Semantics and Information Structure of Definitional Sentences

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Definitions: Some obvious examples

▽ Dictionary definitions (Wikipedia)

A definition is a passage that explains the meaning of a term (a word, phrase or other set of symbols), or a type of thing. The term to be defined is the *definiendum*. A term may have many different senses or meanings. For each such specific sense, a *definiens* is a cluster of words that defines that term.

▽ Definitions in mathematics (G. Birkhoff, *Lattice Theory*):

DEFINITION. A *poset* is a set in which a binary relation $x \leqq y$ is defined, which satisfies for all x, y, z the following conditions:

P1. For all x, $x \leqq x$.   (Reflexive)
P2. If $x \leqq y$ and $y \leqq x$, then $x = y$.   (Antisymmetry)
P3. If $x \leqq y$ and $y \leqq z$, then $x \leqq z$.   (Transitivity)

▽ Definitons in legal documents:

For the purposes of this **Coverage** the following definitions apply:

(a) **Concessions Agreement** means an agreement between the **Insured** and an insurer which requires the insurer to notify the **Insured** in the event that a **Policy of Insurance** is not effected or renewed by, or has been allowed to lapse by, the mortgagor or otherwise becomes invalid.

(b) **Coverage** means this Mortgage Impairment Protection Policy, the **Schedule** and any endorsement attached to or incorporated in this policy.

Definitions: Some more linguistic forms

➤ The *is said* construction (cf. also Cormack 1998):

In order to follow what is explained below, it is important to first understand the concept of Intersection. Two cells are said to "intersect" if they share a row, column, or block. This of course makes it impossible for them to be the same number.

➤ The *is called* construction:

A male donkey or ass is called a **jack**, a female a jenny, and an offspring less than one year old a foal (male: colt, female: filly).

➤ The *is considered* construction:

- An adult who has a BMI between 25 and 29.9 is considered overweight.

- An adult who has a BMI of 30 or higher is considered obese.

➤ The *is defined* construction:

Solution is defined as a homogeneous mixture of two or more chemical substances. The state of matter of a solution may be solid, liquid or gaseous.

Definitions: More linguistic forms

- Generic sentences, especially indefinite generics.

  An octagon is a polygon that has eight sides.

  An oculist is an eye-doctor.

- Partial definitions with generic sentences:

  This can't be an octagon. An octagon has eight sides.

  This can't be an insect. An insect has three pairs of legs.

- Copular infinitive constructions (partial definitions):

  To love is to obey.

  To love is to forgive.

  To love is to risk not being loved in return.

Definitional Texts

A Greenhorn.

Dear reader! Do you know what the word "greenhorn" means? It is a really annoying and denigrating term for anyone to whom it is applied. Green is the color, of course, and horn actually means "feeler". In short, a greenhorn is a person who is still green, new and inexperienced in the country, and who has to extend his feelers gingerly if he does not want to risk giving offense. —

A greenhorn is a fellow who doesn't get up from his chair when a lady wants to sit down, and who greets the man of the house before having paid his respect to the wife and daughter. He slips the cartridge in backward when he loads his gun, or first rams the primer, then the bullet, and finally the powder into his muzzleloader. A greenhorn either speaks no English at all or sounds stilted when he does. (…)

A greenhorn takes a raccoon for an opossum, and the prints of a turkey for the trail of a buffalo. A greenhorn smokes cigarettes and despises the man spitting tobacco juice. When he is slapped by a Paddy, a greenhorn will run to complain to the Justice of the Peace instead of shooting the fellow down on the spot in a true Yankee fashion. (…)

Karl May, Winnetou I (1892), Chapter I: A Greenhorn (translation from German)

Basic observation:

In explicit definitions (is said to, is defined as, is called), the definiendum is in focus:

Two cells are said to "intersect" if they share a row, a column, or a block.

*A male donkey or ass is called a **jack**.*

Coverage *means this mortgage impairment protection policy.*

Solution *is defined as a homogenous mixture of two or more chemical substances.*

In definitional generic sentences, the definiendum is arguably a topic:

An octagon is a polygon that has eight sides.

A greenhorn takes a raccoon for an opossum, and the prints of a turkey for the trail of a buffalo.

Main topic of this talk: Definitional generic sentences, based on M. Krifka, "Definitional generics", to appear.

Information Structure of Definitional Sentences

Suggestion: The defined term (definiendum) is the **topic**.

➤ The definition is about the definiendum:
A: *What is an octagon? / Tell me something about octagons!*
B: *An octagon is a polygon that has eight sides.*

➤ We can apply the as for construction:
Hexagons are polygons that have six sides.
As for octagons, they have eight sides.

➤ In German, the defined term occurs left of sentence adverbials (W. Frey):
weil ein Insekt | schließlich sechs Beine hat.

➤ The definiendum is deaccented.

➤ In formal mathematical definitions, the defined term occurs initially, at the left:
$f(x) := x^3 + x^2 + x + 1$

But the defined term is often new, hence should not be the topic:

➤ The definiendum can be highlighted, accentually or graphically:
*A **weed** is a plant that is considered by the user of the term to be a nuisance*

Two cells are called to interSECT if they share a row, a column, or a block.

In any case: The defined term is informationally separated from the rest.

Two kinds of generic sentences

Lawler (1973): bare plurals vs. indefinite singulars:

(bare plural generic, BPG)

Madrigals are polyphonic.
Madrigals are popular.

(indefinite singular generic, ISG)

A madrigal is polyphonic.
#A madrigal is popular.

A football hero is popular.

Lawler: "indefinite generics seem most natural in definitional sentences, or ones used somehow to identify the nature of the thing specified by the generic by means of properties peculiar to it; they are less acceptable when an accidental quality is predicated on them"

Burton-Roberts (1977): ISGs are analytic statements;
(where definitional statements are a subcase of analytic statements):

A tiger climbs trees.
equivalent to:
To be a tiger is to climb trees.

Burton-Roberts is sceptical about the idea that a sentence can express by its very form that it is analytically true.

Two kinds of generic statements, cont.

Cohen (2001, inspired by Carlson 1995):
  ISGs express rules; BPGs express rules or generalisations.

An electron has / Electrons have a negative electric charge. (Physical rule)

A gentleman opens / Gentlemen open doors for ladies. (Moral rule)

A boy doesn't cry. / Boys don't cry. (Behavioral rule)

A bishop moves / Bishops move diagonally. (Legal rule in chess)

A pomegranate apple costs / Pomegranate apples cost 49 cents. (Legal rule)

A madrigal is / Madrigals are polyphonic. (Linguistic rule, definition of madrigal).

Cohen does not give a semantics for "a rule being in effect"

Greenberg (2003, 2007):
  ISGs a subcase of generic sentences,
  which are generally analyzed as modal statements.
  ISGs are true "in virtue of" a certain property,
  e.g. in virtue of physical laws, of codes of behavior, of rules of a game etc.

Descriptive vs. definitional talk

Descriptive talk:

➤ Interpretation of language is fixed, and identical for all participants.

➤ Communication about the world.

Definitional talk:

➤ Interpretation of language is not fixed

➤ Communication about the language;
with the aim to reach identical interpretation for all participants.

Frege (*Begriffsschrift*, 1879):

➤ Judgement stroke for assertions: |— Φ: The thought Φ is asserted.

➤ Double stroke for definitions: ||— Φ: Terms in Φ are interpreted so that Φ is true.

This suggests that original definitions are of the speech-act type of declarations; word-to-world and world-to-word direction of fit (Searle 1975):

I hereby declare you husband and wife.
A madrigal is polyphonic.

Definitions, just like other declarations, can be reported:

A male donkey is called a jack. / A jack is a male donkey.
They were declared husband and wife.

Semantics of talking about language: Examples

Barker (2002): Fixing standards of vague predicates.

- Descriptive use: Standard of tallness is assumed to be shared; Feynman's height is not known; information about Feynmans height.

  (1) A: *You knew Feynman. What was he like?*
      B: *Well... he was quite TALL, (...)*

- Definitional use: Standard of tallness is not shared; Feynman's height is known; this is used to fix standard of tallness.

  (2) A: *I'm looking for a tall person. I'm new here. What counts as tall around here?*
      B: *Well... FEYNman is tall.*

Hinterwimmer (2010): Special use of conditions.

If I hate anything, it is bad acting.

Quantification over different interpretation standards of *hate*; for every precisification of interpretation of *hate*, the sentence *I hate bad acting* is true.

Modelling descriptive and definitinal talk

Normal interpretation format:

$[\![\alpha]\!]^w$ = the extension of expression α in world w.

Here: Two indices,

➤ w: possible world, factual information

➤ i: indes of interpretation, information about language

Hence:

➤ if for any w, w', i: $[\![\alpha]\!]_{i;w} \neq [\![\alpha]\!]_{i;w'}$,
   then there is a factual difference between w, w'

➤ if for any w, i, i': $[\![\alpha]\!]_{i;w} \neq [\![\alpha]\!]_{i';w}$,
   then there is primarily an interpretational difference between i, i';
   however, there often are concomitant differences in the possible worlds,
   as the interpretation is fixed in actions that happen in the world.

Descriptive / definitional update of Common Ground

Standard model of communication as update of Common Ground CG:

New conception of CG as a pair $\langle I, W \rangle$, where:

➤ I: set of admissible interpretations;

➤ W: Set of possible worlds that are compatible with the factual information of the common ground.

Descriptive vs. definitional update of CG with a statement Φ:

➤ $\langle I, W \rangle + DES(\llbracket \Phi \rrbracket) = \langle I, \{w \in W | \exists i \in I [\llbracket \Phi \rrbracket^{i,w}}\} \rangle$,
i.e. worlds are restricted so that Φ is true for at least one interpretation admissible for the CG.

➤ $\langle I, W \rangle + DEF(\llbracket \Phi \rrbracket) = \langle \{i \in I | \forall w \in W [\llbracket \Phi \rrbracket^{i,w}}\}, W \rangle$,
i.e. interpretations are restricted so that Φ is true at all possible worlds compatible with the CG.

Illustration with Barker's example:

Three interpretations and three worlds:

➤ F(i1, w)(*tall*) = {x| x ≥ 1,90m in w}

➤ F(i2, w)(*tall*) = {x| x ≥ 1,80m in w}

➤ F(i3, w)(*tall*) = {x| x ≥ 1,70m in w}

➤ height of Feynman in w1: 1,95m, in w2: 1,85m, in w3: 1,75m

➤ height of Teller in w1: 1,85m, in w2: 1,75m, in w3: 1,65m

Example of descriptive talk:

➤ ⟨{i1, i2}, {w1, w2, w3}⟩ + DES(⟦*Feynman is tall*⟧) = ⟨{i1, i2}, {w1, w2}⟩

Example of definitional talk, with contrast Feynman vs. Teller:

➤ ⟨{i1, i2, i3}, {w1, w2}⟩ + DEF(⟦*Feynman is tall*⟧ ∧ ¬⟦*Teller is tall*⟧)
 = ⟨{i2}, {w1, w2}⟩

Observe:

➤ Descriptive talk reduces possible worlds;

➤ definitional talk reduces admissible interpretations.

Descriptive vs. definitional generic sentences

Assume again three worlds and three interpretations:

➤ In w1, w2, madrigals happen to be generally popular, in w3, they are not.

➤ According to i1 and i2, madrigals have to be polyphonic, i3 allows for monophonic madrigals.

Example for descriptive talk:

➤ ⟨{i1, i2, i3}, {w1, w2, w3}⟩ + DES(⟦Madrigals are popular⟧)
= ⟨{i1, i2, i3}, {w1, w2}⟩

Example of definitional talk:

➤ ⟨{i1, i2, i3}, {w1, w2, w3}⟩ + DEF(⟦A madrigal is polyphonic⟧)
= ⟨{i1, i2}, {w1, w2, w3}⟩

Problem: With the same interpretation procedure,

⟨I,W⟩ + DEF(⟦A madrigal is polyphonic⟧)

= ⟨{i∈I |∀w∈W ⟦A madrigal is polyphonic⟧^{i,w}}, W⟩

we could also have restricted the definition for polyphonic!

A: *Can you tell me what "polyphonic" means?*
B: *Well... a MAdrigal is polyphonic (for example)*

Definitional talk and topicality

Crucial:
We have to factor in topicality;
definitions are about the definiendum.

Assume: Topic-comment structuring ⟨Topic, Comment⟩,
where comment is applicable to the topic (cf. Dahl 1975, ...)

Interpretation of definitional topic-comment structures:

▽ ⟨I, W⟩ + DEF(⟨⟦α⟧, ⟦β⟧⟩)
= ⟨{i∈I | ∀w∈W∀x[⟦α⟧^{i,w}(x) → ∀i'∈I ⟦β⟧$^{i',w}$(x)]}, W⟩, if α is a predicate,

Example:

▽ ⟨I, W⟩ + DEF(⟨⟦*a madrigal*⟧, ⟦*is polyphonic*⟧⟩)
= ⟨{i∈I | ∀w∈W∀x[⟦*a madrigal*⟧^{i,w}(x) → ∀i'∈I ⟦*is polyphonic*⟧$^{i',w}$(x)]}, W⟩

This restricts the set of admissible interpretations I to those interpretations i
that guarantee that in each of the accessible worlds w,
each x that falls under the predicate *a madrigal* at i also falls under *polyphonic*,
under every of the original admissible interpretations.

We restrict the admissible interpretations w.r.t. *madrigal*, not *polyphonic*.

Connection to topicality: Topic ≈ Restrictor of quantifier (Partee 1991).

Term-related definitional sentences

An oculist is an eye doctor.

Interpretation rules for terms:

➢ ⟨I, W⟩ + DEF(⟨[[α]], [[β]]⟩)

= ⟨{i∈I | ∀w∈W∀X[[[α]]^{i,w} = X → ∀i'∈I [[β]]$^{i',w}$([[X]])]}, W⟩, if α is a term.

Application to example:

➢ ⟨I, W⟩ + DEF(⟨[[*an oculist*]], [[*is an eye doctor*]]⟩)

= ⟨{i∈I | ∀w∈W∀X[[[*an oculist*]]^{i,w} = X → ∀i'∈I[[*is an eye doctor*]]^{i,w}([[X]])]}, W⟩

where [[*is an eye doctor*]]^{i,w}(X)

= λP'λP[P = P']([[*an eye doctor*]]^{i,w})(X)   (Copula of identity)

= [X = [[*an eye doctor*]]^{i,w}]

i.e. whenever the set X is the extension of *oculist*,
it is also the extension of eye doctor.

Interaction Definitions – Facts

A donkey has 62 chromosomes.
considered definitionally true – but is it an analytic sentence?

Kripke (1972, 1980), Putnam (1975) on synthetic sentences a priori.

The morning star is the evening star.
Hesperus is Phosphorus.

As the two terms **happen** to refer to the same entity, they do **necessarily** so.

Application for natural kind terms:

General rule, for animals: same genetic makeup → same species.
It is discovered that a particular specimen of donkey has 62 chromosomes.
As this specimen fell under the definition of *donkey*,
the definition can now be made more precise, following the general rule;
it becomes part of the **definition** of *donkey* to have 62 chromosomes.

Such definitinal properties are "in virtue of" properties of Y. Greenberg.

See Krifka (to appear) for worked-out theory and examples.

Extension of this interpretation to non-"natural" kinds, e.g.:

A gentleman opens the door for a lady.
A greenhorn takes a raccoon for an opossum.
A boy doesn't cry.

Form of generic sentences:

Received opinion:

▷ BPG ambiguous between definitional and descriptive (generalizing) interpretation:

Madrigals are polyphonic.
Madriglas are popular.

▷ IDG only have the definitional interpretation:

A madrigal is polyphonic.
 # A madrigal is popular.

Problem: Clearly non-definitional uses of IDGs:

A trout can be caught by many different methods.
A poodle should be clipped by a professional groomer.
A madrigal sounds best when all voices are doubled.

Explanation:

▷ indefinite singular NPs and bare plural NPs have the same semantic type, hence can be used roughly in the same environments.

▷ indefinite singular NPs are generally better suited for definitional generics, as checking whether an entity falls under the definition or not requires looking at **single** individuals.

▷ If predicates clearly cannot be understood as definitional, they are fine with IDGs.

Conclusion

Argued for a distinction between **descriptive** / **definitional** interpretation, a distinction not often considered.

Argued for a treatment of certain cases of generics as definitional.

Explained why the definiendum part of definitional clauses of this type is topical.

See M. Krifka, 'Definitional generics', to appear in a collection on generics ed. by A. Mari & C. Beyassade;

see paper on http://amor.rz.hu-berlin.de/~h2816i3x/Lehrstuhl.html

Cormack Annabel. 1998. Definitions. Implications for syntax, semantics and the language of thought. New York: Garland.

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