Article selection and anaphora in the German relative clause

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German definite articles are able to contract with prepositions under certain conditions. When a noun phrase is discourse anaphoric, contraction is blocked. In the current paper we present a puzzle: restrictive relative clauses require the use of the non-contracted (strong) article form, despite their apparent lack of anaphoricity; both the determiner of the head noun and the relative pronoun (which is, in most cases, syncretic with the definite article) surface with the strong form. We provide a uniform analysis of discourse anaphoric and relative clause uses that makes use of contexts, as defined in the dynamic framework of de Groote (2006). We argue that a lexical item, which we call "*anaph*", whose purpose is to make reference to an individual provided by the context, intervenes between the noun and the article in the strong form. *anaph* makes reference to an individual provided by the global context in cases of anaphora, and to an individual provided by an updated local context in the case of relative clauses.

Introduction. Work in the semantics of anaphora that makes use of variables has assumed either that anaphoric expressions themselves are variables (Kamp, 1981; Heim, 1982, and work in this tradition), or that variables are properly contained in their syntactic description (Schwarz, 2009; Elbourne, 2005, 2008). Here we present a semantics for anaphoric definite descriptions in German that strongly supports a version of the latter view. The semantics we present is a variable-free account of the phenomenon presented, in that we give a lexical denotation to what traditionally serves the role of a variable on this view. We provide support for the view, and our proposal specifically, by showing that it solves a puzzle in the morphology and semantics of German relative clauses, as well as a novel puzzle involving the appearance of the modifier *same*.

Data. The German definite article contracts with a preposition under certain conditions. Schwarz (2009) argues that the contracted "weak" form surfaces in situationally unique uses of a definite (see (1a)), while the non-contracted "strong" form surfaces in anaphora (see (1b)).

(1) a. Hans ging **zum** Haus
Hans went to+the house
'*Hans went to the house.*'

b. Hans ging **zu dem** Haus
Hans went to the house
'*Hans went to the house.*'

While Schwarz (2009) shows that the strong article form in (1b) is required in anaphoric contexts, it is also obligatory in restrictive relatives clauses, and surprisingly so—restrictive relatives do not at first glance appear to involve anaphora. We explain this puzzling use by showing that relative clauses *do* in fact constitute a case of anaphora, using the the variable-free theory of anaphora laid out by de Groote (2006), who treats pronouns as denoting anaphora-resolution functions.

Puzzle. (2) gives a canonical use of the strong form in cross-sentential anaphora (Schwarz 2009).

(2) Fritz wohnt seit Jahren in einem groβen Haus. Er schwärmt **von dem/#vom** Haus.
Fritz lives since years in a big house. He raves from the house
'*Fritz has lived in a big house for years. He raves about the house.*'

However, as Schwarz points out, the strong form is also required whenever the noun is modified by a relative clause, regardless of whether or not it is anaphoric to something in previous discourse. (The use of the strong form in the relative pronoun—which is just the definite article, see Wiltschko (1998)—is the result of an independent ban on the weak form when it lacks a nominal restriction.)

(3) Fritz wohnt jetzt **in dem/#im** Haus, von dem/*vom er seit Jahren schwärmt.
Fritz lives now in the/in+the house, from the/from+the he since years raves
'*He now lives in the house that he has been raving about for years.*'

The strength of the matrix form in (3) is unexpected given Schwarz's anaphoric generalization about the strong form: relative clauses do not obviously constitute instances of anaphora. We give a variable-free solution to the puzzle, whose composition we illustrate with the associative Lambek Calculus (Lambek, 1958). The analysis relies on the approach to anaphora provided by de Groote (2006), and moreover gives a straightforward account of anaphoric uses like (2), thus uniting both.

Proposal. As indicated, we argue that the strong form is structurally more complex than the weak. A head, which we call *anaph*, intervenes between the determiner and the noun, triggering allomorphy of the determiner (c.f. Elbourne, 2005, 2008; Schwarz, 2009; Wiltschko, 2013; Simonenko, 2015). *anaph* introduces the property of being anaphoric, which is accomplished by the use of contexts, i.e., sets of individuals, whose type is γ (de Groote, 2006). Because not every meaning is

lexically sensitive to contexts, we make use of the intensionalization-transformation of de Groote and Kanazawa (2013), but, following Kobele (2015), set to contexts. (4) gives the relevant derivation, where pairs of expressions and denotations sit on the other side of the turnstile from their syntactic types.

(4) *Strong form:*

$$\dfrac{\langle \textit{dem}, (\lambda P_{(\gamma e)\gamma t}.(\lambda c_\gamma.(\iota x_e.P\ (\lambda c'_\gamma.x)\ c)))\rangle \vdash \texttt{d/n[a]} \quad \dfrac{\langle \textit{anaph}, (\lambda f_{(\gamma e)\gamma t}.(\lambda x_{\gamma e}.(\lambda c_\gamma.x\ c = \textbf{sel}\ c\ \&\ f\ x\ c)))\rangle \vdash \texttt{n[a]/n} \quad \langle \textit{haus}, (\lambda x_{\gamma e}(\lambda c_\gamma.\textbf{house}\ (x\ c)).)\rangle \vdash \texttt{n}}{\langle \textit{anaph haus}, (\lambda x_{\gamma e}.(\lambda c_\gamma.x\ c = \textbf{sel}\ c\ \&\ \textbf{house}\ (x\ c)))\rangle \vdash \texttt{n[a]}}\ /\text{E}}{\langle \textit{dem anaph haus}, (\lambda c_\gamma.(\iota x_e.x = \textbf{sel}\ c\ \&\ \textbf{house}\ x))\rangle \vdash \texttt{d}}\ /\text{E}$$

In (4), **sel**, used in de Groote's analysis of pronouns, is a function from contexts to individuals, i.e., the anaphora-resolution function. *anaph* composes with the NP with the effect that the DP denotes the unique individual with the property denoted by the NP and which is the individual picked by by the function **sel**. *anaph* therefore has the same meaning involved in pronominal anaphora.

Relative clauses. Relative clauses are formed via a head C with the denotation in (5), which selects for a property on its right (the gapped clause) and a function from properties to individuals on its left (the relative pronoun):

(5) $[\![\text{C}]\!] = (\lambda P_{(\text{e})\gamma\text{t}}.(\lambda x_{((\gamma\text{e})\gamma\text{t})\gamma\text{e}}.(\lambda Q_{(\gamma\text{e})\gamma\text{t}}.(\lambda y_{\gamma\text{e}}.(\lambda c_\gamma.P\ (\lambda c'_\gamma.x\ Q\ \{y\ c\})\ c)))))$

The attachment site of the restrictive relative clause is not at the matrix NP, but rather at the phrase headed by *anaph*. We additionally give a raising analysis of RCs (along the lines of Bhatt (2002)), wherein all material that would have been selected by the relative pronoun appears adjacent to the matrix determiner. The proof in (6) (which proceeds in subparts (6a)-(6e)) illustrates composition of the relative clause from (3), given the interpretation of C in (5). The last inference in (6e) yields the resulting meaning.

(6) a.

$$\dfrac{\langle \textit{von}, (\lambda f_{\gamma e}.f)\rangle \vdash \texttt{p[von]/d} \quad \dfrac{\langle \textit{dem}, (\lambda P_{(\gamma e)\gamma t}.(\lambda c_\gamma.(\iota x_e.P\ (\lambda c'_\gamma.x)\ c)))\rangle \vdash \texttt{d/n[a]} \quad \langle P, P\rangle \vdash \texttt{n[a]}}{\langle \textit{dem}\ P, (\lambda c_\gamma.(\iota x_e.P\ (\lambda c'_\gamma.x)\ c))\rangle \vdash \texttt{d}}\ /\text{E}}{\dfrac{\langle \textit{von dem}\ P, (\lambda c_\gamma(\iota x_e.P\ (\lambda c'_\gamma.x)\ c).)\rangle \vdash \texttt{p[von]}}{\langle \textit{von dem}, (\lambda P_{(\gamma e)\gamma t}.(\lambda c_\gamma.(\iota x_e.P\ (\lambda c'_\gamma.x)\ c)))\rangle \vdash \texttt{p[von]/n[a]}}\ /\text{I}}\ /\text{E}$$

b.

$$\dfrac{\langle \textit{anaph}, (\lambda f_{(\gamma e)\gamma t}.(\lambda x_{\gamma e}.(\lambda c_\gamma.x\ c = \textbf{sel}\ c\ \&\ f\ x\ c)))\rangle \vdash \texttt{n[a]/n} \quad \langle \textit{haus}, (\lambda x_{\gamma e}.(\lambda c_\gamma.\textbf{house}\ (x\ c)))\rangle \vdash \texttt{n}}{\langle \textit{anaph haus}, (\lambda x_{\gamma e}.(\lambda c_\gamma.x\ c = \textbf{sel}\ c\ \&\ \textbf{house}\ (x\ c)))\rangle \vdash \texttt{n[a]}}\ /\text{E}$$

c.

$$\dfrac{\dfrac{\langle \textit{schwaermt}, (\lambda x_{\gamma e}.(\lambda y_{\gamma e}.(\lambda c_\gamma.\textbf{rave\_abt}\ (x\ c)\ (y\ c))))\rangle \vdash \texttt{(d\textbackslash t)/p[von]} \quad \langle x, x\rangle \vdash \texttt{p[von]}}{\langle \textit{schwaermt}\ x, (\lambda y_{\gamma e}.(\lambda c_\gamma.\textbf{rave\_abt}\ (x\ c)\ (y\ c)))\rangle \vdash \texttt{d\textbackslash t}}\ /\text{E} \quad \langle \textit{fritz}, (\lambda c_\gamma.\textbf{f})\rangle \vdash \texttt{d}}{\dfrac{\langle \textit{fritz schwaermt}\ x, (\lambda c_\gamma.\textbf{rave\_abt}\ (x\ c)\ \textbf{f})\rangle \vdash \texttt{t}}{\langle \textit{fritz schwaermt}, (\lambda x_{\gamma e}.(\lambda c_\gamma.\textbf{rave\_abt}\ (x\ c)\ \textbf{f}))\rangle \vdash \texttt{t/p[von]}}\ /\text{I}}\ \backslash\text{E}$$

d.

$$\dfrac{\text{(6c)} \qquad \langle c, (5)\rangle \vdash \texttt{((p[von]/n[a])\textbackslash(n[a]\textbackslash n[a]))/(t/p[von])}}{\langle \textit{c fritz schwaermt}, (\lambda x_{((\gamma e)\gamma t)\gamma e}.(\lambda Q_{(\gamma e)\gamma t}.(\lambda y_{\gamma e}.(\lambda c_\gamma.\textbf{rave\_abt}\ (x\ Q\ \{y\ c\})\ \textbf{f}))))\rangle \vdash \texttt{(p[von]/n[a])\textbackslash(n[a]\textbackslash n[a])}}\ /\text{E}$$

e.

$$\dfrac{\dfrac{\text{(6a)} \qquad \text{(6d)}}{\langle \textit{von dem c fritz schwaermt}, (\lambda Q_{(\gamma e)\gamma t}.(\lambda y_{\gamma e}.(\lambda c_\gamma.\textbf{rave\_abt}\ (\iota x_e.Q\ (\lambda c'_\gamma.x)\ \{y\ c\})\ \textbf{f})))\rangle \vdash \texttt{n[a]\textbackslash n[a]}}\ \backslash\text{E} \quad \text{(6b)}}{\langle \textit{anaph haus von dem c fritz schwaermt}, (\lambda y_{\gamma e}.(\lambda c_\gamma.\textbf{rave\_abt}\ (\iota x_e.x = \textbf{sel}\ \{y\ c\}\ \&\ \textbf{house}\ x)\ \textbf{f}))\rangle \vdash \texttt{n[a]}}\ \backslash\text{E}$$

Because there is only one member of the context used in the evaluation of the relative pronoun in (6), **sel** has no option but to select it. (6) may therefore be reduced to (7), the intuitively correct meaning for the relative clause.

(7) $(\lambda y_{\gamma e}.(\lambda c_\gamma.\textbf{rave\_abt}\ (\iota x_e.x = y\ c\ \&\ \textbf{house}\ x)\ \textbf{f}))$

Binding is therefore accomplished through the semantics of C, whose role is to pass a context with a single bound individual to the evaluation of its specifier. The use of the strong form as the determiner that selects nouns modified by relative clauses can now be seen as simply a special case of anaphora, which, following de Groote (2006), binding constitutes an instance of.

The present account thus provides the first unified analysis of the strong form, accounting for its use in anaphora as well as in restrictive relative clauses in precisely the same way. In both cases, *anaph* composes with the NP, resulting in the unique individual both with the property denoted by the NP and which is identical to the individual picked by by the function **sel**. In the case of anaphora, the value of this individual is resolved by a salient antecedent; in the relative clause, it is resolved by the only possible value given by the context carried by C.

Morphological evidence for *anaph*. The proposal that *anaph* intervenes between the article and the noun in the strong form is motivated by the behavior of the anaphoric modifier *same*, which surfaces in anaphora like (8).[1] The appearance *same* in (8) is explained if *same* (on its external reading) is an overt realization of *anaph*. In such examples, the definite article is either pronounced with *same*, or it contracts:

(8) Es hängt an einem Haus. An **demselben**/Am **selben** Haus findet ihr eine Jahreszahl...
It hangs on a house. On the+same/on+the same house find you a date
'*It's hanging on a house. On the same house you'll find a date...*'

If *same* is the overt realization of *anaph*, we expect it to be available in the strong form of the matrix determiner in relative clauses as well. This is borne out, supporting our claim:

(9) Sie wohnte in **demselben**/im **selben** Haus, das sie drei Jahre zuvor gekauft hatte.
she lived in the+same/in+the same house, REL she three years before bought had
'*She lived in the same house that she had bought three years beforehand.*'

The mysterious availability of *same* in a seemingly non-anaphoric context like (9) is explained if it is realizing *anaph* in the strong matrix determiner, required in the formation of restrictive relatives.

Outside of German, the Hebrew pronoun *oto* provides further evidence that the modifier *same* can realize *anaph*. While *oto* is a third-person accusative pronoun, (10) shows that the very same lexical item can also take on the meaning of *same* in anaphoric contexts, providing evidence that the item realizing a pronoun (i.e., that realizing *anaph* in Hebrew) can be realized as *same*.

(10) Karati sefer. Itamar kara et **oto** ha-sefer.
read.1SG book Itamar read.3SG.M ACC same the-book
'*I read a book. Itamar read the same book.*'

Conclusion. Our proposal offers the first variable free analysis of the strong article form in German, crucially explaining its role as the matrix determiner in relative clauses, while uniting this use with other instances of anaphora. We posit *anaph* to the be the locus of pronoun resolution inside the strong form, whose value is determined either by the discourse context (anaphora), or by the context provided by C (restrictive relatives). Independent evidence for *anaph* is shown through the ability of *same* to realize *anaph* in German as well as across languages, as shown by Hebrew.

[1] The examples in (8)-(9) are modified from a Google search.

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