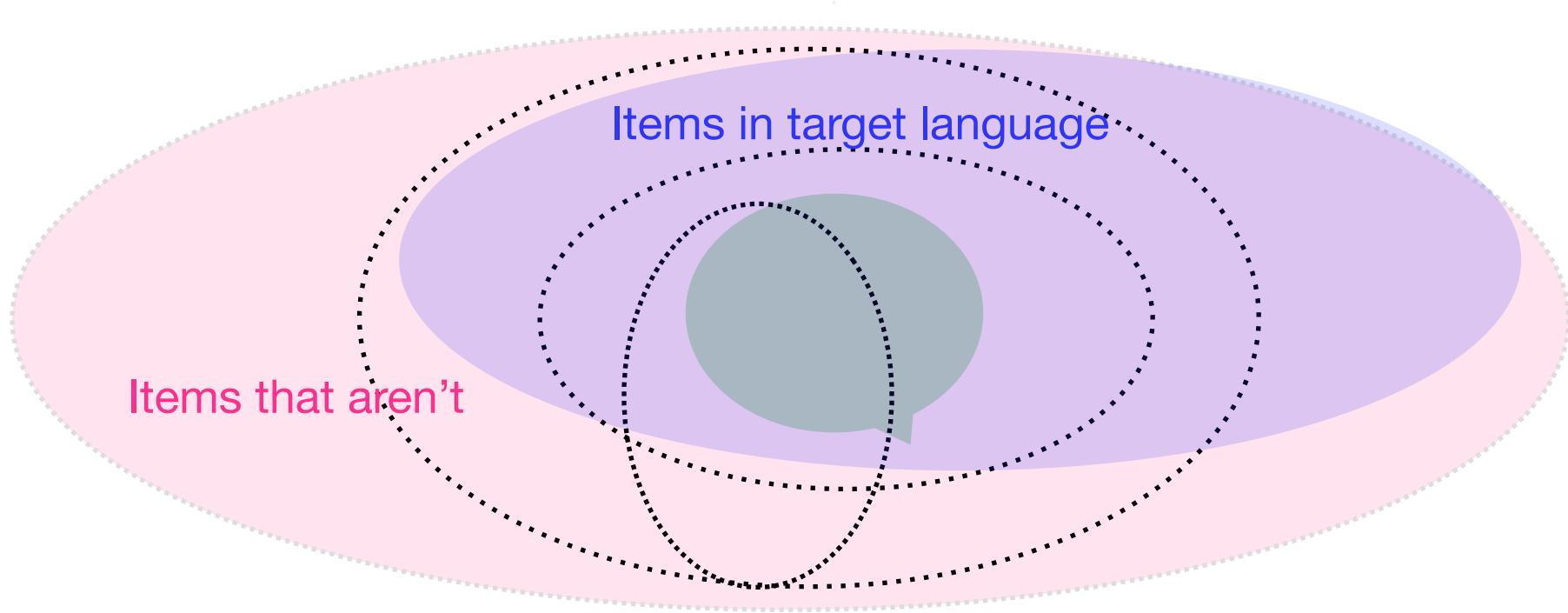
Pearl 2022: “poverty of the stimulus” is just another way of saying that there’s an induction problem for the child...Researchers are then rather impressed when children nonetheless seem to reliably resolve that ambiguity, and end up with the right answer despite the induction problem”



Why it's hard

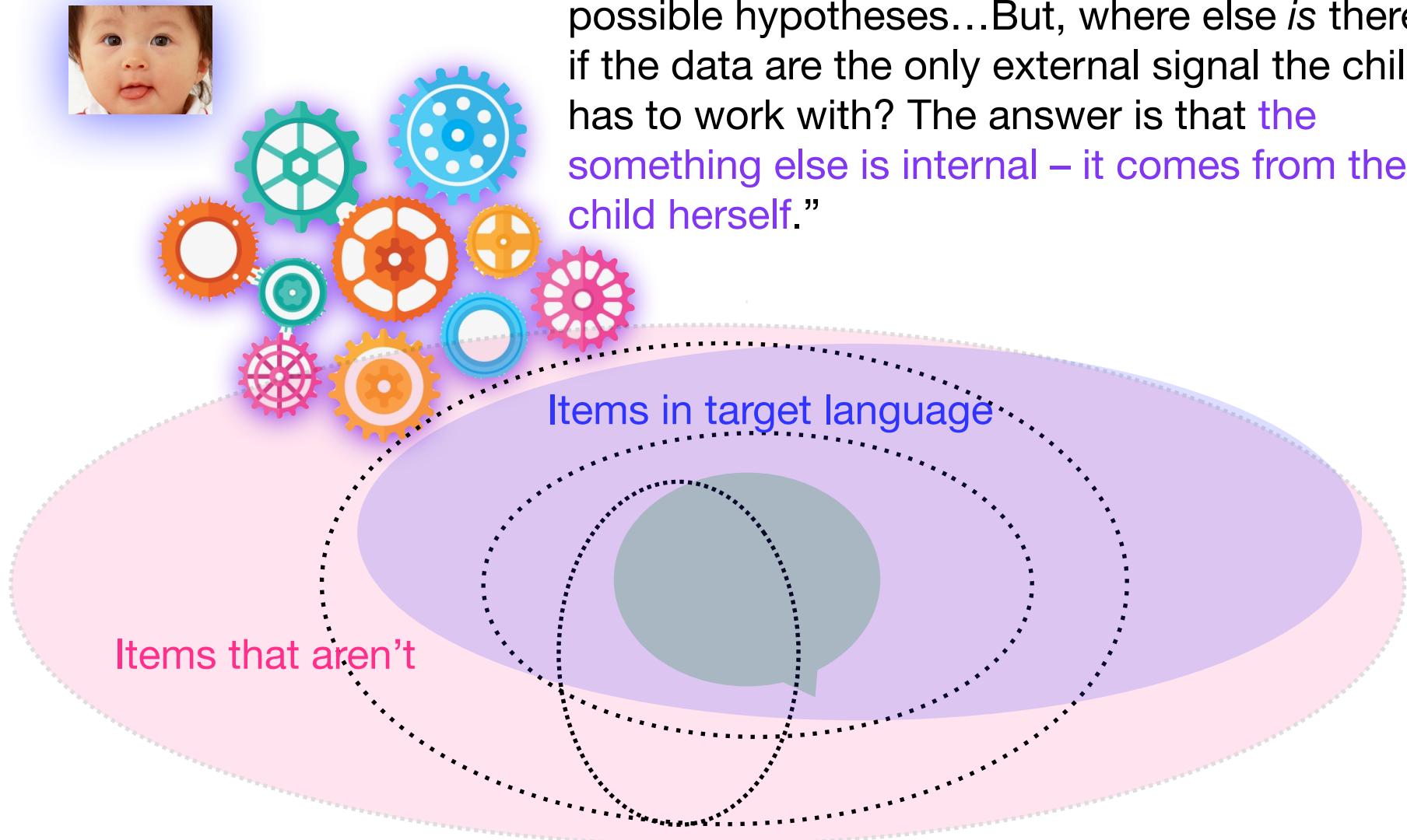


Pearl 2022: When children succeed at acquisition, they're making a “constrained generalization” to the right set of language items. Why? How? What's causing this constrained generalization despite the poverty of the stimulus?



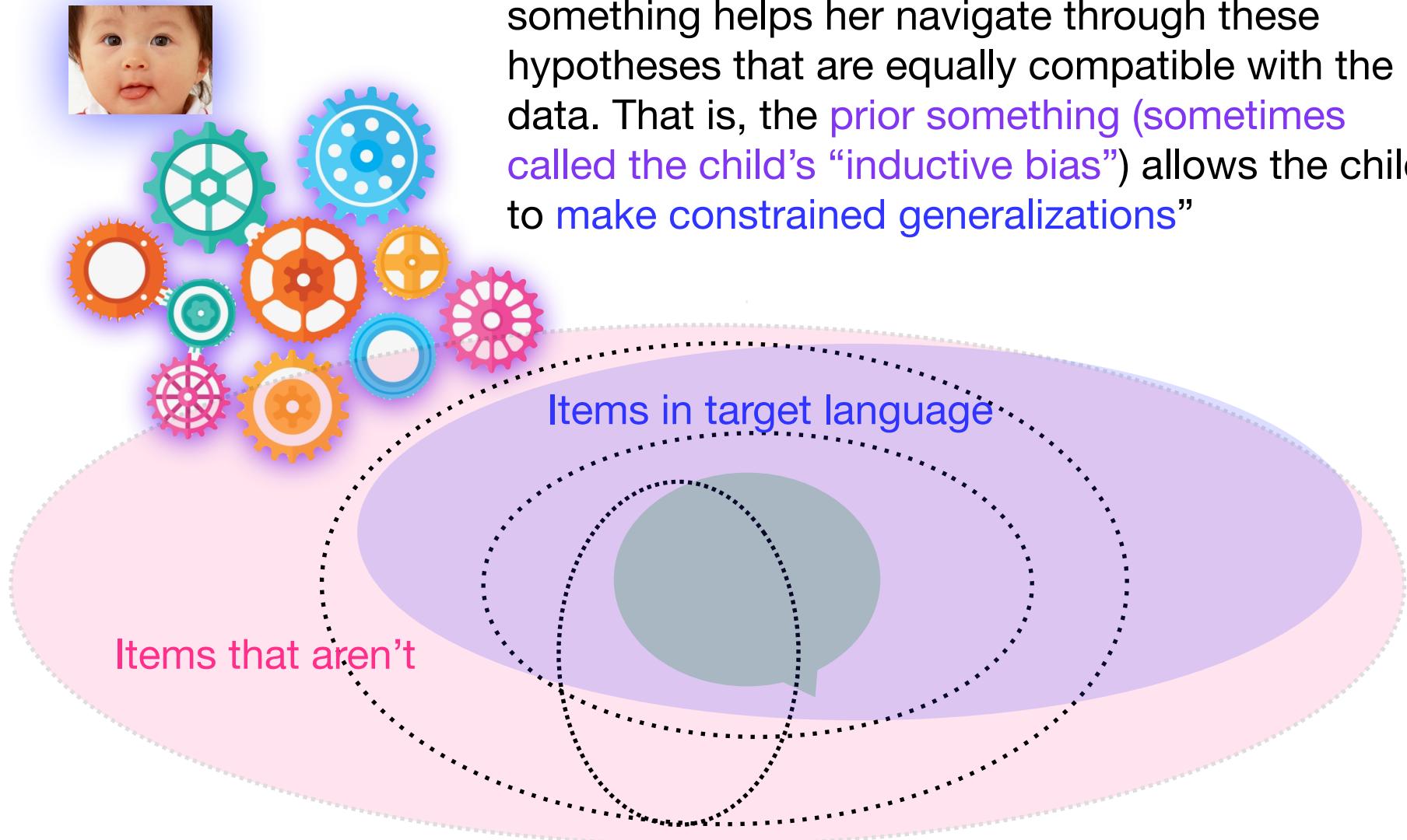
Why it's hard

Pearl 2022: "...children must be using something else to help them decide among the possible hypotheses...But, where else *is* there, if the data are the only external signal the child has to work with? The answer is that **the something else is internal – it comes from the child herself.**"



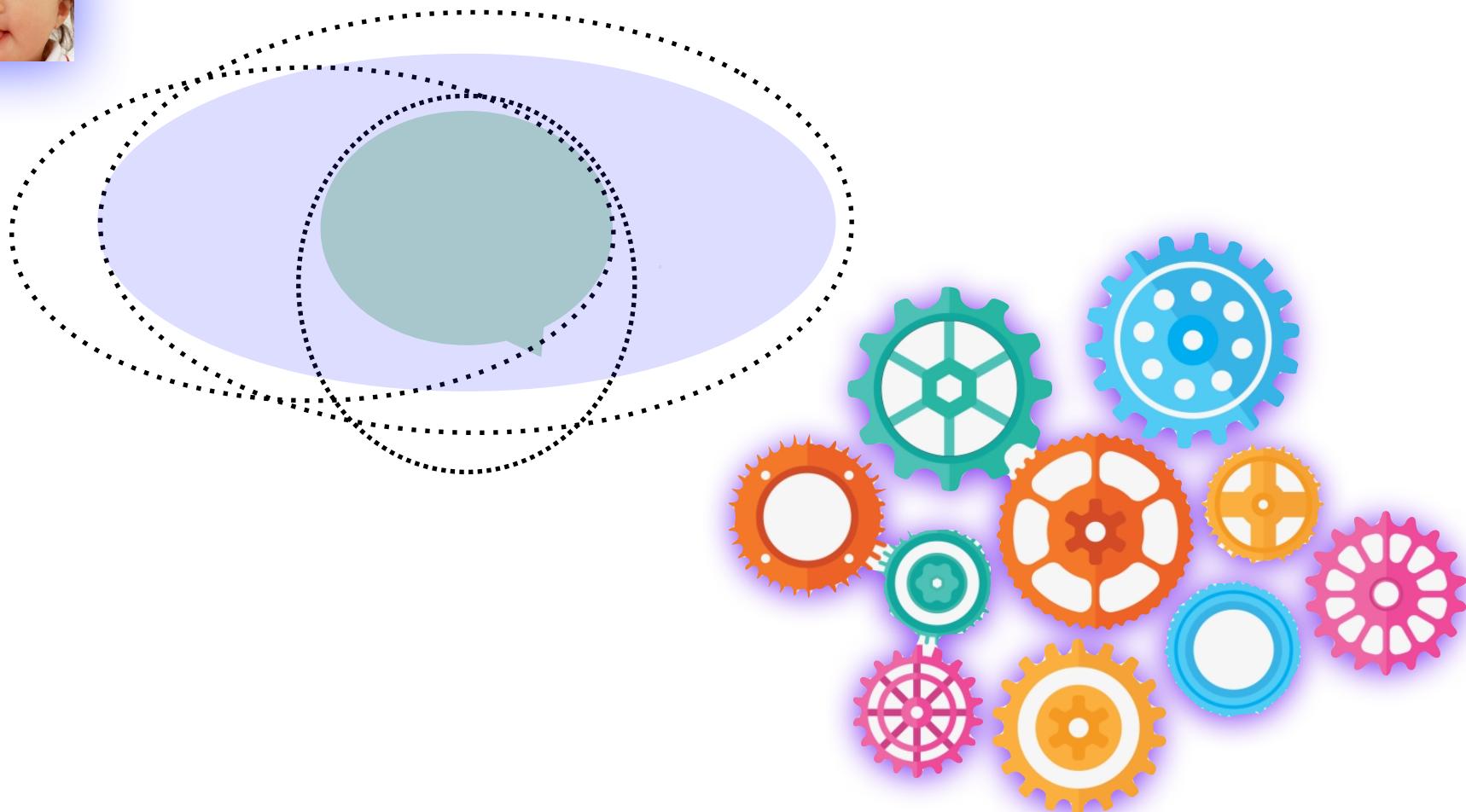
Why it's hard

Pearl 2022: "Prior to learning from these data, the child **already knows something**...and that something helps her navigate through these hypotheses that are equally compatible with the data. That is, the **prior something (sometimes called the child's "inductive bias")** allows the child to **make constrained generalizations**"



What it means: Children have stuff built in

Pearl 2022: “Poverty of the stimulus and constrained generalizations together imply prior knowledge or abilities”

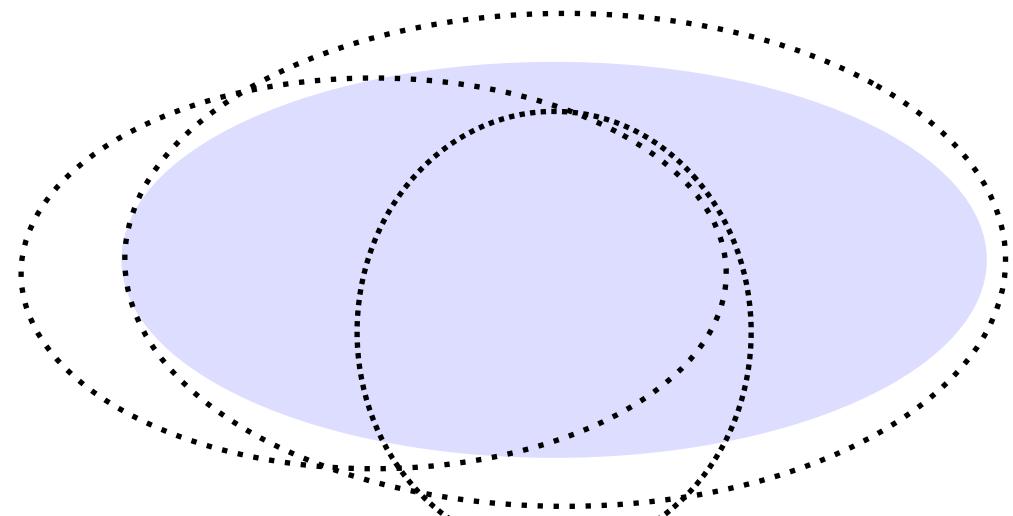


What it means: Children have stuff built in



Pearl 2022

“**Data:** There are **data external to the child** that are available for learning about... language”



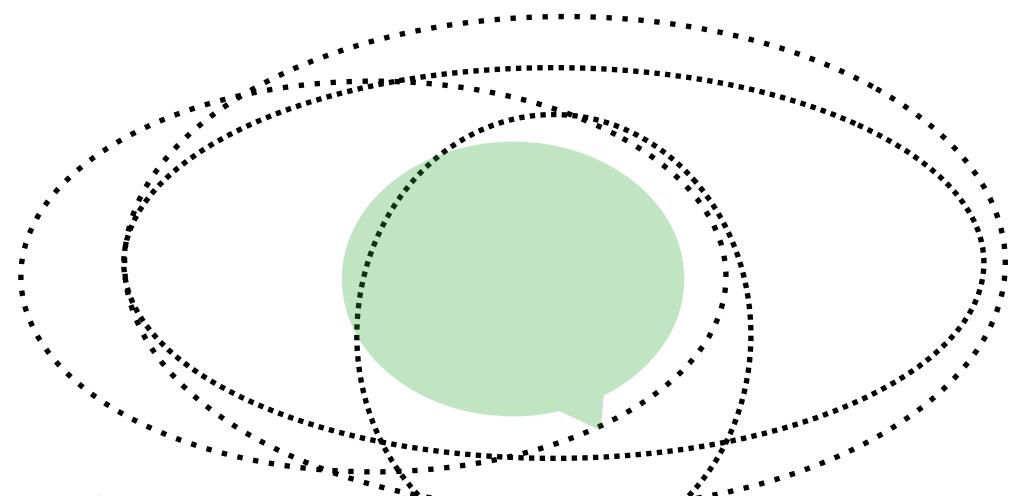
What it means: Children have stuff built in



Pearl 2022

Data

“Poverty of the stimulus: These data are compatible with more than one hypothesis ... This is why they’re considered impoverished or insufficient – they don’t pinpoint the correct hypothesis on their own.”



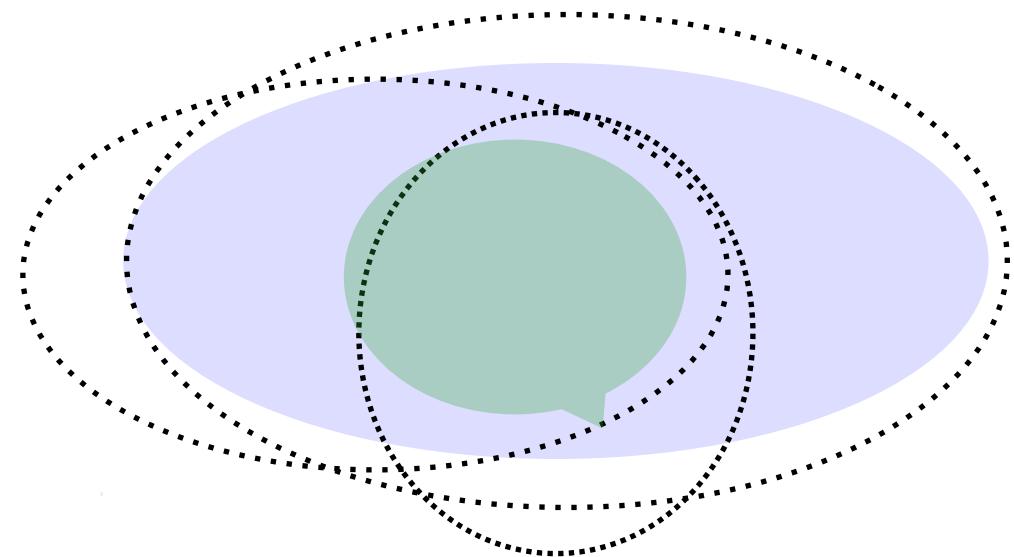
What it means: Children have stuff built in



Pearl 2022

Data

Poverty of the stimulus



“Constrained generalization: Children figure out the correct representation anyway.”



What it means: Children have stuff built in



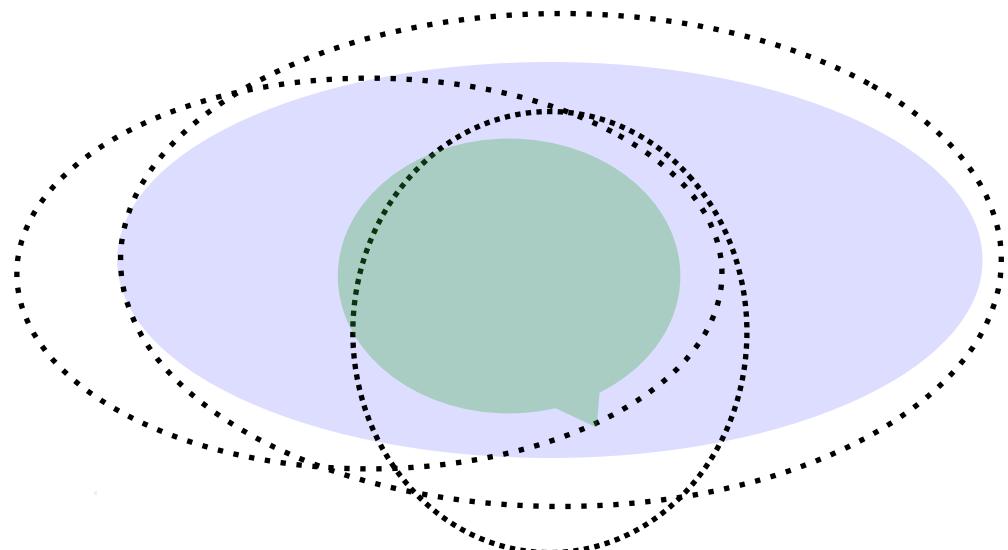
Pearl 2022

Data

Poverty of the stimulus

+

Constrained generalization



“Prior [stuff]: Therefore, children have prior knowledge or abilities that cause them to make the constrained generalization.”



What it means: Children have stuff built in



Pearl 2022

Data

Poverty of the stimulus

+

Constrained generalization

=

Prior stuff



How does this fit into the nature vs. nurture debate in language acquisition?

What it means: Children have stuff built in

Empiricism: all knowledge and reason
come from experience

nurture



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

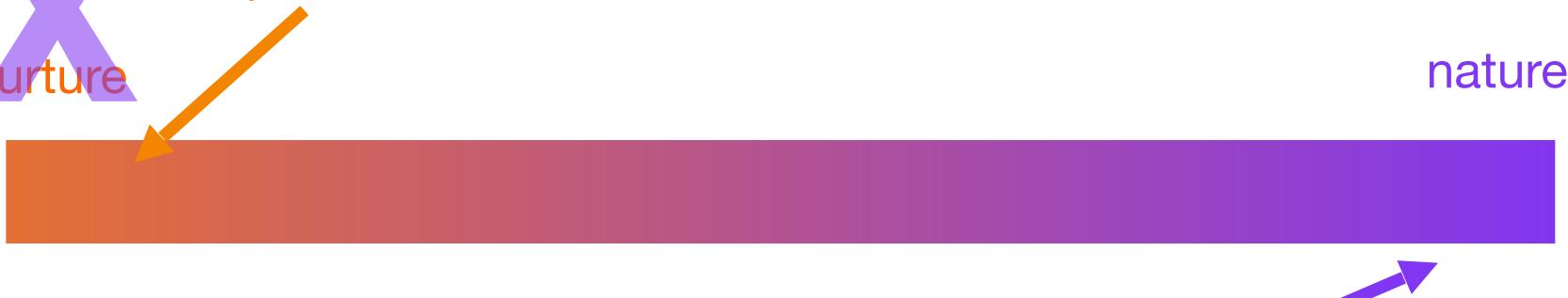
Prior stuff



What it means: Children have stuff built in

Empiricism: all knowledge and reason
come from experience

nurture



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

Okay, so **what is** that stuff
that's built in to children
(**innate** to children))?



The nature of the built-in stuff

There are different ways for something to be innate:

Knowledge itself is innate

Procedures/abilities for learning the knowledge are innate
(knowledge is the result from these procedures)

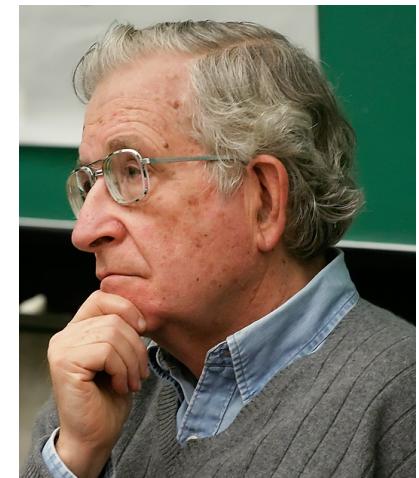
Innate knowledge

Knowledge itself is innate

Children's knowledge of language is innate: it'll grow as long as the environment is supportive

"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)



Innate knowledge

Knowledge itself is innate

Children have knowledge specific to the domain of language
(knowledge about language = domain-specific knowledge).
Sometimes called “Universal Grammar”.

Why this isn't so crazy:

Common properties of human languages: all languages of the world share structural properties. This could be due to innate knowledge 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)

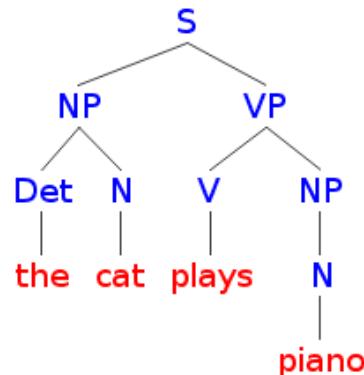


Innate knowledge

Knowledge itself is innate

Children have knowledge **not specific to the domain of language** (knowledge about how things are structured = **domain-general knowledge**)

An example: Language is **structured into chunks**, as are many other aspects of cognition (visual information, temporal information, event cognition). The human mind likes making useful chunks.



Innate knowledge

Knowledge itself is innate

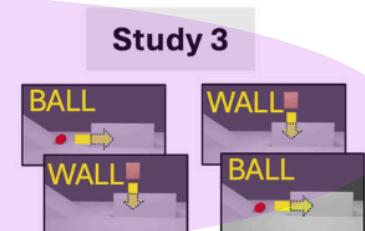
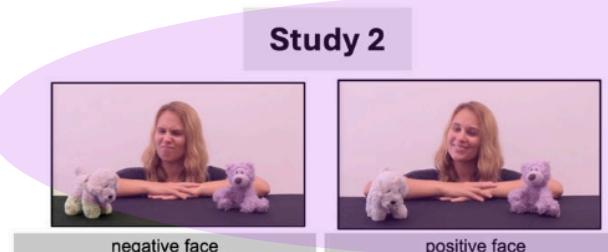
Children have knowledge **not specific to the domain of language** (knowledge about how things are structured = **domain-general knowledge**)

Dautriche & Chemla 2025: young children can chunk different conceptual units together

14 months: nouns+verbs

12 months: facial expressions+objects

10 months: physical transformations in a scene



Innate knowledge

Knowledge itself is innate

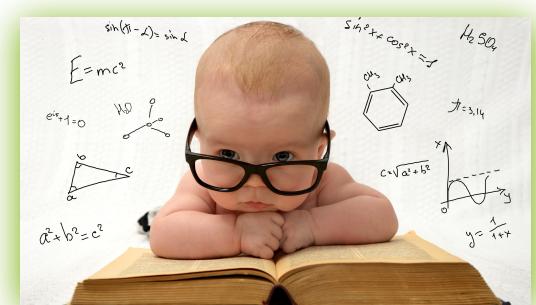
Children have knowledge **not specific to the domain of language** (knowledge about how things are structured = **domain-general knowledge**)

Shi & Emonds 2023: 14-month-olds seem to have a **threshold for when they form a rule**, based on how many exceptions to that rule it's efficient for them to tolerate (this is sometimes called the “Tolerance Principle”: Yang 2016)



Innate abilities

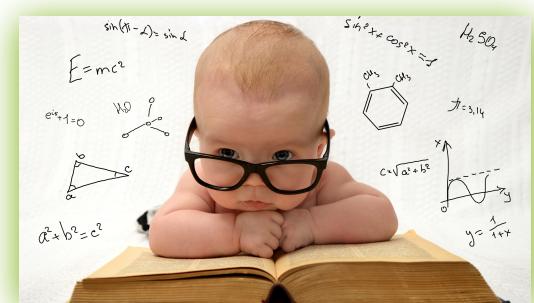
Procedures/abilities for learning the knowledge are innate
(knowledge is the result from these procedures)



From what we can tell, these abilities are often not specific to the domain of language (domain-general) even though they can be used on language input.

Innate abilities

Procedures/abilities for learning the knowledge are innate
(knowledge is the result from these procedures)



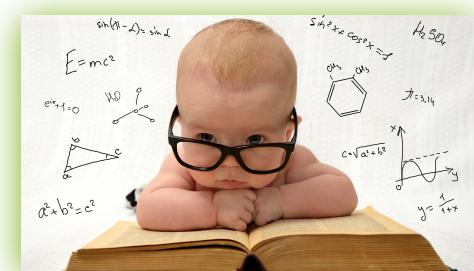
statistical learning: tracking the “statistics” of the input
(counting things in the input, keeping track of relative frequencies, tracking probabilities, etc.)

Kidd & Arciuli 2016: children’s individual statistical learning proficiency is linked to their individual grammatical proficiency — so this ability seems linked to language acquisition

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

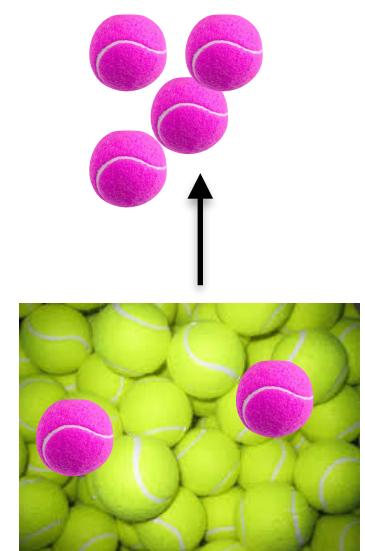
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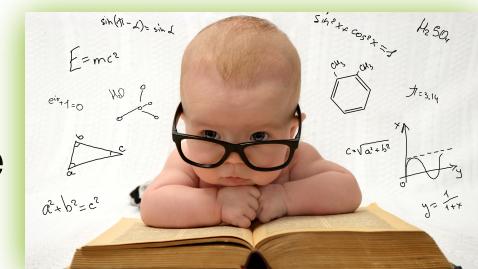
statistical learning (domain-general)

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.



Innate abilities

Procedures/abilities for learning the knowledge are innate
(knowledge is the result from these procedures)



statistical learning (domain-general)

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

Innate abilities

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statistical learning

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>

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

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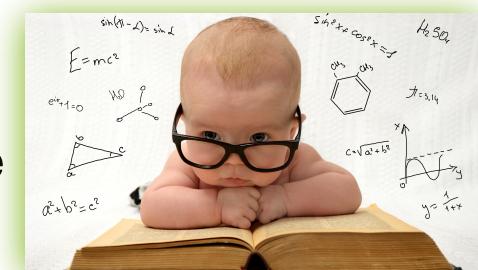
statistical learning

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



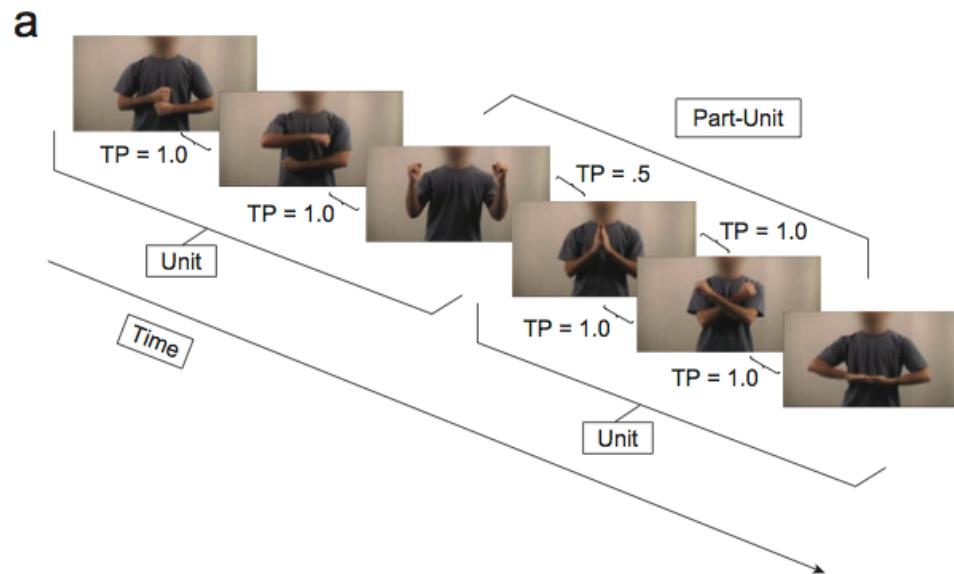
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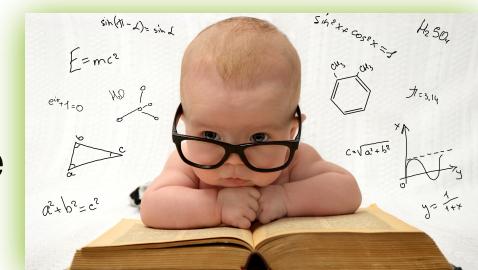
statistical learning

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.



Innate abilities

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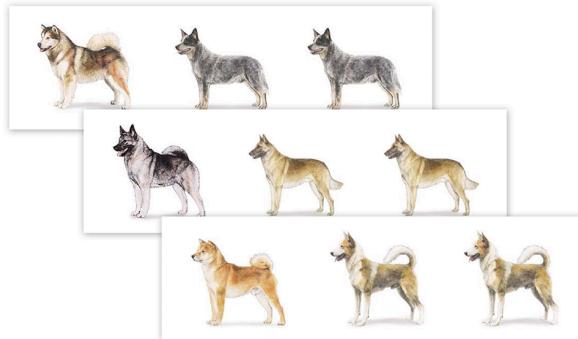


statistical learning

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)



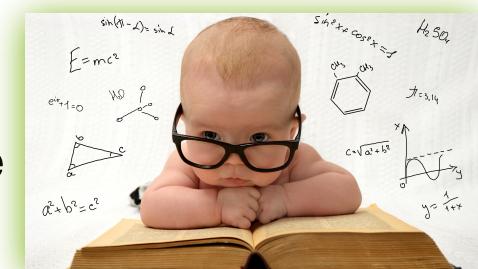
ABA (Novel)



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

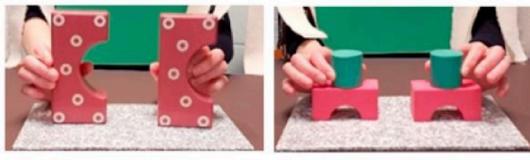
Innate abilities

Procedures/abilities for learning the knowledge are innate
(knowledge is the result from these procedures)



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



Test Trials



Habituation to Different

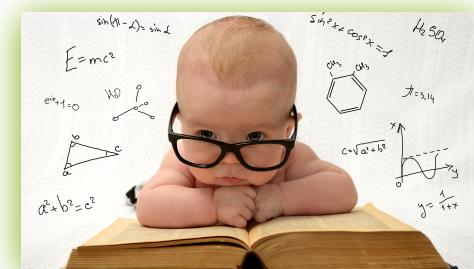


New features

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

Innate abilities

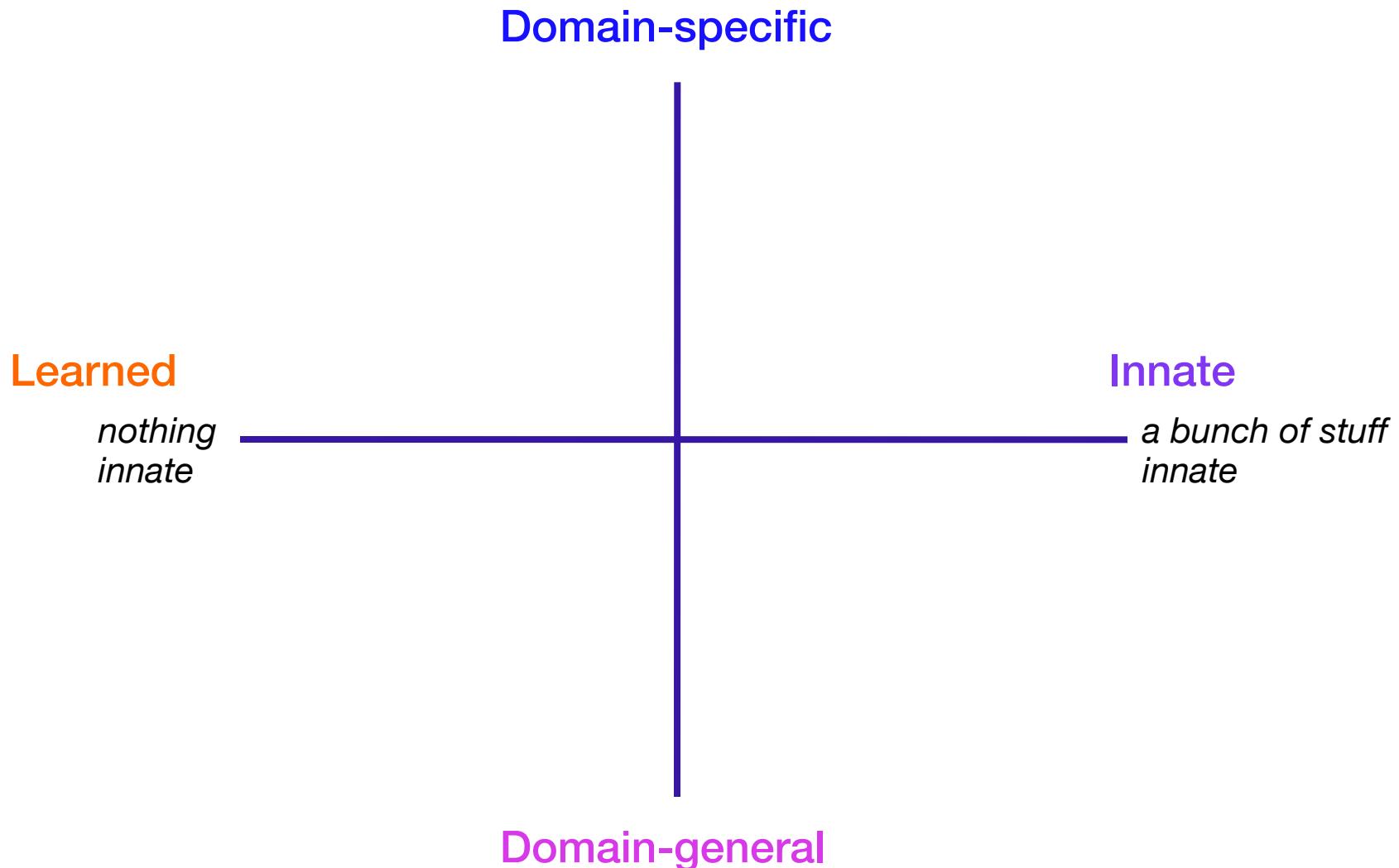
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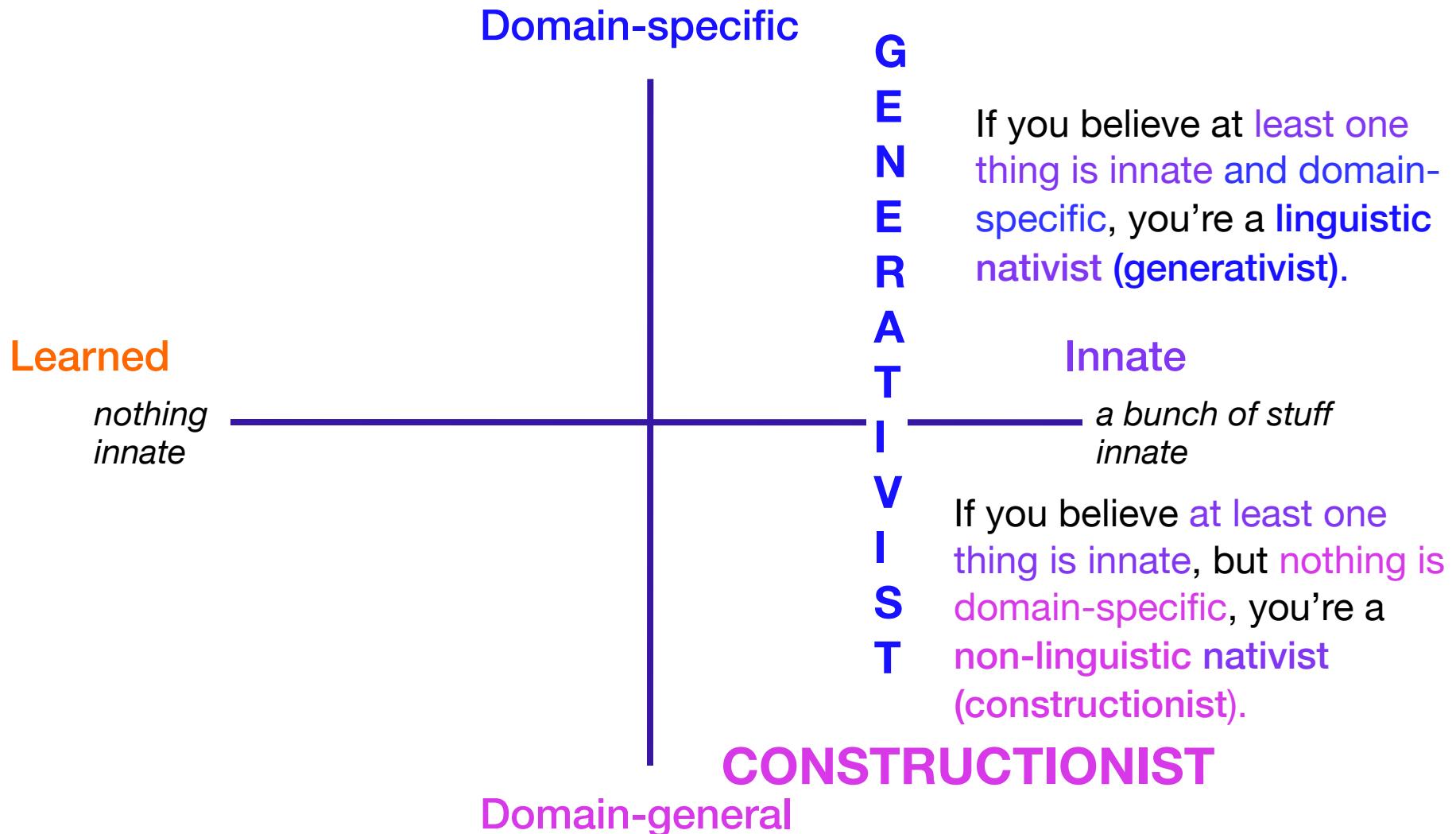
Kidd, Piantadosi, & Aslin (2012): 7- to 8-month-old infants have a tendency to learn only from data whose informational complexity is just right — neither too high nor too low (the “Goldilocks Effect”).



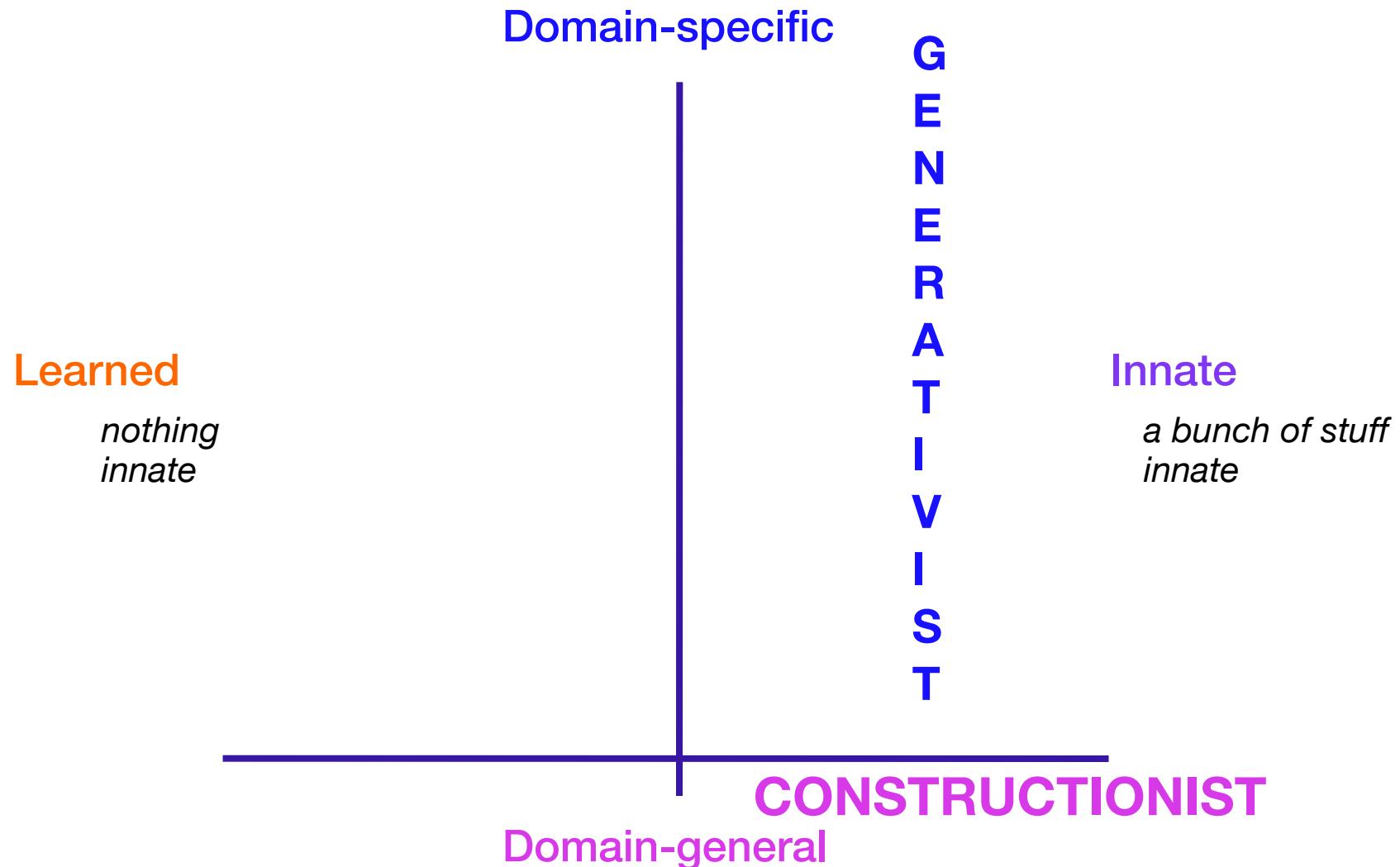
Viewpoint comparison



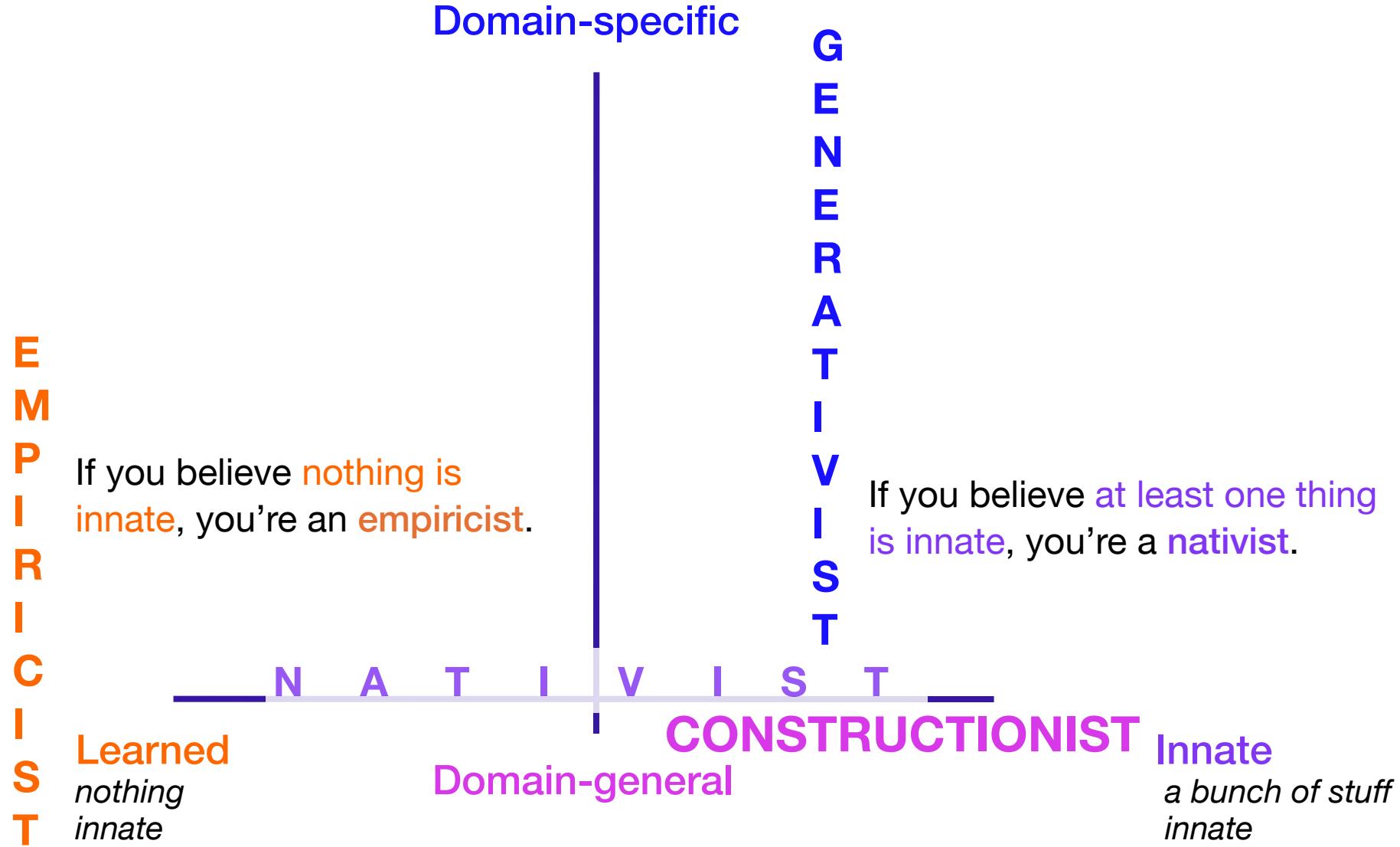
Viewpoint comparison



Viewpoint comparison



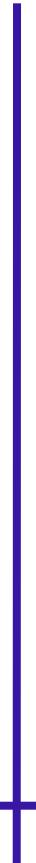
Viewpoint comparison



Viewpoint comparison

E
M
P
I
R
I
C
I
S
T

Learned
nothing innate



Domain-specific

Domain-general

Note: Everyone's pretty much
a nativist because of poverty
of the stimulus + constrained
generalizations in kids.

N A T I V I S T

CONSTRUCTIONIST

Innate
a bunch of stuff innate

G
E
N
E
R
A
T
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V
I
S
T

Viewpoint comparison

“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=tedspread&utm_medium=referral&utm_source=tedcomshare



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)*

Who thinks there is never poverty of the stimulus + constrained generalization?
(Causing the need for prior stuff)
Just the empiricists.

0 things innate

never poverty of
the stimulus +
constrained
generalization

Empiricist

1+ things innate

= nativist

poverty of the stimulus +
constrained generalization

***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 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 (called “poverty of the stimulus”).

Children seem to be exceptional learners, who are able to track a lot of information in their input in useful ways (like using statistical learning).

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** things, though only the generativist approach believes at least some of those things are **domain-specific (language-specific)**.

Questions?



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