

Genericity in Natural Language

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Course Overview

Monday Introduction

- The problem of Genericity
- Episodic/Characterizing sentences
- Carlson's (1977) theory

Tuesday Kinds

- Definite Generics
- Subkinds
- A-generics

Wednesday Neo-Quantificational Analysis

- Generics and Adverbs of Quantification
- Stage-level/Individual level
- Focus and Genericity

Thursday Genericity and Aspect

- Aspectual Class
- Stativity and Genericity
- Markers of Genericity

Friday Rest

- Wrap-Up

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Outline for the day

- 1 Motivation
- 2 Generic Sentences
 - Some tests to establish sentential genericity
 - Habitual vs. Lexical Characterizing Sentences
 - The interpretation of bare plural subjects
- 3 Bare plurals in CS
 - Scopelessness
 - Summary
- 4 Carlson's (1977) Theory
 - Ontology
 - Predication, Realization, and Generalization
 - Some Applications
 - Anaphora problem
- 5 Summary

- One important concern of formal semantics is the issue of *truth values*: how to assign “true” or “false” to, e.g. (1) and (2) given a certain state of the world.
 - (1) Jack passed the exam.
 - (2) Every student passed the exam.
- The problem is how to extend the evaluation of truth values to *generic sentences* such as:
 - (3) a. Dogs bark.
b. Dogs meow.

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The problem can be split in two parts, one more linked to the arguments of the sentence, the other to the predicate.

- Nominal genericity

- (4) a. Dogs have four legs.
b. Dogs have three legs.

How many dogs should one count? Which ones?

- Predicate genericity

- (5) a. Mary smokes.
b. Mary barks.

How frequently does Mary have to smoke? In what situations?

We will concentrate to the second aspect first.

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What are “generic sentences”?

Generic Sentences denote “propositions which does not express specific episodes or isolated facts, but instead report a kind of *general property*, that is, report a regularity which summarizes a group of particular episodes or facts” (from Krifka et al. 1995, henceforth KeA95, pg.2)

A lot of information about the world is given to us in the form of generic sentences, not quantified statements. Children routinely receive (and produce) generic sentences.

Following the terminology in KaA95 we call generic sentences such as (6a) *characterizing sentences* (**CS**), in contrast which *episodic sentences* (**ES**) such as (6b).

- (6) a. Birds fly
- b. Tweety is flying

In English, the typical CS is in the present tense with a determinerless plural noun phrase “*bare plural*” (**BP**) (e.g. “birds”), but characterizing statements can contain any sort of DP:

- (7) a. John smokes a cigarette after dinner.
- b. I am a pipe smoker.
- c. This book is readable.
- d. A professor drinks whisky.
- e. Every professor drinks whisky.
- f. Gold sells for \$400 per ounce.

GS can also vary in the tense of the predicate:

- (8) a. John smoked a pipe.
b. John will smoke (when he grows up).
c. John has been a pipe smoker.

(Not “atemporal truths”)

Tests for sentential genericity

- *Frequency adverbs*

- (9) a. A lion eats raw meat. *meaning close to:*
b. A lion typically/characteristically eats raw meat.

- *Effect of present progressive:*

- (10) A lion is eating raw meat.

The progressive tends to block the generic reading.
But this can be overridden in some cases:

- (11) Before they learned to use fire, humans were eating raw meat.

- *Presence of markers of various sorts:*

- (12) a. John smokes the pipe *these days*.
b. John is smoking the pipe these days.

- (13) a. John *used to* smoke a pipe.
b. John *has the habit of* smoking a pipe.

- *Modality*

Epistemic reading forces a characterizing interpretation.
Deontic reading only allows it.

- (14) John must smoke a pipe
a. ... given the type of ashes in the ash tray.
b. ... if he wants to look like of Sherlock.
- (15) John must *immediately* smoke a pipe...

The examples so far have mostly illustrated a type of CS which express generalizations over episodes (called “Habitual Sentences”).

A second type of CS is exemplified by certain sentences containing stative predicates like:

- (16)
- a. John knows French,
 - b. Fido is a dog.
 - c. Fido likes meat.
 - d. Dogs have four legs.

We will call these cases *Lexical Characterizing Sentences*

Common properties between lexical and habitual CS:

- (17) a. Fido used to like meat.
 b. *Fido is liking meat.
 c. John must know French
 (i) ... to take this job
 (ii) ... judging from his books

“used to” marker
progressive blocks

Deontic
Epistemic

| | Eventive Verb | Stative Verb |
|---------------------------------|-----------------------------------|-------------------------------------|
| Characterizing sentences | <i>Fido barks</i> (HABITUAL) | <i>Fido likes meat</i> (LEXICAL) |
| Episodic sentences | <i>Fido walked across my lawn</i> | <i>Fido is in this cage</i> |

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- (17) a. Fido used to like meat. *“used to” marker*
 b. *Fido is liking meat. *progressive blocks*
 c. John must know French *Deontic*
 (i) ... to take this job *Epistemic*
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In English, one of the major distinction between CS and ES is the interpretation of bare plural (BP) subjects.

- BP in CS express (quasi) universal interpretations.

(18) Dogs are mammals.

- a. = All dogs are mammals.
- b. \neq There are dogs that are mammals.

- BP in ES express existential interpretations.

(19) Dogs walked across my lawn.

- a. \neq All dogs walked across my lawn.
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Bare Plural Interpretation

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Characterizing:

- (20)
- Cats eat meat.
 - Politicians are honest.
 - Sugar cubes dissolve in water.

Episodic:

- (21)
- Cats ate our lunch.
 - Politicians were at the party.
 - Sugar cubes fell in my tea.

How should we treat BP noun phrases?

Initial Hypothesis: BP are quantified noun phrases

- BP in CS could have a null determiner (D^0) with a quantificational interpretation.

(22) D^0 Cats eat meat

- The meaning of D^0 would be “(almost) all”, or perhaps “most”

(23) D^0 Cats eat meat = $\forall x$ [x is a cat][x eats meat]

(We set aside for the moment the existential interpretation of BP with ES)

Carlson (1977): many reasons to reject the hypothesis that BP are quantifiers.

Quantificational vagueness

How many is enough?

- (24)
- a. Snakes are reptiles. *all snakes*
 - b. Telephone books are thick books. *those of large modern cities*
 - c. Mammals give birth to live young. *only adult fertilized females*
 - d. Shoplifters are prosecuted in criminal courts. *most are not even caught*
 - e. Mosquitoes carry the paramecium that causes yellow fever. *very very few do*
 - f. White sharks attack bathers. *only a tiny minority*
- (25)
- a. #Seeds do not germinate. *Most don't*
 - b. #Bees are sexually sterile. *All but queen and drone*
 - c. #Prime numbers are odd numbers. *An infinity minus two*

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Exceptions

Which elements count?

- (26) a. Ducks lay eggs. *Only adult fertilized females*
b. Ducks have colorful feathers. *Only adult males*
- (27) a. #Ducks are females.
b. #Ducks are males.

The Port Royal puzzle (Arnauld 1662)

Suppose (28a) is true; (b) doesn't follow.

- (28) a. Italians are good fencers. \nrightarrow
b. Italians are fencers.

unlike the monotonically increasing quantified cases:

- (29) a. Most/All/Some Italians are good fencers \Rightarrow
b. Most/All/Some Italians are fencers

If BP are quantifiers, they do not seem to be able to interact with other operators, unlike all other quantifiers.
In particular, BP always take narrowest scope.

Negation

- (30) a. I didn't see [a spot] on the floor. *Possible reading: there was a spot I didn't see*
b. I didn't see [spots] on the floor.

Opacity with intensional verbs (e.g. *want, look for, seek*)

- (31) a. Miles wants to meet [policemen]. *only opaque*
b. Miles wants to meet [a policeman]. *both opaque and transparent*

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Differentiated scope w.r.t. frequency adverbials

- (32) a. Miles killed [a rabbit] repeatedly. *narrow scope for "repeatedly"*
b. Miles killed [rabbits] repeatedly. *wide scope for "repeatedly"*

Anaphora

- (33) a. John is trying to find [policemen_{*i*}] and Mary is trying to find them_{*i*}, too. *Just some policemen or other*
b. John is trying to find [some policemen_{*i*}] and Mary is trying to find them_{*i*}, too. *Possible reading: the same policemen*

Predicates that do not accept any (positive) quantifier:

- (34) Commercially, pink diamonds come in three sizes.
- (35) a. ??All/Most/Some/Three pink diamonds come in three sizes.
b. ??Every/Each/A/Some pink diamond comes in three sizes.

Frequency/Distribution Predicates

- (36) Pink diamonds are { common / widespread }
- (37) ??{All / Most / The} pink diamonds are {common / widespread }
- (only meaning: all/most/the *types* of pink diamonds are common/widespread)
- (38) a. Flies were everywhere. “*everywhere there were (different) flies*”
b. #{A / This} fly was everywhere.
c. #{Some / Those} fly were everywhere.

BP with predicates (episodic or characterizing) that apply to “species” or “natural kinds” of objects.

- (39) a. (*The) Dodos were exterminated in the 19th century.
- b. (*The) Tigers are almost extinct.
- c. (*The)Dinosaurs appeared on Earth 245 million years ago.
- (40) a. Fleming discovered (*the) antibiotics.
- b. Paleontologists study (*the) dinosaurs.

Summary

English Bare plural count nouns do not behave like other noun phrases:

- They have an existential interpretation with many episodic predicates, but not in CS.
- With CS, their meaning vary enormously, depending on the predicate: from “all” to “almost none”
- Unlike other quantifiers, they take narrowest scope.
- They can appear with predicates which do not accept most overt quantifiers (“be widespread”, “be extinct”, “come in three sizes”)

Carlson's (1977) Theory

Carlson (1977 U.Mass dissertation) presented an integrated theory of kind-denoting predicates and of the contrast between characterizing and episodic predication.

- Complex ontology: Kinds, objects and stages
- Bare plurals refer to kinds
- Predicates select sort of object they apply to
- Realization relation used for type-conversion

Motivation for Kinds

There are predicates that are incompatible with NPs denoting individuals but are compatible with bare plurals:

- (41) a. Dogs are widespread.
b. Diamonds are rare.
c. Bald eagles are nearly extinct.
- (42) a. *Fido is widespread.
b. *That diamond is rare.
c. *My bald eagle is nearly extinct.

Basic insight: These predicates can hold of NPs headed by *kind*

- (43) a. That kind of dog is widespread.
b. That kind of stone is rare.
c. That kind of bird is nearly extinct.

Basic proposal: kind-predication $\text{extinct}(\text{dog}^k)$

Bare-plurals are kind-denoting

Carlson's fundamental claim:

Bare-plurals (and bare-singular mass nouns) name kinds.

- **Potatoes** denotes the vegetable *Solanum tuberosum*
- **Whales** denotes the species *Cetacea*
- **Milk** denotes the liquid *Lac*

Evidence for BPs as names: *So-called* construction

Only names (and BPs) can be used (Postal 1969)

- (44) a. Slim is so-called because of his slight build.
b. *Every scrawny guy is so-called because of his build.
- (45) a. Cardinals are so-called because of their color.
b. *All cardinals are so-called because of their color.

Kind anaphora

Pronouns can be used to refer back to bare-plural NPs:

- (46) Snow tigers have beautiful white fur. They are very rare. In fact they are nearly extinct.

On the Carlsonian theory this is simple anaphora to the kind:

- (47) **have-beautiful-white-fur(snow-tigers) \wedge very-rare(snow-tigers) \wedge nearly-extinct(snow-tigers)**

Kind-anaphora works like proper-noun anaphora:

- (48) a. John went home. He was tired.
b. **went-home(john) \wedge tired(john)**

Kind-Anaphora in Edinburgh

Some examples we have seen here:

Front Page, *The Guardian* August, 9, 2005

- (49) They climb trees, can which 300 kilos, and are capable of running up to 40mph. And thanks to a reintroduction programme, they are now roaming freely all over the Alps.
The successful comeback of the brown bear . . .

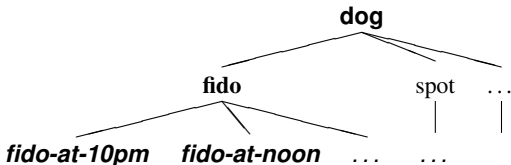
On the label for a bottle of **Innocent juicy water**:

- (50) Hello. You may be thinking that this used to be a glass bottle. And you'd be right. It used to be glass and now it's plastic.

Carlson's Ontology

Kinds are abstract objects which concrete objects might “realize”

- **Kinds** natural or artefactual classes of entities
- **Objects** normal objects that have coherent identity
- **Stages** Time-slices of entities realized at a particular place and time



Stages

How can we understand the notion of a **stage** of an individual?

- Stages can be the object of perception and the agents of action. They are concrete.

(51) Bill was hit by a ball at 10pm on July 14th, 2004.

A stage (time-slice) of Bill that existed at that time came in contact with a stage of the ball.

- Stages “realize” individuals just as individuals realize kinds

Classes of predicates

Predicates are classified in terms of the kind of objects that they apply to.

Kind-level predicates that only apply to kinds
be widespread, be rare, be extinct, be invented

Individual-level predicates that apply to kinds and objects
know French, be intelligent

Stage-level predicates that apply to stages of individuals
be tired, be sick, walk to school

Kind-predication

Basic kind-predicates apply to kinds directly

- (52) a. Dodos are extinct.
b. Edison invented the phonograph.
- (53) a. **extinct'(dodo')**
b. **invent'(Edison',phonograph')**

Some kind predicates are derived from object-level predicates via generalization:

- (54) a. Fido has four legs.
b. Dogs have four legs.

Carlson indicates by using the G' operator:

- (55) a. **have-four-legs(fido)**
b. **G' (have-four-legs)(dogs)**

Quasi-universal interpretation of bare-plurals is indicative of kind-predication

Kinds and objects

Parallel with plural entities: Properties that a plural entity has are related in complex ways to properties of individuals that make up the plurality

(56) The battalion is tired.

Means: soldiers in the battalion are tired.

- (57) a. The battalion shifted its position slightly.
b. The battalion has been disbanded.

No soldier shifted slightly (some shifted, perhaps radically)
Soldiers cannot be “disbanded”

Objects and Stages

Basic object-predicates apply to objects directly

- (58) a. Fido is intelligent.
b. Peter owns a car.
- (59) a. **intelligent'**(fido')
b. $\exists x [\mathbf{car}'(x) \wedge \mathbf{own}'(\mathbf{peter}',x)]$

Some objects predicates are derived from stage-level predicates via generalization:

- (60) a. Fido barks.
b. Fido barked (at noon on Sunday).

Carlson indicates by using the G operator: Generalizing over stages of an individual

- (61) **G(bark)(fido)**

Stage-level predication

- NPs never denote stages: they always denote **individuals** (either **kinds** or **objects**).
- To apply a stage-level predicate to an object, we must mediate the predication via realization:

(62) $\llbracket \text{be barking} \rrbracket = \lambda y^{o/k} \exists x^s [\mathbf{R}(x^s, y) \wedge \text{be barking}(x^s)]$

- (63) a. Fido is barking.
b. $\exists x^s [\mathbf{R}(x, \text{fido}) \wedge \text{is barking}(x^s)]$

The realization relation

Realization relation holds between:

- **objects** and **kinds**
 $R(x^o, \text{dog})$; x^o is a dog
- **stages** and **objects**
 $R(x^s, \text{paul})$; x^s is a stage of Paul
- **stages** and **kinds**
 $R(x^s, \text{dog})$; x^s is a stage of a dog

Properties of realization relation:

- if **bill-at-10pm** realizes the object **bill** and **bill** realizes the kind **man** then **bill-at-10pm** realizes the kind **man**
 $\forall x^s, y^o, z^k [R(x^s, y^o) \wedge R(y^o, z^k) \rightarrow R(x^s, z^k)]$
- if **bill-at-10pm** realizes the the kind **man**, then there must be an object (namely **bill**) that realizes the kind **man** that **bill-at-10pm** realizes.
 $\forall x^s, y^o, z^k [R(x^s, z^k) \rightarrow \exists y^o R(x^s, y^o) \wedge R(y^o, z^k)]$

The realization relation

- Do we really need stages to realize kinds? (i.e. $R(x^s, y^k)$)
Couldn't we get it via transitivity from $R(x^s, y^o)$ and $R(x^o, y^k)$?
- No. Recall that at any time t there is exactly 1 stage of an object x^o . This creates problems if you want to get a plurality of stages. Now consider:

(64) There are many chairs in this room.

The interpretation is (65a), not (b). (b) is impossible because one cannot have 'many stages' of any individual object chair.

- (65)
- a. there are now many stages of the kind **chair** in this room
 - b. there are now many stages of an object **chair** which realizes the kind **chair**

Dog and dogs

Semantic relation between common nouns (*dog*) and kind-denoting expressions (*dogs*):

$$(66) \quad \llbracket \mathbf{dogs} \rrbracket = \iota x^k [\forall z^o \square [\mathbf{dog}(z) \leftrightarrow R(z,x)]]$$

Assures that the following is always true:

$$(67) \quad \text{Dogs are dogs.}$$

Generalization operators

For predicates that have both episodic (stage-level) and characterizing (individual-level) uses, Carlson takes stage-level predication to be “basic” and individual level predication to be “derived” via an operator: **G**:

- (68) a. John is walking to school.
b. John walks to school.
- (69) a. $\exists x^s [\mathbf{R}(x^s, \text{john}') \wedge \text{walk-to-school}'(x^s)]$
b. $\mathbf{G}(\text{walk-to-school}')(\text{john}')$

Note: a generalized predicate can apply directly to an object (no **R** needed)
The **G** operator:

- (70) $[[\mathbf{G}]] = \lambda P \lambda x^o \text{ for-adequately-many } x^s [R(y^s, x^o) \rightarrow P(x^s)]$

Generalization operators

For predicates that have both object-level and kind-level uses Carlson takes object level predication to be “basic” and kind-level predication to be derived:

- (71) a. Peter is hard-working.
b. Graduate students are hard-working:

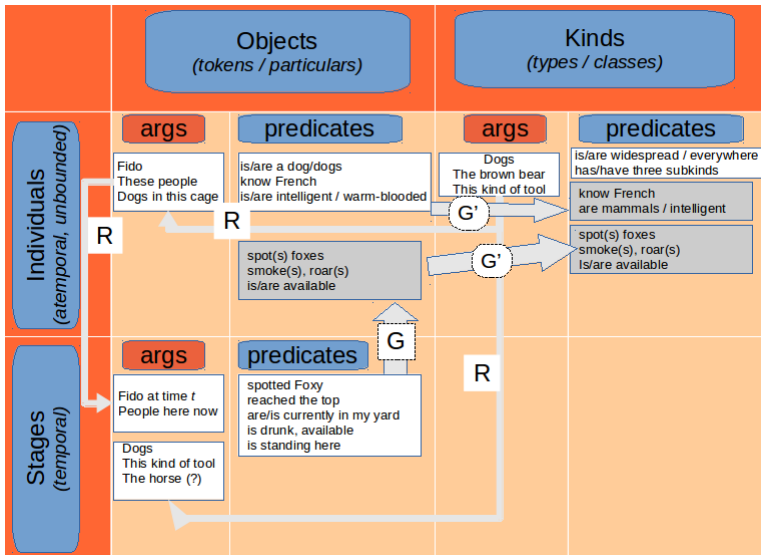
This is accomplished via application of the \mathbf{G}' operator:

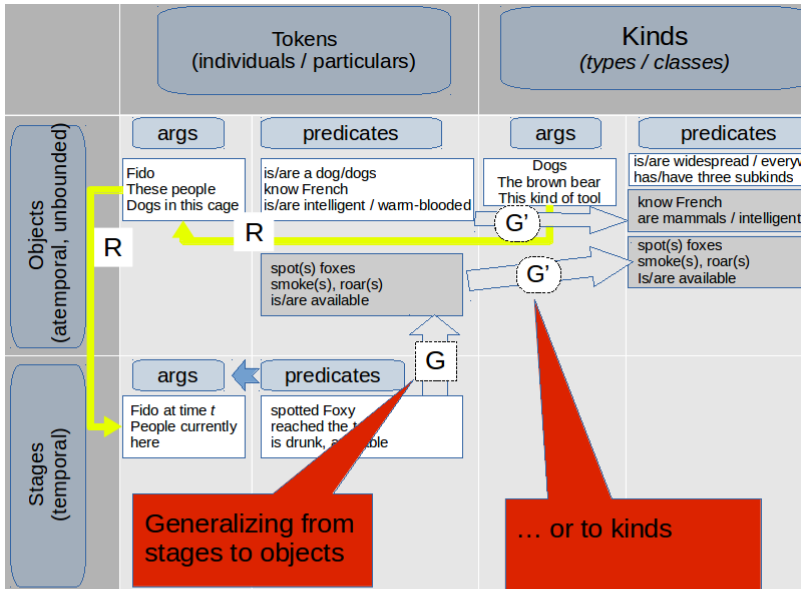
(72) $\mathbf{G}'(\text{hard-working}')(\text{grad-student}')$

(73) $[[\mathbf{G}']] = \lambda P \lambda x^k \text{ for-adequately-many } x^o [R(y^o, x^k) \rightarrow P(x^o)]$

Summary

- \mathbf{G}' generalizes from object-level predicates to kind-level predicates
- \mathbf{G} generalizes from stage-level predicates to object-level predicates





A Puzzle about Predicates

Verbal predicates can always generate “kind-level” generalization

- (74) a. Fido eats beans with rice.
b. Dogs eat beans with rice.

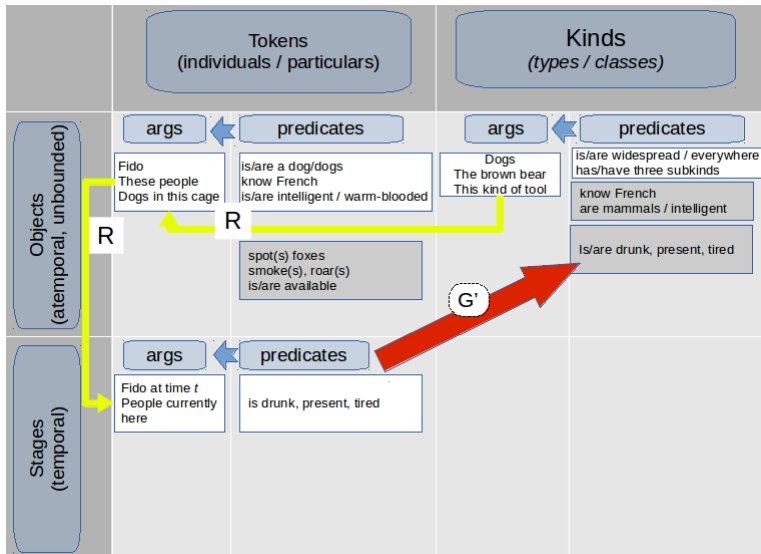
Non-verbal predicates typically cannot generate “object-level” generalization from stage-level properties:

- (75) a. Matt is tired.
b. Elder citizens are tired. (maybe some, not “all” citizens)
c. Elder citizens are always tired. (maybe some, not “all” citizens)

Although non-verbal predicates can generate “kind-level” generalization from object-level properties

- (76) a. Fido is intelligent
b. Dogs are intelligent

Carlson's stipulation: **G** (stage to object generalization) applies only to verbal predicates, but **G'** can apply to any predicate

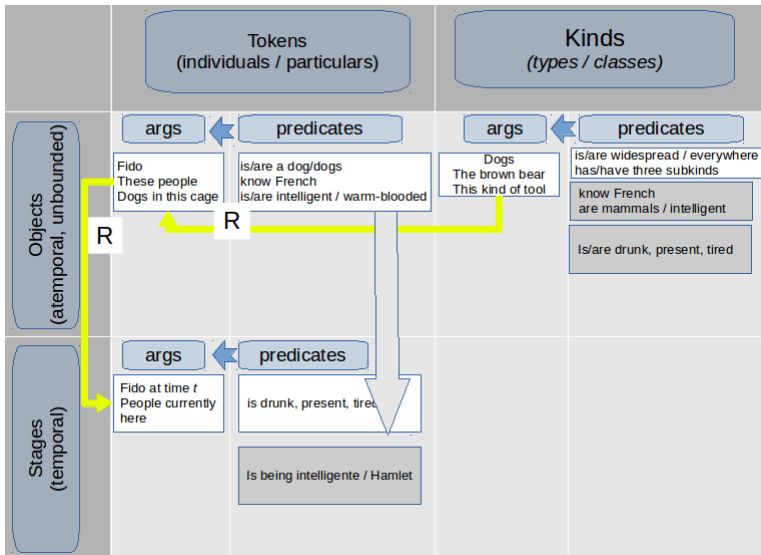


Are there operators in the other direction? E.g. from basic lexical predicates of objects (statives) to predicates of stages?

- (77) a. ??John is always British / a Brit
b. John is always tired / sick / drunk / in this town
- (78) a. John *is being* British / a Brit. *turns into an activity (stages OK)*
b. *John *is being* tired / sick / drunk / in this town *failure: already a stage*

Question: is a conversion (of a different sort) also used to obtain temporal interpretations of object-level predicates?

- (79) a. John has been British / a Brit for many years.
b. John has been drunk / sick / in this town for many years.



Universal/Existential alternation

How can we derive the universal/existential variability?

- (80) a. Dogs are asleep. (some dogs)
b. Dogs are intelligent. ("all" dogs)

Stage-level predicate: existential over stages

- (81) a. Fido is asleep.
b. $\exists x^s [\mathbf{R}(x^s, \mathbf{fido}) \wedge \mathbf{asleep}(x^s)]$
- (82) a. Dogs are asleep.
b. $\exists x^s [\mathbf{R}(x^s, \mathbf{dog}) \wedge \mathbf{asleep}(x^s)]$

Given "realization" axioms this entails:

- (83) $\exists y^s, x^o [\mathbf{R}(x^o, \mathbf{dog}) \wedge \mathbf{R}(y^s, x^o) \wedge \mathbf{asleep}(y^s)]$

Bare-plural with stage-level predicate has existential reading because predicate applies to some realizations (general property of such predicates).

Narrow scope effect

Bare-plurals have “narrowest scope” because the existential introduced by realization relation is lexically introduced: Cannot be scoped.

- (84) a. Dogs were everywhere.
b. Some dogs were everywhere.

- (85) a. $\forall l [\mathbf{location}(l) \rightarrow \exists x^s [\mathbf{R}(x^s, \mathbf{dog}) \wedge \mathbf{located}(x^s, l)]]$
b. $\exists y^o [\mathbf{dog}(y^o) \wedge \forall l [\mathbf{location}(l) \rightarrow \exists x^s [\mathbf{R}(x^s, y^o) \wedge \mathbf{located}(x^s, l)]]]$

Remaining question: why is it so hard to get the inverse scope of (85a) $\forall \exists$ in (85b).

A problem for Carlson's account?

Bound-variable anaphora differs from proper name anaphora:

- (86) a. Every boy loves his mother.
b. Every boy loves every boy's mother.
- (87) a. John loves his mother.
b. John loves John's mother.

Bare-plurals appear to behave both like names and like binders:

- (88) a. Sheep obey their herders. *i.e. each one obeys its own herder*
b. Sheep eat grass because they are stupid animals

“Binding” by Kind-denoting Expressions

Anaphora and kind-object “binding”

(89) Cats like themselves

If we treat *themselves* as an operator, we can solve this problem

(90) $[[\textit{themselves}]] = \lambda P \lambda x^o [P(x^o, x^o)]$

(91) $[[\textit{like themselves}]] = \lambda x^o [\mathbf{like}(x^o, x^o)]$

To this we apply the generalization operator **G'** and then apply the result to *cats*

(92) $[[\textit{Cats like themselves}]] = \mathbf{G}'(\lambda x^o [\mathbf{like}(x^o, x^o)])(\mathbf{cat})$

True iff sufficiently many cats have the self-liking property.

Binding Problems

The **G'** operator only generalizes on the subject position, but we have the same kind of “binding” in many argument positions:

- (93)
- a. **Psychiatrists** explain **people** to themselves.
 - b. **Directors** tell **actors** what they should do on stage
 - c. **Payroll officers** send **workers** their paychecks after they approve them.

This appears to call for some kind of true operator to bind the pronoun.

Generalization on non-subject arguments

Many predicates relate kinds and kinds:

- (94) Fido likes Fifi.
- (95) a. Dogs like cats.
b. That kind of dog likes this kind of cat.

And it also relates kinds and objects in combination:

- (96) a. Fido likes cats.
b. Dogs like Fifi.

This too calls for some account of generalization for non-subject positions

Other languages

Unlike in English, in various languages the universal and existential readings of English bare plurals are not expressed by the same construction. Italian:

- (97) a. Le tigri sono diventate rare. (GEN/* \exists)
the tigers have become rare
“Tigers have become rare.”
b. Carlo ha visto tigri allo zoo. (*GEN/ \exists)
Carlo has seen tigers at_the zoo
“Carlo has seen tigers at the zoo”

Japanese (Mari, Beyssade, and del Prete 2013:14)

- (98) a. Inu wa hasiru (GEN/* \exists)
dog TOP run
‘Dogs run’
b. Inu ga hasitte iru (*GEN/ \exists)
dog NOM run PROG
‘dogs are running/A dog is running’

French (*les* vs. *des*), Finnish (Nominative vs. Partitive case)

Summary

Some features of Carlson's approach

- Carlson's proposes that bare-plurals are kind denoting
- Generic "quantification" is reduced to kind-predication
- Introduces ontology with stages, objects and kinds.
- Accounts for quantificational variability in an appealing way via "realization"

Some problems

- Treats all kind-denoting expressions uniformly.
- Is subject/predicate "fixated"
- "Bound" anaphora
- Comparison with other languages.

Homework

Find examples of:

- Kind-referring NPs
- Anaphoric reference to kind-referring NPs
- Kind-level predicates

Krifka, M. et al. (1995).

Genericity: An introduction.

Chapter 1, pp. 1–124. Chicago, IL: University of Chicago Press.

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