Sense anaphora and partitive anaphora in a dynamic framework

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In their survey of kind reference and genericity, Krifka et al. (1995) observe that non-generic uses of DPs can sponsor anaphoric uptake of kinds, cf. (1), and partitive anaphora to such kinds, cf. (2).

(1)   a. *John killed a spider because they are ugly.*
       b. *John drank some milk even though he is allergic to it.*

(2)   a. *John saw a spider and Mary saw one too.*
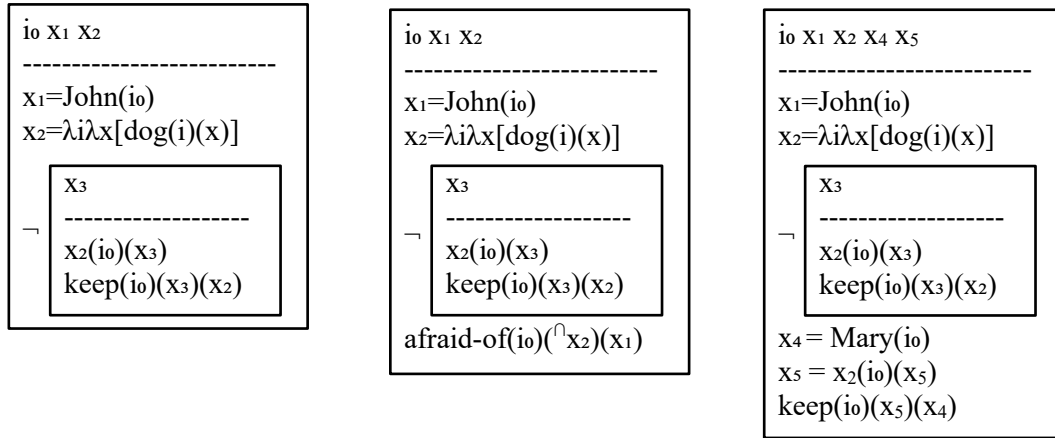   b. *John drank some milk and Mary drank some too.*

They also observe that discourse referents (drefs) of kinds are not restricted in the same way as those for objects; for example, they can be accessed under the scope of negation:

(3)   a. *John doesn't keep a dog. He is afraid of them. But Mary keeps one.*
       b. *Mary didn't buy any milk. She is allergic to it. But John bought some.*

While such facts are documented for a long time, and there exists work on partitive anaphora from descriptive perspectives and computational linguistics (cf. e.g. Webber 1979, Dahl 1984, Lødrup 2012, Recasens et al. 2016), they have not been integrated into frameworks of dynamic interpretation. In this talk I will **(A)** propose a general analysis of the phenomena within DRT, and **(B)** show how this analysis can be captured in a framework of direct dynamic interpretation.

A. I propose that all uses of nominal expressions based on a lexical nominal α introduce a dref anchored to the meaning or sense of α, here modelled by its intension. A second assumption is that this dref, like the drefs of names, is introduced globally. This is exemplified in the DRS (4)(a), where i_0 is the index of evaluation, x_1 is the dref for John at i_0, x_2 is the dref for the intension of *dog* (this is the same for all indices), and x_3 is the dref for an entity that falls under the extension of x_2 at i_0, hence is a dog.

(4)   a. *John doesn't keep a dog.*   b. (a) + *He is afraid of them.*   c. (a) + *Mary keeps one.*

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 i₀ x₁ x₂                          i₀ x₁ x₂                          i₀ x₁ x₂ x₄ x₅
 -----------------------           -----------------------           -----------------------
 x₁=John(i₀)                       x₁=John(i₀)                       x₁=John(i₀)
 x₂=λiλx[dog(i)(x)]                x₂=λiλx[dog(i)(x)]                x₂=λiλx[dog(i)(x)]
    ┌──────────────────┐             ┌──────────────────┐             ┌──────────────────┐
    │ x₃               │             │ x₃               │             │ x₃               │
    │ ------------------│             │ ------------------│             │ ------------------│
  ¬ │ x₂(i₀)(x₃)        │           ¬ │ x₂(i₀)(x₃)        │           ¬ │ x₂(i₀)(x₃)        │
    │ keep(i₀)(x₃)(x₂)  │             │ keep(i₀)(x₃)(x₂)  │             │ keep(i₀)(x₃)(x₂)  │
    └──────────────────┘             └──────────────────┘             └──────────────────┘
                                   afraid-of(i₀)(∩x₂)(x₁)            x₄ = Mary(i₀)
                                                                    x₅ = x₂(i₀)(x₅)
                                                                    keep(i₀)(x₅)(x₄)
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The pronoun *them* in (4)(b) picks up the intensional dref x_2 and creates the kind corresponding to it (cf. Chierchia 1998, who defines the down operator $^\cap$ when applied to a property as the intension of the sum of all entities in the extension of the property, $^\cap P = \lambda i\, \mathrm{sum}(\lambda x[P(i)(x)])$, which explains the plurality of the pronoun in the case of count noun properties). The pronoun *one* in (4)(c) also picks up x_2 and introduces an entity dref x_5 that falls under the concept x_2 at the index i_0. Cases like (5)(a) can be treated similarly; they differ from (4) as the first sentence introduces a kind dref $x_3 = {^\cap}x_2$ at the global level.

(5)   a. *John doesn't like dogs. He is afraid of them. / But he keeps one.*
       b. *A poodle is a good companion. They are friendly to children. / It is friendly to children.*

In generic predications like (5)(b), we can assume a quantificational duplex condition corresponding to the Gen operator in Krifka et al. (1995). Uptake by plural *they* can be interpreted as kind reference similar to (4)(b). Uptake by singular *it* can be analyzed as referring to the intension $\lambda i\lambda x[dog(i)(x)]$ directly, which constrains a dref for the generic statement, leading to the same interpretation as *A dog is friendly to children.*

Anaphora like *one* can also be used in strictly partitive way, as in *John bought some apples. Mary ate one*, where *one* can pick up the dref for the apples that John bought, and introduces a dref for one of them. In cases like *John bought some apples. Mary bought one*, the concept-related interpretation is more prominent; the partitive-related interpretation is more prominent in *...one of them.*

The proposed analysis requires that drefs can be anchored to intensional entities, specifically, properties. However, this is required by other phenomena as well, such as propositional anaphora (Snider 2017) and reference to individual concepts (Hofmann 2022).

B. I presented my proposal concerning anaphoric reference to senses in the representational, non-compositional framework of DRT. One central idea was that concept drefs are introduced in the global DRS. This raises the issue how it can be guaranteed in a compositional dynamic framework that concepts are introduced with widest scope, even when introduced in the scope of other operators, like negation. I propose here that they can be accommodated just like names, as their drefs are anchored to a unique entity (which can be seen by the use of the equal sign in (4)). This is an alternative to Muskens 1998, who treats names as constants.

I will illustrate this with a dynamic framework derived from Rooth (1987). Dynamic meanings are functions from input assignments to output assignments to intensions (with complications, e.g. for quantifiers). See (6) as an example, where g, h are partial assignments, $g<_{1,2}h$ states that h is an extension of g by the drefs 1 and 2, and h_1 is short for $h(1)$.

(6) $[\![$ *John$_1$ keeps a dog$_2$* $]\!] = \lambda g \lambda h \lambda i [g<_{1,2}h \wedge h_1 = F(i)(\textit{John}) = h_1 \wedge F(i)(\textit{dog})(h_2) \wedge F(i)(\textit{keep})(h_2)(h_1)]$

I propose instead that nominal expressions introduce concepts, and that names and concepts are not introduced as drefs in the output assignment but already present in the input assignment. Hence they constrain the input assignment (here represented by a smaller font):

(7) $[\![$ *John$_1$ keeps [a [dog$_2$]$_3$]* $]\!]$
   $= \lambda g \lambda h \lambda i : \text{g}_1=\text{F(i)(John)}, \text{g}_2=\lambda i' \lambda x[\text{F(i')(dog)(x)}] [g<_3h \wedge g_2(i)(h_3) \wedge F(i)(\textit{keep})(h_3)(g_1)]$

Being a condition on the input assignment, the drefs 1 and 2 are projected through operators like negation, cf. (8), and therefore can be accessed in subsequent discourse, in contrast to the dref 3.

(8) $[\![[\![$ *John$_1$ does not keep [a [dog$_2$]$_3$]* $]\!]$
   $= \lambda p \, \lambda g \lambda h \lambda i [g=h \wedge \neg \exists k[g \leq k \wedge p(g)(k)(i)]]([\![$ *John$_1$ keeps [a [dog$_2$]$_3$]* $]\!])$
   $= \lambda g \lambda h \lambda i: \text{g}_1=\text{F(i)(John)}, \text{g}_2=\lambda i' \lambda x[\text{F(i')(dog)(x)}] \, \neg \exists k[g<_3k \wedge g_2(i)(k_3) \wedge F(i)(\textit{keep})(k_3)(g_1)]$

We assume that interpretation is with respect to a CG, represented by a context set c that consists of pairs $\langle i, g \rangle$ of indices and assignments, where all assignments have the same domain. The general update rule is given in (9)(a), and the accommodation rule in (9)(b).

(9) a. $c + p = \{\langle i, h \rangle \mid \exists g[\langle i, g \rangle \in c \wedge p(g)(h)(i)]\}$
   b. If $c + p = \emptyset$ because the domain of the input assignment of p is larger than the domain of the assignments in c, then construct $c' = \{\langle i, g' \rangle \mid \exists g[\langle i,g \rangle \in c \wedge g'$ is the unique minimal extension of g such that $p(g')$ is defined$\}$, and perform the update $c' + p$ instead.

In case the drefs in the input assignment of p are anchored to unique names or to unique concepts, the extensions required by the accommodation rule are unique as well, and the accommodation (9)(b) is possible. This proposal makes the natural assumption that the meanings of expressions like *dog*, just as the carrier of names, are part of the common knowledge of the interlocutors.

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