Binding, agreement and predicative complements

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For the semantic analysis of clauses with a predicative complement, as in (1), it is commonly assumed that the predicative complement and its target form a unit which as a whole is an argument of the verb, as in (2).[1]

(1) a. John is rich.
b. John seems reliable to me.

(2) a. is (rich (John))
b. seems (reliable (John), me)

Since this treatment is part and parcel of predicate logic, we will call it **Fregean**. It has influenced the mainstream transformational analysis, known as the small clause treatment (Chomsky (1981), Stowell (1983)), which in turn has influenced the canonical HPSG treatment. In the latter, predicative complements are assumed to denote a state-of-affairs and to be syntactically unsaturated [SUBJ <NP>], while the verbs which select them are treated as subject raisers. This is illustrated by the AVMs of the English copula in Pollard and Sag (1994, 147) and the German *erscheinen* 'seem' in Müller (2002, 104).[2]

(3)
$$\begin{bmatrix} \text{CONTENT} & \boxed{2}\ soa \\ \text{ARG-ST} & \left\langle \boxed{1}\ \text{NP}\ ,\ \text{XP}[\text{PRD}\ +,\ \text{SUBJ}\ \langle \boxed{1} \rangle : \boxed{2}] \right\rangle \end{bmatrix} \qquad \begin{bmatrix} \text{CONTENT} & \begin{bmatrix} \textit{erscheinen-rel} \\ \text{EXPERIENCER} & i \\ \text{SOA} & \boxed{2}\ soa \end{bmatrix} \\ \text{ARG-ST} & \left\langle \boxed{1}\ \text{NP}\ ,\ \text{NP}[\textit{dative}]_i\ ,\ \text{XP}[\text{PRD}\ +,\ \text{SUBJ}\ \langle \boxed{1} \rangle : \boxed{2}] \right\rangle \end{bmatrix}$$

An alternative proposal for the analysis of clauses with a predicative complement is based on the assumption that the verb denotes a relation between the denotations of the predicative complement, its target and –possibly– a third argument, as in (4).

(4) a. is (John, rich)
b. seems (John, reliable, me)

Since this resembles the analysis of the copula in Montague's PTQ paper, we will call it **Montagovian**. A monostratal version of this proposal was introduced in Van Eynde (2009) and further elaborated in Van Eynde (2015). It assumes that predicative complements denote a scope-object, which implies that their semantic representation consists of an index and a set of restrictions on that index, and that the selecting verbs assign a semantic role to the predicative complement, its target and –possibly– a third argument, as illustrated in (5) for *be*, *seem* and *consider*.

(5)
$$\begin{bmatrix} \text{CONTENT} & \begin{bmatrix} \textit{be-rel} \\ \text{THEME} & i \\ \text{ATTRIBUTE} & j \end{bmatrix} \\ \text{ARG-ST} & \left\langle \text{NP}_i\ ,\ \text{XP}_j \right\rangle \end{bmatrix} \qquad \begin{bmatrix} \text{CONTENT} & \begin{bmatrix} \textit{seem-rel} \\ \text{THEME} & i \\ \text{ATTRIBUTE} & j \\ \text{EXPERIENCER} & k \end{bmatrix} \\ \text{ARG-ST} & \left\langle \text{NP}_i\ ,\ \text{XP}_j\ ,\ \text{PP}_k \right\rangle \end{bmatrix} \qquad \begin{bmatrix} \text{CONTENT} & \begin{bmatrix} \textit{consider-rel} \\ \text{EXPERIENCER} & i \\ \text{THEME} & j \\ \text{ATTRIBUTE} & k \end{bmatrix} \\ \text{ARG-ST} & \left\langle \text{NP}_i\ ,\ \text{NP}_j\ ,\ \text{XP}_k \right\rangle \end{bmatrix}$$

[1] On the assumption that the copula is semantically vacuous (2a) is usually reduced to 'rich (John)'.

[2] These are not literal quotes. The AVM of the copula in Pollard and Sag (1994) contains a third argument for the existential *there*. It is claimed to be derived by lexical rule from an AVM with two arguments, which can be inferred to look like the AVM in (3). Notice that the CONTENT value of the copula is identified with that of its predicative complement. This captures the idea that the copula is semantically vacuous, see footnote 1. For the sake of uniformity, we use the ARG-ST list to spell out the constraints on argument selection, rather than SUBCAT or XCOMP.

In this treatment there are no constraints on the degree of saturation of the predicative complement and there is no subject raising.

The purpose of this paper is to show that the two treatments make different empirical predictions and that the predictions of the Montagovian treatment are more accurate than those of the Fregean one. To this end we make a distinction between open and closed predicative complements. The former include the adjectival and participial predicative complements, and the latter the predicate nominals.

1 Open predicative complements

Typical of the open predicative complements is that they show number and gender agreement with their target, as in the Italian (6).

(6) Questo cane è nero.
'this.SG.MAS dog.SG.MAS is black.SG.MAS'

If the predicative complement contains an anaphoric pronoun, as in (7), there is also agreement between the adjective (*orgoglioso*) and the anaphor (*se stesso*).

(7) Mio fratello è orgoglioso di se stesso.
'my brother.SG.MAS is proud.SG.MAS of REFL self.SG.MAS'

By transitivity, there is agreement between the AP-internal anaphor and the subject. This agreement not only concerns number and gender, but also person, and can be observed in languages which do not inflect the adjectives, such as English.

(8) a. He is so proud of himself/*themselves/*herself/*yourself.
b. They/*I seem afraid of each other.

To model the binding relations, we adopt the canonical HPSG binding theory, which requires an anaphor and its antecedent to be co-arguments (Pollard and Sag 1994, 248–258). The anaphoric pronouns in (7–8) must, hence, be coindexed with a less oblique argument of the adjective, and the obvious candidate for that purpose is its unexpressed subject.[3]

(9) a. Mio fratello è [NP$_i$ orgoglioso [di se stesso$_i$]$_i$]
b. He is [NP$_i$ so proud [of himself$_i$]$_i$]

To model the agreement relations, the Fregean and the Montagovian HPSG analyses work differently.

In the **Fregean** one, the adjective denotes a state-of-affairs, and its unexpressed subject is identified, and hence coindexed, with the subject of the verb, see (3). This accounts for the agreement between the AP-internal anaphor and the subject. For the agreement between the adjective and the subject, the most detailed proposal is the one of Kathol (1999). To deal with mismatches, as in the Spanish (10), he argues that the adjective does not share the grammatical gender of the subject, but rather the GENDER value in its index.

(10) Su Majestad suprema está contento.
'his Majesty.SG.FEM supreme.SG.FEM is pleased.SG.MAS'

[3]The coindexation of the PP and its NP daughter follows from the treatment of argument marking prepositions, see Sag, Wasow and Bender (2003, 209–213).

A similar point is made about the number mismatch in the French (11), quoted from Wechsler and Zlatić (2003).

(11) On a été loyaux.
'one.SG has.SG been loyal.PL.MAS'

To model this, Kathol employs an asymmetric –otherwise unattested– type of agreement: Since predicative complements do not have an index in the Fregean HPSG treatment, it is their grammatical number and gender values that are required to match the corresponding values in the index of the subject.

In the **Montagovian** treatment, the adjective denotes a scope-object and shares its index with that of its unexpressed subject. Intuitively, the adjective is understood to denote those who have the relevant property (of being black or proud or ...). Technically, this is modeled in terms of a constraint on open lexemes (Van Eynde 2015, 135).[4]

(12) *open-lx* $\Rightarrow$
$$\left[\begin{array}{l} \textsc{content} \left[\begin{array}{l} \textit{scope-object} \\ \textsc{index} \ \boxed{1} \ \textit{referential} \end{array}\right] \\ \\ \textsc{arg-st} \left\langle \left[\begin{array}{l} \textit{noncanonical-synsem} \\ \textsc{content}\,|\,\textsc{index} \ \boxed{1} \end{array}\right] \right\rangle \oplus \textit{list} \end{array}\right]$$

Open lexemes are related to words by means of lexical rules. They may introduce inflectional variation and concomitant constraints on the NUMBER and GENDER values of the index, as for the Romance languages. The coindexation requirement in (12), hence, models the AP-internal agreement, licensing *orgoglioso de se stesso*, but blocking instances of gender or number discord, as in *orgoglioso de se stessa/stessi/stesse*. Since the adjective shares its index with the AP as a whole, the agreement with the subject can also be captured in terms of index sharing.

(13) a. [Mio fratello]$_i$ è [NP$_i$ orgoglioso$_i$ di se stesso$_i$]$_i$
b. He$_i$ is [X$_i$ so proud$_i$ of himself$_i$]$_i$
c. They$_i$ seem [X$_i$ afraid$_i$ of each other$_i$]$_i$

Comparing the Fregean treatment with the Montagovian one, it is clearly the latter that is less stipulative. First, since attributive adjectives are canonically treated as denoting a scope-object and as sharing the index of the modified nominal (Pollard and Sag 1994, 55–57), the treatment of the predicative adjectives as denoting a scope-object and as sharing the index of their target is –ceteris paribus– preferable to a treatment in which attributive and predicative adjectives belong to different semantic types. Second, since scope-objects have an index, it follows that the agreement between predicative adjectives and their target can be modeled in terms of index sharing in the Montagovian HPSG treatment, whereas the Fregean treatment requires an asymmetric –otherwise unattested– kind of agreement.

Apart from being less stipulative, the Montagovian treatment is also more accurate. To demonstrate this, let us take the participial predicative complements. They derive from verbal lexemes, but show the same type of inflection and agreement as the adjectives. To model this we use type shifting lexical rules, such as (14) for the English present participle.

[4]The requirement that the first argument be of type *noncanonical-synsem*, in the sense of Ginzburg and Sag (2000, 40), captures the constraint that the subject is left unexpressed. There is no constraint on the part-of-speech value, since the open lexemes also include participles, adverbs and prepositions, see (14).

(14)
$$\begin{bmatrix} \textit{v-lx} \\ \text{FORM} \quad \boxed{A} \\ \text{CONTENT} \quad \boxed{1}\ \textit{soa} \end{bmatrix} \Rightarrow_{LR} \begin{bmatrix} \textit{open-lx} \\ \text{FORM} \quad \mathrm{F}_{ing}\left(\boxed{A}\right) \\ \text{CAT} \mid \text{HEAD} \mid \text{VFORM} \quad \textit{pres-ptc} \\ \text{CONTENT} \begin{bmatrix} \textit{scope-object} \\ \text{RESTR} \left\{ \begin{bmatrix} \textit{fact} \\ \text{PROP} \mid \text{SOA} \quad \boxed{1} \end{bmatrix} \right\} \end{bmatrix} \end{bmatrix}$$

The right hand side is subsumed by the constraint in (12), which implies that the participle's index is identified with that of its first argument and required to be referential.[5] This correctly accounts for the contrast between (15) and (16).

(15) a. His speech does not seem convincing.
b. We consider this speech convincing.

(16) a. * It seemed snowing.
b. * We consider it snowing.

The restriction also applies to the attributive uses, as shown by the contrast between the well-formed *a convincing speech* and the ill-formed *a snowing day*. The Fregean HPSG treatment, by contrast, allows (16) and, hence, requires additional stipulations to block it.

2 Closed predicative complements

Closed predicative complements do not show agreement with their target. Predicate nominals, for instance, have their own person, number and gender values, and these do not need to be shared with the target, as shown in (17).

(17) a. You are a genius.
b. Those traffic jams are becoming a real problem.
c. These days every woman can become a man in this country.

Moreover, NP-internal anaphora are exempt from the localist constraints on the binding principles (Pollard and Sag 1994, 266–272).

(18) a. According to John$_i$ the only relevant item is [that picture of himself$_i$ in *Newsweek*]
b. Mary$_i$ is not interested in [anybody's opinion of herself$_i$].

The anaphora have no antecedent within the bracketed NP and do not share their index with the nominal head of the NP.

In spite of these differences, the **Fregean** HPSG analysis treats the predicate nominals along the same lines as the adjectival ones: The nominals are assumed to denote a state-of-affairs and to have

[5] This restriction does not hold for the participial complement of the progressive *be*. In contrast to the predicate selecting copula *be*, the progressive auxiliary *be* is a subject raiser: It selects a participial VP which denotes a state-of-affairs and whose first argument may be non-referential. Independent evidence for differentiating this use from the predicative/attributive one is provided by the fact that the present participles of most other languages only have the latter uses. This is the case for German, Dutch and Italian.

an unexpressed subject that is identified with the subject of the verb. This necessitates a type shift, since nominals canonically denote a scope object, as well as the addition of an extra argument, also for nominals which are treated as fully saturated NPs in any other context, such as *a genius* and *a real problem*.

The **Montagovian** HPSG treatment, by contrast, treats the predicate nominals as scope-objects, just like the other nominals, so that there is no need for a type shift. Besides, since it does not require the predicative complements to be unsaturated, it does not need to tinker with the argument structure of the (pro)nouns which head a predicate nominal. The only provision to make is that nominal lexemes are not subsumed by (12), i.e. that they do not belong to the open lexemes. This is independently motivated by several other facts: Their ARG-ST list may be empty, as in the case of most proper nouns and pronouns, their first argument, if they have one, need not be left unexpressed, as in *anybody's opinion*, and it need not share the index of the noun.

In sum, while the predicate nominals can be integrated smoothly in the Montagovian HPSG treatment of the predicative complements, they require special and otherwise unmotivated stipulations to fit in with the Fregean HPSG treatment.

3 Conclusion

We have presented two proposals for the semantic analysis of clauses with a predicative complement and shown that they make different empirical predictions. Comparing the results it turns out that the Montagovian treatment is less stipulative and more accurate than the Fregean one.

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