Kinds of Kind Reference: Bare Plurals – Ambiguous or Not?

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1. Generally shared assumption about Genericity

Two types of genericity, cf. Krifka et al. (1995):

- **characterizing statements**: generalizations about sets of entities / situations.
- **kind reference**: reference to an abstract entity that is related to specimens.

Examples of characterizing statements, indefinite NPs.

(1) a. A potato contains vitamin C.
 'For all/typical x: if x is a potato, x contains vitamin C.'
 b. A member of this club doesn't drink alcohol.
 'For all/typical x: If x is a member of this club, s/he doesn't drink alcohol.'

Examples of sentences with definite, kind-referring NPs, episodic statements.

(2) a. The potato was first cultivated in the Andes region of South America.
 'The kind *tuber tuberosum* was first cultivated in the Andes region…'
 b. Shockley invented the transistor.
 'Shockley conceived of, and realized, the idea/kind of the transistor.'

Mixed cases:. Kind reference in characterizing statements:

(3) The potato contains vitamin C.
 'For all/typical specimens of *Tuber tuberosum* x, x contains vitamin C.

But indefinite NPs cannot generally be replaced by kind-referring NPs,
and kind-referring NPs cannot be replaced by indefinites in episodic statements:

(4) a. *The member of this club doesn't drink alcohol.
 b. *A potato was first cultivated in the Andes region of South America.
 (taxonomic reading referring to a subspecies of *tuber tuberosum* o.k.)

There are no specific generic / kind referring NP (except for scientific names like *tuber tuberosum*, and perhaps *Man* as in *God created Man*):

(5) a. A potato rolled out of the bag. (Non-generic uses
 b. The potato rolled out of the bag. of definite / indefinite NPs)

Ambiguity of definite NPs and singular indefinite NPs

- *the potato* is **ambiguous**;
 reference to a salient / unique potato or reference to the kind *tuber tuberosum*.
 Either the entity-level reading is basic and the kind-level reading is derived (6)
 or the kind-level reading is basic and the entity-level reading is derived.(7).

(6) a. ROLLED_OUT_OF_THE_BAG(ιx[POTATO(x)])
 b. FIRST_CULTIVATED_IN_THE_ANDES($^\cap$POTATO)

(7) a. FIRST_CULTIVATED_IN_THE_ANDES(TUBER_TUBEROSUM)
 b. ROLLED_OUT_OF_THE_BAG(ιx[R(x, TUBER TUBEROSUM)])

- *a potato* is **not ambiguous**;
 indefinites in general introduce a variable that, depending on context, may be bound by existential closure or by another quantifier, like the generic quantifier GEN (cf. Lewis (1975), Kamp (1981), Heim (1982))

(8) a. A potato rolled out of the bag.
 $\exists$[POTATO(x) $\wedge$ ROLLED_OUT_OF_THE_BAG(x)]
 b. A potato contains vitamin C.
 GEN[POTATO(x), CONTAINS_VITAMIN_C(x)]

2. Different opinions about Bare NPs

Bare NPs (NPs without determiners) appear in generic and non-generic sentences.

(9) a. Potatoes were first cultivated in the Andes region of South America.
 => apparently kind-referring use, like *the potato.*
 b. Potatoes contain vitamin C.
 c Members of this club don't drink alcohol.
 => apperently indefinite use in context of generic quantifier, like *a potato.*
 d. Potatoes rolled out of the bag.
 => apparently indefinite existential use, like *a potato.*

(10) a. Bronze was invented around 3000 B.C.
 b. Bronze was used for jewellery and weaponry.
 c. Bronze was detected in the remnants of the furnace.

- **Uniform Meaning Hypothesis:** Bare NPs always have one meaning; they always refer to kinds (Carlson (1977); Chierchia (1998)).
 The apparent ambiguity is due to the predicate. In the episodic use, claims about the kind are reduced to claims about specimens [or stages] of the kind.

(11) Potatoes rolled out of the bag.
 $\lambda x \exists y$[R(y, x) $\wedge$ ROLLED_OUT_OF_THE_BAG(y)](TUBER_TUBEROSUM)
 = $\exists y$[R(y, TUBER_TUBEROSUM) $\wedge$ ROLLED_OUT_OF_THE_BAG(y)]

- **Ambiguity Hypothesis:** Bare NPs are ambiguous; they either refer to kinds, or they are indefinites (among others, Wilkinson (1991), Gerstner-Link and Krifka (1993); cf. discussion in Krifka e.a. 1995).

Arguments for uniformity hypothesis:

Lack of ambiguity, role of nature of the predicate (Carlson 1977)

(12) a. Potatoes rolled out of the bag. (only non-generic)
 b. Potatoes contain vitamin C. (only generic)

But: Similar lack of ambiguity for singular indefinites.

(13) a. A potato rolled out of the bag.
b. A potato contains vitamin C.

Anaphoric reference across kind / existential use of BNP (Carlson 1977)

(14) a. John bought potatoes because they contain vitamin C.
b. Potatoes contain vitamin C, so John often buys them.
c. Watermelons contain iron, so John often buys one.

Again, similar phenomena with indefinites:

(15) a. John bought a potato / some potatoes because they contain vitamin C.
b. ?A potato contains vitamin C, so John often buys them.
c. A watermelon contains iron, so John often buys one.

Conjoined generic and episodic predicates Schubert and Pelletier (1987):

(16) Dogs are mammals and are barking right now in front of my window.
$\lambda x[\text{MAMMAL}(x) \wedge \lambda x \exists y[R(y, x) \wedge \text{BE\_BARKING}(y)]](\text{CANIS})$

But: Such sentences are problematic (zeugma), probably not better than sentences with indefinite NPs like *A dog is a mammal and is barking right now in front of my window.*

Reflexives referring to kinds (Rooth (1985)):

(17) a. At the meeting, Martians presented themselves as almost extinct.
$\exists x[R(x, \text{HOMO\_MARTIENSIS}) \wedge \text{PRESENTED\_AS\_EXTINCT}(x, \text{HOMO\_MART.})]$
b. *At the meeting, some Martians presentend themselves as almost extinct.

But: Ambiguity hypothesis assumes that *Martians* has kind-referring interpretation as one of its uses, and allows for "avantgarde" interpretations as in *The rat / Rats reached Australia in 1770.*

Narrow scope of BNPs vs. potential wide scope for indefinites can be explained if BNPs are names of kinds, hence scopeless (Carlson 1977).

(18) a. Minnie wants to talk to psychiatrists. (non-specific only)
$\text{WANT}(\text{MINNIE}, \lambda x[\underline{\lambda y \exists z[R(z,y) \wedge \text{TALK\_TO}(x,z)](\text{PSYCHIATRISTS})}])$

b. Minnie wants to talk to a psychiatrist (non-specific or specific)
i. $\text{WANT}(\text{MINNIE}, \lambda x[\underline{\lambda P \exists y[\text{PSYCHIATRIST}(y) \wedge P(y)]}(\lambda y[\text{TALK\_TO}(x,y)])])$
ii. $\underline{\lambda P \exists y[\text{PSYCHIATRIST}(y) \wedge P(y)]}(\lambda y[\text{WANT}(\text{MINNIE}, \lambda x[\text{TALK\_TO}(x, y)]])$

Arguments for ambiguity hypothesis:

BNPs in episodic sentences pattern with indefinites (cf. Weir 1986).

(19) a. There were potatoes rolling out of the bag.
b. There was a potato rolling out of the bag.
c. *There was the potato rolling out of the bag.

Different realizations, cf. Finnish, Japanese (cf. Kuroda (1972)), English.

(20) a. Koirat haukkuvat.
dogs.NOM bark.PL
'Dogs bark.'
b. Koiria haukku.
dogs.PART bark.SG
'Dogs are barking.'

(21) a. Inu wa hasiru.
dog TOP run.
'Dogs run.' / 'A dog runs.'
b. Inu ga hasitte iru.
dog NOM run PROGR
'Dogs are running.' / 'A dog is running.'

(22) a. DOGs are good pets.
[only contrastive.]
b. DOGS are sitting on my lawn.
[contrastive or all-new,. thetic utterance.]

Languages in which bare NPs cannot be kind-referring but occur in generic predications (cf. Longobardi (2001), Italian).

(23) a. Elefanti di colore bianco possono creare grande curiosità.
'White-colored elefants may raise a lot of curiosity.'
b. *Elefanti di colore bianco sono estinti.
'White-colored elephants are extinct.'

3. The Theory of Chierchia (1998)

Chierchia (1998): principled theory of kind reference with common nouns arguing for the uniformity hypothesis of bare plurals.

3.1 Ontological requirements and semantic types

Individuals form an atomic join semi-lattice, with sum $\oplus$, part $\leq$, Atoms AT, and operator ι. that picks out the maximal element of a set.

Meaning of singular and plural common nouns and mass nouns:

(24) $[\![\textit{dog}]\!] = \text{DOG}, = \lambda w \lambda x[\text{DOG}(w)(x)]$,
the function that maps every world w to the set of (atomic) dogs x in w (a property, in the sense of intensional logic).

(25) $[\![\textit{dogs}]\!] = \text{DOGS}, = \lambda w \lambda x[\neg\text{DOG}(w)(x) \wedge \forall y[y \leq x \wedge \text{AT}(y) \rightarrow \text{DOG}(w)(y)]]$,
the transitive closure of DOG under $\oplus$ minus DOG,
the function that maps every world w to the set of sum individuals consisting of one or more dogs;
DOGS is cumulative.

(26) $[\![\textit{furniture}]\!]$: a cumulative property FURNITURE, including atoms.

Definite article and the maximialization operator (cf. Link (1983)):

(27) a. $[\![\textit{the dogs}]\!] = \iota\text{DOGS}(w)$
is defined, if DOGS(w) is not empty, due to cumulativity of DOGS
b. $[\![\textit{the dog}]\!] = \iota\text{DOG}(w)$, defined only if there is exactly one dog.

Kinds

Kinds are both functions from worlds to individuals, type $\langle s,e\rangle$, and atomic individuals, type e; we have for the set of kinds K: $K \subset AT$.

Relation between kinds and properties by down operator:

(28) Down-operator: $^{\cap}P = \lambda w \iota P(w)$, if this is an element of K, else undefined.

- maps every world to the maximal element of the extension of P in that world,
- is undefined if there is no maximal element in at least one world,
  hence $^{\cap}$DOGS is defined [but only if there is at least one dog in every world!],
  $^{\cap}$DOG is undefined [except if every world has exactly one dog]

(Problem with extinct kinds, like *the dodo*: no maximal element in this world.)

(29) Up-operator $^{\cup}$: If d is a kind, then $^{\cup}d = \lambda w \lambda x[x \leq d(w)]$

- maps every world to the set of parts of the kind in that world.

Some theorems:

(30) a, If $^{\cap}$DOGS = d, then DOGS $\neq$ $^{\cup}$d, as $^{\cup}$d contains atoms.
b. $^{\cap\cup}d = d$, for every kind d.
c. If P is mass: $^{\cup\cap}P = P$
d. If P is count: $^{\cup\cap}P = P \cup$ the atoms that generate P.

Singular kinds

Purpose: Model singular generic article, as in *The dodo is extinct.*
Chierchia follows Dayal (1992) in distinguishing singular and plural kinds.
Treatment of singular kinds by atomic correspondends of sum individuals, cf. treatment of groups by Link (1984), Landman (1989).

(31) If x is a sum individual, then $g(x) \in AT$ is the group corresponding to x.

Basic use of groups: *the* + Mass Noun, should not denote a plurality because of singular agreement.

(32) a. ⟦*the furniture*⟧ = $\lambda w[g(\iota \text{FURNITURE}(w))]$
b. ⟦*the dogs*⟧ = $\lambda w[\iota \text{DOGS}(w)]$

Derived use: Singular generics after "massification" ('universal grinder'):

(33) a. MASS(DOG(w)) = DOG(w) $\cup$ DOGS(w)

b. ⟦*the dog*⟧ = $\lambda w[g(\iota[\text{MASS}(\text{DOG}(w))])]$,
a function from worlds w to atomic group individuals
that correspond to the maximal individual that falls under MASS(DOG(w))

(Note that ι[MASS(DOG(w))] = ι[DOGS(w)] if there is more than one dog in w!)

Explanation of mass-like behavior of definite singular generic NPs, cf. Kleiber (1989).

(34) a. Tigers are numerous.
b. *The tiger is numerous.

Plural kinds

(35) a. ⟦*dogs*⟧ = d = $\lambda w[\iota \text{DOGS}(w)]$, = $^{\cap}$DOGS,
a function from worlds to plural individuals

Why **the gold*, as a kind-referring term? Because ⟦*the gold*⟧ = $\lambda w g(\iota^{\cup}au(w))$ = au = ⟦*gold*⟧. (au: the kind aurum). Problem German:

(36) Gold / Das Gold ist ein Edelmetall.
gold / the gold is a valuable metal

3.2 Typology of Kind Reference

Languages differ in their interpretation of nouns, involving two binary features:

- N[±arg]: Nouns can / cannot be **arguments** (entities);
- N[±pred]: Nouns can / cannot be **predicates**.

Language types:

- NP[+arg, –pred]: Chinese.
  N's denote kinds (type e): bare NPs. N's can serve directly as arguments: bare N's.
  no SG/PL-distinction necessary, classifiers induce shifts to predicates,
  e.g. ⟦*ren*⟧ = h, ⟦*ge ren*⟧ = $\lambda w \lambda x[x \leq h(w)]$, = $^{\cup}$h.
- NP[–arg, +pred]: Romance
  no bare NPs, obligatory use of articles (definite, indefinite, partitive; ∅-articles in Italian in object position) – but see examples like (23) for Italian, Schmitt and Munn (1999) for Brazilian Portuguese). N's can be predicates (count nouns) but don't have to be (mass nouns).
- NP[+arg, +pred]: English, Russian
  no ban on NPs without articles, N's come in two forms: predicates (count) or kinds (mass). Mass N's can serve directly as arguments.
  Plural N's can serve as arguments after type shift to kinds.

3.3 Type shifting between possible NP denotations

(37) Some of Partee's type shift operations, extensional version (Partee (1987))

a. $\exists$:	$\langle e,t\rangle \Rightarrow \langle\langle e,t\rangle,t\rangle$	$P \Rightarrow \lambda P'\exists x[P'(x) \wedge P(x)]$	(general)
b. ι	$\langle e,t\rangle \Rightarrow e$	$\lambda y[y \leq x] \Rightarrow x$	(restricted)

(38) Chierchia's type shift operations, intensional version

a. Up, $^{\cup}$:	$\langle s,e\rangle \Rightarrow \langle s,\langle e,t\rangle\rangle$	$d \Rightarrow \lambda w \lambda x[x \leq d(w)]$,	(unrestricted for kinds)
b. Down $^{\cap}$:	$\langle s,\langle e,t\rangle\rangle \Rightarrow \langle s,e\rangle$	$P \Rightarrow \lambda w \iota P(w)$, if $\in K$	(restricted)

Type shifting can be indicated by determiners:

(39) a. indefinite determiner: $\exists$, e.g. *a dog*
b. definite determiner: ι, e.g. *dogs*

Type shifting as a last resort, i.e. when enforced by the context.

Type shifting is restricted by blocking principle:

(40) If there is an overt determiner D that expresses a type shifting TS, then TS cannot happen freely but must be expressed by D.

- English has a definite determiner and a singular indefinite determiner, hence ι cannot apply freely, and ∃ can apply freely only in the plural.
- Italian also has a plural indefinite determiner, hence ∃ cannot apply freely.
- Slavic languages, Chinese have no determiners, hence ∃, ι can apply freely.
- No specialized determiners for Up and Down, hence this type shift is always free.

3.4 *Types of kind predications*

Meanings are given in extensinal version, for simplicity.

Regular kind predications

(41) a. Gold is a metal. METAL(∩GOLD), or METAL(au)
b. Dodos are extinct. EXTINCT(∩DODOS)]
free type shift GOLD ⇒ ∩GOLD, DODOS ⇒ ∩DODOS
triggered by selectional restriction of predicate.

(42) *Dodo is extinct. *EXTINCT(∩DODO)
not well-formed, as ∩P is not defined for non-cumulative properties P.

(43) The dodo is extinct. EXTINCT(g(ι[MASS(DODO)]))
reference to the function that maps every world w to the group containing all dodos; definite article ι composes with g operator, enforced by selectional restriction of predicate.

Derived kind predications:

(44) Dogs are barking. *[BARKING(DOGS)], due to type mismatch.

(45) DKP-Rule: If P applies to objects, k denotes a kind: P(k) = ∃x[∪k(x) ∧ P(x)].

(46) Dogs are barking.
λw[BARKING(w)(∩DOGS)]
⇔ ∃x[∪∩DOGS(x) ∧ BARKING(x)]

Characterizing statements:

(47) Potatoes contain vitamin C.
GEN[∪∩POTATOES(x); CONTAIN_VITAMIN_C(x)]

Explanation of narrow-scope phenomena

Narrow-scope interpretation of bare NPs even if LF-moved.

(48) John didn't see dogs.
a. LF: dogs_1 [John didn't see t_1]
b. interpretation: λx[¬[SEE(x)(J)]](∩DOGS)
(after type shift DOGS ⇒ ∩DOGS, to satisfy type requirement)
c: after application: ¬[SEE(∩DOGS)(J)]
d. after DKP: ¬∃x[∪∩DOGS(x) ∧ SEE(x)(J)]

DKP is a local adjustment triggered by type mismatch. DKP does not apply after step (b) because the variable x is either sortally unspecific or a variable for kinds. Only at step (c) the sortal requirements of SEE will trigger DKP.

In contrast, NPs with indefinite articles allow for wide scope:

(49) John didn't see a dog.
a. LF: a dog_1 [John didn't see t_1]
b. interpretation: λP∃x[DOG(x) ∧ P(x)](λx[¬[SEE(x)(J)]])
c. after application: ∃x[DOG(x) ∧ ¬[SEE(x)(J)]]

3.5 *Problems with the DKP rule*

Assumption of triggered type shifts restricted by blocking principle is attractive. But the assumption of the DKP rule is problematic.

There is a plausible economy principle that restricts type shifts:

(50) Choose the simplest type shift that satisfies the requirements.

Example, coordination of NPs, cf. Hoeksema (1983).

(51) a. John and Mary <u>are</u> asleep. ASLEEP([JOHN⊕MARY])
b. Every boy and every girl <u>is</u> asleep. [λP[P ⊆ BOY] ∧ λP[P ⊆ GIRL]](ASLEEP)
= λP[P ⊆ BOY ∧ P ⊆ GIRL](ASLEEP)
c. John and every girl <u>is</u> asleep. JOHN ⇒ λP[P(JOHN)]
[λP[P(JOHN)] ∧ λP[P ⊆ GIRL]](ASLEEP)

Chierchia's chain of type shifts to accommodate bare NPs for *Dogs are barking*:

(52) DOG ⇒DOGS ⇒ ∩DOGS ⇒ ∪∩DOGS ⇒ ∃∪∩DOGS
pluralization type requirement DKP-rule DKP-rule

The first two shifts are explicitly triggered (pluralization, type requirement when combined with predicate of type ⟨e,t⟩). The last two shifts are due to the DKP-rule.

Problem: There is a simpler type shifts that are explicitly triggered.

(53) DOG ⇒ DOGS ⇒ ∃DOGS
pluralization type requirement

(54) a. *BARKING(DOGS) (type clash)
b. ∃DOGS(BARKING) (type shift)
= λP∃x[DOGS(x) ∧ P(x)](BARKING)
= ∃x[DOGS(x) ∧ BARKING(x)]

Chierchia is aware of the possible derivation (53), but he considers (52) preferable because $^\cap$ is more meaning preserving (it only changes the type of a predicate P) whereas $\exists$ adds existential import. But notice that the DKP assumes $^\cap$ **and** existential import – this clearly implies a greater meaning change than $\exists$.

Chierchia also assumes that $\exists$ appears in cases in which a predicate does not correspond to a kind like *parts of that machine* or *boys in the next room* (cases already identified by Carlson (1977)), and that in such cases we do find wide-scope readings.

(55) a. John is looking for parts of that machine.
b. John didn't see parts of that machine.

Problem: Wide scope reading questionable for indefinites like *boys in the next room*.

(56) a. John didn't talk to boys sitting in the next room.

Questions concerning derivation (53):

(i) Why does scopal behavior of *dog* and *dogs* differ, if *dogs* is just plural of *dog*?

(ii) Why is the type shift not blocked by the determiner *some*, as in *some dogs*?

(iii) Why not **dog is barking*?

(iv) Why wide scope reading of indefinites like *parts of that machine*?

4. Elements of an Alternative Theory

4.1 The semantics of count nouns

Answer to (iii): Presence of singular indefinite article *a(n)* blocks free type shift $\exists$.

Problem: Then we should expect bare plurals in characterizing statements, as in **dog bark*, as presumably no $\exists$ shift is necessary.

Second answer to (iii): Because count nouns are not predicates, but have a number argument, cf. Krifka (1989)). Representation:

(57) a. $\llbracket dogs \rrbracket = \lambda n\lambda x[\textsc{dog}(n)(x)]$, $= \textsc{dog}$ (type $\langle n,\langle e,t\rangle\rangle$)
b. $\llbracket gold \rrbracket = \lambda x[\textsc{gold}(x)]$, $= \textsc{gold}$ (type $\langle e,t\rangle$)

Determiners and number words bind number arguments:

(58) a. $\llbracket a\ dog \rrbracket = \lambda R\lambda x[R(1)(x)](\textsc{dog})$, $= \lambda x[\textsc{dog}(1)(x)]$
b. $\llbracket two\ dogs \rrbracket = \lambda R\lambda x[R(2)(x)](\textsc{dog})$, $= \lambda x[\textsc{dog}(2)(x)]$

Plural in *two dogs* is just syntactic agreement; it may be lacking in languages that have plurals e.g. Turkish; it may be triggered by decimal fractions even if number is 1.

(59) a. iki köpek
two dog, 'two dogs'
b. köpekler
dogs

(60) a. one dog/*dogs (per square kilometer)
b. one point zero dogs/*dog (per square kilometer)

Why **dog is barking*? Because there is no free type shift from $\langle n,\langle e,t\rangle\rangle$ to $\langle e,t\rangle$ in English, which has the article *a* (and number words) to perform this operation.

Plural in bare plurals, in contrast, is semantically relevant.

(61) $\llbracket dog\text{-}s \rrbracket = \llbracket -s \rrbracket(\llbracket dog \rrbracket)$
$= \lambda R\lambda x\exists n{\geq}1[R(w)(x)](\textsc{dog})$
$= \lambda x\exists n{\geq}1[\textsc{dog}(n)(x)]$

Existential type shift, existential closure or getting under quantifier with bare plurals:

(62) a. *Dogs are barking.* $\exists\llbracket dog\text{-}s \rrbracket(\textsc{barking})$
b. *Dogs are barking.* $\exists[\llbracket dog\text{-}s \rrbracket(x) \wedge \textsc{barking}(x) \ldots]$
c. *Dogs are friendly*. $\mathrm{GEN}[\llbracket dog\text{-}s \rrbracket(x), \textsc{friendly}(x)]$

Type shift to kinds in kind-referring contexts:

(63) Dodos are extinct. $\textsc{extinct}(^\cap\llbracket dodo\text{-}s \rrbracket)$

4.2 Scope Phenomena

Question (i) can be explained in a number of ways:

Existential incorporation by type shifting of predicate (van Geenhoven (1998)):

If a nominal predicate α and a verbal predicate β should be combined, the verbal predicate undergoes type shift: $\beta \Rightarrow \lambda P\exists x[P(x) \wedge \beta(x)]$

(64) Dogs are barking.
a. Type shift: $\textsc{barking} \Rightarrow \lambda P\exists x[P(x) \wedge \textsc{barking}(x)]$
b. Application: $\lambda P\exists x[P(x) \wedge \textsc{barking}(x)](\textsc{dogs})$,
$= \exists x[\textsc{dogs}(x) \wedge \textsc{barking}(x)]$

Chierchia's objection: Why not **Dog is barking*? Because singular count nouns are not predicates, type $\langle e,t\rangle$, but relations between numbers and entities, type $\langle n,\langle e,t\rangle\rangle$.

Narrow scope by local existential interpretation

(65) (John) didn't see dogs
a. $\lambda y[\neg[\lambda x[\textsc{see}(x)(y)](\lambda x\exists n[\textsc{dog}(n)(x)])]]$, type clash!
b. local lifting of $\lambda x\exists n[\textsc{dog}(n)(x)]$ by $\exists$:
$\lambda x\exists n[\textsc{dog}(n)(x)] \Rightarrow \lambda P\exists x[\exists n[\textsc{dog}(n)(x)] \wedge P(x)]$
c. new application:
$\lambda y[\neg[\lambda P\exists x[\exists n[\textsc{dog}(n)(x)] \wedge P(x)](\lambda x[\textsc{see}(x)(y)]])$
$= \lambda y[\neg[\exists x\exists n[\textsc{dog}(n)(x)] \wedge \textsc{see}(x)(y)]]$

This also works for the narrow-scope interpretion of indefinites:

(66) John didn't see a dog.

Problem: How to account for wide-scope interpretation? Various possibilities:

- NPs with overt determiners must undergo LF-movement, which means wide-scope interpretations (cf. de Hoop (1995) on weak vs. strong NPs).

(67) LF: $[\text{a dog}]_1$ [John didn't see t_1]
a. $\exists\llbracket a\ dog \rrbracket(\lambda x_1[\neg\,[\textsc{see}(\textsc{john})(x_1)]])$
b. $\exists x[\llbracket a\ dog \rrbracket(x) \wedge \neg\,[\textsc{see}(\textsc{john})(x)]]$

- Overt determiners allow for an interpretation of indefinites by choice functions, which trigger specific readings (cf. Kratzer (1998), von Heusinger (1997), Reinhart (1997), Winter (1997), also Chierchia 1998 for *parts of that machine*).

(68) a. ⟦*a / some dog(s)*⟧: f(⟦*a / some dog(s)*⟧)

b. ⟦*a dog is barking*⟧, after existential closure:
∃f[BARKING(f(⟦*a dog*⟧))]

That is, there is a salient choice function f that gives us a unique dog or a unique sum individual consisting of dogs.

Choice functions translate into wide-scope readings, if existential closure of choice function variables happens globally:

(69) John didn't see a dog.
∃f[¬SEE(f(λx[DOG(1)(x)]))(JOHN)]
'There is a (particular) dog that John didn't see.'

Choice function approach can explain why *some* NPs cannot be used for characterizing statements (except for taxonomic readings), cf. Kratzer (1998).

(70) a. Some potato contains vitamin C.
b. Some potatoes contain vitamin C.

Generic quantifier requires *some potato* to be in restrictor of quantifier; *some* requires presence of wide-scope choice function; hence restrictor is a singleton.

(71) *∃f[GEN[f(POTATO)(x); CONTAINS_VITAMIN_C(x)]]

<u>Why wide-scope interpretation of NPs like *parts of that machine*?</u>

Question (iv): Data still unclear. But notice that NPs like *parts of that machine* refer to a finite, fixed number of entities. In this context, the determiner *some* has a non-specific partitive reading, hence does not unambiguously express the specific reading. This might enable a choice-function reading for bare NPs.

(72) a. John is looking for some parts of this machine.
(wide-scope or narrow-scope, partitive reading).

<u>Why no blocking of type shift ∃ by *some*?</u>

Question (ii) can now also be answered: The semantic change expressed by *some* in *some dogs* differs from the free type shift of ⟦*dogs*⟧ to ∃⟦*dogs*⟧ insofar as *some* introduces LF movement or choice functions that lead to wide-scope reading.

4.3 *Typological Variation*

Languages without count nouns, like Chinese: Nouns are kinds, or predicates. Free type shifts by ∩, ∃ or ι due to lack of articles.

(73) a. xiongmao kuai jue zhang le. .
panda soon extinct PART
SOON_EXTINCT(<u>∩PANDA</u>)

b. Lai le xiongmao.
arrive PERF panda
<u>∃PANDA</u>(ARRIVED)

c. Xiongmao lai le.
panda arrive PART
ARRIVED(ιPANDA)

where PANDA(x) iff x is a panda or a sum indivial consisting of pandas.

Language with count nouns, lack of articles: Singular count nouns used as predicates (just like plural count nouns in English). Assume a singular operator that binds number argument of count nouns. Example: Czech.

(74) a. ⟦*mamut*⟧: λnλx[MAMMOTH(n)(x)], the meaning of the noun stem.
b. Derivation of predicate by type shift or singular operator:
⟦*mamut-SG*⟧ = λRλx[R(1)(x)](MAMMOTH), = λx[MAMMOTH(1)(x)]
c. Derivation of predicate by plural operator:
⟦*mamut-i*⟧ = λRλx∃n≥1[R(1)(x)](MAMMOTH) = λx∃n≥1[MAMMOTH(1)(x)]

Now, type shifts by ∩, ∃ or ι, similar to Chinese.

Brazilian Portuguese (cf. Schmitt and Munn (1999)): Bare singulars as predicates in spite of presence of indefinite article; they only have narrow-scope interpretations. Cf. English plurals, were we have *dogs* and *some dogs*.

(75) Pedro quer encontrar um policial / policiais / policial.
'Pedro wants to meet a policeman / policemen / policeman.

Assume singular operator that binds number arguments, as in Slavic. Unlike Slavic, singular is numerically unspecific.

(76) ⟦*policial-SG*⟧ = λx[POLITICIAN(1)(x)]

Languages with count nouns, presence of indefinite articles for singular and plural (Romance): Singular and plural in general does not lead to predicate interpretations.

(77) a. ⟦*cane*⟧ = λnλx[DOG(n)(x)] b. ⟦*cani*⟧ = λnλx[DOG(n)(x), n≥1]

Type shifts to predicate presumably blocked because of presence of indefinite articles for singular and plural (partitive):

(78) a. Il cane è / I cani sono rari. 'The dog is / the dogs are rare'
b. Dei cani stanno giocando fuori.
PARTITIVE dogs AUX play outside 'Dogs are playing outside'

But situation is more complex – cf. (23).

4.4 *The Role of Information Structure*

Information structure is factor in the interpretation of generic statements that is often overlooked (but see now Cohen and Erteschik-Shir (2002) for arguments derived from information structure to explain the role of episodic vs. stative predicates).

Information structure in characterizing sentences

Basic idea: the restrictor of the generic quantifier is a topic. This explains a number of observations: Accent facts, word order, topic marking (Japanese), resumptive pronoun (Hebrew, cf. Greenberg (1998)).

(79) a. Dogs | bark.
b. DOGS are barking outside.
c. There are DOGS barking outside.

(80) a. Inu wa hasiru.
dog TOP run.
'Dogs run.' / 'A dog runs.'
b. Inu ga hasitte iru.
dog NOM run PROGR
'Dogs are running.' / 'A dog is running.'

(81) a. halSanim *(hem) saxamim.
linguists 3.PL.MASC smart
'Linguistis are smart.'

This also may explain complexity requirements for bare NPs in Italian (Longobardi (2001) and Spanish (Gutierrez-Rexach and Silva-Villar).

(82) a. Elefanti di colore bianco possono creare grande curiosità.
b. *Elefanti possono creare grande curiosità.

(83) a. Minirobots hacen el trabajo con igual cualidad.
b. *Robots hacen el trabajo con igual cualidad.
(Mini)robots do the job with the same quality.

Complex bare NPs may form a prosodic phrase on their own; this is necessary for interpreting the phrase in the restrictor of a quantifier (cf. notion of integration / separation in Jacobs (1999)).

Information structure and kind reference

Kind-referring NPs need not be topics:

(84) Shockley invented the transistor.

But topicality may make it unnecessary to use definite article to mark kind reference:

(85) a. ??Shockley invented transistors. (o.k. on taxonomic reading)
b. Transistors were invented by Shockley.

(86) a. The dodo is extinct.
b. Dodos are extinct.

Notice that enforcing interpretation of bare NP in the restrictor of a quantifier is easier than enforcing interpretation of bare NP as kind-referring (example: Italian).

(87) *Elefanti di colore bianco sono estinti. 'White-colored elephants are extinct.'

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