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SAP - a strategy of attributive parsimony and its constraints characterizing translations between English and German

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Abstract

The following is the result of a research project on the information structure of nominal phrases (DPs) in translations between English and German, sponsored by the DFG.\footnote{The study involved the members of the project (Dr. Bettina Seifried, Thomas Bonk, Renate Kostritza, Jessica Schmidt, Rebecca Schopfer, Andreas Ljungström, Jenny Ziebal) and students specializing on translation - about ten to twenty German participants and a few native speakers of English. The data were drawn from the Berlin translation corpus, in particular from a sample of twelve popular scientific English texts and their German translations. The original sentences and their translations are aligned and have been screened by the method of control paraphrases, which will be demonstrated in the following discussion. This paper reports the results of the first year, which concentrated on DP-internal differences between original and translation.} DP-internal differences are to some extent grammaticalized, concerning adjectival and non-finite attributes, but even more similar options like prepositional phrases and relative clauses will often be used differently. The overall trend seems to suggest constraints on the distribution of information in the DP parallel to the verb phrase or sentence structures of English and German.

1. Language-specific processing and the method of control paraphrases

It is a well-known phenomenon that English uses attributes with non-finite verbs in many cases where German would use prepositions (see e.g. Kortmann and Meyer, 1991) But as there are also prepositional attributes in English and prenominal non-finite attributes in German, the interesting question is when do we use which attribute? Moreover, there are also full clausal attributes and nominal or adjectival attributes and paraphrases will often allow us to choose between several of these forms, thus the question covers a wide range of variations. If we classify attributes according to their reductive potential, attributes form a hierarchy where adjectival attributes seem to be most economical and relative clauses least. If we assume that language use is to some extent controlled by a principle of least effort (part of the trade-off between processing effort and cognitive gains, summarized as the principle of relevance by Sperber and Wilson, 86), we could expect a strategy of attributive parsimony, SAP, which makes us prefer an attribute of the lowest category possible:

\[
\text{SAP: AP}^2 > \text{NP} > \text{PP} > \text{VP} > \text{CP}.
\]

(with AP for adjective phrases, NP noun phrases, PP prepositional phrases, VP verb phrases, CP clauses; > for preference in line with SAP). That is, if we can express an attribute in the form of an AP, this would be preferred to any of the other attribute phrases, etc. The hierarchy reflects the increasing structural weight which would be associated with the different categories normally.

SAP is an extremely simplified strategy, which, however, offers something like a foothold for the language-specific conditions on attributive parsimony. It is obvious that categorial choice

\footnote{Adjectives proper as in 'das offene Fenster' were classified as AP. But deverbal APs which show their verbal origin, as in 'das geöffnete Fenster', were classified as VP-attributes. Although we can follow Maienborn, 2000, who presents altogether seven diagnostics (syntactic and morphological) in favour of an adjective-analysis of such deverbal cases, the combinatorial properties of the verbs made us use the VP-label not only for postnominal VP-attributes in English but also for the corresponding prenominal case in German.}
depends upon the lexical and syntactic means available in the language involved and that there is a natural limit to parsimony, viz. the amount of information contained in the attribute. However, there are also language-specific stylistic limits to parsimony. For example, if we look at English texts and their German translations, we notice that a great deal of the non-finite attributes in English seem to violate SAP. In almost two thirds of the cases in which attributes are reformulated in the German translation, they have been turned into a lower-category attribute. A sentence like

(1) Another idea is to alter the genes that code for various storage proteins in plants so that they would produce proteins containing a greater proportion of the amino acids that are essential for human nutrition. g 109

has been translated into German as

(2) Man denkt auch daran, die Gene für verschiedene pflanzliche Speichereiweiße so zu verändern, daß sie Proteine mit einem höheren Gehalt an den für unsere Ernährung nötigen Aminosäuren erzeugen.

There are four instances of attribute reduction in the German sentence: (a) CP to PP, (b) PP to AP, (c) VP to PP and (d) CP to AP.

But except for the VP all the English attributes could have been translated analogously into German:

(3) Man denkt auch daran, die Gene, die verschiedene Speichereiweiße in Pflanzen kodieren, so zu verändern, daß sie Proteine, die einen höheren Anteil der/jener Aminosäuren aufweisen, die für die menschliche Ernährung nötig sind.

It is obvious that the sentence in this form is difficult to process because of its 'nested' structure. It will already become more transparent if we use a prepositional attribute in (c):

(4) Man denkt auch daran, die Gene, die verschiedene Speichereiweiße in Pflanzen kodieren, so zu verändern, daß sie Proteine mit einem höheren Anteil der/jener Aminosäuren erzeugen, die für die menschliche Ernährung notwendig sind.

If we accept transparency (processing ease) as a control factor explaining why we prefer (4) to (3), we can also say that (4) is more difficult to process than (5) with its PP:

(5) Man denkt auch daran, die Gene für verschiedene Speichereiweiße in Pflanzen so zu verändern, daß sie Proteine mit einem höheren Anteil der/jener Aminosäuren erzeugen, die für die menschliche Ernährung notwendig sind.

and (5) is more difficult to process than (6) with its AP.³

³Despite their verbless appearance German APs corresponding to English CPs or VPs with predicatively used APs are a subclass of AP closer to VP than to AP proper. They were included in the following generalizations on attributes with 'weak' verbs - the copula before predicatively used APs being one of the 'weak' verbs.
(6) Man denkt auch daran, die Gene für verschiedene Speichereiweiße in Pflanzen so zu verändern, daß sie Proteine mit einem höheren Gehalt an den für unsere Ernährung nötigen Aminosäuren erzeugen.

eetc. Using this method of control paraphrases we can compare the various forms of attributes in translations between English and German and look for the language-specific conditions determining the different preferences found in recurring patterns.

It is important to remember that all the DPs compared are embedded into their intra- and extrasentential discursive context. We can assume that under normal conditions of language use processing ease contributes to the discourse appropriateness of sentence structure. We can also assume that discourse appropriateness of sentence structure in the target language is the dominant criterion in a neutral translational maxim, TM:

(7) TM Normally a translation is as close to the original in form and content as is possible under the conditions of target language appropriateness.

Applied to sets of systematically varied sentence structures in context, the method of control paraphrases should provide us with discourse-appropriate translations, 'target versions'. The following sections will present ample evidence of the discourse-dependent aspects of appropriateness. However, some properties of appropriateness concern sentence structure directly. For example, if the target version (2) is translated back into English, the brevity of

(8) Another idea is to alter the genes for various storage proteins in plants so that they would produce proteins with a greater proportion of the amino acids essential for human nutrition.

seems to suggest that it is easier to process than the original (1). But two of the differences between (1) and (8) concern adjuncts in the form of PPs. As it were, such adjuncts have figured prominently in psycholinguistic research on language processing because they may be processed as attributes or as adverbials. Processing times for sentence pairs like

(9) The spy saw the cop with binoculars
(10) The spy saw the cop with a revolver

(Rayner, Carlson and Frazier, 83)

(11) Manfred fesselte den Mann mit der schwarzen Krawatte.
(12) Manfred fesselte den Mann mit dem festen Strick.

(Felix et al, 1990)

are compared to help determine the way in which lexical knowledge and world knowledge is brought to bear on the syntactic analysis of sentence structures. Although no clear answer has been reached so far, there seems to be some evidence that structures like these may produce weak garden path effects i.e. slightly impede processing. Bader, 2000, describes garden-path sentences as cases of conscious (strong) or unconscious (weak) processing difficulties. p. 190; Frazier and Clifton, 1996, carve out a special processing theory under the name of 'construal'

4There is no adjective to replace the prepositional phrase.
to account for the weaker cases - which would not include (9) - (12), though. The English and German examples seem to display the same processing effect. No language-specific differences are expected.

But the comparison of original sentences and their translations in discourse shows that there are language-specific aspects of processing. Analysing the specific conditions of CP, PP, etc. preferences of English and German attributes, we have compared various features enhancing or impeding discourse-appropriateness in various paraphrases of original sentences and their translations and interpreted the findings in the light of the two language systems involved. The results are thus based on three pillars: intersubjective intuitions on processing ease of sentence structure in discourse; recurring patterns of differences between original and translation; linguistic theories on general or specific properties of the languages involved.

The final discussion will show that the different attributes in English and German are preferred due to parameterized properties of word order, which suggest a parallel between VPs (or CPs) and DPs.

2. Attributes with or without verbs

Considering the structural weight associated with the different attributes in SAP, it seems that the most striking difference between English and German texts concerns the use of attributes with verbs and attributes without verbs. Except for the positional differences between VPs and APs (and possessive/genitive NPs)\(^5\), both languages have roughly similar attributive options. But from a sample of about 1200 English sentences (from articles in New Scientist), there were almost as many attributes reduced to verbless forms in the translations as there were attributes with verbs - used in prenominal positions or extended into clauses.\(^6\) (1/2) illustrated a typical example of English attributes with verbs which were translated by German attributes without verbs.

Most verbless attributes take the form of PPs where the meaning of the preposition carries some of the features of the original verb: contain was replaced by mit, code for reduced to für in (1/2); in a sentence like g 35

*The injected cells were then put into a culture medium in which cells lacking thymidine kinase would be unable to grow.*

lacking was replaced by ohne

*Die geimpften Zellen wurden dann in ein Nährmedium gebracht, in dem sich Zellen ohne Thymidin-Kinase nicht entwickeln können.*

In some cases the original verb was reduced to the prepositional phrase following it. Compare e.g. g 118

*Ask any of the scientists working in the field about future applications of their work ...*

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5NP-attributes were not yet studied systematically, mainly because their translations often involved compound formation or appositions - two of the topics which were reserved for the remaining period of the project.

6Due to source language interference, German translations which are not subjected to the method of control paraphrases use VP-attributes much more often. Teich (03) compares original texts in German and English with translated texts and finds many more premodifiers as well as many more verbs in the German translations than in the German originals.
Jeder Fachmann auf diesem Gebiet wird auf die Frage nach zukünftigen Anwendungsmöglichkeiten seiner Arbeit

Occasionally, the verb was pronominalized or incorporated into another word of the attribute or its head: h 114

Animals grazing in fields surrounding such plants ...

Die Krankheit befiel auch Tiere auf Weideflächen in der Umgebung solcher Betriebe

The verb from the attribute could also become the matrix verb of the sentence; cf. i 17

However, in man for instance, there are at least three different groups of interferon produced by different cells in the body and induced by a great variety of stimuli.

Doch im menschlichen Körper beispielsweise entstehen in unterschiedlichen Körperzellen und auf ganz verschiedene Reize hin schon mindestens drei Interferongruppen.

where there are has been replaced by entstehen, reducing the VP attributes of the original to prepositional phrases: in unterschiedlichen Körperzellen/auf ganz verschiedene Reize hin. Although there are various ways in which an attribute may have 'lost' its verb in the translation, the verbs that were likely to disappear belonged to a class of very general 'weak' semantic relations. Under certain conditions these relations may also be expressed more implicitly by a preposition or case. We have called these verbs 'weak' verbs and generalized the different uses in German/English attributes as a first language-specific constraint (C) on SAP. 7

C1 Attributes with weak verbs are reduced to verbless attributes in German but not in English.

CP- or VP-attributes in English which were turned into verbless attributes in German (PPs, NPs or APs) were controlled by verbs like contain, consist, possess, use, produce, form and the like. Depending upon the context in which they were used, these verbs were only weakly informative. The passage ending on f46, for example

f 46 Many, perhaps most, of the succulents that practise CAM are also able to fix carbon by day by the normal route, when conditions are moist.

is presented under the subtitle: CAM - the succulent solution. The preceding six sentences spell out the mechanism of CAM, the last sentence mentions the two main groups of plants which possess this mechanism. Clearly, the verb of the postnominal attribute 'practice' is only weakly informative. It disappears in the German translation:

7Traxler et al (2000) show that constraint-based and garden path processing theories are comparable in explanatory strength if the strictly structural-syntactic garden path theory is extended by thematic-semantic/pragmatic interpreting principles for 'non-primary' grammatical relations (associated with relative clauses and the like), i.e. if the garden path theory is extended by the processing theory of 'construal', which Frazier and Clifton introduced in 1996. Violations of constraints on SAP result in superfluous processing efforts - whether they are perceivable or not.
The following passage is subtitled 'The C4 alternative' and describes the C4 mechanism distinguishing plants like sugar cane from CAM plants. f 55 is the eighth sentence of this passage:

\textit{In plants that possess this so-called C4 mechanism, the specialised vascular bundle sheath cells in the leaves have ...}

the weakly informative verb 'possess' disappears in the German translation:

\textit{Bei Pflanzen mit dem sog. C4 Mechanismus haben die speziellen Bündelzellen an der Blattscheide}

Shortly before the end of this passage, the rapid growth of C4-plants is compared with the slower C3-plants:

\textit{... rye grass (Lolium perenne), the commonest forage grass of the UK which uses the C3 mechanism.}

The C3-plants were introduced by name about thirty sentences ago; their mechanism and its physiological disadvantage described in detail (14 sentences) form the background to the CAM-solution. The informativity of 'use' is very low, the verb is dropped in the German translation:

\textit{... Roggengras (Lolium perenne), [das] gebräuchlichste Futtergras in Großbritannien mit einem C3-Mechanismus.}

The following belongs to a text about 'interferon'. The preceding sentences refer to the discovery that there was not only one interferon, as originally assumed, but three major types, alpha, beta, and gamma, and a great number of subtypes. The discovery was made with cultured cells and i 34 extends the findings onto naturally produced interferon:

\textit{... that the interferon produced by human white blood cells contained a mixture of the same \(\alpha\) interferons identified by the genetic engineers.}

The weakly informative 'produced' is dropped in the German translation:

\textit{... daß das Interferon der weißen Blutkörperchen des Menschen ebenfalls aus jenen von den Gentechnikern identifizierten Alpha-Interferonen besteht.}

(For the final VP-attribute and the additional change: the prenominal \textit{Aj} human/postnominal noun phrase \textit{des Menschen}, see sections 3 and 4.)

Theoretically most of the weak verbs could also be dropped from the English, so the question is: what is it that retains the 'weak' verb in the English attribute, what ousts it from the German attribute? The answer lies in the language-specific properties of English and German word order which promote a difference in processing ambiguities. We will first look at syntactic ambiguities - which play only a minor role - then at ambiguities arising from the information structure of DPs.
2.1 Syntactic ambiguities

A sentence like g96

The modified cells were then re-injected into the patients in the hope that they would produce normal red cells containing normal haemoglobin.

which was translated as

Anschließend wurden die modifizierten Zellen wieder in die Patienten injiziert, in der Hoffnung, daß sie normale rote Blutkörperchen mit normalem Hämoglobin produzieren würden.

would allow replacing the verbal attribute by a prepositional phrase also in English: in the hope that they would produce normal red cells with normal haemoglobin. However, the attributive nature of the prepositional phrase is no longer certain. Following the finite verb produce, the prepositional adjunct could also be interpreted as an adverbial with an instrumental reading. That the semantic interpretation can correct the syntactic error afterwards does not prevent the initial garden path. And even a weak garden path would be a processing disadvantage. The instrumental interpretation is less likely in German where the attribute precedes the finite verb produzieren:

daß sie normale rote Blutkörperchen mit normalem Hämoglobin produzieren würden.

A similar case is f18

But if wheat is grown in the laboratory in an atmosphere containing only 2 per cent oxygen

which was translated into German using a PP instead of the original VP:

Läßt man jedoch Weizen im Labor in einer Atmosphäre mit nur 2% Sauerstoff wachsen

The prepositional attribute precedes the main verb of the clause in German, but translated back into English, the prepositional attribute follows the verb: grown in a lab in an atmosphere with only 2 % oxygen. The position is likely to promote an adverbial interpretation adjoining the prepositional phrase to the verb phrase controlled by the preceding grown.

If the matrix verb were to precede the adjunct in German, a verbless attribute would lead us into the same sort of syntactic garden path; cf d26

When any light source is observed through a medium containing small particles ...

which has been translated as

Frazier and Clifton (1996 : 20) discuss a whole range of different theories (focusing on argument preference, violations of the Theta criterion, Predicate proximity, frequency ...) and show that in cases like g96 the garden path theory is best suited to explain the attachment of PP to V instead of to NP (in a V NP PP structure).
Betrachtet man eine Lichtquelle durch ein Medium, das kleine Teilchen enthält ...

and not as

betrachtet man eine Lichtquelle durch ein Medium mit kleinen Teilchen

The PP would promote an instrumental reading. Choosing a paraphrase where the matrix verb follows the adjunct weakens or cancels the effect:

wird eine Lichtquelle durch ein Medium mit kleinen Teilchen betrachtet...

But the different order of matrix verb and PP-attribute could only explain a subset of the alternative between German and English attributes with or without verbs. The bulk of the alternative preferences is associated with the difference in the information structure of German and English DPs.

2.2. Informational ambiguities

A great number of English attributes reduced in the translation do not suggest an adverbial interpretation of the verbless paraphrase. Cf. a case like

h8 hydrogen is cleaner than gases containing carbon.

and its German translation:

Wasserstoff ist weniger umweltbelastend als Gase mit Kohlenstoff

which could be translated back as

Hydrogen is cleaner than gases with carbon.

without a syntactic ambiguity. But the VP attribute was preferred to the prepositional form and as cases like these are quite frequent, we have to find yet another explanation for the phenomenon of weak V attributes.

Interpreting the attribute in h8 in its context, we discover that the attribute has a contrastive value: gases with carbon are contrasted with the gas hydrogen. If we assume that the verbal head of an attribute assigns a focus to its structural extension, but the prepositional head does not, it will be easier to identify the contrastive relation in a VP-attribute than in a PP-attribute. Although semantically weak prepositions like 'of' (in the sense of a genitive) could be expected to be prosodically weak, prepositions like 'with', which create their own theta-domain, may be assumed to have their own focus-domain, too. But while the German data show focused and unfocused PPs, the distribution of English VP and PP attributes also suggests unfocused PPs for stronger prepositions. We will certainly have to weaken the constraint later on, but will now tentatively assume that

C2 PP-attributes are normally deaccentuated in English but not in German.

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Gibson et al 96, quoted in Hemforth 2000, distinguish a principle of recency (which would be the same for English and German) and a principle of predicate proximity, which spells out differently in a head-initial and a head-final language.
'Normally' means that PP attributes are stressed in German and destressed in English if nothing suggests the contrary. For example, if the informational ambiguity of a verbless adjunct has already been resolved in the preceding structure, English can also make use of a contrastively stressed prepositional attribute:

The group (CH2O) is the basis of all sugars - the so-called pentoses, like ribulose, which contain five such groups; the hexoses, like glucose, with six; and so on.

We will return to the class of verbless attributes later on and look at attributes with verbs in English and German in the following two sections.

The concept of focus is involved in four of the five constraints that are to explain the different preferences in English and German uses of SAP. It is important to understand that focus has syntactic, semantic and phonological aspects. In particular, it is assumed to be a syntactic feature of phrases, which manifests itself as stress and contains the information essential to progress in discourse.

There are several types of focus to distinguish. Progress in discourse is the pragmatic/semantic effect of 'grammatical' or 'presentational' focus, which is mostly associated with new information. 'Contrastive' focus is associated with given information by the relation of alternatives. It is, as a rule, indicated lexically by focusing particles like 'only' or 'even' (lexically bound focus), but can also be carried by inherently focused items as e.g. superlatives.

Presentational focus is mostly seen as a property of VPs, but there are also grammatical regularities characterising focus in other phrases. Although the details are still far from clear, NPs can be expected to have foci of their own, which are characterized by regular syntactic, semantic and prosodic aspects and show language-specific properties comparable to the foci of sentences. Among the theoretical approaches that are relevant to our studies is, first, the cross-categorial theory presented in Abraham, 92, who - following Cinque, 90, in great lines - assigns grammatical focus to the head of the phrase embedded deepest. Second, the iambic and trochaic stress patterns Jacobs, 91/92 distinguishes when he compares the language-specific asymmetries of neutral stress-patterns in German and English CPs and DPs. The most elaborate theory is presented by Drubig, 97, who shows that there are at least three different layers of pre- and postnominal DP-modifiers, each with a great number of subclasses, and discusses some intricate (theory-internal) evidence of cross-categorial focus structures in English DPs and CPs. However, a comprehensive theoretical framework accounting for the language-specific differences we can observe in the use of English/German attributes is still missing. Aiming at a generalization of our empirical observations, we can therefore only sketch the German/English constraints on SAP in a pretheoretical way loosely linked to those stricter focus theories.

CP2 refers to the prosodic aspect of deaccentuation as is traditionally assumed to characterize background information (Compare e.g. Um bach, 01, who distinguishes between deaccented definite descriptions referring to a given referent and definite descriptions which carry accents and introduce novel referents.) However, tradition attributes deaccentuation to the semantic/pragmatic impact of appropriate antecedents rather than to a language-specific strategy at the level of syntactic processing, i.e. before semantic/pragmatic interpretation sets in. C2 may be untenable in this general form, but even in a modified version such a stilistic contraint could fit in nicely with the trochaic/iambic patterns of the two grammars involved in the comparison (see the concluding remarks).

10Jacobs shows that the stress patterns of German CPs but not German DPs or English CPs and DPs are sensitive to internal grammatical relations and attributes the difference to (the lexically determined relation of) 'integration', which is blocked by intervening structures, such as free adjuncts.
3. CP- or VP-attributes

Attributes with verbs may contain a finite or a non-finite verb, i.e. they may have the form of a clause (CP) or a phrase (VP). If we ignore attributes with the function of complements, the clause will be a relative clause (including 'contact' clauses without relative pronouns), the phrase a participial phrase (present or past) or an infinitival phrase. SAP would have us prefer VPs to CPs, but even if both versions are possible, we will prefer a VP or a CP and the preference can, again, be different in English and German.

3.1 CP- or VP-attributes in English

As both types of attributes are used postnominally in English, they differ only in the degree of structural explicitness, SAP would have us prefer VP-attributes wherever reduction is not blocked by the amount of information contained in the attribute. But we do find cases where CP-attributes are used although VP-reduction would be possible and if we compare the English CP-attributes with their German translations, we even encounter cases where the CP is considered entirely redundant in German and dropped from the sentence. What are the conditions for the use of CP-/VP-attributes in English?

If we compare all those cases where English uses a CP-attribute, we find that the greater structural effort is in most cases licensed by a prenominal specifier/modifier which requires a contrastive stress. (Restrictive and non-restrictive relative clauses show the same regularity in our corpus.) As the postnominal modifier will normally also be informative, we could speak of a special hat-pattern of informativity, where processing ease deserves an extra structural indicator for the second peak.

C3 (hat-pattern of informativity): Prenominal contrast promotes postnominal CP-attributes in English.

Compare an example like f25 where English uses a CP for the second modifier because the nominal head is preceded by a contrasted specifier:

\[ f25 \ldots \text{this three-carbon sugar (a triose) is then converted into other sugars (...) and hence into all other compounds (proteins, fats, and the rest) that the plant requires.} \]

Similarly, prenominal structures with inherently contrastive superlatives are associated with CP attributes in English; cf. f 46 with its contrastive quantifier

\[ 46 \text{Many, perhaps most, of the succulents that practise CAM are also able to fix carbon by day by the normal route ...} \]

and f 63 with its contrastive adjective before the (complex) nominal head:

\[ 63 \ldots \text{the commonest forage grass of the UK which uses the C3 mechanism.} \]

11Although it is generally accepted that there are multiple focus structures with more than one non-contrastive focus, rise-fall contours are often considered as sentences with contrastive topics (cf Büring, 97, Jacobs 97, or - for an alternative view - Hoof, 03). If there also DPs with multiple focus structures - as our data suggest there are - the question arises whether they also include contrasted topics. Drubig 97 considers the possibility of topics in DPs. For our purposes, we will ignore the layer of topic-comment altogether and merely emphasize the contrastive nature of the prenominal attribute that calls for the most explicit attribute structure in postnominal position.
The alternative may be contained in a coordination as in:

*m 60 Powder metallurgy is a forming and fabrication technique that comprises three stages.*

If there is no contrastive prenominal constituent, a VP will be sufficient postnominally. Compare a case like m33 which uses a given head before a VP modifier:

**33 In the early stages, engineers will adapt techniques used in the Earth's workshops.**

The given head may also be modified by a prenominal attribute as long as the attribute is not contrastive; consider a case like m 55 with its specific but normal 'fine':

**55 Another promising separation technique is electrophoresis, which takes advantage of the fine grains found in lunar soil.**

(The contrastive nature of the head *electrophoresis*, which justifies the appositive CP, is 'inherited' from the contrastive specifier 'another'.)

Compare also the difference between heads with of-attributes where the of-attributes may carry a contrastive stress and are then followed by a CP attribute. In

**j 116 A further test of our theories is already available from observations of Saturn, which Voyager made in November 1980.**

the planet 'Saturn' contrasts with the discourse-topic 'Jupiter', which promotes the CP-attribute.

If the of-attribute is unstressed, no extra structure is needed for the postnominal attribute. In

**m 85 Suitable sizes of particles, perhaps representing different materials, proceed to an ejector ...**

the head and its of-attribute were introduced by the immediately preceding sentence

**84 From the sides of the furnace, the powder is directed to a collection port where it is separated into different sizes ...**

Both modifiers of the subject in m 85 are new, but not contrasted, thus the structurally more reduced form of a VP attribute is sufficient. The example suggests that the greater processing effort for a CP-attribute is only worth while if there is an informational peak preceding it that would otherwise be missed.

There are, however, cases which do not need the extra structural weight of a CP attribute despite a contrastive prenominal attribute. Consider an example like  **i17**

*However, in man for instance, there are at least three different groups of interferon produced by different cells in the body and induced by a great variety of stimuli.*

Here the contrastive nature of the quantifier is already indicated, lexically and syntactically, by the focusing element 'at least' and the expletive structure 'there is'. Thus, the structural indicator of a postnominal CP is no longer necessary.
If the prenominal attribute is contrastive and the postnominal attribute is altogether predictable background information, the extra structure of a CP is not needed. Consider m27 where the first VP-attribute follows a weak head but the second VP, which together with a weak head follows a contrasted quantifier, is itself weak - its contrast is part of the discursive background:

\[ m27 \text{Due to the low gravity and lack of atmosphere on the Moon, however, the engineering systems needed to move materials off this body could be a hundredth of the size required on Earth - and consequently much cheaper.} \]

At the same time, the postnominal VP tells us that the attribute cannot be deaccentuated. Although it refers to the default case of the comparison, it is presented in a structure parallel to the primary member of the comparison and not as a PP (which is the preferred version in German)\textsuperscript{12}.

However, there are also exceptional cases where the postnominal attribute may have no other function than to indicate the prenominal contrast. Compare f7 where 'the kind' has to receive a contrastive stress and the CP attribute after the head is totally superfluous but for this focus-indicating function:

\[ f7 \text{ So which strategy a plant adopts (or whether indeed it adopts one at all) depends not so much upon the kind of plant it\textsuperscript{13} is, as upon where it lives.} \]

Without the postnominal structure, the contrast may be placed on the second noun, which would have to be corrected at the end of the sentence. Parallelism in itself could not explain the use of the first CP attribute because the decision in favour of parallel structures is no automatic choice.

In German, the postnominal attribute is altogether redundant:

\[ 7 \text{ Welches Verfahren von der Pflanze genutzt wird (wenn überhaupt eines genutzt wird) wird weniger von der Pflanzenart als vielmehr vom Standort bestimmt.} \]

The reading of the German compound 'Pflanzenart' is immediately correct as is the compound 'Standort' - a lexical gap in English - which renders the implicit head 'place' together with the last relative clause of the original.

3.2 VP- or CP-attributes in the German translation

A great deal of the original English VP attributes are retained in the German translations but are moved before their heads, into the normal position of German participial phrases. To some extent such prenominal attributes also originate in English relative clauses. On the other hand a great number of English VP-attributes are extended into German relative clauses. As the

\textsuperscript{12}m27 Dagegen müßten aufgrund der geringen Schwerkraft und der fehlenden Atmosphäre die technischen Geräte, die für den Materialtransport von der Mondoberfläche weg benötigt werden, nur ein Hundertstel mal so groß sein wie auf der Erde und wären entsprechend billiger.

\textsuperscript{13}In his systematic study of ambiguity avoidance in English relative clauses, Temperley, 03, shows that there is a syntactic strategy controlling the use of complementizer that:relative pronouns in certain types of relative clauses (esp. object relative clauses) which depends upon the nature of the relative clause subject: pronoun, common noun with or without determiner, proper noun or NP. Our project has not looked into the distribution of these elements, but Temperley's approach pursues basically the same line as we do and the first CP in f7 above, which is used without a relative pronoun, can be classified as a prototypical case in Temperley's sense.
latter must be used postnominally, the question is what determines the prenominal or postnominal position of German attributes containing a verb? The question comprises all cases where the English attribute could not be reduced to a verbless German attribute, and will therefore include semantically weak verbs only if reduction is blocked by additional processing problems. Compare e.g. s 56 where the complexity of the conjuncts blocks the VP-modifier in German:14

56 In an ocean in equilibrium the concentration of each element would be established by reactions leading to the formation or dissolution either of a pure solid phase, such as calcium carbonate, or of a layer adsorbed on the surface of solid material already formed.

56 Im Falle des Gleichgewichts entstünde die Konzentration eines jeden Elementes im Ozean durch Reaktionen, die entweder eine reine Feststoffphase, wie zum Beispiel Kalziumkarbonat, oder eine Auflage auf einem bereits gebildeten Feststoff entstehen ließen und wieder auflösten.

Complexity is a vague concept and there are many border-line cases where intersubjective assessment may vary a great deal. In fact, complex prenominal attributes are even considered prototypical of German, at least of certain registers.15 Thus, a sentence like n 121

121 Because supernovae brighten and fade quickly, even by human standards, astronomers have only the most fragmentary data on the roughly 300 events spotted so far this century in other galaxies.

which was translated as

121 Da Supernovae nur während einer auch für menschliche Verhältnisse kurzen Zeitspanne aufleuchten und wieder verblassen, stehen zu den ungefähr 300 Ereignissen, die bisher in diesem Jahrhundert in anderen Galaxien verzeichnet wurden, nur äußerst bruchstückhafte Daten zur Verfügung.

would not be untypical in the form

... zu den bisher in diesem Jahrhundert in anderen Galaxien verzeichneten etwa 300 Ereignissen ...

But there can be no doubt that very complex prenominal attributes like these are stylistically marked and characteristic of special registers and/or authors.16

14 Complexity is one factor blocking reduction, 'natural order' another. For example, a prenominal VP in the translation of a sentence like

we know of two main kinds of supernova, generally called Type I and Type II. (n24)

would be difficult to process as the explicit assignment of a name requires the referent of the name to be given. Thus n24 is translated as

Es sind zwei Hauptarten von Supernovae bekannt, die allgemein als Typ I und II bezeichnet werden.

rather than

Es sind zwei, allgemein als Typ I und II bezeichnete Hauptarten von Supernovae bekannt.

15 cf. e.g. Fabricius-Hansen, 99, who analyses the uses of German individual sentences as compared to English and Norwegian sequences of sentences, exemplifying the difference by an extremely complex German original from Konrad Lorenz.

16 An impressive case is W. Sebald's. The first three pages of his last novel contain no less than twenty five complex prenominal VP attributes. They all assign additional emphasis to their nominal heads - even if the
If we compare all the CP and VP attributes in our - stylistically unmarked - German corpus (and discount all the cases blocking reduction), we find a trend towards CPs where the head of the attribute is less informative than the modifier, and a trend towards prenominal VPs where the head is at least as informative as the modifier.

The concepts of (presentational, contrastive) focus and background are not differentiated enough to cover the wide range of differences in the informational values of constituents. We could, as is usual since Selkirk (84), add a stress to each phrase, increase its strength according to special rules and finalize the result by a final strengthening rule (see Jacobs, 91/92). But we would then have to assess the strength of the different phrases relative to each other and to the context - a task that presupposes a comprehensive, compositional theory about the semantic, syntactic and prosodic aspects of focus structure, which is not yet available. We will instead make use of the pragmatic concept of 'informativity' or 'information values', which are determined by the discursive relevance of the structural segments compared. (See also Doherty, 03, who applies this idea to the different beginning of sentences preferred in English or German.)

Informativity is discourse-determined and graded, the head and the modifier may be more informative or less informative, relative to each other and to the preceding context. The alternative poles of the scale are totally new or totally given information, but a segment may contain both types with a tendency towards the one or the other pole. In many cases given information has to be resumed, the informativity depending upon the distance between the resumptive element and its antecedent: the greater the distance, the higher the informativity. Informativity also increases with contrastiveness, which is superimposed upon the scale of givenness/novelty. (The alternative implied by the contrasted element may be contextually given or evoked with the contrast.)

Although the concept of 'informativity' is very fuzzy, it allows several generalizations about the use of VP/CP attributes in German. What does it mean to say that the distribution of pre- and postnominal attributes in the German translations suggests a difference in the informativity of head and modifier? There are altogether four cases to distinguish.

(i) If the head is given we find a CP-modifier. Take e.g.

\[s23\] To answer such questions we must consider the factors influencing the composition of sea water.

where 'factors' is as little informative as the interrogative 'what' would be. The English VP is extended into a German CP:

\[23\] Um solche Fragen zu beantworten müssen wir die Faktoren betrachten, die die Zusammensetzung des Meerwassers beeinflussen.

A prenominal VP would not be as good:

die die Zusammensetzung des Meerwassers beeinflussende Faktoren

Repetition of the same article is normally avoided, but the final position of the 'dummy' head is also poor.

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17 Vallduví and Engdahl, 96, analysing short sentences in various languages, distinguish three parts of information structure: focus, link and tail, but it is difficult to see how these concepts would apply to the complex sentences of our corpus.
The same is true of 'system', which together with its preposition could be reduced to 'where':

72 In a system dominated by the flux of material rather than by equilibrium reactions, ...

72 In einem System, das nicht durch Gleichgewichtsreaktionen sondern durch einen ständigen Materialfluß gesteuert wird

(ii) If the head is more informative we get a VP-modifier in the German translation. Compare e.g.

m5 If we can tap just some of them - the dusts of the Moon or the solar energy radiating uselessly into space -

where 'solar energy' is more informative than a grammatical dummy - it could even be contrasted since it is the second member of a disjunctive coordination:

... und wenn sich nur einige von ihnen - der Mondstaub oder die nutzlos ins Weltall ausgestrahlte Sonnenenergie - nutzen ließen,

v43 A Danish team headed by C. U. Hammer, of the University of Copenhagen, reported in 1980

where 'Danish team' is more informative than a 'professional dummy' (e.g. 'specialists') would be:

1980 berichtete eine von C. U. Hammer geleitete dänische Forschungsgruppe der Universität Kopenhagen,

In general, the VP modifiers have to be 'transparent' enough to let us also see the informative head. If this is not the case,

(iii) if both head and modifier are highly informative, we need a CP-modifier.

In

v26 The greatest flaw of all similar analyses is that none provides an estimate of the amount of sulphur injected, in the form of one compound or another, into the stratosphere.

the negated matrix predicate has been rephrased as an attributive adjective 'fehlenden':

der schwächste Punkt aller solcher Analysen sind die fehlenden Angaben über die Schwefelmenge, die in Form verschiedener Verbindungen in die Stratosphäre gelangt.

This increases the informativity of the compound head, 'Schwefelmenge', which is additionally contrasted this way. Actually, the contrast is already 'inherited' from the superlative in the DP before the copula: der schwächste Punkt ...

A similar case of focus-proliferation may control the German CP attribute in v 58, where the head 'Zusammensetzung des Materials' inherits its high degree of informativity from the topicalized PP: von entscheidender Bedeutung;
v58 The composition of the material injected into the stratosphere during eruptions, and especially the amount of sulphur in one form or another, is crucially important -

58a Von entscheidender Bedeutung ist dabei die Zusammensetzung des Materials, das während solcher Ausbrüche in die Stratosphäre geschleudert wird und insbesondere die Menge des in der einen oder anderen Form darin enthaltenen Schwefels.

(iv) If the informativity of head and modifier is low, we find a VP-modifier. This is the case where the referent of the entire CP is already given in the discourse, as e.g. in s 29 where the referent of the subject is the discourse-topic of the preceding passages:

s29 Material dissolved in the oceans is removed through the formation of particles of matter ...

Die in den Ozeanen gelösten Stoffe werden in Form von Teilchen ausgefällt

The same is true of the subject in the adverbial clause of v 77 as the use of satellites for the study of climatic impact of volcanoes was introduced earlier and can be said to belong to the background scenery of the text.

v 77 ... a satellite involved in the study just happened to be monitoring Canada at the time of the eruption.

da ein am Forschungsprogramm beteiligter Satellit zur Zeit des Ausbruchs gerade Kanada überwachte.

The criterion of low informativity applies even if the head contains a focused specifier. Informative quantifiers, as e.g. 'part/bulk of' promote a VP attribute in German:

m 85 this will eventually form part of the product being manufactured.

erfolgt allmählich der Aufbau eines bestimmten Teils des herzustellendes Produktes

s30 At the present time the bulk of the particulate material produced in the oceans is of biological origin.

Heute sind die meisten der im Meer gebildeten Teilchen biologischen Ursprungs.

We could interpret iv as the default case of German attributes with verbs, which is used if no special focus-indicator is needed.

With capital letters symbolizing higher informativity of head (H) and/or attribute (M), the directional tendencies of the German distribution can be summarized as:

C4: The choice of VP/CP attributes in German secures end focus within DP.

<table>
<thead>
<tr>
<th>CP</th>
<th>VP</th>
</tr>
</thead>
<tbody>
<tr>
<td>hM</td>
<td>mH</td>
</tr>
<tr>
<td>HM</td>
<td>mh</td>
</tr>
</tbody>
</table>
Because three of four cases have a stronger element at the right side and a weaker element at the left, we can generalize the directional tendency of the distribution and say that higher informativity tends to the right, lower informativity to the left of a German noun phrase. It is always the final element of the DP which is marked as prominent.

4. Prenominal vs. postnominal verbless attributes

As a rule, verbless attributes contain less information than attributes with verbs. Thus, the choice between the different forms of verbless attributes will comprise fewer options. As said before, we find more PP-attributes in German than in English because of the 'weak'-verb reduction. But several of the German PPs replace English APs rather than VPs. In fact, if we compare AP and PP-attributes in English and German, we find that more English APs have been turned into German PPs (or NPs) than vice versa. As it were, this result, too, is in line with our introductory assumption about deaccentuation of PPs in English: the verb in CP or VP-attributes is needed in English to prevent a postnominal attribute from being deaccentuated. Since German PPs corresponding to English VPs/CPs are not deaccentuated, the German PPs corresponding to English APs need not be deaccentuated either. This suggests that English APs may be more informative than English PPs.

As English APs in postnominal position can be classified together with English VPs in postnominal position - the APs being reduced forms of CPs with predicatively used APs - the parallel potential of prominence is only natural. But the comparison between verbless attributes in English and German suggests that English APs may be more informative also in prenominal position. Although information is in most of these cases less 'weighty', the relative values of verbless attributes in prenominal or postnominal positions may still be different. Where adjectives were translated into German as PPs the prenominal attribute of the English original was more informative, normally, but in German the trend was precisely the reverse. German PPs were more informative than G APs.

C5 APs are more informative than PPs in English
PPs are more informative than APs in German

The alternative distribution in DPs with verbless attributes amounts to an iambic pattern of informativity in German and a trochaic pattern in English. In a sentence like j 36, which was taken from a passage about the weather on Jupiter, the DP of the subject is given information and the of-attribute serves no other purpose than to provide the descriptive information which is needed to identify the given referent. In English, the form for the low informativity is an of-attribute, in German an adjective:

36 The movement of the atmosphere ...

die atmosphärischen Bewegungen

An additional attribute increases informativity and promotes the use of an adjective in English:

j20 a detailed picture of Jupiter's atmospheric motions

18 Quirk et al, 1985, show that PP attributes are 3 - 4 times as frequent as other attributes, which underlines the importance of their descriptive content as discourse anchors.
which is replaced by a PP in German: ein genaues Bild von den Veränderungen in seiner Atmosphäre

80 Jupiter's internal energy
die Energie aus dem Planeteninneren

Indefinite DPs also suggest a higher degree of informativity, which will normally comprise the attribute (prenominal in English/postnominal in German):

33 by an internal heat source
von einer Energiequelle aus dem Inneren

95 an outward flow (towards the edges)
eine Strömung nach außen

There is a semantic side to the last AP-PP shift. The adjectives 'outward' 'äußere' are not fully equivalent and the context in j95 cannot make up for the difference. Thus the PP is in reality preferred to a VP 'nach außen gerichtet'. In general, the use of prenominal APs is heavily constrained by lexical gaps, in particular selection restrictions on the combinatorial potential of nouns and adjectives (which, it has to be said, differs a great deal with different registers). The lexical gaps may well be associated with the prevailing structural patterns.

6. Transparency revisited

Let us return once more to our first example and apply the constraints to the four instances of different uses of attributes which we noticed in the English original and its German translation:

(1) Another idea is to alter the genes that code for various storage proteins in plants so that they would produce proteins containing a greater proportion of the amino acids that are essential for human nutrition.

In line with C3 the English original uses a CP attribute at the end as its head contains a comparative quantifier: 'a greater proportion ..' It uses a VP after the second instance of 'proteins' as a PP might be deaccentuated (C2). The PP after the first instance of 'proteins' cannot be reduced any further because there is no adjective (the German 'pflanzlich' is a lexical gap in English), but as this attribute is only weakly informative, the deaccentuated PP is just fine (C5). The English CP-attribute after 'genes', however, is the result of two factors blocking SAP in English: 1. the weak verb is retained so as to prevent deaccentuation of the highly informative attribute (C2); 2. the CP-attribute is preferred to a VP attribute

Another idea is to alter the genes coding for various storage proteins in plants

which could be mistaken for an adverbial, i.e. it is used to avoid a syntactically ambiguous adjunct.

Except for the PP attribute 'in plants', all English attributes contained a verb, the first and last attribute a finite verb, the one in between a present participle. All three verbs were said to be
semantically weak verbs, which disappear under SAP in German (C1), i.e. they are replaced by verbless attributes in the translation. This was the case. The German translation


dropped the weak verbs in (a) and (d) and replaced the verb 'contain' by the preposition 'mit' in (c), yielding two PPs 'für Speichereiweisse ...', 'mit einem Gehalt...' and an AP '...nötigen' in (d). The PPs are in line with the iambic information pattern of German as they contain new information and their heads 'Gene' and 'Proteine' present background information. The AP-attribute in (d) has to be used prenominally for grammatical reasons, but its head is new and a CP attribute would make us miss the prominence of the head (C4ii). Finally, the informational relevance of the head in (b) is higher than that of the prenominal attribute, which is merely resumed information (C5).

If we review the five constraints on SAP in the light of the general differences (between +/− finite clauses) in German and English information structures, we can say that the trend summed up in C5 resembles the basic alternative which characterizes word order in English/German VPs. In line with its head-initial VP, English assigns focus early in the sentence, viz to a verb-adjacent element, permitting less informative elements to the right, while German, with its head-final verb, assigns focus close to the end of a sentence, placing less informative elements to the left, earlier in the VP. This alternative of prominence at the left or right periphery of the VP, which results in a trochaic or an iambic pattern, repeats itself in a modified way in the DP.

Although attributes extend to both sides of the nominal head, verbless attributes at the right side are less informative in English and more informative in German. The prenominal attributes are distributed alternatively. Consequently, more informative attributes need an extra indicator, viz. a verb, at the right side in English and at the left side in German. As the 'natural' order of processing favours attributes at the right side of their heads, German can use many more verbless attributes than English (C1, C2). The heavy CP-attributes, which are extended to the right in both languages (reminiscent of the principle of end-weight and related theories; see Hawkins, 91/92, for an influential approach), are not only used if the attributes carry an irreducible amount of information, but also if there is another element in the DP which is highly informative ('hat-pattern' of informativity, C3). Finally, the additional positional difference between VP and CP in German gives rise to an even more differentiated 'competition' between elements of higher and lower informativity (C4). But here, too, the iambic pattern is the prevailing trend suggesting that German DPs have 'end prominence' generally. Thus, the general English/German preferences in distributing DP-internal information (mainly attributes with or without verbs) reflect the specific directionalities of their (SVO/SOV) languages.

Literature:


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