

NUMBER and asymmetric  
conceptual connections  
in genericity

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# Morphosyntax and generalization

1. Chicken is considered a delicacy in some regions. (Bare Singular)
2. The chicken was domesticated in Southern China in 6000 BC. (Definite Singular)
3. Chickens lay eggs. (Bare Plural)
4. A chicken is feathered. (Indefinite Singular)

# Some questions and puzzles

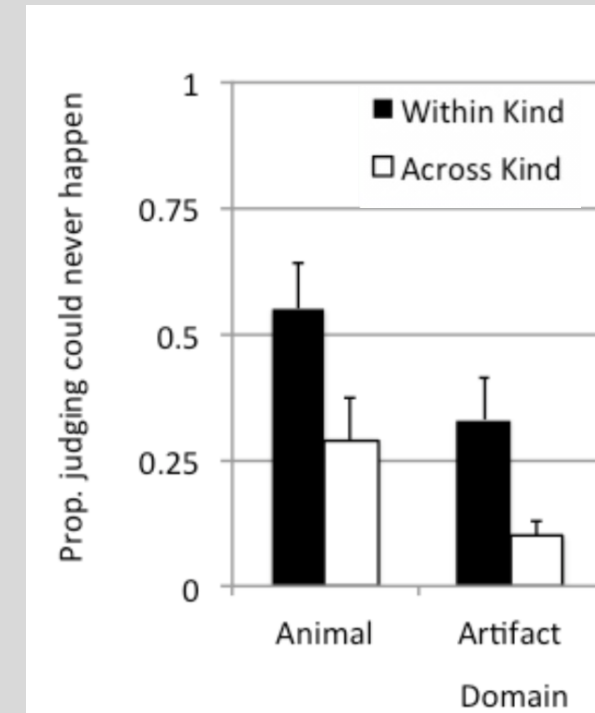
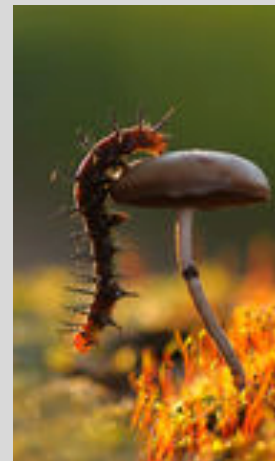
- How do morphosyntactic differences relate to interpretative differences in the expression of generalizations?
- How do such interpretative differences interface with our conceptual system?
- What role does *number* play in all of this?



# CONCEPTUAL CONNECTIONS



- This is the caterpillar Absolem.
  - Could Absolem become/transform into a butterfly?
  - Could Absolem become/transform into a different caterpillar?



Prasada & Hall in prep.



Most theories about concepts focus on the specific conditions under which a concept applies.

Definition: necessary and sufficient properties

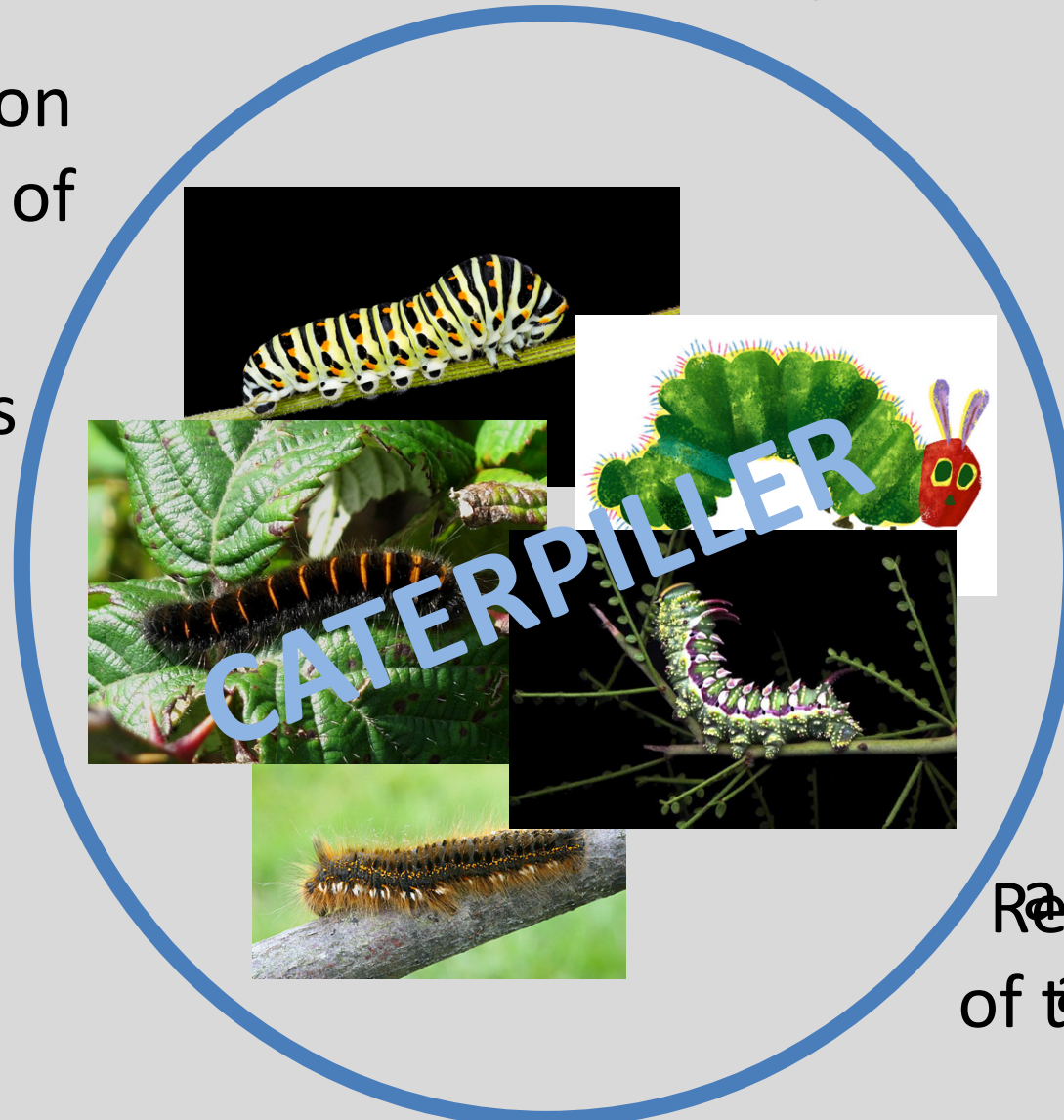
Prototype: sufficient similarity to a prototype

Theory: appropriate causal-explanatory structure

Exemplar: instances only (no concepts)

# What are concepts?

The means  
Representation  
for thinking  
for instances of  
about  
a kind  
Indefinitely  
many entities  
as being the  
same with  
respect to  
their kind



The means  
for thinking  
about a single  
Representation  
of the kind itself  
abstract kind

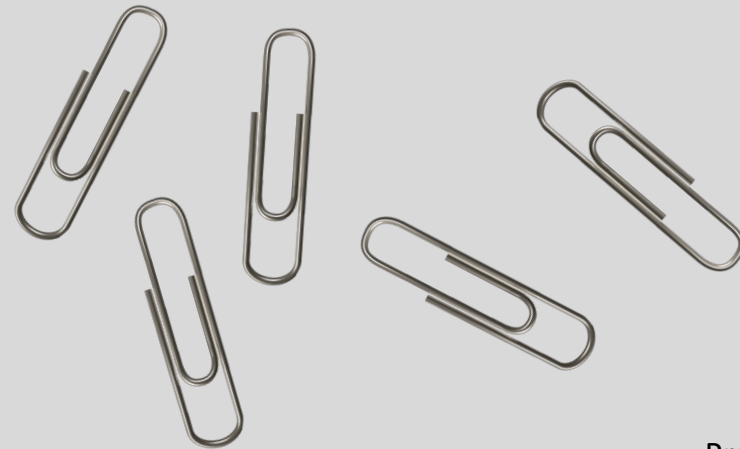
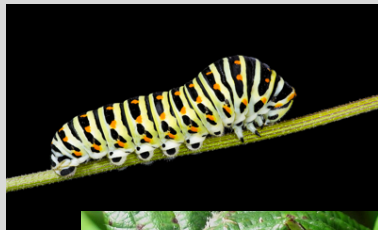
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# Instances of a Kind



Distinguishing between instances of a kind minimally requires *numerical* distinctness.

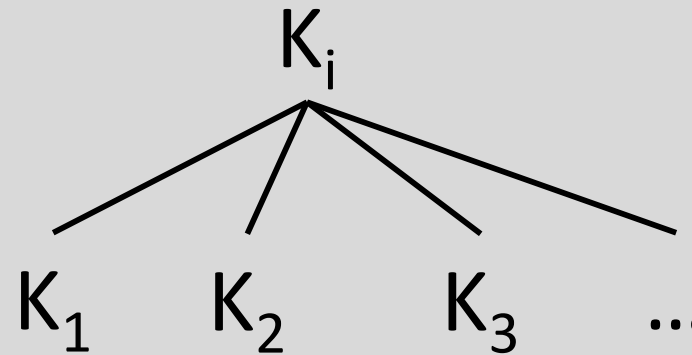


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# A formal approach

Representation of indefinitely many instances of a kind

Used to think about and store information about a *numerically* distinct instances of the same kind.



Representation of the kind itself

Generative mechanism for the instances of a kind



Prasada 2016



# The Kind Itself

Distinguishing between two kinds cannot be a matter of *numerical* distinction.



Prasada 2016

# The Kind Itself

## Descriptively Distinct:

Representations of kinds must be distinguished by descriptive content that characterizes and individuates kinds.

## Nonaccidental Connection:

These characteristics must be nonaccidentally connected to the kind such that they can be extended to indefinitely many instances that have yet to be encountered (Goodman, 1955).

Prasada 2016

# Distinct Types of Content

## Principled Properties

- Properties that instances of a kind have by virtue of being the kinds of things they are.

- Support formal explanations
- License normative expectations
- License expectations of high prevalence

## Statistical Properties

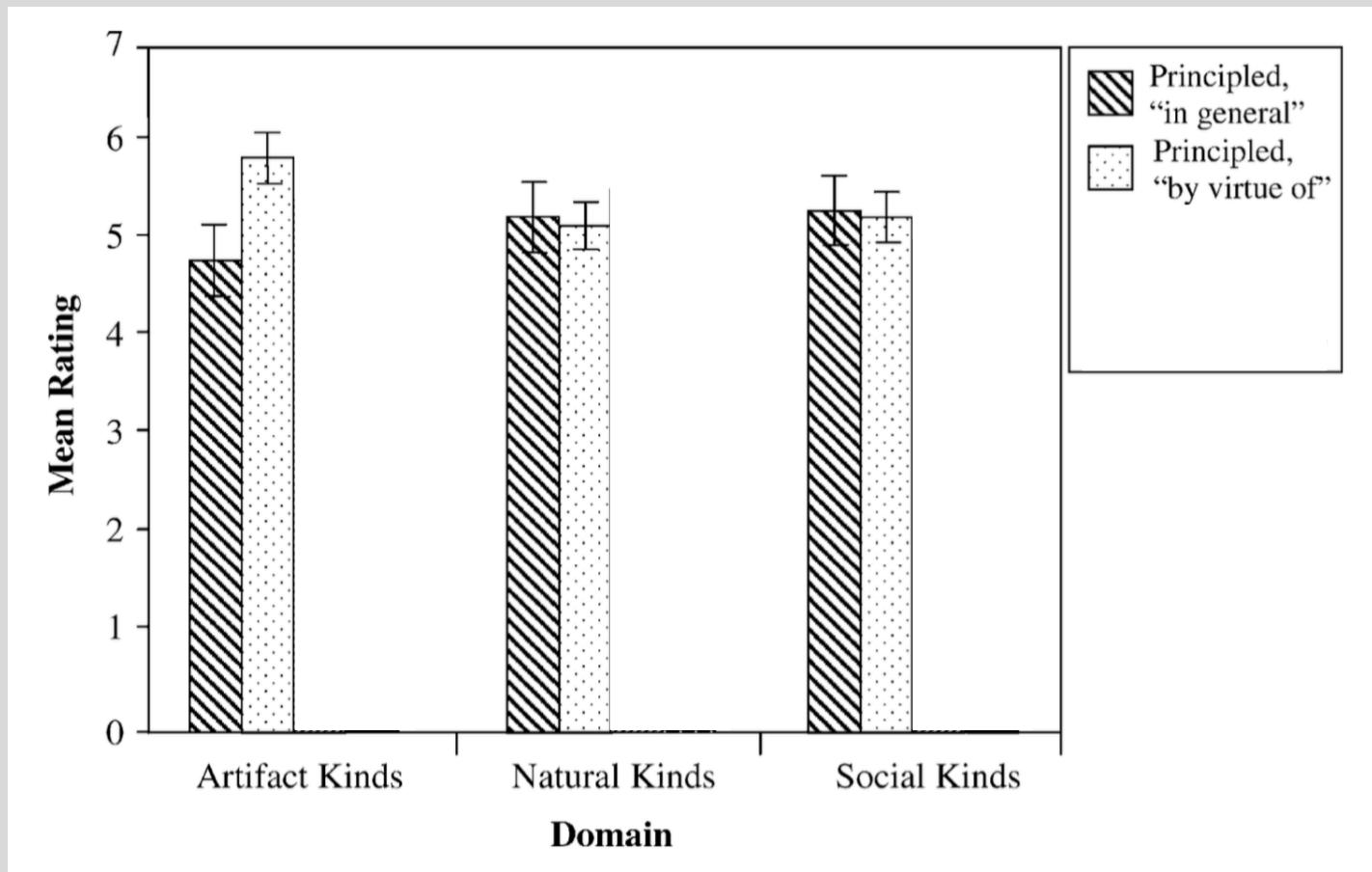
- Properties that are simply prevalent among instances of a kind.

That is four-legged because its a dog.

Dogs are normally four-legged.

Most dogs are four-legged.

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### Principled Connection

Dogs are four-legged.

Dogs in general are four-legged.

Dogs, by virtue of being the kinds of things they are, are four-legged.

### Statistical Connection

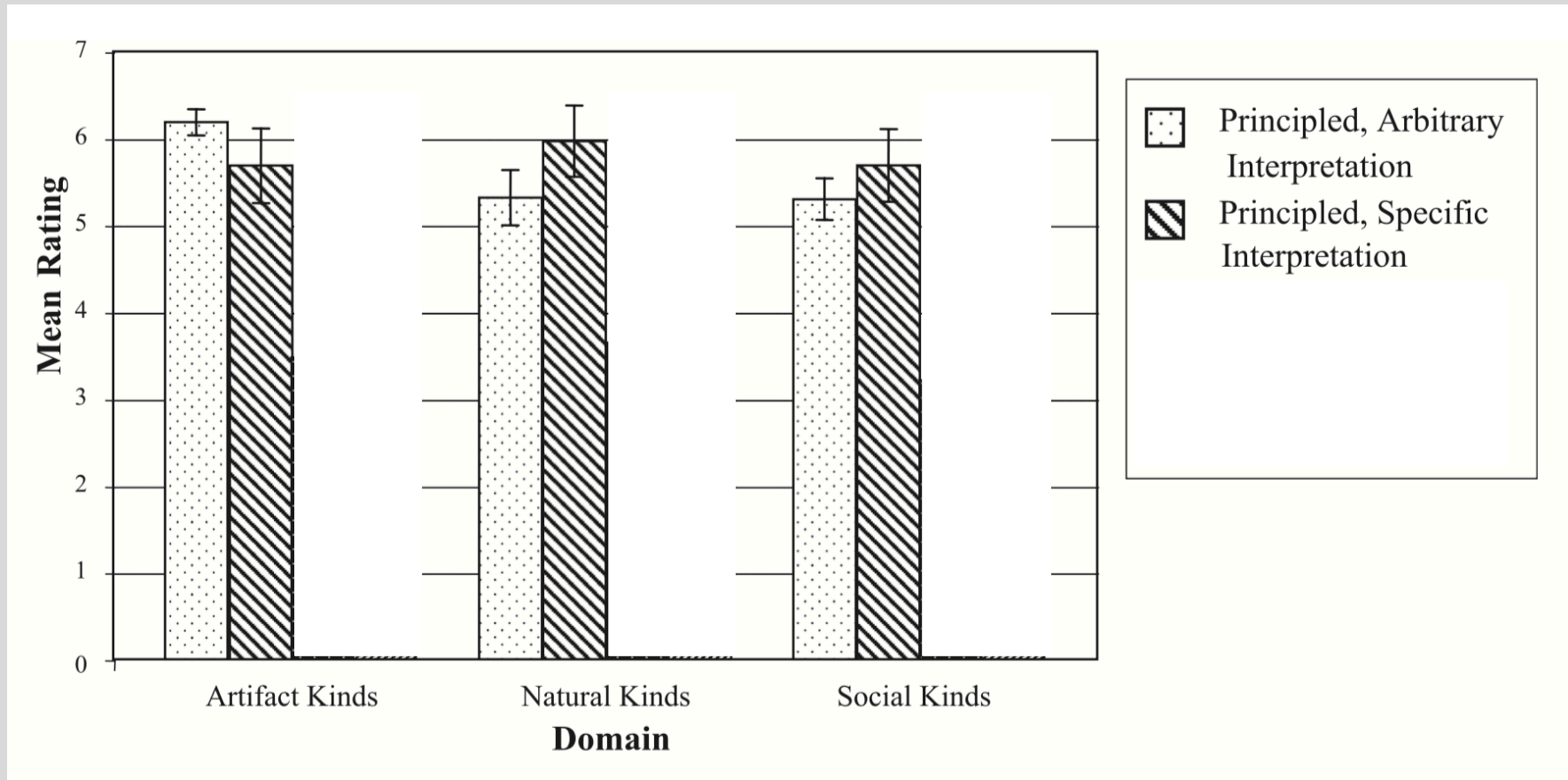
Barns are red.

Barns in general are red.

Bars, by virtue of being the kinds of things they are, are red.

Prasada & Dillingham 2006





### Principled Connection

A dog is four-legged.

### Statistical Connection

A barn is red.

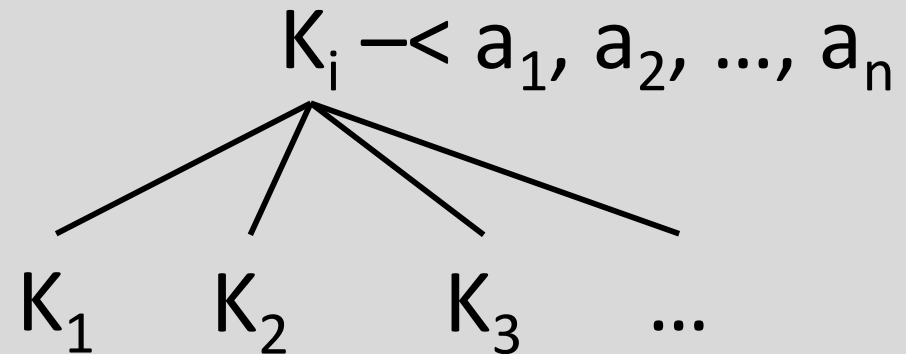
Arbitrary: Can this sentence be used to describe what any X is like?

Specific: Can this sentence be used to describe what one specific X is like?

Prasada & Dillingham 2009

# A formal approach

Principled properties are projected from the kind as aspects that the kind has by virtue of being that kind of thing.



Properties that differ between instances of a kind are not determined by the kind.

These are expected to be unsystematic and understood to be accidental.

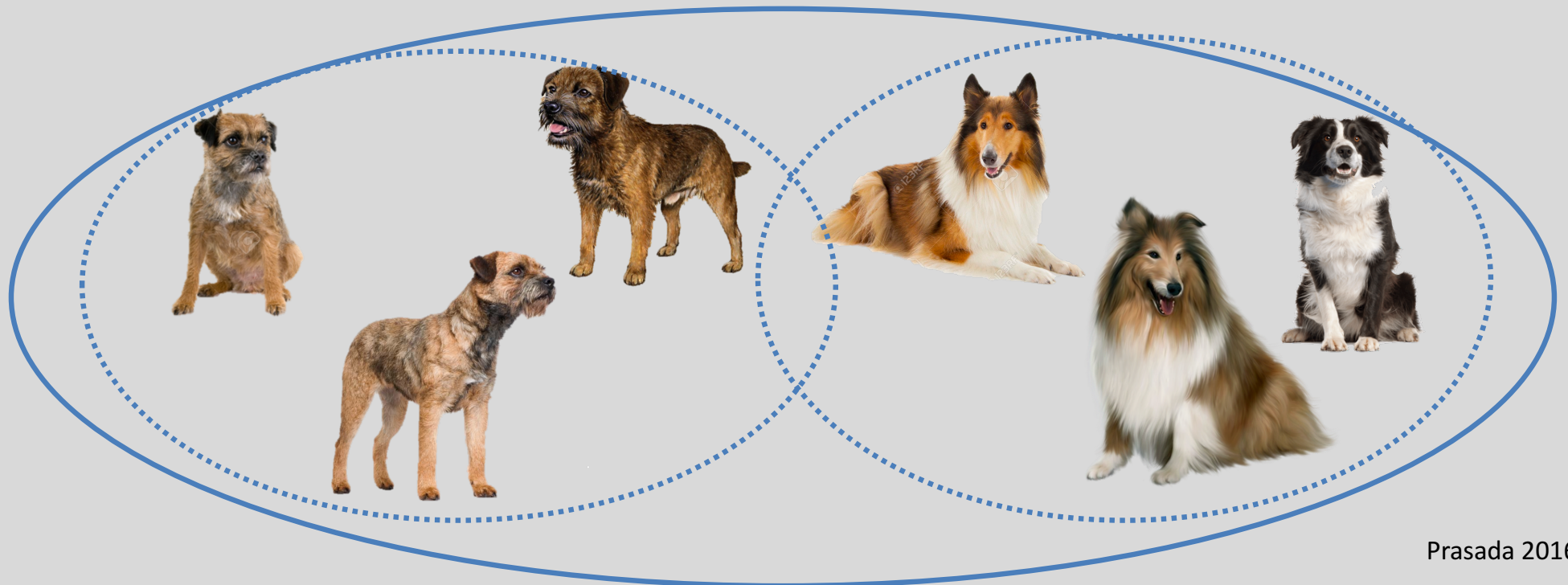


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# Kinds of Kinds?

Some qualitative differences between instances of a kind may be thought to be systematic and nonaccidental.

Instances are different kinds of the kind in question.



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# Kinds of Kinds?

Kinds also contain a *number* of subkinds in addition to a *number* of instances (Shipley 1993).

They have two elephants at the zoo.

1. Two individual elephants (via the perspective of a single kind elephant)
2. Two kinds of elephants (via the perspective of two subkinds of the kind elephant)

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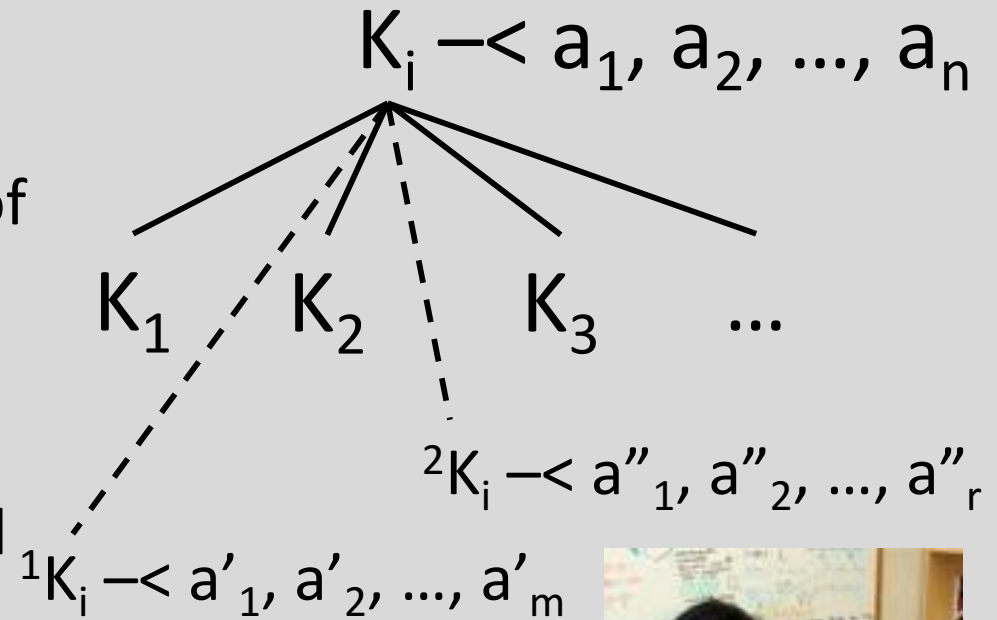


# A formal approach

Subkinds are related to kinds via the 'kind of' relation such that subkinds specify (qualitatively) different ways of being the kind of thing.

They inherit the principled properties of the kind and add their own distinct principled properties.

These may override principled properties of the kind (e.g. penguins and flight).



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# Under this view

- Kinds are atomic (Fodor 1998) and integral representations.
  - Distinguished by the content they project, not some *numerical* identity.
- Instances of kinds are (at a minimum) *numerically* distinct.
  - Principled connections to a kind provide (defeasible) reasons for applying the concept.
  - Other connections are understood to be accidental and unsystematic, or systematic and related to a subkind.

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# NUMBER IN GENERICITY



# Morphosyntax and generalization

1. Chicken is considered a delicacy in some regions. (Bare Singular)
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# Reference to kinds emerges in the absence of overt morphological number.

The tiger has stripes.	(kind)
The tigers have stripes.	(*kind)
This tiger has stripes.	(*kind)
These tigers have stripes.	(*kind)

Borik & Espinal 2012

Collective nouns can trigger plural agreement in British English Plural agreement but not when referring to a kind.

The orchestra is/are performing a concerto.

The orchestra is/\*are multi-familied, with strings, woodwinds, brass, and percussion.

# Subkind interpretation emerges in the presence of overt morphological number.

The whale is almost extinct.	(kind)
The (two) whales are almost extinct.	(subkind)
This (one) whale is almost extinct.	(subkind)
These (two) whales are almost extinct.	(subkind)

Borik & Espinal 2012

‘kind of’ insertion requires overt morphological number.

This (one) kind of whale is almost extinct. (subkind)

These (two) kinds of whales are almost extinct. (subkind)

\*The kind of whale is almost extinct.

Zamparelli 1995; Borik & Espinal 2012



# Structure for Kinds

The extended projection of nominals contains (at least)

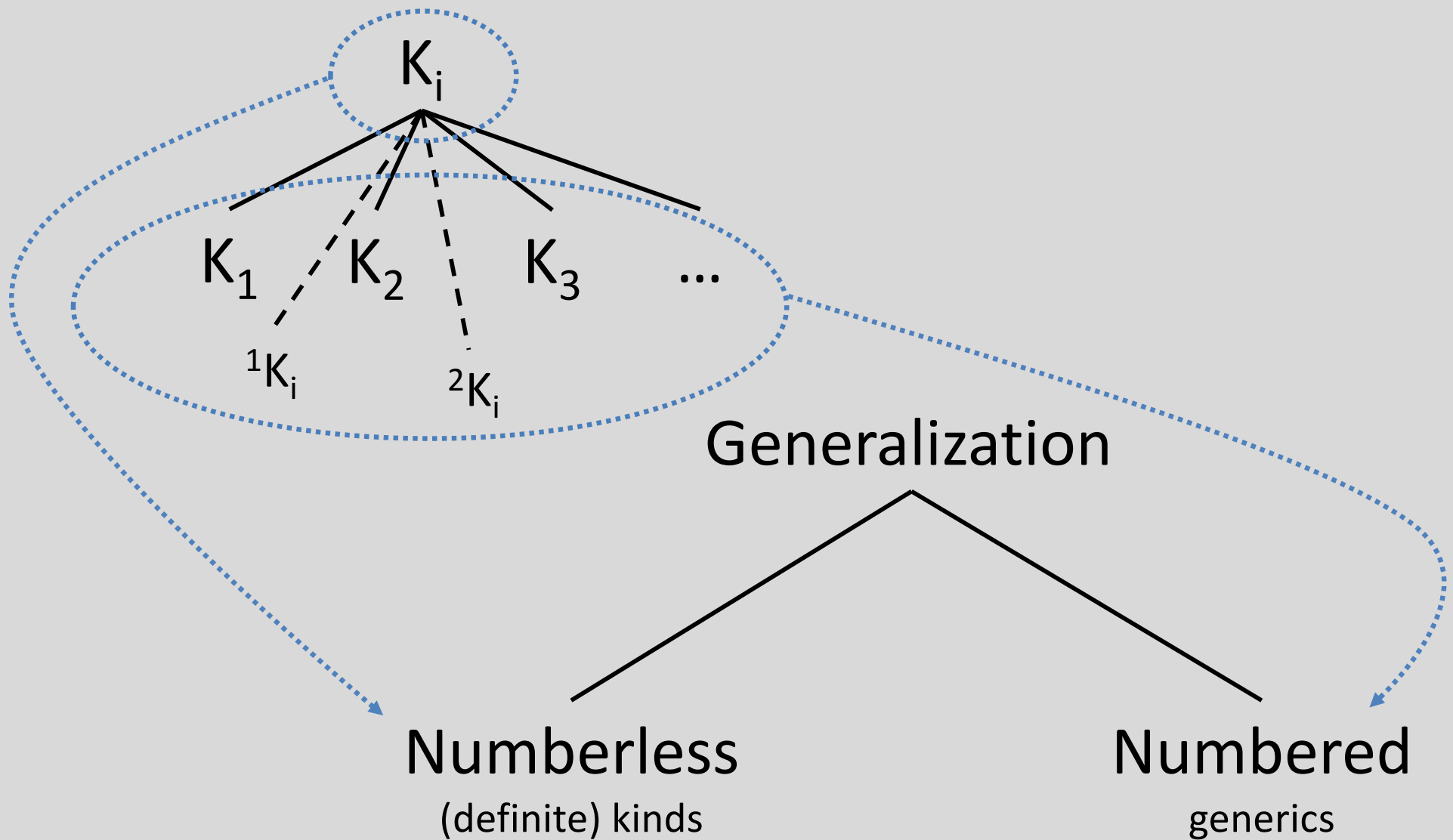
$[_{DP} D [_{\#P} \# [_{NP} N ] ] ]$

Definite kind:  $[_{DP} \text{the} [_{NP} N ] ]$

$\llbracket N \rrbracket = \lambda x^k [P(x^k)]$  (property of kinds)

- Kinds are
  - Intensional entities
  - Atomic – no internal structure
  - Integral – do not form a standard quantificational structure

Borik & Espinal 2012



# Morphosyntax and generalization

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Bare plural generics admit accidental properties.

Madrigals are polyphonic/popular.

A madrigal is polyphonic/\*popular.

Barns store farm products/are red.

A barn stores farm products/\*is red.

Lawler 1973

Bare plural generics can combine with dynamic predicates.

Rats reached Australia in 1770.

\*A rat reached Australia in 1770.

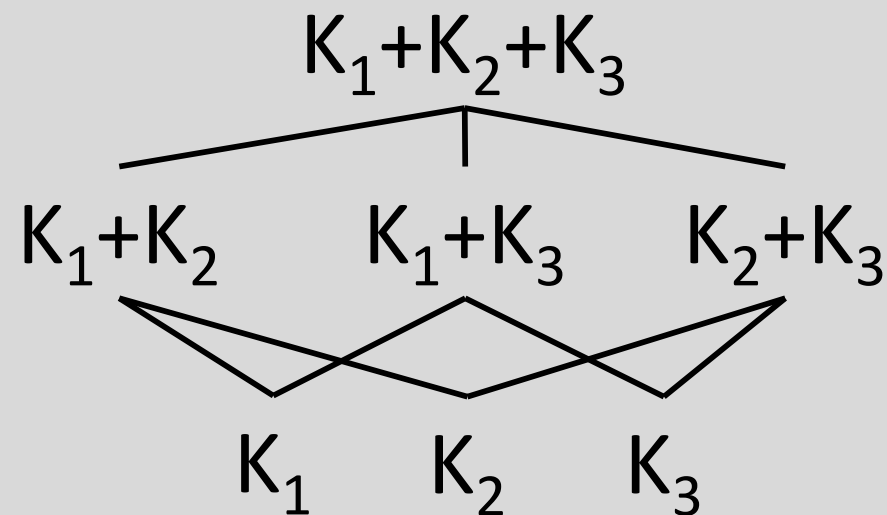
Krifka 1987

# Indefinite singular generics resist collective predicates.

Lions gather near acacia trees when they are tried.

\*A lion gathers near acacia trees when it is tired.

This suggests that instances of a kind form a sum.



Dayal 2004



# Subkind reference is also forms sum representations.

(Two) lions gather near acacia trees when they are tried.

1. (Two) individual lions (via the perspective of a single kind lion)
2. (Two) kinds of lions (via the perspective of two subkinds of the kind lion)

Two boys gathered in the yard. (collective)

\*Every/\*Each boy gathered in the yard. (\*collective)

Every/Each lion gathers near acacia trees when it is tried.

1. \*Every/each individual lion (via the perspective of a single kind lion)
2. Every/each kind of lions (via the perspective of every/each subkind of the kind lion)

# Structure for Generics

Numberless kind:  $[_{DP} D [_{NP} N ] ]$

Numbered generic:  $[_{DP} D [_{\#P} \# [_{NP} N ] ] ]$

$[[\text{singular}]] = \lambda P \lambda x^o \exists x^k [ P(x^k) \& R(x^o, x^k) \& x^o \in \text{Atom} ]$

$[[\text{plural}]] = \lambda P \lambda x^o \exists x^k [ P(x^k) \& R(x^o, x^k) \& x^o \in \text{Sum} ]$

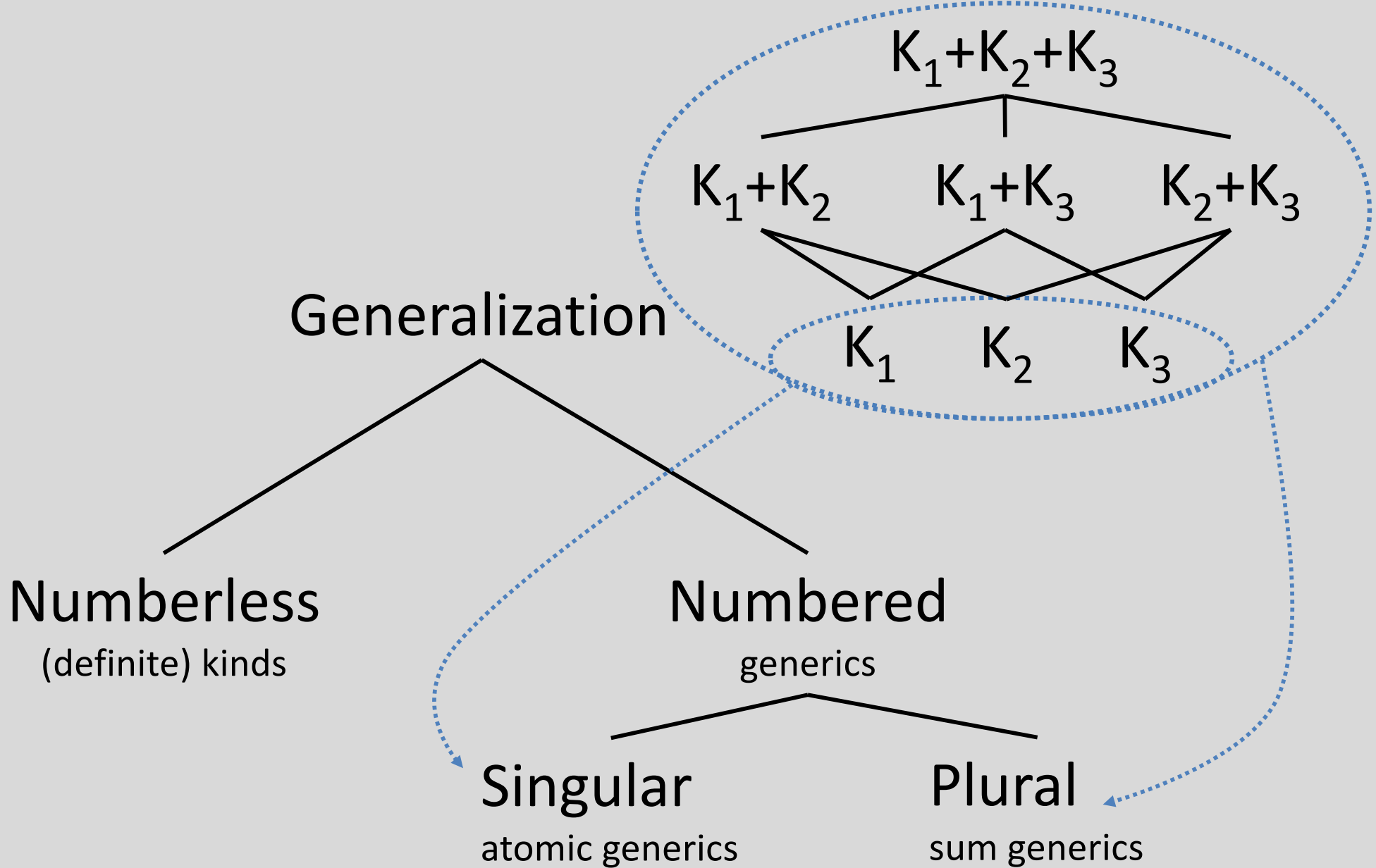
R is a realize operator that shifts kinds to individuals.

# Structure for Generics

How do numbered nominals come to make generalizations?

Predicate-driven type-shift:  $e^0 \rightarrow e^{sk}$  (Borik & Espinal, 2012)

Covert generic quantifier GEN.



# USING GENERICS



# Morphosyntax of number controls the denotation of nominals in generalization.

How does this relate to conceptual connections?

	<b>Definite Kind</b>	<b>Indefinite Singular</b>	<b>Bare Plural</b>
Representation	kind itself	generic atomic individuals	generic sum individuals
Principled Properties	yes	yes	yes
Statistical Properties	no	no	yes



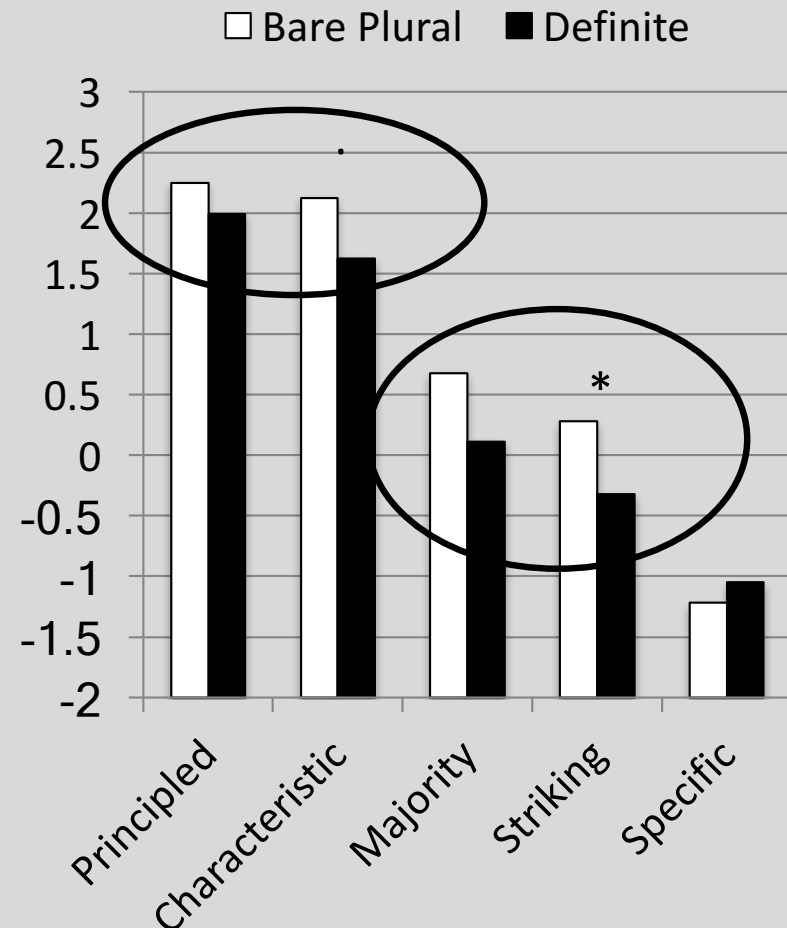
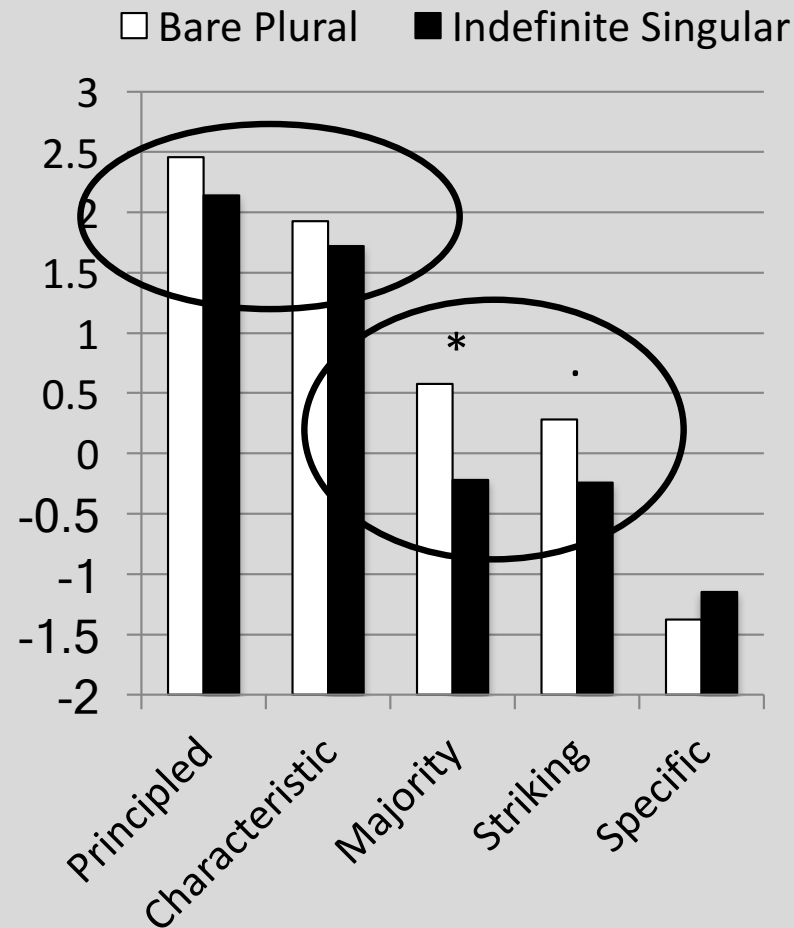
Principled: TIGER has stripes.

Characteristic: DUCK lays eggs.

Majority: BARN is red.

Striking: SHARK attacks swimmers.

Specific: KANGAROO was jumping in my backyard.



Leslie Khemlani Prasada & Glucksberg 2009

# Morphosyntax of number controls the denotation of nominals in generalization.

How does this relate to conceptual connections?

	<b>Definite Kind</b>	<b>Indefinite Singular</b>	<b>Bare Plural</b>
Representation	kind itself	generic atomic individuals	generic sum individuals
Principled Properties	yes ✓	yes ✓	yes ✓
Statistical Properties	no ?	no ✓	yes ✓

Can morphosyntactic cues be used to guide our interpretation of properties in terms of being principally or statistically connected?

Two learnability studies:

50 Participants (Amazon's Mechanical Turk)

Training: 30 Items (15 per condition)

Testing: 24 Questions (12 per conceptual connection)

Welcome! You have arrived on a foreign island and are surrounded by many unfamiliar objects, creatures, and other things. Fortunately, you have met some researchers who will introduce you to some of the things around you, but these researchers also need your help in characterizing several new things too. First, they will tell you what they know about 30 things they have found on the island. The things they have found are unusual, so the researchers have made up a vocabulary to describe them. **Pay close attention to what they tell you as this will help you think about the characteristics of the new things that you and the researchers find.** You don't have to remember what specific things are like. Rather, try to get a general feeling of what the island may be like and what kinds of characteristics things can have. After this, the researchers will take you to a different part of the island. There, you will be asked what you think about the characteristics of the new things that you encounter.



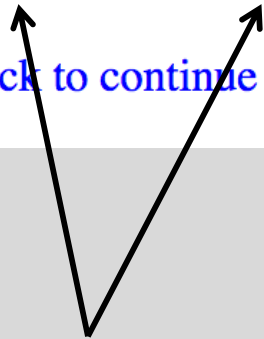
*progress*

Here we have a cav.

Cavs have a voove.

1. Press 1 or click to continue when you are ready

Bare plural always linked with one property.



Indefinite singular always linked with the other property.

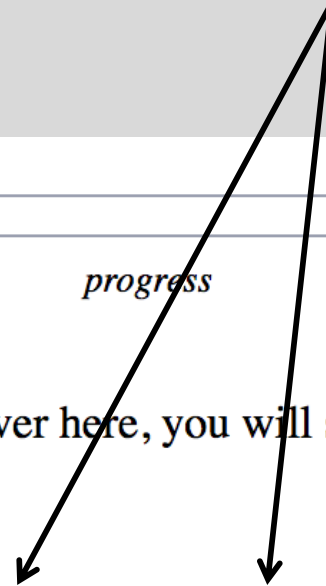


*progress*

If you look over here, you will see a basdo.

A basdo has a larbial.

1. Press 1 or click to continue when you are ready.



Good job! That was the first part. We will now move on to a different region of the island that the researchers haven't explored yet. They hope that the characteristics they have given you so far will be useful in helping them answer some questions about the new things they find there. The researchers will ask you to answer some questions about the things they encounter based on what you have learned so far.

You may not always feel very certain about your answer, so try to go with your initial reaction to the question.





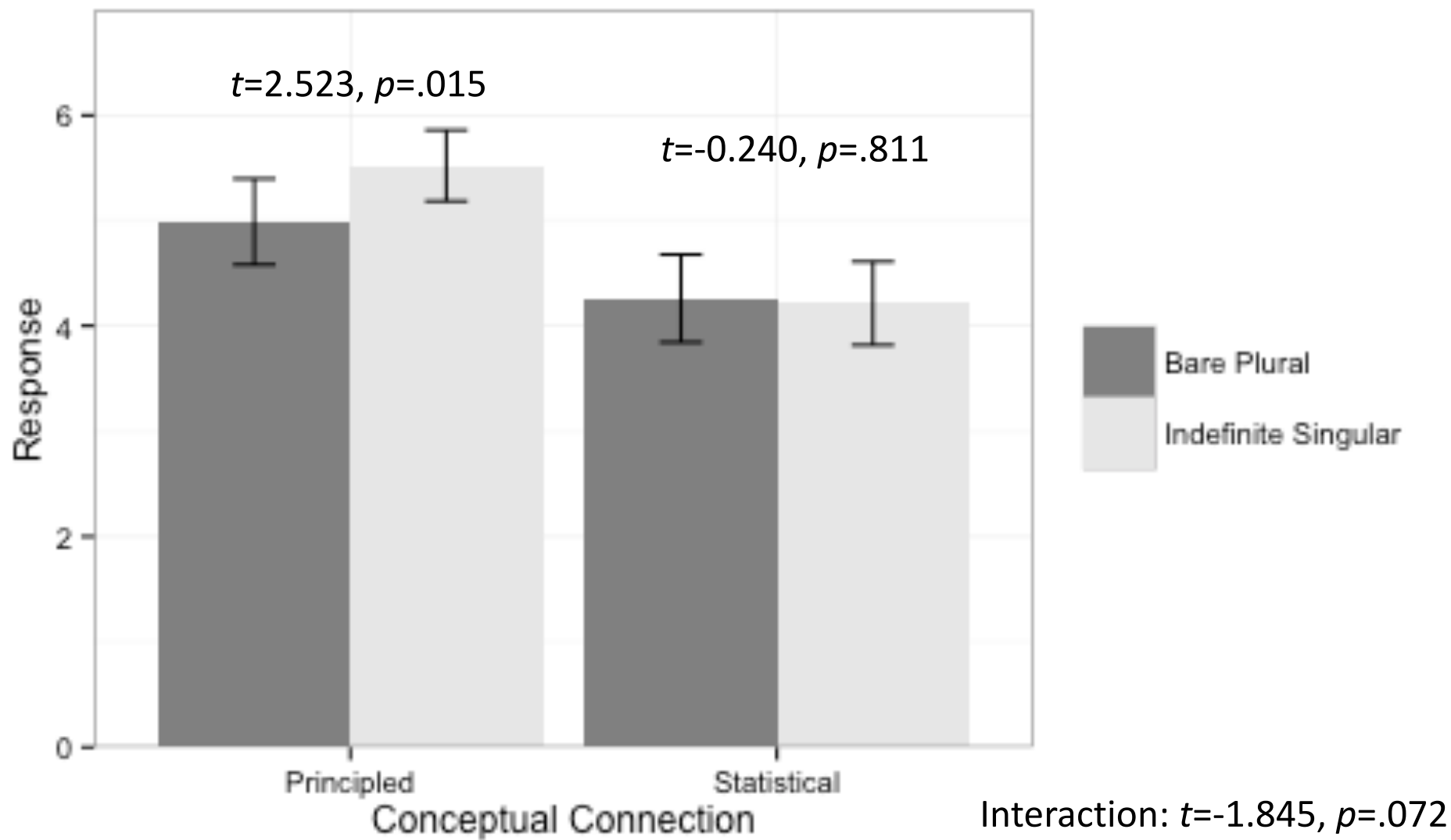
*progress*

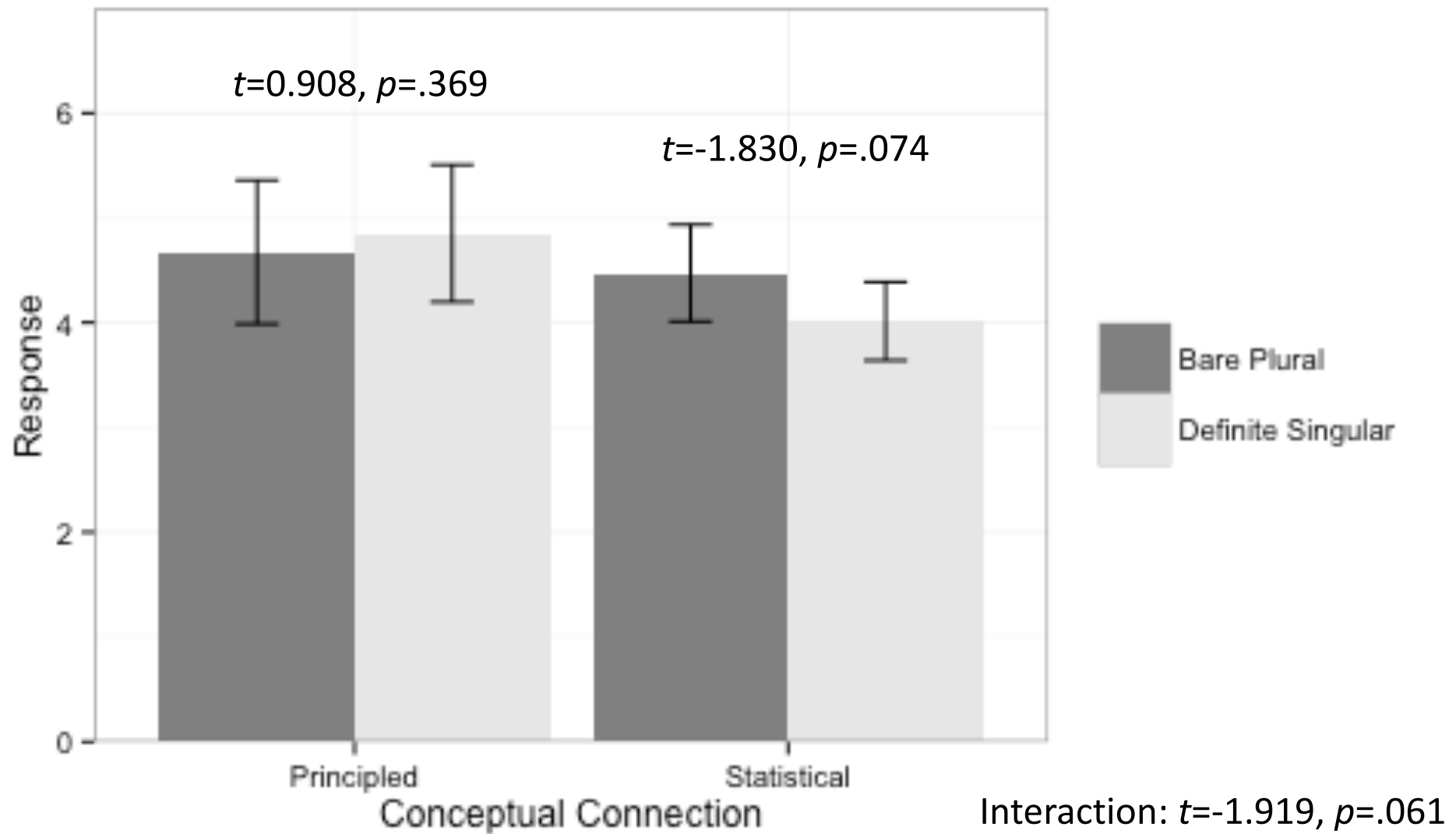
We thought we might find a dreep and this one has a labrial.

Do you think that dreeps have a larbial just because most dreeps have a larbial?

(*Definitely No*)    1    2    3    4    5    6    7    (*Definitely Yes*)

- Principled
  - Do you think that a N, by virtue of being a N, has a Prop?
  - Do you think that it is an aspect of being a N that it has a Prop?
- Statistical
  - Do you think that Ns just happen to have a Prop?
  - Do you think that Ns have a Prop just because most Ns have a Prop?





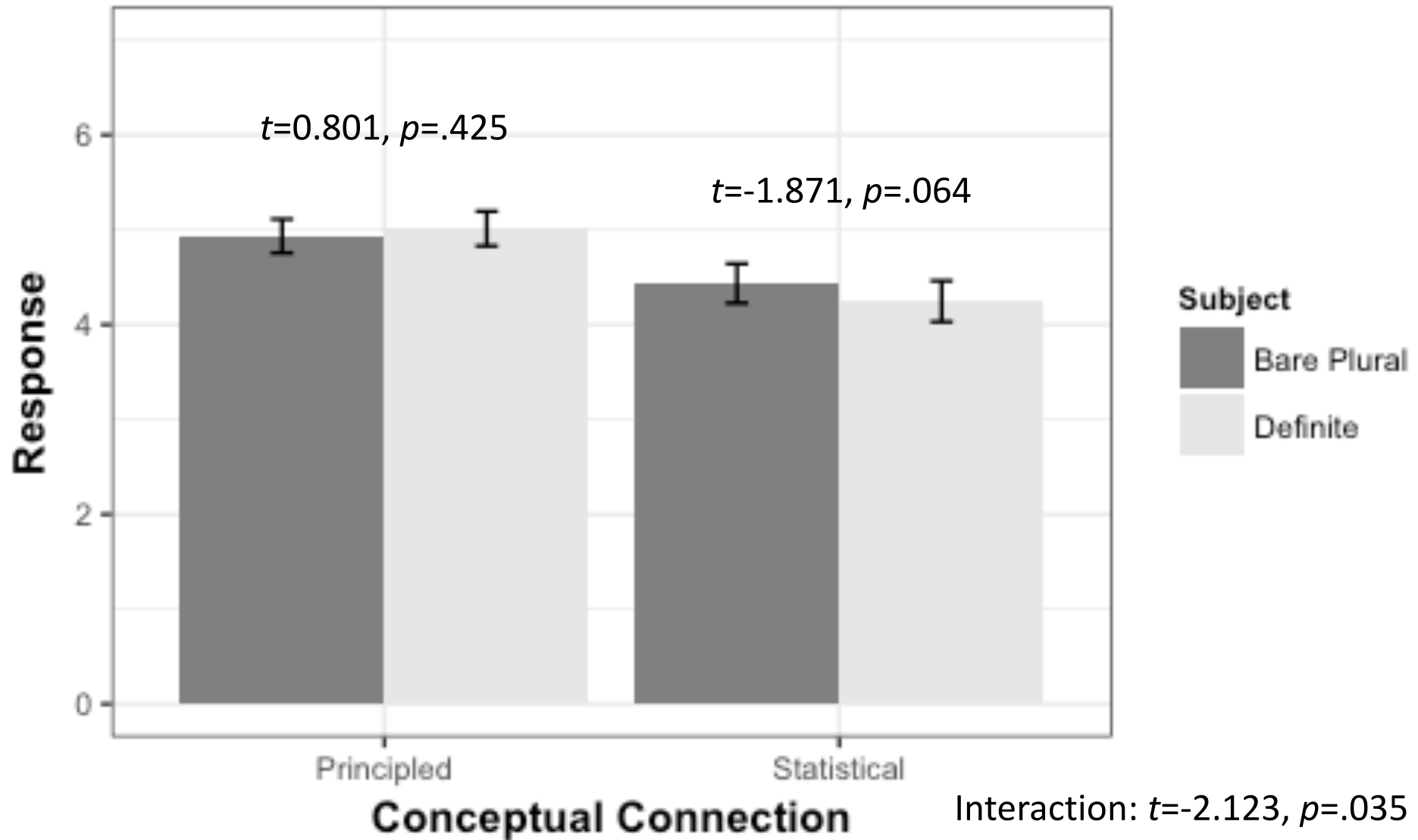
Can morphosyntactic cues be used to guide our interpretation of properties in terms of being principally or statistically connected?

Two learnability studies

50 Participants

Training: 30 Items (15 per condition)

Testing: 48 Questions (24 per conceptual connection)



# Summary

Compared to bare plural generics...

Indefinite singular generics enhanced expectations that the property was principally connected.

Definite kinds diminished expectations that the property was statistically connected.

Indefinite singular generics denote generic atomic individuals

Definite kinds denote the kind itself

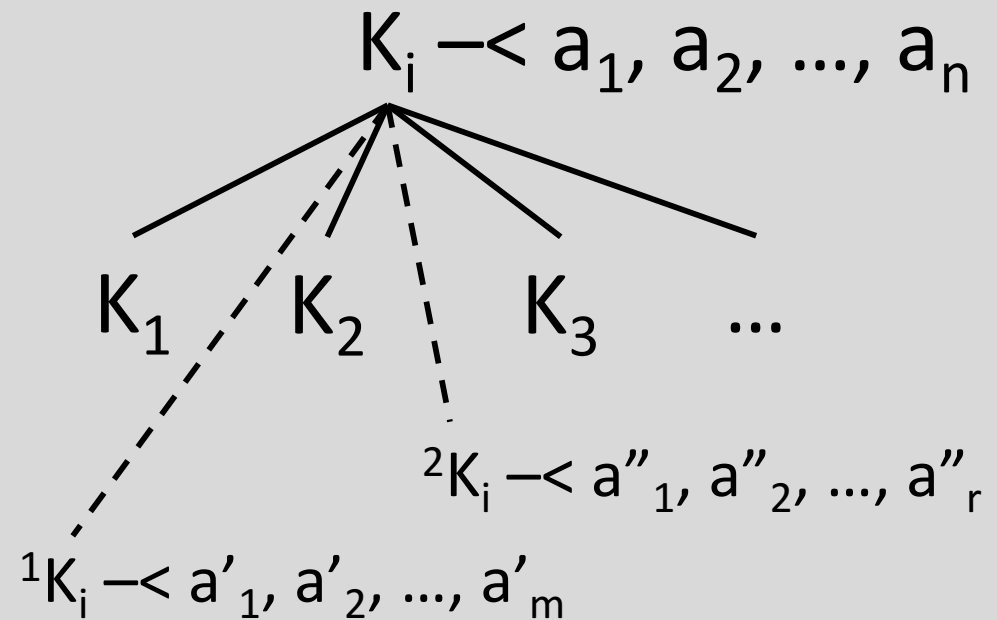


# SUMMARY



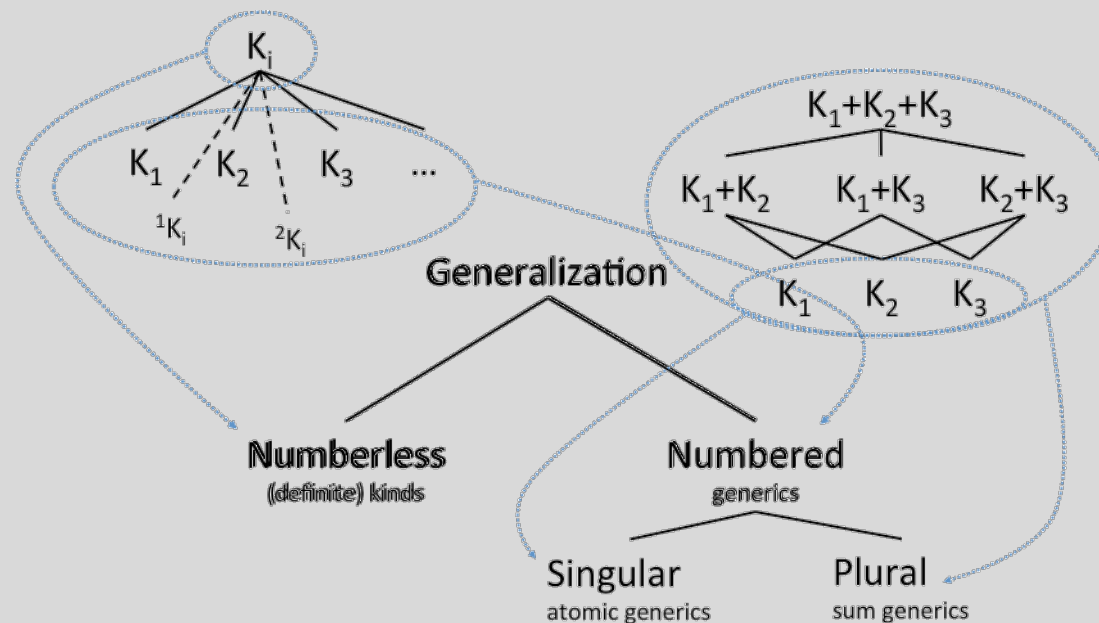
# Concepts are dual in nature

- the means for thinking about indefinitely many entities as being the same with respect to their kind, and
- for thinking about an abstract kind itself.
- Number plays an important role in distinguishing these two aspects of a concept in Prasada's formal model.



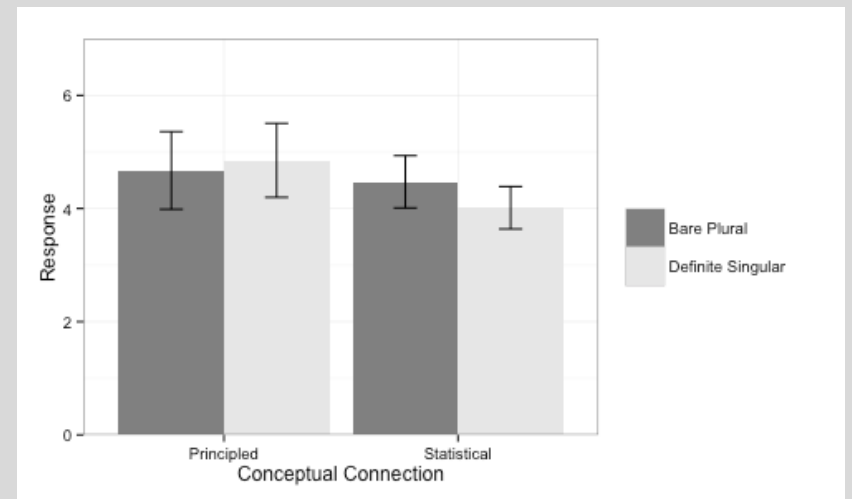
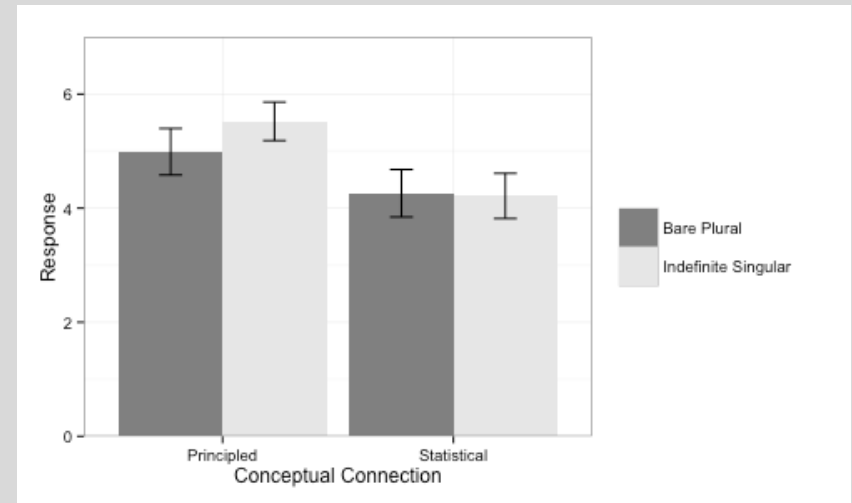
# Number distinguishes between kinds and instances of a kind (and subkinds)

- Both in Prasada’s model of concepts and in analysis of genericity/kind reference.
  - Numberless nominals denote in the domain of kinds.
  - Numbered nominals denote in the domain of individuals.



The semantic representation of nominals in generalizing expressions guides our interpretation of properties.

- Properties that must apply to each atomic individual are more likely to be principally connected (though individuals may also have accidental properties, too).
- Properties that apply to a kind itself are less likely to be statistically connected given that a kind projects only principled properties.



# Language & Brain Laboratory

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# Thank You!

## St. Hugh's College