Amount Semantics

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Abstract:

Within the typology of quantizing nouns, the word *amount* and other degree nouns stand out on the basis of their EXISTENTIAL interpretation

- *Amount* references abstract representations of measurement, i.e., degrees
- Degrees contain information about the objects that instantiate them

Outside the domain of quantizing nouns, *kind*'s behavior parallels that of *amount*

- Kind-denoting nominals also yield EXISTENTIAL interpretations
- The same machinery handling kinds handles degrees (DKP; Chierchia, 1998)

Degrees are nominalized quantity-uniform properties of individuals – the same sort of beast as kinds; as properties, degrees are instantiated by objects

A Puzzle: the existential interpretation of *amount*

The word *amount* admits both DEFINITE and EXISTENTIAL interpretations

(1) John ate the amount of apples you bought.
↪ John ate those apples there (DEFINITE)

(2) John ate the amount of apples you ate.
↪ there were some apples that John ate equal in amount to the apples that you ate (EXISTENTIAL)

Other quantizing nouns do not deliver this EXISTENTIAL interpretation

(3) a. ✓ John ate that **amount** of apples every day for a year.
b. ✗ John drank that **glass** of wine every day for a year. (container)
c. ✗ John bought that **kilo** of potatoes every day for a year. (measure)
d. ✗ John dropped that **grain** of rice every day for a year. (atomizer)

BUT: kind-denoting nominals do yield EXISTENTIAL interpretations

(4) a. ✓ John drank that vintage of wine every day for a year.
b. ✓ John bought those potatoes every day for a year.
c. ✓ John dropped that **kind** of rice every day for a year.

Compare *that amount of apples* and *that grain of rice*:

- An abstract representation of measurement instantiated by real-world objects
- A sortal concept – a nominalized property – instantiated by real-world objects

Degrees like *that amount of apples* are context dependent

- Three apples? Three pounds of apples? The measure must be fixed by context

Fixing the measure, degrees behave like properties which can be instantiated

- John ate an instance of that amount of apples every day for a year

The task: derive the EXISTENTIAL interpretation for *amount* in a way that tracks its similarities with *kind*; reevaluate our understanding of degrees

The Existential Interpretation of Kinds

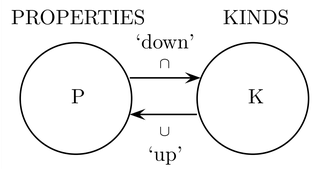
- With object-level predicates in episodic sentences, kind-denoting nominals yield EXISTENTIAL readings

(5) That kind of dog is barking outside my window
↪ There is an instance of the BULLDOG kind barking outside my window

Bulldog? Puppy?

- Like degrees, the dimension of evaluation by which the kind is determined must be fixed by context
- The noun *kind* applies to a kind and returns a set of kinds (its subkinds)

(6) a. $[\![\text{kind}]\!] = \lambda j \lambda k.\ \texttt{subkind}(j)(k)$
b. $[\![\text{kind of dog}]\!] = \lambda k.\ \texttt{subkind}(\text{DOG})(k)$
c. $[\![\text{kind of dog}]\!] = \left\{ \begin{array}{l} {}^{\cap}\lambda x.\ \texttt{bulldog}(x) \\ {}^{\cap}\lambda x.\ \texttt{collie}(x) \\ {}^{\cap}\lambda x.\ \texttt{poodle}(x) \\ \dots \end{array} \right\}$



d. $[\![\text{that kind of dog}]\!] = {}^{\cap}\lambda x.\ \texttt{bulldog}(x) = \text{BULLDOG}$

- EXISTENTIAL readings arise by ascribing properties to **instances** of the kind

(7) *Derived Kind Predication* (DKP; Chierchia, 1998):
If P apples to objects and k denotes a kind, then $P(k) = \exists x[{}^{\cup}k(x) \wedge P(x)]$

(8) $[\![\text{that kind of dog is barking}]\!] = \exists x[{}^{\cup}\text{BULLDOG}(x) \wedge \texttt{barking}(x)]$

A New Kind of Degree

- Degrees contain information that determines the objects that instantiate them

(9) John ate that amount of apples every day for a year
↪ there were apples that measured three in cardinality that John ate

- **The innovation**: degrees are nominalizations of quantity-uniform properties

(10) $[\![\text{that amount of apples}]\!] = {}^{\cap}\lambda x.\ \pi(\text{APPLE})(x) \wedge \mu_{\text{CARD}}(x) = 3$ (= d)

- Degrees are information bundles with four coordinates: $< \mu, n, \pi, k >$

(11) $\text{DEGREE} := {}^{\cap}\lambda x.\ \pi(k)(x) \wedge \mu_f(x) = n$
where μ_f is a contextually-supplied **measure**,
n is some **value** in the range of the measure μ_f, and
π is the contextually-supplied **partitioning instantiation** of the **kind** k.

- Degrees are the same sort of entity as kinds; DKP applies to them as well

(12) $[\![\text{John ate that amount of apples}]\!]$
$= \texttt{ate}({}^{\cap}\lambda x.\ \pi(\text{APPLE})(x) \wedge \mu_{\text{CARD}}(x) = 3)(\texttt{john})$
$= \exists y[\pi(\text{APPLE})(y) \wedge \mu_{\text{CARD}}(y) = 3 \wedge \texttt{ate}(y)(\texttt{john})]$

- *Amount* relates a kind-denoting substance noun with a set of degrees

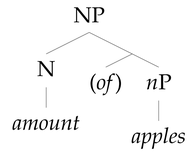
(13) $[\![\text{amount}]\!] = \lambda k \lambda d.\ \exists n[d = {}^{\cap}\lambda x.\ \pi(k)(x) \wedge \mu_f(x) = n]$

- Other degree nouns include *size*, *width*, *length*, etc. (any words naming degrees)

Referencing Degrees

- At the NP-level, transitive *amount* composes with the substance noun

(14) $[\![\text{amount of apples}]\!]$



$= \left\{ \begin{array}{l} {}^{\cap}\lambda x.\ \pi(\text{APPLE})(x) \wedge \mu_{\text{CARD}}(x) = 1 \\ {}^{\cap}\lambda x.\ \pi(\text{APPLE})(x) \wedge \mu_{\text{CARD}}(x) = 2 \\ {}^{\cap}\lambda x.\ \pi(\text{APPLE})(x) \wedge \mu_{\text{CARD}}(x) = 3 \\ \dots \end{array} \right\}$

- We access nominalized properties through the objects that instantiate them

(15) $[\![\text{that}]\!] = \lambda A.\ \iota y[A(y) \wedge {}^{\cup}y(\text{THAT})]$
where A is a set of individuals, either nominalized properties or objects, and THAT is the salient object indicated in the use of the demonstrative

- Applies to nominalized properties elsewhere: *that kind of dog*, *that style of art*
– In basic uses, e.g., *that boy*, assume ${}^{\cup}a := \text{IDENT}(a)$ $(= \lambda x.\ x = a)$

Modifying Degrees

- Sets of degrees may be modified by object-level predicates via point-wise DKP

(16) *Existential Degree Modification*:
$A_{\langle d,t \rangle} \bigcap P_{\langle e,t \rangle} := \lambda d.\ A(d) \wedge \exists x[P(x) \wedge {}^{\cup}d(x)]$
$P_{\langle e,t \rangle} \bigcap A_{\langle d,t \rangle} := \lambda x.\ P(x) \wedge \exists d[A(d) \wedge {}^{\cup}d(x)]$

(17) John ate the **amount of apples on the table**
a. $[\![\text{amount of apples}]\!] = \lambda d.\ \exists n[d = {}^{\cap}\lambda x.\ \pi(\text{APPLE})(x) \wedge \mu_f(x) = n]$
b. $[\![\text{on the table}]\!] = \lambda x.\ \texttt{on-table}(x)$
c. $\lambda d.\ \texttt{amount-of-apples}(d) \wedge \exists x[\texttt{on-table}(x) \wedge {}^{\cup}d(x)]$

- Degrees may be abstracted over, as in relative clauses headed by *amount*

(18) John ate the amount of apples λd (that) you ate d
a. $\lambda d.\ \texttt{ate}(d)(\texttt{you}) \quad \Rightarrow \textit{via DKP} \Rightarrow \quad \lambda d.\ \exists x[\texttt{ate}(x)(\texttt{you}) \wedge {}^{\cup}d(x)]$
b. $\lambda d.\ \texttt{amount-of-apples}(d) \wedge \exists x[\texttt{ate}(x)(\texttt{you}) \wedge {}^{\cup}d(x)]$
He ate an instance of the maximal apple degree true of something you ate

- By tracking the objects that instantiate them, degrees yield "degree relatives"

(19) John ate the apples λd (that) there were d on the table

- A degree relative references objects directly; no EXISTENTIAL interpretation

Degrees-as-Kinds vs. Degrees-as-Points

- Reimagining degrees as nominalized properties, no coverage is lost
– Degrees are traditionally considered points along a scale ($<\mu$, n>)
– These degrees-as-points will not deliver the EXISTENTIAL interpretation
- Degrees-as-kinds translate straightforwardly into theories of gradability

(20) a. $[\![\text{tall}]\!] = \lambda d \lambda x.\ \mu_{\texttt{tall}}(x) \geq d \quad \Rightarrow \quad \lambda d \lambda x.\ \exists d'[d' \geq d \wedge {}^{\cup}d'(x)]$
b. $[\![\text{John is taller than Bill}]\!] = \exists d[\texttt{tall}(d)(\texttt{john}) \wedge \neg\texttt{tall}(d)(\texttt{bill})]$

- Measurement becomes the job of degrees, not gradable predicates

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