Prominence in Discourse

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Abstract

This paper seeks to clarify the notion of prominence in discourse. We propose that one entity in a set of equals is more prominent than the others with respect to a given state of a discourse representation if it is more apt to be referred to or serve as attachment site for structural relations, and if it can lose this status as the discourse unfolds promoting other entities to prominence. This idea is illustrated by multiple examples from existing studies showing a variety of manifestations of prominence that apply to discourse entities of different kinds, from individuals to events and discourse goals

1 Introduction

The goal of this paper is to clarify the notion of prominence in discourse. We follow Himmelmann & Primus (this volume) and Vogel (this volume) in assuming that generally, prominence is a relation between entities of the same type that designates one entity as being more apt to attract processes, operations or structural links that pertain to the given level of linguistic representation. In discourse, the notion of prominence applies primarily to discourse referents—individuals, events, and other entities that we talk about. One referent is more prominent than another at a given point in discourse if it is more apt to be referred to, i.e. to be mentioned directly by the use of a referring expression, or to be the target of implicit discourse-structural links, such as coherence relations. In somewhat more abstract terms, the following three aspects are central to the notion of discourse prominence in our view:

- entities of the same type are (partially) ranked in the discourse representation;
- the ranking is updated as the discourse is progressing; there are linguistic devices whose function it is to signal that the ranking should be updated (e.g. markers of topic shift);
- the ranking is used by speakers in their type of referring expression choice; there are linguistic devices whose use is dependent on the ranking (e.g. anaphoric pronouns).

The ranking reflects the relative prominence of discourse entities that is created by the dynamic process of updating the prominence structure of the discourse. In the following we focus on linguistic devices that update or rely on prominence

Previous studies have given rise to a whole range of notions that seem to match our definition or are related to it: salience, accessibility, activation, givenness, topicality, nuclearity, etc.

(Chafe 1976, Lewis 1979, Mann & Thompson 1988, Ariel 1990, Gundel et al. 1993). Without trying to tease apart these partly overlapping notions, in this paper we will give illustrations of how they instantiate the overarching notion of prominence in discourse. This investigation will contribute to a better understanding of prominence as a general linguistic principle organizing language, linguistic structure and communication. We argue that prominence is a central structure forming relation between equal units that complements other structure principles such as precedence and dominance relations. Of course, there are cross-linguistic differences in the expression of prominence and presumably also in the range of prominence relations realised in a language. In this paper, however, we gloss over those differences concentrating on the general notion.

In a similar vein, we will try to give an overview of how the notion of prominence and its various instantiations apply to discourse entities of different types: individuals (section 2), times and events (section 3), as well as discourse segments and their communicative goals (section 4). Among these issues, prominence of individuals has by far the longest research history and takes up the longest section of this paper. Our goal is, however, to highlight the similarities between all the different types, and in particular, the fact that the notion of prominence is relevant to all of them. The work we cite comes from a variety of frameworks and scholarly traditions, and not all of it explicitly mentions prominence. Again, our goal is to put side by side a variety of perspectives upon what we believe is a single abstract notion. The most general perspective we can take is a 'text-centered' one, i.e. we assume that the text exhibits a prominence structure (in the sense of Grosz & Sidner 1986) by abstracting away from the speaker and hearer perspective. In a subsequent and more detailed study one must also address the differences between a speaker perspective and a hearer perspective (see Kehler & Rohde 2013 for an overview).

2 Prominence of individuals

The interest in the ranking of individual discourse referents according to their prominence comes from the need to explain how referential expressions—personal pronouns, proper names, demonstratives, definite noun phrases and (specific) indefinite noun phrases—pick out their referents in discourse. A referent can be determined by means of three interacting semantic/pragmatic operations, namely: identification of descriptive content, domain restriction and referential prominence structure, also called 'salience' and 'salience structure'

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in the semantic and philosophic literature (Lewis 1979, Egli & von Heusinger 1995, von Heusinger 1997, von Heusinger 2013). In section 2.1 we focus on expressions that have rich descriptive content (i.e. full noun phrases like *the cat in the carton*) and argue that the descriptive content is not the only factor that determines their resolution to a specific referent, but that full noun phrases depend on prominence as well. Section 2.2 concentrates on referential expressions with poor descriptive content, such as anaphoric pronouns, whose interpretation is heavily dependent on prominence, which in turn is influenced by a large variety of contextual factors. Finally, one of those factors, topicality, is explored in more detail in section 2.3.

2.1 Definite noun phrases

Referential expressions refer to a uniquely identifiable object (in the case of specific indefinites only identifiable by the speaker). The different types of referential expressions establish the referential relations by different means, still all expressions must "single out" one referent among potentially many referents. In a pre-theoretical definition, a definite singular expression unambiguously denotes or refers to one object, i.e. the object can be identified as the only one that is denoted by the expression. In this section we concentrate on definite noun phrases (or *definite descriptions* in the semantic and philosophical literature). Definite noun phrases are the centrepieces for establishing individual reference, since domain restriction, matching descriptive content and prominence or uniqueness interact in order to determine the intended referent. For example, the expression *the cat* unambiguously refers to an object in the shared knowledge of speaker and hearer that is a cat. "Unambiguous reference" is semantically reconstructed by "uniqueness", i.e. by the condition that there is only one object with the relevant property (Russell 1905, Heim 2011). However, as will be shown below, there is evidence that uniqueness is not flexible enough to account for all uses of definite noun phrases.

The concept of prominence (sometimes also called 'salience') was introduced into the discussion of the semantics of definite noun phrases in the seventies (Lewis 1970, 1979). Lewis (1979: 178) uses it in order to replace Russell's uniqueness condition for definite descriptions: "'the F' denotes x if and only if x is the most salient F in the domain of discourse, according to some contextually determined salience ranking." The notion of prominence in turn, is a bundle of different linguistic and extra-linguistic factors, as Lewis

(1970: 63) notes: "An object may be prominent because it is nearby, or pointed at, or mentioned; but none of these is a necessary condition of contextual prominence." In the following, prominence assigned in a particular discourse context is assigned to one object relative to each set (or to each predicate). The object so designated is the most prominent object of the extension of the predicate. We can therefore speak of 'the most prominent F' in the context. We can illustrate the function of prominence in a short paragraph (based on an example from Lewis (1979: 179; our indices):

(1)   i   Imagine yourself with me as I write these words. In the room is a cat_1, $Bruce_1$,

        ii   who has been making $himself_1$ very salient by dashing madly about.

        iii He_1 is the only cat in the room, or in sight, or in earshot.

        iv   I start to speak to you:

        v   The cat_1 is in the carton. The cat_1 will never meet our other cat_2,

        vi   because our other cat_2 lives in New Zealand.

        vii Our New Zealand cat_2 lives with the Cresswells.

        viii And there he_2'll stay, because Miriam would be sad if **the cat_2** went away.

In (i) the indefinite *a cat* introduces the cat 'Bruce', which is also the topic of discussion in (ii)-(iv). However, in (v) the indefinite *our other cat* introduces a second cat, which is the topic of the subsequent sentences. Thus, the definite noun phrase *the cat* in (vii) refers to the secondly introduced cat. This shows that (static) uniqueness is too strong a condition and that prominence is crucial for the establishing of reference, in particular in an unfolding discourse, which dynamically updates the prominence structure.

2.2 Pronouns

While full noun phrases significantly rely on their descriptive content for unique referential identification, pronouns like *he* and *that* have little or no descriptive content. Their resolution to a unique referent relies entirely on the prominence ranking of individuals in the context. Accordingly, it is not surprising that pronouns have been the prime targets in investigations of referential prominence and the various contextual factors that affect it. The latter include

givenness, syntactic prominence, semantic prominence, implicit causality, and coherence relations, which we briefly present in this section.

The first contextual factor that affects referential prominence is **givenness**. From a discourse perspective, different types of referring expressions introduce discourse referents, which are associated with a given/anaphoric, inferred/linked/bridged, or brand-new/unfamiliar information status (Prince 1981). The general assumption is that given information (including bridged/linked information) is more prominent than non-given one, which is reflected by the preference to use pronouns for the first but not for the latter, as illustrated in (2).

(2)   a. Brad bought a beautiful old Italian car.

         b. Given reference: *He* was enthralled.

         c. Inferred reference: *The steering wheel* was made of genuine wood.

         d. New reference: *Some mechanics* were pleased.

Syntactic prominence is another factor that affects pronoun resolution. In general, referents realized as the grammatical subject are more likely to be subsequently pronominalized compared to direct objects or oblique arguments (Ariel 1990, Gundel et al. 1993, Crawley et al. 1990, Gordon et al. 1993, Lambrecht 1994, Walker et al. 1998, Strube & Hahn 1999, Poesio et al. 2004). The use of a pronoun for the subject argument *Andi* and a repeated name for the non-subject *Paul* (3c) is more natural than for (3d). This holds for both the active sentence (3a) and the passive sentence (3b).

(3)   a. Andi invited Paul to go on a bike ride.

         b. Andi was invited by Paul to go on a bike ride.

         c. He asked Paul to bring the snacks.

         d. Andi asked him to bring the snacks.

Other syntactic structures that have been shown to boost the prominence status of discourse referents are clefts (Arnold 1998, Almor 1999, Foraker & McElree 2007), or the syntactic topic in languages like Japanese (e.g., Walker et al. 1994). The preferred referent for a pronoun has been furthermore shown to correspond to the referent that occupies a parallel syntactic position (Chambers & Smyth 1998).

Semantic prominence represents a third factor that has often been linked to the prominence of a referent in terms of likelihood of subsequent pronominalization (Arnold 1998). For example, in a sentence describing a transitive event with a Source and a Goal referent, participants often choose pronouns to pick up the Goal referent. Interestingly, an otherwise low in prominence object referent is more prone to be subsequently pronominalized (4b) compared to its subject counterpart.

(4)   a. Sarah$_{GOAL}$ took the cat from Rebecca$_{SOURCE}$. She$_{SARAH}$_____

        b. Sarah$_{SOURCE}$ passed the salt to Rebecca$_{GOAL}$. She$_{REBECCA}$_____

Implicit causality has been shown to influence the pronoun resolution as well. Specifically, to identify the biases in pronoun assignment, comprehenders have to compute the causal relations between two events. For example, in (5a) they have to understand that the event described in the first sentence of (5a) is a reaction to what *Mary* did, and in (5b), they have to understand that *Mary* is angry, because *Jane* stole a tennis racket.

(5)   a. Jane hit Mary because she$_{MARY}$ had stolen a tennis racket.

        b. Jane angered Mary because she$_{JANE}$ had stolen a tennis racket.

Garvey & Caramazza (1974) divided verbs into three classes depending on the direction of pronoun interpretation, i.e. NP1-bias (e.g. *anger*, *frighten*, *delight*), NP2-bias (e.g. *hit, scold, admire*), or NP-neutral (e.g. *see, babysit, notice*).

Finally, pronouns are assigned a value (i.e. a referent) based on the **coherence relations** that hold between two adjacent utterances (Hobbs 1979; Kehler 2002; Kaiser 2010). For example, given the *result*-interpretation in (6a), the pronoun *he* is interpreted as referring back to the direct object referent, *Kerry*. Under a reading in which the events described in the matrix and subordinate clause represent an enumeration of the events that happened (6b), the subject pronoun *he* is preferentially interpreted to have *Bush* as an antecedent (Kehler et al. 2008).

(6) a. Bush narrowly defeated Kerry, and as a result he$_{KERRY}$ took some days off.

      b. Bush narrowly defeated Kerry, and then he$_{BUSH}$ took some days off.

2.3 Topicality

Topicality is yet another factor that depends on the previous prominence structure, and updates this structure to a new prominence structure. Here we concentrate on its subnotions aboutness topic, discourse topic, and contrastive topic (see Jacobs 2001, Roberts 2012, Hinterwimmer 2012 for a more general overview and discussion).

Most sentences (with the exception of thetic sentences such as *the telephone is ringing*) are assumed to have an **aboutness topic**—the individual about which the respective sentence is felt to convey relevant information and are sometimes also characterised as the logical subject (cf. Strawson 1964, Reinhart 1981). Aboutness topics tend to be expressed by grammatical subjects and the subject is interpreted as aboutness topic by default, as in (7a). However, in languages with (relatively) free word order such as German, where constituents other than grammatical subjects can easily occur in clause-initial position, fronted noun phrases are often (though not always) understood as the aboutness topic of the respective sentence, whether they are the grammatical subjects or not. For instance, in the first sentence in (7b) the direct object is the aboutness topic. This is evident from the pronoun resolution preferences in the second sentence of (7a) and (7b): While the personal pronoun *er* tends to refer to the aboutness topic, although it is in principle free to pick out both potential antecedents, the demonstrative pronoun *der* has a rather strong bias against picking out the topic (Bosch and Umbach 2006, Hinterwimmer to appear; see also Cook & Bildhauer 2013 on difficulties in identifying aboutness topics in natural texts). The fact that *der* in (7b) cannot refer to fronted object suggests that the object is the aboutness topic.

(7)   a. [Der neue Assistenzarzt]$_i$ untersuchte [den Patienten auf Zimmer 3]$_k$. Der$_k$/Er$_{i,k}$ war nämlich sehr geduldig.

        The new assistant doctor examined the patient in room 3, since he {DEM$_k$/Ppro$_{i,k}$} was very patient.

    b. [Den Patienten auf Zimmer 3]$_i$ untersuchte [der neue Assistenzarzt]$_k$. Der$_k$/Er$_{i,k}$ war nämlich sehr geduldig.

        The patient in room 3 was examined by the new assistant doctor, since he {DEM$_k$/Ppro$_{i,k}$} was very patient.

The term **discourse topic** is used with two different meanings in the literature (see Roberts 2012 and the references cited therein for detailed discussion): On the one hand, it designates the current question under discussion, i.e. the explicit or implicit question a discourse segment is understood to answer (Roberts 1996). On the other hand, it is often understood as designating the individual about which a discourse segment conveys relevant information (Prince 1992). In a mini-discourse like the one in (8), *Karl* is intuitively understood as the discourse topic in the latter sense of the term, while a question such as *How is Karl doing at the moment*? is the discourse topic in the first sense. It is the second sense that is the most relevant one for our current purposes. Interestingly, in (8) the demonstrative pronoun in the last sentence is understood as referring to Peter, although *Peter* is not only the grammatical subject of the preceding sentence, but also occurs in canonical clause initial position. The personal pronoun, in contrast, is in principle free to pick out both potential antecedents, but has a slight preference for *Karl* (although not all speakers share this intuition).

(8) $Karl_i$ ist stinksauer darüber, dass Claudia zu Paulas Hochzeit eingeladen wurde und er_i nicht. Woher $Karl_i$ das weiß? $[_{SU} Peter]_k$ hat $[_{DO} es]$ $[_{IO} ihm]_i$ gesagt. $\{Der_k/Er_{i,k}\}$ war gerade hier.
Karl is terribly annoyed because Claudia has been invited to Paula's wedding and he hasn't. [How does $Karl_i$ know? $Peter_k$ told him_i. He $\{DEM_k/Ppro_{i,k}\}$ has just been here].

The behaviour of demonstrative pronouns in such cases can either be taken to show that they are subject to an independent ban against picking out discourse topics (Bosch & Umbach 2006) or that the notion of discourse topicality can at least in some cases be reduced to that of a chain of aboutness topics. If the latter option is chosen, the fact that the demonstrative pronoun has to pick out *Peter*, while the personal pronoun has a preference for picking out *Karl* follows directly from the fact that *Karl* is the aboutness topic of not only the first two sentences, but also of the third sentence in (8). Either way, the behaviour of the pronouns in (7) and (8) clearly shows that topicality is an independent prominence related notion that cannot be reduced to grammatical notions such as subjecthood or fronting.

Contrastive topics are marked by a characteristic intonation pattern: a rising accent on the fronted constituent, which functions as the contrastive topic, is combined with a falling accent on some sentence-internal constituent, which is thus marked as focal (see Büring 1997, 2003

and the references cited therein for detailed discussion). A typical example is given in (9), where rising accents are marked by /, and falling accents by \:

(9)   /SCHOENberg MAG\ ich (während ich Berg und Webern hasse).
        Schoenberg, I like (while I hate Berg and Webern).

Crucially, the sentence in (9) is automatically understood as being implicitly contrasted with sentences involving alternatives to Schoenberg, such as the other two composers of the second Viennese School, Alban Berg and Anton Webern. As argued for in detail in Büring (1997, 2003), contrastive topics are always understood as partial answers to a question under discussion (i.e. a discourse topic in the first sense of the term discussed above) and thus indicate that the relevant question has been broken down into various subquestions (see section 4 below for additional discussion). The sentence in (9) is thus naturally understood as: (a) a *partial* answer to an explicit or implicit question about the speaker's opinion regarding the three composers of the Second Viennesse School, and (b) as a complete answer to the subquestion of that question that asks for the speaker's opinion about Schoenberg. Consequently, the three composers of the Second Viennese School are the discourse topic (of some discourse segment) in the second sense of the term discussed above, while each one of them is at the same time the aboutness topic and the contrastive topic of its own sentence. Discourse topics (in the second sense of the term) can thus not only be aboutness topics that are repeated over a discourse segment (as in (8) above), but also „super-aboutness topics" that are decomposed into several aboutness topics. In the latter case, the respective „sub-aboutness topics" have to be marked as contrastive topics (but see Hinterwimmer, 2011, for the discussion of more complex cases).

Finally, a few words should be said about **topic chains**. Givón (1981, 1983) extensively discusses the graded concept of 'topic continuity' (the situation in which the same topic extends over several clauses) with respect to the behavior of discourse referents across more than one sentence. This behavior is mirrored by the type of referring expressions used. Givón showed that a discourse referent taken up by a zero anaphor is a highly activated topic and is most continuous, i.e. it is mentioned by several anaphoric expressions in the discourse, while a referent associated with an indefinite noun phrase is less accessible and therefore usually discontinuous. That is, there is an inverse correlation between activation and explicitness of referring expression.

Assuming that more important referents tend to be more anaphorically accessible and cataphorically persistent, Givón (1981, 1983) proposed the three methods for measuring topic continuity which correlate with the form and type of the referring expression used: referential distance, potential interference, and referential persistence. The first factor, 'referential distance', determines how recently an entity has been mentioned, by looking at previous sentences. Givón (1983) showed that the smaller the distance between antecedent and anaphor, the more important or prominent the referent of the anaphor is. The second factor. 'potential interference', describes the interaction of the descriptive content of the expression with the descriptive contents of similar referring expressions. The observed tendency is that the more descriptive material is given, the fewer are the competitors for a referent. The third factor, 'referential persistence', measures how long the entity will remain in the subsequent discourse after it was introduced for the first time. This parameter is less well studied because most theories concentrate on the way in which a referent was mentioned in the preceding discourse (Ariel 1988, Grosz et al. 1995) and since it is quite difficult to establish the appropriate factors that could influence it. Let us have a look at a concrete example:

(10)   It was late and everyone had left the café except an old man who sat in the shadow the leaves of the tree made against the electric light. [...] **The two waiters$_{1+2}$** inside the café knew that the old man was a little drunk [...]. "Last week he tried to commit suicide," **one waiter$_i$** said. "Why?" [...] **The younger waiter$_1$** went over to him. [...] The old man looked at **him$_1$**. **The waiter$_1$** went away. [...] **The waiter who was in a hurry$_2$** came over. "Finished," **he$_2$** said [...]. "Another," said the old man. "No. Finished." **The waiter$_2$** wiped the edge of the table with a towel and shook **his$_2$** head. The old man stood up [...]. "Why didn't you let him stay and drink?" **the unhurried waiter$_1$** asked. (Hemingway 1925, 380; *A clean, well-lighted place*).

(11) Structure:
       The younger waiter$_1$ ... him$_1$ ... the waiter$_1$ ... The waiter who was
       in a hurry$_2$ ... he$_2$ ... the waiter$_2$ ... his$_2$ ... the unhurried waiter$_1$

As shown in (10), the noun phrase *the two waiters* introduces two discourse referents. One of the referents is then picked out by *the younger waiter* and subsequently referred to by means of *him* and *the waiter*. The other referent is picked out by *the waiter who was in a hurry* and

then referred to by *he* and *the waiter*. In both cases, the respective waiter is picked out by a pronoun after first having been introduced as the aboutness topic of the preceding sentence via a definite description (*the younger waiter* and *the waiter who was in a hurry*, respectively). As soon as another individual has been the aboutness topic of the preceding sentence (*the old man*, in both cases), a definite description has to be used again to refer to the respective waiter. Finally, in order to change reference back to the first-mentioned waiter in the last sentence, a definite description with even more descriptive material has to be used (*the unhurried waiter*). In all three cases, Givón (1981) makes the right predictions: Since aboutness topics are the most prominent entities in their clauses, a referring expression with (almost) no descriptive content can be used to pick out a recently mentioned aboutness topic even in cases of potential interference/ambiguity. In order to pick out a recent non-topic referent, a referring expression with more descriptive content has to be used, such as *the waiter*. This noun phrase does not resolve the ambiguity which waiter in the whole discourse unit is meant). Finally, in order to pick out a non-recent entity, a referring expression has to be used that contains enough descriptive content to resolve the potential ambiguity, such as *the unhurried waiter*.

In a series of papers, von Heusinger and Chiriacescu (Chiriacescu & von Heusinger 2010, Chiriacescu 2011, von Heusinger & Chiriacescu 2013) have further differentiated Givón's parameters of topic continuity in three measurable parameters, which all represent the "forward looking" or "discourse structuring potential" of a referent. The discourse structuring potential is understood as the property of an expression that introduces a discourse referent to provide information about the status of that referent in the subsequent discourse. It is characterized by: (a) referential persistence, which measures the frequency with which a referent is mentioned in the subsequent discourse (Givón 1983, Gernsbacher & Shroyer 1989, Arnold 1998); (b) topic shift potential, which measures the distance in number of sentences with which a non-topical referent is mentioned again as a topic for the first time in the subsequent discourse (Givón's topic continuity is different from this parameter, since it measures the duration of being a topic and not the first usage as a topic); and (c) explicitness of the anaphoric expression, which investigates the type of referring expression that picks out the referent after its first introduction. The lexical and descriptive material is considered to be inverse to the prominence of the discourse referent.

3 Prominence of events and times

There is a tradition in semantics that represents events and times as special kinds of discourse referents on a par with individuals. In that sense, the notion of prominence should be relevant for events and times as well. Indeed, it is commonly believed that verb tenses refer anaphorically to events and times in essentially the same way as pronouns refer to individuals (Kamp and Rohrer, 1983; Hinrichs, 1986; Webber, 1988). This idea has been applied in particular to modelling temporal relations in discourse, such as the chronological sequence in the narrative. More recent studies have shown, however, that this picture is oversimplified, and temporal relations result from the interaction of various factors including tense and aspect semantics, coherence relations, lexical and world knowledge, etc. (see e.g. Lascarides and Asher 1993, Kehler 2000). Moreover, one should wonder how temporal relations are established in tenseless languages such as Mandarin Chinese, i.e. languages where the topic time (the temporal discourse referent, cf. Klein, 1994) cannot be introduced or managed by the predicate of the sentence. It turns out that in tenseless languages temporal reference depends on reference to individuals, and, as suggested by Bittner (to appear) tense chains are parallel to topic chains. The idea developed by Bittner is that a topic introduces also a topic state, to which the events and states introduced by the predicates of comment sentences refer, that is, a predicational relation holds between that topic state and non-tensed predicates that form a topic chain with it (Li 2005). A Mandarin example is given in (12a,b), its translation in (13a,b) and its analysis in terms of topic-comment structure in (14) (see Bittner (2013) for more details)

(12) a. Na Liang che, jiaqian tai Gui   yanse hai bu   hao, Lisi bu   xihuan
          that CL   car, price   too expensive color also NEG good Lisi NEG like
       b. Jintian qu   kan le,   hai kai le   yi huir, haishi bu   xihuan
          Today   go   watch ASP also drive ASP a   while yet   NEG like

(13) a. That car is too expensive, its color is also ugly, Lisi doesn't like it.
       b. Today he went to see it, he also drove it for a while, he still didn't like it.

(14) **1. topic state S1** general state of the car now; that car$_{S1}$

          ... comment1: S1.1 is part of S1; price too expensive$_{S1:1}$

          ... comment2: S1.2 is part of S1; color also not good$_{S1:2}$

          ... comment3: S1.3 is part of S1; new discourse referent Lisi; Lisi not like$_{S1:3}$

2. topic state S2 focus on part of S1 today, with Lisi in the background; today$_{S2}$

... **comment1:** E2.1 is part of S2; go watch ASP$_{E2:1}$

... **comment2:** E2.2 is part of S2; also drive ASP$_{E1:2}$ a while

... **comment3:** S2.3 is part of S1; still not like$_{S2:3}$

Looking in particular at tenseless languages, temporal relations have been described as depending on the aspectual properties of the predicate: its Aktionsart and the contribution of aspectual markers. In Bittner's model, aspectual operators explicitly introduce events as referents in the discourse (of type E or S), and relate them to the current topic state, therefore making them accessible for the temporal chain. The usual principles of temporal progression defined in previous approaches may then apply: boundedness vs. unboundedness for temporal succession vs. co-temporal extension (see also Smith & Erbaugh 2005; Lin 2006). An advantage of a model attributing temporal indices to discourse referents, however, is precisely that it makes possible to integrate to the temporal chain the information contributed by discourse relations: for instance, S2 above may be in a subordination relation with respect to S1, being an elaboration of the general state of the car. Tenseless and topic-prominent languages like Mandarin offer a clear set of prominence relations for organizing discourse (e.g. subordination, topic-comment structures), thus offering an ideal context for exploring the link between temporal reasoning and discourse interpretation.

4 Prominence of discourse segments and discourse goals

Not only individuals and events that we talk about, but also elements of the discourse itself—speech acts and communicative intentions or goals that stand behind them—can be ranked by prominence. One prominence-related notion that applies specifically in this domain is **nuclearity**. Various theories of discourse structure make a distinction between nucleus-satellite and multinuclear discourse relations (Mann & Thompson 1988), or in another terminology, subordinating vs. coordinating relations (Asher & Lascarides 2003). Nucleus-satellite relations establish an asymmetry between the discourse segments they connect. The nuclear segment is more central for the overall goal of the discourse. This asymmetry manifests itself most clearly in the possibilities for attachment of new discourse material and for anaphoric reference. For example, (15b) explains why the speaker believes (15a) by reference to a source. That is, the discourse relation between (15a) and (15b) is explanation, evidence, or source (in different terminologies). Relations of this kind are generally believed

to be subordinating, or nucleus-satellite, (15a) being the nucleus, and (15b) the satellite. Crucially, the following sentence (15c) can either attach to (15a) and continue the story about John, or to (15b) and continue the explanation. The pronoun *he* in (15c) can therefore be resolved to John in the first case, and to Bill in the second (a generalisation commonly referred to as the right frontier constraint, cf. Polanyi 1988, Asher & Lascarides 2003).

(15) a. John broke the vase.
      b. Bill told me that.
      c. He*John/Bill* …

In contrast, in multinuclear or coordinating relations, such as parallel in (16), there is no such asymmetry and all that counts is recency. The following sentence can only be attached to the most recent preceding sentence, and hence the pronoun *he* can only be resolved to *Bill*, the subject of the most recent sentence. As illustrated in (15), nuclearity can work against recency by making a nucleus more prominent and more likely to be referred to.

(16)   John broke the vase. Bill broke the mirror. He$_{BILL}$ ...

The same asymmetry can also be phrased in terms of communicative goals in a goal-based framework of discourse structure such as Grosz & Sidner's (1986). The communicative goal of (15a) dominates that of (15b), i.e. achieving the goal of (15b) contributes to achieving the goal of (15a). Goals, in turn, are managed by means of a stack. The dominant goal stays on the stack while the subordinate goal is processed, and therefore can be returned to when the subordinate goal is achieved and popped off the stack. This "reopens" it and makes the associated discourse referents accessible for anaphoric reference.

The goal-based reformulation of nuclearity reveals another, more basic notion of prominence behind it, which could be labelled as **priority**—the property of being most "urgent" goal on the agenda, which corresponds to the position of a goal on top of the stack. Apart from discourse attachment and anaphora, this notion is at work in the domain of information structure. To see this, it is useful to think of discourse goals as questions under discussion (QUD). On this view, the goal of an utterance, a bigger discourse segment or the whole discourse is to answer an explicit or implicit question (Klein & von Stutterheim 1987, van Kuppevelt 1995, Ginzburg 1996, Roberts 1996, Büring 2003). (This corresponds to the first

meaning of discourse topic discussed in section 2.3.) Questions have several interrelated aspects: they are sets of mutually exclusive alternative informational states determined by the communication participants' decision problem (van Rooy, 2003)—this aspect is most closely related to their 'goal side'; they are also sets of mutually compatible Hamblin alternatives, e.g. {Mary praised Bill, Mary praised Sue, Mary praised John}, for a question like *Who (of Bill, Sue and John) did Mary praise?*; and they can also be seen as open propositions, or predicates where the *wh*-term is replaced by a variable: λx[Mary praised(x)]. The latter two aspects are most closely related to their linguistic side and to information structure. The question on top of the stack determines the information structure of a sentence (Roberts, 1996): The question predicate corresponds to the background and the variable to the focus of the sentence. Other linguistic devices that operate on the stack of QUDs include contrastive topics (already discussed in section 2), discourse connectives like *but*, which signal a shift of prominence from one QUD to another (Jasinskaja and Zeevat 2009), and a range of others.

5 Conclusion

In this paper we have tried to summarize the main findings pertaining to the notion of prominence that is relevant for discourse structure and discourse interpretation. We have demonstrated a number ways in which discourse referents are unequal in their ability to be picked out by different types of referring expressions. The properties or relations that make referents unequal in this respect (syntactic and semantic prominence, givenness, topicality, etc.) are the different manifestations of prominence in discourse. We have further argued that not only individuals, but also other kinds of entities in the universe of discourse are subject to asymmetries that impact their ability to be referred to or serve as attachment sites for structural relations. Temporal structure can be parasitic on topic structure and is therefore closely related to topicality, while discourse segments and discourse goals are ranked by nuclearity and priority. The pervasive influence of prominence at all levels of discourse connectivity suggests that prominence should be counted among the central relations that give structure to the discourse and language in general.

Bibliographical References

Almor, Amit 1999. Noun-Phrase, anaphora and focus. The informational load hypothesis. *Psychological Review* 106(4). 748–765.

Ariel, Mira 1988. Referring and accessibility. *Journal of Linguistics* 24(1). 65–87.

Ariel, Mira 1990. *Accessing Noun-Phrase Antecedents*. London & New York: Routledge.

Arnold, Jennifer E. 1998. *Reference Form and Discourse Patterns*. Stanford: Stanford University. PhD dissertation.

Asher, Nicholas & Alex Lascarides. 2003. *Logics of Conversation. Studies in Natural Language Processing*. Cambridge: Cambridge University Press.

Bittner, Maria *to appear*. Topic states in Mandarin discourse. *Proceedings of NACCL 25*. Ann Arbor, MI: University of Michigan..

Bosch, Peter & Carla Umbach 2006. Reference determination for demonstrative pronouns. In Dagmar Bittner & Natalia Gagarina (eds.). *Proceedings of the Conference on Intersential Pronominal Reference in Child and Adult Language*. Berlin: Germany. 39–51.

Büring, Daniel 1997. *The Meaning of Topic and Focus — The 59th Street Bridge Accent*. London: Routledge.

Büring, Daniel 2003. On D-trees, beans and B-accents. *Linguistics and Philosophy* 26. 511–545.

Burkhardt, Petra 2006. Inferential bridging relations reveal distinct neural mechanisms: Evidence from event-related brain potentials. *Brain and Language* 98(2). 159–168.

Chafe, Wallace 1976. Givenness, contrastiveness, definiteness, subjects, topics, and point of view. In Charles N. Li (ed.) *Subject and Topic*. New York: Academic Press. 25-55.

Chambers, Craig G. & Ronald Smyth 1998. Structural parallelism and discourse coherence: A test of centering theory. *Journal of Memory and Language* 39. 593–608.

Crawley, Rosalind A., Rosemary Stevenson & David Kleinman 1990. The use of heuristic strategies in the interpretation of pronouns. *Journal of Psycholinguistic Research* 19. 245–264.

Chiriacescu, Sofiana & Klaus von Heusinger 2010. Discourse prominence and *pe*-marking in Romanian. *International Review of Pragmatics* 2(2). 298–332.

Chiriacescu, Sofiana 2011. *The Discourse Structuring Potential of Indefinite Noun Phrases. Special Markers in Romanian, German and English*. Stuttgart: Universität Stuttgart. PhD dissertation.

Cook, Philippa & Felix Bildhauer 2013. Identifying "aboutness topics": two annotation experiments. *Dialogue & Discourse* 4(2). 118–141.

Egli, Urs & Klaus von Heusinger 1995. The epsilon operator and E-type pronouns. In Urs Egli et al. (eds) *Lexical Knowledge in the Organization of Language*. Amsterdam: Benjamins. 121–141.

Foraker, Stephanie & Brian McElree 2007. The role of prominence in pronoun resolution: Active versus passive representations. *Journal of Memory and Language* 56. 357–383.

Garvey, Catherine & Alfonso Caramazza 1974. Implicit causality in verbs. *Linguistic Inquiry* 5. 459–469.

Gernsbacher, Morton A. & Suzanne Shroyer 1989. The cataphoric use of the indefinite *this* in spoken narratives. *Memory & Cognition* 17(5). 536–540.

Ginzburg, Jonathan 1996. Dynamics and the semantics of dialogue. In Jerry Seligman & Dag Westerståhl (eds) *Logic, Language and Computation*, volume 1. Standord, CA: CSLI Publications. 1–16.

Givón, Talmy 1981. On the development of the numeral "one" as an indefinite marker. *Folia Linguistica Historica*. 35–53.

Givón, Talmy 1983. Topic Continuity in Discourse: An Introduction. In Talmy Givón (ed) *A Quantitative Cross- Language Study*. Amsterdam: Benjamins. 1-14.

Gordon, Peter, Barbara J. Grosz & Laura Gilliom 1993. Pronouns, names, and the centering of attention in discourse. *Cognitive Science* 17. 311–341.

Grosz, Barbara J., Aravind K. Joshi & Scott Weinstein 1995. Centering: A framework for modeling the local coherence of discourse. *Computational Linguistics* 21. 203–226.

Grosz, Barbara. J. & Candace L. Sidner 1986. Attention, intentions and the structure of discourse. *Computational Linguistics* 12. 175–204.

Gundel, Jeanette, Nancy Hedberg & Ron Zacharski 1993. Cognitive status and the form of referring expressions in discourse. *Language* 69. 274–307.

Heim, Irene 2011. Definiteness and indefiniteness. In Klaus von Heusinger, Claudia Maienborn & Paul Portner (eds) *Semantics. An International Handbook of Natural Language Meaning*, volume 2. Berlin: de Gruyter. 996–1025.

von Heusinger, Klaus 1997. *Salienz und Referenz. Der Epsilonoperator in der Semantik der Nominalphrase und anaphorischer Pronomen*. Berlin: Akademie Verlag.

von Heusinger, Klaus 2013. The salience theory of definiteness. In Alessandro Capone, Franco Lo Piparo & Marco Carapezza (eds) *Perspectives on Linguistic Pragmatics*. Berlin: Springer. 349–374.

von Heusinger, Klaus & Sofiana Chiriacescu 2013. The Discourse Structuring Potential of Differential Object Marking. The case of indefinite and definite direct objects in Romanian. *Revue Roumaine de Linguistique* LVIII. 439–456.

Himmelmann, Nikolaus & Beatrice Primus 2015. Prominence beyond prosody. In: De Amedeo Dominicis (ed*.). Prominences in Linguistics. Proceedings of the pS-prominenceS International Conference*. Viterbo: DISUCOM Press.

Hinrichs, Erhard W. 1986. Temporal anaphora in discourses of English. *Linguistics and Philosophy* 9. 63–82.

Hinterwimmer, Stefan 2011. Information structure and truth-conditional semantics. In Klaus von Heusinger, Claudia Maienborn & Paul Portner (eds) *Semantics: An International Handbook of Natural Language Meaning*, volume 2. Berlin: de Gruyter. 1875–1908.

Hinterwimmer, Stefan *to appear*. A unified account of the properties of demonstrative pronouns in German. In Patrick Grosz, Irene Heim, Pritty Patel-Grosz & Igor Yanovich (eds) *A Special Volume for the Workshop on Pronouns at the 40th Conference of the North Eastern Linguistic Society (NELS 40)*. Amherst, MA: GLSA

Hobbs, Jerry R. 1979. Coherence and coreference. *Cognitive science* 3. 67–90.

Jacobs, Joachim 2001 . The Dimensions of Topic-Comment. *Linguistics* 39. 641–681.

Jasinskaja, Katja & Henk Zeevat 2009. Explaining conjunction systems: Russian, English, German. In Arndt Riester & Torgrim Solstad (eds.) *Proceedings of Sinn und Bedeutung 13, volume 5 of SinSpeC*. Working Papers of the SFB 732. Stuttgart: University of Stuttgart. 231–245.

Kaiser, Elsi 2010. Effects of contrasts on referential form: Investigating the distinction between strong and weak pronouns. *Discourse Processes* 47. 480–509.

Kamp, Hans & Christian Rohrer 1983. Tense in texts. In Rainer Bäuerle, Christoph Schwarze & Arnim von Stechow (eds). *Meaning, Use and Interpretation of Language*. Berlin: de Gruyter. 250–269.

Kehler, Andrew 2000. Resolving temporal relations using tense meaning and discourse interpretation. In Martina Faller, Stefan Kaufmann & Marc Pauly (eds) *Formalizing the Dynamic of Information*. Stanford: CSLI Publications. 189–205

Kehler, Andrew 2002. *Coherence, reference, and the theory of grammar*. Stanford: CSLI Publications.

Kehler, Andrew, Laura Kertz, Hannah Rohde & Jeffery L. Elman 2008. Coherence and coreference revisited. *Journal of Semantics* 25. 1–44.

Kehler, Andrew & Hannah Rohde 2013. A probabilistic reconciliation of coherence-driven and centering- driven theories of pronoun interpretation. *Theoretical Linguistics* 39. 1–37.

Klein, Wolfgang 1994. *Time in Language*. London: Routledge.

Klein, Wolfgang & Christiane von Stutterheim 1987. Quaestio und die referentielle Bewegung in Erzählungen. *Linguistische Berichte* 109. 163–185.

Lambrecht, Knut 1994. *Information Structure and Sentence Form: Topic, Focus and the Mental Representations of Discourse Referents*. Cambridge, MA: Cambridge University Press.

Lascarides, Alex & Nicholas Asher 1993. Temporal interpretation, discourse relations and common sense entailement. *Linguistics and Philosophy* 16. 437–493.

Lewis, Daniel 1970. General semantics. *Synthese* 22. 18–67.

Lewis, Daniel 1979. Scorekeeping in a language game. In Rainer Bäuerle, Urs Egli & Arnim von Stechow (eds), *Semantics from Different Points of View*. Dordrecht: Springer. 172–187

Li, Weidan 2005. *Topic chains in Chinese Discourse*. München: Lincom.

Lin, Jo-Wang 2006. Time in a language without tense: The case of Chinese. *Journal of Semantics* 23. 1–53.

Mann, William. C. & Sandra Thompson 1988. Rhetorical structure theory: Toward a functional theory of text organization. *Text* 8. 243–281.

Poesio, Massimo, Rosemary Stevenson, Barbara di Eugenio & Janet Hitzeman. 2004. Centering: A Parametric theory and its instantiations. *Computational Linguistics* 30(3). 309-363

Polanyi, Livia. 1988. A formal model of the structure of discourse. *Journal of Pragmatics* 12. 601–638.

Prince, Ellen F. 1981. Toward a taxonomy of given-new information. In Peter Cole (eds), *Radical Pragmatics*. New York: Academic Press. 223–256.

Prince, Ellen F. 1992. The ZPG letter: Subjects, definiteness and information status. In Sandra Thompson & William C. Mann (eds) *Discourse Description: Diverse analyses of a Fund-Raising Text*. Philadelphia, PA: John Benjamins. 295–325

Reinhart, Tanja 1981. Pragmatics and linguistics: An analysis of sentence topics. *Philosophica* 27. 53–93.

Roberts, Craige 1996. Information structure in discourse: towards an integrated formal theory of pragmatics. *OSU Working Papers in Linguistics: Papers in Semantics* 49. 91–136.

Roberts, Craige 2012. Topics. In Claudia Maienborn, Klaus von Heusinger & Paul Portner (eds) *Semantics: An International Handbook of Natural Language Meaning.* Berlin: de Gruyter. 1908–1934

Russell, Bertrand 1905. On denoting. *Mind* 14(56). 479-493.

Smith, Carlota & Mary Erbaugh 2005. Temporal interpretation in Mandarin Chinese. *Linguistics* 43(4). 713-756.

Schumacher, Petra 2009. Definiteness marking shows late effects, during discourse processing: Evidence from ERPs. In Sobha Lalitha Devi, António Branco & Ruslan Mitkov (eds.) *Proceedings of DAARC 2009.* Berlin: Springer. 91–106.

von Stutterheim, Christiane & Wolfang Klein 1989. Referential movement in descriptive and narrative discourse. In Rainer Dietrich & Carl F. Graumann (eds.) *Language Processing in Social Context.* Amsterdam. North Holland. 39–76.

Strawson, Peter F. 1964. Identifying reference and truth values. *Theoria* 30. 96–118.

Strube, Michael & Udo Hahn. 1999. Functional Centering—grounding referential coherence in information structure. *Computational Linguistics* 25(3). 309-344.

van Kuppevelt, Jan 1995. Discourse structure, topicality and questioning. *Journal of Linguistics* 31. 109–147.

van Rooy, Robert 2003. Questioning to resolve decision problems. *Linguistics and Philosophy* 26. 727–763.

Vogel, Ralf 2015. Is prominence a useful concept for the theory of syntax? In: De Amedeo Dominicis (ed*.). Prominences in Linguistics. Proceedings of the pS-prominenceS International Conference.* Viterbo: DISUCOM Press.

Walker, Marilyn, Aravind Joshi & Ellen Prince 1998. Centering in naturally occuring discourse: An overview. In Marilyn Walker, Aravind Joshi & Ellen Prince (eds.) *Centering Theory in Discourse.* Oxford: Clarendon Press. 1–28.

Walker, Marilyn, Massayo Iida & Sharon Cote 1994. Japanese discourse and the process of centering. *Computational Linguistics* 20. 193–232.

Webber, Bonnie 1988. Tense as discourse anaphor. *Computational Linguistics* 14. 61–73.